



# Safety Matters

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## Electrical Safety

Electrical current exposes workers to a serious, widespread occupational hazard. Practically all members of the workforce are exposed to electrical energy during the performance of their daily duties, and workers in various job categories experience electrocutions. Many workers are unaware of the potential electrical hazards their work environment presents, making them more vulnerable to the dangers of electrocution. Electrical injuries consist of four main types: electrocution (fatal), electric shock, burns, and falls, caused as a result of contact with electrical energy.

### Burns

Current moving through your cells or tissue will cause burns. High-voltage shocks can lead to deep internal burns. Most burns are at the entry and exit points, however deep internal burns can cause damage to organs if the current has passed through the body. The term "electrical burn" is used widely to describe the variety of injuries created by electrical energy interacting with living tissue. Although thermal burns are the most common results of such an interaction, this term does not adequately describe the range of effects that they have in the human body.

### Ventricular Fibrillation

A low-voltage (110 to 220 V), 50 or 60-Hz AC current traveling through the chest for a fraction of a second may induce ventricular fibrillation at currents as low as 60mA. With DC, 300 to 500 mA is required. If the current has a direct pathway to the heart a much lower current of less than 1 mA, (AC or DC) can cause fibrillation. Fibrillations are usually lethal because all the heart muscle cells move independently. Above 200mA, muscle contractions are so strong that the heart muscles cannot move at all.

### Neurological Effects

Current can cause interference with nervous control, especially over the heart and lungs. Repeated or severe electric shock which does not lead to death has been shown to cause neuropathy. Neuropathy is any disease that affects the nervous system. Neuropathic pain is usually perceived as a steady burning, "pins and needles," and/or "electric shock" feelings. The difference is due to the fact that normal pain stimulates only pain nerves, while a neuropathy often results in the firing of both pain and non-pain (touch, warm, cool) sensory nerves in the same area, producing signals that the spinal cord and brain do not normally expect to receive.

### Arc-Flash Hazards

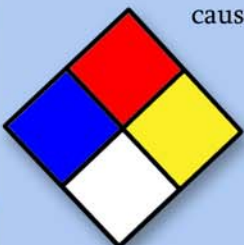
Over 80% of all injuries and fatalities caused by electrical incidents are not caused by electric shock, but by the intense heat, light, and pressure wave (blast) caused by electrical faults. The arc-flash in an electrical fault produces the same type of light radiation from which electric welders protect themselves using face shields, dark glasses, heavy leather gloves, and full-coverage clothing. The heat produced may cause severe burns, especially on unprotected skin. The blast produced by vaporizing metallic components can break bones and irreparably damage internal organs. Most countries have worker safety regulations that require the electricity to be turned off before work is performed unless a greater hazard will result from turning the power off.

Electrical Currents, and Associated Bodily Harm

Electric Current (Amperes)	Voltage for Body Resistance (10,000 Ohms)	Voltage for Body Resistance (1,000 Ohms)	Maximum Power (Watts)	Physiological Effect
0.001 A	10 V	1 V	0.01 W	Threshold of feeling an electric shock
0.005 A	50 V	5 V	0.25 W	Maximum harmless current
0.01-0.02 A	100-200 V	10-20 V	1-4 W	Sustained muscular contraction. "Cannot let go" current
0.050 A	500 V	50 V	25 W	Ventricular interference, pain, respiratory difficulty
0.1-0.3 A	1000- 3000 V	100-300 V	100-900 W	Ventricular fibrillation. Can be fatal.
6 A	60,000 V	6,000 V	400,000 W	These are the operation parameters for a Defibrillator. Temporary respiratory paralysis and possibly burns.

### Tips to follow when using Test Instruments and Equipment

- Test instruments and equipment are intended only for use by qualified personnel and must be used in accordance with local safety rules.
- A qualified person should inspect all test instruments and equipment to ensure they are safe to use as intended by the manufacturer.
  - Visually inspect test instruments and equipment before each use. Poor maintenance can cause injury or death.
  - Test instruments and equipment and their accessories shall be electrically rated for their intended use.
  - Always wear proper PPE (Personal Protective Equipment).



Test Before You Touch!

## Remember... Safety Matters.

Comments and suggestions are always welcomed and encouraged.



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