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Don't Court Disaster: Use Electrical Equipment Safely

by Alison Osinski, Ph.D.

Concern has been expressed about the proliferation of boom boxes, radios, CD players, electrical speakers, telephones, portable pool vacuums, metal extension poles, and pace clocks being used at pool side during instructional and water fitness classes. It's true that electricity and pool water do not mix well. The danger of electrocution and/or fire are always present in a wet area environment.

According to the U.S. Consumer Product Commission, approximately 600 Americans are electrocuted yearly in non work related accidents. In an average year, 20 people in the U.S. are electrocuted in their pools and bathtubs. In more than half of the fatal accidents which occurred while the victim was submersed in water, the source of the electrical current involved hair dryers, lamps, TVs, radios and fans falling into the water.

Aquatic professionals, including water fitness instructors should use extreme caution when using electrical appliances, equipment or tools in the vicinity of a swimming pool. Pools can be high voltage death traps if they are not properly wired, bonded and grounded, or if cord powered electrical appliances are used in an inappropriate or unapproved manner at pool side.

Don't take chances with electricity and water. Keep electrical devices away from the pool, unless the equipment is approved for pool side use. Approved equipment will have a third party (Underwriters Laboratories, NSF International, etc.) certification sticker affixed to the outside of the device, and will be double insulated or designed with other precautionary protective devices to prevent electrical shock.

The National Electrical Code (NEC) is published by the National Fire Protection Association, and is revised on a regular schedule. The 1993 revision has just been released and is now available for reference. The original NEC was developed in 1897 by insurance, electrical, architectural and related interests. The purpose of the NEC is the "practical safeguarding of persons and property from hazards arising from the use of electricity." The Code is designed to be suitable for application by regulatory or governmental authorities and insurance inspectors who have enforcement responsibilities. Article 680 entitled "Swimming Pools, Fountains, and Similar Installations" pertains specifically to aquatic facilities.

Lights, transformers, outlets, junction boxes, connections for timing and sound systems and all other electrical fixtures in and around a pool must be installed in compliance with the National Electrical Code, Article 680; or to more strict state or local codes. The NEC specifies that all receptacles must be 10 or more feet from the pool walls, and that all receptacles within 20 feet of the pool must be protected by ground fault circuit interrupters (GFCI). All electrical equipment with power supply cords must be protected by GFCIs. GFCIs will interrupt the flow of electricity if the cord is accidently cut or frayed. Flexible cords must not exceed 3 feet in length, have a grounding type attachment plug, and if immersed or exposed to water, must be "Type SO" or Type ST" and marked "water-resistant." Regular household uninsulated extension cords should not be used on a pool deck. Extension cords, even when plugged into a GFCI, should not be used to bring the appliance closer than 10 feet to the pool water. Only insulated and grounded cords should be used. The ends of the flexible cords and the ground connection within the equipment should be covered or encapsulated in a potting compound to prevent the entry of water into the equipment through the cord or its conductors.

Ground fault circuit interrupters should be installed on all electrical outlets in the pool area, in the pump room, locker rooms and other wet areas of the facility. A GFCI breaker installed in a central service panel which protects all the outlets on the circuit, or a multi-outlet strip that plugs into a 3-hole receptacle and protects equipment or appliances plugged into it, may also be utilized.

GFCIs guard against potential shock by interrupting electrical current before elec-

Continued on page 14

INDEX

Don't Court Disaster

Continued from page 1

trocution results. A GFCI monitors the flow of current through hot and neutral wires in an electrical circuit. A GFCI can detect an imbalance as small as 0.005 amperes (5 milliamps) and will cut power to interrupt the flow of electricity to the GFCI protected receptacle within a fraction of a second to prevent shock. *GFCIs are not fool proof. Even 5 milliamps of stray current with no resistance could produce a jolt, and cause a patron to fall, or a pacemaker to malfunction.*

The two buttons on a GFCI receptacle (test button and reset button) should be tested on a weekly basis. To make sure the GFCI is operating properly, press the button marked "test." The GFCI will simulate a current leak and the reset button will pop out. To reset, press the "reset" button.

All metal parts comprising the pool, including reinforcing bar, ladders, slides, diving boards, starting platforms, filters, pumps, motors, heaters, lifeguard chairs, rails, and lights must be bonded together and grounded. The point of bonding is to provide a second layer of protection, and to ground all interconnected metal equipment through one master bond wire, eliminating shock hazard from stray currents, voltage gradients or faulty equipment circuits.

Improperly installed heaters and underwater lighting fixtures are the primary potential for electrocution in the pool area. The danger of electrocution is greatest in pools built before 1974. Older pools may not have adequate GFCI protection, particularly on underwater wet niche lights installed before that time. Ground wires and ground connections may have corroded away, or deteriorated from exposure to chemicals and moisture.

Don't permit electricity to flow through you on its way to the ground. A current passing through a body may burn tissue and disrupt electrical heart signals causing ventricular fibrillation. One-third ampere can kill.Do not allow extension poles used for rescue or maintenance purposes to come in contact with electric utility company power lines, or any electrical equipment in the vicinity of the pool. Remove jewelry, including metal bracelets, rings or earrings that could accidently come into contact with live wires or metal ground wires, and could cause electricity to pass through your body on its way to ground. Leaking current from electrical appliances can travel the path of least resistance through wet or sweaty bodies to metal. Symptoms of electrical current leakage include a tingling sensation and shock. Being wet increases your likelihood of shock. Dry off before touching any electrical equipment or appliances in the pool area. Wear rubber soled shoes to help reduce the possibility of electrical shock. Leather shoes hold moisture, and should not be worn while working at the pool.

According to the electricians at the National Fire Protection Association, aquatic professionals can best insure their safety when using electrical equipment in proximity to a pool by making sure all electrical equipment in and around the pool is installed in compliance with the NEC, Article 680; using battery operated equipment whenever possible; and by only using electrical appliances which have been U.L. or NSF approved for use in aquatic environments.

For more information on electrical safety, or to order a copy of the National Electrical Code, contact: National Fire Protection Association, Electrical Department, Batterymarch Park, Quincy, MA 02269, (617) 770-3000, Ext. 7445.

Continued on page 15

Electrical Safety Tips

- Don't place an appliance or piece of electrical equipment where it could fall or be pulled into the water.
- Don't reach for an appliance that has fallen into the water without first unplugging it from the power source.
- Don't use the telephone while soaking in the pool or spa.
- Don't unplug appliances by yanking on the cord.
- Don't force a plug to make it fit into an outlet.
- Don't plug a 3 prong cord into a 2 prong outlet.
- Replace worn or exposed electrical wires.
- Don't use indoor electrical appliances outdoors.
- Unplug appliances when they are not in use.
- When you are wet, don't touch an appliance with one hand, while touching something metal with another hand (for example: turning up the volume on the boom box while holding onto a pool ladder).
- Don't turn on wet niche lights when they are not submersed in water - they will heat up, explode under pressure and spray glass with force.
- Read and follow the manufacturer's directions before operating, or attempting to repair, any mechanical or electrical equipment.
- Turn off the power, disconnect the power supply, and lock the panel box with a padlock before working on any electrical equipment in the pool area.
- Call a qualified and licensed electrician to perform major electrical repairs on pool equipment. Don't attempt to make the repairs yourself, and don't allow an unqualified pool serviceman do electrical work.

Don't Court Disaster

Continued from page 14

The NEC can be purchased for $32.50 (softcover) or $38.59 (hardcover). A reprint of NEC Article 680 can be purchased for 50¢ per page plus shipping and handling. Article 680 is approximately 18 pages in length.

Interviewed: Mark Ode, Senior Electrical Speciality, Electrical Department, NFPA.

Alison Osinski is currently in private practice as an aquatic consultant. Her firm, Aquatic Consulting Services, located in San Diego, California has as clients: social service agencies, health and fitness organizations, therapeutic facilities, aquatic equipment manufacturers, attorneys, architectural firms, and municipal park and recreation and safety management departments. Dr. Osinski's specializations within the field of aquatics include: aquatic risk management; aquatic facility design and renovation; swimming pool chemistry, maintenance and operation; and aquatic training program development.

For more information on electrical safety around swimming pools, or on any pool operation or maintenance issue, Dr. Osinski can be reached at the "Swimming Pool Hotline," (900) 446-6075, 8:00 am - 8:00 pm (Pacific Time Zone). Callers will be billed $2.95 per minute. Charges will appear on the caller's next phone bill. ■