

# Boat and Marina Electrical Safety

The NFPA 303 Standard, "Fire Protection Standard for Marinas and Boatyards" addresses marinas and docking facilities up to and including the shore power receptacle on the power pedestal. The NFPA Standard 302, "Fire Protection Standard for Pleasure and Commercial Motor Craft" along with the ABYC Standard E-11 cover everything from the shore-end of your shore power cord up to and including your boat. Don't be fooled by the names of the NFPA standards. They are designed to protect you from fire, and contain specific electrical system requirements to do just that.

NFPA 303 addresses areas that are required to be inspected on an annual basis. While we can perform a large portion of this inspection, a licensed code electrician is required for a complete inspection. The code electrician is licensed to inspect the internals of power panels and shore pedestals to ensure compliance and serviceability.

One area required by the 303 standard is an annual check of the ground integrity of the marina ground system. The reason this is so important is that the ground system is your vital link to ensure personal safety in the marina and to prevent fires. If this system is not in good condition, and an electrical fault occurs on a boat, the ground wiring might not be capable of carrying the resulting large fault currents back to the source. It's these large fault currents which cause circuit protective devices to trip in an instant to prevent electrical shock and fires. Without this ground system intact, fault currents may persist while generating heat at the fault location. In addition faulty ground wiring may cause the voltage on metal casings in the boat to rise creating a shock or electrocution hazard.

Using an ohmmeter on the ground wiring is not sufficient to test its integrity. Our equipment places a momentary load on the ground wiring and tells us the impedance of this critical path. From this measurement we can determine if the wiring is capable of carrying the fault current necessary to trip a circuit breaker to quickly secure the power supply to the faulty equipment.

Other areas affecting safety in the marine environment include the use of shore cords and various adapters at the marina. Believe me when I say that there are adapters for literally every situation out there in the boating world, but some are just plain not safe. For instance, let's say you need a 120v receptacle to plug your electric buffer into. The 120v convenience receptacle on the shore power pedestal is not working or none is installed. So, you get a hold of an adapter that plugs into a 30 amp twistlock receptacle on the shore pedestal and off you go. Problem here is that you have just plugged into a receptacle that is not protected by a GFCI! Should that tool get wet, as serious shock and injury hazard can result.

NFPA 303 clearly states that 30 amp receptacles are only to be used to power boats. It specifically

requires that 120v convenience outlets on power pedestals be of the GFCI type to provide personal protection during use. So, in our example above you should have found a GFCI outlet (that is working) or you could have picked up one of those GFCI outlet boxes at the home centers that are designed to be plugged into ordinary outlets. Then you would plug your tool into the GFCI outlet on the box.

Since the ABYC standards require all receptacles subject to weather be protected by GFCIs, you could have also just plugged your buffer into one of these outlets on the boat.

A note on GFCIs. Recent data indicate that approximately 30% of the GFCI outlets installed in homes don't work. This is because they are sensitive electronic instruments that are easily damaged by electrical transients (like lightning). That's why they have a test button and are recommended to be tested monthly. Just think about the failure rate in the harsher marina and boat environment. I recently did a marina inspection where more than 50% of the GFCI receptacles on the power pedestals did not pass the test. This is a significant compromise of personal safety. Check a few at your marina and report this to the marina operator.

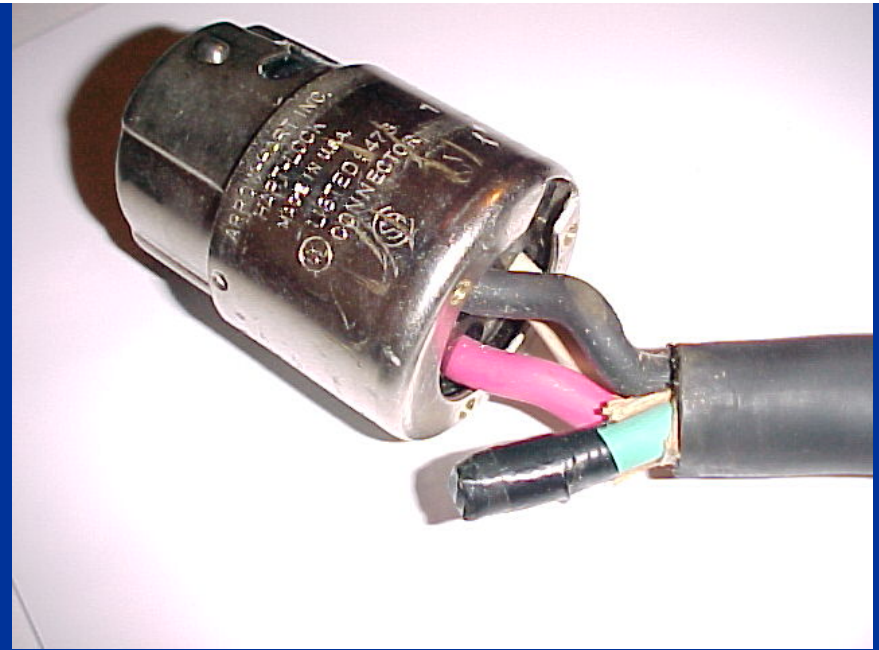
NFPA 303 clearly states that add-on plugs and electrical tape on shore cords are prohibited. How many like this do you normally see in your marina? We have documented cases where the improper assembly of replacement plugs caused fatalities.

For your own safety, it would be advisable to ask your marina operator when the last annual inspection was conducted as required by the NFPA standards. This inspection is designed to prevent fires and save lives.

Below are some pictures showing items which are clearly in violation of the standards. They were taken in everyday marinas you might encounter as a home for your boat or in your travels.



This plug was wired by the boat owner. The pink wire is a 120v ungrounded conductor (hot wire). He attached it where the ground wire was supposed to go. He unknowingly electrified the metal hull of his houseboat which ultimately led to the electric-shock drowning deaths of his wife and daughter.



This is the same plug as above. Note how the green ground wire was taped off and unused.



Note the exposed wires where this conduit parted. There is no chaff protection for this wiring.



It won't take much to wear through the hot wires exposed by this conduit break. This could lead to electrifying dock structures, creating a safety hazard.



Example of a heavily burned hot conductor in the receptacle. This is another fire hazard not uncommon in the marina environment.



Looks like here they were trying to provide two 30 amp cords with a single 30 amp connector. This illegal splice is a fire hazard.



No strain relief. The conductors in this plug can lose contact in the receptacle and become a fire hazard.



Here some strain relief is provided for the shore cord.



This jumble of disorganized cords makes it impossible to tell what's powering what. In an emergency, where is that one plug you want to disconnect?



A more organized installation making it easier to identify the sources of power.



Plugs and receptacles put together with electrical tape. What are the chances that they are wired improperly creating a hazard on the dock or boat?



A 30 amp boat being powered by a 15 amp extension cord from a convenience outlet at the dock. This is expressly prohibited by NFPA 303. Essentially you have a 15 amp fuse (the cord) waiting to overheat if too many loads are turned on in the boat.



Another adapter problem. This time they are attempting to power a 30 amp boat directly from a 15 amp receptacle. The GFCI on this particular receptacle was not functioning.



A homemade cord shown here. There is little protection from the elements as required by NFPA 303. The result will be corroded contacts, high resistance connections and possibility of fire.



This cord should be condemned and removed immediately.  
Report things like this to marina management.