

UNIT 6

DANGERS OF ELECTRICITY

6.1 Introduction

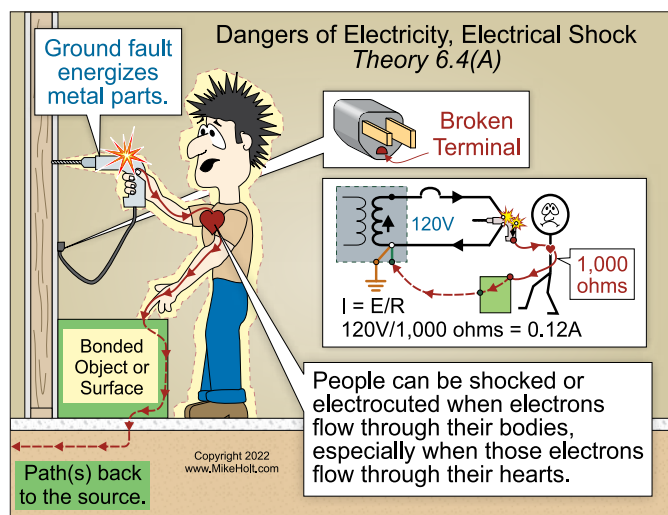
People working in the electrical industry are responsible for ensuring that electrical installations are as safe as possible. In this unit you will learn:

- ▶ the purpose of the *National Electrical Code*
- ▶ how electrical fires are created
- ▶ what electric shock/electrocution are
- ▶ what arc flashes and arc blasts are

6.4 Electric Shock

(A) General. The National Safety Council estimates that approximately 300 people in the United States die each year because of an electric shock from 120V and 277V circuits. For electrical current to flow, there must be a power source and a path for electrons to leave that power source and return to the same power source. People and animals can be shocked or electrocuted when electrons flow through their bodies, especially when those electrons flow through their hearts. ▶Figure 6–3

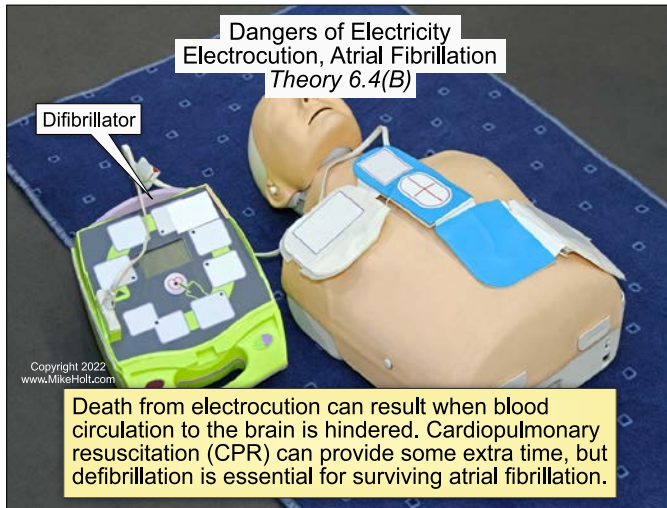
(B) Electric Shock or Electrocution. In less than a second, an individual can go into atrial fibrillation from electrical current when as little as 50/1,000 of an ampere connects with them. An electric shock disrupts the heart's electrical signal, and when that occurs the heart goes into a rapid, ineffective heartbeat of over 350 beats per minute. This is called “atrial fibrillation” and prevents blood from circulating through the body. Death can result in a matter of minutes (electrocution), particularly when blood circulation to the brain is hindered. Cardiopulmonary resuscitation (CPR) can provide extra time, but defibrillation is essential for surviving atrial fibrillation. ▶Figure 6–4



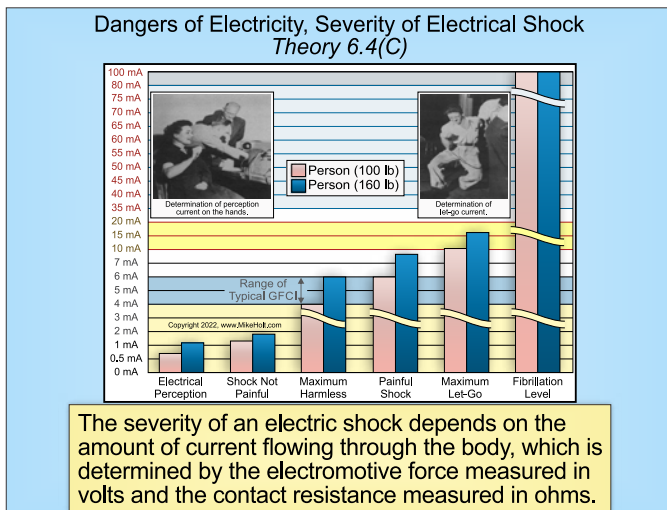
▶Figure 6–3

(C) Severity of Electric Shock. A shock from as little as 30V alternating current for as little as one second can disrupt the heart's electrical circuitry, causing it to go into ventricular fibrillation. The severity of an electric shock depends on the amount of current flowing through the body, which is determined by the electromotive force measured in volts and the contact resistance measured in ohms. The effects of 60 Hz alternating current on an average human include:

▶Figure 6–5



►Figure 6-4



►Figure 6-5

- **Electrical Sensation.** Tingle sensation occurs at about 0.30 mA for an adult female and 0.40 mA for an adult male.
- **Perception Let-Go.** Current over 0.70 mA is very uncomfortable to both genders.
- **Maximum Let-Go Level.** The top let-go threshold level for a female is approximately 10 mA, and about 16 mA for a male. The “let-go threshold” is the current level where we lose control of our muscles, and the electricity causes muscles to contract until the current is removed. In other words, at this point we cannot let go of an energized circuit.
- **Fibrillation Level.** 50 mA for 0.20 seconds (female) and 75 mA for 0.50 seconds (male).

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