

CHAPTER 37  
**WIRING METHODS**  
Reserved

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**TABLE E3702.1**  
**GENERAL INSTALLATION AND SUPPORT REQUIREMENTS FOR WIRING METHODS<sup>a,b,c,d,e,f,g,h,i</sup>**

<b>INSTALLATION REQUIREMENTS (requirement applicable only to wiring methods marked "A")</b>	<b>AC MC</b>	<b>EMT IMC RMC</b>	<b>ENT</b>	<b>FMC LFC</b>	<b>NM UF</b>	<b>RNC</b>	<b>SE</b>	<b>SR<sup>a</sup></b>	<b>USE</b>
Where run parallel with the framing member, the wiring shall be 1.25 inches from the edge of a framing member such as a joist, rafter or stud or shall be physically protected.	A	—	A	A	A	—	A	—	—
Bored holes in studs and vertical framing members for wiring shall be located 1.25 inches from the edge or shall be protected with a minimum 0.0625-inch steel plate or sleeve or other physical protection.	A	—	A	A	A	—	A	—	—
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 or by not less than 1.25-inch free space for the full length of the groove in which the cable or raceway is installed.	A	—	A	A	A	—	A	A	A
Bored holes in joists, rafters, beams and other horizontal framing members shall be 2 inches from the edge of the structural framing member.	A	A	A	A	A	A	A	—	—
Securely fastened bushings or grommets shall be provided to protect wiring run through openings in metal framing members.	—	—	A <sup>j</sup>	—	A <sup>j</sup>	—	A <sup>j</sup>	—	—
The maximum number of 90-degree bends shall not exceed four between junction boxes.	—	A	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	—	A	—
Ends of raceways shall be reamed to remove rough edges.	—	A	A	A	—	A	—	A	—
Maximum allowable on center support spacing for the wiring method in feet.	4.5 <sup>b, c</sup>	10	3 <sup>b</sup>	4.5 <sup>b</sup>	4.5 <sup>i</sup>	3 <sup>d</sup>	2.5 <sup>e</sup>	—	2.5 <sup>e</sup>
Maximum support distance in inches from box or other terminations.	12 <sup>b, f</sup>	36	36	12 <sup>b, g</sup>	12 <sup>h, i</sup>	36	12	—	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.009 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. Thirty-six inches where flexibility is necessary.
- 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.

**E3702.6 Raceways exposed to different temperatures.** Where portions of a cable, raceway or sleeve are known to be subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air to a colder section of the raceway or sleeve.

**SECTION E3703  
UNDERGROUND INSTALLATION REQUIREMENTS**

**E3703.1 Minimum cover requirements.** Direct buried cable or raceways shall be installed in accordance with the minimum cover requirements of Table E3703.1.

**E3703.2 Warning ribbon.** Underground service conductors that are not encased in concrete and that are buried 18 inches (457 mm) or more below grade shall have their location identified by a warning ribbon that is placed in the trench not less than 12 inches (300 mm) above the underground installation.

**E3703.3 Grounding.** All underground installations shall be grounded and bonded in accordance with this code.

**E3703.4 Protection from damage.** Direct buried conductors and cables emerging from the ground shall be protected by enclosures or raceways extending from the minimum cover distance below grade required by Section 3703.1 to a point at least 8 feet (2438 mm) above finished grade. In no case shall the protection be required to exceed 18 inches (457 mm) below finished grade. Service laterals that are not encased in concrete and that are buried 18 inches (457 mm) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 12 inches (305 mm) above the underground installation. Conductors entering a building shall be protected to the point of entrance. Where the enclosure or raceway is subject to physical damage, the conductors shall be installed in rigid metal conduit, intermediate metal conduit, Schedule 80 rigid nonmetallic conduit or the equivalent.

**E3703.5 Splices and taps.** Direct buried conductors or cables shall be permitted to be spliced or tapped without the use of

**TABLE E3703.1  
MINIMUM COVER REQUIREMENTS, BURIAL IN INCHES<sup>a,b,c,d</sup>**

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)	0	0	0 (In raceway only)	0 (In raceway only)
Under minimum of 4-inch-thick concrete exterior slab with no vehicular traffic and the slab extending not less than 6 inches beyond the underground installation	18	4	4	6 (Direct burial) 4 (In raceway)	6 (Direct burial) 4 (In raceway)
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.

- a. Raceways approved for burial only where encased concrete shall require concrete envelope not less than 2 inches thick.
- b. Lesser depths shall be permitted where cables and conductors rise for terminations or splices or where access is otherwise required.
- c. 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.
- d. 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.

splice boxes. The splices or taps shall be made by approved methods with materials listed for the application.

**E3703.6 Backfill.** Backfill containing large rock, paving materials, cinders, large or sharply angular substances, or corrosive material shall not be placed in an excavation where such materials cause damage to raceways, cables or other substructures or prevent adequate compaction of fill or contribute to corrosion of raceways, cables or other substructures. Where necessary to prevent physical damage to the raceway or cable, protection shall be provided in the form of granular or selected material, suitable boards, suitable sleeves or other approved means.

**E3703.7 Raceway seals.** Conduits or raceways shall be sealed or plugged at either or both ends where moisture will enter and contact energized parts.

**E3703.8 Bushing.** A bushing, or terminal fitting, with an integral bushed opening shall be installed on the end of a conduit or other raceway that terminates underground where the conductors or cables emerge as a direct burial wiring method. A seal incorporating the physical protection characteristics of a bushing shall be considered equivalent to a bushing.

**E3703.9 Single conductors.** All conductors of the same circuit and, where present, the grounded conductor and all equipment grounding conductors shall be installed in the same raceway or shall be installed in close proximity in the same trench.

**Exception:** Where conductors are installed in parallel in raceways, each raceway shall contain all conductors of the same circuit including grounding conductors.

**E3703.10 Ground movement.** Where direct buried conductors, raceways, or cables are subject to movement by settlement or frost, direct buried conductors, raceways, or cables shall be arranged to prevent damage to the enclosed conductors or to equipment connected to the raceways.

