

KISH P & I LOSS PREVENTION CIRCULAR KPI-LP-106-2013 **(Problem of Power Surge Protectors on board ships)**

With the increasing prices of various electrical devices & their lower qualities in comparison with the elder versions; there is a tendency to use power surge protective devices both ashore & on board ship.

Surge protective devices (SPDs), more commonly known as surge protectors or power strips help protect our expensive electronic devices from being damaged from excessive currents and allow us to simultaneously deliver power to multiple devices.

By this Loss Prevention Circular we address the use of certain electrical protection devices onboard vessels and the inherent risks they may cause. Most commercially available SPDs are designed for use ashore and will interrupt only the hot conductor when a surge occurs. What does that mean for the ship owner/operator?

It means that while these devices may provide protection in our homes and offices, these same devices may be a fire risk onboard vessels.

A marine casualty investigation of two separate fire incidents onboard a U.S. Flag Container ship revealed that the sources of the fires were attributed to the use of SPDs plugged into a lighting circuit. It was discovered that a ground had developed on another circuit that was connected to the same distribution panel providing power to the staterooms. This ground created an imbalance of voltage between the two power conductors supplying the SPDs which caused excessive currents, overheating, and subsequently, a fire. In this instance, even if the SPDs automatically tripped as designed, only one power conductor would have been secured while the other would continue to provide power, possibly shorting to the device's ground wire and the structure of the vessel.

For shipboard applications, it is critical for a device to interrupt both power conductors. It is thus recommended that vessel Owners, Operators, Class Society Surveyors, Insurers, and other inspection personnel examine the risks associated with the use of SPDs aboard their vessels, and if necessary ensure their organizations have policies and procedures relating to their use. Vessels may include defined procedures for checking the condition and grounding capabilities of personal/portable electrical equipment, and trained shipboard personnel should be assigned to check and approve all SPDs in use or brought on board for compatibility with the vessel's electrical distribution system prior to use. Routine checks of switchboard and distribution system 120 VAC ground detection systems are necessary to detect the presence of grounds that may cause similar circumstances with non-marine type SPDs.

Additional Technical Information:

- This Loss Prevention Alert only applies to vessels with alternating current power systems and may be most likely applicable to larger industrial and commercial vessels. It relates to different manners in which power is generated, transformed and supplied throughout the vessel.
- There is no official Underwriters Laboratory standard for Marine Surge Protective

If there is excessive use of power strips onboard there may be a need to consider the installation of additional permanent components such as distribution panels, breakers, cabling or receptacles. An SPD should be:

- Only permitted for use onboard once approved by a trained crewmember,
- Removed from service if it is hot to touch,
- Unplugged when not in use,
- Regularly inspected for damage or wear,
- Limited to one SPD per single duplex receptacle outlet and never daisy chained,
- Prevented from use in excessively humid or moist environments,
- Provided air circulation and not covered with carpet or other items, and
- Checked frequently to ensure that all plugs are fully engaged.

The primary concern is to ensure electrical protection devices such as SPDs operate correctly with the manner in which the 120 volt receptacle circuitry onboard the vessel is wired. Receptacle circuitry may be wired in Delta or WYE configurations.

Using a voltmeter, a marine electrical professional will note that a Delta wired circuit will read the voltage across the terminals as shown in the image on the right. The Delta configuration has two hot leads one at +/-60 VAC, the other at +/- 60 VAC, simultaneously to provide the 120 VAC potential. Here lies the problem with inexpensive and older SPDs that only disconnect one "hot" terminal lead. The other "hot" terminal remains hot if the circuit breaker supplying the receptacle and SPD does not trip.

A marine electrical professional using a voltmeter on a WYE wired circuit will read voltage across the terminals as shown in the image on the left. For a WYE configuration 120 VAC is established between the hot terminal and the neutral terminal and the hot terminal and the ground terminal of the receptacle. It should also be noted that related issues (mismatches between Delta or WYE systems) have been reported with 120 VAC Uninterrupted Power Supplies purchased ashore and used onboard vessels. Such devices should be selected to match the power supply configuration.

