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UL 813

**STANDARD FOR SAFETY**

Commercial Audio Equipment

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UL Standard for Safety for Commercial Audio Equipment, UL 813

Seventh Edition, Dated December 13, 1996

### **Summary of Topics**

***This revision to UL 813 is being issued to remove the reference to the withdrawal date of UL 873 and to address universal upkeep of UL Standards for Safety. These revisions are considered to be non-substantive and not subject to UL's STP process.***

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**UL 813**

**Standard for Commercial Audio Equipment**

The first, second, and third editions were titled Standard for Sound-Recording and -Reproducing Equipment.

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**Seventh Edition**

**December 13, 1996**

This UL Standard for Safety consists of the Seventh Edition including revisions through October 4, 2013.

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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**APPENDIX A**

Standards for Components..... A1

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## INTRODUCTION

### 1 Scope

1.1 These requirements cover power-operated audio equipment and accessories, rated 300 volts or less, that are intended for use in commercial enterprises or establishments and other locations such as churches, schools, theaters, and factories. This equipment is for use on supply circuits in accordance with the National Electrical Code, NFPA 70.

1.2 Commercial audio equipment includes amplifiers, preamplifiers, mixers, signal processors, public address and centralized sound systems, intercommunicating devices and systems, phonographs, tape players, and recorders, radio receivers, tuners, and tuner-amplifiers, power supplies intended for use with commercial sound systems, special effects units, and integral amplifier-speakers.

1.3 These requirements also cover accessories for use with commercial audio equipment such as tape erasers and head demagnetizers.

1.4 These requirements do not cover equipment that is covered by individual requirements separate from this standard such as:

- a) Dictating and transcribing machines for office use;
- b) Musical instruments and accessories for non-professional use;
- c) Household type amplifiers, tuner-amplifiers, phonographs, radio receivers, and recorders; and
- d) Amateur radio equipment.

1.5 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this standard, and that involves a risk of fire or of electric shock or injury to persons shall be evaluated using appropriate additional component and end-product requirements to maintain the level of safety as originally anticipated by the intent of this standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this standard does not comply with this standard. Revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard.

1.5 revised December 7, 1999

## 2 General

### 2.1 Components

2.1.1 Except as indicated in 2.1.2, 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.

2.1.2 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 standard, or
- b) Is superseded by a requirement in this standard.

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

2.1.4 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.

### 2.2 Units of measurement

2.2.1 When a value for measurement is followed by a value in other units in parentheses, the first stated value is the requirement.

2.2.2 Unless otherwise indicated, all voltage and current values mentioned in this standard are root-mean-square (rms).

### 2.3 Undated references

2.3.1 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.

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### 3 Glossary

- 3.1 For the purpose of this standard the following definitions apply.
- 3.2 CORD-CONNECTED EQUIPMENT – Equipment intended to be connected to the supply circuit by means of a flexible cord.
- 3.3 FIBER – Where the term “fiber” is used, vulcanized fiber is meant.
- 3.4 HAZARDOUS ENERGY – Circuit energy that involves a possible source of fire or electric shock.
- 3.5 INSULATION, FUNCTIONAL – The insulation necessary for the intended functioning of the equipment and for basic protection against electric shock.
- 3.6 INSULATION, REINFORCED – An improved functional insulation with such mechanical and electrical qualities that it, provides the same degree of protection against electric shock as an insulation system comprised of both functional insulation and supplementary insulation.
- 3.7 INSULATION, SUPPLEMENTARY (PROTECTIVE) – An independent insulation provided in addition to the functional insulation to protect against electric shock in case of failure of the functional insulation.
- 3.8 INTERLOCK – A device that automatically eliminates electrical shock from a part that becomes accessible when the enclosure of the part is opened or a cover is removed.
- 3.9 LIVE PART – A part involving a possible source of fire or electric shock.
- 3.10 ORDINARY TOOL – Flat-bladed and Phillips screwdriver and pliers.
- 3.11 POWER AMPLIFIERS – Equipment capable of sufficiently increasing the amplitude or power of a low level electric audio signal to drive a speaker. Equipment may be portable, rack mounted, or permanently installed, with output terminals for connection to speaker loads, or with self contained speaker(s).

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3.12 PRIMARY CIRCUIT – Circuit that is conductively connected to the supply circuit.

3.13 RACK MOUNTED EQUIPMENT – Equipment that is provided with means for rack mounting.

3.14 SECONDARY CIRCUIT – Circuit that is conductively connected to the secondary winding of an isolating transformer.

3.15 SIGNAL PROCESSING UNITS – An amplifier or other equipment connected to a low level audio signal source to present required input and output impedances and provide equalization, buffering, isolation, mixing, or gain so the signal may be further processed.

## CONSTRUCTION

### 4 General

4.1 The equipment shall be constructed so that:

- a) Intended use and user servicing does not result in a risk of fire, electric shock, or injury to persons;
- b) The materials and components are used within their electrical, mechanical, and temperature limits; and
- c) The assembly protects the components and wiring from being displaced or damaged.

4.2 The materials and components referred to in 4.1 and in other requirements are those involving a risk of fire, electric shock, or injury to persons and are so considered unless specifically indicated otherwise.

4.3 A transformer that is intended to be connected across the supply circuit shall comply with the construction requirements in the Standard for Transformers and Motor Transformers for Use in Audio-, Radio-, and Television-Type Appliances, UL-1411.

### 5 Enclosures

#### 5.1 General

5.1.1 Equipment shall be provided with an enclosure that houses all vacuum tubes, motor driven parts, and live parts, other than cords and cables, that involve a risk of fire or electric shock. The enclosure shall be constructed so that it will protect the various parts of the equipment against mechanical damage.

5.1.2 Equipment shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it might be subjected, without increasing the risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other serious defects.

5.1.3 The bottom shall be complete so as to protect all electrical parts. When evaluating the bottom of movable equipment, consideration shall be given to the possibility of the equipment being placed on objects that might damage wiring or other electrical components.

5.1.4 The enclosure of permanently connected equipment shall be constructed of metal.

*Exception: Panel meters or other polymeric parts may serve as part of the required enclosure defined in 5.1.8 if they are found to be in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.*

5.1.5 The thickness of a sheet metal enclosure shall be as indicated in Table 5.1.

5.1.6 The minimum thickness of cast metal shall be in accordance with Table 5.2.

5.1.7 The thickness of a wooden enclosure shall be no less than 1/2 inch (12.7 mm) for those portions of the enclosure that serve as a supporting frame for equipment weighing 10 pounds (4.54 kg) or more.

*Exception No. 1: The thickness of a wooden enclosure may be thinner than 1/2 inch if investigated and determined to provide equivalent strength.*

*Exception No. 2: Those portions of a wooden enclosure that do not serve as a support of parts or as structural members of the frame may be 1/8 inch (3.2 mm) thick.*

5.1.8 A polymeric enclosure or part of an enclosure used on cord-connected equipment shall comply with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, when used to:

- a) Render inaccessible all or any parts that may otherwise present the risk of electric shock or injury to persons or
- b) Reduce the risk of propagation of flame initiated by electrical disturbance within the equipment.

## 5.2 Corrosion resistance

5.2.1 Iron and steel parts shall be resistant to corrosion by means of enameling, galvanizing, plating, or the equivalent if the corrosion of such parts would result in a risk of fire, electric shock, or injury to persons.

*Exception No. 1: In certain instances where the oxidation of iron or steel is not likely to be appreciable due to:*

- a) *The exposure of the metal to air, moisture, and temperature and*
- b) *The thickness of metal.*

*A surface of sheet metal or a cast iron part within an enclosure may not be required to be corrosion resistant.*

*Exception No. 2: The requirement does not apply to bearings, laminations, or minor parts of iron or steel, such as washers and screws.*

**Table 5.1**  
**Minimum thickness of sheet metal**

Maximum dimensions of enclosure				Steel								Copper, brass, or aluminum			
				Without supporting frame				With supporting frame or equivalent reinforcing				Without supporting frame,		With supporting frame or equivalent reinforcing,	
Length or width,		Area,		Zinc coated,		Uncoated,		Zinc coated,		Uncoated,		Without supporting frame,		With supporting frame or equivalent reinforcing,	
inches	(m)	inches <sup>2</sup>	(m <sup>2</sup> )	inch	(mm)	inch	(mm)	inch	(mm)	inch	(mm)	inch	(mm)	inch	(mm)
12	0.30	90	0.06	0.036	0.91	0.032	0.81	0.025 <sup>a</sup>	0.64	0.021 <sup>a</sup>	–	0.045	1.14	0.029	0.74
18	0.46	135	0.09	0.046	1.17	0.043	1.09	0.036	0.91	0.032	0.81	0.058	1.47	0.046	1.14
24	0.61	360	0.23	0.057	1.45	0.054	1.37	0.046	1.17	0.043	1.09	0.075	1.91	0.058	1.47
48	1.22	1200	0.77	0.071	1.80	0.067	1.70	0.057	1.45	0.054	1.37	0.095	2.41	0.075	1.91
60	1.52	1500	0.97	0.098	2.49	0.095	2.41	0.057	1.45	0.054	1.37	0.122	3.10	0.075	1.91
Over 60	Over 1.52	Over 1500	Over 0.97	0.127	3.23	0.124	3.15	0.057	1.45	0.054	1.37	0.153	3.89	0.075	1.91

<sup>a</sup> Sheet steel for an enclosure intended for outdoor use (raintight) shall not be less than 0.036 inch in thickness if zinc coated and not less than 0.032 inch in thickness if uncoated.

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**Table 5.2**  
**Minimum thicknesses of cast metal**

Metal	At base of threads, at small, flat, unreinforced surfaces and at surfaces that are reinforced by curving, ribbing, and the like (or are otherwise of a shape or size) to provide physical strength,		At relatively large unreinforced flat surface,	
	inch	(mm)	inch	(mm)
Die-cast metal	3/64	1.2	5/64	2.0
Cast malleable iron or permanent mold cast aluminum	1/16	1.6	3/32	2.4
Other cast metal	3/32	2.4	1/8	3.2

## 6 Mechanical Assembly

6.1 A switch, lampholder, attachment-plug, pressure wire connector, or similar component shall be mounted securely and shall be made resistant to turning.

*Exception No. 1: The requirement that a switch be made resistant to turning may be waived when all of the following conditions are met:*

- a) The switch is a plunger or other type that does not rotate when operated. (A toggle switch is considered to be subject to forces that to turn the switch during the intended operation of the switch).*
- b) The means of mounting the switch makes it unlikely that operation of the switch loosens it.*
- c) The spacings are not reduced below the minimum acceptable values if the switch rotates.*
- d) Intended operation of the switch is by mechanical means rather than by direct contact by persons.*

*Exception No. 2: A lampholder of a type in which the lamp cannot be replaced, (such as a neon pilot or indicator light where the lamp is sealed in by a nonremovable jewel) need not be made resistant to turning if rotation cannot reduce spacings below the minimum acceptable values.*

6.2 The means for turn resistance specified in 6.1 is to consist of more than friction between surfaces. For example, a lock washer may be used as the means for making a small stem-mounted switch or other device that has a single-hole mounting means resistant to turning.

## 7 Supply Connections – Permanently Connected Equipment

### 7.1 General

7.1.1 Permanently-connected equipment shall be provided with means for permanent connection to the primary-circuit power. Cord connected equipment that is intended to be fastened in place or located in a dedicated space shall be provided with means for permanent connection to the primary-circuit power, unless connection by means of a supply cord is necessary to facilitate the interchange of units; or removal is necessary for maintenance and repair, in which case, the shortest feasible length of cord shall be used.

7.1.2 A unit intended for permanent connection to the branch circuit shall have provision for such connection.

7.1.3 A sheet-metal member to which a wiring system is to be connected in the field shall have a thickness not less than 0.032 inch (0.81 mm) if of uncoated sheet steel, not less than 0.034 inch (0.86 mm) if of galvanized sheet steel, not less than 0.044 inch (1.11 mm) if of sheet aluminum, and not less than 0.043 inch (1.09 mm) if of sheet copper or sheet brass.

7.1.4 A terminal box or compartment shall be provided in which branch-circuit connections to a permanently wired unit are to be made and shall be such that these connections can be readily made and inspected without disturbing the wiring or the unit after the unit is installed as intended.

7.1.5 The volume of a field wiring compartment provided with pigtail leads for connection to the supply wiring shall not be less than indicated in Table 7.1.

**Table 7.1**  
**Minimum size of field wiring compartment**

AWG	Size of lead,		Wire space within compartment for each lead,	
		(mm <sup>2</sup> )	inches <sup>3</sup>	(cm <sup>3</sup> )
14		2.1	2	32.8
12		3.3	2.25	36.9
10		5.3	2.5	41.0
8		8.4	3	49.2
6		13.3	5	81.9

7.1.6 A pigtail lead shall be no more than two wire sizes smaller than the copper supply conductor to which it will be connected. For example, if 14 AWG (2.1 mm<sup>2</sup>) supply conductors will be used, the pigtail leads provided shall not be smaller than 18 AWG (0.82 mm<sup>2</sup>).

7.1.6 revised May 7, 2010

7.1.7 No electrical component shall be mounted on a part, such as the cover of a wiring terminal compartment, that must be removed for the connection or inspection of field wiring.

*Exception: This requirement does not apply to a unit in which the power supply circuit wires are intended to be connected to an attachment plug receptacle.*

7.1.8 A terminal compartment intended for the connection of a supply raceway shall be attached to the unit so that it is resistant to turning.

## 7.2 Separation of circuits

7.2.1 Field installation conductors of any circuit shall be separated by barriers from:

- a) Field- and factory-installed conductors connected to any other circuit, unless the conductors of both circuits are insulated for the maximum voltage in either circuit; and
- b) An uninsulated part of any other circuit in the unit and from any uninsulated live part, the short-circuiting of which results in a risk of fire or electric shock.

7.2.2 Separation of some field-installed conductors from others and from uninsulated live parts connected to different circuits can be accomplished by arranging the openings in the enclosure for the various conductors (regarding the terminals or other uninsulated live parts) so that there is no likelihood that the conductors, or parts of different circuits, can be intermingled. If no more openings are provided in the enclosure than are necessary for proper wiring of the unit and each opening is opposite a set of terminals, it is to be assumed in determining compliance with 7.2.1, that conductors entering the enclosure through any such opening will be connected only to the terminals opposite that opening. If more openings are provided in the enclosure than are necessary for the intended wiring of the unit, it is to be assumed (in determining compliance with 7.2.1 ) that conductors will enter the enclosure through openings not opposite the terminals for which they are intended to be connected, and may touch insulated conductors and uninsulated live parts of other circuits.

## 7.3 Wiring terminals

7.3.1 Permanently connected equipment shall be provided with wiring terminals or leads for the connection of conductors having an ampacity no less than the current rating of the equipment. A wiring terminal shall be provided with a soldering lug or an acceptable pressure wire connector, firmly bolted or held by a screw.

*Exception: A wire-binding screw may be used at a wiring terminal intended to accommodate a 10 AWG (5.3 mm<sup>2</sup>) or smaller conductor if an upturned lug or the equivalent is provided to hold the wire in position. A fixed wiring terminal shall be prevented from turning.*

7.3.1 revised May 7, 2010

7.3.2 A field-wiring terminal shall be prevented from turning or shifting in position by means other than friction alone. For example, two screws or rivets, square shoulders or mortises, dowel pins, lugs, offsets, connecting straps or clips fitted into an adjacent part, or some similar method may be used.

7.3.3 A wire-binding screw shall not be smaller than No. 10 (4.8 mm diameter).

*Exception: A No. 8 (4.2 mm diameter) machine screw may be used at a terminal intended only for the connection of a 14 AWG (2.1 mm<sup>2</sup>) conductor, and a No. 6 (3.5 mm diameter) screw may be used for the connection of a 16 or 18 AWG (1.3 or 0.82 mm<sup>2</sup>) conductor.*

7.3.3 revised May 7, 2010

7.3.4 A 14 AWG (2.1 mm<sup>2</sup>) is the smallest conductor that is to be used for branch-circuit wiring and thus is the smallest conductor that is to be anticipated at a terminal for connection of a branch-circuit conductor.

7.3.4 revised May 7, 2010

7.3.5 A terminal plate for a wire-binding screw shall be of metal not less than 0.050 inch (1.27 mm) in thickness and shall have not less than two full threads in the metal.

7.3.6 A terminal plate formed from stock having the minimum required thickness as given in 7.3.5 may have the metal extruded at the tapped hole for the binding screw so as to provide two full threads.

7.3.7 An upturned lug or a cupped washer shall be capable of retaining a supply conductor as described in 7.3.1, but shall be not smaller than 14 AWG (2.1 mm<sup>2</sup>), under the head of the screw or the washer.

7.3.7 revised May 7, 2010

7.3.8 The free length of a lead inside an outlet box or wiring compartment shall be 6 inches (152 mm) or more if the lead is intended for field connection to an external circuit.

7.3.9 Permanently connected equipment rated at 125 or 125/250 volts (3-wire) or less shall have one terminal or lead identified for the connection of the grounded circuit conductor of the power supply circuit.

7.3.10 If a lampholder is provided, the identified terminal or lead specified in 7.3.8 and described in 7.3.11 shall be connected to the screw shell of the lampholder. A fuse or single-pole switch, circuit breaker, or automatic control shall not be connected to the identified grounded conductor.

*Exception: A single-pole automatic control without a marked off position may be connected to the grounded conductor.*

7.3.11 The plug and receptacle shall be polarized if a unit or chassis within a rack or similar enclosure is provided with an attachment plug for supply connection to a receptacle that is part of the equipment, and if the unit or chassis has an Edison screw shell lampholder or a single-pole switch connected on the load side of the plug.

7.3.12 A field-wiring terminal intended for the connection of a grounded neutral supply conductor shall be identified by means of a metallic coating that is substantially white in color and shall be easily distinguishable from the other terminals; or proper identification of the terminal for the connection of the grounded conductor shall be clearly shown in some other manner, such as on an attached wiring diagram. If wire leads are provided instead of terminals, the identified lead shall have a white or gray color and shall be easily distinguishable from the other leads.

7.3.12 revised May 7, 2010

7.3.13 The distance between any pressure terminal connector intended for field wiring and the wall of the enclosure toward which the conductor is directed or through which the conductor may be intended to pass shall be as indicated in Table 7.2. However, the spacings may be less where the wall or other obstruction lies outside of the area occupied by the conductor that is bent or deflected to a radius no less than the distance given in Table 7.2.

**Table 7.2**  
**Minimum wire bending space**

AWG	Size of wire,		Minimum bending space terminal to wall,	
		(mm <sup>2</sup> )	inches	(mm)
14 – 10	2.1 – 5.3		Not specified	
8 – 6	8.4 – 13.3		1-1/2	38.1
4 – 3	21.2 – 26.7		2	50.8
2	33.6		2-1/2	63.5
1	42.4		3	76.2

## 8 Supply Connections – Cord- and Plug-Connected Equipment

### 8.1 General

8.1.1 Cord-connected equipment shall be provided with a length of flexible cord and an attachment plug.

8.1.2 Cord-connected equipment provided with an input voltage selector shall not create a risk of fire or electric shock when tested in accordance with 48.1.14 (e).

8.1.3 Cord connected equipment shall be provided with instructions and be marked in accordance with 64.10.1 and 64.11.1.

8.1.4 The construction of the supply circuit voltage selector shall be such that the supply circuit voltage setting cannot be changed unintentionally.

8.1.5 If the equipment is constructed so that the supply circuit voltage selector setting can be changed by the user, the action of changing the voltage selector setting shall also change the supply circuit voltage indication.

8.1.6 Equipment that can be set to different rated supply circuit voltages shall be constructed so that the indication of voltage to which the equipment is set is externally visible in the area adjacent to the rating information.

### 8.2 Power supply cords and cord sets

8.2.1 The ampacity of the cord shall be no less than the marked rating of the equipment.

8.2.2 A power supply cord or cord set shall be one of the types indicated in Table 8.1, or the equivalent. For example, an appliance wiring material construction that has been determined to be equivalent to Non-Integral Type SPT-2 cord may be used in applications where Non-Integral Type SPT-2 cord is specified.

Revised 8.2.2 effective December 1, 1998

**Table 8.1**  
**Types of power supply cords intended for use**

Revised Table 8.1 effective December 1, 1998

Equipment	Type of cord	Maximum length,	
		feet	(m)
Amplifiers <sup>a</sup> , general use	Non-Integral SPT-2, SV, SVT, SVE	10	3.1
	SJ, SJT, SJE	25	7.6
Amplifier speakers	SJ, SJE, SJT	25	7.6
Intercommunication systems	Non-Integral SPT-2, SV, SVE, SVT	10	3.1
Public address systems	Non-Integral SPT-2, SV, SVE, SVT	10	3.1
	SJ, SJE, SJT	25	7.6
Sound systems <sup>b</sup>	SJ, SJE, SJT	25	7.6
Phonographs, tape players, and recorders	Non-Integral SPT-2, SV, SVE, SVT	10	3.1
	SJ, SJE, SJT	25	7.6
Tape erasers and head demagnetizers	Non-Integral SPT-2, SV, SVE, SVT	10	3.1

<sup>a</sup> Includes mixers, preamplifiers, power supplies, radio tuners, and other equipment that is used in conjunction with an amplifier.  
<sup>b</sup> A sound system may be comprised of a number of different components (amplifier, tape recorder, record changer, radio tuner, and the like) as may be found in a school sound system or a language teaching system.

8.2.3 20 AWG conductors may be employed in appliance wiring material constructions as referenced in 8.2.2 when:

- a) The appliance is rated 2.0 A or less,
- b) The appliance does not employ a convenience receptacle, and
- c) Overcurrent protection rated 2.0 A or less is provided in the attachment plug and connected so as to interrupt the ungrounded side of the supply circuit.

8.2.3 revised May 7, 2010

8.2.4 The length of the cord shall not be more than the value shown in Table 8.1 and not less than specified in 8.2.6.

8.2.5 The length of the cord shall not be less than 5 feet (1.52 m).

*Exception: Equipment specifically intended for use in a location where a power receptacle will be available adjacent to the equipment may use a cord shorter than that specified.*

8.2.6 The length of a power supply cord is to be measured from the face of the attachment plug to the point where the cord emerges from the equipment. The length of a cord set is to be measured from the face of the attachment plug to the face of the appliance coupler.

### 8.3 Appliance coupler

8.3.1 An appliance coupler used as part of a separable cord set shall be constructed so that the appliance coupler cannot readily be used to defeat the conventional interlock device.

8.3.2 The conventional interlock device referred to in 8.3.1 has nominally 3/32 inch (2.4 mm) diameter pins, spaced 5/16 inch (7.9 mm) apart, measured between pin centers.

### 8.4 Cord strain relief

8.4.1 The power supply cord shall be attached to the equipment so that a mechanical strain on the cord leaving the overall enclosure cannot:

- a) Be transmitted to terminals, splices, or interior wiring;
- b) Separate an interlock connector from the part of the equipment to which it is attached; or
- c) Damage an interlock so that it does not perform its intended function.

### 8.5 Cord push-back relief

8.5.1 The power supply cord or leads shall be provided with a means that prevents them from being pushed inside the enclosure if, when pushed inside, any of the following occurs:

- a) The insulation of the cord or leads is subjected to temperatures or voltages above the assigned ratings,
- b) The cord or leads contact a sharp edge or moving part that could damage the insulation,
- c) The cord or leads displace a part resulting in reduction of spacings in hazardous circuitry or a strain on internal connections, or
- d) The cord or leads remain inside the equipment enclosure and cannot be retrieved when the equipment is marked in accordance with 65.1.1.

*Exception: Subitem (d) does not apply when a separate cord storage compartment that has been evaluated is provided.*

To determine compliance with this criteria, the cord (or leads) shall be subjected to the Pushback Relief Test, Section 54.

8.5.1 revised December 13, 1996

## 8.6 Cord-bearing surface

8.6.1 If a knot in a power supply cord serves as strain relief, the surface against which the knot may bear or with which it might come in contact shall be free from projections, sharp edges, burrs, fins, and the like that cause abrasion of the insulation on the cord.

## 8.7 Cord and wire routing

8.7.1 A separate flexible cord or wire that is not connected in the supply circuit or that does not involve a risk of fire or electric shock shall not be routed through a bushing or opening with the power supply cord at a point of flexure.

## 8.8 Attachment plug

8.8.1 The attachment plug shall have an American Standard configuration of pins and American Standard ratings. It shall be a type intended for use with a current no lower than the rated current for the equipment, and at a voltage equal to the rated voltage of the equipment. If the equipment can be adapted for use on two or more different supply voltages by means of an input voltage selector, the attachment plug provided with the equipment shall be acceptable for the voltage for which the equipment is intended to be connected when it is shipped from the factory.

8.8.2 The attachment plug of the power supply cord of equipment provided with a 15- or 20-ampere general-use convenience receptacle shall be a 3-wire grounding type. The attachment plug of the power supply cord of all other equipment that is not required to be grounded shall be polarized or of the grounding type.

8.8.3 The supply cord polarity of a 3-conductor cord shall be identified as follows:

- a) The line conductor shall be black, the identified (neutral) conductor shall be white, and the grounding conductor shall be green, or
- b) The line conductor shall be brown, the identified (neutral) conductor shall be light blue, and the grounding conductor shall be green with one or more yellow stripes.

Revised 8.8.3 effective December 1, 1998

8.8.4 When a polarized attachment plug is used, a fuseholder, an overcurrent protective device (other than an automatic control without a marked off position), the center contact of an Edison base lampholder, an interlock, and a manual on-off switch with a marked off position shall be connected to the ungrounded side of the line when used in the primary circuit.