Swimming Pools

2003 IBC, 2005 NEC and 2003 IRC

IBC and IRC

- Swimming Pool: any structure intended for swimming, recreational bathing or wading that contains water over 24 inches deep. This includes in-ground, above ground and on-ground pools; hot tubs; spas and fixed in place wading pools.

NEC

- **Pool.** Manufactured or field-constructed equipment designed to contain water on a permanent or semi permanent basis and used for swimming, wading, or other purposes.

NEC

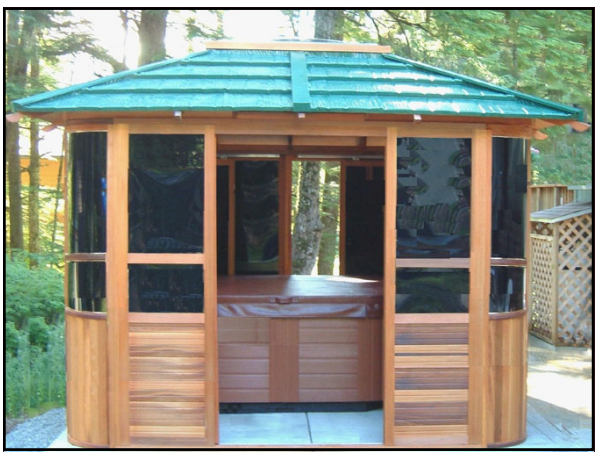
- **Permanently Installed Swimming, Wading, and Therapeutic Pools.** Those that are constructed in the ground or partially in the ground, and all others capable of holding water in a depth greater than 1.0 m (42 in.), and all pools installed inside of a building, regardless of water depth, whether or not served by electrical circuits of any nature.

NEC

- **Storable Swimming or Wading Pool.** Those that are constructed on or above the ground and are capable of holding water to a maximum depth of 1.0 m (42 in.), or a pool with nonmetallic, molded polymeric walls or inflatable fabric walls regardless of dimension.

IRC R308.4 & IBC 2406.3

- Hazardous glazing locations requiring safety glazing materials:
  - Glazing in doors and enclosures for hot tubs and whirlpools
  - Glazing in any portion of a building wall enclosing these compartments where the bottom exposed edge of the glazing is less than 60 inches above a standing surface



IRC R308.4 & IBC 2406.3

- Hazardous glazing locations requiring safety glazing materials:
  - Glazing in walls and fences enclosing swimming pools, hot tubs and spas where all of the following conditions are present:
    - The bottom edge of the glazing on the pool or spa side is less than 60 inches above a walking surface on the pool or spa side of the glazing; and
    - The glazing is within 60 inches horizontally of the water's edge of a swimming pool or spa

IRC

IBC 3109.1.1

- No person shall construct, substantially alter or reconstruct a swimming pool until the construction documents and water discharge provisions have been approved by the Department of Public Health, in accordance with the regulations adopted pursuant to section 19a-36 of the Connecticut General Statutes
  - Exception: Owner occupied detached 1, 2 or 3 family residences where the pool is intended to be used by the owner and invited guests

IRC and IMC

- **IRC M2006.1 and IMC 916.1 General:**
  - Pool and spa heaters shall be installed in accordance with the manufacturer's installation instructions.
  - Oil fired pool heaters shall be tested in accordance with UL 726.
  - Electric pool and spa heaters shall be tested in accordance UL 1261.

IRC

- **M2006.3 Temperature and pressure-limiting devices.** Pool heaters shall have temperature and pressure-relief valves.
- **M2006.4 Bypass valves.** Where an integral bypass system is not provided as a part of the pool heater, a bypass line and valve shall be installed between the inlet and outlet piping for use in adjusting the flow of water through the heater.

IRC Appendix G

- AG 101.1 Applies to pools in or on the lot of a 1 & 2 family dwelling
- Definitions:
  - Barrier: fence, wall, building wall or combination thereof which surrounds and obstructs access to the swimming pool
  - Portable spa: nonpermanent structure intended for recreational bathing, all controls, circulators and heaters are an integral part

IRC Appendix G

- AG 102 Definitions:
  - Swimming pool: Any structure intended for recreational bathing with water over 24 inches deep. Includes:
    - In ground
    - Above ground
    - On ground
    - Hot tubs
    - Spas
  - Indoor swimming Pool: totally contained within a structure and surrounded on four sides by walls of said structure
  - Outdoor swimming pool: all others

Residential and Public Swimming Pool Barriers

- AG 105.2 and IBC 3109.4.1
- Top of barrier shall be 48 inches above grade
  - Maximum clearance between grade and bottom of barrier shall be 2 inches
  - Above ground pools
    - May be pool structure itself
    - If section is added maximum clearance is 4 inches
- Openings in barrier shall not allow passage of a 4 inch diameter sphere

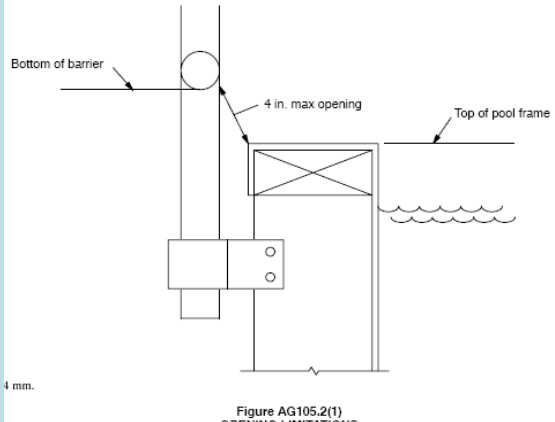
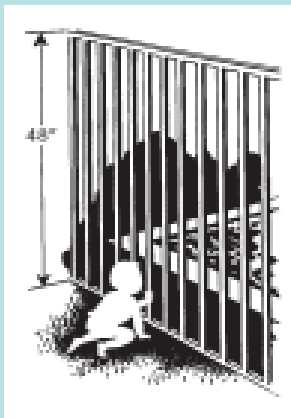
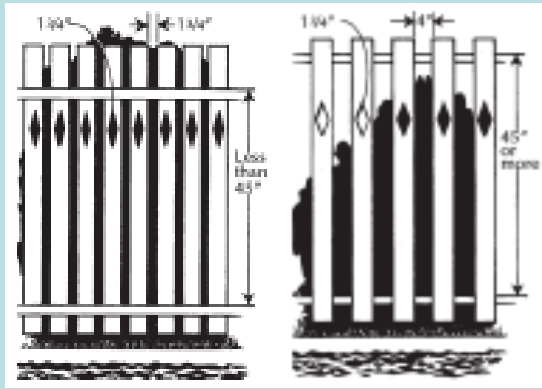


Figure AG105.2(1)
OPENING LIMITATIONS



Barriers for Outdoor Pools

- Solid barriers with no openings shall not contain indentations or protrusions
- Where barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is less than 45 inches:
  - The horizontal members shall be located on the pool side
  - Spacing between vertical members shall not exceed 1-3/4 inches
  - Decorative cutout openings shall not exceed 1-3/4 inches in width



Barriers for Outdoor Pools

- Where barrier is composed of horizontal and vertical members and the distance between the tops of horizontal members is 45 inches or more:
  - Spacing between the vertical members shall not allow the passage of a 4-inch diameter sphere
  - Decorative cutouts within vertical members shall not exceed 1-3/4 inches in width
- Maximum mesh size for chain link fences shall not exceed 2-1/4 inches square
  - Unless slats reduce openings to 1-3/4 inches

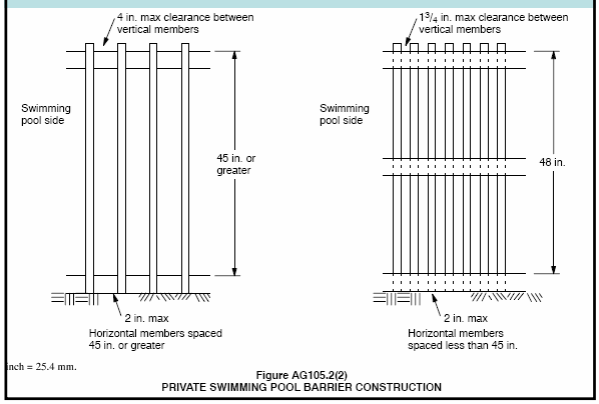


Figure AG105.2(2)
PRIVATE SWIMMING POOL BARRIER CONSTRUCTION

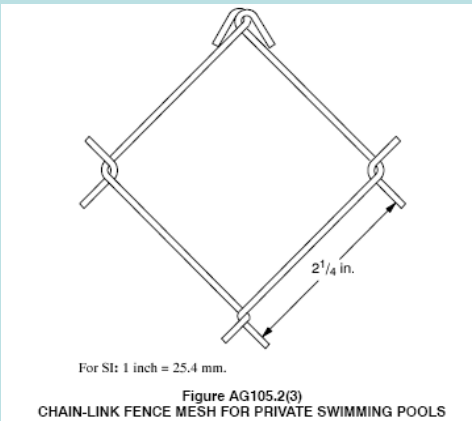


Figure AG105.2(3)
CHAIN-LINK FENCE MESH FOR PRIVATE SWIMMING POOLS

Barriers for Outdoor Pools

- Lattice fence openings shall not exceed 1-3/4 inches
- Access gates shall meet all the above requirements and:
  - Gates shall be equipped with a locking and self latching device
  - Pedestrian gates shall:
    - Open away from the pool
    - Be self closing and latching

Barriers for Outdoor Pools

- Self latching devices
  - Where the release mechanism of the device is less than 54 inches from bottom of gate:
    - Release mechanism shall be on pool side at least 3 inches below top of gate
    - Barrier shall have no opening greater than ½ inch within 18 inches of the release mechanism

Barriers for Indoor and Outdoor Pools AG 105.2 & IBC 3109.4.1.8

- Wall of a Dwelling as Part of the Barrier; One of three choices:
  1. Pool shall be equipped with a power safety cover

Barriers for Indoor and Outdoor Pools AG 105.2 & IBC 3109.4.1.8

- Wall of a Dwelling as Part of the Barrier; One of three choices:
  2. Doors with direct access to the pool:
     1. Shall be equipped with alarm:
        1. Sound for 30 second within 7 seconds of opening
        2. Capable of being heard throughout the house
        3. Automatically reset
        4. Manual means to bypass for single opening (15 sec.)
        5. Located minimum 54 inches above threshold

Barriers for Indoor and Outdoor Pools AG 105.2 & IBC 3109.4.1.8

- Wall of a Dwelling as Part of the Barrier; One of three choices:
  3. Doors shall be self closing and latching
     1. With release mechanism minimum 54 inches above threshold
     2. Swinging doors to open away from the pool

Barriers for Pools

- Above ground or on ground pools:
  - When pool structure is used as barrier and access is via ladder
    - The ladder or steps shall be surrounded by barrier that meets prior items

Barriers for Pools

- AG 105.4, IBC 3109.4.3
  - Barriers shall be located so as to prohibit permanent structures, equipment or similar objects from being used to climb the barriers
- AG 105.5 residential only
  - Spas and Hot tubs with a safety cover complying with ASTM F 1346 shall be exempt from the barrier provisions

Temporary enclosure

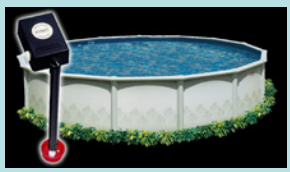
- AG 105.6, IBC 3109.6
  - A temporary enclosure shall be installed prior to the commencement of the installation of any in-ground pool, or
    - The permanent barrier is first in place
  - The temporary enclosure shall:
    - be a minimum of 4 feet in height
    - Have no openings that will allow the passage of a 4 inch sphere
    - Be equipped with a positive latching device on any openings

Pool Alarm

- AG 105.7, IBC 3109.7
  - **NO** building permit shall be issued for the construction or substantial alteration of a swimming pool at a residence occupied by, or being built for, one or more families unless a pool alarm is installed with the swimming pool
  - Pool Alarm means a device that emits a sound of at least 50 decibels when a person or an object weighing 15 pounds or more enters the water in a swimming pool
    - Hot tubs and spas are exempt from this requirement

Appendix G

- Pool Alarm is required
  - A device that emits a sound of at least 50 decibels when a person or an object weighing 15 pounds or more enters the water in a swimming pool



Entrapment avoidance

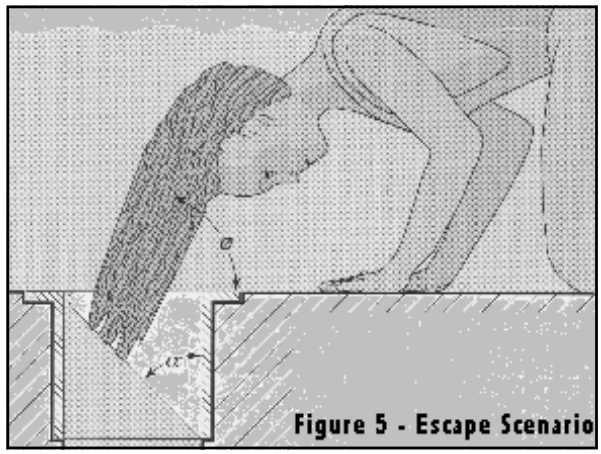
- IBC requires compliance with Section 11 of ANSI/NSPI-1 2003
- IRC spells it out.....

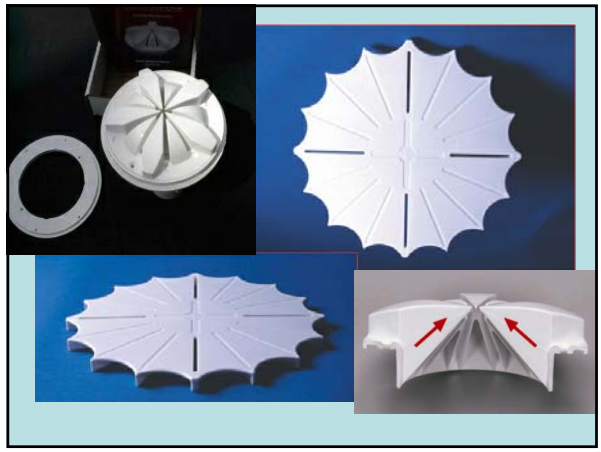
Entrapment Protection

- AG106.1, .2
  - Single outlet circulators shall be protected against user entrapment
  - All suction outlets shall be provided with
    - A cover conforming with ANSI/ASME A112.19.8M
    - Or, have a minimum 12” x 12” drain grate
    - Or, have an approved channel drain system

Entrapment Protection

- AG106.3
  - All pool and spa single or multiple systems shall be equipped with atmospheric vacuum relief should grate covers located therein become missing or broken
  - Shall be approved or engineered to:
    - ASME A112.19.17
    - Or, approved gravity drainage system





Entrapment Protection

- AG106.4
  - Single or multiple pump circulation systems shall be provided with a minimum of two suction outlets of the approved type
  - A minimum of three feet shall separate such outlets
  - These suction outlets shall be piped so that water is drawn through them simultaneously through a vacuum relief protected line to the pump(s)

Entrapment Protection

- AG106.5
  - Where provided, vacuum or pressure cleaner fitting(s) shall be located in an accessible position(s)
    - between 6 and 12 inches below the minimum operational water level
    - Or, as an attachment to the skimmers

IBC 3109.8

- Accessibility
  - Public swimming pools, when less than 50 meters in length, shall be provided with ramps or approved fixed or portable lifting equipment for the purpose of providing assisted access to the water for persons with disabilities.

IBC 3109.8

- Accessibility
  - Public swimming pools, when 50 meters or more in length, shall be provided with ramps.
  - All public swimming pools, pool decks, toilet facilities, showers, locker and dressing areas shall be accessible and located along accessible routes.

IBC 3109.8.1

- Slopes and handrails
  - 24 inches below water
    - Slope of 1:8
  - Above 24 inches
    - Slope of 1:12
  - All ramps shall have handrails on both sides per 1010.8

IBC 3109.9

- Pool Structure
  - The pool structure shall be engineered and designed to withstand the expected forces to which the pool will be subjected.

IECC 101.4.1

- Residential buildings shall use one of the following:
  - Chapter 4
    - Systems approach
  - Chapter 5
    - Performance of individual components
    - Performance of total building envelope
    - Acceptable practice for each component
    - Prescriptive specification for individual component
  - Chapter 6
    - Simplified Prescriptive Specification

IECC 504.3

- Pools with heaters:
  - Shall have an ON-OFF switch with easy access
  - Shall have a pool cover
    - Exc.: pools deriving more than 20% of the energy from renewable sources
- Time clocks shall be installed so that the pump can be set to run in off peak electrical demand periods

IRC Inclusion article

- **E3301.1 Applicability.** The provisions of Chapters 33 through 42 shall establish the general scope of the electrical system and equipment requirements of this code. Chapters 33 through 42 cover those wiring methods and materials most commonly encountered in the construction of one- and two-family dwellings and structures regulated by this code. Other wiring methods, materials and subject matter covered in the NFPA 70 are also allowed by this code.

Electrical Requirements

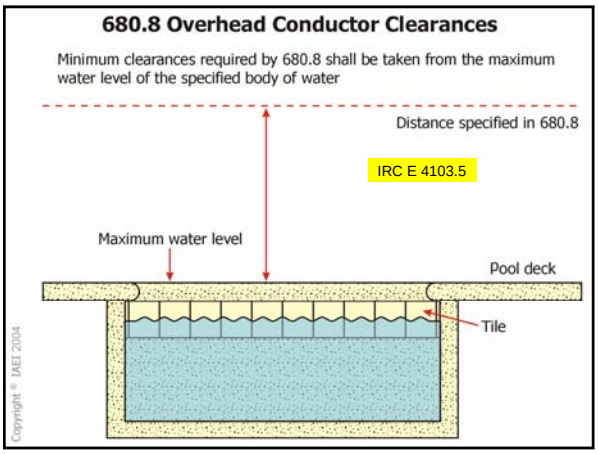
- Combined rules from the IRC and the NEC

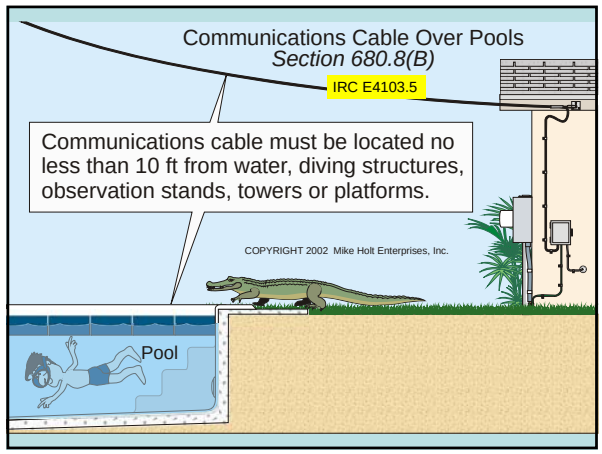
Disclaimer article

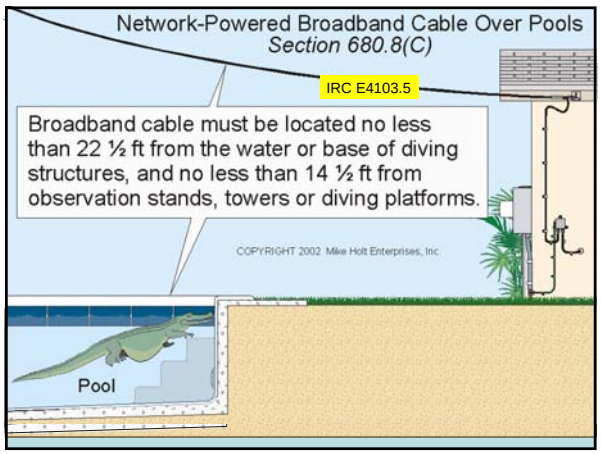
- **E3301.2 Scope.** ..... The omission from these chapters of any material or method of construction provided for in the referenced standard NFPA 70 shall not be construed as prohibiting the use of such material or method of construction. Electrical systems, equipment or components not specifically covered in these chapters shall comply with the applicable provisions of the NFPA 70.

CT Supplement

- **(Add) E3301.2.1 Alternative compliance.** Compliance with the requirements of the 2005 National Electrical Code portion of the 2005 State Building Code shall be deemed to be alternative compliance to the requirements of Chapters 33 through 42 of this code.


680.8 Overhead Conductor Clearances
Minimum clearances required by 680.8 shall be taken from the maximum water level of the specified body of water
Distance specified in 680.8
IRC E 4103.5
Maximum water level
Pool deck
Tile
Copyright © IAEI 2004


Communications Cable Over Pools
Section 680.8(B)
IRC E4103.5
Communications cable must be located no less than 10 ft from water, diving structures, observation stands, towers or platforms.
COPYRIGHT 2002 Mike Holt Enterprises, Inc.
Pool


Network-Powered Broadband Cable Over Pools
Section 680.8(C)
IRC E4103.5
Broadband cable must be located no less than 22 ½ ft from the water or base of diving structures, and no less than 14 ½ ft from observation stands, towers or diving platforms.
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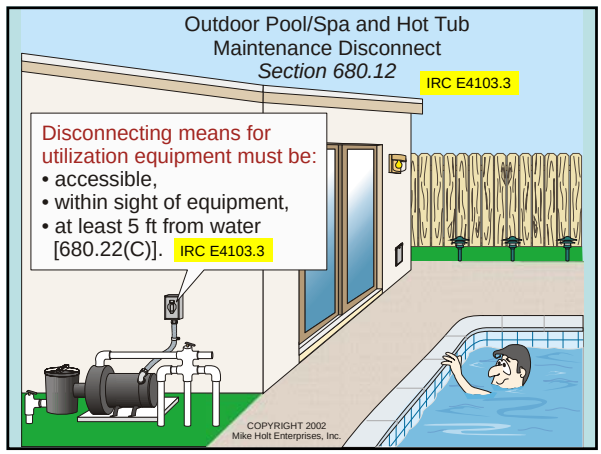
Pool


Outdoor Pool/Spa and Hot Tub
Maintenance Disconnect
Section 680.12
IRC E4103.3
Disconnecting means for utilization equipment must be:
• accessible,
• within sight of equipment,
• at least 5 ft from water [680.22(C)].
IRC E4103.3
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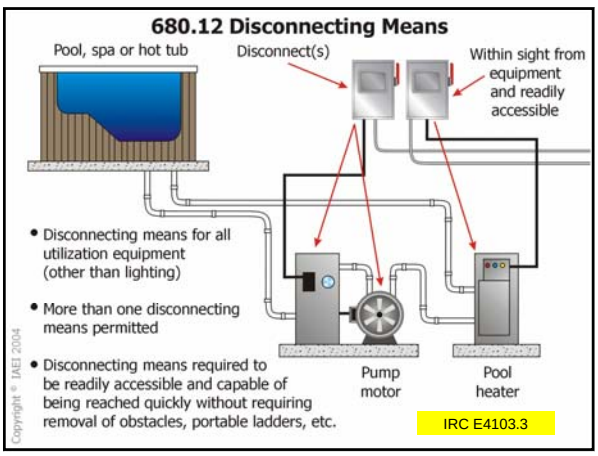
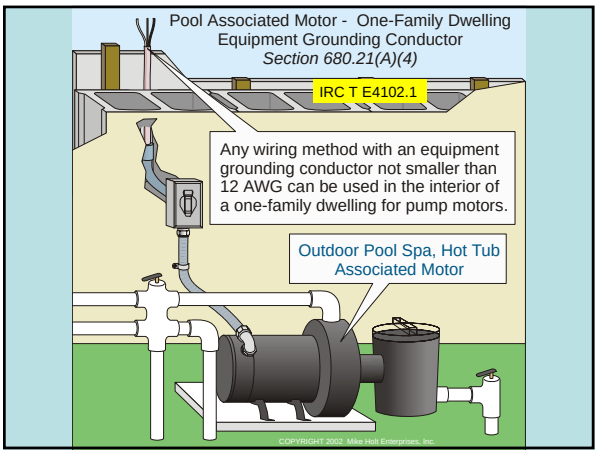
Mike Holt Enterprises, Inc.


680.12 Disconnecting Means
Pool, spa or hot tub
Disconnect(s)
Within sight from equipment and readily accessible
• Disconnecting means for all utilization equipment (other than lighting)
• More than one disconnecting means permitted
• Disconnecting means required to be readily accessible and capable of being reached quickly without requiring removal of obstacles, portable ladders, etc.
Pump motor
Pool heater
IRC E4103.3
Copyright © IAEI 2004


Pool Associated Motor - One-Family Dwelling
Equipment Grounding Conductor
Section 680.21(A)(4)
IRC T E4102.1
Any wiring method with an equipment grounding conductor not smaller than 12 AWG can be used in the interior of a one-family dwelling for pump motors.
Outdoor Pool Spa, Hot Tub Associated Motor
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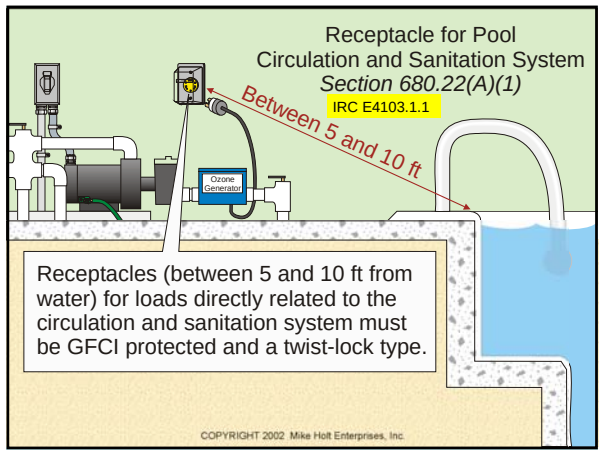
Receptacle for Pool
Circulation and Sanitation System
Section 680.22(A)(1)
IRC E4103.1.1
Between 5 and 10 ft
Ozone Generator
Receptacles (between 5 and 10 ft from water) for loads directly related to the circulation and sanitation system must be GFCI protected and a twist-lock type.
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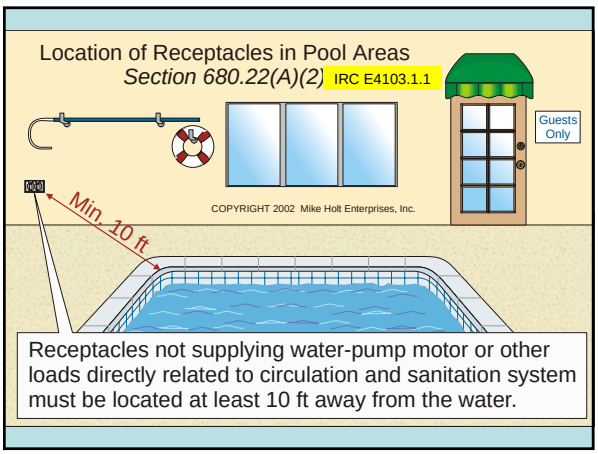
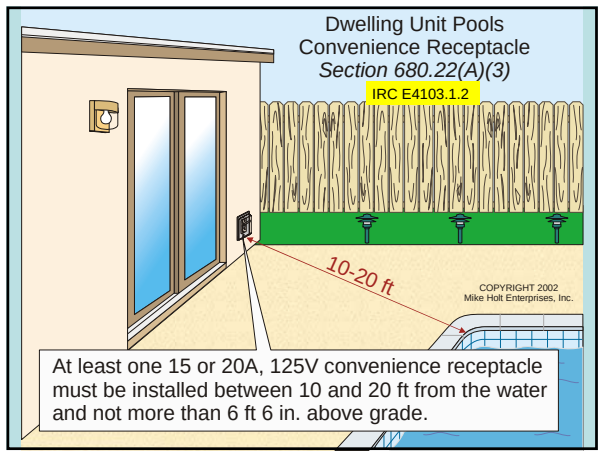
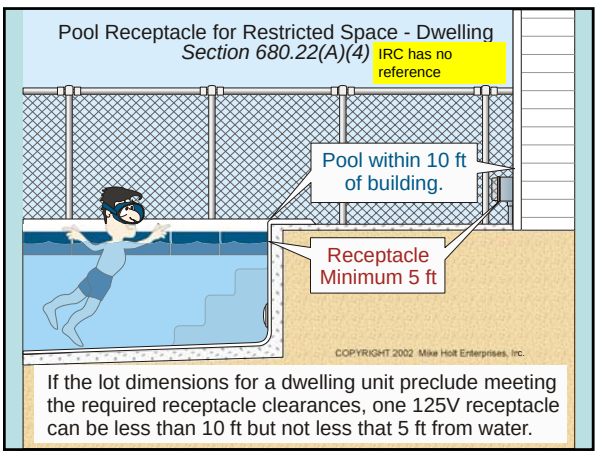
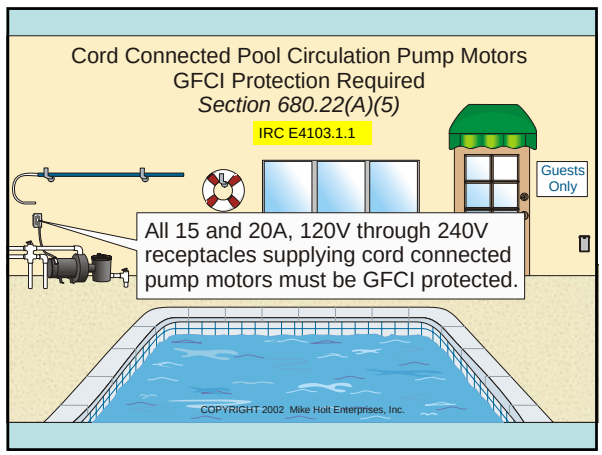

Location of Receptacles in Pool Areas
Section 680.22(A)(2)
IRC E4103.1.1
Guests Only
COPYRIGHT 2002 Mike Holt Enterprises, Inc.
Min. 10 ft
Receptacles not supplying water-pump motor or other loads directly related to circulation and sanitation system must be located at least 10 ft away from the water.


Dwelling Unit Pools
Convenience Receptacle
Section 680.22(A)(3)
IRC E4103.1.2
10-20 ft
COPYRIGHT 2002
Mike Holt Enterprises, Inc.
At least one 15 or 20A, 125V convenience receptacle must be installed between 10 and 20 ft from the water and not more than 6 ft 6 in. above grade.


Pool Receptacle for Restricted Space - Dwelling
Section 680.22(A)(4)
IRC has no reference
Pool within 10 ft of building.
Receptacle Minimum 5 ft
COPYRIGHT 2002 Mike Holt Enterprises, Inc.
If the lot dimensions for a dwelling unit preclude meeting the required receptacle clearances, one 125V receptacle can be less than 10 ft but not less that 5 ft from water.


Cord Connected Pool Circulation Pump Motors
GFCI Protection Required
Section 680.22(A)(5)
IRC E4103.1.1
Guests Only
All 15 and 20A, 120V through 240V receptacles supplying cord connected pump motors must be GFCI protected.
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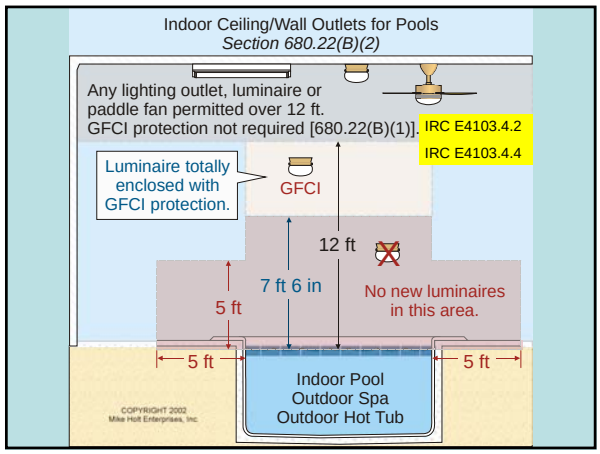
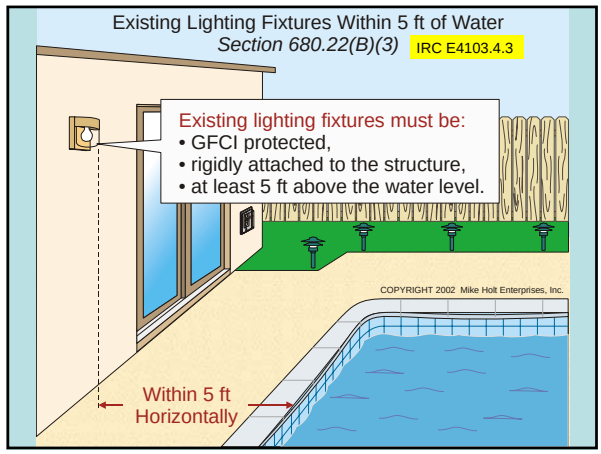
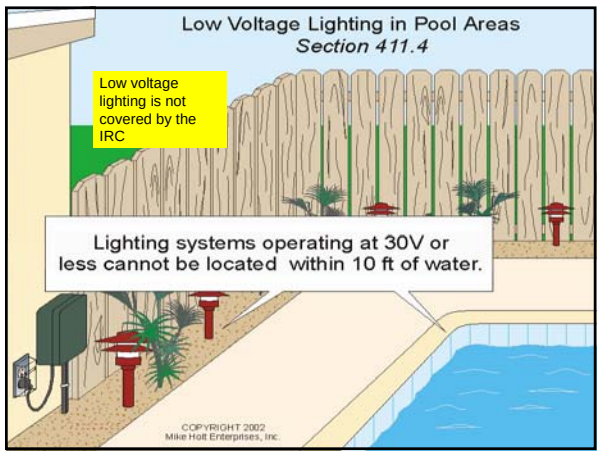
Indoor Ceiling/Wall Outlets for Pools
Section 680.22(B)(2)



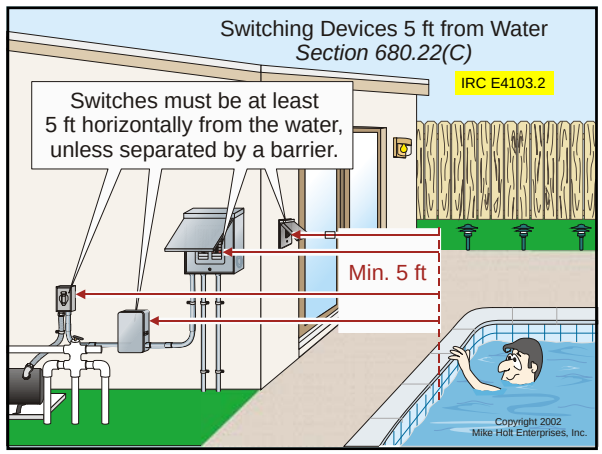
Existing Lighting Fixtures Within 5 ft of Water
Section 680.22(B)(3) IRC E4103.4.3



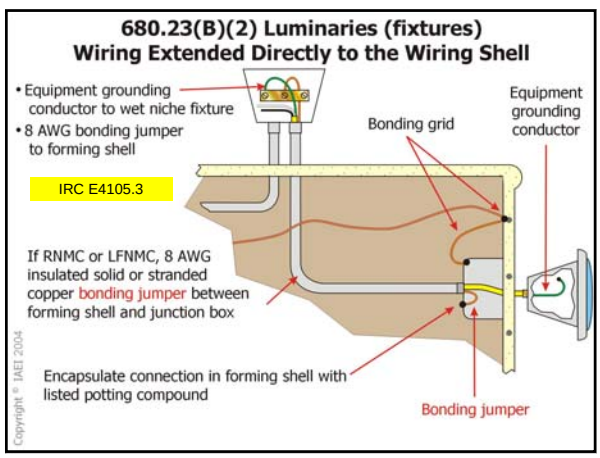
Low Voltage Lighting in Pool Areas
Section 411.4



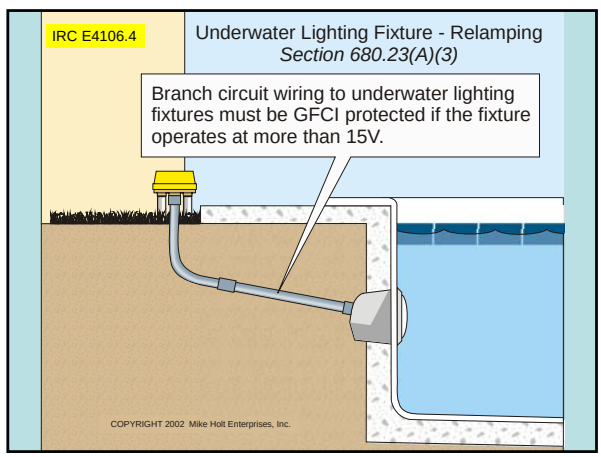
Switching Devices 5 ft from Water
Section 680.22(C) IRC E4103.2



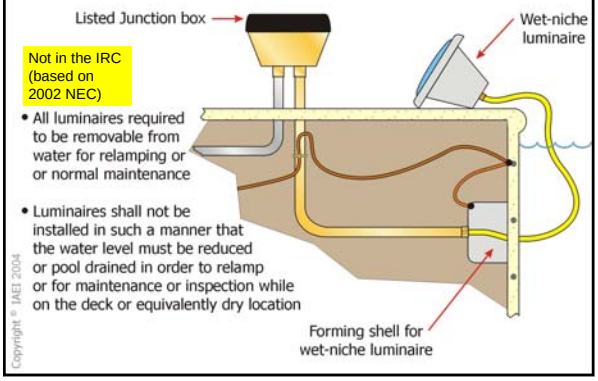
680.23(B)(2) Luminaries (fixtures) Wiring Extended Directly to the Wiring Shell



Underwater Lighting Fixture - Relamping
Section 680.23(A)(3)



680.23(B)(6) Servicing and Relamping of Wet-Niche Luminaries (fixtures)

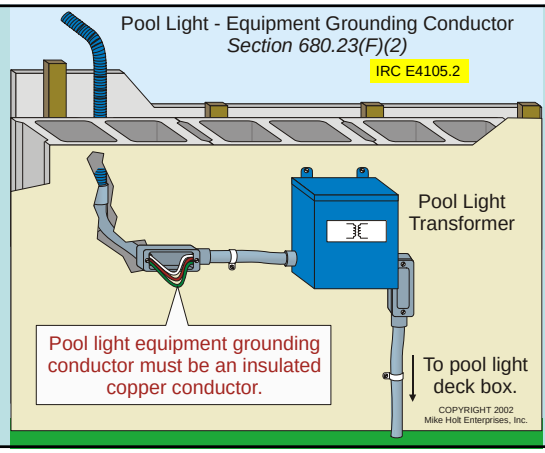


Not in the IRC (based on 2002 NEC)

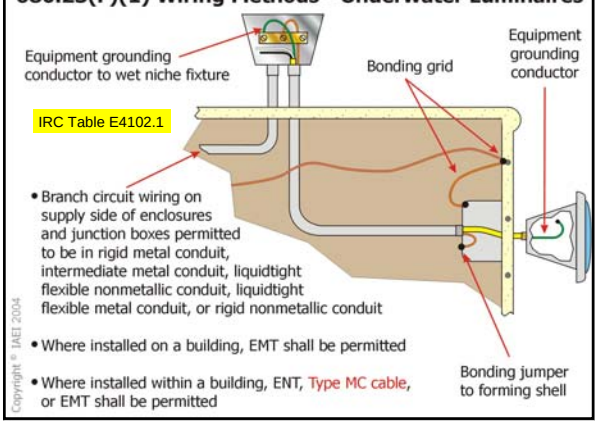
- All luminaires required to be removable from water for relamping or or normal maintenance
- Luminaires shall not be installed in such a manner that the water level must be reduced or pool drained in order to relamp or for maintenance or inspection while on the deck or equivalently dry location

Pool Light - Equipment Grounding Conductor
Section 680.23(F)(2)

IRC E4105.2



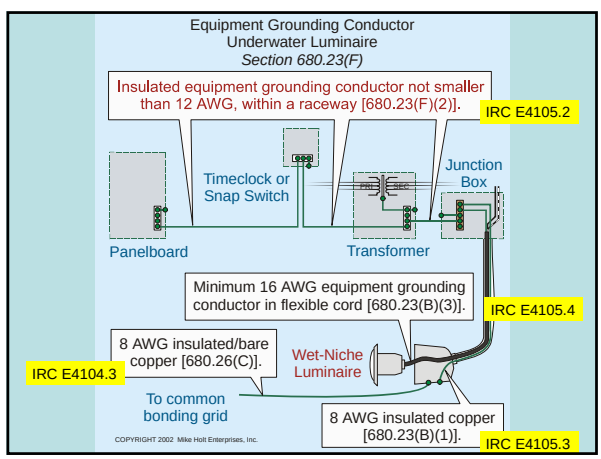
680.23(F)(1) Wiring Methods - Underwater Luminaires

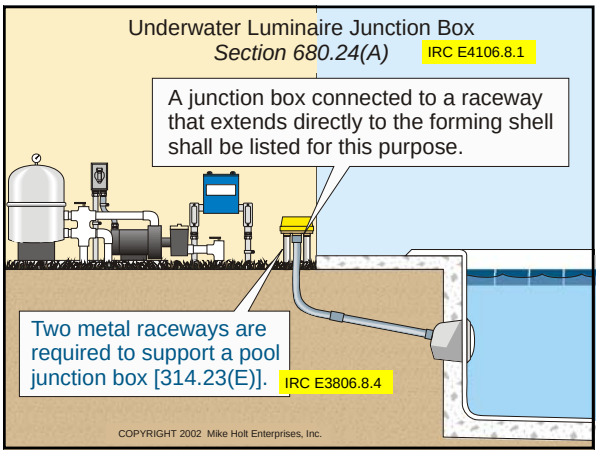


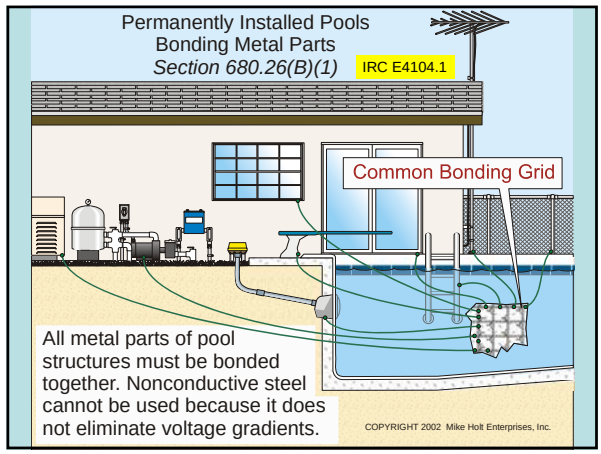
IRC Table E4102.1

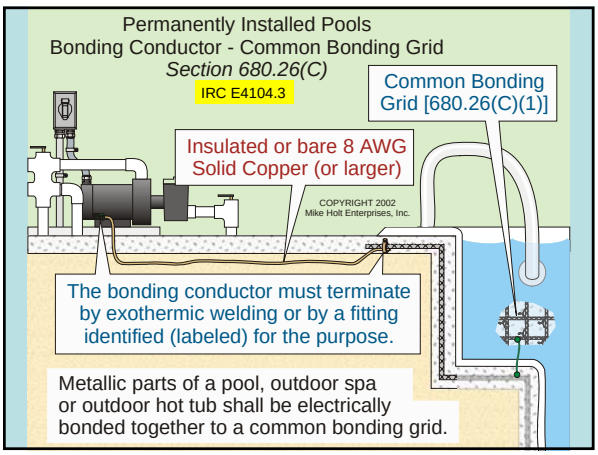
- Branch circuit wiring on supply side of enclosures and junction boxes permitted to be in rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, liquidtight flexible metal conduit, or rigid nonmetallic conduit
- Where installed on a building, EMT shall be permitted
- Where installed within a building, ENT, Type MC cable, or EMT shall be permitted

Equipment Grounding Conductor
Underwater Luminaire
Section 680.23(F)




Underwater Luminaire Junction Box
Section 680.24(A)
IRC E4106.8.1
A junction box connected to a raceway that extends directly to the forming shell shall be listed for this purpose.
Two metal raceways are required to support a pool junction box [314.23(E)].
IRC E3806.8.4
COPYRIGHT 2002 Mike Holt Enterprises, Inc.


Permanently Installed Pools
Bonding Metal Parts
Section 680.26(B)(1)
IRC E4104.1
Common Bonding Grid
All metal parts of pool structures must be bonded together. Nonconductive steel cannot be used because it does not eliminate voltage gradients.
COPYRIGHT 2002 Mike Holt Enterprises, Inc.


Permanently Installed Pools
Bonding Conductor - Common Bonding Grid
Section 680.26(C)
IRC E4104.3
Common Bonding Grid [680.26(C)(1)]
Insulated or bare 8 AWG Solid Copper (or larger)
COPYRIGHT 2002 Mike Holt Enterprises, Inc.
The bonding conductor must terminate by exothermic welding or by a fitting identified (labeled) for the purpose.
Metallic parts of a pool, outdoor spa or outdoor hot tub shall be electrically bonded together to a common bonding grid.

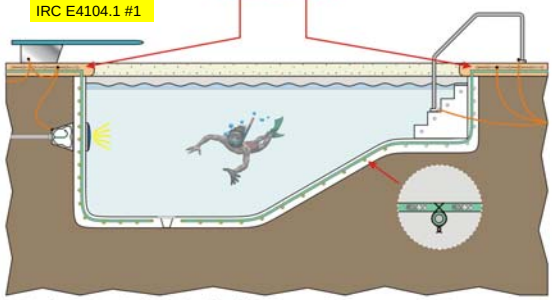

680.26 Equipotential Bonding
Not in the IRC, based on the 2002 NEC
IRC E4104.1 Bonded Parts
Copyright © IAEI 2004
The title of this section has been changed to "equipotential bonding" which helps clarify and describe the purpose of the requirements of this section


02/09/2006

680.26(B)(1) Metallic Structural Components

Where reinforcing steel for coping stones and deck is insulated by encapsulating nonconductive compound or another conductive material is not available, provisions shall be made for an alternative method of eliminating voltage gradients

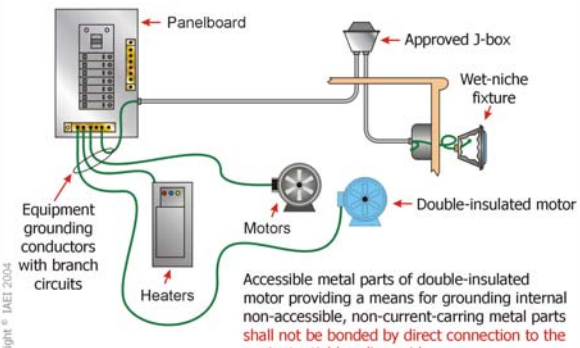
IRC E4104.1 #1



Reinforcing steel that is insulated by encapsulating nonconductive compound at the time of manufacture and installation not required to be bonded

680.26(B)(4) Electrical Equipment

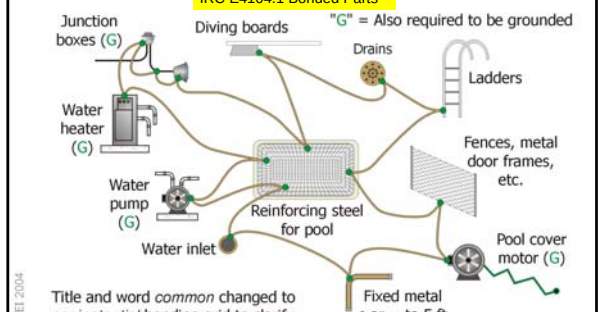
Not in the IRC, based on the 2002 NEC; IRC E4104.1 Bonded Parts



Accessible metal parts of double-insulated motor providing a means for grounding internal non-accessible, non-current-carring metal parts shall not be bonded by direct connection to the equipotential bonding grid

680.26(C) Equipotential Bonding Grid

IRC E4104.1 Bonded Parts

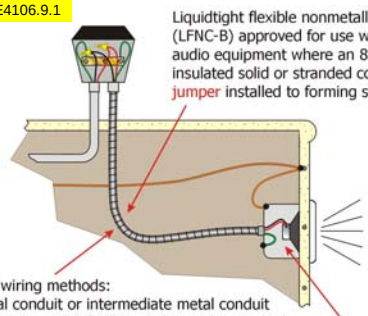


Title and word *common* changed to *equipotential* bonding grid to clarify the purpose of bonding required by this section "...to eliminate voltage gradients in the pool area as described."

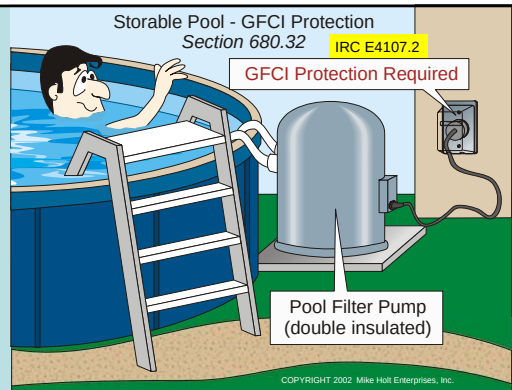

DIESEL

680.27(A)(2) Specialized Pool Equipment
Underwater Audio Equipment-Wiring Methods

IRC E4106.9.1



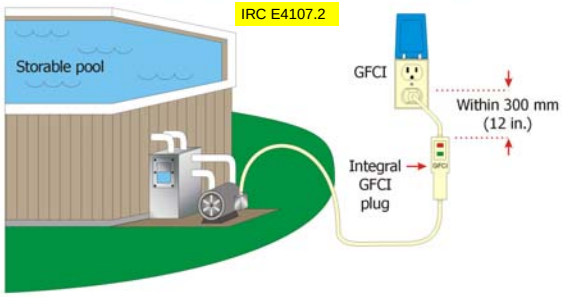
Storable Pool - GFCI Protection
Section 680.32 IRC E4107.2



All electrical equipment, including the power supply cord, used by storable pools shall be GFCI protected.

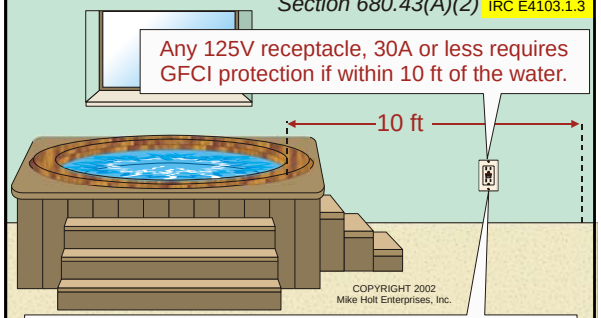
680.32 Storable Pools - GFCI Required

IRC E4107.2



- All electrical equipment, including power-supply cords require GFCI protection
- GFCI required to be integral part of attachment plug or located in supply cord within 300 mm (12 in.) of attachment plug
- All 125-volt receptacle outlets located within 6.0 m (20 ft) of storable pool require GFCI protection

Indoor Spa and Hot Tub - Receptacle
Section 680.43(A)(2) IRC E4103.1.3

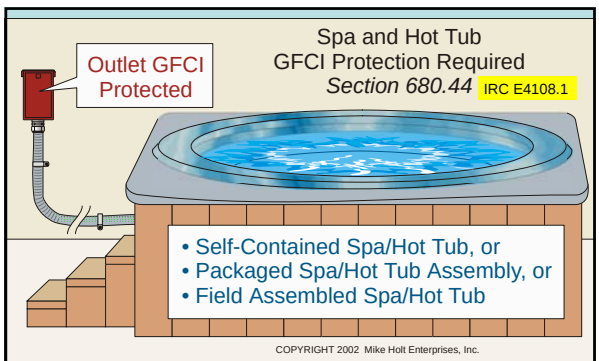


680.43(A)(1) required at least one 15 or 20A,125V receptacle located between 5 and 10 ft from the water.

Indoor Spas and Hot Tubs - Wall Switches
Section 680.43(C) IRC E4103.2

At least one 15 or 20A, 125V, GFCI protected receptacle shall be located between 5 and 10 ft from the water [680.43(A)]. IRC E4103.1.4

Spa and Hot Tub
GFCI Protection Required
Section 680.44 IRC E4108.1



The outlet(s) that supplies a self-contained spa or hot tub, a packaged spa or hot tub equipment assembly, or a field assembled spa or hot tub must be GFCI protected.

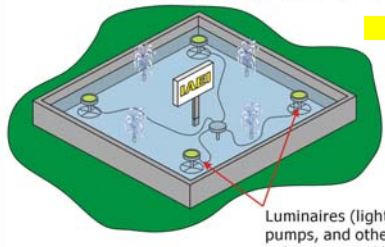
Listed Spa and Hot Tub
Integral GFCI Protection
Section 680.44(A)

IRC E4108.1

GFCI protection is not required for the outlet that supplies a spa or hot tub that has integral GFCI protection.

680.51(A) GFCI for Luminaires (light fixtures), Submersible Equipment in Fountains

No IRC reference



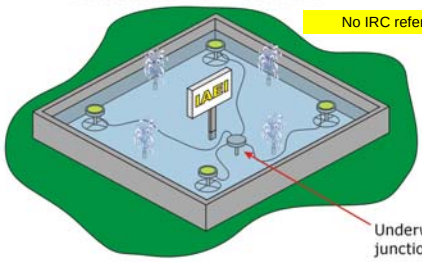
Luminaires (light fixtures), submersible pumps, and other submersible equipment to be protected by a GFCI

Note:

- GFCI not required for submersible equipment listed for operation at 15-volts or less and supplied by a transformer as per 680.26(A)(2)
- GFCI not required for all fountain-related equipment such as electric swimming pool/fountain heater

680.52(B)(2)(b) Junction Box and Other Enclosures for Fountains

No IRC reference



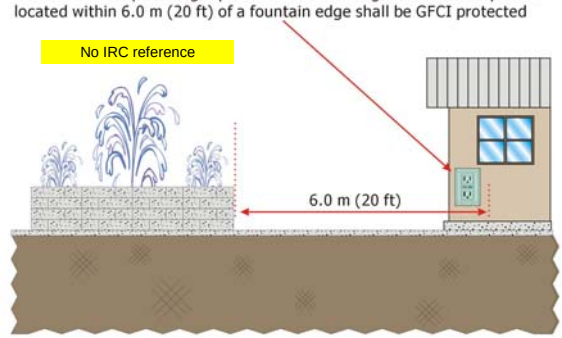
Underwater junction box

- Where underwater junction boxes are supported only by the conduit, conduit shall be of copper, brass, stainless steel, or other approved corrosion-resistant metal
- Nonmetallic conduit shall have additional supports and fasteners of copper, brass, or other approved corrosion-resistant material

680.58 GFCI Protection for Adjacent Receptacle Outlets to Fountains

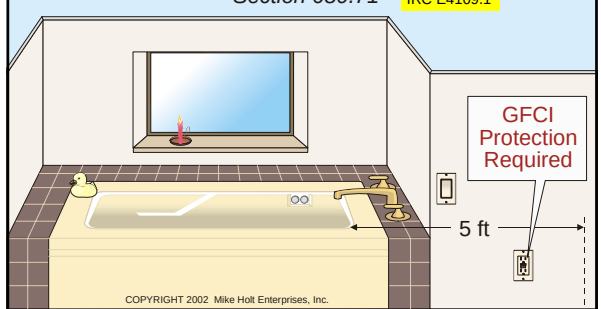
All 15- or 20-ampere single-phase 125-volt through 250-volt receptacles located within 6.0 m (20 ft) of a fountain edge shall be GFCI protected

No IRC reference

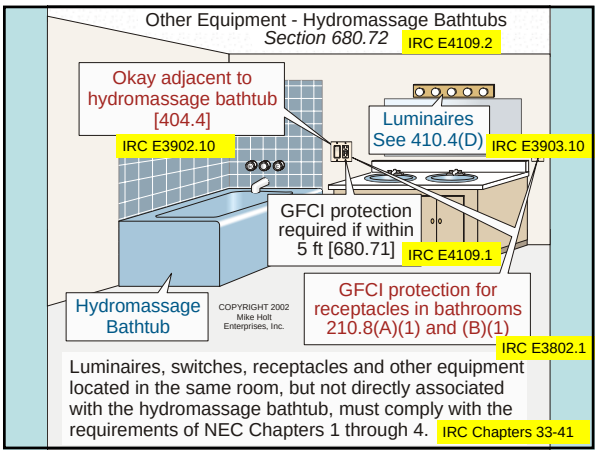


Hydromassage Bathtub - GFCI Protection
Section 680.71

IRC E4109.1



The electrical components of a hydromassage bathtub and all 125V receptacles within 5 ft must be GFCI protected.



CT Supplement NEC

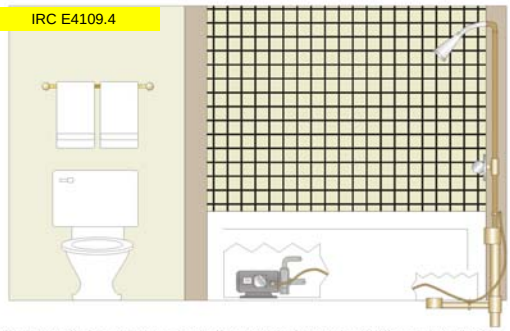
- **(Amd) 680.73 Accessibility.** Hydromassage bathtub electrical equipment shall be accessible without damaging the building structure or building finish. Ground-fault circuit-interrupter devices shall be located in a readily accessible location for testing purposes. Ground-fault circuit-interrupter devices shall not be installed within the enclosure of the hydromassage tub.

CT Supplement IRC

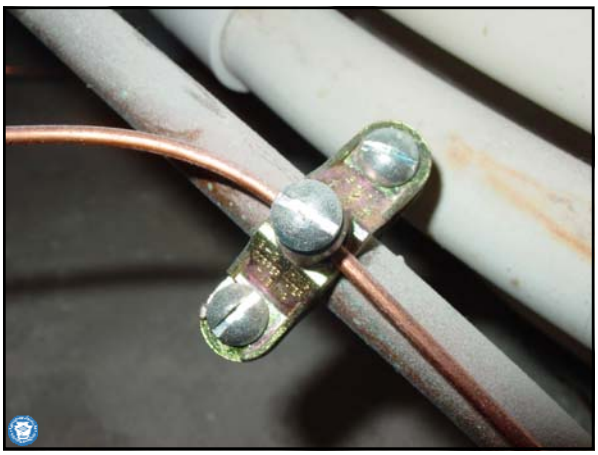
- **(Amd) E4109.3 Accessibility.** Hydromassage bathtub electrical equipment shall be accessible without damaging the building structure or building finish. Ground-fault circuit-interrupter devices shall be located in a readily accessible location for testing purposes. Ground-fault circuit-interrupter devices shall not be installed within the enclosure of the hydromassage tub.

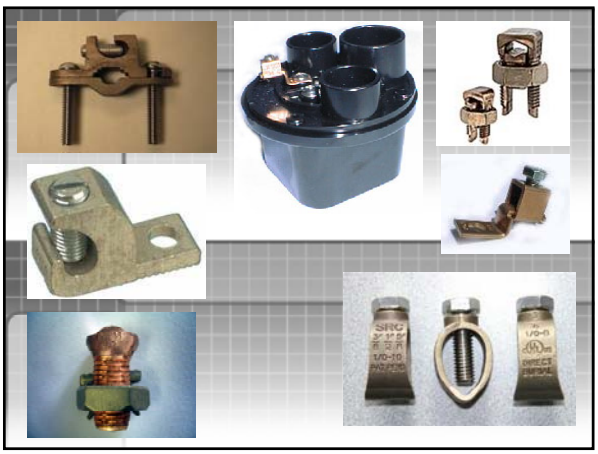
680.74 Hydromassage Bathtubs - Bonding

IRC E4109.4



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






IMPORTANT

Article 682
Natural and Artificially Made Bodies of Water

Article 682

Part I. General
Part II. Installation
Part III. Grounding and Bonding

Not included in the IRC

A new Article 682 has been added to cover natural and artificially made bodies of water which are not covered by Article 680.

This new article includes three parts.

682.1 Scope

- Applies to the installation of electrical wiring for and equipment in and adjacent to, natural and artificial bodies of water
  - Aeration ponds
  - Fish farm ponds
  - Storm retention basins
  - Treatment ponds
  - Irrigation facilities

682.2 Definitions

- Artificially made bodies of water
  - Bodies of water that have been constructed or modified to fit some decorative or commercial purpose
  - Water depths may vary seasonally or be controlled

Electrical Datum Plane for tidal areas

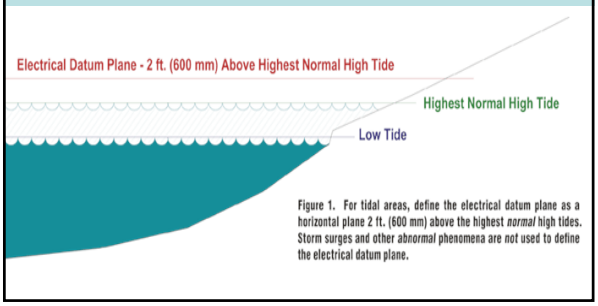


Figure 1. For tidal areas, define the electrical datum plane as a horizontal plane 2 ft. (600 mm) above the highest *normal* high tides. Storm surges and other *abnormal* phenomena are *not* used to define the electrical datum plane.

Electrical Datum Plane for areas not subject to tides

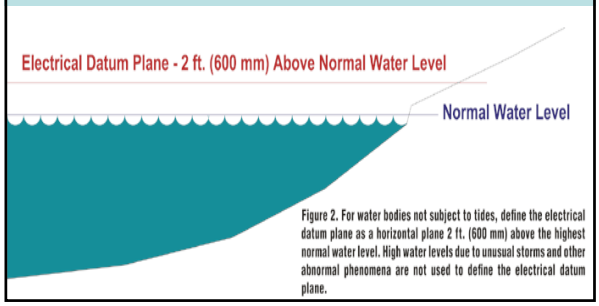


Figure 2. For water bodies not subject to tides, define the electrical datum plane as a horizontal plane 2 ft. (600 mm) above the highest normal water level. High water levels due to unusual storms and other abnormal phenomena are not used to define the electrical datum plane.

Electrical Datum Plane for flood prone areas

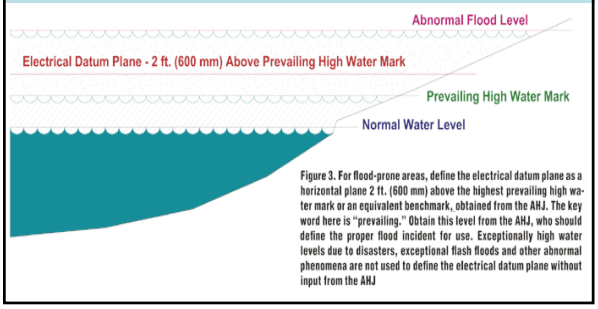
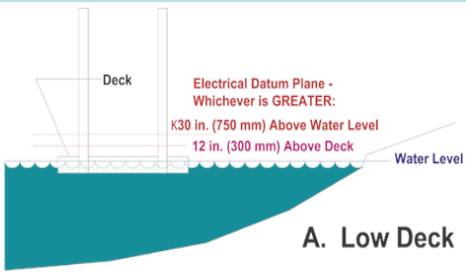


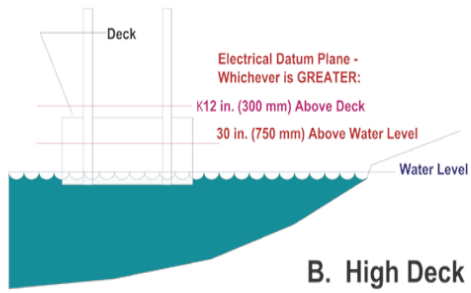
Figure 3. For flood-prone areas, define the electrical datum plane as a horizontal plane 2 ft. (600 mm) above the highest prevailing high water mark or an equivalent benchmark, obtained from the AHJ. The key word here is "prevailing." Obtain this level from the AHJ, who should define the proper flood incident for use. Exceptionally high water levels due to disasters, exceptional flash floods and other abnormal phenomena are not used to define the electrical datum plane without input from the AHJ

Figure 4. For floating structures not subject to lateral movement, define the electrical datum plane as a horizontal plane 30 inches (750 mm) above the water level and a minimum of 12 inches (300 mm) above the deck elevation. Inset A shows a structure with a low deck, close to the water surface. In this case the electrical datum plane is 30 inches (750 mm) above the water surface. Inset B shows a structure with a tall deck, over 30 inches (750 mm) above the water surface; the electrical datum plane here is 12 inches (300 mm) above the deck. NOTE: floating structures capable of lateral movement are not covered under 682. Err on the side of conservatism when addressing these latter structures.

Electrical Datum Plane for low floating structures



Electrical Datum Plane for high floating structures



Definitions

- Shoreline:
  - The farthest extent of standing water under the applicable conditions that determine the electrical datum plane for the specified body of water

Photo 1. Electrical equipment serving flood-prone areas, such as this gate protecting a low water crossing, is covered under Article 682. In cases such as this, where equipment is intended for use during extreme situations, the AHJ likely will have to use a definition of electrical datum plane that is more conservative than the one in the article.

682.10 Equipment

- No portion of an enclosure for electrical equipment not identified for operation while submerged shall be located below the electrical datum plane

682.11 Service Equipment

- On land, service equipment for floating structures and submersible electrical equipment shall be located no closer than 5 feet horizontally from the shoreline, and live parts elevated a minimum of 12 inches above the electrical datum plane
- Service equipment shall disconnect when the water level reaches the height of the established electrical datum plane

682.12 Electrical Connections

- All electrical connections not intended for operation while submerged shall be located at least 12 inches above the deck of a floating or fixed structure, but not below the electrical datum plane

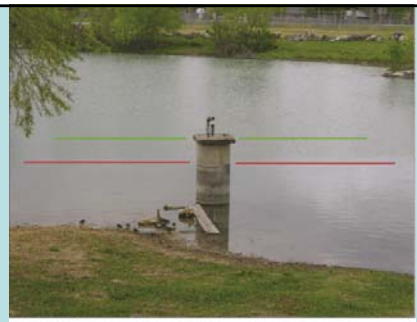


Photo 2. Regardless of the type of structure, 682.12 requires that all electrical connections not intended to be submerged must be at least 12 inches (300 mm) above the deck level (green line), and cannot be below the electrical datum plane (red line in this photo of a permanent pump structure). In the case of this near-constant level lake in an old rock quarry, the electrical datum plane can correspond to the high water mark.

682.15 GFCI Protection

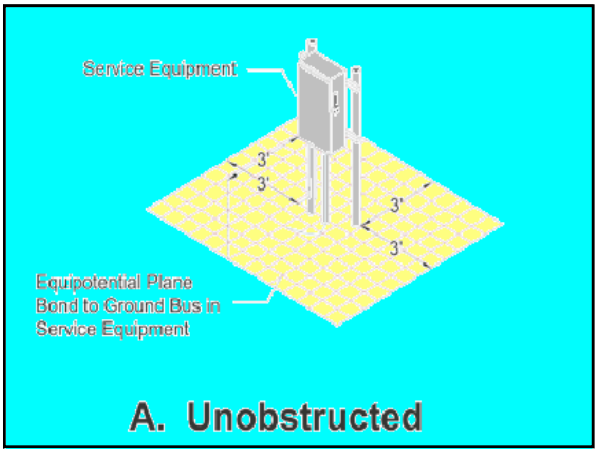
- 15 and 20 ampere, single phase, 125-250 volt receptacles require GFCI protection if used for:
  - Storage, maintenance, or repair where
  - Portable electric hand tools, electrical diagnostic equipment, or portable lighting equipment
- The GFCI device shall be located not less than 12 inches above the electrical datum plane

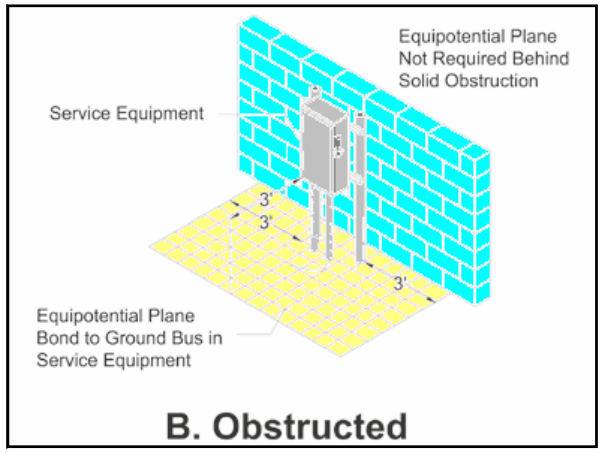
682.33 Equipotential Planes

- An equipotential Plane shall be installed to mitigate step and touch potential adjacent to:
  - all outdoor service equipment
  - Disconnecting means that control equipment in or on the water
    - That have metallic enclosures, and
    - Controls accessible to personnel, and
    - That are likely to become energized
- Shall encompass the area of the equipment and 36 inches in all directions from which a person would be able to stand and come in contact with the equipment

682.33 Equipotential Planes

- Equipotential planes are NOT required for the controlled equipment supplied by the service equipment or disconnecting means
- All circuits rated not more than 60 amperes at 120-250 volts, single phase, shall have GFCI protection





682.33 Equipotential Planes

- Equipotential planes shall be bonded to the electrical grounding system.
- The bonding conductor shall be solid copper, insulated covered or bare, not smaller than 8 AWG
- Connections shall be made by
  - Exothermic welding
  - Listed pressure connectors
  - Clamps labeled as being suitable for the purpose
    - Stainless steel, brass, copper or copper alloy

The End