

# Helping Protect Female Firefighters From Shock Hazards With UL 3741



ANSI/CAN/UL 3741: Standard for Safety for Photovoltaic Hazard Control addresses safety principles and processes for evaluating rapid shutdown photovoltaic (PV) arrays that can help protect firefighters from shock hazards on homes and buildings with solar panels.

In developing the Standard, UL Standards & Engagement collaborated with Sandia National Laboratories under a U.S. Department of Energy grant to analyze body impedance models and corresponding shock thresholds for both male and female firefighters with standard protective

equipment and tools. It was noted that physical characteristics such as body weight and skin sensitivity could have a direct effect on certain threshold limits for electricity, and that women tended to have lower threshold limits than most men.

Male and female firefighters were considered in the calculations of potential current that could pass through a firefighter's body during various firefighting scenarios featuring a damaged PV array. As a result, the Standard uses direct current body resistance data modified for females, which are roughly two-thirds the limits for males.

## Hazard level (HL) description (DC current limits for adult women derived from 1.33 times the IEC 60479-1 Figure 22 table values that include children)

Hazard Level	Range mA	Description
0	0-2.67	Perception with slight prickling sensation. No risk of shock or reaction (Similar to IEC 60479-1 DC-1 modified for adult females.)
1	>2.67-40	Muscle Contraction. Insignificant threat to life or injury. May result in a reaction response. (Similar to IEC 60479-1 DC-2 modified for adult females.)
2	>40-100	Strong Involuntary Muscular Reaction. (Similar to IEC 60479-1 DC-3 modified for adult females.)
3	>100	For the purpose of this standard, this is the maximum allowed exposure current. This 100mA value was chosen to provide a safety factor and is 66% of the fibrillation threshold (Catastrophic - serious life or injury probable (Similar to IEC 60479-1 DC-4 modified for adult females) calculated for 5% of the adult women population.

NOTE: Level 1 and higher limits are not compliant under normal conditions as described in 12.2.2(e). Level 1, 2 and 3 limits may be compliant after accessing PVHCS abnormal conditions along with FF interactions with PVHCS as determined by following the steps in 12.2.3.