

above-ground electric utility lines, or encroach upon any privately owned property without the written consent of the owner of the encroached-upon property, space or above-ground electric utility lines. Towers shall be equipped with climbing and working facilities in compliance with TIA-222. Access to the tower sites shall be limited as required by applicable OSHA, FCC and EPA regulations.

## SECTION 3109 SWIMMING POOL ENCLOSURES AND SAFETY DEVICES

**3109.1 General.** Swimming pools shall comply with the requirements of Sections 3109.2 through 3109.5 and other applicable sections of this code.

**3109.2 Definition.** The following term is defined in Chapter 2:  
**SWIMMING POOLS.**

**3109.3 Public swimming pools.** Public swimming pools shall be completely enclosed by a fence not less than 4 feet (1290 mm) in height or a screen enclosure. Openings in the fence shall not *permit* the passage of a 4-inch-diameter (102 mm) sphere. The fence or screen

enclosure shall be equipped with self-closing and self-latching gates.

**3109.4 Residential swimming pools.** Residential swimming pools shall be completely enclosed by a barrier complying with Sections 3109.4.1 through 3109.4.3.

**Exception:** A swimming pool with a power safety cover or a spa with a safety cover complying with ASTM F 1346 need not comply with this section.

**3109.4.1 Barrier height and clearances.** The top of the barrier shall be not less than 48 inches (1219 mm) above grade measured on the side of the barrier that faces away from the swimming pool. The vertical clearance between grade and the bottom of the barrier shall be not greater than 2 inches (51 mm) measured on the side of the barrier that faces away from the swimming pool. Where the top of the pool structure is above grade, the barrier is authorized to be at ground level or mounted on top of the pool structure, and the vertical clearance between the top of the pool structure and the bottom of the barrier shall be not greater than 4 inches (102 mm).

**3109.4.1.1 Openings.** Openings in the barrier shall not allow passage of a 4-inch-diameter (102 mm) sphere.

**3109.4.1.2 Solid barrier surfaces.** Solid barriers which do not have openings shall not contain indentations or protrusions except for normal construction tolerances and tooled masonry joints.

**3109.4.1.3 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 swimming pool side of the fence. Spacing between vertical members shall be not greater than  $1\frac{3}{4}$  inches (44 mm)

in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall be not greater than  $1\frac{3}{4}$  inches (44 mm) in width.

**3109.4.1.4 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 be not greater than 4 inches (102 mm). Where there are decorative cutouts within vertical members, spacing within the cutouts shall be not greater than  $1\frac{3}{4}$  inches (44 mm) in width.

**3109.4.1.5 Chain link dimensions.** Mesh size for chain link fences shall be not greater than a  $2\frac{1}{4}$ -inch square (57 mm square) unless the fence is provided with slats fastened at the top or the bottom that reduce the openings to not more than  $1\frac{3}{4}$  inches (44 mm).

**3109.4.1.6 Diagonal members.** Where the barrier is composed of diagonal members, the opening formed by the diagonal members shall be not greater than  $1\frac{3}{4}$  inches (44 mm).

**3109.4.1.7 Gates.** Access doors or gates shall comply with the requirements of Sections 3109.4.1.1 through 3109.4.1.6 and shall be equipped to accommodate a locking device. Pedestrian access doors or gates shall open outward away from the pool and shall be self-closing and have a self-latching device. Doors or gates other than pedestrian access doors or gates shall have a self-latching device. Release mechanisms shall be in accordance with Sections 1010.1.9 and 1109.13. Where the release mechanism of the self-latching device is located less than 54 inches (1372 mm) from the bottom of the door or gate, the release mechanism shall be located on the pool side of the door or gate 3 inches (76 mm) or more, below the top of the door or gate, and the door or gate and barrier shall be without openings greater than  $\frac{1}{2}$  inch (12.7 mm) within 18 inches (457 mm) of the release mechanism.

**3109.4.1.8 Dwelling wall as a barrier.** Where a wall of a *dwelling* serves as part of the barrier, one of the following shall apply:

1. Doors with direct access to the pool through that wall shall be equipped with an alarm that produces an audible warning when the door or its screen, if present, are opened. The alarm shall be *listed* and labeled in accordance with UL 2017. In dwellings not required to be *Accessible units, Type A units* or *Type B units*, the deactivation switch shall be located 54 inches (1372 mm) or more above the threshold of the door. In dwellings required to be *Accessible units, Type A units* or *Type B units*, the deactivation switch shall be located not higher than 54 inches (1372 mm) and not less than 48 inches (1219 mm) above the threshold of the door.
2. The pool shall be equipped with a power safety cover that complies with ASTM F 1346.

3. Other means of protection, such as self-closing doors with self-latching devices, which are *approved*, shall be accepted so long as the degree of protection afforded is not less than the protection afforded by Item 1 or 2 above.

**3109.4.1.9 Pool structure as barrier.** Where an above-ground 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 the ladder or steps either shall be capable of being secured, locked or removed to prevent access, or the ladder or steps shall be surrounded by a barrier that meets the requirements of Sections 3109.4.1.1 through 3109.4.1.8. Where 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.

**3109.4.2 Indoor swimming pools.** Walls surrounding indoor swimming pools shall not be required to comply with Section 3109.4.1.8.

**3109.4.3 Prohibited locations.** Barriers shall be located so as to prohibit permanent structures, equipment or similar objects from being used to climb the barriers.

**3109.5 Entrapment avoidance.** Suction outlets shall be designed and installed in accordance with ANSI/APSP-7.

## SECTION 3110 AUTOMATIC VEHICULAR GATES

**3110.1 General.** *Automatic vehicular gates* shall comply with the requirements of Sections 3110.2 through 3110.4 and other applicable sections of this code.

**3110.2 Definition.** The following term is defined in Chapter 2:  
**VEHICULAR GATE.**

**3110.3 Vehicular gates intended for automation.** *Vehicular gates* intended for automation shall be designed, constructed and installed to comply with the requirements of ASTM F 2200.

**3110.4 Vehicular gate openers.** *Vehicular gate* openers, where provided, shall be *listed* in accordance with UL 325.

## SECTION 3111 PHOTOVOLTAIC PANELS AND MODULES

**3111.1 General.** Photovoltaic panels and modules shall comply with the requirements of this code and the *International Fire Code*.

**3111.1.1 Rooftop-mounted photovoltaic panels and modules.** Photovoltaic panels and modules installed on a roof or as an integral part of a roof assembly shall comply with the requirements of Chapter 15 and the *International Fire Code*.

minals in a quantity not less than the number of conduit entries plus one. [680.24(D)]

**E4206.9.5 Strain relief.** The termination of a flexible cord of an underwater luminaire within a junction box, transformer or power supply enclosure, ground-fault circuit-interrupter, or other enclosure shall be provided with a strain relief. [680.24(E)]

**E4206.10 Underwater audio equipment.** Underwater audio equipment shall be identified for the purpose. [680.27(A)]

**E4206.10.1 Speakers.** Each speaker shall be mounted in an approved metal forming shell, the front of which is enclosed by a captive metal screen, or equivalent, that is bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to open for installation or servicing of the speaker. The forming shell shall be installed in a recess in the wall or floor of the pool. [680.27(A)(1)]

**E4206.10.2 Wiring methods.** Rigid metal conduit of brass or other identified corrosion-resistant metal, rigid polyvinyl chloride conduit, rigid thermosetting resin conduit or liquid-tight flexible nonmetallic conduit (LFNC-B) shall extend from the forming shell to a suitable junction box or other enclosure as provided in Section E4206.9. Where rigid nonmetallic conduit or liquid-tight flexible nonmetallic conduit is used, an 8 AWG solid or stranded insulated copper bonding jumper shall be installed in this conduit with provisions for terminating in the forming shell and the junction box. The termination of the 8 AWG bonding jumper in the forming shell shall be covered with, or encapsulated in, a suitable potting compound to protect such connection from the possible deteriorating effect of pool water. [680.27(A)(2)]

**E4206.10.3 Forming shell and metal screen.** The forming shell and metal screen shall be of brass or other approved corrosion-resistant metal. Forming shells shall include provisions for terminating an 8 AWG copper conductor. [680.27(A)(3)]

**E4206.11 Electrically operated pool covers.** The electric motors, controllers, and wiring for pool covers shall be located not less than 5 feet (1524 mm) from the inside wall of the pool except where separated from the pool by a wall, cover, or other permanent barrier. Electric motors installed below grade level shall be of the totally enclosed type. The electric motor and controller shall be connected to a branch circuit protected by a ground-fault circuit-interrupter. The device that controls the operation of the motor for an electrically operated pool cover shall be located so that the operator has full view of the pool. [680.27(B)(1) and (B)(2)]

**E4206.12 Electric pool water heaters.** Electric pool water heaters shall have the heating elements subdivided into loads not exceeding 48 amperes and protected at not more than 60 amperes. The ampacity of the branch-circuit conductors and the rating or setting of overcurrent protective devices shall be not less than 125 percent of the total nameplate load rating. (680.9)

**E4206.13 Pool area heating.** The provisions of Sections E4206.13.1 through E4206.13.3 shall apply to all pool deck

areas, including a covered pool, where electrically operated comfort heating units are installed within 20 feet (6096 mm) of the inside wall of the pool. [680.27(C)]

**E4206.13.1 Unit heaters.** Unit heaters shall be rigidly mounted to the structure and shall be of the totally enclosed or guarded types. Unit heaters shall not be mounted over the pool or within the area extending 5 feet (1524 mm) horizontally from the inside walls of a pool. [680.27(C)(1)]

**E4206.13.2 Permanently wired radiant heaters.** Electric radiant heaters shall be suitably guarded and securely fastened to their mounting devices. Heaters shall not be installed over a pool or within the area extending 5 feet (1524 mm) horizontally from the inside walls of the pool and shall be mounted not less than 12 feet (3658 mm) vertically above the pool deck. [680.27(C)(2)]

**E4206.13.3 Radiant heating cables prohibited.** Radiant heating cables embedded in or below the deck shall be prohibited. [680.27(C)(3)]

## SECTION E4207 STORABLE SWIMMING POOLS, STORABLE 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. (680.31)

**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. 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, doorway with hinged or sliding door, window opening, or other effective permanent barrier. (680.32)

**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 storable pools shall comply with the requirements of Section E4207.3.1 or E4207.3.2. (680.33)

**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. [680.33(A)]

**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. [680.33(B)]

**E4207.4 Receptacle locations.** Receptacles shall be located not less than 6 feet (1829 mm) from the inside walls of a storable pool, storable spa or storable hot tub. 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. (680.34)

**E4207.5 Clearances.** Overhead conductor installations shall comply with Section E4203.6 and underground conductor installations shall comply with Section E4203.7.

**E4207.6 Disconnecting means.** Disconnecting means for storable pools and storable/portable spas and hot tubs shall comply with Section E4203.3.

**E4207.7 Ground-fault circuit interrupters.** Ground-fault circuit interrupters shall comply with Section E4206.2.

**E4207.8 Grounding of equipment.** Equipment shall be grounded as required by Section E4205.1.

**E4207.9 Pool water heaters.** Electric pool water heaters shall comply with Section E4206.12.

## SECTION E4208 SPAS AND HOT TUBS

**E4208.1 Ground-fault circuit-interrupters.** The outlet(s) that supplies a self-contained spa or hot tub, or a packaged

spa or hot tub equipment assembly, or a field-assembled spa or hot tub with a heater load of 50 amperes or less, shall be protected by a ground-fault circuit-interrupter. (680.44)

A listed self-contained unit or listed packaged equipment assembly marked to indicate that integral ground-fault circuit-interrupter protection is provided for all electrical parts within the unit or assembly, including pumps, air blowers, heaters, lights, controls, sanitizer generators and wiring, shall not require that the outlet supply be protected by a ground-fault circuit interrupter. [680.44(A)]

**E4208.2 Electric water heaters.** Electric spa and hot tub water heaters shall be listed and shall have the heating elements subdivided into loads not exceeding 48 amperes and protected at not more than 60 amperes. The ampacity of the branch-circuit conductors, and the rating or setting of over-current protective devices, shall be not less than 125 percent of the total nameplate load rating. (680.9)

**E4208.3 Underwater audio equipment.** Underwater audio equipment used with spas and hot tubs shall comply with the provisions of Section E4206.10. [680.43(G)]

**E4208.4 Emergency switch for spas and hot tubs.** A clearly labeled emergency shutoff or control switch for the purpose of stopping the motor(s) that provides power to the recirculation system and jet system shall be installed at a point that is readily accessible to the users, adjacent to and within sight of the spa or hot tub and not less than 5 feet (1524 mm) away from the spa or hot tub. This requirement shall not apply to single-family dwellings. (680.41)

## SECTION E4209 HYDROMASSAGE BATHTUBS

**E4209.1 Ground-fault circuit-interrupters.** Hydromassage bathtubs and their associated electrical components shall be supplied by an individual branch circuit(s) and protected by a readily accessible ground-fault circuit-interrupter. All 125-volt, single-phase receptacles not exceeding 30 amperes and located within 6 feet (1829 mm) measured horizontally of the inside walls of a hydromassage tub shall be protected by a ground-fault circuit interrupter(s). (680.71)

**E4209.2 Other electric equipment.** Luminaires, switches, receptacles, and other electrical equipment located in the same room, and not directly associated with a hydromassage bathtub, shall be installed in accordance with the requirements of this code relative to the installation of electrical equipment in bathrooms. (680.72)

**E4209.3 Accessibility.** Hydromassage bathtub electrical equipment shall be accessible without damaging the building structure or building finish. Where the hydromassage bathtub is cord- and plug-connected with the supply receptacle accessible only through a service access opening, the receptacle shall be installed so that its face is within direct view and not more than 12 inches (305 mm) from the plane of the opening. (680.73)

**E4209.4 Bonding.** Both metal piping systems and grounded metal parts in contact with the circulating water shall be bonded together using an insulated, covered or bare solid copper bonding jumper not smaller than 8 AWG. The bond-