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Question of the Month – What amount of electrical current flowing through a person’s body will cause loss of muscle control? – See correct answer on page 2.

Legislative Update

The [February 2016](#) newsletter contained a list of bills the legislature has been considering that may affect the electrical program.

After various deadlines for passage, the only bill remaining is [House Bill 2886](#). This bill allows the department to alter work scopes of three specialties that are partially or entirely defined in the law. It passed both the House and Senate and is currently awaiting the governor’s signature.

Safety Tip of the Month

Do not allow yourself or anyone else to swim near a dock or marina where electrical power is present. Stray leakage current in the water can paralyze or kill.

If you must enter the water to work on a boat or dock, turn off and lock out all sources of electricity first.

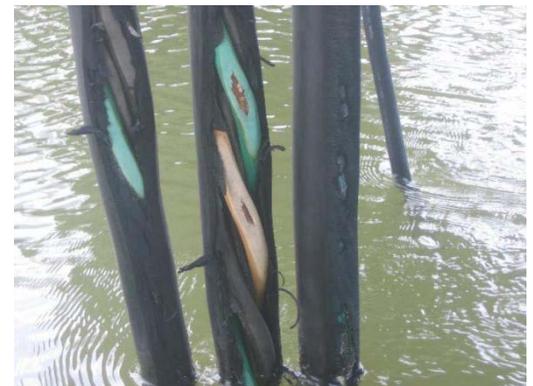
Two Solar Photovoltaic Requirements to be Effective July 1, 2016

As discussed in the [February 2016](#) newsletter, two important National Electrical Code® (NEC®) safety requirements for solar photovoltaic (PV) systems will be implemented July 1, 2016. The two requirements are NEC® 690.11 Arc-Fault Circuit Protection (Direct Current) and NEC® 690.12 Rapid Shutdown of PV Systems on Buildings. Implementation of a third requirement for Wire Harness and Exposed Cable Arc-Fault Protection in NEC® 705.12(D)(6) is delayed until further notice. There is a proposal to remove this requirement from the NEC® in the 2017 edition.

All solar photovoltaic (PV) installations made with electrical work permits obtained on or after July 1, 2016 must comply with NEC® 690.11 and NEC® 690.12. If you would like to comment on the implementation of these requirements, you may email the Electrical Program at ElectricalProgram@lni.wa.gov, attention: Rod Mutch.

Electric Shock Drowning - Ground-Fault Protection of Marinas and Floating Buildings

Every year, people die while swimming or falling in the water around docks and boats which have electric shore power connected to them. Many of these deaths are attributed simply to drowning, but in some cases, Electric Shock Drowning (ESD) is the culprit. ESD is a phenomena caused by a fault in the wiring system supplying power to a marina, boat, or floating building being transmitted into the body of someone in the water. Energized metal parts of boats and voltage gradients in the water cause current to flow through the person’s body and paralyze them resulting in the inability to swim. Sometimes, the tragedy is compounded due to a person trying to rescue the first victim becoming another victim. Many major boating publications such as [Boating Magazine](#), [Boat U.S.](#), and [Yachting](#), contain articles of recent tragedies involving ESD. The National Fire Protection Association (NFPA) journal contains a recent article entitled [Troubled Waters](#) which discusses this issue.



Damaged cables at a marina

There is a difference in hazard between freshwater and saltwater. Saltwater is more conductive than freshwater. When a person is in saltwater, voltage gradients are much smaller, causing less current flow through a person’s body. There are fewer cases of electric shock drowning in saltwater. However, if a person in saltwater contacts an energized boat or metal dock part, there is a high electrocution hazard. Because freshwater is less conductive, voltage gradients are much higher causing greater current flow through a person’s body and electric shock drowning is the greater hazard.

To address this growing problem, in 2011, new requirements appeared in National Electrical Code® (NEC®) 555.3, Marinas and Boatyards, and 553.4, Floating Buildings, requiring ground-fault protection. The main overcurrent protective device that feeds the marina or floating structure shall have ground-fault protection not exceeding 100 mA. Ground-fault protection of each individual branch or feeder circuit shall be permitted as a suitable alternative. This requirement will probably be expanded when the 2017 NEC® is published this fall. A proposal contained in the First Draft for 555.3 reads: “The overcurrent protective devices that supply the marina, boat yards, and noncommercial docking facilities shall have ground-fault protection not exceeding 30 mA”.

These requirements are currently in effect, but questions have been asked about application of the rules regarding alterations to a portion of the wiring system supplying marinas and floating buildings. Where a portion of the wiring system is extended or new feeders or branch circuits are added to an existing system, the ground-fault requirements of NEC® 553.4 and 555.3 will only be required for the new or extended feeders or circuits. The department will not require the main overcurrent protective device to have ground-fault protection in this case. Any alterations to the main overcurrent protective device will require it to have ground-fault protection not exceeding 100 mA.

Any changes to these requirements resulting from the adoption of the 2017 NEC® will be addressed during the rulemaking period next year prior to adoption of the new code.

Third-Party Evaluation Is Required For Unlisted Electrical Equipment

In order to meet the minimum electrical safety standards for installations, all materials, devices, appliances, and equipment, not exempted in chapter 19.28 RCW, must conform to applicable electrical product standards recognized by the department, be listed, field evaluated, or in specific cases, engineer reviewed. See [WAC 296-46B-903](#)(5) and (6) for eligible industrial utilization equipment and details of the engineering review process.

Unless built with all listed components and wired in accordance with the National Electrical Code®, the electrical inspector can only approve equipment for use if it meets the one of the following third-party identification criteria:

- It arrives on the job site listed and identified with the certification mark of an L&I approved electrical products testing laboratory. The mark will identify the appropriate product category for the equipment. There may be listed individual components within the assembly but they are only a part of the product.
- Field evaluated with a field evaluation label applied by an L&I approved electrical testing lab.
- For industrial control panels and industrial utilization equipment only, Engineer Evaluated with the engineering evaluation label applied by an L&I approved engineer.

A third-party evaluator can have no organizational, managerial, financial, design, or promotional affiliation with manufacturers, suppliers, installers, or vendors of products covered under its certification or evaluation programs. Only laboratories or engineers approved by the department are allowed to perform field or engineering evaluations. “Approved” means the evaluator has met the requirements of WAC 296-46B-[997](#), or [999](#), and is authorized by the department to evaluate electrical products that are installed in Washington.

You can find information about accredited electrical product testing laboratories and approved engineers at the following links to our website: [Product Testing Laboratories](#), or [Approved Engineers](#).

Ugly Picture: *If viewing this document online, click on the picture to open a larger image.* Electrical equipment and conductors must be protected from overcurrent in accordance with the rating of the equipment and ampacity of the conductor. This dangerous installation was made by someone without regard for the safety of those who may come in contact with this equipment in the future. They also have little regard for their electrical certificate of competency.



Answer to Question of the Month: Depending on the person, painful shock and loss of muscular control can happen at current levels of between 6 milliamperes and 30 milliamperes. For more information, see the [Controlling Electrical Hazards](#) page of OSHA’s website.

This document may contain hyperlinks to internet web pages. To access this PDF document online, go to:

<http://www.ElectricalCurrents.lni.wa.gov>

Electrical Section Internet Address: <http://www.ElectricalProgram.Lni.wa.gov/>

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