

Improper wiring can be the cause of a shocking surprise

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Did you know?

Did you know that a 12 volt DC battery can't by itself cause a deadly shock! But the output of your engine's ignition coil can!

In Title 33 CFR Sections 183.401 - 183.460 ('Code') the US Government outlines the requirements of all vessels that have gasoline engines, except outboard engines for electrical generation, mechanical power or propulsion.

The code, while not a complete engineering document, is meant to set the broad standards that manufacturers need to adhere to, in order for protect both ship and occupants while on the vessel. Areas covered are ignition protection, grounding, batteries and conductors.

Why does the US Government go to such lengths to outline specific electrical requirements for boats? The reasons are simple – improperly configured electrical systems can cause mishaps and deaths.

Large recreational vessels have complex electrical systems that use both DC and AC/DC systems to power the boat. But, we're going to focus on the smaller boats, where most people take for granted there electrical system and this is where the problems start...

Small Recreational Boats

Most small recreational boats have one or two batteries. Usually one is a deep cycle starting battery; the other is a normal marine battery which then runs all of the vessels electronics. One or both batteries are kept charged by the engines alternator, so any draw from either the electronic equipment or the act of starting the engine is replaced during the time the engine is running.

However, even in this small system, there are many areas that can lead to problems, from both a loss of electrical connectivity to damage to equipment and ultimately the off-chance freak deadly accident.

I'm not exactly going to follow the order of the Code, but will touch on the aspects that all boaters should be aware about.

Let's start with the heart of the small boat electrical system the batteries. While a lecture on different batteries are outside the scope of this article, a few statements need to be said about the safety of your batteries. The Code stipulates that a battery should not be able to move more than 1 inch when a force equal to its weight is applied.

Think of it this way, if a battery started shifting it could break the leads that are connected to the terminals; which may cause a spark which could ignite a fire or explosion. The battery may possibly hit with enough force the engine that it could break the casing, causing the electrolyte to leak (usually sulfuric acid which can cause damage to the fiberglass, and any metal it comes in contact with).

In addition, batteries should be mounted in such a way as to limit the potential of the battery to interact with metallic substances. Plastic boxes properly installed, with batteries properly installed within them are a best practice.

A whole article could talk about safely installing your battery, but this are just a tease – a prompt for you to learn more about boating... and boating safety.

Next, the Code talks about grounding. All vessels should be grounded. Should there be a break in the starter motor, the current could possibly melt a fuel line, causing a fire or explosion. Grounding directs stray currents safely away from the other parts of the electrical and metallic items.

Ignition protection is another key area the Code discusses. As we talked about earlier, a 12 volt battery can't kill you, or even give you a really bad shock – but the ignition coil can and will kill you. The output of a typical ignition coil is 15,000-20,000 volts or more. With this much energy flowing, the Code wants to make sure that high-voltage electrical equipment is isolated from the gasoline fuel source.

An example of an ignition protection device is the back flame arrester. (http://www.safetyseal.net/vsc_images/backfire.jpg)

Wiring – the Code talks a great deal about wiring. It talks about the need for the proper gauge wire to be installed in and around the engine due to high temperatures associated with gasoline engines.

This section gets very technical as to what electrical systems need what types of conductors. Unless you're wiring your entire boat from scratch, or have reason to believe the wiring hasn't changed since manufacture, always replace wires with the exact same type (AWG gauge).

When you get a Vessel Safety Check (VSC) by the USCG Auxiliary (www.safetyseal.net), the VSC Examiner will look at your wiring. The Examiner is looking for:

“The electrical system - Must be protected by fuses or manual reset circuit breakers. Switches and fuse panels must be protected from rain or water spray. Wiring must be in good condition, properly installed and with no exposed areas or deteriorated insulation. Batteries must be secured and terminals covered to prevent accidental arcing. If installed, self-circling or kill switch mechanism must be in proper working order. All PWCs require an operating self circling or kill switch mechanism.”

Did you know?

In 2006, there were 20 boating accidents reported due to electrical system malfunctions – according to the USCG Boating Statistics COMDTPUB P16754.20

Resources

To find out more information about both the Code of Federal Regulations as it pertains to electrical systems, and additional information about boat building and batteries, check out these web sites:

USCG Office of Boating Safety (CG-5422)

<http://www.uscgboating.org/safety/boatbuilder/index.htm>

American Boat & Yacht Council (ABYC)

<http://www.abycinc.org/>

Marine Battery Primer

http://www.boatsafe.com/nauticalknowhow/marine_battery.htm

About.com

http://powerboat.about.com/od/electrical_systems/Marine_Electrical_Systems.htm

The more you know about boating, your boat and safety, the more enjoyable and the safer this sport becomes.

For more information on boating safety, contact the United States Coast Guard Auxiliary at www.cgaux.info.