



NAVAL SAFETY COMMAND

SAFETY AWARENESS DISPATCH



SA 23-02

Afloat Electrical Mishaps

“Electricity is really just organized lightning” — George Carlin

Electrical hazards have existed in the afloat community since the installation of electric lights on the USS Trenton in 1883. For a variety of reasons, we haven't seemed to master electrical safety since. In 2010, Petty Officer David Mudge was electrocuted while performing maintenance in an auxiliary machine space. Investigators deemed that corrosion in an electrical enclosure was a likely factor. Following Petty Officer Mudge's death, the Navy ordered the inspection of all electrical enclosures fleet wide. In more than a decade since, the afloat community continues to have electrical mishaps caused by many factors, with corrosion being only one. Frayed wires, level of knowledge (including tag out procedures) and lack of PPE are a few additional common causes. A quick search of our database revealed more than 550 electrical mishaps and hazard reported from fiscal year (FY) 2018 through FY 2022. That's an average of more than 110 incidents annually. You don't need to be an electrician's mate to get shocked either, so regardless of your rate, read on and consider your day-to-day actions around electricity — the invisible Killer.



- Three Sailors were replacing lightbulbs and starter assemblies in light fixtures that appeared to be non-functional. The report noted that the Sailors did not turn off the local light switches prior to replacing the lightbulbs — *but securing the power alone doesn't mean the starters aren't energized*. After replacing lightbulbs and starters in multiple fixtures, one of the Sailors received a shock when he inserted a starter into a fixture. Shocks while changing lightbulbs and starters are one of the most common and avoidable mishaps that we see. While most result in a minor to moderate shock, this unfortunate Sailor suffered much worse. The Sailor experienced profound sensorimotor weakness and numbness of his right arm below the elbow, which required surgery to relieve pressure on his nerves from swelling. He was placed on six months light duty and will likely have permanent partial disability according to the report. — *Changing florescent lightbulbs can be tedious and time consuming, but damaged nerves can last a lifetime. Even if you secure power, ensure the lightbulb is remove before touching the starter.*
- A Sailor was shifting a load center from normal to alternate electrical power, but did not follow the published procedure. When the Sailor incorrectly aligned both power sources simultaneously, he caused them to short at the load center. The short caused an arc flash that inflicted burns to both of the Sailor's hands. The Sailor was treated for his burns and given two days SIQ and 14 days on light duty.— *Any Electrician's Mate will tell you that shifting the electrical load must be done exactly right every time. There is zero wiggle room. Having an experienced observer when doing critical tasks such as shifting electrical power would help reduce the chances of a mistake.*
- A Sailor completed start up maintenance on a recirculation fan when he received reports of white smoke from contractors who were working in a nearby fan room. The contractors reported hearing cracking and popping in addition to the smoke. The inport emergency team responded and the ship's electricians isolated power to the junction box. This class C fire occurred due to an omission of periodic maintenance checks. The ship's electricians had not performed required periodic maintenance on 67 of 79 fan motors. —*While the direct cause of the fire was the fan motor being incorrectly wired to the junction box, a combination of long-term deficiencies caught up to the electrical division. The electrical division had no*

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chief and the only khaki supervisor was a first tour division officer who had only been onboard for one month. Absent senior leadership, required maintenance could be overlooked or skipped, which will come at a cost over time, in either dollars or lives.

- Three civilian mariners were cleaning the bilge when they unknowingly sprayed water on an exposed live 440 volt power cable that was hanging beneath the deck plates, causing it to short and spark. The ship's electricians unwired and stowed the cables from two motor operated valves as part of scheduled work. After the electricians stowed the cables, they restored power to the circuit to enable operation of the fire main that was powered by the same circuit. — *This incident was technically a near miss, but could have easily been an electrocution. "Live" cable ends (if they must remain live) should be appropriately wrapped or capped and warning tags should be applied to them. The extra couple of minutes of work could save a life.*
- A ship was unloading a small boat for deployment and, upon closing the stern doors using the hydraulic power unit, the operator received an electrical shock. The investigation revealed a missing cover, exposing wires in the HPU panel. The report surmised that the operator's arm contacted the wires resulting in electrical shock. — *This mishap is an example of why zone inspections matter. A missing cover may seem insignificant, until someone is injured or worse. Regular walks about your spaces and detailed zone inspections will go a long way toward having a safer ship.*
- A contractor worked on a water mist valve in "Main 2." In preparation for the work, the ship's force (S/F) tagged out the valve per the available ship's drawings and power panel diagram. The drawing depicted 440VAC power, which was properly tagged out. However, the valve had an additional electrical supervisory control that the ship's force did not tag out and there was no isolation guide list for this equipment. The drawing for the equipment also did not detail the 120V supervisory panel power, so it was not tagged out. When the contractor began work, she received a shock on her finger from the live 120V supervisory panel power. She did not perform an initial voltage verification (IVV) before commencing work. Following the incident, the commanding officer ordered a full review of water mist valve drawings and implemented a mandatory policy requiring IVVs to be conducted before any contractor work with electrical equipment. — *This mishap demonstrates why you must perform initial voltage verification checks when required to confirm you have de-energized equipment before starting maintenance, as NSTM 300 instructs. Tag out and verify.*

Key Takeaways

The vast majority of electrical mishaps are preventable. Unseen degradation of faulty components may be difficult to find, but a sound maintenance and inspection program can help mitigate them. In this dispatch, all of the incidents were preventable as are most of the electrical mishaps in our database.

1. **"It's in there."** Like the old 1980s pasta sauce commercial says, NSTM chapter 300 contains all the *"ingredients"* for the general electrical plant that are common to all types of electrical equipment. NSTM 300 also references other technical documents to provide the information and safety precautions you need. If you're thinking, "yes, I already know that," well the Sailors in this dispatch may have thought they did too, but they missed a key step...they didn't follow the NSTM. Do not *"think"* you know the NSTM, Know it and use it.
2. **Don't become a human voltage meter.** NSTM 300 and associated references are full of cautions and warnings about ensuring electrical power is secured or de-energized before starting work, yet some of us continue to assume the power is off or that they can perform the work on a live circuit. If the NSTM says secure the power, then secure it...and verify it.
3. **Focus.** NSTM 300 describes how electrical shocks occur. The victims in this dispatch demonstrated (*albeit unwillingly*) the many ways one can receive an electrical shock. NSTM 300 lists Human factors, including inattention as significant causes of electrical shock. That statement should raise some eyebrows when reading up on electrical safety (*and you should be reading up on it*). Do not be in a rush or get distracted while doing electrical work or it will get your attention in a split second.

And remember, "Let's be careful out there"