



UL 1008A

STANDARD FOR SAFETY

Medium-Voltage Transfer Switches



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UL Standard for Safety for Medium-Voltage Transfer Switches, UL 1008A

First Edition, Dated March 30, 2012

SUMMARY OF TOPICS

This revision of UL 1008A is being issued to incorporate an effective date for requirements in 5.7, 7.9, 14.1.1, 44 – 45, 47.2.1, and 47.5.3 originally published March 30, 2012. No changes in requirements are involved.

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.

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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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.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 Dates	References
April 17, 2015	5.7, 7.9, 14.1.1, 44 – 45, 47.2.1, and 47.5.3

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HISTORICAL NOTE

ANSI/UL 1008A-2012

Prior to the publication of this first edition these requirements were covered by the Outline of Investigation for Transfer Switch Equipment, Over 600 Volts, UL 1008A.

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UL 1008A

Standard for Medium-Voltage Transfer Switches

First Edition

March 30, 2012

This ANSI/UL Standard for Safety consists of the First edition including revisions through April 17, 2013.

The most recent designation of ANSI/UL 1008A as an American National Standard (ANSI) occurred on March 30, 2012. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

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INTRODUCTION

1 Scope

1.1 These requirements cover automatic, non-automatic, and manual transfer switches, operating at above 750 V AC, and intended for use in ordinary locations to provide for power as follows:

a) Automatic transfer switches for use in emergency systems in accordance with Articles 517-Health Care Facilities, 700-Emergency Systems, 701-Legally Required Standby Systems, and 702-Optional Standby Systems of the National Electrical Code, ANSI/NFPA 70; and the Standard for Health Care Facilities, ANSI/NFPA 99.

b) Transfer switches for use in optional standby systems in accordance with Article 702 of the National Electrical Code, ANSI/NFPA 70.

c) In legally required standby systems in accordance with Article 701 of the National Electrical Code, ANSI/NFPA 70.

d) Automatic transfer switches for use in accordance with the National Fire Protection Association Standard for Centrifugal Fire Pumps, ANSI/NFPA 20.

e) Non-Automatic transfer switches for use in accordance with Articles 517-Health Care Facilities, and 702-Optional Standby Systems of the National Electrical Code, ANSI/NFPA 70; and the Standard for Health Care Facilities, ANSI/NFPA 99.

1.2 An automatic transfer switch for use in a legally required stand-by system shall comply with the requirements for a transfer switch for emergency systems.

1.3 These requirements cover transfer switches rated greater than 750 Volts, up to 46 kV.

1.4 These requirements cover transfer switches together with their associated control devices including, but not limited to, voltage sensing relays, frequency sensing relays, and time delay relays.

1.5 An automatic transfer switch as covered by these requirements is a device that automatically transfers a common load from a normal supply to an alternate supply in the event of failure of the normal supply, and automatically returns the load to the normal supply when the normal supply is restored. An automatic transfer switch may be provided with a logic control circuit that inhibits automatic operation of the device from either a normal to an alternate supply, or from an alternate to a normal supply when the switch reverts to automatic operation upon loss of power to the load.

1.6 A non-automatic transfer switch as covered by these requirements is a device, operated manually by a physical action, or electrically by a remote control, for transferring a common load between a normal and alternate supply.

1.7 A transfer switch may incorporate overcurrent protection for the main power circuits.

1.8 These requirements only cover completely enclosed transfer switches.

1.9 Transfer switches are rated in amperes and are considered to be acceptable for total system transfer, which includes control of motors, electric-heating loads, and transformer loads.

2 Components

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

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

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

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

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

3 Units of Measurement

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

4 Undated References

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

5 Glossary

5.1 For the purpose of this standard the following definitions apply.

5.2 **ACCESSIBLE PART** – A part located so that it can be contacted by a person, either directly or by means of a probe or tool during user servicing, or that is not recessed the required distance behind an opening.

5.3 **BARRIER** – A partition for the insulation or isolation of electric circuits, for the isolation of electric arcs, or for isolation of moving parts or hot surfaces. In this respect, a barrier may serve as a portion of an enclosure or as a functional part.

5.4 **CONTROL CIRCUIT** – A circuit that carries electric signals directing the performance of a transfer switch. A control circuit does not carry main power current.

5.5 **ENCLOSURE** – That portion of a transfer switch that reduces the accessibility and unintentional contact of a part that may involve a risk of fire, electric shock or injury to persons, or reduces the risk of propagation of flame, sparks, and molten metal initiated by an electrical disturbance occurring within.

5.6 **LIVE PART** – Denotes metal or conductive parts that, during intended use, have a potential difference with respect to ground or any other conductive part.

5.7 **OPERATING DUTY CLASS** – The minimum number of operations a transfer switch can be expected to perform over the life of the equipment. The three operating duty classes are:

- a) Class A – 2000 operations,
- b) Class B – 1000 operations, and
- c) Class C – 400 operations.

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5.8 **OPERATOR** – Trained persons having familiarity with the construction and operation of the equipment, and the risks involved, including, but not limited to, persons who may periodically open a transfer switch to repair or maintain electrical or mechanical components.

5.9 **POLLUTION DEGREE 1** – No pollution or only dry, nonconductive pollution occurs. The pollution has no influence.

5.10 **POLLUTION DEGREE 2** – Normally, only nonconductive pollution occurs; however, temporary conductivity caused by condensation may be expected.

5.11 **POLLUTION DEGREE 3** – Conductive pollution occurs, or dry, nonconductive pollution occurs that becomes conductive due to condensation that is expected.

5.12 **PRIMARY CIRCUIT** – Wiring and components that are conductively connected to the preferred or alternate source of supply or another branch circuit.

5.13 **PRINTED-WIRING BOARD** – The finished combination of a pattern of conductive paths either on, in, or both on and in (multilayer) a sheet of insulating material, including printed components, and the base material.

5.14 **RISK OF ELECTRIC SHOCK** – A risk of electric shock is considered to exist at any part when the potential between the part and earth ground or any other accessible part is greater than 42.4 V peak AC or 60 V DC, and the continuous current flow through a 1500 Ω resistor connected across the potential exceeds 5 mA.

5.15 **RISK OF INJURY TO PERSONS** – A condition that exists when stationary parts (such as sharp metal edges and projections), moving parts, falling objects, inadequate mechanical strength of material, or the physical instability of the equipment are such that injury to persons may result.

5.16 **SECONDARY CIRCUIT** – A circuit conductively connected to the secondary winding of an isolating power supply transformer.

5.17 **SERVICING** – Any form of servicing that can be performed by personnel other than those who are trained to maintain the unit. Some examples of user servicing are:

- a) The installation of accessories.
- b) The replacement of lamps and fuses, or the resetting of circuit breakers located in a user access area.
- c) The making of routine operating adjustments necessary to adapt the unit for different intended functions.
- d) Routine cleaning.

5.18 **SWITCH, TRANSFER** – An automatic or nonautomatic device for transferring load conductor connections from one power source to another.

5.19 **TOOL** – A hand-held implement, such as a wrench, screwdriver, or any other object that may be used during servicing, including a coin, key or other object that can be used to operate a lock, screw latch, or similar fastening means.

CONSTRUCTION

6 General

6.1 Transfer switches shall employ materials throughout which are rated for the particular use, and shall be made and finished with the degree of uniformity and grade of workmanship practicable in a well-equipped factory.

6.2 Transfer switch assemblies may consist of a single section, or of multiple sections, bolted or welded together into a single lineup of equipment. When consisting of multiple sections, all sections comprising the transfer switch assembly shall comply with these requirements.

7 Enclosure

7.1 A transfer switch shall be provided with an enclosure, unless marked in accordance with 50.12.

7.2 An enclosure shall comply with the requirements detailed in one of the following standards:

- a) Standard for High Voltage Industrial Control Equipment, UL 347;
- b) Standard for Metal-Clad Switchgear, ANSI/IEEE C37.20.2; or
- c) Standard for Metal-Enclosed Interrupter Switchgear, ANSI/IEEE C37.20.3.

7.3 A ventilating opening in the top of the enclosure shall be covered by a hood or protective shield spaced above the opening to reduce the possibility of the entry of foreign material.

7.4 An enclosure may be marked with a type number or numbers indicating the external conditions for which it is rated. See Table 7.1. The marking may be on the inside or outside surface but shall be visible after installation. See 50.17.

Table 7.1
Enclosure types and tests

Designation	Intended use and description	Requirement or qualification test ^a
1	Indoor use primarily to provide protection against contact with the enclosed equipment and against a limited amount of falling dirt.	Rod Entry and Indoor Corrosion Protection.
2	Indoor use to provide a degree of protection against limited amounts of falling water and dirt.	Drip, Rod Entry, Indoor Corrosion Protection, Gasket, and Misalignment.
3	Outdoor use to provide a degree of protection against windblown dust and windblown rain; undamaged by the formation of ice on the enclosure.	Outdoor Dust, External Icing, Outdoor Corrosion Protection, Gasket, and Misalignment.
3R	Outdoor use to provide a degree of protection against falling rain; undamaged by the formation of ice on the enclosure.	Rod Entry, Rain, External Icing, Outdoor Corrosion Protection, Gasket, and Misalignment.
3S	Outdoor use to provide a degree of protection against windblown dust, windblown rain, and sleet; external mechanisms remain operable while ice laden.	Outdoor Dust, External Icing, Outdoor Corrosion Protection, Gasket, and Misalignment.
4	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.	External Icing, Hosedown, Outdoor Corrosion Protection, Gasket, and Misalignment.
4X	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure; resists corrosion.	External Icing, Hosedown, Outdoor Corrosion Protection, Additional Corrosion Protection, Gasket, and Misalignment.

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Table 7.1 Continued

Designation	Intended use and description	Requirement or qualification test ^a
6	Indoor or outdoor use to provide against the entry of water during temporary, limited submersion, undamaged by the formation of ice on the enclosure.	External Icing, Outdoor Corrosion Protection, Submersion, Gasket, and Misalignment.
6P	Indoor and outdoor use to provide a degree of protection against the entry of water during prolonged submersion at limited depths.	External Icing, Hosedown, Outdoor Corrosion Protection, Additional Corrosion Protection, Pressure, Gasket, and Misalignment.
12, 12K	Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and external condensation of noncorrosive liquids.	Indoor (Circulating) Dust, Indoor Corrosion Protection, Gasket, and Misalignment.
13	Indoor use to provide a degree of protection against lint, dust seepage, external condensation and spraying of water, oil, and noncorrosive liquids.	Indoor Corrosion Protection, Oil Exclusion, Gasket, and Misalignment.
^a For description of tests, see the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E.		

7.5 An enclosure that complies with the requirements for more than one type of enclosure may have multiple designations.

7.6 An external operating means – such as those for a disconnect, a pilot device, or a resetting operation – mounted on or through an enclosure shall withstand the tests specified for the enclosure.

7.7 Marking and instructions on the exterior of an enclosure shall be permanent. See 52.1.

7.8 When marked with an enclosure type number, an enclosure shall be subjected to the tests specified in Table 7.1, and shall comply with the construction requirements applicable to an enclosure of the type number or numbers with which it is marked.

7.9 Outdoor enclosures shall comply with the Method for the Weatherproofing Test for Outdoor Switchgear from the Standard of Common Requirements for High Voltage Power Switchgear Rated Above 1000 V, IEEE C37.100.1, in addition to tests required for all enclosure type ratings marked on the enclosure.

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8 Insulating Material

8.1 Material for the support of uninsulated live parts operating at voltages of 1500 V and below shall be porcelain, phenolic, or cold molded composition, or other material suitable for the support of such parts in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, and shall be capable of withstanding the most severe conditions likely to be met in service.

8.2 Material for the support of uninsulated live parts operating at voltages above 1500 V shall comply with the Dielectric Voltage-Withstand Test, Section 37, and the Impulse Voltage Withstand Test, Section 47.

8.3 Insulating material, including barriers between parts of opposite polarity (phase barriers) and material that may be subject to the influence of an arc formed by the opening of a switch, shall be rated for the particular application.

9 Mounting of Parts

9.1 All parts of transfer switches shall be securely mounted in position and prevented from loosening or turning when such motion may adversely affect the intended performance of the equipment, or may affect the risk of fire and shock or injury to persons incident to the operation of the equipment.

9.2 Uninsulated live parts other than pressure wire connectors, shall be secured to their supporting surfaces so that they will be prevented from turning or shifting in position when such motion may result in a reduction of spacings to less than those indicated in Table 19.1. The security of contact assemblies shall be such as to provide the continued alignment of contacts.

9.3 Friction between surfaces is not permitted as a means to prevent turning, loosening, or shifting of a part as required in 9.1 and 9.2, but a lock washer, properly applied, may be accepted.

9.4 External handle(s) and push-button(s), if provided, shall be located in accordance with the following:

- a) Control and transfer switch handles and a push-button shall be located in a readily accessible location at an elevation above the equipment mounting surface not in excess of 78 inches (1.98 m).
- b) Operating handles requiring more than 50 lbf (222 N) to operate shall not be located higher than 66 inches (1.67 m) in either the open or closed position.
- c) Operating handles for infrequently operated devices, such as isolating means reset devices, drawout fuses, or fused transformer primary disconnects need not comply with (a) and (b).

9.5 In determining compliance with 9.4, measurements shall be made to the center of the handle grip with the handle in the highest possible position. Where the handle grip is not clearly defined, it shall be considered to be at a point 3 inches (76 mm) in from the end of the handle.

9.6 When the mechanism of a switching device is such that automatic operation of the transfer switch, or operation of a remote or automatic tripping devices will permit sudden movement of an operating handle, the motion of the handle shall be restricted or the handle shall be guarded to prevent injury to persons in the vicinity of the handle.

10 Guarding and Accessibility of Live Parts

10.1 Energized uninsulated live parts of control circuits mounted on doors shall be guarded or enclosed to reduce the risk of unintentional contact, when the door is opened for maintenance of equipment or removal of drawout equipment.

10.2 When access is required to a compartment that contains energized parts operating above 750 V, barriers shall be provided to:

- a) Keep from unintentional contact with energized parts.
- b) Keep tools or other equipment from being dropped on energized parts.

10.3 Barriers shall be provided to protect against contact with live parts of adjacent functional units.

10.4 Any barrier intended to be removed during routine maintenance or servicing shall be marked in accordance with 50.16.

11 Current-Carrying Parts

11.1 A current-carrying part shall have mechanical strength and current-carrying capacity for the service, and shall be of metal that is rated for the particular application.

11.2 When parts are held together by screws, a threaded part shall have no fewer than two full, clean-cut threads engaged. When the screw does not extend all the way through a threaded part, the taper or lead and the first full thread are to be disregarded in a determination of the number of threads engaged.

12 Field Wiring Terminals for Control Circuits

12.1 Transfer switches shall be provided with terminals for the connection of each control circuit conductor intended to be field installed. The terminals shall be sized to accommodate conductors having an ampacity equal to or greater than the current rating of the circuit for which they provide connection, and shall comply with the requirements in the Standard for Terminal Blocks, UL 1059.

12.2 Sizes of field-installed conductors for circuits operating at 750 V and below shall be determined in accordance with Table 12.1.

Table 12.1
Ampacity of insulated conductors – 750 V and below^{a, b}

Wire size		60°C (140°F)		75°C (167°F)	
AWG or kcmil	mm ²	Copper	Aluminum	Copper	Aluminum
14	2.1	15	—	15	—
12	3.3	20	15	20	15
10	5.3	30	25	30	25
8	8.4	40	30	50	40
6	13.3	55	40	65	50
4	21.2	70	55	85	65
3	26.7	85	65	100	75
2	33.6	95	75	115	90
1	42.4	110	85	130	100
1/0	53.5	125	100	150	120
2/0	67.4			175	135
3/0	85			200	155
4/0	107.2			230	180
250	127			255	205
300	152			285	230
350	177			310	250
400	203			335	270
500	253			380	310
600	304			420	340
700	355			460	375
750	380			475	385
800	405			490	395
900	456			520	425
1000	507			545	445
1250	633			590	485
1500	760			625	520
1750	887			650	545
2000	1010			665	560

^a For a multiple-conductor at a terminal, the value is to be multiplied by the number of conductors that the terminal accommodates (1/0 AWG or larger).

^b These values of ampacity apply only when not more than 3 conductors are intended to be field installed in the raceway. When 4 or more conductors, other than a neutral that carries the unbalanced current, are intended to be installed in a raceway, the ampacity of each of those conductors is 80 percent of the value given in the table when 4 – 6 conductors are involved, and 70 percent of that value when 7 – 24 conductors are involved.

12.3 A wiring terminal without a marked wire size range shall hold the next larger size conductor than that specified in 12.2 when the terminal is sized to receive the larger size conductor, unless the equipment is marked to indicate the wire size to be used.

13 Internal Wiring

13.1 General

13.1.1 The internal wiring of transfer switches shall consist of Type SIS wire, general use wire or appliance wiring material (AWM) suitable for the particular application when considered with respect to the temperature and voltage, and conditions of service to which the wiring is likely to be subjected.

13.1.2 Wireways shall be smooth and entirely free from sharp edges, burrs, fins, moving parts, and similar hazards, which may cause abrasion of the conductor insulation.

13.1.3 All joints and connections shall be mechanically secure and shall provide effective electrical contact without strain on connections and terminals.

13.1.4 Stranded conductors clamped under wire-binding screws or similar parts shall have the individual strands restrained by cupped washers or the equivalent to provide connections.

13.1.5 A splice shall be provided with insulation equivalent to that of the wires involved.

13.2 Barriers defining wireways

13.2.1 A sheet steel barrier shall not be less than 0.053 inch (1.35 mm) thick, when uncoated and not less than 0.056 inch (1.42 mm) thick when galvanized, unless the configuration of the barrier is such to provide strength and rigidity at least equal to a flat sheet of steel having the same dimensions as the barrier and of the required thickness.

13.2.2 A nonmetallic barrier shall not be less than 1/4 inch (6.4 mm) thick unless it is located where it will not be subject to mechanical abuse during installation and maintenance. All nonmetallic barriers shall be constructed so as to have physical strength and rigidity.

13.2.3 An air space shall be provided between live parts and a nonmetallic barrier unless the barrier is of a material that has been investigated and found to comply with the Dielectric Voltage-Withstand Test, Section 37, and the Impulse Voltage Withstand Test, Section 47, as required for this equipment.

13.2.4 An opening in a barrier through which factory installed wiring passes, or through which field installed wiring may pass, shall be provided with a bushing, or shall be formed so that there are no sharp edges with which conductors may come in contact.

13.2.5 A bushing employed as described in 13.2.4 shall be of glass, ceramic, hard fiber, phenolic composition, cold-molded composition, or other polymeric material which has been investigated and found suitable for the application. Rubber, neoprene, and similar materials are not permitted for this bushing.

13.3 Wiring in circuits 750 V and below

13.3.1 The internal wiring of the control circuit of transfer switches shall consist of Type SIS wire, general use wire or appliance wiring material (AWM) intended for the particular application, when considered with respect to the temperature and voltage and conditions of service to which the wiring is likely to be subjected.

13.3.2 Appliance wiring material of one or more of the types indicated in Table 13.1, may be used for internal wiring when considered with respect to the requirements in 13.3.1.

Table 13.1
Appliance wiring material

Type of insulation	Nominal thickness of insulation ^a
	750 V and below applications
Thermoplastic	1/32 inch (0.8 mm)
Silicone	1/32 inch (0.8 mm) plus an impregnated-braid cover 1/32 inch (0.8 mm) without a braid cover ^b
^a The minimum thickness of 0.028 inch (0.71 mm) for 1/32 inch (0.8 mm) nominal thick insulation. ^b Only when routed away from live parts of opposite polarity and protected from mechanical damage both during installation of field wiring and while in operation, unless the material has adequate resistance to mechanical damage.	

13.3.3 Appliance wiring material having lesser thicknesses of insulation than those indicated in Table 13.1 may be used for a particular application provided the insulation, with respect to temperature and voltage, and condition of service is equivalent to the type of insulation described in Table 13.1.

13.3.4 Electrical components may be mounted on hinged covers, drawout equipment, or doors, when conductors subject to flexing are not larger than 10 AWG (5.3 mm²), are stranded, and have at least 1/32 inch (0.8 mm) thick insulation or are part of a flexible cord assembly, see 13.3.5. These conductors shall be cabled, routed, secured, and protected so that they will not be damaged during the opening and closing of the door or cover or during the movement of a drawout unit.

13.3.5 Cord-connected circuits in industrial control equipment shall be provided with the correct length, size, and type of hard-service or junior hard-service flexible cord (such as Type S, and SJ) or the equivalent, that is suitable for use at the temperature and voltage involved, terminating with an attachment plug.

13.4 Wiring in circuits above 750 V

13.4.1 All wiring in circuits operating above 750 V shall be suitable for the particular application when considered with respect to the temperature and voltage, and conditions of service to which the wiring is likely to be subjected.

13.4.2 Wiring in circuits operating above 750 V shall be sized in accordance with Table 13.2. Wiring smaller than that shown in Table 13.2 is permitted when tested in accordance with the Temperature Test, Section 35.

Table 13.2
Insulated copper conductor ampacities

Conductor Size		2001 – 5000 V conductors	Greater than 5000 V conductors
AWG – kcmil	(mm ²)		
8	(8.4)	64	—
6	(13.3)	85	90
4	(21.1)	110	115
2	(33.6)	145	155
1	(42.4)	170	175
1/0	(53.5)	195	200
2/0	(67.4)	220	230
3/0	(85.0)	250	260
4/0	(107)	290	295
250	(127)	320	325
350	(177)	385	390
500	(253)	470	465
750	(372)	585	565
1000	(497)	670	640

13.4.3 Except for component units and as noted in 13.4.4, when the conductors of an alternating-current circuit pass through a wall or partition of metal having magnetic properties, all of the conductors of the circuit, including the neutral, shall be routed through the same opening. See 13.2.4 and 13.2.5.

13.4.4 With reference to the requirement in 13.4.3, the conductors may pass through individual openings in a wall or partition of metal having magnetic properties when:

- a) The openings are connected by slots cut in the metal wall; or
- b) During the Temperature Test, Section 35, temperatures are recorded on interposed metal to determine that conductor insulation is not adversely affected. The conductors may be routed through individual openings in an insulating block used to cover an opening in the metal wall sufficiently large for all the conductors of the circuit, when no metal bracket, brace, or the like, is placed across the insulating material between the conductors. See Figure 13.1.