

### What should I do if I think I'm being shocked while in the water?

- Move away from the source of the shock.
- Get out of the water. If possible, exit without using a metal ladder; touching a metal ladder may increase the risk of shock.

### What should I do if I think someone in the water is experiencing an electrical shock?

- Immediately turn off all power. If the power is not turned off, rescuers can also become victims.
- Call or have someone else call 9-1-1 or the local emergency number.

The American Red Cross also recommends:

- Using a fiberglass Shepherd's crook/rescue hook, extend your reach to the victim and then follow these steps:
  - Brace yourself on the pool deck;
  - Extend the Shepherd's crook/rescue hook toward the victim;
  - If the victim cannot grasp the Shepherd's crook/rescue hook, use the loop to encircle the victim's body and pull him or her, face-up, to the edge;
- Carefully remove the victim from the water;
- Position the victim on his or her back;
- Tilt the victim's head and lift the chin to open the airway;
- Check the victim for breathing and, if the victim isn't breathing, give two rescue breaths;
- Check the victim for signs of circulation (normal breathing, coughing, or movement in response to rescue breaths) and
  - If there are no signs of circulation, begin CPR;
  - If there are signs of circulation, begin rescue breathing.

### U.S. Consumer Product Safety Commission



(800) 638-2772

[www.cpsc.gov](http://www.cpsc.gov)

For more electrical safety information, check out, "Install Ground Fault Circuit Interrupter Protection for Pools, Spas, and Hot Tubs," at [www.cpsc.gov/cpscpub/pubs/5039.html](http://www.cpsc.gov/cpscpub/pubs/5039.html)

For more information about safe swimming contact:



Together, we can save a life

(202) 303-4498

[www.redcross.org](http://www.redcross.org)

# Don't Swim With SHOCKS

## Electrical Safety In and Around Pools, Hot Tubs, & Spas

[www.cpsc.gov](http://www.cpsc.gov)      [www.redcross.org](http://www.redcross.org)

U.S. Consumer Product Safety Commission

### What is the problem?

There have been 60 electrocutions and nearly 50 serious electrical shocks, involving electrical hazards in and around swimming pools, since 1990. Some of these deaths and shocks happened during attempted rescues of shock victims because the rescuer did not know about the electrical hazards. Hot tubs and spas may present the same electrical hazards as swimming pools.

### What is electrocution?

Electrocution is death by an electrical shock. Wet skin or wet surfaces (such as grass or a pool deck) can greatly increase the chance of electrocution when electricity is present.

### Where would I find electricity around pools, hot tubs, and spas?

- underwater lights
- electric pool equipment - pumps, filters, vacuum, etc.
- extension and power cords
- electrical outlets or switches
- radios, stereos, TVs and other electrical products
- overhead power lines

### How do I know if I or someone else may be receiving an electrical shock?

- Swimmers may
  - feel a tingling sensation,
  - experience muscle cramps, and/or
  - not be able to move at all and/or feel as if something is holding them in place.
- You may see
  - unsettled or panic behavior by others in the water,
  - one or more passive or motionless swimmers in the water,
  - swimmers actively moving away from a specific area or from a motionless swimmer, and/or
  - underwater lights that are not working properly (e.g. lights are on when they should not be on, lights flickering).
- The pool operator or lifeguard received earlier complaints of tingling or other odd sensations.

# Ways to Protect Yourself and Others From Shock or Electrocution

## ELECTRICAL CORDS

- Do not use an electrical cord that is damaged or repaired with tape.
- Keep electrical cords, wires, and products out of reach and at least 5 feet from the water. Examples include temporary or permanent wires (e.g. telephone, television), light strings, rope lights, and extension or power cords.
- Use portable Ground Fault Circuit Interrupters (GFCIs) where permanently installed GFCI-protected outlets are not available.
- If an electrical product falls into the water, unplug it before touching it. DO NOT reach into the water until it is unplugged. Even submersible pumps, which are designed to operate under water, may not be safe to use when a person is in the water.

- Have a fiberglass Shepherd's crook/rescue hook for rescue nearby.

- Label power switches for pool, hot tub, and spa equipment and lighting.

- Use battery-operated products, whenever possible.

- Post an emergency plan within clear view of those using the pool.

- Have a licensed electrician who is qualified in pool, hot tub, and spa repairs, inspect and upgrade your pool, hot tub or spa, in accordance with applicable local codes and the National Electrical Code (NEC).

## IN GENERAL

- Know where all the electrical switches and circuit breakers for pool, hot tub and spa equipment and lights are located and how to turn them off in an emergency.
- Know where emergency equipment, including a Shepherd's crook/rescue hook, is stored.
- Learn CPR and rescue breathing procedures.

## OVERHEAD POWER LINES

- Do not set up a storable pool or install a permanent pool where power lines are overhead or within 25 feet of the water.
- While cleaning the pool, keep long-handled tools and poles away from nearby utility power lines, including the ones leading to your home. Hold long-handled tools and poles as low as possible to the ground.

## ATTIRE

- Always have dry hands and feet, and wear dry rubber-soled shoes while using electrical products.
- Avoid touching electrical products or wires when you are wet or in contact with wet surfaces.

5 FEET MINIMUM

## UNDERWATER LIGHTS

- Signs of mold or other growth on the inside of the lens can indicate water leakage.
- Have an electrician inspect the underwater lights and make certain that junction boxes and wiring connections to the lighting are correctly and safely installed.
- Be certain that the power switch and GFCI for underwater lights are clearly marked and easy to get to in case of an emergency.

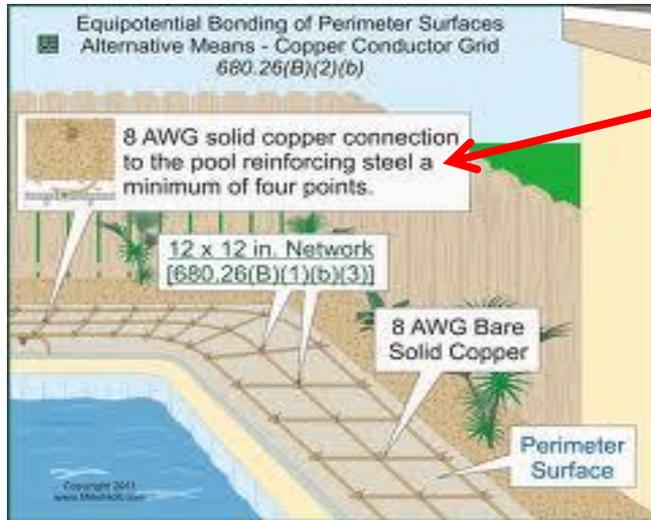
## GFCIs

Ground Fault Circuit Interrupters (GFCIs) are the best protection against electrocution.

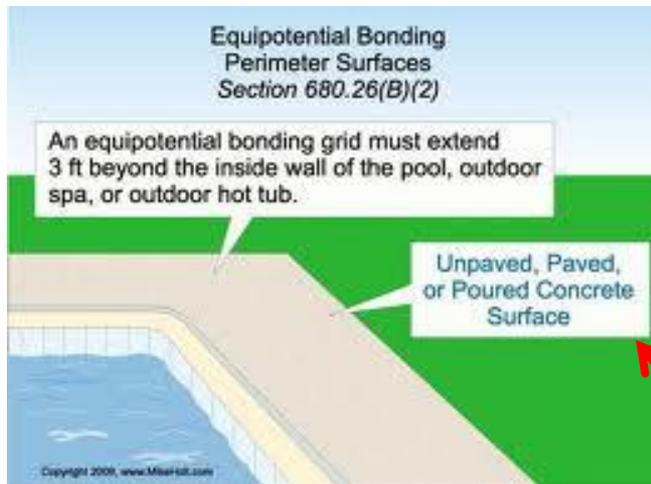
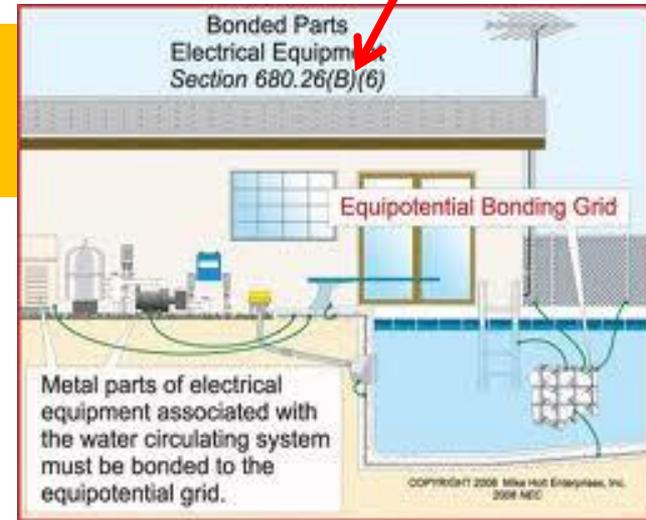
- Make sure that GFCIs are installed:
  - On underwater lighting circuits operating at more than 15 volts;
  - On electrical equipment used with pools, hot tubs, and spas, including 120-volt and 240-volt heaters close to the pool;
  - On all outdoor receptacles, and receptacles within 20 feet of the water's edge, to protect people from injury.
- Test permanently installed GFCIs at least monthly to assure continued protection. Infrequently used and portable or cord-connected GFCIs should be tested before each day's use.

# IRC Chapter 42 – Equipotential Bonding

2008 NEC SECTION



For nonconductive pool shells, bonding at four points shall not be required.



Where structural reinforcing steel is not available or is encapsulated in a nonconductive compound, see next slide for alternative.

# Equipotential Bonding Alternate Means

2.2. Alternate Means. Where structural reinforcing steel is not available or is encapsulated in a nonconductive compound, a copper conductor shall be used in accordance with Items 2.2.1 through 2.2.5:

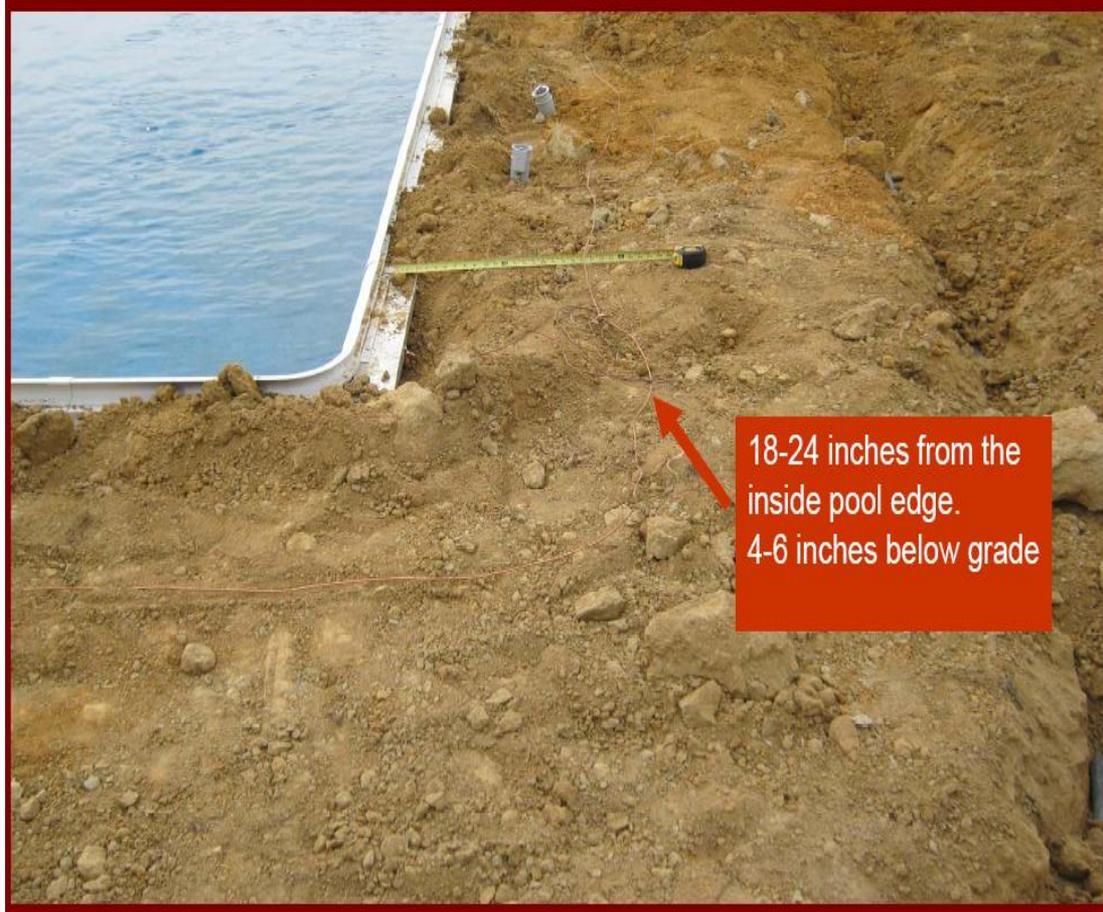
2.2.1. At least one minimum 8 AWG bare solid copper conductor shall be provided.

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

2.2.3. Splices shall be listed.

2.2.4. The required conductor shall be 18 to 24 inches from the inside walls of the pool.

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



# E4204.3 Water Bonding

E4204.3 Pool water. The pool water shall be intentionally bonded by means of a conductive surface area not less than 9 square inches installed in contact with the pool water. This bond shall be permitted to consist of parts that are required to be bonded in Section E4204.2.

What if none of the parts of E4204.2 exist? The pool is fiberglass, all pump parts are plastic, all ladders are plastic, etc..



[Waterbonder.com](http://Waterbonder.com)

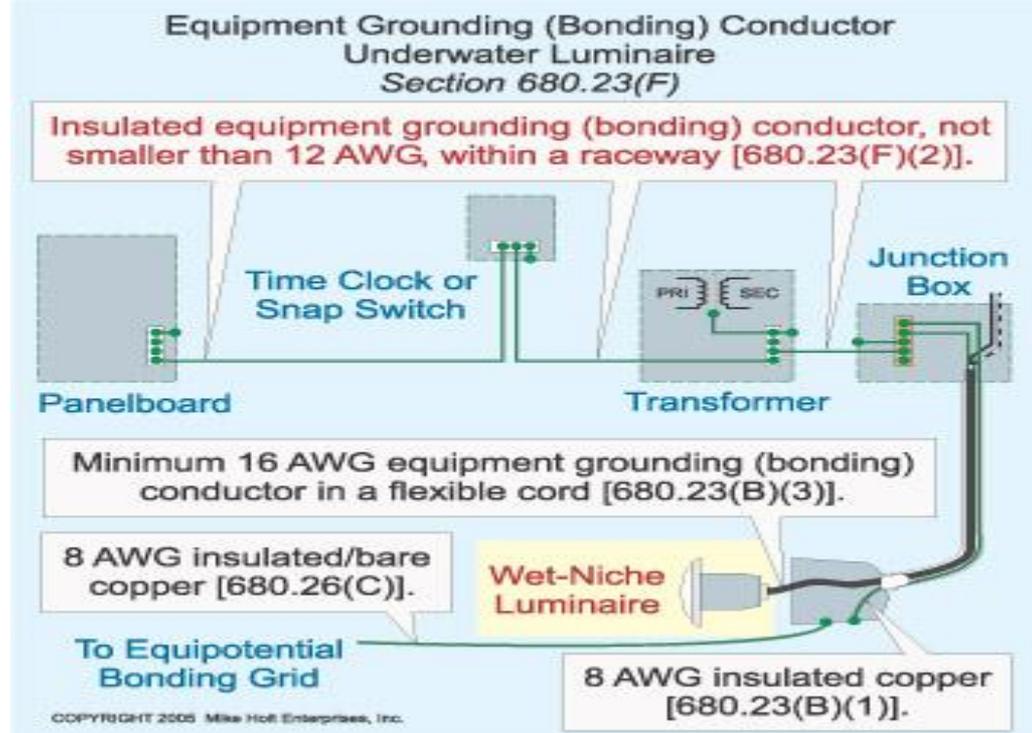
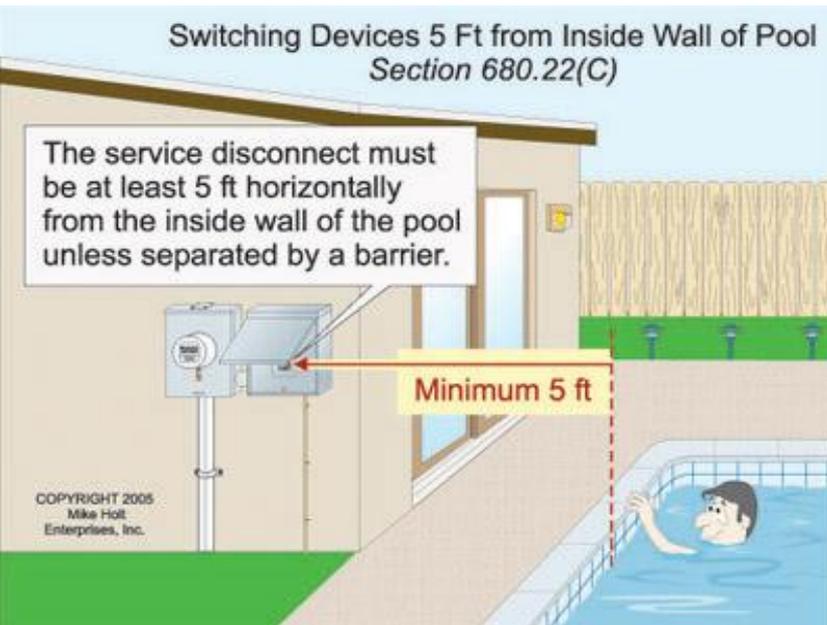
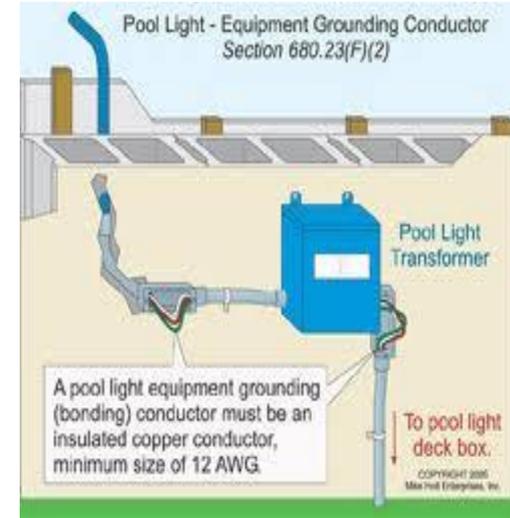
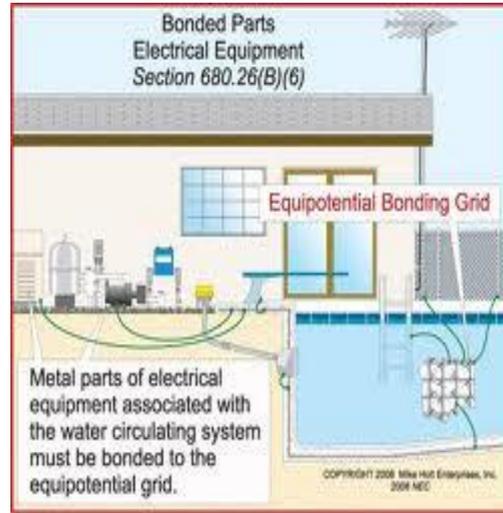


[Bondsaf680.com](http://Bondsaf680.com)

# IRC E4205 Grounding

E4205.1 Equipment to be grounded. The following equipment shall be grounded:

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



# 2009 IECC Section 504.7.1 Pool Heaters



504.7.1 Pool heaters. All pool heaters shall be equipped with a readily *accessible* on-off switch to allow shutting off the heater without adjusting the thermostat setting. Pool heaters fired by natural gas or LPG shall not have continuously burning pilot lights.

504.7.2 Time switches. Time switches that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed on swimming pool heaters and pumps.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Where pumps are required to operate solar- and waste-heat-recovery pool heating systems.

# 2009 IECC Section 504.7.3 Pool Covers

504.7.3 Pool covers. Heated pools shall be equipped with a vapor retardant pool cover on or at the water surface. Pools heated to more than 90°F (32°C) shall have a pool cover with a minimum insulation value of R-12. Exception: Pools deriving over 60 percent of the energy for heating from site-recovered energy or solar energy source.

