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SHOCK AND 120 VAC RECEPTACLES

Shock is the physical stimulation that results when electric current passes through the body. There are only two kinds of electrical shock; discomfort and death. The difference between the two may be only a few moments in time of the duration or a few milli – amperes of current flow through vital organs.

The amount of current flow depends upon several factors, including voltage of the circuit, body resistance, duration of the contact, type of circuit and the pathway of current through the body.

The effects of current on the body vary from case to case. Effects on the body can range from mild tingling sensation to painful shock and cause tissue damage, muscular contractions, reparatory paralysis or ventricular fibrillation.

As little as 32 volts AC, 10 milliamps passing through the chest, can affect the heart and disrupt the electrical signals the heart uses to maintain normal heartbeat. Disruption of these electrical signals by stray current passing through the heart can cause rapid, irregular contractions of the heart, cause ventricular fibrillation and stop pumping blood.

There are no documented cases where a heart has gone end of regulation and return to normal rhythm unassisted. Therefore, if your heart goes into fibrillation, you will definitely die unless someone applies CPR or a de-fibrillator to your chest to paralyze your heart and then get it restarted in normal rhythm. Surviving heart fibrillation has a 1 to 2% chance, if you are at the right place, at the right time. This is not very good odds, so ensuring the portable equipment, portable extension cords, plugs, and receptacles can form a complete ground system, before being used.

Now the question begging to be asked, is what has this to do with me. Since the body is a conductor of electricity, Ohm's law applies as it does to any other physical substance. That means, you are a good conductor of electrical current.

Shipboard electrical 120 outlets are all to be grounded to the ship's hull. It has been found that many electrical receptacles throughout different ships, for unknown reasons, have been left ungrounded. This constitutes a major safety issue. If you plug-in to one of these ungrounded outlets and happen to have a short in the device sits plugged in, such as a drill, or a grinder, or a sander, in all likelihood, you will be shocked for there is no protection in the outlet. The shock that you could receive could cause permanent damage to you and possible death from electrocution.

It is extremely important that all 120 receptacles be checked for proper grounding before use.



Equipotential zones of protection.

This equipotential zone is formed when metallic conductors bypassed the fault current around the work area. OSHA 1910.269 (n) mandates grounding and short-circuiting be done in such a way that it creates a equipotential works zone for the protection of the employees while working on the energized systems. The low resistance metallic conductors of the safety ground bypass the worker. Thus, if the conductor being worked on becomes the same potential, thereby minimizing potential difference across the workers body. When the potential difference is minimized, the voltage drop across the worker and the accompanying current flow through the worker is minimized. Current flow through the worker is minimized (not completely eliminated) due to different resistances of the worker and the earth or ships' metal hull.

Personal protective grounds must be installed so as to fulfill the following three criteria at the worksite:

1. Create a zone of equalized potential
2. be installed in such a way as to have a low enough impedance to cause the circuit protective devices, either fuses or breaker, to operate immediately
3. to protect the workers from being exposed to any induced voltages and bleed off any static charge

How to solve the problem

It is extremely important, that the ship conduct a 120 V AC receptacle inspection to ensure proper wiring and proper grounding. This can be done in a relatively short period of time and should not cause man-hours issues. All 120 V AC receptacles found ungrounded should be tagged out until repairs are made, reinspected and found good. This inspection should also be performed prior to the ship going into a availability or extended downtime where the receptacles could be in use quite frequently with sanding and grinding and drilling or other portable tools. It is very important that all receptacles on the exterior of the ship and on the weather decks be inspected minimally on an annual basis or prior to a shipyard to ensure the safety of the personnel utilizing these outlets.

Wear rubber electrically approved rubber gloves for the rated voltage and sleeves. Do not take an intentional shock, no matter how minor it seems, Even a tickling sensation should cause you to not use the equipment and inform a qualified electrician to check out the receptacle, extension cord, and the portable tool for missing ground connections, or low meg-ohm readings. Do not use the circuit receptacle or equipment until declared safe by qualified electrical personnel.



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Suggested additional information for electrical safety can be found in the following documents:

1. Safe Electrical Operations, OSHA and NFPA 70E Electrical Safety for Alaska Marine Highway System Personnel.
2. NFPA 70E Electrical Safety Requirements for Employees Workplaces
3. OSHA 1910.331 through 1910.335