

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. [300.5(A)]

TABLE E3803.1 (Table 300.5)
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 <u>concrete</u> encasement or other approved raceways	4 Residential <u>branch</u> 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 ^{f, g}
In trench below 2- inch- thick <u>concrete</u> 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 <u>concrete</u> 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 <u>dwelling</u> -related purposes	18	18	18	12	18

In <u>solid</u> rock where covered by minimum of 2 inches <u>concrete</u> extending down to rock	2 (In raceway only)	2	2	2 (In raceway only)	2 (In raceway only)
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For SI: 1 inch = 25.4 mm.

1. Raceways approved for burial only where encased concrete shall require concrete envelope not less than 2 inches thick.
2. Lesser depths shall be permitted where cables and conductors rise for terminations or splices or where access is otherwise required.
3. 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.
4. 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.
5. 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.
6. A lesser depth shall be permitted where specified in the installation instructions of a listed low-voltage lighting system.
7. A depth of 6 inches shall be permitted for pool, spa, and fountain lighting that is installed in a nonmetallic raceway, limited to not more than 30 volts and part of a listed low-voltage lighting system

E3803.2 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 (305 mm) above the underground installation. [300.5(D)(3)]

E3803.3 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 E3803.1 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. 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 electrical metallic tubing, rigid metal conduit, intermediate metal conduit, Schedule 80 PVC conduit, RTRC-XW or the equivalent. [300.5(D)(1)]

E3803.4 Splices and Taps

Direct buried conductors or cables shall be permitted to be spliced or tapped without the use of splice boxes. The splices or taps shall be made by approved methods with materials listed for the application. [300.5(E)]

E3803.5 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. [300.5(F)]

E3803.6 Raceway Seals

Conduits or raceways shall be sealed or plugged at either or both ends where moisture will enter and contact live parts. Spare or unused raceways shall also be sealed. Sealants shall be identified for the use with the cable insulation, conductor insulation, bare conductor or other components. [300.5(G)]

E3803.7 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. [300.5(H)]

E3803.8 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. [300.5(I)]

Exception: Conductors shall be permitted to be installed in parallel in raceways, multiconductor cables, and direct-buried single conductor cables. Each raceway or multiconductor cable shall contain all conductors of the same circuit, including equipment grounding conductors. Each direct-buried single conductor cable shall be located in close proximity in the trench to the other single conductor cables in the same parallel set of conductors in the circuit, including equipment grounding conductors. [300.5(I) Exception 1]

E3803.9 Earth 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. [300.5(J)]

E3803.10 Wet Locations

The interior of enclosures or raceways installed underground shall be considered to be a wet location. Insulated conductors and cables installed in such enclosures or raceways in underground installations shall be listed for use in wet locations. [300.5(B)]

E3803.11 Under Buildings

Underground cable and conductors installed under a building shall be in a raceway. [300.5(C)]

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:

1. The metallic covering is impervious to moisture.
 2. A moisture-impervious jacket is provided under the metal covering.
 3. The insulated conductors under the metallic covering are listed for use in wet locations.
- [300.5(C) Exception 2]

Related Code Sections

E3803.5 Wiring Methods, Backfill

Backfill containing large rock, paving materials, cinders, large or sharply angular substances, or corrosive material shall not be placed ...