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# **Swimming Pool and Spa Barrier and Bonding Requirements 2018 ISPSC / 2018 VRC**

## **Section 305 of the 2018 International Swimming Pool and Spa Code.**

**The 2018 Virginia Residential Code requires any structure intended for swimming or recreational bathing that contains water shall have a compliant barrier or fence.**

**There are instances when the contract with the pool contractor does not include the construction of the barrier or fence and conveys this requirement to the homeowner. However, by code, the pool contractor cannot obtain a final approval until the installation of the barrier or fence has been completed and approved by this office.**

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## SECTION 201 GENERAL

### 201.1 Scope.

Unless otherwise expressly stated, the following words and terms shall, for the purposes of this code, have the meanings shown in this chapter.

### 201.2 Interchangeability.

Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

### 201.3 Terms defined in other codes.

Where terms are not defined in this code and are defined in the *International Building Code, International Energy Conservation Code, International Fire Code, International Fuel Gas Code, International Mechanical Code, International Plumbing Code or International Residential Code*, such terms shall have the meanings ascribed to them as in those codes.

### 201.4 Terms not defined.

Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

## SECTION 202 DEFINITIONS

**POOL OR SPA RECREATION FACILITY.** A facility that is designed for free-form pool or spa play and recreation. The facilities may include, but are not limited to, wave or surf action pools, Leisure Rivers, sand bottom pools, vortex pools, activity pools, inner tube rides and body slides, and interactive play attractions.

**BARRIER.** A permanent fence, wall, building wall, or combination thereof that completely surrounds the pool or spa pool or spa and obstructs the access to the pool or spa. Permanent shall mean "not being able to be removed, lifted, or relocated without the use of a tool."

**COVER.** A device that covers, protects, or spa, or hot tub. See safety cover.

**LADDER.** A structure for ingress/egress that usually consists of two long parallel side pieces joined at intervals by crosspieces (treads).

**TYPE A DOUBLE ACCESS LADDER.** An "A-Frame" ladder that straddles the pool wall of an above-ground pool and provides ingress and egress and is intended to be removed when not in use.

**TYPE B LIMITED ACCESS LADDER.** An "A-Frame" ladder that straddles the pool wall of an above-ground/on ground pool. Type B ladders are removable and have a built-in feature that prevents entry to the pool when the pool is not in use.

**TYPE C LADDER.** A "ground to deck"

access to an above-ground pool deck and has a built-in entry-limiting feature.

**TYPE D IN POOL LADDER.** Located in the pool to provide a means of ingress and egress from the pool to the deck.

**TYPE E or F IN POOL STAIRCASE LADDER.** Located in the pool to provide a means of ingress and egress from the pool to the deck.

**POWER SAFETY COVER.** A pool cover that is placed over the water area, and is opened and closed with a motorized mechanism activated by a control switch.

**RESIDENTIAL SWIMMING POOL** (Residential Pool). A pool intended for use which is accessory to a residential setting and available only to the household and its guests. All other pools shall be considered public pools for purposes of this code.

**SAFETY COVER.** A barrier intended to be completely removed before entry of users for swimming pools, spas, hot tubs or wading pools, attendant appurtenances and/or anchoring mechanisms that will, when properly labeled, installed, used, and maintained in accordance with the manufacturer's published instructions. These covers are either a power or manual type.

**SLIP RESISTANT.** A surface that has been so treated or constructed to significantly reduce the chance of a user slipping. The surface shall not be an abrasion hazard.

**PERMANENT RESIDENTIAL SPA.** A spa, intended for use that is accessory to a residential setting and available to the household and its guests and where the water heating and water-circulating equipment is not an integral part of the product. The spa is intended as a permanent plumbing fixture and not intended to be moved.

**PORTABLE RESIDENTIAL SPA.** A spa intended for use that is accessory to a residential setting and available to the household and its guests and where it is either self-contained or nonself-contained. Shall not be installed on elevated surfaces without approval from an Engineer or the Building Official.

## SECTION 305 BARRIER REQUIREMENTS

### 305.1 General.

The provisions of this section shall apply to the design of barriers for restriction entry into areas having pools and spas. Where spas or hot tubs are equipped with a lockable safety cover complying with ASTM F1346 and that swimming pools are equipped with a powered safety cover that complies with ASTM F1346 the areas where those spas, hot tubs, or pools are located shall not be required to comply with sections 305.2 through 305.7.

### 305.2 Outdoor swimming pools and spas.

All outdoor pools and spas and indoor swimming pools shall be surrounded by a barrier that complies with [Sections 305.2.1](#) through [305.7](#).

#### 305.2.1 Barrier height and clearances.

Barrier heights and clearances shall be in accordance with all of the following:

1. The top of the *barrier* shall be not less than 48 inches (1219 mm) above grade where measured on the side of the *barrier* that faces away from the *pool or spa pool or spa*. Such height shall exist around the entire perimeter of the pool or spa and for a distance of 3 feet (914 mm) where measured horizontally from the required *barrier*.
2. The vertical clearance between grade and the bottom of the *barrier* shall not exceed 2 inches (51 mm) for grade surfaces that are not solid, such as grass or gravel, where measured on the side of the barrier that faces away from the pool or spa.
3. The vertical clearance between a surface below the barrier to a solid surface, such as concrete, and the bottom of the required *barrier* shall not exceed 4 inches (102 mm) where measured on the side of the required barrier that faces away from the pool or spa.
4. Where the top of the pool or spa structure is above grade, the *barrier* shall be installed on grade or shall be mounted on top of the pool or spa structure. Where the *barrier* is mounted on the top of the pool or spa, the vertical clearance between the top of the pool or spa and the bottom of the *barrier* shall not exceed 4 inches (102 mm).

#### 305.2.2 Openings.

Openings in the *barrier* shall not allow passage of a 4 inch (102 mm) diameter sphere.

#### 305.2.3 Solid barrier surfaces.

Solid *barriers* that do not have openings shall not contain indentations or protrusions that form handholds and footholds, except for normal construction tolerances and tooled masonry joints.

#### 305.2.4 Mesh restraining barrier/fence.

Mesh fences, other than chain link fences in accordance with [Section 305.2.7](#), shall be installed in accordance with the manufacturer's instructions and shall comply with the following:

1. The bottom of the mesh restraining fence shall be not more than 1 inch (25 mm) above the deck or installed surface or grade.
2. The maximum vertical clearance from the bottom of the mesh fence and the solid surface shall not permit the fence to be lifted more than 4 inches (102 mm) from grade or decking.
3. The fence shall be designed and constructed so that it does not allow passage of a 4-inch (102 mm) sphere under any mesh panel. The maximum vertical clearance from the bottom of the mesh fence and the solid surface shall not be more than 4 inches (102 mm) from grade or decking.
4. An attachment device shall attach each barrier section at a height not lower than 45 inches (1143 mm) above grade. Common attachment devices include, but are not limited to, devices that provide the security equal to or greater than that of a hook-and-eye-type latch incorporating a spring-actuated retaining lever such as a safety gate hook.

5. Where a hinged gate is used with a mesh *barrier*, the gate shall comply with [Section 305.3](#).

6. Patio deck sleeves such as vertical post receptacles which are placed inside the patio surface shall be of a nonconductive material.

7. Mesh fences shall not be used on top of on ground *residential pools*.

#### 305.2.5 Closely spaced horizontal members.

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 *pool or spa* side of the fence. Spacing between vertical members shall not exceed 1.75 inches (44 mm) in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 1.75 inches (44 mm) in width.

#### 305.2.6 Widely spaced horizontal members.

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 1.75 inches (44 mm) in width.

#### 305.2.7 Chain link dimensions.

The maximum opening formed by a chain link fence shall be not more than 1.75 inches (44 mm). Where the fence is provided with slats fastened at the top and bottom which reduces the openings, such openings shall be not more than 1.75 inches (44 mm).

### **305.2.8 Diagonal members.**

Where the *barrier* is composed of diagonal members, the maximum opening formed by the diagonal members shall be not more than 1.75 inches (44 mm). The angle of diagonal members shall not be greater than 45 degrees (0.79 rad) from vertical

### **305.2.9 Clear zone.**

There shall be a clear zone of not less than 36 inches (914 mm) around the exterior of the *barrier* and around any permanent structures or equipment such as pumps, *filters* and heaters that can be used to climb the barrier.

### **305.2.10 Poolside barrier setbacks.**

The *pool or spa* side of the required *barrier* shall be not less than 20 inches from the water's edge.

## **305.3 Gates.**

Access gates shall comply with the requirements of [Sections 305.3.1](#) through [305.3.3](#) and shall be equipped to accommodate a locking device. Pedestrian access gates shall open outward away from the pool or spa and shall be self-closing and have a self-latching device.

### **305.3.1 Utility or service gates.**

Gates not intended for pedestrian use, such as utility or service gates, shall remain locked when not in use.

### **305.3.2 Double or multiple gates.**

Double gates or multiple gates shall have at least one leaf secured in place and the adjacent leaf shall be secured with a self-latching device. The gate and *barrier* shall not have openings larger than  $\frac{1}{2}$  inch (12.7 mm) within 18 inches (457 mm) of the latch release mechanism. The self-latching device shall comply with the requirements of [Section 305.3.3](#).

### **305.3.3 Latches.**

Where the release mechanism of the self-latching device is located less than 54 inches (1372 mm) from grade, the release mechanism shall be located on the pool or spa side of the gate at least 3 inches (76 mm) below the top of the gate, and the gate and *barrier* shall not have openings greater than  $\frac{1}{2}$  inch (12.7 mm) within 18 inches (457 mm) of the release mechanism.

### **305.4 Structure wall as a barrier.**

Where a wall of a dwelling or structure serves as part of the barrier and where doors or windows provide direct access to the pool or spa through that wall, one of the following shall be required:

1. Operable windows having a sill height of less than 48 inches above the indoor finished floor and doors shall have an alarm that produces an audible warning when the door or their screen are opened. The alarm shall be *listed* and *labeled* as a water hazard entrance alarm in accordance with UL 2017. In dwellings or structures not required to be Accessible units, Type A units or Type B units, the operable parts of the alarm deactivation switch shall be located 54 inches (1372 mm) or more above finished floor. In dwellings or structures required to be Accessible units, Type A units or Type B units, the operable parts of the alarm deactivation switch shall be located not greater than 54 inches (1372 mm) and not less than 48 inches (1219 mm) above the finished floor.
2. A safety cover that is *listed* and *labeled* in accordance with ASTM F 1346. Is installed for the pool or spa.

3. An *approved* means of protection, such as self-closing doors with self-latching devices, is provided. Such means shall provide a degree of protection that is not less than the protection afforded by Items 1 or 2.

### **305.5 Onground residential pool structure as a barrier.**

An onground *residential pool* wall structure or a *barrier* mounted on top of an onground residential pool wall structure shall serve as a barrier where all of the following conditions are present:

1. Where only the pool wall serves as a barrier, the bottom of the wall is on grade, the top of the wall is not less than 48 inches above grade for the entire perimeter of the pool, the wall complies with the requirements of [Section 305.2](#) and the pool manufacturer allows the wall to serve as a barrier.
2. Where a barrier is mounted on top of the pool wall, the top of the barrier is not less than 48 inches above grade for the entire perimeter of the pool, and the wall and the barrier on top of the wall comply with the requirements of Section 305.2
3. *Ladder* or steps used as means of access to a pool are capable of being secured, locked or removed to prevent access except where the ladder or steps are surrounded by a barrier that meets the requirements of Section 305.
4. Openings created by the securing, locking or removal of ladders and steps do not allow the passage of a 4 inch diameter sphere.

5. Barriers that are mounted on top of onground residential pool walls are installed in accordance with the manufacturer's instructions.

### **305.6 Natural barriers.**

In the case where the pool or spa area abuts the edge of a lake or other natural body of water, public access is not permitted or allowed along the shoreline, and required *barriers* extend to and beyond the water's edge a minimum of 18 inches (457 mm), a *barrier* is not required between the natural body of water shoreline and the pool or spa.

### **305.7 Natural topography.**

Natural topography that prevents direct access to the *pool or spa area* shall include but not be limited to mountains and natural rock formations. A natural *barrier approved* by the governing body shall be acceptable provided that the degree of protection is not less than the protection afforded by the requirements of [Sections 305.2](#) through [305.5](#)

## **SECTION 306**

### **DECKS**

#### **306.1 General.**

The structural design and installation of decks around pools and spas shall be in accordance with the *International Residential Code* or the *International Building Code*, as applicable in accordance with section 102.7 and this section.

#### **306.2 Slip resistant.**

Decks, ramps, coping, and similar step surfaces shall be *slip-resistant* and cleanable. Special features in or on decks such as markers, brand insignias, and similar materials shall be *slip-resistant*

#### **306.3 Stair treads and risers.**

Stair riser heights shall be in accordance with the *International Residential Code* or the *International Building Code*, as applicable in accordance with Section 102.7.1

#### **306.4 Slope.**

The minimum slope of decks shall be in accordance with Table 306.5 except where an alternative drainage method is provided that prevents the accumulation or pooling of water. The slope for decks, other than wood decks, shall be not greater than  $\frac{1}{2}$  inch per foot (1 mm per 24 mm) except for ramps. The slope for wood and wood/plastic composite decks

shall be not greater than  $\frac{1}{4}$  inch per 1 foot (1 mm per 48 mm). Decks shall be sloped so that standing water will not be deeper than  $\frac{1}{8}$  inch (3.2 mm), 20 minutes after the cessation of the addition of water to the deck.

**TABLE 306.5 MINIMUM DRAINAGE SLOPES**

<b>SURFACE</b>	<b>TYPICAL MINIMUM DRAINAGE SLOPE (INCH PER FOOT)</b>
Travertine/brick-set paver, public pools or spas	$\frac{3}{8}$ inch
Travertine/brick-set pavers, residential pools or spas	$\frac{1}{8}$ inch
Carpet	$\frac{1}{2}$ inch
Exposed aggregate	$\frac{1}{4}$ inch
Textured, hand-finished concrete	$\frac{1}{8}$ inch
Wood	$\frac{1}{8}$ inch
Wood/plastic composite	$\frac{1}{8}$ inch

#### **306.5 Gaps.**

Gaps shall be provided between deck boards in wood and wood/plastic composite decks. Gaps shall be consistent with *approved* engineering methods with respect to the type of wood used and shall not cause a tripping hazard.

##### **306.5.1 Maximum gap.**

The open gap between pool decks and adjoining decks or walkways, including joint material, shall be not greater than  $\frac{3}{4}$  inch (19.1 mm). The difference in vertical elevation between the pool deck and the adjoining sidewalk shall be not greater than  $\frac{1}{4}$  inch (6.4 mm)

#### **306.6 Concrete joints.**

Isolation joints that occur where the pool coping meets the concrete deck shall be watertight.

##### **306.6.1 Joints at coping.**

Joints that occur where the pool coping meets the concrete deck shall be installed to protect the coping and its mortar

bed from damage as a result of the anticipated movement of adjoining deck.

### **306.6.2 Crack control.**

Joints in a deck shall be provided to minimize visible cracks outside of the control joints caused by imposed stresses or movement of the slab

### **306.6.3 Movement control.**

Areas where decks join existing concrete work shall be provided with a joint to protect the pool from damage due to relative movement

### **306.7 Deck edges.**

The edges of all decks shall be radiused, tapered, or otherwise designed to eliminate sharp corners

### **306.8 Valves under decks.**

Valves installed in or under any deck shall be provided with access for operation, service, and maintenance as required by the *International Plumbing Code* or *International Residential Code*, as applicable in accordance with Section 102.7.1. Where access through the deck walking surface is required, an access cover shall be provided for the opening in the deck. Such access covers shall be slip resistant and secured.

## **SECTION E4201**

### **GENERAL**

**E4201.1 Scope.** The provisions of this chapter shall apply to the construction and installation of electric wiring and equipment associated with all swimming pools, wading pools, decorative pools, fountains, hot tubs and spas, and hydromassage bathtubs, whether permanently installed or storable, and shall apply to metallic auxiliary equipment, such as pumps, filters and similar equipment. Sections E4202 through E4206 provide general rules for permanent pools, spas and hot tubs. [Section E4207](#) provides specific rules for storable pools. [Section E4208](#) provides specific rules for spas and hot tubs. [Section E4209](#) provides specific rules for hydromassage bathtubs.

## **SECTION E4202**

### **WIRING METHODS FOR POOLS, SPAS, HOT TUBS AND HYDROMASSAGE BATHTUBS**

#### **E4202.1 General.**

Wiring methods used in conjunction with permanently installed swimming pools, spas, or hot tubs that are installed in corrosive environments described in section E4202.2.1 shall comply with table E4202.1, sections E4202.2 and E4202.5 and Chapter 38 except as otherwise stated in this section. Wiring methods used in conjunction with permanently installed swimming pools, spas, or hot tubs that are not installed in corrosive environments shall comply with Chapter 38. Storable swimming pools shall comply with section E4207. Hydromassage bathtubs shall comply with section E4209.

#### **E4202.2 Flexible cords.**

Flexible cords used in conjunction with a pool, spa, hot tub or hydromassage bathtub shall be installed in accordance with the following:

1. For other than underwater luminaires, fixed or stationary equipment shall be permitted to be connected with a flexible cord to facilitate removal or disconnection for maintenance or repair. For other than storable pools, the flexible cord shall not exceed 3 feet (914 mm) in length. Cords that supply swimming pool equipment shall have a copper equipment grounding conductor not smaller than 12 AWG and shall terminate in a grounding-type attachment plug.
2. Other than listed low-voltage lighting systems not requiring grounding, wet-niche luminaires that are supplied by a flexible cord or cable shall have all exposed noncurrent-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of the cord or cable. Such grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure and shall be not smaller than the supply conductors and not smaller than 16 AWG.
3. A listed packaged spa or hot tub installed outdoors that is GFCI protected shall be permitted to be cord-and-plug-connected provided that such cord does not exceed 15 feet (4572 mm) in length.
4. A listed packaged spa or hot tub rated at 20 amperes or less and installed indoors shall be permitted to be cord-and-plug-connected to facilitate maintenance and repair.
5. For other than underwater and storable pool lighting luminaire, the requirements of Item 1 shall apply to any cord-equipped luminaire that is located within 16 feet (4877 mm) radially from any point on the water surface.

#### **E4202.3 Double insulated pool pumps.**

A listed cord and plug-connected pool pump incorporating an approved system of double insulation that provides a means for grounding only the internal and nonaccessible, noncurrent-carrying metal parts of the pump shall be connected to any wiring method recognized in Chapter 38 that is suitable for the location. Where the bonding grid is connected to the equipment grounding conductor of the motor circuit in accordance with Section E4204.2, Item 6.1, the branch circuit wiring shall comply with Sections E4202.1 and E4205.5.

## SECTION E4203

### EQUIPMENT LOCATION AND CLEARANCES

#### E4203.1 Receptacle outlets.

Receptacles outlets shall be installed and located in accordance with Sections E4203.1.1 through E4203.1.5. Distances shall be measured as the shortest path that an appliance supply cord connected to the receptacle would follow without penetrating a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other effective permanent barrier.

#### E4203.1.1 Location.

Receptacles that provide power for water-pump motors or other loads directly related to the circulation and sanitation system shall be permitted to be located not less than 6 feet (1829 mm) from the inside walls of pools and outdoor spas and hot tubs, and ground fault circuit interrupter protected.

#### E4203.1.2 Other receptacles.

Other receptacles on the property shall be located not less than 6 feet (1829 mm) from the inside walls of pools and outdoor spas and hot tubs.

#### E4203.1.3 Where required.

At least one 125-volt, 15- or 20-ampere receptacle supplied by a general-purpose branch circuit shall be located a minimum of 6 feet (1829 mm) from and not more than 20 feet (6096 mm) from the inside wall of pools and outdoor spas and hot tubs. This receptacle shall be located not more than 6 feet, 6 inches (1981 mm) above the floor, platform or grade level serving the pool, spa or hot tub.

#### E4203.1.4 GFCI protection.

All 15- and 20-ampere, single phase, 125-volt receptacles located within 20 feet (6096 mm) of the inside walls of pools and outdoor spas and hot tubs shall be protected by a ground-fault circuit-interrupter. Outlets supplying pool pump motors supplied from branch circuits rated 120 volts through 240 volts, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel.

#### E4203.2 Switching devices.

Switching devices shall be located not less than 5 feet (1524 mm) horizontally from the inside walls of pools, spas and hot tubs except where separated from the pool, spa or hot tub by a solid fence, wall, or other permanent barrier or the switches are listed for use within 5 feet (1524 mm). Switching devices located in a room or area containing a hydromassage bathtub shall be located in accordance with the general requirements of this code.

#### E4203.3 Disconnecting means.

One or more means to simultaneously disconnect all ungrounded conductors for all utilization equipment, other than lighting, shall be provided. Each of such means shall be readily accessible and within sight from the equipment it serves and shall be located at least 5 feet (1524 mm) horizontally from the inside walls of a pool, spa, or hot tub unless separated from the open water by a permanently installed barrier that provides a 5-foot (1524 mm) or greater reach path. This horizontal distance shall be measured from the water's edge along the shortest path required to reach the disconnect.

#### E4203.4 Luminaires, equipment and ceiling fans.

Lighting outlets, luminaires, equipment and ceiling-suspended paddle fans shall be installed and located in accordance with Sections E4203.4.1 through E4203.4.5.

##### E4203.4.1 Outdoor location.

In outdoor pool, outdoor spas and outdoor hot tubs areas, luminaires, lighting outlets, and ceiling-suspended paddle fans shall not be installed over the pool or over the area extending 5 feet (1524 mm) horizontally from the inside walls of a pool except where no part of the luminaire or ceiling-suspended paddle fan is less than 12 feet (3658 mm) above the maximum water level.

##### E4203.4.3 Low-voltage luminaires.

Listed low-voltage luminaires not requiring grounding, not exceeding the low-voltage contact limit, and supplied by listed transformers or power supplies that comply with Section E4206.1 shall be permitted to be located less than 5 feet from the inside walls of the pool.

##### E4203.4.4 Existing lighting outlets and luminaires.

Existing lighting outlets and luminaires that are located within 5 feet (1524 mm) horizontally from the inside walls of pools and outdoor spas and hot tubs shall be permitted to be located not less than 5 feet (1524 mm) vertically above the maximum water level, provided that such luminaires and outlets are rigidly attached to the existing structure and are protected by a ground-fault circuit-interrupter.

##### E4203.4.5 Indoor spas and hot tubs.

1. Luminaires, lighting outlets, and ceiling-suspended paddle fans located over the spa or hot tub or within 5 feet (1524 mm) from the inside walls of the spa or hot tub shall be a minimum of 7 feet, 6 inches (2286 mm) above the maximum water level and shall be protected by a ground-fault circuit interrupter.

Luminaires, lighting outlets, and ceiling-suspended paddle fans that are located 12 feet (3658 mm) or more above the maximum water level shall not require ground-fault circuit interrupter protection.

2. Luminaires protected by a ground-fault circuit interrupter and complying with Item 2.1 or 2.2 shall be permitted to be installed less than 7 feet, 6 inches (2286 mm) over a spa or hot tub.

2.1. Recessed luminaires shall have a glass or plastic lens and nonmetallic or electrically isolated metal trim, and shall be suitable for use in damp locations.

2.2. Surface-mounted luminaires shall have a glass or plastic globe and a nonmetallic body or a metallic body isolated from contact. Such luminaires shall be suitable for use in damp locations.

#### **E4203.4.6 GFCI protection in adjacent areas.**

Luminaires and outlets that are installed in the area extending between 5 feet (1524 mm) and 10 feet (3048 mm) from the inside walls of pools and outdoor spas and hot tubs shall be protected by ground-fault circuit-interrupters except where such fixtures and outlets are installed not less than 5 feet (1524 mm) above the maximum water level and are rigidly attached to the structure.

#### **E4203.5 Other outlets.**

Other outlets such as for remote control, signaling, fire alarm and communications shall be not less than 10 feet (3048 mm) from the inside walls of the pool. Measurements shall be determined in accordance with [Section E4203.1](#).

#### **E4203.6 Overhead conductor clearances.**

Except where installed with the clearances specified in Table E4203.6, the following parts of pools and outdoor spas and hot tubs shall not be placed under existing service-drop overhead service conductors, or any other open overhead wiring; nor shall such wiring be installed above the following:

1. Pools and the areas extending not less than 10 feet (3048 mm) horizontally from the inside of the walls of the pool.

2. Diving structures or the areas extending not less than 10 feet horizontally from the outer edge of such structures.

3. Observation stands, towers, and platforms and the areas extending not less than 10 feet horizontally from the outer edge of such structure.

Overhead conductors of network-powered broadband communications systems shall comply with the provisions in Table E4203.6 for conductors operating at 0 to 750 volts to ground.

Utility-owned, -operated and -maintained communications conductors, community antenna system coaxial cables and the supporting messengers shall be permitted at a height of not less than 10 feet (3048 mm) above swimming and wading pools, diving structures, and observation stands, towers, and platforms.

#### **E4203.7 Underground wiring.**

Underground wiring shall not be installed under or within the area extending 5 feet (1524 mm) horizontally from the inside walls of pools and outdoor hot tubs and spas except where the wiring is installed to supply pool, spa or hot tub equipment or where space limitations prevent wiring from being routed 5 feet (1524 mm) or more horizontally from the inside walls. Where installed within 5 feet (1524 mm) of the inside walls, the wiring method shall be a complete raceway system of rigid metal conduit, intermediate metal conduit or a nonmetallic raceway system. Metal conduit shall be corrosion resistant and suitable for the location. The minimum cover depth shall be in accordance with Table E4203.7.

### **SECTION E4204 BONDING**

#### **E4204.1 Performance.**

The equipotential bonding required by this section shall be installed to reduce voltage gradients in the areas of permanently installed swimming pools and spas and hot tubs other than the storable/portable type.

#### **E4204.2 Bonded parts.**

The parts of pools, spas, and hot tubs specified in Items 1 through 7 shall be bonded together using insulated, covered or bare solid copper conductors not smaller than 8 AWG or using rigid metal conduit of brass or other identified corrosion-resistant metal. An 8 AWG or larger solid copper bonding conductor provided to reduce voltage gradients in the pool, spa, or hot tub area shall not be required to be extended or attached to remote panel boards, service

equipment, or electrodes. Connections shall be made by exothermic welding, by listed pressure connectors or clamps that are labeled as being suitable for the purpose and that are made of stainless steel, brass, copper or copper alloy, machine screw-type fasteners that engage not less than two threads or are secured with a nut, thread-forming machine screws that engage not less than two-threads, or terminal bars. Connection devices or fittings that depend solely on solder shall not be used. Sheet metal screws shall not be used to connect bonding conductors or connection devices:

1. Conductive pool shells. Bonding to conductive pool shells shall be provided as specified in Item 1.1 or 1.2. Poured concrete, pneumatically applied or sprayed concrete, and concrete block with painted or plastered coatings shall be considered to be conductive materials because of their water permeability and porosity. Vinyl liners and fiberglass composite shells shall be considered to be nonconductive materials.

1.1. Structural reinforcing steel. Unencapsulated structural reinforcing steel shall be bonded together by steel tie wires or the equivalent. Where structural reinforcing steel is encapsulated in a nonconductive compound, a copper conductor grid shall be installed in accordance with Item 1.2.

1.2. Copper conductor grid. A copper conductor grid shall be provided and shall comply with Items 1.2.1 through 1.2.4:

1.2.1. It shall be constructed of minimum 8 AWG bare solid copper conductors bonded to each other at all points of crossing.

1.2.2. It shall conform to the contour of the pool and the pool deck.

1.2.3. It shall be arranged in a 12-inch (305 mm) by 12-inch (305 mm) network of conductors in a uniformly spaced perpendicular grid pattern with a tolerance of 4 inches (102 mm).

1.2.4. It shall be secured within or under the pool not more than 6 inches (152 mm) from the outer contour of the pool shell.

2. Perimeter surfaces. The perimeter surface to be bonded shall be considered to extend for 3 feet (914 mm) horizontally beyond the inside walls of the pool and shall include unpaved surfaces, poured concrete surfaces and other types of paving. Perimeter surfaces that are separated from the pool by a permanent wall or building 5 feet or more in height shall require equipotential bonding only on the pool side of the permanent wall or building.

Bonding to perimeter surfaces shall be provided as specified in Item 2.1 or 2.2 and shall be attached to the pool, spa, or hot tub reinforcing steel or copper conductor grid at a minimum of four points uniformly spaced around the perimeter of the pool, spa, or hot tub. For nonconductive pool shells, bonding at four points shall not be required.

**Exception:**

1. The equipotential bonding of perimeter surfaces shall not be required for spas and hot tubs where all of the following conditions apply:

1.1. The spas or hot tub is listed as a self-contained spa for above ground use.

1.2. The spa or hot tub is not identified as suitable only for indoor use.

1.3. The installation is in accordance with the manufacturer's instructions and is located on or above grade.

1.4. The top rim of the spa or hot tub is not less than 28 inches above all perimeter surfaces that are within 30 inches, measured horizontally from the spa or hot tub. The height of nonconductive external steps for entry or to exit from the self-contained spa is not used to reduce or increase this rim height measurement.

2. The equipotential bonding requirements for perimeter surfaces shall not apply to self-contained spa or hot tub located indoors and installed above the finished floor.

2.1. Structural reinforcing steel. Structural reinforcing steel shall be bonded in accordance with Item 1.1.

2.2. Alternating means. Where structural reinforcing steel is not available or is encapsulated in a nonconductive compound, a copper conductor(s) shall be used in accordance with Items 2.2.1 through 2.2.5

2.2.1 At least 1 minimum 8 AWG bar solid copper conductor shall be provided.

2.2.2. The conductors shall follow the contour of the perimeter surface.

2.2.3. Splices shall be listed.

2.2.4. The required conductor shall be 18 to 24 inches (457 to 610 mm) from the inside walls of the pool.

2.2.5. The required conductor shall be secured within or under the perimeter surface 4 to 6 inches (102 mm to 152 mm) below the subgrade.

3. Metallic components. All metallic parts of the pool structure, including reinforcing metal not addressed in Item 1.1, shall be bonded. Where reinforcing steel is encapsulated with a nonconductive compound, the reinforcing steel shall not be required to be bonded.

4. Underwater lighting. All metal forming shells and mounting brackets of no-niche luminaires shall be bonded.

**Exception:** Listed low-voltage lighting systems with nonmetallic forming shells shall not require bonding.

5. Metal fittings. All metal fittings within or attached to the pool structure shall be bonded. Isolated parts that are not over 4 inches (102 mm) in any dimension and do not penetrate into the pool structure more than 1 inch (25.4 mm) shall not require bonding.

6. Electrical equipment. Metal parts of electrical equipment associated with the pool water circulating system, including pump motors and metal parts of equipment associated with pool covers, including electric motors, shall be bonded.

**Exception:** Metal parts of listed equipment incorporating an approved system of double insulation shall not be bonded.

6.1. Double-insulated water pump motors. Where a double-insulated water pump motor is installed under the provisions of this item, a solid 8 AWG copper conductor of sufficient length to make a bonding connection to a replacement motor shall be extended from the bonding grid to an accessible point in the vicinity of the pool pump motor. Where there is no connection between the swimming pool bonding grid and the equipment grounding system for the premises, this bonding conductor shall be connected to the equipment grounding conductor of the motor circuit.

6.2. Pool water heaters. For pool water heaters rated at more than 50 amperes and having specific instructions regarding bonding and grounding, only those parts designated to be bonded shall be bonded and only those parts designated to be grounded shall be grounded.

7. All fixed metal parts including, but not limited to, metal-sheathed cables and raceways, metal piping, metal awnings, metal fences and metal door and window frames.

#### **Exceptions:**

1. Those separated from the pool by a permanent barrier that prevents contact by a person shall not be required to be bonded.

2. Those greater than 5 feet (1524 mm) horizontally from the inside walls of the pool shall not be required to be bonded.

3. Those greater than 12 feet (3658 mm) measured vertically above the maximum water level of the pool, or as measured vertically above any observation stands, towers, or platforms, or any diving structures, shall not be required to be bonded.

#### **E4204.3 Pool water.**

Where none of the bonded parts is in direct connection with the pool water, the pool water shall be in direct contact with an approved corrosion-resistant conductive surface that exposes not less than 9 sq inches of surface area to the pool water at all times. The conductive surface shall be located where it is not exposed to physical damage or dislodgement during usual pool activities, and it shall be bonded in accordance with [Section E4204.2](#).

#### **E4204.4 Bonding of outdoor hot tubs and spas.**

Outdoor hot tubs and spas shall comply with the bonding requirements of [Sections E4204.1](#) through [E4204.3](#). Bonding by metal-to-metal mounting on a common frame or base shall be permitted. The metal bands or hoops used to secure wooden staves shall not be required to be bonded as required in [Section E4204.2](#).

#### **E4204.5 Bonding of indoor hot tubs and spas.**

The following parts of indoor hot tubs and spas shall be bonded together:

1. All metal fittings within or attached to the hot tub or spa structure.
2. Metal parts of electrical equipment associated with the hot tub or spa water circulating system, including pump motors unless part of a listed self-contained spa or hot tub.
3. Metal raceway and metal piping that are within 5 feet (1524 mm) of the inside walls of the hot tub or spa and that are not separated from the spa or hot tub by a permanent barrier.

4. All metal surfaces that are within 5 feet (1524 mm) of the inside walls of the hot tub or spa and that are not separated from the hot tub or spa area by a permanent barrier.

**Exception:** Small conductive surfaces not likely to become energized, such as air and water jets and drain fittings, where not connected to metallic piping, towel bars, mirror frames, and similar nonelectrical equipment, shall not be required to be bonded.

5. Electrical devices and controls that are not associated with the hot tubs or spas and that are located less than 5 feet (1524 mm) from such units.

#### **E4204.5.1 Methods.**

All metal parts associated with the hot tub or spa shall be bonded by any of the following methods:

1. The interconnection of threaded metal piping and fittings.
2. Metal-to-metal mounting on a common frame or base
3. The provision of an insulated, covered or bare solid copper bonding jumper not smaller than 8 AWG. It shall not be the intent to require that the 8 AWG or larger solid copper bonding conductor be extended or attached to any remote panelboard, service equipment, or any electrode, but only that it shall be employed to eliminate voltage gradients in the hot tub or spa area as prescribed.

#### **E4204.5.2 Connections.**

Permitted methods: E3406.13.1 Equipment grounding conductors, grounding electrode conductors, and bonding jumpers shall be connected by one or more of the following means:

1. Listed pressure connectors.
2. Terminal Bars.
3. Pressure connectors listed as grounding and bonding equipment.
4. Exothermic welding process.
5. Machine screw-type fasteners that engage not less than two threads or are secured with a nut.
6. Thread-forming machine screws that engage not less than two threads in an enclosure.
7. Connections that are part of an assembly.
8. Other listed means [250.8 (A)]

#### **Methods not permitted.**

Connection devices or fittings that depend solely on solder shall not be used.

## **SECTION E4205**

### **GROUNDING**

#### **E4205.1 Equipment to be grounded.**

The following equipment shall be grounded:

1. Through-wall lighting assemblies and underwater luminaires other than those low-voltage lighting products listed for the application without a grounding conductor.
2. All electrical equipment located within 5 feet (1524 mm) of the inside wall of the pool, spa or hot tub.
3. All electrical equipment associated with the recirculating system of the pool, spa or hot tub.
4. Junction boxes.
5. Transformer and power supply enclosures.
6. Ground-fault circuit-interrupters.

7. Panel boards that are not part of the service equipment and that supply any electrical equipment associated with the pool, spa or hot tub.

#### **E4205.2 Luminaires and related equipment.**

Where branch-circuit wiring on the supply side of enclosures and junction boxes connected to conduits run to underwater luminaires are installed in corrosive environments as described in Section E4202.2, the wiring method of that portion of the branch circuit shall be as required in Section E4202.2.1 or shall be liquid-tight flexible nonmetallic conduit (LFNMC). Where not installed in corrosive environments, branch circuits shall comply with Chapter 38. Wiring methods shall contain an insulated copper equipment grounding conductor sized in accordance with table E3908.12 but not smaller than 12 AWG. The equipment grounding conductor between the wiring chamber of the secondary winding of a transformer and a junction box shall be sized in accordance with the overcurrent device in such circuit.

The insulated copper equipment grounding conductor shall be connected to all through-wall lighting assemblies, wet niche, dry niche, or no niche luminaires other than listed low voltage luminaires not requiring grounding. The junction box, transformer enclosure, or other enclosure in the supply circuit to a wet niche or no niche luminaire and the field wiring chamber of a dry niche luminaire shall be grounded to the equipment grounding terminal of the panelboard. The equipment ground terminal shall be directly connected to the panelboard enclosure. The equipment grounding conductor shall be installed without joint or splices.

#### **Exceptions:**

1. Where more than one underwater luminaire is supplied by the same branch circuit, the equipment grounding conductor, installed between the junction boxes, transformer enclosures, or other enclosures in the supply circuit to wet-niche luminaires, or between the field-wiring compartments of dry-niche luminaires, shall be permitted to be terminated on grounding terminals.
2. Where an underwater luminaire is supplied from a transformer, ground-fault circuit-interrupter, clock-operated switch, or a manual snap switch that is located between the panelboard and a junction box connected to the conduit that extends directly to the underwater luminaire, the equipment grounding conductor shall be permitted to terminate on grounding terminals on the transformer, ground-fault circuit-interrupter, clock-operated switch enclosure, or an outlet box used to enclose a snap switch.

#### **E4205.3 Nonmetallic conduit.**

Where a nonmetallic conduit is installed between a forming shell and a junction box, transformer enclosure, or other enclosure, a 8 AWG insulated copper bonding jumper shall be installed in this conduit except where a listed low-voltage lighting system not requiring grounding is used. The bonding jumper shall be terminated in the forming shell, junction box or transformer enclosure, or ground-fault circuit-interrupter enclosure. The termination of the 8 AWG bonding jumper in the forming shell shall be covered with, or encapsulated in, a listed potting compound to protect such connection from the possible deteriorating effect of pool water.

#### **E4205.4 Flexible cords.**

Other than listed low-voltage lighting systems not requiring grounding, wet-niche luminaires that are supplied by a flexible cord or cable shall have all exposed noncurrent-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of the cord or cable. This grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure. The grounding conductor shall not be smaller than the supply conductors and not smaller than 16 AWG.

#### **E4205.5 Pool Motors.**

Wiring methods installed in the corrosive environments described in Section E4202.2.1 shall comply with Section E4202.2.2 or shall be Type MC cable listed for that location.

Wiring methods installed in corrosive environments described in Section 4202.2.1 shall contain an insulated copper equipment conductor sized in accordance with Table 3908.12 but not smaller than 12 AWG.

Where installed in noncorrosive environments, branch circuit wiring methods shall comply with Chapter 38.

#### **E4205.6 Feeders.**

These provisions shall apply to any feeder on the supply side of panelboards supplying branch circuits for pool equipment covered in this chapter and on the load side of the service equipment. Where feeders are installed in corrosive environments as described in Section E4202.2, the wiring method of that portion of the feeder shall comply with Section E4202.2.1 or shall be liquid-tight flexible nonmetallic conduit (LFNMC). Wiring methods installed in corrosive environments as described in Section E4202.2.1 shall contain an insulated copper equipment grounding conductor sized in accordance with Table E3908.12, but not smaller than 12 AWG.

Where installed in noncorrosive environments, feeder wiring methods shall comply with Chapter 38.

#### **E4205.6.1 Separate buildings.**

A feeder to a separate building or structure shall be permitted to supply swimming pool equipment branch circuits, or feeders supplying swimming pool equipment branch circuits, provided that the grounding arrangements in the separate building meet the requirements of [Section E3607.3](#). Where installed in other than existing feeders covered in the exception to [Section E4205.6](#), a separate equipment grounding conductor shall be an insulated conductor.

#### **E4205.7 Cord-connected equipment.**

Where fixed or stationary equipment is connected with a flexible cord to facilitate removal or disconnection for maintenance, repair, or storage, as provided in [Section E4202.2](#), the equipment grounding conductors shall be connected to a fixed metal part of the assembly. The removable part shall be mounted on or bonded to the fixed metal part.

#### **E4205.8 Other equipment.**

Other electrical equipment shall be grounded in accordance with [Section E3908](#).

#### **E4205.9 Grounding and bonding terminals.**

Grounding and bonding terminals shall be identified for use in wet and corrosive environments. Field-installed grounding and bonding connections in a damp, wet or corrosive environment shall be composed of copper, copper alloy or stainless steel and shall be listed for direct burial use.

**SECTION E4207**  
**STORABLE SWIMMING POOLS,**  
**STOREABLE SPAS, AND STORABLE HOT TUBS**

**E4207.1 Pumps.**

A cord and plug-connected pool filter pump for use with storable pools shall incorporate an approved system of double insulation or its equivalent and shall be provided with means for grounding only the internal and nonaccessible noncurrent-carrying metal parts of the appliance.

The means for grounding shall be an equipment grounding conductor run with the power-supply conductors in a flexible cord that is properly terminated in a grounding-type attachment plug having a fixed grounding contact. Cord and plug-connected pool filter pumps shall be provided with a ground-fault circuit interrupter that is an integral part of the attachment plug or located in the power supply cord within 12 inches (305 mm) of the attachment plug.

**E4207.2 Ground-fault circuit-interrupters required.** Electrical equipment, including power-supply cords, used with storable pools shall be protected by ground-fault circuit-interrupters. All 125-volt, 15- and 20-ampere receptacles located within 20 feet (6096 mm) of the inside walls of a storable pool, storable spa, or storable hot tub shall be protected by a ground-fault circuit interrupter. In determining these dimensions, the distance to be measured shall be the shortest path that the supply cord of an appliance connected to the receptacle would follow without passing through a floor, wall, ceiling, and doorway with hinged or sliding door, window opening, or other effective permanent barrier.

**E4207.3 Luminaires.**

Luminaires for storable pools, storable spas, and storable hot tubs shall not have exposed metal parts and shall be listed for the purpose as an assembly. In addition, luminaires for storables pools shall comply with the requirements of Section E4207.3.1 or E4207.3.2.

**E4207.3.1 Within the low-voltage contact limit.**

A luminaire installed in or on the wall of a storable pool shall be part of a cord and plug-connected lighting assembly. The assembly shall:

1. Have a luminaire lamp that is suitable for the use at the supplied voltage;
2. Have an impact-resistant polymeric lens, luminaire body, and transformer enclosure;
3. Have a transformer meeting the requirements of [Section E4206.1](#) with a primary rating not over 150 volts; and
4. Have no exposed metal parts.

**E4207.3.2 Over the low-voltage contact limit but not over 150 volts.**

A lighting assembly without a transformer or power supply, and with the luminaire lamp(s) operating at over the low-voltage contact limit, but not over 150 volts, shall be permitted to be cord and plug-connected where the assembly is listed as an assembly for the purpose and complies with all of the following:

1. It has an impact-resistant polymeric lens and luminaire body.
2. A ground-fault circuit interrupter with open neutral conductor protection is provided as an integral part of the assembly.
3. The luminaire lamp is permanently connected to the ground-fault circuit interrupter with open-neutral protection.
4. It complies with the requirements of [Section E4206.4](#).

5. It has no exposed metal parts.

**E4207.4 Receptacle locations.**

Receptacles shall be located not less than 6 feet (1829 mm) from the inside walls of a pool. In determining these dimensions, the distance to be measured shall be the shortest path that the supply cord of an appliance connected to the receptacle would follow without passing through a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other effective permanent barrier.

**TABLE E4203.6**  
**OVERHEAD CONDUCTOR CLEARANCES**

	<b>INSULATED SUPPLY OR SERVICE DROP CABLES, 0-750 VOLTS TO GROUND, SUPPORTED ON AND CABLED TOGETHER WITH AN EFFECTIVELY GROUNDED BARE MESSENGER OR EFFECTIVELY GROUNDED NEUTRAL CONDUCTOR (feet)</b>	<b>ALL OTHER SUPPLY OR SERVICE DROP CONDUCTORS (feet)</b>	
		<b>Voltage to ground</b>	
		<b>0-15 kV</b>	<b>Greater than 15 to 50 kV</b>
A. Clearance in any direction to the water level, edge of water surface, base of diving platform, or permanently anchored raft	22.5	25	27
B. Clearance in any direction to the diving platform	14.5	17	18

**TABLE E4203.7**  
**MINIMUM BURIAL DEPTHS**

<b>WIRING METHOD</b>	<b>UNDERGROUND WIRING (inches)</b>
Rigid metal conduit	6
Intermediate metal conduit	6
Nonmetallic raceways listed for direct burial and under concrete exterior slab not less than 4 inches in thickness and extending not less than 6 inches (162 mm) beyond the underground installation	6
Nonmetallic raceways listed for direct burial without concrete encasement	18
Other approved raceways	18

a. Raceways approved for burial only where concrete-encased shall require a concrete envelope not less than 2 inches in thickness.