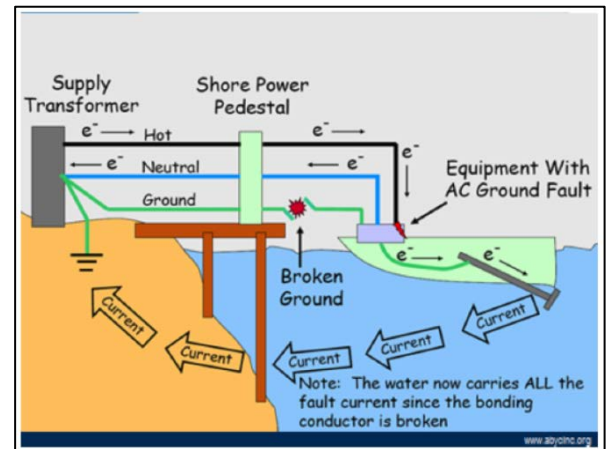


Understanding Electric Shock Drowning

By Gowrie Group: Whitney Peterson & Kellie Crete

Warning, electricity can be a hidden, invisible danger in our waters around docks and marinas. Boaters, sailors, swimmers, marine professionals, sailing organizations and other individuals and companies that operate or play near or in the water, need to understand the risk factors for Electric Shock Drowning (ESD).

What exactly is Electric Shock Drowning? ESD is caused by alternating current (AC) flowing through water encountering a human body. The current tries to pass through the body and causes skeletal muscular paralysis, which ultimately results in a drowning. The electricity tends to enter the water from an electric fault from a nearby dock or marina's wiring, or from a boat that is connected to a power supply. Often, the electric fault occurring from the boat is intermittent and only leaks current into the water when a switch is flipped and/or an electrical device cycles on.



Common waterfront scenarios which expose individuals to a risk of Electric Shock Drowning (ESD).

- A diver cleaning a boat's bottom before a weekend race
- A powerboat owner swimming to inspect a new propeller while tied to the dock
- A marina employee falling off a dock
- Someone climbing out of the water onto a boat using a boat ladder or a swim platform
- Kids jumping off a marina dock and using the marina's emergency escape ladders to get out
- An extension cord draped across a lake dock to charge a ski boat's battery

Why have I never heard of this? Many people, even marine industry experts, have never heard of ESD. Given that prior to 2000 very few docks were powered, ESD is a relatively new problem. However, with lights, electric boat-lifts, and shore-power connections becoming more commonplace on public and private docks – and at nearly every marina, boatyard, and yacht club – the risk of ESD continues to increase each year. The Electric Shock Drowning Prevention Association reported that of a random sampling of shore power cords in several fresh water marinas in the US, approximately 13% of the boats tested were leaking potentially lethal amounts of electrical (AC) current into the water.

Fresh vs. Salt Water. While the risk of ESD is higher in fresh water (lakes, ponds, rivers), ESD can also occur in salt water and brackish environments. Why is there a difference? Salt water naturally has a high conductivity and low resistance, so leaking current in water tends to go around a human body to stay in the low resistant salt water. In fresh water, which has low conductivity and high resistance, the electrical fault or current seeks a path of lower resistance to get back to its source – and a human body can serve as this low resistance path. Fresh water is nearly 70x more resistive than salt water.

Tiny Amounts can be Deadly. Minute amounts of leaking alternating current can kill. As little as 10 milliamps (1/50th the current used by a 60 watt light bulb) can cause paralysis/drowning. Sixty (60) milliamps in the body can cause heart failure.

Faulty Wiring. Many times, it is later discovered that the leaking current in an ESD fatality resulted from faulty wiring done by an amateur, which did not meet marine code. The marine codes are NFPA 303 (Fire Protection Standard for Marinas and Boatyards), NFPA 70, and National Electric Code 555 (NEC). The 2017 NEC requires that marinas and boatyards have ground-fault protection to help prevent water electrifications. Often boats not wired in accordance with standards set forth by the American Boat & Yacht Council (ABYC) can be a source of AC leakage. Ed Sherman, a certified master technician and Vice President and Education director at the ABYC, shared with Gowrie Group his recommendations related to marine wiring and reducing ESD risk:

“One of the most common sources of AC ground faults on boats are onboard water heaters that have developed electrical leakage in their heating elements. This is not enough to trip a fuse or circuit breaker, but it is definitely enough to present a potentially dangerous level of electrical current into the water around a boat. Boats that have had electrical repairs performed on them by land-based electricians are also often the cause of leakages. Non-marine electricians will often innocently wire boats as they would a home, without knowing that the wiring configuration requirements on boats is quite different from homes. I strongly recommend that you only have your boat wiring performed by and checked by an ABYC certified marine electrical specialist.”

Preventing Electric Shock Drowning. (Source: [ESD Association](#))

- **Don't swim** in or near marinas, docks or boatyards energized with 120-volt AC power. Find a swimming location at least 50 yards from any electrically powered docks.
- **Do not allow swimming off powered docks and post signage to notify others of ESD dangers:** “No Swimming, Danger of Electrocution” ([print ESD danger sign](#)).
- **Be current with Electrical Codes & Standards:**
 - **If you are a boat owner,** have your boat inspected by an electrician with a current ABYC (American Boat and Yacht Council) Electrical Certification or by an ABYC Certified Tech.
 - **If you are a marina, boatyard, or sailing facility,** be up to code. Make sure GFCI's are installed on all shore power pedestals and on all marina wiring circuits. Schedule regular inspections by qualified electricians who are familiar with National Fire Protection Association Codes: NFPA 303 and NFPA 70. Do not allow swimming off your docks.
- **Tell others about the danger** of Electric Shock Drowning and visit the [ESD Prevention](#) website.

Additional resources, associations, and articles about ESD:

- [Electric Shock Drowning Prevention Association](#)
- [Electrical Safety Foundation International \(ESFI\)](#)
- "[Does Death Lurk Below?](#)," Boating Magazine
- "[Preventing ESD at Marinas & Yacht Clubs](#)," CHUBB/Ace Insurance
- "[ESD, What You Need to Know](#)," ABYC Master Tech, Ed Sherman

Gowrie's Safety & Loss Prevention insights are created by Kellie Crete and Whitney Peterson. Kellie manages Gowrie Group's Safety & Loss Prevention practice area and has more than 25 years of experience in safety and loss control, and specializes in advising the marine industry and other niche segments of the commercial marketplace. Kellie is an OSHA authorized instructor. Whitney Peterson is Gowrie Group's VP of Marketing. She is responsible for client communications, branding, strategic partnerships, and outreach. For more information, kelliec@gowrie.com, whitneyp@gowrie.com, or www.gowrie.com/safety



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Sources: Electric Shock Drowning Association, CHUBB, Boating Magazine, American Boat and Yacht Council, Ed Sherman, ESFI.org, Gowrie Group.