PLAINFIELD CHARTER TOWNSHIP
BELMONT 49306

SWIMMING POOL INFORMATION

6161 BELMONT NE
PHONE 364-8466

Date _____

Name of Owner _____ Telephone _____

Address _____ City _____ Zip _____

Name of Contractor _____ Telephone _____

Address _____ City _____ Zip _____

GENERAL INFORMATION

License Number _____

Pool Location: ( ) Above Ground ( ) Below Ground

Construction: ( ) Cement ( ) Metal ( ) Plastic ( ) Other _____

Length _____ Width _____ Minimum Depth _____ Maximum Depth _____

Volume _____ gal. Surface Area _____ Sq. Ft.

Number of: Bottom Drains _____ Skimmers _____ Return Inlets _____

Ladders _____ Steps _____ Diving Boards _____

Source of Water Supply: ( ) Public ( ) Private Well

Method of Pool Water Disposal: ( ) Public Sanitary Sewer ( ) Storm Drain ( ) Drain to ground surface

WATER TREATMENT EQUIPMENT

Pump Size _____ HP. Pump Capacity _____ gal./min.

Type of Filter: ( ) Sand ( ) Diatomaceous Earth ( ) Cartridge

Filter Area _____ Sq. Ft. Max. Capacity of Filter _____ gal./min.

Type of Disinfectant: ( ) Chlorine ( ) Bromine ( ) Other _____

Method of Dispensing Disinfectant: ( ) Pump ( ) Erosion Feeder ( ) Hand

RECIRCULATION INFORMATION

Flow Rate, Recirculation System _____ gal./min. x 60 = _____ gal./hr.

Pool Volume, _____ gal. = _____ hrs. (Turnover Rate)
Flow Rate, gal/hr.

Flow Rate, _____ gal. /min. = _____ gal./sq.ft./min. (Filter Load)
Filter Area, Sq. ft.

SAFETY DEVICES AND EQUIPMENT

Type of Pool Enclosure or Protective Device: ( ) Fence ( ) Other _____

Height of Pool Enclosure or Protective Device _____ (Code requires 4 ft.)

GROUNDING AND ELECTRICAL INSPECTIONS ARE REQUIRED BY THE TOWNSHIP.

PLEASE DRAW PLOT PLAN ON BACK

_____
SIGNATURE OF OWNER OR CONTRACTOR

APPENDIX G

SWIMMING POOLS, SPAS AND HOT TUBS

SECTION AG101
GENERAL

AG101.1 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- or two-family dwelling.

SECTION AG102
DEFINITIONS

AG102.1 General. For the purposes of these requirements, the terms used shall be defined as follows and as set forth in Chapter 2.

ABOVE-GROUND/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, above-ground 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 the walls of the enclosing structure.

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

SECTION AG103
SWIMMING POOLS

AG103.1 In-ground pools. In-ground pools shall be designed and constructed in conformance with ANSI/NSPI-5 as listed in Section AG108.

AG103.2 Above-ground and on-ground pools. Above-ground and on-ground pools shall be designed and constructed in conformance with ANSI/NSPI-4 as listed in Section AG108.

SECTION AG104
SPAS AND HOT TUBS

AG104.1 Permanently installed spas and hot tubs. Perma nently installed spas and hot tubs shall be designed and co structed in conformance with ANSI/NSPI-3 as listed in Sectic AG108.

AG104.2 Portable spas and hot tubs. Portable spas and h tubs shall be designed and constructed in conformance wi ANSI/NSPI-6 as listed in Section AG108.

SECTION AG105
BARRIER REQUIREMENTS

AG105.1 Application. The provisions of this chapter sha control the design of barriers for residential swimming pool spas and hot tubs. These design controls are intended to pr vide protection against potential drownings and nea drownings by restricting access to swimming pools, spas ar hot tubs.

AG105.2 Outdoor swimming pool. An outdoor swimmir pool, including an in-ground, above-ground or on-grour pool, hot tub or spa shall be surrounded by a barrier which sha comply with the following:

1. The top of the barrier shall be at least 48 inches (121 mm) above grade measured on the side of the barri which faces away from the swimming pool. The max mum vertical clearance between grade and the bottom the barrier shall be 2 inches (51 mm) measured on tl side of the barrier which faces away from the swimmi pool. Where the top of the pool structure is above grad such as an above-ground pool, the barrier may be ground level, such as the pool structure, or mounted top of the pool structure. Where the barrier is mounted top of the pool structure, the maximum vertical clearan between the top of the pool structure and the bottom the barrier shall be 4 inches (102 mm).
2. Openings in the barrier shall not allow passage of 4-inch-diameter (102 mm) sphere.
3. Solid barriers which do not have openings, such as masonry or stone wall, shall not contain indentations protrusions except for normal construction toleranc and tooled masonry joints.
4. Where the barrier is composed of horizontal and vertic members and the distance between the tops of the ho zontal members is less than 45 inches (1143 mm), t horizontal members shall be located on the swimmi pool side of the fence. Spacing between vertical me bers shall not exceed $1^3/_4$ inches (44 mm) in wid Where there are decorative cutouts within vertical me bers, spacing within the cutouts shall not exceed 1 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 $1^3/_4$ inches (44 mm) in width.
6. Maximum mesh size for chain link fences shall be a $2^1/_4$-inch (57 mm) square unless the fence has slats fastened at the top or the bottom which reduce the openings to not more than $1^3/_4$ 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 $1^3/_4$ inches (44 mm).
8. Access gates shall comply with the requirements of Section AG105.2, 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 larger than $^1/_2$ inch (13 mm) within 18 inches (457 mm) of the release mechanism.
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 F 1346; or
   - 9.2. 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/or its screen, if present, are opened. The alarm shall be listed in accordance with UL 2017. The audible alarm shall activate within 7 seconds and sound continuously for a minimum of 30 seconds after the door and/or its screen, if present, are 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 touch pad or switch, to temporarily deactivate the alarm for a single opening. 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 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:
    - 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 AG105.2, 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.

AG105.3 Indoor swimming pool. Walls surrounding an indoor swimming pool shall comply with Section AG105.2, Item 9.

AG105.4 Prohibited locations. Barriers shall be located to prohibit permanent structures, equipment or similar objects from being used to climb them.

AG105.5 Barrier exceptions. Spas or hot tubs with a safety cover which complies with ASTM F 1346, as listed in section AG107 of the code, shall be exempt from the provisions of sections AG105.2, AG105.3, and AG105.4 of the code.

R 408.30547

SECTION AG106
ENTRAPMENT PROTECTION FOR SWIMMING POOL AND SPA SUCTION OUTLETS

AG106.1 General. Suction outlets shall be designed to produce circulation throughout the pool or spa. Single-outlet systems, such as automatic vacuum cleaner systems, or multiple suction outlets, whether isolated by valves or otherwise, shall be protected against user entrapment.

AG106.2 Suction fittings. Pool and spa suction outlets shall have a cover that conforms to ANSI/ASME A112.19.8M, or an 18 inch × 23 inch (457 mm by 584 mm) drain grate or larger, or an approved channel drain system.

Exception: Surface skimmers

AG106.3 Atmospheric vacuum relief system required. Pool and spa single- or multiple-outlet circulation systems shall be equipped with atmospheric vacuum relief should grate covers located therein become missing or broken. This vacuum relief system shall include at least one approved or engineered method of the type specified herein, as follows:

1. Safety vacuum release system conforming to ASME A112.19.17; or
2. An approved gravity drainage system.

AG106.4 Dual drain separation. Single or multiple pump circulation systems shall be provided with a minimum of two suction outlets of the approved type. A minimum horizontal or vertical distance of 3 feet (914 mm) shall separate the outlets. These suction outlets shall be piped so that water is drawn through them simultaneously through a vacuum-relief-protected line to the pump or pumps.

AG106.5 Pool cleaner fittings. Where provided, vacuum or pressure cleaner fitting(s) shall be located in an accessible position(s) at least 6 inches (152 mm) and not more than 12 inches (305 mm) below the minimum operational water level or as an attachment to the skimmer(s).

SECTION AG107
ABBREVIATIONS

AG107.1 General.

ANSI—American National Standards Institute
11 West 42nd Street, New York, NY 10036

ASME—American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

ASTM—ASTM International
100 Barr Harbor Drive, West Conshohocken, PA 19428

NSPI—National Spa and Pool Institute
2111 Eisenhower Avenue, Alexandria, VA 22314

UL—Underwriters Laboratories, Inc.
333 Pfingsten Road, Northbrook, Illinois 60062-2096

SECTION AG108
STANDARDS

AG108.1 General.

ANSI/NSPI

ANSI/NSPI-3-99 Standard for Permanently Installed Residential Spas. AG104.1

ANSI/NSPI-4-99 Standard for Above-ground/On-ground Residential Swimming Pools AG103.2

ANSI/NSPI-6-99 Standard for Residential Portable Spas AG104.2

ANSI/NSPI-5-2003 Standard for Residential In-ground Swimming Pools AG103.1

ANSI/ASME A112.19.8M-1987 (R1996) Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, Hot Tubs and Whirlpool Bathing Appliances AG106.2

ASTM

ASTM F 1346-91 (2003) Performance Specification for Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs AG105.2, AG105.5

ASME

ASME A112.19.17 Manufacturers Safety Vacuum Release Systems (SVRS) for Residential and Commercial Swimming Pool, Spa, Hot Tub and Wading Pool. AG106.3

UL

UL2017-2000 Standard for General-purpose Signaling Devices and Systems—with Revisions through June 2004. . . . . AG105.2

CHAPTER 41
SWIMMING POOLS

SECTION E4101
GENERAL

E4101.1 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 E4102 through E4106 provide general rules for permanent pools, spas and hot tubs. Section E4107 provides specific rules for storable pools. Section E4108 provides specific rules for spas and hot tubs. Section E4109 provides specific rules for hydromassage bathtubs.

E4101.2 Definitions.

CORD-AND-PLUG-CONNECTED LIGHTING ASSEMBLY. A lighting assembly consisting of a cord-and-plug-connected transformer and a luminaire intended for installation in the wall of a spa, hot tub, or storable pool.

DRY-NICHE LUMINAIRE. A luminaire intended for installation in the wall of a pool or fountain in a niche that is sealed against the entry of pool water.

FORMING SHELL. A structure designed to support a wet-niche luminaire assembly and intended for mounting in a pool or fountain structure.

FOUNTAIN. Fountains, ornamental pools, display pools, and reflection pools. The definition does not include drinking fountains.

HYDROMASSAGE BATHTUB. A permanently installed bathtub equipped with a recirculating piping system, pump, and associated equipment. It is designed so it can accept, circulate and discharge water upon each use.

MAXIMUM WATER LEVEL. The highest level that water can reach before it spills out.

NO-NICHE LUMINAIRE. A luminaire intended for installation above or below the water without a niche.

PACKAGED SPA OR HOT TUB EQUIPMENT ASSEMBLY. A factory-fabricated unit consisting of water-circulating, heating and control equipment mounted on a common base, intended to operate a spa or hot tub. Equipment may include pumps, air blowers, heaters, luminaires, controls and sanitizer generators.

PERMANENTLY INSTALLED SWIMMING AND WADING POOLS. Those that are constructed in the ground or partially in the ground, and all others capable of holding water with a depth greater than 42 inches (1067 mm), and all pools installed inside of a building, regardless of water depth, whether or not served by electrical circuits of any nature.

POOL COVER, ELECTRICALLY OPERATED. Motor-driven equipment designed to cover and uncover the water surface of a pool by means of a flexible sheet or rigid frame.

SELF-CONTAINED SPA OR HOT TUB. A factory-fabricated unit consisting of a spa or hot tub vessel with all water-circulating, heating and control equipment integral to the unit. Equipment may include pumps, air blowers, heaters, luminaires, controls and sanitizer generators.

SPA OR HOT TUB. A hydromassage pool, or tub for recreational or therapeutic use, not located in health care facilities, designed for immersion of users, and usually having a filter, heater, and motor-driven blower. They are installed indoors or outdoors, on the ground or supporting structure, or in the ground or supporting structure. Generally, a spa or hot tub is not designed or intended to have its contents drained or discharged after each use.

STORABLE SWIMMING OR WADING POOL. Those that are constructed on or above the ground and are capable of holding water with a maximum depth of 42 inches (1067 mm), or a pool with nonmetallic, molded polymeric walls or inflatable fabric walls regardless of dimension.

THROUGH-WALL LIGHTING ASSEMBLY. A lighting assembly intended for installation above grade, on or through the wall of a pool, consisting of two interconnected groups of components separated by the pool wall.

WET-NICHE LUMINAIRE. A luminaire intended for installation in a forming shell mounted in a pool or fountain structure where the luminaire will be completely surrounded by water.

SECTION E4102
WIRING METHODS FOR POOLS, SPAS, HOT TUBS AND HYDROMASSAGE BATHTUBS

E4102.1 General. Wiring methods used in conjunction with permanently installed swimming pools, spas, hot tubs or hydromassage bathtubs shall be installed in accordance with Table E4102.1 and Chapter 37 except as otherwise stated in this section. Storable swimming pools shall comply with Section E4107.

E4102.2 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, rated at 20 amperes or less shall be permitted to be connected with a flexible cord to facilitate the 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 be provided with a grounding-type attachment plug.

2. Flexible cord that is supplied as part of a listed underwater swimming pool lighting luminaire shall be permitted to be installed in any of the permitted wiring methods from the luminaire to a deck box or other enclosure. Splices shall not be made within a raceway. The equipment grounding conductor shall be an insulated copper conductor that is 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.

E4102.3 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 37 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 E4104.2, Item 4, the branch circuit wiring shall comply with Sections E4102.1 and E4105.5.

TABLE E4102.1
ALLOWABLE APPLICATIONS FOR WIRING METHODS[a, b, c, d, e, f, g, h]

WIRING LOCATION OR PURPOSE (Application allowed where marked with an "A")	AC, FMC, NM, SR, SE	EMT	ENT	IMC, RMC, RNC	LFMC	LFNMC	UF	MC	Flex Cord
Panelboard(s) that supply pool equipment: from service equipment to panelboard	A[b, e]	A[c]	—	A	—	A	A[e]	A[e]	—
Wet-niche and no-niche luminaires: from branch circuit OCPD to deck or junction box	—	A[c]	A[b]	A	—	A	—	A[b]	—
Wet-niche and no-niche luminaires: from deck or junction box to forming shell	—	—	—	A[d]	—	A	—	—	A[h]
Dry niche: from branch circuit OCPD to luminaires	—	A[c]	A[b]	A	—	A	—	A[b]	—
Pool-associated motors: from branch circuit OCPD to motor	A[b]	A[c]	A[b]	A	A[f]	A	A[b]	A	A[h]
Packaged or self-contained outdoor spas and hot tubs with underwater luminaire: from branch circuit OCPD to spa or hot tub	—	A[c]	A[b]	A	A[f]	A[f]	—	—	A[h]
Packaged or self-contained outdoor spas and hot tubs without underwater luminaire: from branch circuit OCPD to spa or hot tub	A[b]	A[c]	A[b]	A	A[f]	A[f]	A[b]	A	A[h]
Indoor spa and hot tubs, hydromassage bathtubs, and other pool, spa or hot tub associated equipment: from branch circuit OCPD to equipment	A[b]	A[c]	A[b]	A	A	A	A	A	A[h]
Connection at pool lighting transformers	—	A[c]	A[b]	A	A[g]	A[g]	—	A[b]	—

For SI: 1 foot = 304.8 mm.

a. For all wiring methods, see Section E4105 for equipment grounding conductor requirements.
b. Limited to use within buildings.
c. Limited to use on or within buildings.
d. Metal conduit shall be constructed of brass or other approved corrosion resistant metal.
e. Permitted only for existing installations in accordance with the exception to Section E4105.6.
f. Limited to use at pool, spa or hot tub equipment where flexibility is necessary. For spas and hot tubs, the maximum length shall be 6 feet (1.8 m).
g. Limited to use in individual lengths not to exceed 6 feet (1.8 m). The total length of all individual runs of LFMC and LFNMC shall not exceed 10 feet (3 m). LFNMC Type B shall be limited to lengths not exceeding 10 feet (3 m).
h. Flexible cord shall be installed in accordance with Section E4102.2.

SECTION E4103
EQUIPMENT LOCATION AND CLEARANCES

E4103.1 Receptacle outlets. Receptacles outlets shall be installed and located in accordance with Sections E4103.1.1 through E4103.1.6. 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.

E4103.1.1 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 between 5 feet and 10 feet (1524 mm and 3048 mm) from the inside walls of pools and outdoor spas and hot tubs, and, where so located, shall be single and of the locking and grounding type and shall be protected by ground-fault circuit interrupters.

Other receptacles on the property shall be located not less than 10 feet (3048 m) from the inside walls of pools and outdoor spas and hot tubs except where permitted by Section E4103.1.3.

E4103.1.2 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 10 feet (3048 mm) from and not more than 20 feet (6096 mm) from the inside wall of pools and outdoor spas and hot tubs except as permitted by Section E4103.1.3. 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.

E4103.1.3 Restricted space. Where a pool is within 10 feet (3.0 m) of a dwelling and the dimensions of the lot preclude meeting the required distances of Sections E4103.1.1 and E4103.1.2, not more than one receptacle outlet shall be permitted provided that such outlet is not less than 5 feet (1.5 m) measured horizontally from the inside wall of the pool.

E4103.1.4 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. Receptacles that supply pool pump motors and that are rated 15 or 20 amperes, 125 volts through 250 volts, single phase, shall be provided with GFCI protection.

E4103.1.5 Indoor locations. Receptacles shall be located not less than 5 feet (1524 mm) from the inside walls of indoor spas and hot tubs. A minimum of one 125-volt receptacle shall be located between 5 feet (1524 mm) and 10 feet (3048 mm) from the inside walls of indoor spas or hot tubs.

E4103.1.6 Indoor GFCI protection. All 125-volt receptacles rated 30 amperes or less and located within 10 feet (3048 mm) of the inside walls of spas and hot tubs installed indoors, shall be protected by ground-fault circuit-interrupters.

E4103.2 Switching devices. Switching devices shall be located not less than 5 feet (1.5 m) 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. Switching devices located in a room or area containing a hydromassage bathtub shall be located in accordance with the general requirements of this code.

E4103.3 Disconnecting means. One or more means to 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.

E4103.4 Luminaires and ceiling fans. Lighting outlets, luminaires, and ceiling-suspended paddle fans shall be installed and located in accordance with Sections E4103.4.1 through E4103.4.5.

E4103.4.1 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.

E4103.4.2 Indoor locations. In indoor pool areas, the limitations of Section E4103.4.1 shall apply except where the luminaires, lighting outlets and ceiling-suspended paddle fans comply with all of the following conditions:

1. The luminaires are of a totally enclosed type;
2. A ground-fault circuit interrupter is installed in the branch circuit supplying the luminaires or ceiling-suspended (paddle) fans; and
3. The distance from the bottom of the luminaire or ceiling-suspended (paddle) fan to the maximum water level is not less than 7 feet, 6 inches (2286 mm).

E4103.4.3 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.

E4103.4.4 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.

E4103.4.5 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.

E4103.5 Overhead conductor clearances. Except where installed with the clearances specified in Table E4103.5, the following parts of pools and outdoor spas and hot tubs shall not be placed under existing service-drop conductors or any other open overhead wiring; nor shall such wiring be installed above the following:

1. Pools and the areas extending 10 feet (3048 mm) horizontally from the inside of the walls of the pool;
2. Diving structures; or
3. Observation stands, towers, and platforms.

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.

E4103.6 Underground wiring. Underground wirin be installed under or within the area extending 5 f mm) horizontally from the inside walls of pools an hot tubs and spas except where the wiring is installed pool, spa or hot tub equipment or where space limita vent wiring from being routed 5 feet (1524 mm) or n zontally from the inside walls. Where installed wit (1524 mm) of the inside walls, the wiring method sha metal conduit, intermediate metal conduit or a no raceway system. Metal conduit shall be corrosion res suitable for the location. The minimum raceway bu shall be in accordance with Table E4103.6.

SECTION E4104
BONDING

E4104.1 Performance. The equipotential bonding re this section shall be installed to eliminate voltage gr the pool area as prescribed.

E4104.2 Bonded parts. The following parts shall b together:

1. All metallic parts of pool, spa and hot tub s including the reinforcing metal of pool, spa an shells, coping stones, and decks. The usual steel shall be considered suitable for bonding the re steel together, and welding or special clamping be required. Such tie wires shall be made tigh reinforcing steel is effectively insulated by encapsulating nonconductive compound, at th manufacture and installation, it shall not be re be bonded. Where reinforcing steel is encapsul

TABLE E4103.5
OVERHEAD CONDUCTOR CLEARANCES

	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)	ALL OTHER SUPPLY OR SERVICE DROP CONDUCTOR (feet)	
		Voltage to ground	
		0-15 kV	Greater than 15 to 50
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

For SI: 1 foot = 304.8 mm.

TABLE E4103.6
MINIMUM BURIAL DEPTHS

WIRING METHOD	UNDERGROUND WIRING (inches)
Rigid metal conduit	6
Intermediate metal conduit	6
Nonmetallic raceways listed for direct burial without concrete encasement	18
Other approved raceways[a]	18

For SI: 1 inch = 25.4 mm.

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

a nonconductive compound or another conductive material is not available, provisions shall be made for an alternate means to eliminate voltage gradients that would otherwise be provided by unencapsulated bonded reinforcing steel.

2. All metal forming shells and mounting brackets of no-niche luminaires except where a listed low-voltage lighting system with a nonmetallic forming shell is used that does not require bonding.
3. All metal fittings within or attached to pool, spa and hot tub structures. 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. The metal bands or hoops used to secure wooden staves for a hot tub or spa shall not be required to be bonded.
4. Metal parts of electrical equipment associated with pool, spa and hot tub water circulating systems, including pump motors and metal parts of equipment associated with pool covers, including electric motors. Accessible metal parts of listed equipment incorporating an approved system of double insulation and providing a means for grounding internal nonaccessible, noncurrent-carrying metal parts shall not be bonded by a direct connection to the equipotential bonding grid. The means for grounding internal nonaccessible, noncurrent carrying metal parts shall be an equipment grounding conductor run with the power-supply conductors in the case of motors supplied with a flexible cord, or a grounding terminal in the case of motors intended for permanent connection. Where a double-insulated water-pump motor is installed under the provisions of this section, a solid 8 AWG copper conductor that is 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 motor vicinity. 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.
5. Electrical devices and controls not associated with pools, spas or hot tubs and located within 5 feet (1.5 m) of such units.
6. Metal-sheathed cables and raceways, metal piping and all fixed metal parts that are within 5 feet (1524 mm) horizontally of the inside walls of the pool, spa or hot tub and that are within 12 feet (3658 mm) above the maximum water level of the pool or any observation stands, towers or platforms, or from any diving structures, and that are not separated from the pool by a permanent barrier.
7. 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.

E4104.3 Parts not required to be bonded. Small conductive surfaces not likely to become energized, such as towel bars, mirror frames, and air and water jets and drain fittings that are not connected to metallic piping, and similar equipment installed on or within indoor spas and hot tubs shall not be required to be bonded.

E4104.4 Methods of bonding. 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 pool area as prescribed. Bonding shall be accomplished by one or more of the following methods:

1. Equipotential bonding grid. The parts specified in Section E4104.2 above shall be connected to an equipotential bonding grid with a solid copper conductor, insulated, covered, or bare, not smaller than 8 AWG or rigid metal conduit of brass or other identified corrosion resistant metal conduit. Connection shall be made by exothermic welding or 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.

   Exception: The equipotential bonding grid shall not be required to be installed under the bottom of or vertically along the walls of vinyl lined polymer wall, fiberglass composite, or other pools constructed of nonconductive materials. Any metal parts of the pool, including metal structural supports, shall be bonded in accordance with Section E4104.1. For the purposes of this section, poured concrete, pneumatically applied (sprayed) concrete, and concrete block, with painted or plastered coatings, shall be considered as conductive materials.

   The equipotential bonding grid shall conform to the contours of the pool and shall extend within or under paved walking surfaces for 3 feet (1 m) horizontally beyond the inside walls of the pool and shall be permitted to be any of the following:

   1.1. The structural reinforcing steel of a concrete pool or deck where the reinforcing rods are bonded together by the usual steel tie wires made up tight or the equivalent. Where deck reinforcing steel is not an integral part of the pool, the deck reinforcing steel shall be bonded to the other parts of the bonding grid using a solid conductor not smaller than 8 AWG. Connections shall be in accordance with Item 1.4.

   1.2. The wall of a bolted or welded metal pool.

   1.3. As an alternative means, the system shall be constructed as specified in Items 1.3.1 through 1.3.3:

   1.3.1. Materials and connections. The equipotential bonding grid shall be constructed of bare solid copper conductors not smaller than 8 AWG. Such conductors shall be bonded to each other at all points of crossing. Connections shall be made as required by Item 1.4.

1.3.2. Grid structure. The equipotential bonding grid shall cover the contour of the pool and the pool deck extending 3 feet (1 m) horizontally from the inside walls of the pool. The equipotential bonding grid shall be arranged in a 12 inch (300 mm) by 12 inch (300 mm) network of conductors in a uniformly spaced perpendicular grid pattern with tolerance of 4 inches (100 mm).

1.3.3. Securing. The below-grade grid shall be secured within or under the pool and deck media.

1.4. Connections. Where structural reinforcing steel or the walls of bolted or welded metal pool structures are used as an equipotential bonding grid for nonelectrical parts, the connections shall be connected by exothermic welding, listed pressure connectors, listed clamps, or other listed means. 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.

2. For indoor hot tubs and spas, metal to metal mounting on a common frame or base.

3. For indoor hot tubs and spas the interconnection of threaded metal piping and fittings.

4. For indoor hot tubs and spas the provision of a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG.

SECTION E4105
GROUNDING

E4105.1 Equipment to be grounded. The following equipment shall be grounded:

1. Through-wall lighting assemblies and underwater luminaires other than those low-voltage systems 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 enclosures.
6. Ground-fault circuit-interrupters.
7. Panelboards that are not part of the service equipment and that supply any electrical equipment associated with the pool, spa or hot tub.

E4105.2 Luminaires and related equipment. Through-wall lighting assemblies, wet-niche, dry-niche, or no-niche luminaires shall be connected to an insulated copper equipment grounding conductor sized in accordance with Table E3808.12 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 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 grounding terminal shall be directly connected to the panelboard enclosure. The equipment grounding conductor shall be installed without joint or splice.

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.

E4105.3 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.

E4105.4 Flexible cords. 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.

E4105.5 Motors. Pool-associated motors shall be connected to an insulated copper equipment grounding conductor sized in accordance with Table E3808.12, but not smaller than 12 AWG. Where the branch circuit supplying the motor is installed in the interior of a one-family dwelling or in the interior of accessory buildings associated with a one-family dwelling, using a cable wiring method permitted by Table E4102.1, an uninsulated equipment grounding conductor shall be per-

mitted provided that it is enclosed within the outer sheath of the cable assembly.

E4105.6 Panelboards. A panelboard that is not part of the service equipment, or source of a separately derived system shall have an equipment grounding conductor installed between its grounding terminal and the grounding terminal of the applicable service equipment or source of a separately derived system. The equipment grounding conductor shall be insulated, shall be sized in accordance with Table E3808.12, and shall be not smaller than 12 AWG.

Exception: An existing feeder between an existing remote panelboard and service equipment shall be permitted to run in flexible metal conduit or an approved cable assembly that includes an equipment grounding conductor within its outer sheath. The equipment grounding conductor shall not be connected to the grounded conductor in the remote panelboard.

E4105.6.1 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 E3507.3. Where installed in other than existing feeders covered in the exception to Section E4105.6, a separate equipment grounding conductor shall be an insulated conductor.

E4105.7 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 E4102.2, 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.

E4105.8 Other equipment. Other electrical equipment shall be grounded in accordance with Section E3808.

SECTION E4106
EQUIPMENT INSTALLATION

E4106.1 Transformers. Transformers used for the supply of underwater luminaires, together with the transformer enclosure, shall be listed as a swimming pool and spa transformer. Such transformers shall be of an isolated winding type with an ungrounded secondary that has a grounded metal barrier between the primary and secondary windings.

E4106.2 Ground-fault circuit-interrupters. Ground-fault circuit-interrupters shall be self-contained units, circuit-breaker types, receptacle types or other approved types.

E4106.3 Wiring on load side of ground-fault circuit-interrupters and transformers. For other than grounding conductors, conductors installed on the load side of a ground-fault circuit-interrupter or transformer used to comply with the provisions of Section E4106.4, shall not occupy raceways, boxes, or enclosures containing other conductors except where the other conductors are protected by ground-fault circuit interrupters or are grounding conductors. Supply conductors to a feed-through type ground-fault circuit interrupter shall be permitted in the same enclosure. Ground-fault circuit interrupters shall be permitted in a panelboard that contains circuits protected by other than ground-fault circuit interrupters.

E4106.4 Underwater luminaires. The design of an underwater luminaire supplied from a branch circuit either directly or by way of a transformer meeting the requirements of Section E4106.1, shall be such that, where the fixture is properly installed without a ground-fault circuit-interrupter, there is no shock hazard with any likely combination of fault conditions during normal use (not relamping). In addition, a ground-fault circuit-interrupter shall be installed in the branch circuit supplying luminaires operating at more than 15 volts, so that there is no shock hazard during relamping. The installation of the ground-fault circuit-interrupter shall be such that there is no shock hazard with any likely fault-condition combination that involves a person in a conductive path from any ungrounded part of the branch circuit or the luminaire to ground. Compliance with this requirement shall be obtained by the use of a listed underwater luminaire and by installation of a listed ground-fault circuit-interrupter in the branch circuit. Luminaires that depend on submersion for safe operation shall be inherently protected against the hazards of overheating when not submerged.

E4106.4.1 Maximum voltage. Luminaires shall not be installed for operation on supply circuits over 150 volts between conductors.

E4106.4.2 Luminaire location. Luminaires mounted in walls shall be installed with the top of the fixture lens not less than 18 inches (457 mm) below the normal water level of the pool, except where the luminaire is listed and identified for use at a depth of not less than 4 inches (102 mm) below the normal water level of the pool. A luminaire facing upward shall have the lens adequately guarded to prevent contact by any person.

E4106.5 Wet-niche luminaires. Forming shells shall be installed for the mounting of all wet-niche underwater luminaires and shall be equipped with provisions for conduit entries. Conduit shall extend from the forming shell to a suitable junction box or other enclosure located as provided in Section E4106.9. Metal parts of the luminaire and forming shell in contact with the pool water shall be of brass or other approved corrosion-resistant metal.

The end of flexible-cord jackets and flexible-cord conductor terminations within a luminaire shall be covered with, or encapsulated in, a suitable potting compound to prevent the entry of water into the luminaire through the cord or its conductors. In addition, the grounding connection within a luminaire shall be similarly treated to protect such connection from the deteriorating effect of pool water in the event of water entry into the luminaire.

Luminaires shall be bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to remove the luminaire from the forming shell.

E4106.5.1 Servicing. All luminaires shall be removable from the water for relamping or normal maintenance. Luminaires shall be installed in such a manner that personnel

can reach the luminaire for relamping, maintenance, or inspection while on the deck or equivalently dry location.

E4106.6 Dry-niche luminaires. Dry-niche luminaires shall be provided with provisions for drainage of water and means for accommodating one equipment grounding conductor for each conduit entry. Junction boxes shall not be required but, if used, shall not be required to be elevated or located as specified in Section E4106.9 if the luminaire is specifically identified for the purpose.

E4106.7 No-niche luminaires. No-niche luminaires shall be listed for the purpose and shall be installed in accordance with the requirements of Section E4106.5. Where connection to a forming shell is specified, the connection shall be to the mounting bracket.

E4106.8 Through-wall lighting assembly. A through-wall lighting assembly shall be equipped with a threaded entry or hub, or a nonmetallic hub, for the purpose of accommodating the termination of the supply conduit. A through-wall lighting assembly shall meet the construction requirements of Section E4105.4 and be installed in accordance with the requirements of Section E4106.5 Where connection to a forming shell is specified, the connection shall be to the conduit termination point.

E4106.9 Junction boxes and enclosures for transformers or ground-fault circuit interrupters. Junction boxes for underwater luminaires and enclosures for transformers and ground-fault circuit-interrupters that supply underwater luminaires shall comply with the following:

E4106.9.1 Junction boxes. A junction box connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche luminaire shall be:

1. Listed as a swimming pool junction box;
2. Equipped with threaded entries or hubs or a nonmetallic hub;
3. Constructed of copper, brass, suitable plastic, or other approved corrosion-resistant material;
4. Provided with electrical continuity between every connected metal conduit and the grounding terminals by means of copper, brass, or other approved corrosion-resistant metal that is integral with the box; and
5. Located not less than 4 inches (102 mm), measured from the inside of the bottom of the box, above the ground level, or pool deck, or not less than 8 inches (203 mm) above the maximum pool water level, whichever provides the greatest elevation, and shall be located not less than 4 feet (1219 mm) from the inside wall of the pool, unless separated from the pool by a solid fence, wall or other permanent barrier. Where used on a lighting system operating at 15 volts or less, a flush deck box shall be permitted provided that an approved potting compound is used to fill the box to prevent the entrance of moisture; and the flush deck box is located not less than 4 feet (1219 mm) from the inside wall of the pool.

E4106.9.2 Other enclosures. An enclosure for a transformer, ground-fault circuit-interrupter or a similar device connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche luminaire shall be:

1. Listed and labeled for the purpose, comprised of copper, brass, suitable plastic, or other approved corrosion-resistant material;
2. Equipped with threaded entries or hubs or a nonmetallic hub;
3. Provided with an approved seal, such as duct seal at the conduit connection, that prevents circulation of air between the conduit and the enclosures;
4. Provided with electrical continuity between every connected metal conduit and the grounding terminals by means of copper, brass or other approved corrosion-resistant metal that is integral with the enclosures; and
5. Located not less than 4 inches (102 mm), measured from the inside bottom of the enclosure, above the ground level or pool deck, or not less than 8 inches (203 mm) above the maximum pool water level, whichever provides the greater elevation, and shall be located not less than 4 feet (1219 mm) from the inside wall of the pool, except where separated from the pool by a solid fence, wall or other permanent barrier.

E4106.9.3 Protection of junction boxes and enclosures. Junction boxes and enclosures mounted above the grade of the finished walkway around the pool shall not be located on the walkway unless afforded additional protection, such as by location under diving boards or adjacent to fixed structures.

E4106.9.4 Grounding terminals. Junction boxes, transformer enclosures, and ground-fault circuit-interrupter enclosures connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche luminaire shall be provided with grounding terminals in a quantity not less than the number of conduit entries plus one.

E4106.9.5 Strain relief. The termination of a flexible cord of an underwater luminaire within a junction box, transformer enclosure, ground-fault circuit-interrupter, or other enclosure shall be provided with a strain relief.

E4106.10 Underwater audio equipment. Underwater audio equipment shall be identified for the purpose.

E4106.10.1 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.

E4106.10.2 Wiring methods. Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion-resistant metal, rigid nonmetallic 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 E4106.9. 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.

E4106.10.3 Forming shell and metal screen. The forming shell and metal screen shall be of brass or other approved corrosion-resistant metal. All forming shells shall include provisions for terminating an 8 AWG copper conductor.

E4106.11 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 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.

E4106.12 Electric pool water heaters. All 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.

E4106.13 Pool area heating. The provisions of Sections E4106.13.1 through E4106.13.3 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.

E4106.13.1 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.

E4106.13.2 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.

E4106.13.3 Radiant heating cables prohibited. Radiant heating cables embedded in or below the deck shall be prohibited.

E4106.14 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, non-current-carrying metal parts of the pump shall be permitted to be used with permanently installed swimming pools. Branch circuit wiring to the pump shall comply with Section E4102.3.

SECTION E4107
STORABLE SWIMMING POOLS

E4107.1 Pumps. A cord-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.

E4107.2 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 receptacles located within 20 feet (6.0 m) of the inside walls of a storable pool 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.

E4107.3 Luminaires. Luminaires for storable pools 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 E4107.3.1 or E4107.3.2.

E4107.3.1 Fifteen (15) volts or less. 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 operates at 15 volts or less;
2. Have an impact-resistant polymeric lens, luminaire body, and transformer enclosure;
3. Have a transformer meeting the requirements of section E4106.1 with a primary rating not over 150 volts; and
4. Have no exposed metal parts.

E4107.3.2 Not over 150 volts. A lighting assembly without a transformer, and with the luminaire lamp(s) operating at 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 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 E4106.4.
5. It has no exposed metal parts.

E4107.4 Receptacle locations. Receptacles shall be not less than 10 feet (3.0 m) 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.

SECTION E4108
SPAS AND HOT TUBS

E4108.1 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.

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, luminaires, controls, sanitizer generators and wiring, shall not require that the outlet supply be protected by a ground-fault circuit interrupter.

A combination pool/hot tub or spa assembly commonly bonded need not be protected by a ground-fault circuit interrupter.

E4108.2 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 overcurrent protective devices, shall be not less than 125 percent of the total nameplate load rating.

E4108.3 Underwater audio equipment. Underwater audio equipment used with spas and hot tubs shall comply with the provisions of Section E4106.10.

E4108.4 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 (1.5 m) away from the spa or hot tub. This requirement shall not apply to single-family dwellings.

SECTION E4109
HYDROMASSAGE BATHTUBS

E4109.1 Ground-fault circuit-interrupters. Hydromassage bathtubs and their associated electrical components shall be protected in accordance with Section E4108. All 125-volt, single-phase receptacles not exceeding 30 amperes and located within 5 feet (1524 mm) measured horizontally of the inside walls of a hydromassage tub shall be protected by a ground-fault circuit interrupter(s).

E4109.2 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.

E4109.3 Accessibility. Hydromassage bathtub electrical equipment shall be accessible without damaging the building structure or building finish.

E4109.4 Bonding. All metal piping systems and all grounded metal parts in contact with the circulating water shall be bonded together using a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG.