



UL 498

STANDARD FOR SAFETY

Attachment Plugs and Receptacles

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UL Standard for Safety for Attachment Plugs and Receptacles, UL 498

Fifteenth Edition, Dated March 30, 2012

SUMMARY OF TOPICS

This revision of ANSI/UL 498 is being issued to address the following topics:

Addition of Requirements for Receptacles Employing Rotatable Outlets

Revision of Requirements for the Retention of Plugs Test for Connectors and Receptacles

Revision to Include Reference to ANSI E1.24-2012, Entertainment Technology Dimensional Requirements for Stage Pin Connectors

Revision to the Scope to Exclude Single Pole Locking-Type Separable Connectors Covered by UL 1691

Revision to Update References to the Standard for Wiring Device Configurations, UL 1681

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated May 25, 2012.

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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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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

Future Effective Date	Reference
September 30, 2013	Paragraphs 31.2.6 and 31.2.7, SB3.3 Sections 140 – 142, and Table 58.4.
March 1, 2015	1.3
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1

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The most recent designation of ANSI/UL 498 as an American National Standard (ANSI) occurred on November 16, 2012. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

The Department of Defense (DoD) has adopted UL 498 on August 17, 1981. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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

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CONTENTS

INTRODUCTION

1 Scope	14A
2 Glossary	14B
3 Components	19
4 Units of Measurement	20
5 References	20

CONSTRUCTION

ALL DEVICES

6 General	20
7 Configurations	20
8 Insulating Materials	20A
8.1 General	20A
8.2 Flammability	21
8.3 Electrical properties	21
8.4 Thermal properties	22
8.5 Vulcanized fiber	23
8.6 Sealing compounds	23
8.7 Fuse enclosures	24
9 Enclosure	24
9.1 General	24
9.2 Male faces and wire terminations	26
10 Current-Carrying Parts	27
10.1 General	27
10.2 Contacts	28
11 Grounding and Dead Metal Parts	29
12 Terminals	30
12.1 General	30
12.2 Wire-binding screw terminals	31
12.3 Soldering lugs	32
12.4 Pressure-wire terminals	32
13 Cord Entry and Strain Relief	33
14 Spacings	34
15 Assembly	34
15.1 General	34
15.2 Grounding and polarization	35
15.3 Mating and interchangeability	35
15.4 Fuseholders	37
15.5 Switches	37

ATTACHMENT PLUGS AND INLETS

16 Insulating Materials	38
17 Enclosure	38
17.1 General	38
17.2 Grip	38
17.3 Face size	39

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Documents
Document Sharing Hub

18	Current-Carrying Parts	39
19	Grounding and Dead Metal Parts	40
20	Terminals and Leads	42
20.1	Terminals	42
20.2	Leads	42
21	Assembly	43
22	Weatherproof Type	45

CORD CONNECTORS

23	Enclosure	45
23.1	General	45
23.2	Face size	46
24	Grounding and Dead Metal Parts	50
25	Terminals	50
26	Assembly	50
26.1	General	50
26.2	Outlet separation	51

RECEPTACLES

27	Insulating Materials	51
28	Enclosure	51
29	Grounding and Dead Metal Parts	52
29.1	General	52
29.2	Flush receptacles	53
30	Terminals and Leads	53
30.1	General	53
30.2	Push-in terminals	54
30.3	Pin-type or insulation-displacement terminals	54
30.4	Open wiring on insulators	54
30.5	Leads	55
30.6	Separable terminal assembly	56
31	Assembly	56
31.1	General	56
31.2	Flush receptacles	57
31.3	Surface-mount receptacles	59
32	Flush Plates	59
33	Self-Grounding Receptacles	59
34	Isolated-Ground Receptacles	60
35	CO/ALR Type	60
36	AL-CU Type	60
37	Tamper-Resistant Receptacles	60
38	Weather-Resistant Receptacles	60A
39	Pendant Receptacles	60A
40	Pop-Out Receptacle	60A
41	Pop-Up Receptacle Assembly	60A
41A	Rotatable Outlets	60A

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Documents
Document Sharing Hub

SELF-CONTAINED RECEPTACLES FOR USE WITHOUT A SEPARATE OUTLET BOX

42 General	.60B
43 Spacings	.60B
44 Insulating Materials	.60B
45 Enclosures	.61
46 Mounting Means	.63
47 Frame-Construction Mounting Brackets	.63
48 Field Replacement	.64

CURRENT TAPS

49 General	.64
------------------	-----

FLATIRON AND APPLIANCE PLUGS

50 General	.65
51 Current-Carrying Parts	.65
52 Cord Guard	.65
53 Strain Relief	.66
54 Female Contacts	.66
55 Terminals	.67
56 Spacings	.67
57 Assembly	.67

PERFORMANCE

GENERAL

58 Representative Devices	.68
---------------------------------	-----

ALL DEVICES

59 Comparative Tracking Index Test	.77
60 Glow Wire Test	.78
61 High-Current Arc Resistance to Ignition Test	.78
62 Mold Stress Relief Test	.79
63 Moisture Absorption Resistance Test	.80
64 Dielectric Voltage-Withstand Test	.81
64.1 Devices for fixed or permanent installation	.81
64.2 Cord-connected devices	.82
65 Accelerated Aging Tests	.82
65.1 General	.82
65.2 Rubber, EPDM, and TEE compounds	.82
65.3 PVC compounds and copolymers	.83
66 Insulation Resistance Test	.83
67 Conductor Secureness Test	.84
68 Tightening Torque Test	.84

ATTACHMENT PLUGS

ALL DEVICES

69 General	84
70 Security of Blades Test	84
70.1 General	84
70.2 Self-hinged plugs	85
71 Secureness-Of-Cover Test	85
72 Crushing Test	85
73 Attachment Plug Grip Tests	86
74 Integrity of Assembly Test	90
74.1 General	90
74.2 Self-hinged plugs	91
75 Self-Hinge Flexing Test	91
76 Terminal Temperature Test	92
77 Fuseholder Temperature Test	92

PIN-TYPE TERMINALS

78 General	94
79 Assembly Test	94
80 Temperature Test	94
81 Strain Relief Test	95
82 Fault Current Test	96
83 Dielectric Voltage-Withstand Test	97

INLETS

ALL DEVICES

84 General	97
85 Security of Blades Test	97
86 Terminal Temperature Test	97
87 Fuseholder Temperature Test	98

PRESSURE-WIRE TERMINALS

88 General	100
89 Strength of Insulating Base Test	100A

CORD CONNECTORS

ALL DEVICES

90 General	100A
91 Retention of Plugs Tests	100B
92 Overload Tests	101
92.1 General	101
92.2 Current overload test	104
92.3 Horsepower overload test	104
93 Temperature Test	108
94 Retention of Plugs Test (Repeated)	109

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Documents

Document Sharing Hub

94.1 General	109
94.2 Plug retention	109
94.3 Plug Withdrawal	110
95 Resistance to Arcing Test	110A
96 Latching Mechanism Tests	111
96.1 General	111
96.2 Cycling test	111
96.3 Pull test	112
97 Fuseholder Temperature Test	113
98 Improper Insertion Test	114
99 Potential Drop in Grounding Connections Test	115
100 Integrity of Assembly Test	115
100.1 General	115
100.2 Self-hinged cord connectors	116
101 Self-Hinge Flexing Test	116

PIN-TYPE TERMINALS

102 General	116
103 Assembly Test	116
104 Temperature Test	117
105 Strain Relief Test	117
106 Fault Current Test	118
107 Dielectric Voltage-Withstand Test	118A

RECEPTACLES

ALL DEVICES

108 General	118A
109 Retention of Blades Test	118B
110 Overload Test	124
111 Temperature Test	125
112 Retention of Blades Test (Repeated)	127
113 Resistance to Arcing Test	127
114 Retention of Plugs Test	128
115 Overload Test	129
115.1 General	129
115.2 Current overload test	130
115.3 Horsepower overload test	130A
116 Temperature Test	134
116.1 Contact and terminal temperature	134
116.2 Feed-through terminal temperature	136
117 Retention of Plugs Test (Repeated)	137
117.1 General	137
117.2 Plug retention	137
117.3 Plug withdrawal	138
118 Resistance to Arcing Test	138
119 Fuseholder Temperature Test	139
120 Fault Current Test	140
121 Terminal Strength Test	141
122 Assembly Security Test	145
123 Grounding Contact Test	152

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Documents
Document Sharing Hub

PRESSURE-WIRE TERMINALS

124 General	159
125 Strength of Insulating Base Test	161

SELF-GROUNDING RECEPTACLES

126 General	161
127 Fault Current Test	161

PUSH-IN TERMINALS

128 General	164
129 Pullout Test	164
130 Temperature Test	165
131 Conductor Insertion and Retention Test	165
132 Conductor Push-In Test	166
133 Terminal Abuse Test	167
134 Temperature Test	170

TAMPER-RESISTANT RECEPTACLES

135 General	175
136 Probe Test	175
137 Impact Test	177
137.1 General	177
137.2 Ball-pendulum impact	178
137.3 Vertical-ball impact	182
138 Mechanical Endurance Test	184
139 Dielectric Voltage-Withstand Test	184

RECEPTACLE WITH INTEGRAL ADJUSTABLE MOUNTING YOKE

140 Bonding (Non-Metallic Outlet Box Fault Current) Test	185
141 Bonding (Metallic Outlet Box Fault Current) Test	187
142 Mounting Yoke Resistance Test	188

POP-OUT RECEPTACLES AND POP-UP RECEPTACLE ASSEMBLIES

143 General	189
143.1 Pop-out receptacles	189
143.2 Pop-up receptacle assemblies	189
144 Mechanical Endurance Test	189
145 Mechanical Load Test	190
146 Spill Test	190

PIN-TYPE OR INSULATION-DISPLACEMENT TERMINALS

147 General	191
148 Heat Cycling and Vibration Tests	191
148.1 General	191
148.2 Heat cycling test	191
148.3 Vibration test	192

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DISTRIBUTION WITHOUT PERMISSION FROM UL



Documents
Document Sharing Hub

148.4 Heat cycling test (Continued)	192
148.5 Calculations	192

RECEPTACLES EMPLOYING A SEPARABLE TERMINAL ASSEMBLY

149 General	193
150 Retention of Tab Connection Test	193
151 Separable Connector Pull Test	193
152 Mold Stress Relief Test	194
153 Dielectric Voltage-Withstand Test	194
154 Grounding Contact Temperature Test	195
155 Resistance Test	195
156 Latching Mechanism Test	195
157 Short Circuit Test	196
158 Continuity Impedance Test	196

RECEPTACLES EMPLOYING ROTATABLE OUTLETS

158A General	196A
158B Rotational Endurance Test	196A
158C Temperature Test	196A
158D Dielectric Voltage-Withstand Test	196B
158E Resistance Test	196B
158F Fault Current Test	196B

SELF-CONTAINED RECEPTACLES

159 General	197
160 Heat Cycling and Vibration Tests	197
160.1 General	197
160.2 Heat cycling test	197
160.3 Vibration test	198
160.4 Calculations	199
161 Cable Pullout Test	199
162 Conductor Pullout Test	200
163 Mounting Strength Test	200
163.1 General	200
163.2 Receptacles mounted directly in panels	200
163.3 Receptacles supported by mounting brackets	200
163.4 Testing	200
164 Wall-Mounting Secureness Test	201
165 Assembly Security Test	205
165.1 General	205
165.2 Method A	205
165.3 Method B	208
166 Field Replacement Test	208
167 Fault Current Withstand Test	208
168 Knockouts Test	209
169 Creep Test	209
170 Mold Stress Test	209
171 Specimen Flammability Test	209
171.1 General	209
171.2 Method A	210

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DISTRIBUTION WITHOUT PERMISSION FROM



Documents
Document Sharing Hub

171.3 Method B	210
CURRENT TAPS	
ALL DEVICES	
172 General	210
173 Contact Security Test	210
FLATIRON AND APPLIANCE PLUGS	
174 General	211
175 Millivolt Drop Test	211
176 Overload Test	211
177 Heating Test	212
178 Millivolt Drop Test Repeated	212
179 Crushing Test	212
180 Mechanical Endurance Test	212
181 Accelerated Aging Test	215
182 Cord Guard Test	215
RATINGS	
183 Details	217
MARKINGS AND INSTRUCTIONS	
184 General	221
184.1 Details	221
184.2 Location of markings and instructions	242A
185 Identification and Marking of Terminals	244
185.1 Grounded and grounding	244
185.2 Other terminals	247
185.3 Removable parts	248
SUPPLEMENT SA - RESERVED FOR FUTURE USE	
SUPPLEMENT SB - ENCLOSURE TYPES FOR ENVIRONMENTAL PROTECTION	
INTRODUCTION	
SB1 Scope	SB1
SB2 Glossary	SB1

CONSTRUCTION

SB3 General	SB2
SB4 Polymeric Enclosures	SB3
SB5 Gaskets	SB4

PERFORMANCE

SB6 General	SB4
-------------------	-----

No Text on This Page



MARKINGS

SB7 General SB8

SUPPLEMENT SC - MARINE SHORE POWER INLETS**INTRODUCTION**

SC1 Scope SC1
SC2 Glossary SC1
SC3 General SC1

CONSTRUCTION

SC4 General SC2
SC5 Insulating Materials SC4
SC6 Corrosion Resistance SC4

PERFORMANCE

SC7 General SC4
SC8 Salt-Spray Test SC4
SC9 Dielectric Voltage-Withstand Test SC5
SC10 Mechanical Strength Test SC5
SC11 Water-Spray Test SC7
SC12 Shock Test SC10

SUPPLEMENT SD - HOSPITAL GRADE DEVICES**INTRODUCTION**

SD1 Scope SD1

CONSTRUCTION

SD2 General SD1

PERFORMANCE**GENERAL**

SD3 Representative Devices SD2

HOSPITAL GRADE ATTACHMENT PLUGS

SD4 General	SD4
SD5 Strain Relief Tests	SD4
SD5.1 General	SD4
SD5.2 Method A – static pull	SD4
SD5.3 Method B – rotary pull	SD4
SD5.4 Method C – abrupt removal	SD5
SD5.5 Straight attachment plugs	SD11
SD5.6 Angle attachment plugs	SD11
SD6 Crushing Test	SD11
SD7 Impact Resistance Test	SD12
SD8 Mechanical Drop Test	SD12
SD9 Mold Stress Relief Test	SD14

HOSPITAL GRADE CORD CONNECTORS

SD10 General	SD14
SD11 Grounding Contact Temperature Test	SD14
SD12 Resistance Test	SD15
SD13 Grounding Contact Overstress Test	SD15
SD14 Plug Connection and Separation Test	SD19
SD15 Crushing Test	SD19
SD16 Impact Resistance Test	SD20
SD17 Mechanical Drop Test	SD20
SD18 Mold Stress Relief Test	SD22
SD19 Strain Relief Tests	SD22
SD19.1 General	SD22
SD19.2 Method A – static pull	SD23
SD19.3 Method B – rotary pull	SD23
SD19.4 Method C – abrupt removal	SD23

HOSPITAL GRADE RECEPTACLES

SD20 General	SD27
SD21 Abrupt Plug Removal Test	SD27
SD22 Grounding Contact Temperature Test	SD33
SD23 Resistance Test	SD33
SD24 Fault Current Test	SD33
SD25 Grounding Contact Overstress Test	SD34
SD26 Terminal Strength Test	SD36
SD27 Assembly Security Test	SD36
SD28 Impact Test	SD36
SD29 Mold Stress Relief Test	SD36

MARKINGS

SD30 General	SD37
--------------------	------

SUPPLEMENT SE - WEATHER-RESISTANT RECEPTACLES**INTRODUCTION**

SE1 Scope	SE1
-----------------	-----

CONSTRUCTION

SE2 General	SE1
SE3 Insulating Materials	SE2
SE4 Corrosion Resistance	SE2

PERFORMANCE

SE5 General	SE3
SE6 Cold Impact Test	SE3
SE7 Accelerated Aging Test	SE3
SE8 Ultraviolet Light and Water Exposure Test	SE4

MARKINGS

SE9 General	SE5
-------------------	-----

SUPPLEMENT SF - RECEPTACLES WITH INTEGRAL POWER SUPPLY WITH CLASS 2 OUTPUT CONNECTORS**INTRODUCTION**

SF1 Scope	SF1
SF2 Glossary	SF1

CONSTRUCTION

SF3 General	SF2
SF4 Polymeric Enclosures	SF2
SF5 Spacings	SF2

PERFORMANCE

SF6 General	SF3
SF7 Class 2 Output Power Supply	SF3
SF8 Assembly Test	SF3

MARKINGS AND INSTRUCTIONS

SF9 Installation Instructions	SF4
SF10 User Instructions	SF5
SF11 Markings	SF5

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APPENDIX A

Standards for Components..... A1

APPENDIX B Wiring Device Configurations

INTRODUCTION

1 Scope

1.1 These requirements cover attachment plugs, receptacles, cord connectors, inlets, current taps provided with wiring terminals for flexible cord, and flatiron and appliance plugs - all intended for connection to a branch circuit for use in accordance with the National Electrical Code, ANSI/NFPA 70.

1.2 These requirements do not cover devices rated at more than 200 A or for more than 600 V. See 6.1.

1.3 This Standard does not directly apply to, but supplements the following standards:

- a) Devices produced integrally with flexible cord or cable, covered by the Standard for Cord Sets and Power-Supply Cords, UL 817;
- b) Current taps and adapters not provided with wiring terminals for flexible cord covered by the Standard for Current Taps and Adapters, UL 498A;
- c) Devices employing male or female screwshells, covered by the Standard for Lampholders, UL 496;
- d) Devices solely intended for direct connection to the branch circuit in accordance with the National Electrical Code, ANSI/NFPA 70, that are provided with contacts of the pin and sleeve type, covered by the Standard for Plugs, Receptacles and Cable Connectors of the Pin-and-Sleeve Type, UL 1682;
- e) Single and multipole connectors intended for factory assembly to copper or copper alloy conductors or printed wiring boards for use in data, signal, control and power applications within and between electrical equipment, covered by the Standard for Component Connectors for Data, Signal, Control and Power Applications, UL 1977;
- f) Devices intended for installation and use in hazardous (classified) locations in accordance with the National Electrical Code, ANSI/NFPA 70, covered by the Standard for Explosion-Proof and Dust-Ignition-Proof Equipment for Use in Hazardous (Classified) Locations, UL 1203;
- g) Devices intended for use with telecommunications networks, covered by the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1, or the Standard for Communications Circuit Accessories, UL 1863;
- h) Devices incorporating ground-fault circuit interruption circuitry, covered by the Standard for Ground-Fault Circuit Interrupters, UL 943;
- i) Single- or two-outlet direct plug-in devices incorporating transient voltage surge suppression circuitry, covered by the Standard for Surge Protective Devices, UL 1449;
- j) Single- or two-outlet direct plug-in devices incorporating electromagnetic interference filter circuitry, covered by the Standard for Electromagnetic Interference Filters, UL 1283;
- k) Cord-connected, relocatable power taps intended only for indoor use as a temporary extension of a grounding alternating-current branch circuit for general use, covered by the Standard for Relocatable Power Taps, UL 1363; or

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l) Single pole locking-type separable connectors, covered by the Standard for Single Pole Locking-Type Separable Connectors, UL 1691.

Revised 1.3 effective March 1, 2015

1.4 This Standard contains the following supplements:

- a) Supplement SA – Reserved for future use.
- b) Supplement SB – Enclosure Types for Environmental Protection
- c) Supplement SC – Marine Shore Power Inlets
- d) Supplement SD – Hospital Grade Devices
- e) Supplement SE – Weather-Resistant Receptacles
- f) Supplement SF – Receptacles with Integral Power Supply with Class 2 Output Connectors

2 Glossary

2.1 For the purposes of this Standard, the following definitions apply.

2.2 **APPLIANCE COUPLER** – A single-outlet, female contact device for attachment to a flexible cord as part of a detachable power-supply cord to be connected to an inlet (motor attachment plug).

2.3 **APPLIANCE PLUG** – An appliance coupler type of device having a cord guard and a slot configuration specified for use with heating or cooking appliances.

2.4 **ATTACHMENT PLUG** – A male contact device for the temporary connection of a flexible cord or cable to a receptacle, cord connector, flanged equipment power outlet, or other outlet device.

2.5 **BULK SHIPMENT** – Any packaging container having more than one receptacle not provided with a unit container.

2.6 **CONFIGURATION, LOCKING** – A device having a configuration that requires a motion other than a straight push or pull to connect or separate it when used with its mating part.

2.7 **CORD CONNECTOR** – A female contact device to be wired on flexible cord for use as an extension from an outlet to make a detachable electrical connection to an attachment plug or, as an appliance coupler, to an equipment inlet.

2.8 **CURRENT TAP** – A device provided with one set of male blades, one or two female outlets, and wiring terminals for flexible cord intended either for factory or field wiring.

2.9 **ELECTRICAL (FUNCTIONAL) INSULATION** – The insulation necessary for the proper functioning of the product and for basic protection against electrical shock. This includes all parts relied upon to support live parts in place, all internal barriers necessary to maintain spacings, and the outlet face portion of all female devices.

2.10 **ENCLOSURE** – That part of the device that renders inaccessible all or any parts of the device that may otherwise present a risk of electric shock, retards propagation of flame initiated by electrical disturbances occurring within, or both.

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2.11 **FIXTURE, EQUIPMENT, OR APPLIANCE OUTLET** – A receptacle outlet device for mounting on utilization equipment.

2.12 **FLATIRON PLUG** – An appliance coupler type of a device having a cord guard and a slot configuration specified for use with heating or cooking appliances.

2.13 **GROUNDING-CONDUCTOR PATH** – A path between the grounding pin, blade, or 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.

2.14 **GROUNDING DEVICE** – A device having a 5-15, 5-20, 5-30, 5-50, 6-15, 6-20, 6-30, 6-50, 7-15, 7-20, 7-30, 7-50, 14-15, 14-20, 14-30, 14-50, 14-60, 15-15, 15-20, 15-30, 15-50, 15-60, L5-15, L5-20, L5-30, L6-15, L6-20, L6-30, L7-15, L7-20, L7-30, L8-20, L8-30, L9-20, L9-30, L14-20, L14-30, L15-20, L15-30, L16-20, L16-30, L17-30, L21-20, L21-30, L22-20, L22-30, L23-20, L23-30, TT-R, or ML-2R configuration, the standard configuration illustrated in Figure C1.1, or a nonstandard configuration that employs one blade, pin, or contact exclusively for grounding.

2.14 revised November 16, 2012

2.15 **HOUSING ADAPTER, ANGLE** – A part that is intended to replace a portion of an attachment plug or cord connector housing so that the flexible cord exits the strain relief in the same plane as the face of the device.

2.16 **HOUSING ADAPTER, SHROUD** – A part that is intended to be assembled onto an attachment plug or cord connector to extend the housing beyond the plane of the face of the device.

2.17 **INLET** – (Motor Attachment Plug) A male contact device to be mounted on utilization equipment to provide an integral blade configuration for the connection of an appliance coupler or cord connector.

2.18 **POLARIZED DEVICE** – A device constructed for connection to a mating device only in the position that connects related poles of an electrical circuit.

2.19 **RECEPTACLE, CLOCK** – A flush receptacle having a recessed cord-storage space in an integral flush-device cover plate, commonly used with wall clocks.

2.20 **RECEPTACLE, DISPLAY** – A flush receptacle provided with a flush device plate or outlet box cover and closure plug or plugs that is intended for use in show window floors and similar locations where the device is not likely to be subjected to scrub water.

2.21 **RECEPTACLE, DUPLEX** – A receptacle having two contact devices on a single mounting yoke for flush mounting in a plane surface.

2.22 **RECEPTACLE, FLUSH** – A receptacle which is intended for mounting in or on an outlet box, an outlet-box cover, or a flush-device cover plate for fixed installation on a branch circuit.

2.23 **RECEPTACLE, INTERCHANGEABLE or MODULAR** – A flush receptacle which is assembled as a single, duplex or triplex outlet in the field from a system of individual outlet modules, mounting yokes, or flush device cover plates.

2.24 **RECEPTACLE, ISOLATED GROUND** – A receptacle having the grounding terminal electrically isolated from the system ground when installed in a metallic outlet box or raceway system.

2.25 RECEPTACLE, PENDANT – Pendant receptacles include an enclosure with cover plate and strain relief means, intended to be assembled at the end of flexible cord, for use in branch circuit applications.

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2.26 RECEPTACLE, POP-OUT – A retractable flush mount receptacle intended for mounting in or on an outlet box, an outlet-box cover, or a flush device plate for fixed installation on a branch circuit and is only intended to be installed in a wall and other vertical surfaces.

2.27 RECEPTACLE, POP-UP ASSEMBLY – An assembly consisting of a retractable flush mount receptacle, outlet box and flush device cover plate intended for fixed installation on a branch circuit. A pop-up receptacle assembly is suitable for installation in a kitchen or bathroom countertop. They are provided with one or more receptacle outlets. The outlets are retractable for storage below the counter surface.

2.28 RECEPTACLE, SELF-CONTAINED – A receptacle which includes an enclosure and mounting means intended for flush mounting without the use of a separate flush-device or other outlet box and for connection to one or more nonmetallic sheathed cables containing copper conductors in accordance with National Electrical Code, ANSI/NFPA 70. A self-contained receptacle is primarily used in mobile homes, recreational vehicles, manufactured buildings, and on-site frame construction.

2.29 RECEPTACLE, SELF-GROUNDING – A receptacle which includes a spring clip or other part to provide for electrical continuity between the grounded device yoke and the mounting screw.

2.30 RECEPTACLE, SPLIT – A duplex receptacle having line terminals which are capable of being electrically separated.

2.31 RECEPTACLE, SURFACE-MOUNT – A receptacle which includes an enclosure and mounting means intended for surface mounting without the use of a separate outlet box in accordance with the National Electrical Code, ANSI/NFPA 70.

2.32 RECEPTACLE, TAMPER-RESISTANT – A receptacle which by its construction is intended to limit improper access to its energized contacts in accordance with the National Electrical Code, ANSI/NFPA 70.

2.33 RECEPTACLE, WEATHER-RESISTANT – A flush-type receptacle which by its construction is intended to provide resistance to the effects of outdoor exposure when installed in accordance with Article 406 of the National Electrical Code, ANSI/NFPA 70.

2.34 SELF-HINGE – A thin molded portion of an enclosure intended to bend during the assembly of a wiring device to a flexible cord.

2.35 TABLE TAP – A cord connector having more than one outlet and intended to rest on a horizontal surface while in use.

2.36 TERMINAL, INSULATION-DISPLACEMENT – A terminal having a contacting member that forces the conductor insulation aside and presses against the side of the conductor to make contact.

2.37 TERMINAL, PIN-TYPE (INSULATION-PIERCING) – A terminal having a contact pin that punctures the conductor insulation to contact the current-carrying conductor.

2.38 TERMINAL, PRESSURE-WIRE – A terminal which establishes a connection between one or more conductors and a terminal plate by means of mechanical pressure without the use of solder. A pressure-wire terminal may be either of the following types:

- a) Clamp-Type – A pressure-wire terminal in which the conductor is held under a pressure plate or saddle clamp by one or more screws. This type of terminal may be provided in combination with a wire-binding screw terminal.

b) Setscrew-Type – A pressure-wire terminal in which the pressure is applied by the end of the screw bearing on the conductor, either directly or through a wire-protecting pad.

2.39 TERMINAL, PUSH-IN – A terminal where the stripped end of a conductor is pushed into the terminal and the clamping pressure is maintained by a spring mechanism, without the use of screws.

2.40 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.

2.41 TERMINAL ASSEMBLY, SEPARABLE – A two-piece terminal assembly provided with an integral mechanical latching mechanism(s). It consists of permanently attached pins or tabs located on the body of the receptacle and is capable of receiving a special purpose connector with leads for connection to the branch circuit.

2.42 THROUGH-WIRING – A wiring method which permits a group of receptacles to be wired in parallel to a common branch circuit.

2.43 UNIT CONTAINER – The smallest carton, package, or container, in which a receptacle is packaged. A unit container may contain more than one receptacle if they are not intended to be removed from the container for individual sale.

3 Components

3.1 Except as indicated in 3.2, 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.

3.2 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.

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

3.4 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.

4 Units of Measurement

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

5 References

5.1 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.

CONSTRUCTION

ALL DEVICES

6 General

6.1 The ratings mentioned throughout this Standard including those mentioned in Table 183.1 represent maximum ampacity and maximum operating potential in volts for receptacles and other outlet devices such as cord connectors or current taps.

6.2 A device is considered to be for use on either alternating or direct current unless the rating includes the letters "ac" to restrict the use to alternating current.

7 Configurations

7.1 The NEMA configurations of various attachment plug and receptacle combinations referenced in this Standard are in accordance with Wiring Devices – Dimensional Specifications, ANSI/NEMA WD6, and are included in Appendix B for ease of reference. The figures referenced as Section C1 contain non-NEMA configurations and are found in the Standard for Wiring Device Configurations, UL 1681.

7.1 revised November 16, 2012

7.2 The PLASA configurations of various attachment plugs and receptacle combinations referenced in this Standard are in accordance with Entertainment Technology Dimensional Requirements for Stage Pin Connectors, ANSI/PLASA E1.24.

Added 7.2 effective November 16, 2015

8 Insulating Materials

8.1 General

8.1.1 All parts that act as the electrical insulation or enclosure of a device shall be made of an insulating material intended for the particular application and shall comply with the requirements in 8.2.1 – 8.4.1. Hard rubber shall not be employed.

Exception No. 1: The internal insulating systems of components where component requirements exist are not required to comply with the requirements in 8.2.1 – 8.4.1.

Exception No. 2: A small part meeting all of the following criteria is not required to comply with the requirements in 8.2.1 – 8.4.1:

- a) Its volume does not exceed 0.122 cubic inch (2 cm³),*
- b) Its maximum dimension does not exceed 1.18 inches (3 cm), 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.*

Exception No. 3: Fiber or similar material that is equal to or less than 0.010 inch (0.25 mm) thick is not required to comply with the requirements in 8.2.1 – 8.4.1.

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8.1.2 A polymeric material used for electrical insulation or enclosure of live parts shall be fabricated in accordance with the Standard for Polymeric Materials – Fabricated Parts, UL 746D.

Exception: A polymeric material that is fabricated in the same location where final assembly takes place and where no blending or compounding operations are involved is not required to comply with this requirement.

8.2 Flammability

8.2.1 A polymeric material used for electrical insulation or enclosure of live parts shall have a flame class rating of HB, V-2, V-1, V-0, VTM-2, VTM-1, or VTM-0 in accordance with the requirements of the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. The flame class rating of the material shall be judged at the minimum thickness employed at the walls and barriers in the device which are critical to the functioning of the insulation or enclosure of the device.

Exception No. 1: Insulating materials employed in a self-contained receptacle shall instead comply with 40.1.

Exception No. 2: A polymeric material that complies with either the 12 mm or 20 mm (3/4-inch) flame flammability test described in UL 746C, need not have a flammability class rating.

8.3 Electrical properties

8.3.1 A polymeric material used for electrical insulation or enclosure of live parts shall have a Comparative Tracking Index (CTI) rating of 175 V or greater or a performance level class of at least 3.

Exception No. 1: A polymeric material used for electrical insulation or enclosure of live parts is not required to comply with this requirement if it complies with the Comparative Tracking Index Test, Section 59.

Exception No. 2: A polymeric material used in an enclosure that is separated through air by more than 1/32 inches (0.8 mm) from uninsulated live parts and more than 1/2 inch (12.7 mm) from arcing parts is not required to comply with this requirement.

8.3.2 A polymeric material used for electrical insulation or enclosure of live parts shall have Hot Wire Ignition (HWI) and High-Current Arc Resistance to Ignition (HAI) ratings or performance level classes of at least those shown in Table 8.1 for the flame class rating determined in accordance with 8.2.1. For materials with other than VTM flammability classifications, the HWI and HAI ratings of the material shall be evaluated using the specimen thickness employed in the end product or nominal 1/8 inch (3.2 mm) thickness, whichever is greater.

Exception No. 1: A polymeric material used for electrical insulation or enclosure of live parts is not required to comply with the HWI requirements if it complies with the Glow Wire Test, Section 60.

Exception No. 2: A polymeric material used for electrical insulation or enclosure of live parts is not required to comply with the HAI requirements if it complies with the High-Current Arc Resistance to Ignition Test, Section 61.

Exception No. 3: A polymeric material used in an enclosure of an attachment plug or cord connector which does not enclose live parts, or which encloses insulated live parts where the insulation thickness is greater than 0.028 inches (0.71 mm), is not required to comply with the HWI requirements.

Exception No. 4: A polymeric material used in an enclosure that is separated through air by more than 1/32 inches (0.8 mm) from uninsulated live parts and more than 1/2 inch (12.7 mm) from arcing parts is not required to comply with the HWI and HAI requirements.

Exception No. 5: Insulating materials employed in a self-contained receptacle shall instead comply with 40.1.

Table 8.1
Hot wire ignition (HWI) and high-current arc resistance to ignition (HAI) ratings of insulating materials

Flammability classification ^a	HWI ^{b,d}		HAI ^{c,d}	
	Mean ignition time (sec)	PLC	Mean no. of arcs	PLC
V-0, VTM-0	7 and up to 15	4	15 and up to 30	3
V-1, VTM-1 ^e	15 and up to 30	3	15 and up to 30	3
V-2, VTM-2	15 and up to 30	3	15 and up to 30	3
HB	30 or more	2	60 or more	1

^a Flammability classification – Described in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

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

^c High-Current Arc Resistance to Ignition – Described in UL 746A.

^d Mean ignition time and mean no. of arcs to be used to evaluate Filament Wound Tubing, Industrial Laminates, Vulcanized Fiber, and similar polymeric materials only. All other materials are to be judged using the performance level class values.

^e A polymeric material subjected to the flammability test with either the 12 mm or 20 mm (3/4- inch) flame in accordance with Exception No. 2 to 8.2.1 shall comply with the PLC for a V-1 rating.

8.4 Thermal properties

8.4.1 A polymeric material used for electrical insulation or enclosure of live parts shall have the relative thermal index ratings shown in Table 8.2 for the specific application of the insulating material. For materials with other than VTM flammability classifications, the material shall be evaluated using the specimen thickness employed in the end product or nominal 1/8 inch (3.2 mm) thickness, whichever is greater.

Exception: The following generic materials having readings of 65 or less on the Shore Durometer D scale (when measured for 5 seconds at an ambient temperature of 23.0 ±2.0°C (73.4 ±3.6°F)) are acceptable for use at 60°C (140°F) based on their successful completion of the appropriate accelerated aging test described in Accelerated Aging Tests, Section 65:

- a) Ethylene/Propylene/Diene (EPDM)
- b) Natural Rubber (NR)
- c) Neoprene (Chloroprene Butadiene) Rubber (CBR)
- d) Nitrile Rubber (NBR)
- e) Polyvinyl Chloride (PVC) and its copolymers

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f) *Silicone Rubber (SIR)*

g) *Styrene (Butadiene) Rubber (SBR)*

h) *Thermo Elastomeric [TEE; includes Thermoplastic Elastomers (TPE) and Ethylene Propylene Thermoplastic Rubber (EPTR)]*

Table 8.2
Minimum relative thermal indices of insulating materials used in insulation and enclosure applications

Application	Minimum relative thermal index ^a , Degrees C		
	Electrical	Mechanical with impact ^b	Mechanical without impact
Permanently-wired devices (including appliance, fixture and equipment outlets, inlets, and receptacles)	80 ^c	60 ^c	80 ^c
Cord-connected devices (including attachment plugs, cord connectors, and current taps)	60 ^c	60 ^c	60 ^c
^a Relative Thermal Index – Described in the Standard for Polymeric Materials – Long Term Property Evaluations, UL 746B. ^b For industrial laminates, vulcanized fiber, and similar polymeric materials, the material's minimum RTI for Mechanical shall be evaluated using the values specified for Mechanical Without Impact. ^c For devices containing fuses, the minimum thermal indices shall be the values shown above or the temperature measured on the insulating material during the Fuseholder Temperature Test, whichever is greater. See Sections 77, 87, 97, and 119.			

8.5 Vulcanized fiber

8.5.1 Vulcanized fiber is not prohibited from being used for insulating washers, separators, and barriers, but shall not be used as the sole support of live parts.

8.5.2 Vulcanized fiber shall comply with the requirements in 8.2.1 – 8.4.1 and shall be moisture-resistant in accordance with 63.1 and 63.2.

8.6 Sealing compounds

8.6.1 A sealing compound shall be insulating, waterproof, and shall not soften at a temperature of 65°C (149°F). The softening point is to be determined using the Standard Test Methods for Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus, ASTM E28.

8.6.2 Sulphur shall not be employed as a sealing compound.

8.7 Fuse enclosures

8.7.1 A fuse enclosure shall be of a moisture-resistant material in accordance with 63.1 and 63.2. Fiber and similar absorptive materials shall not be used for the enclosure of a fuse.

8.7.2 A polymeric material classified as Type V-0, V-1, or V-2 is considered as having flammability properties acceptable for use as the enclosure of a fuse.

9 Enclosure

9.1 General

9.1.1 A device shall have live parts protected against exposure to contact by persons when fully assembled using all essential parts (described in 9.1.5) and installed in the intended manner.

Exception No. 1: Male blades which are energized only when mated with the corresponding outlet are not required to comply with this requirement.

Exception No. 2: Exposed wiring terminals or other live parts enclosed within equipment or within an outlet box when the device is installed in the intended manner are not required to comply with this requirement.

9.1.2 Accessible dead-metal parts of a grounding device shall be conductively connected to the grounding-conductor path through the device.

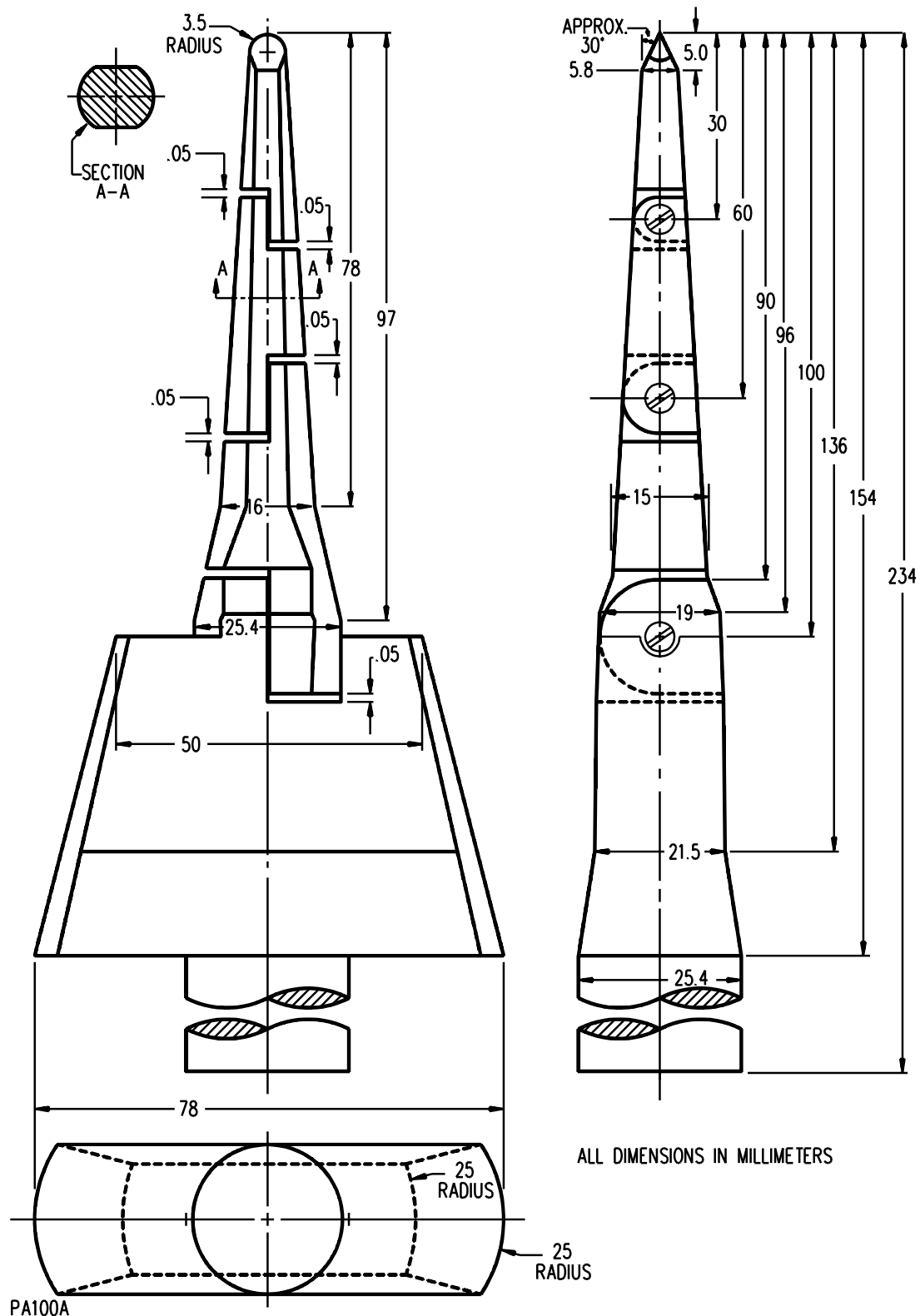
Exception: Accessible dead-metal parts electrically insulated from current-carrying parts are not required to comply with this requirement.

9.1.3 Accessible dead-metal parts of a nongrounding device shall be electrically insulated from live parts and wiring other than the complete flexible cord so that they are unable to be energized by stray strands, failure of wiring terminals (such as loosening of screws), or damaged or broken wiring. When the stray strand length affects whether a device complies with this requirement, the device shall be marked in accordance with Reference No. 3 to Table 184.1. See 9.1.7.

9.1.4 In order to judge the accessibility of a live or dead-metal part, the device is to be wired and assembled in accordance with the manufacturer's instructions, except that any nonessential parts (described in 9.1.6) that are able to be opened or removed by the user without using a tool are to be opened or removed. The probe shown in Figure 9.1 is to be applied with a force of not more than 3 lbf (13.3 N) to any depth that recessing will permit. The probe is to be rotated, changed in configuration, or angled before, during, and after application to any position that is necessary to examine the device. A live or dead-metal part is determined to be accessible when:

- a) The part is contacted by the probe, or
- b) The part is located in a hole larger than 7.1 mm (9/32 inch) in diameter and recessed less than 4.8 mm (3/16 inch).

Figure 9.1
Articulate probe with web stop



ALL DIMENSIONS IN MILLIMETERS

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9.1.5 A separable part is considered essential for the operation of the device if it employs a latch or detent or requires use of a tool to remove, and if it performs any of the following functions:

- a) Encloses or completes the enclosure of current-carrying parts other than those on the male face of an attachment plug or current tap;
- b) Encloses or completes the enclosure of the flexible cord from which the jacket has been removed for wiring;
- c) Mechanically secures flexible cord to pin-type terminals; or
- d) Provides for the placement and removal of a fuse.

9.1.6 A separable part (such as an insulating face cover, disc or strain relief clamp) is not considered essential for the operation of the device if it can be removed without the use of a tool or without defeating a latch or detent and if it performs any of the following functions:

- a) Provides strain relief;
- b) Encloses wiring terminals that would otherwise be exposed on the male face of an attachment plug or current tap; or
- c) Provides access to a fuse through the male face of an attachment plug or current tap.

9.1.7 With respect to 9.1.5(b), the enclosure of a flexible cord is not considered to be complete where two insulated conductors of a parallel-type cord are split apart or where the jacket is removed from the insulated conductors of a jacketed-type cord.

9.2 Male faces and wire terminations

9.2.1 The wire terminations of a 15 or 20 A attachment plug or current tap shall be completely enclosed when the device is wired on flexible cord and assembled as intended, using only those parts essential for the operation of the device (dead-front construction). See 9.1.5 and 9.1.6.

9.2.2 An exposed live part on the face of an attachment plug or current tap rated other than 15 or 20 A shall be provided with an insulating disc or face cover that is at least 0.028 inch (0.71 mm) thick and completely covers all exposed live parts. Any unfilled openings on a face cover or disc provided with multiple clearance openings to enable its use with a number of blade arrangements are to be located opposite the anticipated insulating face of the corresponding outlet device.

9.2.3 An insulating disc or face cover intended to be opened or removed to provide access to the wiring terminals shall be mechanically secured after wiring by one or more screws, latches, or detents that cannot be unintentionally opened or removed. A cover that is held in place by only friction without any positive detent action is not considered mechanically secured and is to be subjected to the Secureness-Of-Cover Test described in Section 71.

9.2.4 An insulating disc or face cover shall enclose the wiring terminal compartments with a fit at the periphery that will not permit the entrance of a 0.030 inch diameter (0.76 mm) probe.

Exception: A notch may be provided in the cover to facilitate removal but only in areas remote from wiring terminals so that unclamped live strands cannot reach the opening. The notch is to comply with all of the following:

- a) It shall not be deeper than 1/8 inch (3.2 mm) from the periphery;*
- b) It shall not be wider than 3/8 inch (9.5 mm) along the periphery of the cover; and*
- c) It shall not be located within 3/8 inch (9.5 mm) of the binding screw head as measured from the closest point in the notch periphery.*

9.2.5 A device with a separable face cover shall be capable of being properly wired with the maximum size of the heaviest-duty type of flexible cord intended without inhibiting the full seating of the cover. The flexible cord used to determine compliance shall either:

- a) Have an ampacity at least equal to the rating of the device configuration;
- b) Be of the type and size marked on the device; or
- c) Be of the maximum size that can be accommodated by the cord-entrance opening into the device.

9.2.6 An attachment plug or current tap with a separable face cover or disc shall be shipped with the cover attached to the device but not necessarily mechanically secured.

10 Current-Carrying Parts

10.1 General

10.1.1 Iron or steel, plated or unplated, shall not be used for parts that are depended upon to carry current.

Exception No. 1: Stainless steel may be employed for a part not subject to arcing.

Exception No. 2: A steel that is corrosion-resistant (stainless) or is protected against corrosion by cadmium plating, zinc plating, or an equivalent protective coating, may be used for wire-binding nuts and screws if these parts are not depended upon to carry current.

Exception No. 3: Iron or steel current-carrying parts employed on a flatiron or appliance plug are not prohibited when protected against corrosion by a metallic plating or other metal coating. See 51.1.

10.1.2 A current-carrying part shall be restricted from turning relative to the surface on which it is mounted if such turning would adversely affect the performance of the device.

10.1.3 Uninsulated live parts shall be secured in place so that a reduction in the spacings below those required in 14.1 is not likely.

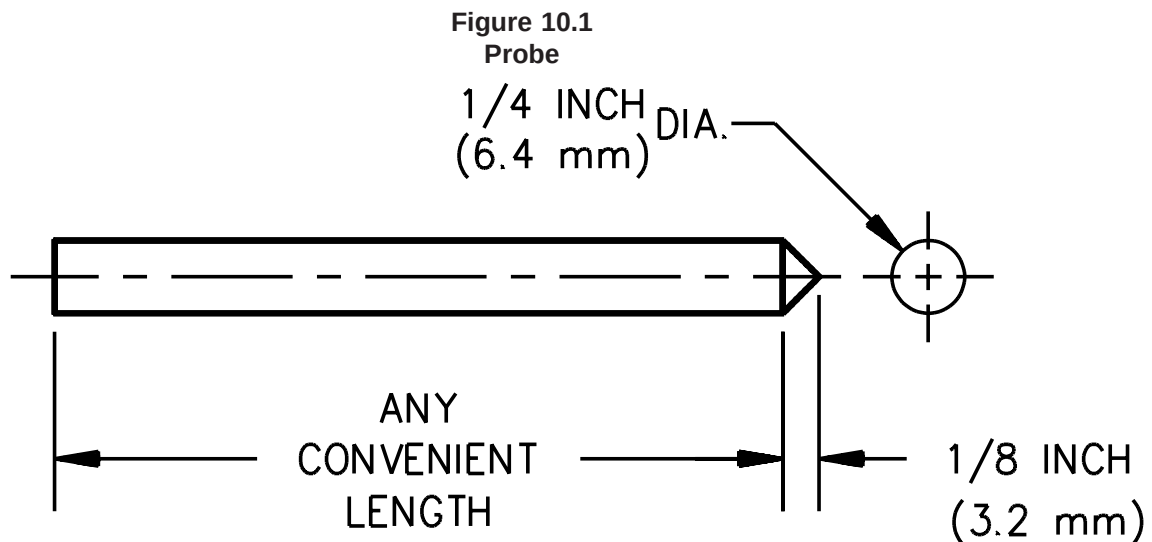
10.2 Contacts

10.2.1 Female contacts and associated live parts in the contact opening of an outlet device that can be touched by the probe illustrated in Figure 10.1 shall be recessed from the plane of the opening a distance not less than 1/4 of the maximum straight-line dimension of the opening, or 3/64 inch (1.2 mm), whichever is larger. That plane nearest the face of the device having the minimum opening for the pin or blade clearance is to be used to determine the minimum recess. Bevels, tapers, or other expansions of the opening to the face of the device do not affect the measurement. The probe in Figure 10.1 is to be inserted point first as far as possible in the opening without distorting the perimeter of the opening. The maximum straight-line dimension is the maximum-length straight-line that will fit within the opening at the plane of measurement.

Exception No. 1: A cord-connector having a 1-15R configuration shall comply with 23.1.1.

Exception No. 2: Devices having openings that close upon removal of the attachment plug are not required to comply with this requirement.

Exception No. 3: Specific-purpose devices intended only for disconnecting use (see 183.6), are not required to comply with this requirement.



PA190

11 Grounding and Dead Metal Parts

11.1 The following grounding parts shall be of copper or of a copper-base alloy:

- a) The grounding pin, blade, or contact,
- b) The grounding-conductor path through an attachment plug, current tap or cord connector, except for a metal housing or armor, and
- c) The grounding-conductor path through a receptacle up to the strap, yoke, or other mounting means.

Exception: A rivet, bolt, or clamp that is used to secure parts in the grounding-conductor path, but which is not an essential conductor in the grounding-conductor path, may be of steel or its equivalent.

11.2 A copper-base-alloy rivet that is used to secure parts in the grounding-conductor path, or that forms a part of the grounding-conductor path, shall not contain less than 80 percent copper.

11.3 The grounding-conductor path connections in a grounding device shall be secured by riveting, bolting, welding, or equivalent means.

Exception: Another form of connection employed in a cord connector is not prohibited when the connection complies with the requirement in Potential Drop in Grounding Connections Test, Section 99.

11.4 The grounding pin, blade, or contact, of a grounding device shall be permanently attached to the body of the device.

Exception: A device in which the grounding member is mounted in soft rubber or similarly flexible material is not precluded by this requirement. The requirement contemplates that the element is to be secured in a manner so that it is not readily removable or movable.

11.5 Grounding and other dead metal parts shall be secured in place so that a reduction in spacings below those required in 14.1 is not likely.

11.6 The grounding terminal of a grounding device shall be connected to the contact that is intended for use for equipment grounding. For devices having one of the standard grounding configurations, the grounding contact is identified by the letter "G" in the corresponding figure in Wiring Devices – Dimensional Specifications, ANSI/NEMA WD6, and in the Standard for Wiring Device Configurations, UL 1681. The grounding terminal shall be permanently identified in accordance with 185.1.1 in a manner that is readily recognizable during installation. See also 19.1, 24.1, 29.1.2, and Section 185.

11.7 Dead-metal parts of a grounding device shall be conductively connected to the grounding-conductor path through the device. See 9.1.2.

Exception: Dead-metal parts isolated from current-carrying parts and wiring other than complete flexible cords (see 9.1.7) are not required to comply with this requirement.

11.8 A conductive connection between a blade, pin, or contact, and an exposed dead-metal part capable of being grounded in service, such as the mounting strap, yoke, or body armor, shall be provided only in a grounding device. A nongrounding device with exposed dead-metal parts shall not be provided with a wiring terminal identified for an equipment grounding conductor. See also 19.4 and 24.2.

Exception: A nonstandard-configuration device that does not employ a dedicated grounding blade, pin, or contact, but which uses body armor or similar exposed metal parts as an equipment grounding conductor is not prohibited from being provided with an equipment grounding terminal only when the conductive connection between the grounding terminal and the exposed metal parts is obvious to the installer.

11.9 Dead metal parts of a device for use in nongrounding applications shall be insulated from live parts and wiring other than the complete flexible cord so that stray strands, failure of wiring terminals, or failure of wiring shall not energize accessible dead metal parts. See 9.1.3.

11.10 Iron or steel other than machine screws, washers, nuts, and stainless steel parts shall be protected against corrosion.

Exception: Parts determined to comply with 31.2.4 and 51.1, are not required to comply with this requirement.

12 Terminals

12.1 General

12.1.1 When a device is intended for the connection of conductors, a means shall be provided for connection such as a wire-binding screw or pressure-wire type wiring terminal, or a lead that is factory-assembled by means of soldering, welding, riveting or crimping. A wire-binding screw terminal shall not be used for the connection of circuit wires to a device rated more than 30 A and intended for connection to conductors greater than 10 AWG (5.3 mm²).

Exception: Other forms of construction, such as push-in or insulation-displacement terminals, may be accepted if the mechanical features and current-carrying capability are equivalent to those of the connections mentioned above. See also 20.1.1, 25.1, 30.2.1, and 30.3.1.

12.1.2 A terminal provided for the field connection of a grounding conductor shall employ a mechanical clamping means that does not depend upon solder for the connection of the wire.

12.2 Wire-binding screw terminals

12.2.1 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.

12.2.2 A terminal plate that has a tapped hole for a wire-binding screw shall be of 0.030 inch (0.76 mm) or thicker metal and shall not have fewer than two full threads in the metal. A binding screw that has 32 or more threads per inch (per 25.4 mm) with a terminal plate formed from stock 0.030 inch (0.76 mm) thick, may have the metal extruded at the tapped hole to provide two full threads for the binding screw.

12.2.3 A wire-binding screw shall thread into metal.

12.2.4 The minimum size and maximum number of threads per inch (per 25.4 mm) for a wire-binding screw shall be as indicated in Table 12.1.

Table 12.1
Sizes of terminal screws

Rating of device in amperes	Minimum size of screw	Maximum number of threads per inch (per 25.4 mm)
15 or less	6 ^a	36 ^c
20	8 ^b	32 ^c
30	8	32
^a No. 5-40 screws may be used on devices intended only for other than outlet-box use. ^b No. 6-36 screws with a 0.296 inch diameter (7.52 mm) or larger head may be used for terminals on attachment plugs and cord connectors. On the device with a 5-20 configuration, the terminal screw that is used for connecting the grounding conductor to the outlet box shall not be smaller than No. 6-36. ^c No. 8 or larger screws having more than the number of threads per inch (per 25.4 mm) indicated may be used for terminals when the assembly complies with the Tightening Torque Test, Section 68.		

12.2.5 A receptacle or inlet rated 30 A or less and employing wire-binding screw terminals for connection to copper branch circuit conductors only, shall comply with the general performance requirements for receptacles, Sections 108 – 123, or the general performance requirements for inlets, Sections 84 – 87, as applicable.

12.2.6 In addition to the requirements in Sections 108 – 123, a receptacle rated 15 or 20 A and employing wire-binding screw terminals for connection to copper and/or aluminum branch circuit conductors shall comply with the CO/ALR Type requirements contained in 35.1.

12.3 Soldering lugs

12.3.1 A terminal plate for a soldering lug shall be at least 0.050 in (1.27 mm) thick and shall not have fewer than two full threads in the metal for a terminal screw.

12.4 Pressure-wire terminals

12.4.1 A terminal plate for a pressure-wire terminal shall be at least 0.030 inch (0.76 mm) thick and shall not have fewer than two full threads in the metal for a terminal screw.

12.4.2 A pressure-wire terminal intended for the connection of branch circuit conductors to an inlet or receptacle shall be investigated in accordance with Table 12.2.

Table 12.2
Pressure-wire terminals used in receptacles and inlets

Use	Current rating	Pressure-wire terminal type	Reference paragraphs
Copper wire only	<30A	Clamp Setscrew	88.2, 124.3 12.4.3, 88.1, 124.2
	≥35A	Clamp Setscrew	12.4.3, 88.1, 124.3 12.4.3, 88.1, 124.3
Copper or aluminum wire	All	All	12.4.3, 36.1, 124.1

12.4.3 The tightening torque for the pressure-wire terminals designated in Table 12.2 shall be specified by the device manufacturer and shall be marked as described in Reference No. 4 of Table 184.2 for inlets and Reference No. 17 of Table 184.4 for receptacles. The specified tightening torque shall not be less than 90 percent of the value employed in the static heating test in the Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors, UL 486E, for the maximum wire size corresponding to the ampere rating of the device.

Exception: A lesser torque value is not prohibited when the connector is investigated in accordance with the Standard for Wire Connectors, UL 486A-486B or UL 486E using the lesser assigned torque value.

13 Cord Entry and Strain Relief

13.1 A device intended for connection to flexible cord shall be provided with a means of strain relief so that a pull on the flexible cord will not be transmitted directly to the wiring terminations. Acceptability of the strain relief means shall be determined by the test described in Integrity of Assembly Test, Sections 74 or 100.

Exception: The strain relief provided on a device intended solely for factory assembly to the conductors of a flexible cord shall be subjected to the Integrity of Assembly Test, Sections 70 or 96, but is not required to restrict a pull on the flexible cord from being transmitted directly to the wiring terminations when the conductors are terminated as described in 13.2 (a).

13.2 A device intended solely for factory assembly to the conductors of a flexible cord is to be connected to the conductors by:

- a) Welding, riveting, crimping, or the equivalent, or
- b) Soldering, when an offset or one or more right-angle bends in the conductor are employed so that a pull on the conductor will not be transmitted directly to the connection.

13.3 A device intended for use with Type SP, SPT, or other parallel-conductor flexible cord, shall be provided with one of the following means for securing the individual conductor insulation:

- a) An integral strain relief, not external to the body of the device,
- b) A means for snubbing, or
- c) Space within the device for a strain-relief knot. If a knot is to be used, all surfaces on which the knot may bear shall be smooth and well-rounded.

13.4 The diameter of a round cord-entry hole or the minor axis of an oblong cord-entry hole provided on a device intended for use on Type SP, SPT, or other parallel-conductor flexible cord shall not be longer than 1/4 inch (6.4 mm).

13.5 A metal-covered device intended for connection to a flexible cord shall be provided with an insulating bushing of porcelain, phenolic or cold-molded composition, or other insulating material with equivalent properties.

Exception No. 1: Hard fiber is acceptable for the bushing if the fiber is not less than 3/64 inch (1.2 mm) thick, and it is so formed and secured in place that it will not be affected by ordinary conditions of moisture.

Exception No. 2: If the metal covering (armor) of a device is not in proximity to the cord-entry hole, and the insulating material of which the plug is made serves as a smooth, well-rounded bushing for a flexible cord, a separate insulating bushing is not required.

Exception No. 3: A metal-covered device with a metal cord grip intended specifically for use with a jacketed type of flexible cord, such as Type S or SJ is not required to have an insulating bushing.

14 Spacings

14.1 The spacings maintained through air or over surface shall be a minimum 3/64 inch (1.2 mm) for a device rated 250 V or less, and a minimum 1/8 inch (3.2 mm) for a device rated more than 250 V, between the following:

- a) Uninsulated live parts of opposite polarity;
- b) An uninsulated live part and a dead-metal part that is likely to be grounded or exposed to contact by persons when the device is installed as intended, including a metal surface on which the device is mounted in the intended manner or a metal face plate used with a flush receptacle.

Exception No. 1: The grounding terminal of a flush receptacle shall instead comply with the spacing requirements in 31.2.1.

Exception No. 2: A self-contained receptacle shall instead comply with the spacing requirements in 43.1.

Exception No. 3: A dead-metal screw head, rivet, or the like, which is located in a hole not larger than 9/32 inch (7.1 mm) in diameter and recessed not less than 3/16 inch (4.8 mm) is not considered to be exposed to contact by persons after the device is installed in the intended manner.

14.2 In measuring a spacing, an isolated dead-metal part interposed between live parts of opposite polarity, or between a live part and a grounded or exposed dead-metal part, is considered to reduce the spacing by an amount equal to the dimension of the isolated dead-metal part in the direction of the measurement.

15 Assembly

15.1 General

15.1.1 A device shall be capable of being readily wired as intended.

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

15.1.3 An outlet device shall have live parts protected against exposure to contact by persons when the outlet is assembled and installed as intended.

15.1.4 When internal connections exist in a multiple-outlet device, similar and corresponding contacts of individual outlets shall be connected together.

15.1.5 A device having female contacts shall be constructed so that a standard attachment plug of the same configuration and with maximum length blades is capable of seating properly without exposure of the blades between the plane of the face of the plug and the plane of the rim of the female contact device.

Exception: Exposure of the wide side of the blade for a distance of 1/32 inch (0.8 mm) or less (measured along the length of the blade) is acceptable, and exposure of the narrow side of the blade is acceptable if the exposed area is recessed for a distance not shorter than the length (measured along the blade) of the exposed area.

15.2 Grounding and polarization

15.2.1 A grounding outlet device shall be so constructed that the grounding member of the corresponding attachment plug cannot be inserted by hand into any outlet slot to touch the live contact.

15.2.2 A device consisting of two or more pieces shall be such that polarization cannot be defeated by improper assembly during installation.

15.2.3 A cord connector or current tap having a 1-15R nonpolarized configuration shall not accommodate an attachment plug having polarized blades to the extent that the wider (polarized) blade can make electrical contact with either outlet device contact. Compliance shall be determined by the test described in Improper Insertion Test, Section 98.

15.2.4 A cord connector or current tap having a 1-15R polarized configuration shall not accommodate an attachment plug having polarized blades in other than the intended orientation to the extent that the wider (polarized) blade can make electrical contact with the contact of the narrower (non-polarized) slot. Compliance shall be determined by the test described in Improper Insertion Test, Section 94.

15.3 Mating and interchangeability

15.3.1 A general-use device, including any configuration illustrated in Wiring Devices – Dimensional Specifications, ANSI/NEMA WD6, the Standard for Wiring Device Configurations, UL 1681, or the Entertainment Technology Dimensional Requirements for Stage Pin Connectors, ANSI/PLASA E1.24, shall be constructed so that electrical continuity between respective and similarly marked terminals is established automatically when the mating plug and outlet device are connected together.

Exception No. 1: A 2-pole non-polarized device is not required to comply with this requirement

Exception No. 2: A special-purpose device for use in equipment where intermixed connections do not increase the risk of fire, electric shock, injury to persons, or damage to equipment, is not required to comply with this requirement.

Revised 15.3.1 effective November 16, 2015

15.3.2 An outlet device shall not accommodate an attachment plug other than one that is specifically intended for use with the outlet.

15.3.3 A male or female device that is capable of making a conductive connection with a female or male device of an established general-use design shall be constructed and rated for complete and correct interchangeability with the established design. An established general-use design is considered to include any of the following:

- a) Any of the configurations outlined in Wiring Devices – Dimensional Specifications, ANSI/NEMA WD6;
- b) Any of the configurations outlined in the Standard for Wiring Device Configurations, UL 1681;
- c) Any of the configurations identified in Entertainment Technology Dimensional Requirements for Stage Pin Connectors, ANSI/PLASA E1.24;
- d) Another configuration that is an American National Standard configuration; or

- e) A special-purpose configuration that is acceptable for use in one of the wiring systems that complies with the National Electrical Code, ANSI/NFPA 70.

Exception: A special-purpose receptacle configuration that will not accept any standard general-use plugs shall be permitted to accept a modified general-use plug that will also be accepted by the mating general-use receptacle. (For example, a receptacle for use in a hazardous location that is intended to supply hazardous-location equipment provided with a modified plug that may be used in either an ordinary or hazardous location.)

Revised 15.3.3 effective November 16, 2015

15.3.4 A male or female device of an established general-use design shall comply with the dimensions, spacings, and the relative arrangement of blade and contact slots required by one of the following:

- a) Wiring Devices – Dimensional Specifications, ANSI/NEMA WD6;
- b) The Standard for Wiring Device Configurations, UL 1681;
- c) Entertainment Technology Dimensional Requirements for Stage Pin Connectors, ANSI/PLASA E1.24; or
- d) Other American National Standard.

Revised 15.3.4 effective November 16, 2015

15.3.5 Attachment plugs, cord connectors, current taps, and receptacles that have different electrical ratings shall not be interchangeable with one another.

Exception No. 1: A 20-A outlet device is not prohibited from accommodating a 15-A attachment plug for a single and identical voltage rating only.

Exception No. 2: A special-purpose configuration that will not mate with a standard general-use configuration shall be permitted to have multiple current and voltage ratings if the device is intended for installation in facilities where it will be serviced only by qualified personnel, and where the configuration will be used on circuits with one of the device's rated currents, voltages and frequencies throughout the facility.

Exception No. 3: Plugs, cord connectors, and current taps for use on flexible cords, or that are provided with fuses, that have a lower current rating, as described in Exception No. 1 to 183.1, are not prohibited from mating with corresponding devices with the standard current rating and the identical voltage rating.

Exception No. 4: Devices of the ANSI/PLASA E1.24 Standard, Type 5 configurations (5T20, 5T30, 5T60 and 5T100) are identified as dual-rated voltage devices ("125-250V"). These configurations are only intended for use on grounded-neutral electrical circuits.

Revised 15.3.5 effective November 16, 2015

15.3.6 An outlet device having a nongrounding configuration shall not accept a grounding-type attachment plug.

Exception: The locking grounding device illustrated in Figure C1.1 and marked "Hospital Only" shall be permitted to be interchangeable with other nongrounding general-use devices which are not so marked.

15.3.6 revised November 16, 2012

15.4 Fuseholders

15.4.1 An enclosure shall be provided for the fuse or fuses in a device intended to accommodate such components.

15.4.2 A fuse enclosure shall reduce the risk of persons unintentionally contacting uninsulated live parts of the fuse and fuseholder.

15.4.3 A fuse enclosure shall confine the effects of a fuse rupture to the interior of the enclosure.

15.4.4 A device intended for use with a branch-circuit type fuse shall not be capable of accommodating a fuse or fuses that have a rating lower than the maximum rating in volts for the device.

15.4.5 In a fusible device, there shall be provision for a fuse in each ungrounded conductor, but there shall be no provision for a fuse in any other conductor.

15.4.6 The construction of a fusible device that has male pins or blades shall be such that the fuse or fuses will not be removable when the pins or blades are in a receptacle.

Exception: A fusible attachment plug having a configuration that is not illustrated in Wiring Devices – Dimensional Specifications, ANSI/NEMA WD6, or in the Standard for Wiring Device Configurations, UL 1681, may be provided with a fuse or fuses which is removable when the pins or blades are in a receptacle when the attachment plug is marked in accordance with Reference No. 12 of Table 184.1.

15.4.7 A fusible outlet device, such as a receptacle or a cord connector, shall not have live parts exposed to contact by persons when a fuse is being removed or replaced.

15.5 Switches

15.5.1 A switch provided as a part of a wiring device shall comply with the Standard for General-Use Snap Switches, UL 20. A switch provided as part of a device intended for factory assembly as a component of end-use equipment shall comply either with the Standard for Special-Use Switches, UL 1054, or the Standard for Switches for Appliances – Part 1: General Requirements, UL 61058-1.

UL 1054 will be withdrawn on June 23, 2015

ATTACHMENT PLUGS AND INLETS

16 Insulating Materials

16.1 An insulating plate employed for the backing of an inlet shall not be less than 1/32 inch (0.8 mm) thick and shall be moisture-resistant in accordance with 63.1 and 63.2. Phenolic composition or a similar material is acceptable for the insulating plate. Fiber may be employed if it is not less than 1/16 inch (1.6 mm) thick, is impregnated to resist the absorption of moisture in accordance with 63.1 and 63.2, and is not depended upon (by itself) to hold contacts or other live parts in place.

17 Enclosure

17.1 General

17.1.1 A general-use attachment plug shall not be provided with more than one cord-outlet hole.

17.1.2 A 2-pole attachment plug shall have a 2-inch (51-mm) or shorter overall length measured from the face of the plug to include any handle grip.

Exception: A 2-5/8 inch (66.7 mm) (maximum) overall length is acceptable for an attachment plug or current tap if the device:

- a) Weighs less than 6 oz (170 g),*
- b) Is torsionally balanced about an axis that is perpendicular to the pin face and that is centered between the blades or pins, and*
- c) Has a center of gravity located on this axis no further than 1 inch (25.4 mm) from the pin face.*

17.1.3 A 50-A attachment plug with a molded phenolic shell enclosing the wiring terminals is not acceptable in an application in which the attachment plug is likely to be subject to severe mechanical abuse.

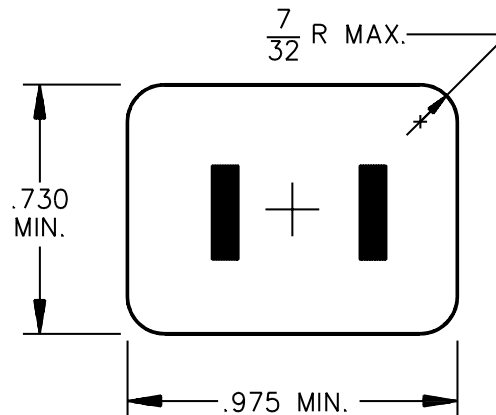
17.2 Grip

17.2.1 An attachment plug having a 1-15P configuration for use on parallel or vacuum cleaner (SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE, SVEO, and SVEOO) type flexible cord shall have a surface that facilitates gripping between the thumb and forefinger or some equivalent finger gripping means independent of the cord to provide for easy insertion and withdrawal from an outlet. See Attachment Plug Grip Tests, Section 73.

17.3 Face size

17.3.1 The perimeter of the face of an attachment plug having a 1-15P configuration shall encompass an area equal to or larger than that indicated in Figure 17.1.

Figure 17.1
Minimum attachment plug face dimensions



BLADES CENTERED

SA1945

inch	7/32	0.730	0.975
mm	5.6	18.5	24.8

18 Current-Carrying Parts

18.1 The folded-over blades of 15- or 20-A attachment plugs shall be formed from stock that is 0.028 – 0.032 inches (0.71 – 0.81 mm) thick.

Exception: Folded-over blades may be formed from stock less than 0.028 inches (0.71 mm) thick provided the stock is not less than 0.020 inch (0.51 mm) thick and both ends of the blade are securely retained within the body of the device, such that the overall thickness is maintained.

18.2 The profiles of the blades employed in an attachment plug having a 1-15P, 2-15P, 2-20P, 5-15P, 5-20P, 6-15P, or 6-20P configuration shall comply with the dimensional requirements of the Standard for Attachment Plug Blades for Use in Cord Sets and Power-Supply Cords, UL 1659.

19 Grounding and Dead Metal Parts

19.1 The grounding terminal mentioned in 11.6 and its corresponding contact shall be conductively connected to the mounting means (yoke or strap) of a flanged inlet and to the armor of an armored attachment plug.

Exception: The conductive connection is not required to be provided in a flanged inlet provided all of the following conditions are met:

- a) The mounting bracket, yoke, strap, or flange is constructed of an insulating material.*
- b) The lack of grounding continuity to the mounting means is obvious to the installer.*
- c) The device is plainly marked in accordance with Reference No. 3 of Table 184.2.*

19.2 For a grounding device, the blade to be used for grounding (G in the figures) shall be longer (see respective figures) than the other blades. For an attachment plug with a nonstandard configuration, the construction of the plug shall be such that, when the plug is inserted into its corresponding receptacle, contact between the grounding blade and the corresponding outlet contact will be made before contact between the other blades and their corresponding contacts.

19.3 A grounding blade or pin of a 15- or 20-A nonlocking type attachment plug shall not contain surface discontinuities that would tend to interfere with insertion or withdrawal from a grounding contact of an outlet device. Abrupt surface transitions such as gaps, steps, offsets, detents, holes or sharp chamfers are specifically prohibited in the following areas shown in Figure 19.1:

- 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.