

CHAPTER 12 BUILDINGS AND BUILDING REGULATIONS*

INTERNATIONAL RESIDENTIAL CODE

*Cross reference(s)--Airport zoning, § 5-36 et seq.; erosion and sedimentation control, Ch. 15; fire prevention codes and standards, § 17-101 et seq.; floodplain management, Ch. 18; open housing, § 22-41 et seq.; planning and development, Ch. 34; preservation, Ch. 37; awnings, § 42-176 et seq.; subdivisions, Ch. 43; zoning, App. A. --State law reference(s)--Powers of home rule units, Ill. Const. art. VII, § 6.

ARTICLE II. BUILDING CODES* DIVISION 7. RESIDENTIAL CODE

Sec. 12-17.6. Additions, insertions, deletions and changes. The following sections of the **Aurora's adopted International Residential Code** adopted in section 12-16 are hereby revised as follows:

ARTICLE II F. - INTERNATIONAL RESIDENTIAL CODE - CHAPTERS 34-43

Chapter 34 General Requirements

SECTION E3401 GENERAL

E3401.1 Applicability. The provisions of **2012 International Residential Code Chapters 34 through 43** with the amendments below shall replace the adopted 2009 International Residential Code Chapters 34 through 43 and hereby establish the general scope of the electrical system and equipment requirements of this code. Chapters 34 through 43 cover those wiring methods and materials most commonly encountered in the construction of one- and two-family dwellings and structures regulated by this code. Other wiring methods, materials and subject matter covered in NFPA 70 are also allowed by this code.

E3401.2 Scope. Chapters 34 through 43 shall cover the installation of electrical systems, equipment and components indoors and outdoors that are within the scope of this code, including services, power distribution systems, fixtures, appliances, devices and appurtenances. Services within the scope of this code shall be limited to 120/240-volt, 0- to 400-ampere, single-phase systems. These chapters specifically cover the equipment, fixtures, appliances, wiring methods and materials that are most commonly used in the construction or alteration of one- and two-family dwellings and accessory structures regulated by this code. The omission from these chapters of any material or method of construction provided for in the referenced standard NFPA 70 shall not be construed as prohibiting the use of such material or method of construction.

E3401.2.1 Electrical systems, equipment or components not specifically covered in these chapters shall comply with the applicable provisions of NFPA 70. (Including but not limited to: alternative power generating equipment, photovoltaic, wind turbines and generators, etc.)

E3401.4 Additions and alterations. Any addition or alteration to an existing electrical system shall be made in conformity to the provisions of Chapters 34 through 43 **additionally refer to Appendix J for additional requirement based upon the scope and area of work.** Where additions subject portions of existing systems to loads exceeding those permitted herein, such portions shall be made to comply with Chapters 34 through 43.

Chapter 36 Services

SECTION E3601 GENERAL SERVICES E3601.6.2 Service disconnect location. The service disconnecting means shall be installed at a readily accessible location **at the meter.** Service disconnecting means shall not be installed in bathrooms. Each occupant shall have access to the disconnect serving the dwelling unit in which they reside.

SECTION E3602 SERVICE SIZE AND RATING E3602.2.1 Services under 100 amperes.

Services that are not required to be 100 amperes shall be sized in accordance with Chapter 37.

SECTION E3603 SERVICE, FEEDER AND GROUNDING ELECTRODE CONDUCTOR SIZING

E3603.1 Grounded and ungrounded service conductor size. Conductors used as ungrounded service entrance conductors, service lateral conductors, and feeder conductors that serve as the main power feeder to a dwelling unit shall be those listed in Table E3603.1. The main power feeder shall be the feeder(s) between the main disconnect and the panelboard that supplies, either by branch circuits or by feeders, or both, all loads that are part of or are associated with the dwelling unit. The feeder conductors to a dwelling unit shall not be required to have an allowable ampacity greater than that of the service-entrance conductors that supply them. Ungrounded service conductors shall have a minimum size in accordance with Table **E3603.1**. The grounded conductor ampacity shall be not less than the maximum unbalance of the load and its size shall be not smaller than the required minimum grounding electrode conductor size specified in Table E3603.1.

TABLE E3603.1 SERVICE CONDUCTOR AND GROUNDING ELECTRODE CONDUCTOR SIZING

CONDUCTOR TYPES AND SIZES--THHN, THHW, THW, THWN, , RHH, RHW, XHHW, RHW-2, THW-2, THWN-2, XHHW-2, (Parallel sets of 1/0 and larger conductors are permitted in either a single raceway or in separate raceways)		SERVICE OR FEEDER RATING (AMPERES)	MINIMUM GROUNDING ELECTRODE CONDUCTOR SIZE ^a	
Copper (AWG)	Aluminum and copper-clad aluminum (AWG)	Maximum load (amps)	Copper (AWG)	Aluminum (AWG)
3	1	100	8 ^b	1/0
2	1/0	115	8 ^b	1/0
1	2/0	130	6 ^c	1/0
1/0	3/0	150	6 ^c	1/0
2/0	4/0 or two sets of 1/0	175	4 ^d	1/0
3/0	250 kcmil or two sets of 2/0	200	4 ^d	1/0
4/0 or two sets of 1/0	300 kcmil or two sets of 3/0	230	2 ^d	1/0 ^d
250 kcmil or two sets of 2/0	350 kcmil or two sets of 4/0	255	2 ^d	1/0 ^d
350 kcmil or two sets of 3/0	500 kcmil or two sets of 250 kcmil	310	1/0 ^d	1/0 ^d
400 kcmil or two sets of 4/0	600 kcmil or two sets of 300 kcmil	335	1/0 ^d	3/0 ^d

SECTION E3605 SERVICE-ENTRANCE CONDUCTORS

E3605.5 Protection of all other service cables. Above-ground service-entrance cables, where subject to physical damage, shall be protected by one or more of the following: rigid metal conduit, intermediate metal conduit, Schedule 80 PVC conduit, electrical metallic tubing or other approved means.

E3605.5.1 Conduit Support. Shall be added as follows: All service entrance conduit for overhead service drops shall be supported by galvanized 2 piece back-straps or an approved equal. Corrosion resistant materials shall be required per NEC 300.6

E3605.7 Mounting supports.

be supported by straps or other approved means within 12 inches (305 mm) of every service head, gooseneck or connection to a raceway or enclosure and at intervals not exceeding 30 inches (762 mm).

E3605.9 Overhead service locations. Connections at service heads shall be in accordance with Sections E3605.9.1 through E3605.9.7.

E3605.9.2 Service cable, service head or gooseneck.

head or shall be formed into a gooseneck in an approved manner. The service head shall be listed for use in wet locations.

E3605.9.3 Service-head location. Service heads and goosenecks in service-entrance cables, shall be located above the point of attachment of the service-drop or overhead service conductors to the building or other structure. **Exception:** Where it is impracticable to locate the service head or gooseneck above the point of attachment, the service head or gooseneck location shall be not more than 24 inches (610 mm) from the point of attachment.

E3605.9.5 Drip loops. Drip loops shall be formed on individual conductors. To prevent the entrance of moisture, service-entrance conductors shall be connected to the service-drop or overhead conductors either below the level of the service head or below the level of the termination of the service-entrance cable sheath.

E3605.9.7 Secured.

Service-entrance cables shall be held securely in place.

SECTION E3606 SERVICE EQUIPMENT—GENERAL

E3606.4 Marking. Service equipment shall be marked to identify it as being suitable for use as service equipment. Service equipment shall be listed. Individual meter socket enclosures shall not be considered as service equipment.

SECTION E3608 GROUNDING ELECTRODE SYSTEM**E3608.1 Grounding electrode system.****E3608.1.2 Concrete-encased electrode.**

Unless otherwise accepted by the building official, a concrete encased electrode shall be installed in new structures with an electrical service.

A concrete-encased electrode consisting of at least 20 feet (6096 mm) of either of the following shall be considered as a grounding electrode:

1. One or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods not less than 1/2 inch (13 mm) in diameter, installed in one continuous 20-foot (6096 mm) length, or if in multiple pieces connected together by the usual steel tie wires, exothermic welding, welding, or other effective means to create a 20-foot (6096 mm) or greater length.
2. A bare copper conductor not smaller than 4 AWG.

Metallic components shall be encased by at least 2 inches (51 mm) of concrete and shall be located horizontally within that portion of a concrete foundation or footing that is in direct contact with the earth or within vertical foundations or structural components or members that are in direct contact with the earth. Where multiple concrete-encased electrodes are present at a building or structure, only one shall be required to be bonded into the grounding electrode system.

Chapter 37 - Branch Circuit and Feeder Requirements**SECTION E3701 GENERAL**

E3701.3 Selection of ampacity. Where more than one calculated or tabulated ampacity could apply for a given circuit length, the lowest value shall be used.

Exception: Where two different ampacities apply to adjacent portions of a circuit, the higher ampacity shall be permitted to be used beyond the point of transition, a distance equal to 10 feet (3048 mm) or 10 percent of the circuit length figured at the higher ampacity, whichever is less

SECTION E3702 BRANCH CIRCUIT RATINGS

E3702.1.1 Existing 12 AWG branch circuits: Existing branch circuits with 12 AWG conductors that cannot be completely traced throughout the circuit shall be served by no more than 15 ampere breakers.

SECTION E3705 CONDUCTOR SIZING AND OVERCURRENT PROTECTION**TABLE E3705.1 ALLOWABLE AMPACITIES**

CONDUCTOR SIZE	CONDUCTOR TEMPERATURE RATING						CONDUCTOR SIZE
	60°C	75°C	90°C	60°C	75°C	90°C	
AWG kcmil	Types TW, UF	Types RHW, THHW, THW, THWN, USE, XHHW	Types RHW-2, THHN, THHW, THW-2, THWN-2, XHHW, XHHW-2, USE-2	Types TW, UF	Types RHW, THHW, THW, THWN, USE, XHHW	Types RHW-2, THHN, THHW, THW-2, THWN-2, XHHW, XHHW-2, USE-2	AWG kcmil
	Copper			Aluminum or copper-clad aluminum			
14 ^a 12 ^a 10 ^a 8	15 20 30 40	20 25 35 50	25 30 40 55				
6 4 3 2 1	55 70 85 95 110	65 85 100 115 130	75 95 115 130 145				
1/0 2/0 3/0 4/0	125 145 165 195	150 175 200 230	170 195 225 260	100 115 130 150	120 135 155 180	135 150 175 205	1/0 2/0 3/0 4/0

E3705.4.4 Conductors of Type NM cable. Delete section in its entirety

Chapter 38 - Wiring Methods**SECTION E3801 GENERAL REQUIREMENTS****TABLE E3801.2 ALLOWABLE WIRING METHODS**

ALLOWABLE WIRING METHOD		NEW STRUCTURES	EXISTING STRUCTURES for limitations of use refer to IRC Appendix J
Armored cable (BX)	AC	Deleted	Deleted – See FMC and MC for other options
Electrical metallic tubing (Conduit)	EMT	Permitted without indenter type couplings	Permitted without indenter type couplings
Electrical nonmetallic tubing	ENT	Deleted	Deleted
Flexible metal conduit (Greenfield)	FMC	Deleted Except In unexposed assemblies. Then where partially exposed to transition to EMT/RMC shall only be permitted in lengths not to exceed (6) six feet	Limited see (IRC Appendix J) In existing unexposed assemblies. Then where partially exposed to transition to EMT/RMC shall only be permitted in lengths not to exceed (6) six feet.
Intermediate metal conduit	IMC	Permitted	Permitted
Liquidtight flexible metallic conduit	LFMC	Permitted in lengths not to exceed 6 feet	Permitted in lengths not to exceed 6 feet
Liquidtight flexible non-metallic conduit	LFNC	Permitted in lengths not to exceed 6 feet	Permitted in lengths not to exceed 6 feet
Metal-clad cable	MC	Deleted Except In unexposed assemblies. Then where partially exposed to transition to EMT/RMC shall only be permitted in lengths not to exceed (6) six feet	Limited see (IRC Appendix J) In existing unexposed assemblies. Then where partially exposed to transition to EMT/RMC shall only be permitted in lengths not to exceed (6) six feet.
Nonmetallic sheathed cable (Romex)	NM	Deleted	Deleted
Rigid polyvinyl chloride conduit – (PVC)	RNC / PVC	Underground use only.	Underground use only.
Rigid metallic conduit	RMC	Permitted	Permitted
Service entrance cable	SE	Deleted	Deleted
Surface Metal raceways	SMR	Permitted when containing an equipment grounding conductor	Permitted when containing an equipment grounding conductor
Surface Non-Metallic raceways	SNR	Deleted	Deleted
Underground feeder cable	UF	Deleted	Limited see (IRC Appendix J) Only in exterior applications, and in conformance with the cable listing
Underground service cable	USE	Deleted	Deleted
USE-2	USE-2	Above ground when part of a manufacturers systems/requirements	Above ground when part of a manufacturers systems/requirements

TABLE E3801.4 ALLOWABLE APPLICATIONS FOR WIRING METHODS a, b, c, d, e, f, g, h, i, j, k**Note that uses of wiring methods are further restricted by Table 3801.2**

ALLOWABLE APPLICATIONS (application allowed where marked with an "A")	AG	EMT	ENT	FM C	IMC RMC RNC	LFC ^{a, g}	MC	NM	SMR	SE	UF	USE
Services					A				—			
Feeders		A		A	A	A			—			
Branch circuits		A		A	A	A	A		A			
Inside a building		A		A	A	A	A		A			
Wet locations exposed to sunlight		A		—	A	A	A		—			
Damp locations		A		A ^d	A	A	A		—			
Embedded in noncinder concrete in dry location		A		—	A	A ⁱ	—		—			
In noncinder concrete in contact with grade				—	A ^f		—		—			
Embedded in plaster not exposed to dampness		A		A	A	A	A		—			
Embedded in masonry		A		—	A ^f	A	A		—			
In masonry voids and cells exposed to dampness or below grade line					A ^f	A	A		—			
Fished in masonry voids		—		A	—	A	A		—			
In masonry voids and cells not exposed to dampness		A		A	A	A	A		—			
Run exposed		A		A	A	A	A		A			
Run exposed and subject to physical damage		—		—	A ^g	—	—		—			
For direct burial				—	A ^f	A			—			

For SI: 1 foot = 304.8 mm.

- Liquid-tight flexible nonmetallic conduit without integral reinforcement within the conduit wall shall not exceed 6 feet in length.
- Type USE cable shall not be used inside buildings.
- The grounded conductor shall be insulated.
- Conductors shall be a type approved for wet locations and the installation shall prevent water from entering other raceways.
- Shall be listed as "Sunlight Resistant."
- Metal raceways shall be protected from corrosion and approved for the application. Aluminum RMC requires approved supplementary corrosion protection.
- RNC shall be Schedule 80.
- Shall be listed as "Sunlight Resistant" where exposed to the direct rays of the sun.
- Conduit shall not exceed 6 feet in length.
- Liquid-tight flexible nonmetallic conduit is permitted to be encased in concrete where listed for direct burial and only straight connectors listed for use with LFNC are used.
- In wet locations under any of the following conditions:
 - The metallic covering is impervious to moisture.
 - A lead sheath or moisture-impervious jacket is provided under the metal covering.
 - The insulated conductors under the metallic covering are listed for use in wet locations and a corrosion-resistant jacket is provided over the metallic sheath.

SECTION E3802 ABOVE-GROUND INSTALLATION REQUIREMENTS**TABLE E3802.1 GENERAL INSTALLATION AND SUPPORT REQUIREMENTS FOR WIRING METHODS** a, b, c, d, e, f, g, h, i, j, k**Note that uses of wiring methods are further restricted by Table 3801.2**

INSTALLATION REQUIREMENTS (Requirement applicable only to wiring methods marked "A")	AG MC	EMT IMC RMC	ENT	FMC LFC	NM UF	RNC / PVC	SE	SR ^a	USE
Where run parallel with the framing member or furring strip, the wiring shall be not less than 1 ¹ / ₄ inches from the edge of a furring strip or a framing member such as a joist, rafter or stud or shall be physically protected.	A	—		A	A	—		—	
Bored holes in framing members for wiring shall be located not less than 1 ¹ / ₄ inches from the edge of the framing member or shall be protected with a minimum 0.0625-inch steel plate or sleeve, a listed steel plate or other physical protection.	A ^k	—		A ^k	A ^k	—		—	
Where installed in grooves, to be covered by wallboard, siding, paneling, carpeting, or similar finish, wiring methods shall be protected by 0.0625-inch-thick steel plate, sleeve, or equivalent, a listed steel plate or by not less than 1 ¹ / ₄ -inch free space for the full length of the groove in which the cable or raceway is installed.	A	—		A	A	—		A	
Securely fastened bushings or grommets shall be provided to protect wiring run through openings in metal framing members.	—	—		—	A ^j	—		—	
The maximum number of 90-degree bends shall not exceed four between junction boxes.	—	A		A	—	A		—	
Bushings shall be provided where entering a box, fitting or enclosure unless the box or fitting is designed to afford equivalent protection.	A	A		A	—	A		A	
Ends of raceways shall be reamed to remove rough edges.	—	A		A	—	A		A	

Maximum allowable on center support spacing for the wiring method in feet.	4.5 ^{b,c}	10 ^l		4.5 ^b	4.5 ^j	3 ^{d,l}		—	
Maximum support distance in inches from box or other terminations.	12 ^{b,f}	36		12 ^{b,g}	12 ^{h,i}	36		—	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0175 rad.

- a. Installed in accordance with listing requirements.
- b. Supports not required in accessible ceiling spaces between light fixtures where lengths do not exceed 6 feet.
- c. Six feet for MC cable.
- d. Five feet for trade sizes greater than 1 inch.
- e. Two and one-half feet where used for service or outdoor feeder and 4.5 feet where used for branch circuit or indoor feeder.
- f. Twenty-four inches where flexibility is necessary.
- g. Where flexibility after installation is necessary, lengths of flexible metal conduit and liquidtight flexible metal conduit measured from the last point where the raceway is securely fastened shall not exceed: 36 inches for trade sizes 1/2 through 1 1/4, 48 inches for trade sizes 1 1/2 through 2 and 5 feet for trade sizes 2 1/2 and larger.
- h. Within 8 inches of boxes without cable clamps.
- i. Flat cables shall not be stapled on edge.
- j. Bushings and grommets shall remain in place and shall be listed for the purpose of cable protection.
- k. See Sections R502.8 and R802.7 for additional limitations on the location of bored holes in horizontal framing members.

E3802.2 Cables in accessible attics. When permitted by table E3801.2. Cables in attics or roof spaces provided with access shall be installed as specified in Sections E3802.2.1 and E3802.2.2.

E3802.4 In unfinished basements and crawl spaces.

When existing and permitted to remain. Where type NM or SE cable is run at angles with joists in unfinished basements and crawl spaces, cable assemblies containing two or more conductors of sizes 6 AWG and larger and assemblies containing three or more conductors of sizes 8 AWG and larger shall not require additional protection where attached directly to the bottom of the joists. Smaller cables shall be run either through bored holes in joists or on running boards. Type NM or SE cable installed on the wall of an unfinished basement shall be permitted to be installed in a listed conduit or tubing or shall be protected in accordance with Table E3802.1. Conduit or tubing shall be provided with a suitable insulating bushing or adapter at the point where the cable enters the raceway. The sheath of the Type NM or SE cable shall extend through the conduit or tubing and into the outlet or device box not less than 1/4 inch (6.4 mm). The cable shall be secured within 12 inches (305 mm) of the point where the cable enters the conduit or tubing. Metal conduit, tubing, and metal outlet boxes shall be connected to an equipment grounding conductor complying with Section E3908.13.

SECTION E3803 UNDERGROUND INSTALLATION REQUIREMENTS E3803.1 Minimum cover requirements.

Direct buried cable or raceways shall be installed in accordance with the minimum cover requirements of Table E3803.1.

TABLE E3803.1 MINIMUM COVER REQUIREMENTS, BURIAL IN INCHES a, b, c, d, e

LOCATION OF WIRING METHOD OR CIRCUIT	TYPE OF WIRING METHOD OR CIRCUIT				
	1 Direct burial cables or conductors	2 Rigid metal conduit or intermediate metal conduit	3 Nonmetallic raceways listed for direct burial without concrete encasement or other approved raceways	4 Residential branch circuits rated 120 volts or less with GFCI protection and maximum overcurrent protection of 20 amperes	5 Circuits for control of irrigation and landscape lighting limited to not more than 30 volts and installed with type UF or in other identified cable or raceway
All locations not specified below	24	6	18	12	6
In trench below 2-inch-thick concrete or equivalent	18	6	12	6	6
Under a building	0 (In raceway only or Type MC identified for direct burial)	0	0	0 (In raceway only or Type MC identified for direct burial)	0 (In raceway only or Type MC identified for direct burial)
Under minimum of 4-inch-thick concrete exterior slab with no vehicular	18	4	4	6 (Direct burial) 4 (In raceway)	6 (Direct burial) 4 (In raceway)

traffic and the slab extending not less than 6 inches beyond the underground installation					
Under streets, highways, roads, alleys, driveways and parking lots	24	24	24	24	24
One- and two-family dwelling driveways and outdoor parking areas, and used only for dwelling-related purposes	18	18	18	12	18
In solid rock where covered by minimum of 2 inches concrete extending down to rock	2 (In raceway only)	2	2	2 (In raceway only)	2 (In raceway only)

For SI: 1 inch = 25.4 mm.

- Raceways approved for burial only where encased concrete shall require concrete envelope not less than 2 inches thick.
- Lesser depths shall be permitted where cables and conductors rise for terminations or splices or where access is otherwise required.
- Where one of the wiring method types listed in columns 1 to 3 is combined with one of the circuit types in columns 4 and 5, the shallower depth of burial shall be permitted.
- Where solid rock prevents compliance with the cover depths specified in this table, the wiring shall be installed in metal or nonmetallic raceway permitted for direct burial. The raceways shall be covered by a minimum of 2 inches of concrete extending down to the rock.
- Cover is defined as the shortest distance in inches (millimeters) measured between a point on the top surface of any direct-buried conductor, cable, conduit or other raceway and the top surface of finished grade, concrete, or similar cover.

E3803.11 Under buildings. Underground cable installed under a building shall be in a(n) **RMC, IMC, RNC/PVC**, raceway.

Exception: Type MC Cable shall be permitted under a building without installation in a raceway where the cable is listed and identified for direct burial or concrete encasement and one or more of the following applies:

- The metallic covering is impervious to moisture.
- A moisture-impervious jacket is provided under the metal covering.
- The insulated conductors under the metallic covering are listed for use in wet locations, and a corrosion-resistant jacket is provided over the metallic sheath.

Chapter 39 - Power and Lighting Distribution

SECTION E3901 RECEPTACLE OUTLETS

E3901.9.1 Unfinished Basements. Unfinished basements shall have a min of 4 receptacles mounted at 42 inches above finished floor equally spaced on separate walls around the perimeter of the basement

SECTION E3902 GROUND-FAULT AND ARC-FAULT CIRCUIT-INTERRUPTER PROTECTION

E3902.12 Arc-fault circuit-interrupter protection. All branch circuits that supply 120-volt, single-phase, 15- and 20-ampere outlets installed in family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreations rooms, closets, hallways and similar rooms or areas shall be protected by a combination type arc-fault circuit interrupter installed to provide protection of the branch circuit. **Exception:**

- Where an outlet branch-circuit type AFCI is installed at the first outlet to provide protection for the remaining portion of the branch circuit, the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet shall be installed with metal outlet and junction boxes and RMC, IMC, EMT, type MC, or ~~steel armored type AC~~ cables meeting the requirements of Section E 3908.8.
- Where an outlet branch-circuit type AFCI is installed at the first outlet to provide protection for the remaining portion of the branch circuit, the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet shall be installed with metal or nonmetallic conduit or tubing that is encased in not less than 2 inches (51 mm) of concrete.
- AFCI protection is not required for an individual branch circuit supplying only a fire alarm system where the branch circuit is wired with metal outlet and junction boxes and RMC, IMC, EMT or steel- ~~sheathed armored cable Type AC~~, or Type MC meeting the requirements of Section E3908.8.

SECTION E3903 LIGHTING OUTLETS

E3903.1 General. Lighting outlets shall be provided in accordance with Sections E3903.2 through E3903.4.

E3903.2 Habitable rooms. At least one wall switch-controlled lighting outlet shall be installed in every habitable room, **closet with a depth greater than 4 feet**, and bathroom.

SECTION E3904 GENERAL INSTALLATION REQUIREMENTS

E3904.6 Conduit and tubing fill. The maximum number of conductors installed in conduit or tubing shall **not exceed 9 conductors**.

E3904.7 Low Voltage Air handling-stud cavity and joist spaces. Where wiring methods having a nonmetallic covering pass through stud cavities and joist spaces used for air handling, such wiring shall pass through such spaces perpendicular to the long dimension of the spaces.

SECTION E3905 BOXES, CONDUIT BODIES AND FITTINGS

E3905.3 Nonmetallic boxes. Nonmetallic boxes shall not be installed, except in corrosive locations or in non-grounded circuits when they are permitted to remain. Further when permitted they shall be used only with cabled wiring methods with entirely nonmetallic sheaths, flexible cords and nonmetallic raceways.

E3905.6.2 Ceiling outlets. At every outlet not physically capable of hanging a ceiling fan, the box shall be designed or installed so that a luminaire or lampholder can be attached. Such boxes shall be capable of supporting a luminaire weighing up to 50 pounds (22.7 kg). A luminaire that weighs more than 50 pounds (22.7 kg) shall be supported independently of the outlet box, unless the outlet box is listed and marked for the maximum weight to be supported. Ceiling outlets physically capable (due to location and clearances) of hanging a future ceiling fan shall meet the requirements of E3905.8 Boxes at fan outlets.

SECTION E3908 GROUNDING

E3908.8.3 Nonmetallic sheathed cable (Type NM).

In addition to the insulated conductors, the cable shall have an insulated, covered, or bare equipment grounding conductor. Equipment grounding conductors shall be sized in accordance with Table E3908.12.

E3908.9 Equipment fastened in place or connected by permanent wiring methods. Noncurrent-carrying metal parts of equipment, raceways and other enclosures, where required to be grounded, shall be grounded by one of the following methods:

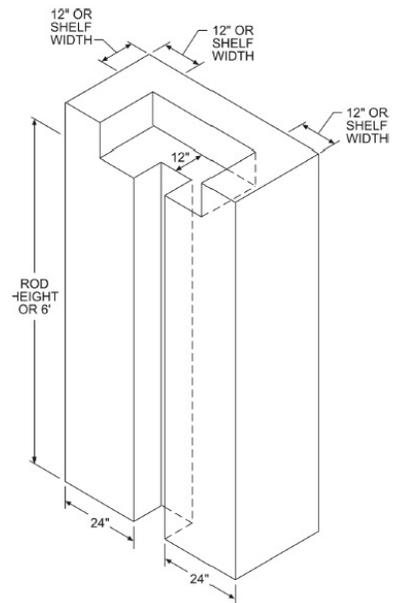
1. By any of the equipment grounding conductors permitted by Sections E3908.8 through E3908.8.2.
2. By an equipment grounding conductor contained within the same raceway, cable or cord, or otherwise run with the circuit conductors. Equipment grounding conductors shall be identified in accordance with Section E3407.2.

TABLE E3908.12 EQUIPMENT GROUNDING CONDUCTOR SIZING

RATING OR SETTING OF AUTOMATIC OVERCURRENT DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC., NOT EXCEEDING THE FOLLOWING RATINGS (amperes)	MINIMUM SIZE	
	Copper wire No. (AWG)	Aluminum or copper-clad aluminum wire No. (AWG) Minimum 1/0

E3908.16 Nonmetallic boxes. When allowed per 3905.3, one or more equipment grounding conductors brought into a nonmetallic outlet box shall be arranged to allow connection to fittings or devices installed in that box.

E3908.21 Underground / Under-slab / Concrete Encased Raceway: shall be added
Equipment Grounding Conductor: A conductor to serve as a 100% redundant Equipment Grounding conductor shall be installed in all underground raceways and raceways in concrete.



SECTION E4003 FIXTURES

E4003.12 Luminaires in clothes closets. ...

The types of luminaires installed in clothes closets shall be limited to surface-mounted or recessed incandescent or LED luminaires with completely enclosed light sources, surface-mounted or recessed fluorescent luminaires, and surface-mounted fluorescent or LED luminaires identified as suitable for installation within the closet storage area. The minimum clearance between luminaires installed in clothes closets and the nearest point of a closet storage area shall be as follows:

1. Surface-mounted LED luminaires with a completely enclosed light source shall be installed on the wall above the door or on the ceiling, provided that there is a minimum clearance of 12 inches (305 mm) between the fixture and the nearest point of a storage space.
2. Surface-mounted fluorescent luminaires shall be installed on the wall above the door or on the ceiling, provided that there is a minimum clearance of 6 inches (152 mm).
3. Recessed LED luminaires with a completely enclosed light source shall be installed in the wall or the ceiling provided that there is a minimum clearance of 6 inches (152 mm).

SECTION E4202 WIRING METHODS FOR POOLS, SPAS, HOT TUBS & HYDROMASSAGE BATHTUBS

TABLE E4202.1 ALLOWABLE APPLICATIONS FOR WIRING METHODS a, b, c, d, e, f, g, h, I

Note that uses of wiring methods are further restricted by Table 3801.2

WIRING LOCATION OR PURPOSE (Application allowed where marked with an "A")	AC, FMC, NM, SMR, SE	EMT	ENT	IMC ^j , RMC ^j , RNC/ PVC ⁱ	LF MC	LFN MC	UF	MC ^k	FLEX CORD
Panelboard(s) that supply pool equipment: from service equipment to panelboard	A ^{b, e} SR not permitted	A ^c	A ^b	A	—	A		A ^e	—
Wet-niche and no-niche luminaires: from branch circuit OCPD to deck or junction box	AC ^b only	A ^c	A ^b	A	—	A		A ^b	—
Wet-niche and no-niche luminaires: from deck or junction box to forming shell	—	—	—	A ^d	—	A		—	A ^h
Dry niche: from branch circuit OCPD to luminaires	AC ^b only	A ^c	A ^b	A	—	A		A ^b	—

Pool-associated motors: from branch circuit OCPD to motor	A ^b	A ^c	A ^b	A	A ^f	A ^f		A	A ^h
Packaged or self-contained outdoor spas and hot tubs with underwater luminaire: from branch circuit OCPD to spa or hot tub	AC ^b only	A ^c	A ^b	A	A ^g	A ^g		A ^b	A ^h
Packaged or self-contained outdoor spas and hot tubs without underwater luminaire: from branch circuit OCPD to spa or hot tub	A ^b	A ^c	A ^b	A	A ^g	A ^g		A	A ^h
Indoor spas and hot tubs, hydromassage bathtubs, and other pool, spa or hot tub associated equipment: from branch circuit OCPD to equipment	A ^b	A ^c	A ^b	A	A	A		A	A ^h
Connection at pool lighting transformers or power supplies	AC ^b only	A ^c	A ^b	A	A ^{m,g}	A ^g		A ^b	—

- a. For all wiring methods, see Section E4205 for equipment grounding conductor requirements.
- b. Limited to use within buildings.
- c. Limited to use on or within buildings.
- d. Metal conduit shall be constructed of brass or other approved corrosion-resistant metal.
- e. Permitted only for existing installations in accordance with the exception to Section E4205.6.
- f. Limited to where necessary to employ flexible connections at or adjacent to a pool motor.
- g. Sections installed external to spa or hot tub enclosure limited to individual lengths not to exceed 6 feet. Length not limited inside spa or hot tub enclosure.
- h. Flexible cord shall be installed in accordance with Section E4202.2.
- i. Nonmetallic conduit shall be rigid polyvinyl chloride conduit Type PVC or reinforced thermosetting resin conduit Type RTRC.
- j. Aluminum conduits shall not be permitted in the pool area where subject to corrosion.
- k. Where installed as direct burial cable or in wet locations, Type MC cable shall be listed and identified for the location.
- l. See Section E4202.3 for listed, double-insulated pool pump motors.
- m. Limited to use in individual lengths not to exceed 6 feet. The total length of all individual runs of LFMC shall not exceed 10 feet.