

## Note-A-Rific: Shocking!

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When dealing with electricity, you must always be careful.

- The question is, what is it about electricity that can cause so much damage to a human?
- There are two main ways electricity will hurt a person:
  1. Electricity can block the normal functions of nerve cells, which can cause anything from a mild tingle to a major heart attack.
  2. Electrical burns can be caused when electricity arcs. They are essentially treated like any other burn.

Focusing on the interruption electricity can cause to nerve cells, we can still ask why?

- It is actually the current that will hurt you, not the voltage.
- To remember this, keep the phrase “Current kills” in your mind.

### Effect of Various Electric Currents on the Human Body

Current (A)	Effect
0.001	Can be felt, tingling
0.005	Painful
0.010	Involuntary muscle contractions (spasms)
0.015	Loss of muscle control
0.070	Serious disruption of nervous system, fatal if it lasts more than about one second.

So why is it that some people in their homes just get a little zap, but others are fatally shocked?

- Current depends on the voltage (120V from North American outlets) and the resistance of the conductor.
  - Different peoples’ bodies have different resistances, though for the most part an average person is a pretty good conductor.
  - It also depend on the condition of the person... is their skin dry or did they just get out of the tub?

Completely Dry Skin → 500 000Ω

Salt Water Soaked Body → 100Ω

**Example:** What would the effect be on a person if they stuck their finger into a regular wall outlet under the following conditions... (don’t try this at home, folks!)

- a) with completely dry skin?  
 $I = V / R = (120\text{V}) / (500\,000\Omega) = 2.4 \times 10^{-4} \text{ A}$   
You probably wouldn’t even be able to feel this...
- b) after sitting in a bathtub filled with salt water?

$$I = V/R = (120\text{V}) / (100\Omega) = 1.2 \text{ A}$$

Youch! If this lasts more than a second, that person's probably dead.