



UL 183

Underwriters Laboratories Inc. Standard for Safety

Manufactured Wiring Systems



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UL Standard for Safety for Manufactured Wiring Systems, UL 183

Fourth Edition, Dated September 22, 2009

Summary of Topics

This Fourth Edition of ANSI/UL 183 is being issued to include the following changes in requirements:

Clarification of requirements when using non standard trade size conduits in Manufactured Wiring Systems

UL 50 reference changes

Addition to the Overload Test

Additions to the Performance and Manufacturing and Production Line Tests

The new requirements are substantially in accordance with Proposal(s) on this subject dated May 1, 2009.

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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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

Future Effective Date	Reference
February 23, 2011	Paragraphs 2.6, 2.14, 2.15, 3.8, 11.8, 11.9, 11.10, 14.10, 15.3, 15.5, 16.1, 20.4, 20.5, 20.6, 22.4, 26.1, 27.2, 27.3, 35.1, 39.3, 45.1, 45.9, 45.18, 45.19, 46.5, 46.6, Table 16.1, Sections 8, 17, 18, 21, 26, 42, and Supplement SA

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Standard for Manufactured Wiring Systems

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Fourth Edition

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

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INTRODUCTION

1 Scope

1.1 These requirements cover wiring systems for use in outdoor locations, field-installed wiring assemblies using off-site manufactured subassemblies for branch circuits, remote-control circuits, signaling circuits, and communication circuits in accessible areas. The products covered under this standard are to be installed in accordance with Article 604 of the National Electrical Code, ANSI/NFPA 70.

2 Glossary

2.1 For the purposes of this standard the following definitions apply.

2.2 ACCESSIBLE PART – A part that is:

- a) Located so that it can be contacted by a person; or
- b) Not recessed the required distance behind an opening.

2.3 BRANCH CIRCUIT – The circuit conductors between the final over-current device protecting the circuit and the outlet(s).

2.4 BRANCH CIRCUIT, MULTIWIRE – A branch circuit that consists of two or more ungrounded conductors that have a voltage between them, and a grounded conductor that has equal voltage between it and each ungrounded conductor of the circuit, and that is connected to the neutral or grounded conductor of the system.

2.5 CLASS 2 CIRCUIT – An isolated secondary circuit involving a potential of not more than 30-volt rms maximum 42.4 volts peak open circuit secondary potential under any condition of loading or open circuit by:

- a) An inherently-limited Class 2 transformer;
- b) A combination of an isolated transformer secondary winding and a fixed impedance or regulating network that together comply with the performance requirements for an inherently-limited Class 2 transformer;
- c) A dry-cell battery having output characteristics not greater than those of an inherently-limited Class 2 transformer;
- d) Any combination of (a), (b), and (c) that together comply with the performance requirements for an inherently-limited Class 2 transformer; or
- e) One or more combinations of a Class 2 transformer and an overcurrent protective device that together comply with the performance requirements for a noninherently-limited Class 2 transformer.

A circuit derived from a line-connected circuit by connecting impedance in series with the supply circuit as a means of limiting the voltage and current is not considered to be a Class 2 circuit.

2.6 CONTINUOUS PLUG-IN BUSWAY – A continuous plug-in busway is rated at 600V, 40 Amperes or less, has no exposed bus bars, and is intended for general use, including installation within the reach of persons.

2.6 effective February 23, 2011

2.7 ENCLOSURE – A housing which provides a degree of protection against contacting live parts (i.e., connector, conductors, and contacts). The enclosures are constructed of metal, polymeric material, or hybrid (combination of metal and polymer).

2.8 ENCLOSURE, ENVIRONMENTAL – The portion or portions of a device intended to provide a degree of protection to the contacts, blades, terminals, conductors, and other live parts of the device and of any adjoining devices or components comprising a complete protective system against outdoor conditions, both when the device is unmated and when it is fully connected to its intended mating device.

2.9 FITTING – A means of securing conduit, cable, or raceway to an enclosure or box.

2.10 INSULATION, BASIC – The insulation necessary for the intended functioning of the product and for basic protection against the risk of electric shock.

2.11 INSULATION, SUPPLEMENTARY – An independent insulation provided in addition to the basic insulation to reduce the risk of electric shock in case of breakdown of the basic insulation.

2.12 LIMITED POWER SOURCE (LPS) – A limited power source is as specified in the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1, and shall comply with the requirements of UL 60950-1.

2.13 LOW-VOLTAGE CIRCUIT – A circuit involving a potential of not more than 30 volts dc or ac rms (42.4 volts ac peak).

2.14 MANUFACTURED WIRING SYSTEM CONNECTOR – A device consisting of an electrical and mechanical enclosure, multi-pole electrical contacts and provided in either a male or female locking configuration for connection to a like configured connector.

2.14 effective February 23, 2011

2.15 MULTI-POLE SPLICING WIRE CONNECTOR – An insulated multi-pole mating or non-mating connector intended for factory wiring or field wiring contained in an outlet box, junction box, or within an equipment enclosure. Used to connect two or more branch-circuit conductors.

2.15 effective February 23, 2011

2.16 RACEWAY – A completely enclosed channel intended specifically for holding and routing wiring and providing separation of:

- a) Power and lighting circuits; and
- b) Power-limited or communication circuits.

2.17 RISK OF ELECTRIC SHOCK – A risk of electric shock is considered to exist in any accessible connective part of a system if a potential greater than 42.4 volts peak (30 volts rms) exists, and the available current is more than 5 milliamperes (7.07 mA peak) through a 1500-ohm resistor connected between:

- a) The part and other accessible connective parts; or
- b) Between the part and ground.

2.18 RISK OF FIRE – A risk of fire is considered to exist in any branch-circuit-connected component part or assembly. In addition, risk of a fire is considered to exist in a component part or assembly if the power supply for such a part or assembly is capable of delivering more than 15 watts into an external resistor connected between the point in question and any return to the supply. A power supply not capable of delivering more than 15 watts as previously mentioned, is considered to be energy limited.

2.19 SECONDARY CIRCUIT – A circuit that is supplied by an induced voltage from a primary, where a primary circuit is that supplied by a branch circuit.

3 Components

3.1 A component of a product covered by this standard shall comply with the requirements for that component, and shall be used in accordance with its recognized rating and other limitations of use. See Appendix A for a list of standards covering components used in the products covered by this standard.

3.2 Component receptacles shall be used with conductors or leads in accordance with their recognized rating and other limitations of use in accordance with the Standard for Attachment Plugs and Receptacles, UL 498.

3.3 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.

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

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

3.6 Prefabricated floor boxes shall comply with the Standard for Metallic Outlet Boxes, UL 514A, when used as a component of a manufactured wiring system.

3.7 NEMA type receptacles shall comply with the Standard for Attachment Plugs and Receptacles, UL 498, when used as a component of a manufactured wiring system.

3.8 Insulated multi-pole splicing wire connectors shall comply with the Standard for Insulated Multi-Pole Splicing Wire Connectors, UL 2459.

3.8 effective February 23, 2011

4 Units of Measurement

4.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

5 Undated 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

6 General

6.1 A manufactured wiring system shall be formed and assembled so that it has the strength and secureness of connections necessary to resist the abuses to which it is subjected without introducing a risk of fire, electric shock, or injury to persons due to the total or partial separation and resulting reduction of spacings, loosening or displacement of parts, or other serious defects.

6.2 Manufactured wiring systems intended for outdoor locations shall comply with the outdoor use construction and performance requirements specified in Section 40, Outdoor Use Performance, and 45.17.

7 Connecting Cable and Flexible Metal Conduit

7.1 Cable shall be Type AC or Type MC, having 8 AWG (8.4 mm²), 10 AWG (5.3 mm²), or 12 AWG (3.3 mm²) insulated copper ungrounded circuit conductors nominally rated 600 volts. A bare or insulated copper grounding conductor equivalent in size to the ungrounded circuit conductor shall also be provided.

Exception No. 1: A fixture tap not longer than 6 feet (1.83 m) and intended for connection to a single fixture may contain conductors smaller than 12 AWG but not smaller than 18 AWG.

Exception No. 2: Conductors for use in remote control, signaling, or communications circuits may be smaller than 12 AWG.

Exception No. 3: The grounded circuit conductor of type MC or type AC cable may be larger in size than the other conductors provided the grounded circuit conductor does not exceed 8 AWG (8.4 mm²).

7.2 Type AC or Type MC shall comply with the Standard for Armored Cable, UL 4, or the Standard for Metal Clad Cables, UL 1569.

7.3 Flexible metal conduit or liquid-tight flexible conduit shall be 3/8 inch (9.5 mm) or larger trade size provided with 8 AWG (8.4 mm²), 10 AWG (5.3 mm²), or 12 AWG (3.3 mm²) insulated copper conductors and an insulated or uninsulated copper-grounding conductor equivalent in size to the ungrounded circuit conductor.

Exception No. 1: Conductors shall not be smaller than 12 AWG unless they comply with Exception No. 1 or Exception No. 2 of 7.1.

Exception No. 2: The grounded circuit conductor shall not be larger in size than the other conductors unless the grounded circuit conductor does not exceed size 8 AWG (8.4 mm²).

7.4 Flexible metal conduit, liquid-tight flexible metal conduit, or liquid-tight flexible nonmetallic conduit shall comply with the Standard for Flexible Metal Conduit, UL 1, the Standard for Liquid-Tight Flexible Steel Conduit, UL 360, or the Standard for Liquid-Tight Flexible Nonmetallic Conduit, UL 1660.

Exception: Flexible metal conduit is not required to comply with all specified construction dimensions under the following conditions:

- a) Trade sizes of 9/16-inch and 5/8-inch oval shaped and flexible metal conduit shall comply with the 1/2-inch trade size performance requirements in UL 1, and trade size of 3/8-inch reduced wall flexible conduit shall be provided with internal and external diameters as specified in Table 7.1. All other construction and performance requirements shall be in accordance with UL 1;*
- b) All mating fittings and connector assemblies used with conduit specified in (a) shall be factory installed;*
- c) The field installation end of a fitting or connector intended for field assembly to the building electrical system shall comply with the construction requirements of the Standard for Conduit, Tubing, and Cable Fittings, UL 514B;*
- d) All conduit specified in (a) shall be provided with factory installed conductors;*
- e) The flexible metal conduit in (a) shall be subjected to follow up evaluation on performance testing in accordance with UL 1 on the indicated trade sizes.*

Table 7.1
Conduit dimensions

Trade size of conduit (inches)	External diameters		Internal diameters	
	Minimum	Maximum	Minimum	Maximum
3/8	0.560	0.690	0.375	0.520

7.5 Liquid-tight flexible nonmetallic conduit shall not be used in lengths exceeding 6 feet (1.8 m) between mating connectors or enclosures.

Exception: This requirement does not apply to liquid-tight flexible nonmetallic conduit with a smooth inner surface with integral reinforcement within the conduit wall identified as type "B" or "FNMC-B."

7.6 Electrical components marked in accordance with 45.5(a), shall comply with the following conduit restrictions:

- a) Type MC cable employing a smooth or corrugated impervious metal sheath without an overall nonmetallic covering has no length restrictions; and
- b) Flexible metal conduit and liquid-tight flexible metal conduit is suitable for use in lengths up to 4 ft (1.2 m).

Exception: Installation instructions that include a statement about maximum allowed length of conduit that may be installed in the duct or plenum meet the intent of this requirement.

7.7 Electrical components marked in accordance with 45.5(b) shall incorporate one of the following conduit types without length restrictions:

- a) Type MC cable, without an overall nonmetallic cover;
- b) Type AC Cable; or
- c) Flexible Metallic Conduit.

7.8 Insulated conductors shall have a minimum temperature rating of 75°C (167°F).

7.9 The connectors used with cable or conduit shall effectively close any openings in the connection.

8 Continuous Plug-in Busway

8.1 Continuous plug-in busway and busway fittings shall comply with the Standard for Busways, UL 857.

8.1 effective February 23, 2011

8.2 Continuous plug-in busway shall have provision for installation and support in accordance with the National Electrical Code, NFPA 70.

8.2 effective February 23, 2011

8.3 A continuous plug-in busway shall contain factory mounted, bare, or insulated conductors which shall be copper or aluminum bars, rods, or tubes. The busway shall be grounded and provided with an equipment ground busbar equivalent in size to the ungrounded busbar. The busway shall be rated a nominal 600 volts, 20, 30, or 40 amperes.

8.3 effective February 23, 2011

9 Knockouts

9.1 A knockout provided in a raceway for a 1/2 inch or larger trade size conduit shall comply with the knockout requirements in Connections for Wiring Systems in the Standard for Metallic Outlet Boxes, UL 514A.

10 Connecting Flexible Cord

10.1 Components of a manufactured wiring system which are intended to serve as a transition between a manufactured wiring system and utilization equipment which is not permanently secured to the building structure may utilize flexible cord in lieu of the flexible metal conduit, liquid-tight flexible metal conduit, or Type AC or MC cable specified in Section 7, Connecting Cable and Flexible Metal Conduit. The flexible cord shall be classified for hard usage, shall utilize minimum 12 AWG conductors, and shall not exceed 6 feet (1.83 m) in length. The cord shall be provided with a strain relief means as specified in Section 24, Flexible Cord Strain Relief.

11 Mechanical Assembly and Enclosure

11.1 A fitting or other component shall be prevented from turning, loosening, or otherwise becoming disengaged from its mounting means.

11.2 The means by which the turning or loosening is prevented is to include more than friction between surfaces.

11.3 A manufactured wiring system may be shipped from the factory unassembled or disassembled to the degree necessary to facilitate shipment, if the following conditions are met:

- a) The manufactured wiring system is constructed so that field assembly can be accomplished without drilling, cutting, crimping, or performing other operations requiring the use of tools for other than field-wiring connections.
- b) The relationship between the current-carrying parts is established at the time of manufacture, and is not dependent upon installation personnel.

11.4 A junction box or similar device made of sheet metal shall have a thickness not less than the value specified in Table 11.1, unless investigated and found acceptable for the application.

Table 11.1
Thickness of sheet metal for enclosures

Maximum area of any surface		Maximum dimension		Minimum thickness, inch (mm)											
				Steel								Copper, brass, or aluminum			
square-inches	(cm ²)	inches	(mm)	Without supporting frame				With supporting frame or equivalent reinforcing				Without supporting frame		With supporting frame or equivalent reinforcing	
				Zinc-coated		Uncoated ^a		Zinc-coated		Uncoated ^a					
6 ^b	(38.7)	3	(76.2)	0.023	(0.54)	0.020	(0.51)	0.023	(0.54)	0.020	(0.51)	0.023	(0.54)	0.023	(0.54)
36	(232.2)	8	(203.2)	0.029	(0.74)	0.026	(0.66)	0.023	(0.54)	0.020	(0.51)	0.036	(0.91)	0.029	(0.74)
90	(580.5)	12	(304.8)	0.034	(0.85)	0.032	(0.81)	0.023	(0.54)	0.020	(0.51)	0.045	(1.10)	0.029	(0.74)
135	(870.7)	18	(457.2)	0.045	(1.10)	0.042	(1.07)	0.034	(0.85)	0.032	(0.81)	0.058	(1.48)	0.045	(1.10)
360	(2322)	24	(609.6)	0.056	(1.40)	0.053	(1.35)	0.045	(1.10)	0.042	(1.07)	0.075	(1.88)	0.058	(1.48)
1200	(7740)	48	(1219.2)	0.070	(1.78)	0.067	(1.71)	0.056	(1.40)	0.053	(1.35)	0.095	(2.40)	0.075	(1.88)
1500	(9675)	60	(1524.0)	0.097	(2.44)	0.093	(2.37)	0.056	(1.40)	0.053	(1.35)	0.122	(3.10)	0.075	(1.88)
Over 1500	(9675)	—	—	0.126	(3.10)	0.123	(3.09)	0.056	(1.40)	0.053	(1.35)	0.153	(3.88)	0.075	(1.88)

^a Including stainless steel.
^b Volume of enclosure not more than 12 cubic inches (196.64 cm³)

11.5 For an unreinforced flat surface, cast metal shall not be less than 1/8 inch (3.2 mm) thick, malleable iron shall not be less than 3/32 inch (2.4 mm) thick, and die-cast metal shall not be less than 5/64 inch (2.0 mm) thick.

Exception: Metal of lesser thickness but not less than 3/32 inch, 1/16 inch (1.6 mm), and 3/64 inch (1.2 mm), respectively, shall comply with the Compression and Deflection Tests in the Standard for Office Furnishings, UL 1286.

11.6 An enclosure shall be constructed as follows:

- a) When intended for use in ducts or plenums used for environmental air-handling, there shall be no openings. An enclosure shall be constructed of metal.
- b) When intended for use in environmental air-handling spaces, other than ducts or plenums, openings in the enclosure that are not closed during the assembly shall comply with the following:
 - 1) The largest dimension of an opening shall not be more than 1/4 inch (6.4 mm) and the smallest dimension shall not be more than 1/16 inch (1.6 mm);
 - 2) There shall be a maximum of five openings in any one side or end of the enclosure and the total area of all openings shall not be more than 0.2 square inch (1.3 cm²); and
 - 3) There shall be a maximum of 15 openings in the enclosure and the total area of all openings shall not be more than 0.5 square inch (3.2 cm²); and
 - 4) Enclosures molded of polymeric materials shall comply with:
 - i) The requirements for Fixtures for Use As Air Handling Registers in the Standard for Luminaires, UL 1598; or
 - ii) The Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces, UL 2043.
- c) An enclosure not intended for use in environmental air-handling spaces shall comply with the following:
 - 1) The largest dimension of an opening shall not be more than 1/4 inch (6.4 mm) and the smallest dimension shall not be more than 1/16 inch (1.6 mm);
 - 2) There shall be a maximum of five openings in any one side or end of the enclosure and the total area of all openings shall not be more than 0.2 square inch (1.3 cm²);
 - 3) There shall be a maximum of 15 openings in the enclosure and the total area of all openings shall not be more than 0.5 square inch (3.2 cm²).

11.7 An interconnecting cable or other component shall be constructed so that the wire terminations will not be stressed when the complete device is extended to its maximum length.

11.8 Each manufactured wiring system shall be provided with a means for capping any unused connector opening in the field. The cap for each connector shall be secured by screws, bolts and nuts, or other positive means; or a snap-fit method that complies with the Cap Separation Test, Section 42. Caps shall be provided with each assembly, or may be provided as an accessory kit when specified in the installation and operating instructions in accordance with 46.5.

Exception: A manufactured wiring system connector that complies with Section 26, Accessibility to Uninsulated Live Parts, need not be provided with a means to cap unused connector openings. The installation instructions shall contain a statement to inform the user that caps are not required in accordance with 46.6.

11.8 effective February 23, 2011

11.9 A cap made of sheet metal shall have a thickness not less than the values specified in Table 11.1. A polymeric cap that does not contact live parts shall have the strength to resist the mechanical stresses to which it is subjected during intended use of the product and have a minimum HB rating. Polymeric caps that contact live parts shall comply with the requirements for direct support and enclosure of live parts in UL 746C, as specified in the table for material property considerations.

11.9 effective February 23, 2011

11.10 Receptacles mounted to and supported by a cover shall be provided with more than one securement point for the receptacle.

11.10 effective February 23, 2011

12 Enclosures of Polymeric Material

12.1 The material thickness of a polymeric enclosure, including a cap or cover, is not specified. A polymeric enclosure provided as the sole means of protecting electrical components against mechanical abuse shall have the strength to resist the mechanical stresses to which it is subjected during intended use of the product. A polymeric enclosure or part shall comply with the enclosure requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

13 Protection Against Corrosion

13.1 Enclosures and fittings for use in a manufactured wiring system shall be protected against corrosion on all inside and outside surfaces, unless the metal is inherently resistant to ordinary dry location indoor atmosphere corrosion. The acceptability of corrosion protection shall be determined as described in the applicable requirements for protection against corrosion in the Standard for Metallic Outlet Boxes, UL 514A, and Conduit, Tubing and Cable Fittings, UL 514B.

Exception: This requirement does not apply to cut edges.

13.2 Iron and steel parts other than those described in 13.1 shall be provided with corrosion protection, such as enameling, galvanizing, plating, or other equivalent means, if the malfunction of unprotected parts introduces a risk of fire, electric shock, or injury to persons.

13.3 Enclosures for outdoor locations of a metallic construction shall comply with the applicable requirements in the Standard for Enclosures for Electrical Equipment, UL 50, and the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E.

13.4 Enclosures for outdoor locations of a nonmetallic construction shall comply with the applicable requirements in the Standard for Enclosures for Electrical Equipment, UL 50, the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E, and the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.