

September 2023 Newsletter: Start Battery Installation

Photo Essay: Battery Installation

<https://stevedmarineconsulting.com/wp-content/uploads/2023/09/Start-Batteries.mp4>

It's an all-too-common occurrence; while conducting an inspection I reach the area where batteries (often for starting but occasionally house as well) are located, I grab the battery box and can move it with ease, in some cases several inches. When this happens I take a moment to envision the most challenging sea conditions this vessel might be expected to encounter, and for blue water vessels those might be something like those I endured while on a passage between Norway and Svalbard, detailed in this article. I then say to myself, 'what would happen to this battery in those conditions?' In many cases these batteries are secured using the iniquitous, gossamer web straps, with plastic buckles, plastic strap eyes, and mild steel tapping screws, an arrangement that's hardly fit for a tender, much less an ocean going vessel.

Standards established by the American Boat & Yacht Council are clear on battery security. However, while it's rare, there are times where I believe ABYC Standards are inadequate, and in those cases I supplant them with my own, and battery installations are just such an example (I sit on the committee that revises the battery standard and have repeatedly attempted to make the installation section more stringent). ABYC Standard E-10 Storage Batteries includes the following language...

10.7.3 Fasteners for the attachment of battery boxes or trays shall be isolated from areas intended to collect spilled electrolyte.

10.7.4 Batteries, as installed, shall be restrained to not move more than one inch (25 mm) in any direction when a pulling force of twice the battery weight is applied through the center of gravity of the battery as follows:

10.7.4.1 vertically for a duration of one minute, and

10.7.4.2 horizontally and parallel to the boat's centerline for a duration of one minute fore and one minute aft, and

10.7.4.3 horizontally and perpendicular to the boat's centerline for a duration of one minute to starboard and one minute to port.

My own approach goes something like this...

Fasteners for the attachment of battery boxes or trays shall be isolated from areas intended to collect spilled electrolyte.

Batteries, as installed, shall be restrained to not move (note the omission here) in any direction when a pulling force of twice the battery weight is applied through the center of gravity of the battery as follows...

In other words, batteries should be completely immobilized. Under what circumstances would it be advantageous for batteries to move one inch? Imagine making a days' or weeks' long passage, and with every wave the vessel encounters, the battery, and its cables, move from port to starboard, or from fore to aft, one inch.

I'm a firm believer in batteries remaining firmly in place. Often the best way to accomplish this is with a strong back, a beam of sorts, ideally fiberglass channel or square stock, located across the top of the battery longitudinally, secured

with vertical bolts, J-hooks or threaded rods, or a ratcheting strap that utilizes a stainless buckle, in that order. Boxes are not required for ABYC compliance, although containment is recommended for batteries that can leak; this can be achieved using a tray. The only case where I recommend full containment, i.e. boxes with lids, is for flooded lead acid batteries.

Ask Steve

Hi Steve,

I have enjoyed your articles in Professional BoatBuilder Magazine. Being in the marine industry all my life I appreciate your information on systems that are not fully in my wheelhouse.

In my shop I modify and rebuild boats, all have been shorthanded race boats, but this winter it is a 1982 Nauset 27 Bass boat that we purchased in April.

It has a 2021 MerCruiser 350 with 220 hr., that runs great and has been winterized. This is the first gas boat that has been in my shop, and I am looking for all the right ways to protect my shop, and me, from two 50-gal gas tanks? I will be cutting off the cockpit sole to replace rotten bulkheads and plywood sole.

I figured this is right in your wheelhouse, and you might be able to send me in the right direction? The boat is not in the shop yet; it is getting the bottom blasted this week.

Thank you for any info you can supply.

Paul Cronin

Paul:

My gasoline monologue...

When I was a US Naval Sea Cadet in the late 70s, I spent a few weeks at the Naval Education and Training Center in Newport Rhode Island. One day we reported to a shed at the dock yard where we were to spend time under way, aboard training YPs (then and now the last timber vessels operated by the US Navy). Before getting underway, however, a Senior Chief Petty Officer gave us a safety briefing. One demonstration made a life-long impression on me, he took about a thimble full of gasoline and placed it under an elevated metallic can. He struck a long fireplace match and pushed it towards the gasoline; the resulting explosion launched the can into the overhead and scared the heck out of every kid in the room. He said, "A cup-full of gasoline," he held up an empty measuring cup for emphasis, "is equal to a stick of dynamite". He then repeated the demonstration except this time he placed a small section of screen over the reservoir of gasoline, when he touched the match to it nothing happened, the screen prevented the flame from passing through it to the gasoline vapors. This is one of the reasons why fuel vents are equipped with screens, they act as flame blockers.

Early in my career I had another close encounter with gasoline. A colleague of mine was preparing to remove a gasoline sterndrive engine from a small boat. In doing so he had spilled a small amount of gasoline into the bilge. He then disconnected the positive cable from the starter. While working he bumped into that cable, it brushed against the block, generating a spark, which ignited the gasoline vapors. Two large fire extinguishers were not enough to extinguish the flames, the vessel was engulfed in minutes. Thankfully it was blocked outside, and no other vessels were damaged. The fire department was literally across the street from the yard, they were able to extinguish it quickly, but the vessel was a total loss. My deeply embarrassed co-worker got away with nothing

more than singed eyebrows, he was lucky. Comedian and car enthusiast Jay Leno recently suffered a similar fate, only with more severe burns.

Finally, two teenage boys, friends of my children, were filling a gasoline generator inside one of their family's garages. The power had gone out, so to see the level of gas in the tank one of them lit a butane lighter. I realize that sounds crazy, but how well do most teens understand the explosive power of gasoline (thanks to the US Navy I was an exception, that demonstration should be performed in every junior high school shop class)? The gasoline immediately ignited, seriously burning them both and ultimately the garage, ultimately only one survived the conflagration.

When I set foot aboard a vessel with a diesel leak, my first thought is, "what a mess". When I set foot aboard a vessel and even just smell gasoline, my first thought is "oh s&*t!"

All of these anecdotes are designed to inspire nothing less than a healthy degree of respect for gasoline, and its potential destructive power. I have over a dozen small gasoline engines, and antique vehicles, and I think about these episodes in my life every time I fill or break into the fuel system on one of them. Treated properly, it is safe, but there is virtually no margin for error. Even the smallest static electric spark generated by walking over a plastic floor covering, or a bed liner can lead to disaster. Unlike diesel, any leak is too much, and any odor of gasoline must be investigated, corrected and ventilated immediately.

If the vessel and its fuel are brought from outside, where it's cold, into a warm building, and the tanks are full, the fuel will expand and it's possible you could have some leakage from the vents. Ideally, the tanks should be slightly less than full, 7/8 or so, and the fuel stabilized.

If you are a "diesel shop" then this will require some level

of re-education. Unless you empty and gas-free the tanks (removing any vapors using compressed air) of this vessel, you and your staff will need to have an elevated sense of caution when working aboard her. It would also make sense to review the two relevant ABYC Standards, H-24 Gasoline Fuel Systems, and P-4 Marine Inboard Engines. Shops all over the country safely work on and store gasoline powered vessels inside, doing so simply requires a little education and precautionary measures.

Steve,

I've recently added a number of lights and fans to my boat. All the wiring connections were made with heat shrink ring terminals. Do you recommend spraying these terminals with a battery protectant? If so, do you have any product recommendations, or product types?

Thank you as always for your expert advice!

Sincerely,

Richard C. Brown

Richard:

You don't mention if these connections are AC or DC. If they are AC or DC, tinned heat shrink terminals and tin-plated terminal strips are the gold standard for seagoing electrical connections, they provide protection against moisture intrusion as well as strain and vibration. If they are AC, they must also be housed within a purpose-made electrical enclosure, which may be either metallic or plastic, although the latter is more common and preferred for corrosion resistance.

As far as corrosion protection coatings, there are many, I'm partial to, and have used for decades, CRC Heavy Duty

Corrosion Inhibitor, it dries to a wax-like consistency, which will not easily wipe or wash off.

Steve,

I have a 2001 49' DeFever RPH, with a 12.5Kw Westerbeke engine.

I recently read (and reread) your articles on smoke and carbon monoxide detectors. I settled on First Alert SC0501CN-3ST Smoke and Carbon Monoxide Alarm for the engine room and SA511CN2-3ST Smoke Alarm for the bedrooms, hallway, electrical space behind the pilothouse helm station, space behind the flybridge electronics, and salon. They are all interconnected as you recommended when sounding the alarm.

An issue I discovered, the CO alarm in the engine room was triggered after running the generator for about 1-2 hours. Its location is next to the galley access hatch which is the furthest away from the generator. All the alarms sounded but only the CO alarm will tell the PPM level which is impossible to hear with the generator running. I have an engine room fan which quickly cleared the compartment and now I need to troubleshoot the issue(s).

My question to you is, any suggested troubleshooting steps, if this is something to be expected with generators and carbon monoxide, additional mitigation options besides keeping on an engine room exhaust fan.

Sincerely,

Millard Blakey

Millard:

Generally, CO detectors are only installed in accommodation spaces. Installing them in engineering spaces often leads to

false alarms as paint and insulation are heated and off-gas. Accommodation spaces should be equipped with either combination smoke and CO detectors, or both as stand-alone units. It appears, therefore, you may have this protocol reversed.

Having said that, in this case, it seems as though your engine room CO detector may have detected a genuine CO leak.

The genset's exhaust system is a combination of both dry and wet exhaust. The dry portion is entirely metallic, while the wet portion is usually a combination of metallic, flexible hose and fiberglass/plastic components. It's possible the leak is coming from either the wet or dry portion of the system, however, if it is originating in the wet portion, you will almost certainly have a water leak as well, whereas if it is leaking from the dry section, that will be gas alone, which is more difficult to identify. With the genset at rest, initially a very close visual inspection of the system should be carried out. Look for signs of water leaks in the wet section, and soot in the dry section. The dry section of a generator exhaust is comparatively small, it is limited to the exhaust manifold and the mixing elbow. If you are unable to identify the leak, searching for it with the generator running would be another option, however, use caution as CO poisoning is insidious, make certain you have spotter, a person who knows you are working in the engine room, he or she should check on you frequently.

Portable CO detection tools are inexpensive and readily available, you could use one of these to try to narrow down the source of the above efforts are unsuccessful.

More on smoke and CO detectors here...

<https://stevedmarineconsulting.com/co-poisoning/>

<https://stevedmarineconsulting.com/the-need-for-smoke-detectors-editorial-read-the-contract/>