

## APPENDIX D

# SWIMMING POOLS, SPAS AND HOT TUBS

### SECTION D101 GENERAL

The provisions of this appendix shall control the design and construction of swimming pools, spas and hot tubs installed in or on the lot of a one- and two-family dwelling.

### SECTION D102 DEFINITIONS

For the purposes of these requirements, the terms used shall be defined as follows and as set forth in Chapter 2.

**ABOVEGROUND/ON-GROUND POOL.** See "Swimming pool."

**BARRIER.** A fence, wall, building wall or combination thereof which completely surrounds the swimming pool and obstructs access to the swimming pool.

**HOT TUB.** See "Swimming pool."

**IN-GROUND POOL.** See "Swimming pool."

**RESIDENTIAL.** That which is situated on the premises of a detached one- or two-family dwelling or a one-family townhouse not more than three stories in height.

**SPA, NONPORTABLE.** See "Swimming pool."

**SPA, PORTABLE.** A nonpermanent structure intended for recreational bathing, in which all controls, water-heating and water-circulating equipment are an integral part of the product.

**SWIMMING POOL.** Any structure intended for swimming or recreational bathing that contains water over 24 inches (610 mm) deep. This includes in-ground, aboveground and on-ground swimming pools, hot tubs and spas.

**SWIMMING POOL, INDOOR.** A swimming pool which is totally contained within a structure and surrounded on all four sides by walls of said structure.

**SWIMMING POOL, OUTDOOR.** Any swimming pool which is not an indoor pool.

### SECTION D103 SWIMMING POOLS

**D103.1 In-ground pools.** In-ground pools shall be designed and constructed in conformance with NSPI-5 as listed in Section D107.

**D103.2 Aboveground and on-ground pools.** Aboveground and on-ground pools shall be designed and constructed in conformance with ANSI/NSPI-4 as listed in Section D107.

### SECTION D104 SPAS AND HOT TUBS

**D104.1 Permanently installed spas and hot tubs.** Permanently installed spas and hot tubs shall be designed and constructed in conformance with ANSI/NSPI-3 as listed in Section D107.

**D104.2 Portable spas and hot tubs.** Portable spas and hot tubs shall be designed and constructed in conformance with ANSI/NSPI-6 as listed in D107.

### SECTION D105 BARRIER REQUIREMENTS

**D105.1 Application.** The provisions of this chapter shall control the design of barriers for residential swimming pools, spas and hot tubs. These design controls are intended to provide protection against potential drownings and near-drownings by restricting access to swimming pools, spas and hot tubs.

**D105.2 Outdoor swimming pool.** An outdoor swimming pool, including an in-ground, aboveground or on-ground pool, hot tub or spa shall be provided with a barrier which shall comply with the following:

1. The top of the barrier shall be at least 48 inches (1219 mm) above grade measured on the side of the barrier which faces away from the swimming pool. The maximum vertical clearance between grade and the bottom of the barrier shall be 2 inches (51 mm) measured on the side of the barrier which faces away from the swimming pool. Where the top of the pool structure is above grade, such as an aboveground pool, the barrier may be at ground level, such as the pool structure, or mounted on top of the pool structure. Where the barrier is mounted on top of the pool structure, the maximum vertical clearance between the top of the pool structure and the bottom of the barrier shall be 4 inches (102 mm).
2. Openings in the barrier shall not allow passage of a 4-inch-diameter (102 mm) sphere.
3. Solid barriers which do not have openings, such as a masonry or stone wall, shall not contain indentations or protrusions except for normal construction tolerances and tooled masonry joints.
4. Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is less than 45 inches (1143 mm), the horizontal members shall be located on the swimming pool side of the fence. Spacing between vertical members shall not exceed  $1\frac{3}{4}$  inches (44 mm) in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed  $1\frac{3}{4}$  inches (44 mm) in width.
5. Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is 45 inches (1143 mm) or more, spacing

between vertical members shall not exceed 4 inches (102 mm). Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 1<sup>3</sup>/<sub>4</sub> inches (44 mm) in width.

6. Maximum mesh size for chain link fences shall be a 1<sup>1</sup>/<sub>4</sub>-inch (32 mm) square unless the fence is provided with slats fastened at the top or the bottom which reduce the openings to not more than 1<sup>3</sup>/<sub>4</sub> inches (44 mm).
7. Where the barrier is composed of diagonal members, such as a lattice fence, the maximum opening formed by the diagonal members shall not be more than 1<sup>3</sup>/<sub>4</sub> inches (44 mm).
8. Access gates shall comply with the requirements of Section D105.2, Items 1 through 7, and shall be equipped to accommodate a locking device. Pedestrian access gates shall open outward away from the pool and shall be self-closing and have a self-latching device. Gates other than pedestrian access gates shall have a self-latching device. Where the release mechanism of the self-latching device is located less than 54 inches (1372 mm) from the bottom of the gate, the release mechanism and openings shall comply with the following:
  - 8.1 The release mechanism shall be located on the pool side of the gate at least 3 inches (76 mm) below the top of the gate, and
  - 8.2 The gate and barrier shall have no opening greater than 1/2 inch (12.7 mm) within 18 inches (457 mm) of the release mechanism.

Where a wall of a dwelling serves as part of the barrier one of the following conditions shall be met:

9. Where a wall of a dwelling serves as part of the barrier one of the following conditions shall be met.
  - 9.1 The pool shall be equipped with a powered safety cover in compliance with ASTM ES 13-89; or
  - 9.2 All doors with direct access to the pool through that wall shall be equipped with an alarm which produces an audible warning when the door and its screen, if present, are opened. The alarm shall sound continuously for a minimum of 30 seconds immediately after the door is opened and be capable of being heard throughout the house during normal household activities. The alarm shall automatically reset under all conditions. The alarm system shall be equipped with a manual means, such as touchpad or switch, to temporarily deactivate the alarm for a single opening. Such deactivation shall last for not more than 15 seconds. The deactivation switch(es) shall be located at least 54 inches (1372 mm) above the threshold of the door; or
  - 9.3 Other means of protection, such as self-closing doors with self-latching devices, which are approved by the governing body, shall be acceptable so long as the degree of protection afforded is not less than the protection afforded by Item 9.1 or 9.2 described above.

10. Where an aboveground pool structure is used as a barrier or where the barrier is mounted on top of the pool structure, and the means of access is a ladder or steps, then:
  - 10.1 The ladder or steps shall be capable of being secured, locked or removed to prevent access or
  - 10.2 The ladder or steps shall be surrounded by a barrier which meets the requirements of Section D105.2, Items 1 through 9. When the ladder or steps are secured, locked or removed, any opening created shall not allow the passage of a 4-inch-diameter (102 mm) sphere.

**D105.3 Indoor swimming pool.** All walls surrounding an indoor swimming pool shall comply with Section D105.2, Item 9.

**D105.4 Prohibited locations.** Barriers shall be located so as to prohibit permanent structures, equipment or similar objects from being used to climb the barriers.

**D105.5 Barrier exceptions.** A portable spa with a safety cover which complies with ASTM ES 13, as listed in Section D107, shall be exempt from the provisions of this appendix. Swimming pools, hot tubs and nonportable spas with safety covers shall not be exempt from the provisions of this appendix.

**SECTION D106  
ABBREVIATIONS**

- ANSI— American National Standards Institute  
11 West 42nd Street, New York, NY 10036
- ASTM— American Society for Testing and Materials  
1916 Race Street, Philadelphia, PA 19103
- NSPI— National Spa and Pool Institute  
2111 Eisenhower Avenue, Alexandria, VA 22314

**SECTION D107  
STANDARDS**

- ANSI/NSPI**  
ANSI/  
NSPI-3-1992 Standard for Permanently Installed Residential Spas . . . . . D104.1
- ANSI/  
NSPI-4-1992 Standard for Aboveground/  
Onground Residential Swimming Pools . . D103.2
- ANSI/  
NSPI-6-1992 Standard for Residential Portable Spas . . . . D104.2
- ASTM**  
ASTM  
ES 13-89 Emergency Standard Performance Specification for Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tub . . . . . D105.2, D105.5
- NSPI**  
NSPI-5-1987 Standard for Residential Swimming Pools . D103.1

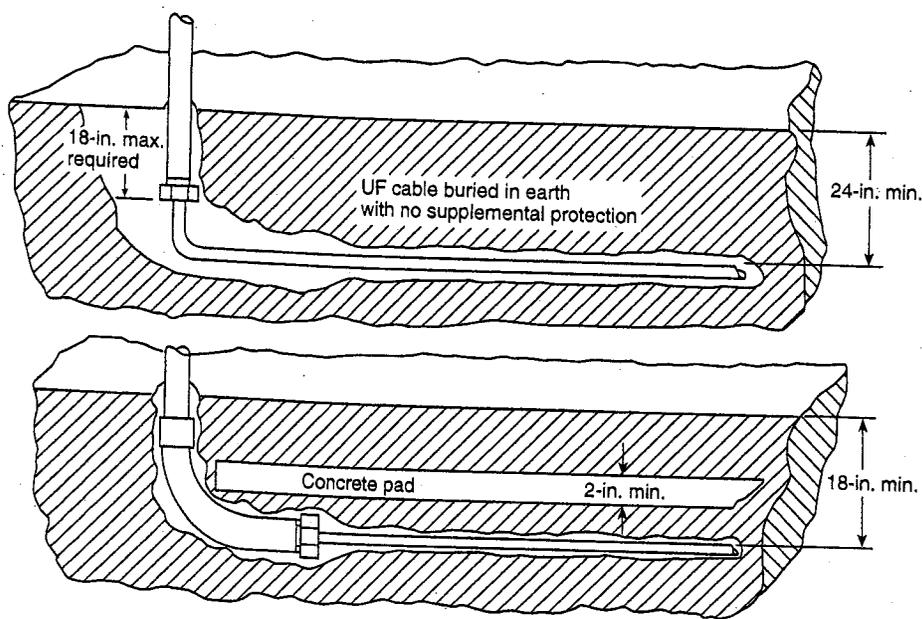


Figure 300-9. Type UF cable buried in compliance with Table 300-5. Note the protective bushing where the cable is used with metal conduit.

Isolated phase installations are those that contain only one phase per raceway. Such an installation may have some advantages where there are many large conductors in parallel, as it avoids crossing conductors in the close quarters of the termination compartment of switchboards, unit substations, or transformer enclosures. The spacing between isolated phase raceways should be as small as possible and the length of the run limited, in order to avoid the increased circuit impedance and resulting increase in voltage drop inherent in an installation involving alternating-current circuits.

Isolated phase installations present an inherent hazard of overheating that must be understood and carefully controlled. This hazard is a result of induced currents in metal surrounding a raceway that contains only one phase conductor. See Sections 300-20(a) and 300-20(b). The surrounding metal acts as a shorted transformer turn. In underground installations, it is unlikely that a single conductor will be installed in a metal raceway or, if it were, that it would present a fire hazard. This is not true, however, for above-ground raceways, and it is the reason isolated phase installations are not permitted aboveground.

See Sections 300-3(b), Exception No. 1, and 330-16, which recognize single-conductor MI cable.

(i) **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.

(FPN): This section recognizes "S" loops in underground direct burial to raceway transitions, expansion joints in pipe risers to fixed equipment, and generally the provision of flexible connections to equipment subject to settlement or frost heaves.

This section, new in the 1996 Code, points out the need for installers to allow for movement of direct buried equipment, cables, and raceways. Slack must be allowed in cables or expansion joints, or other measures must be taken, if ground movement due to frost or settlement is anticipated.

**300-6. Protection Against Corrosion.** Metal raceways, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports, and support hardware shall be of materials suitable for the environment in which they are to be installed.

(a) **General.** Ferrous raceways, cable armor, boxes, cable sheathing, cabinets, metal elbows, couplings, fittings, supports and support hardware shall be suitably protected against corrosion inside and outside (except threads at joints) by a coating of approved corrosion-resistant material such as zinc, cadmium or enamel. Where protected from corrosion solely by enamel they shall not be used out-of-doors or in wet locations as described in (c) below. Where boxes or cabinets have an approved system of organic coatings and are marked "Raintight," "Rainproof" or "Outdoor Type," they shall be permitted out-of-doors.

*Exception: Threads at joints shall be permitted to be coated with an identified electrically conductive compound.*

Zinc chromate paste is one type of electrically conductive compound that can be used.

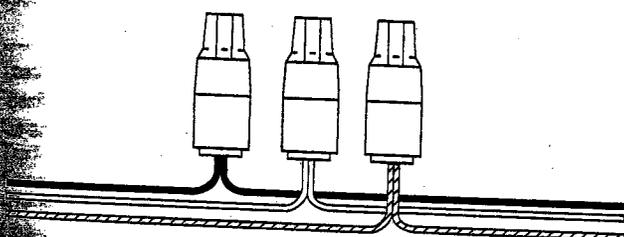
(c) **Underground Cables under Buildings.** Underground cable installed under a building shall be in a raceway that is extended beyond the outside walls of the building.

(d) **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 required by Section 300-5(a) below grade to a point at least 8ft (2.44 m) above finished grade. In no case shall the protection be required to exceed 18 in. (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 rigid metal conduit, intermediate metal conduit, Schedule 80 rigid nonmetallic conduit, or equivalent.

(e) **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 in accordance with Section 110-14(b).



Electrical splicing kit for single-conductor direct-buried cables



Figure 300-7. Examples of underground splicing methods. (top: *Technology Inc.*; bottom: *3M Co., Electrical Products Division*)

(f) **Backfill.** Backfill containing large rock, paving materials, lumps, large or sharply angular substance, or corrosive materials shall not be placed in an excavation where materials may

damage 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 running boards, suitable sleeves, or other approved means.

(g) **Raceway Seals.** Conduits or raceways through which moisture may contact energized live parts shall be sealed or plugged at either or both ends.

(FPN): Presence of hazardous gases or vapors may also necessitate sealing of underground conduits or raceways entering buildings.

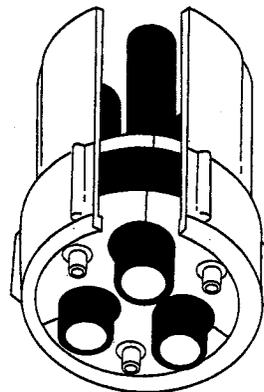


Figure 300-8. Conduit sealing bushing used to prevent the entrance of gas or moisture. See Section 230-8 for sealing service raceways. (*O.Z./Gedney Co.*)

(h) **Bushing.** A bushing, or terminal fitting, with an integral bushed opening shall be used at 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 permitted to be used in lieu of a bushing.

(i) **Conductors of the Same Circuit.** All conductors of the same circuit and, where used, 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 No. 1: Conductors in parallel in raceways shall be permitted, but each raceway shall contain all conductors of the same circuit including grounding conductors.*

This exception permits the installation of paralleled conductors in different raceways. See Section 310-4.

*Exception No. 2: Isolated phase installations shall be permitted in nonmetallic raceways in close proximity where conductors are paralleled as permitted in Section 310-4 and the conditions of Section 300-20 are met.*

enclosure, or raceway, the conductors shall be protected by a substantial fitting providing a smoothly rounded insulating surface, unless the conductors are separated from the fitting or raceway by substantial insulating material securely fastened in place.

The previous requirements found in Sections 370-17 and 373-6(c) were moved to this new section for the 1996 Code. This move now ensures that these requirements will apply to all raceway wiring methods.

**Exception:** Where threaded hubs or bosses that are an integral part of a cabinet, box enclosure, or raceway provide a smoothly rounded or flared entry for conductors.

Conduit bushings constructed wholly of insulating material shall not be used to secure a fitting or raceway. The insulating fitting or insulating material shall have a temperature rating not less than the insulation temperature rating of the installed conductors.

### 300-5. Underground Installations.

**(a) Minimum Cover Requirements.** Direct buried cable or conduit or other raceways shall be installed to meet the minimum cover requirements of Table 300-5.

Conductors under residential driveways must be at least 18 in. below grade. If the conductors are protected by an overcurrent device rated at not more than 20 amperes and provided with ground-fault circuit-interrupter protection for personnel, the burial depth may be reduced to 12 in.

**(b) Grounding.** All underground installations shall be grounded and bonded in accordance with Article 250 of this Code.

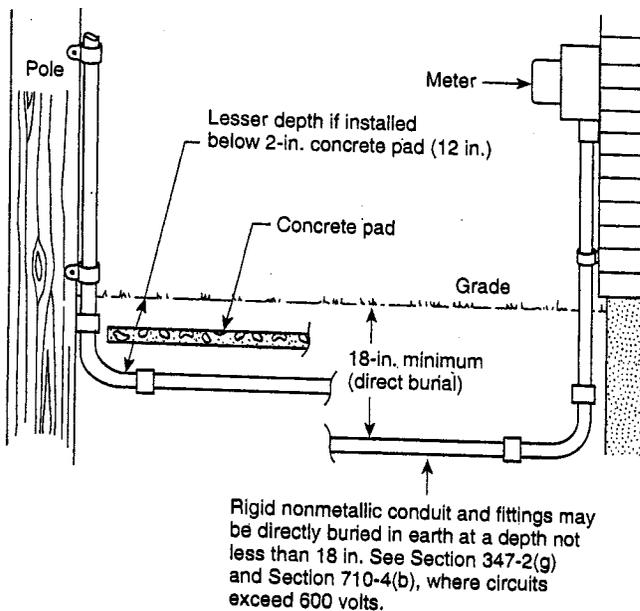


Figure 300-4. PVC rigid nonmetallic conduit buried in compliance with Section 300-5 and installed in accordance with Section 300-5(a).

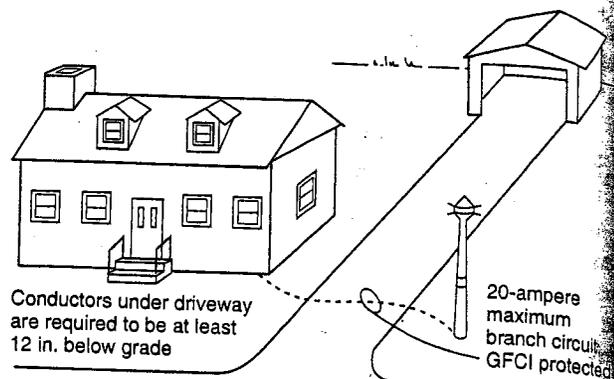


Figure 300-5. A 20-ampere, GFCI-protected residential branch circuit is permitted to be installed with a minimum burial depth of 12 in. beneath a residential driveway and outdoor parking areas used only for dwelling-related purposes.

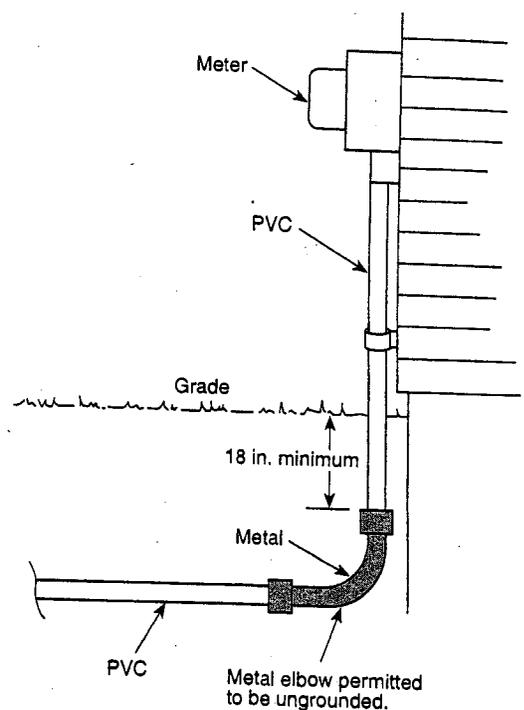


Figure 300-6. An application of Section 250-32, Exception, which permits the metal elbow to be ungrounded, provided it is isolated from possible contact by a minimum cover of 18 in. to any part of the elbow. For other than service raceways, see companion Section 250-33, Exception No. 4.

Rigid nonmetallic conduit elbows installed in long runs are often damaged in the process of pulling the conductors, due to friction at the bend. Section 250-33, Exception No. 4, permits a metal elbow to be installed without being grounded, provided it is isolated from contact by at least 18 in. of cover for other than service raceways. For service raceways, a companion exception to Section 250-32 applies.