Section 3
Burns Caused by Electricity

The most common shock-related, nonfatal injury is a burn. Burns caused by electricity may be of three types: electrical burns, arc burns, and thermal contact burns. Electrical burns can result when a person touches electrical wiring or equipment that is used or maintained improperly. Typically, such burns occur on the hands. Electrical burns are one of the most serious injuries you can receive. They need to be given immediate attention. Additionally, clothing may catch fire and a thermal burn may result from the heat of the fire.

Arc-blasts occur when powerful, high-amperage currents arc through the air. Arcing is the luminous electrical discharge that occurs when high voltages exist across a gap between conductors and current travels through the air. This situation is often caused by equipment failure due to abuse or fatigue. Temperatures as high as 35,000°F have been reached in arc-blasts.

There are three primary hazards associated with an arc-blast.

1. Arcing gives off thermal radiation (heat) and intense light, which can cause burns. Several factors affect the degree of injury, including skin color, area of skin exposed, and type of clothing worn. Proper clothing, work distances, and overcurrent protection can reduce the risk of such a burn.

2. A high-voltage arc can produce a considerable pressure wave blast. A person 2 feet away from a 25,000-amp arc feels a force of about 480 pounds on the front of the body. In addition, such an explosion can cause serious ear damage and memory loss due to concussion. Sometimes the pressure wave throws the victim away from the arc-blast. While this may reduce further exposure to the
thermal energy, serious physical injury may result. The pressure wave can propel large objects over great distances. In some cases, the pressure wave has enough force to snap off the heads of steel bolts and knock over walls.

(3) A high-voltage arc can also cause many of the copper and aluminum components in electrical equipment to melt. These droplets of molten metal can be blasted great distances by the pressure wave. Although these droplets harden rapidly, they can still be hot enough to cause serious burns or cause ordinary clothing to catch fire, even if you are 10 feet or more away.

Five technicians were performing preventive maintenance on the electrical system of a railroad maintenance facility. One of the technicians was assigned to clean the lower compartment of an electrical cabinet using cleaning fluid in an aerosol can. But, he began to clean the upper compartment as well. The upper compartment was filled with live circuitry. When the cleaning spray contacted the live circuitry, a conductive path for the current was created. The current passed through the stream of fluid, into the technician’s arm, and across his chest. The current caused a loud explosion. Co-workers found the victim with his clothes on fire. One worker put out the fire with an extinguisher, and another pulled the victim away from the compartment with a plastic vacuum cleaner hose. The paramedics responded in 5 minutes. Although the victim survived the shock, he died 24 hours later of burns.

This death could have been prevented if the following precautions had been taken:

- Before doing any electrical work, de-energize all circuits and equipment, perform lock-out/tag-out, and test circuits and equipment to make sure they are de-energized.
- The company should have trained the workers to perform their jobs safely.
- Proper personal protective equipment (PPE) should always be used.
- Never use aerosol spray cans around high-voltage equipment.
Electrical Fires

Electricity is one of the most common causes of fires and thermal burns in homes and workplaces. Defective or misused electrical equipment is a major cause of electrical fires. If there is a small electrical fire, be sure to use only a Class C or multi-purpose (ABC) fire extinguisher, or you might make the problem worse. All fire extinguishers are marked with letter(s) that tell you the kinds of fires they can put out. Some extinguishers contain symbols, too.

The letters and symbols are explained below (including suggestions on how to remember them).

A (think: Ashes) = paper, wood, etc.

B (think: Barrel) = flammable liquids

C (think: Circuits) = electrical fires

Here are a couple of fire extinguishers at a worksite. Can you tell what types of fires they will put out?

This extinguisher can only be used on Class B and Class C fires.

This extinguisher can only be used on Class A and Class C fires.

Learn how to use fire extinguishers at work.

However, do not try to put out fires unless you have received proper training. If you are not trained, the best thing you can do is evacuate the area and call for help.
Thermal burns may result if an explosion occurs when electricity ignites an explosive mixture of material in the air. This ignition can result from the buildup of combustible vapors, gasses, or dusts. Occupational Safety and Health Administration (OSHA) standards, the NEC, and other safety standards give precise safety requirements for the operation of electrical systems and equipment in such dangerous areas. Ignition can also be caused by overheated conductors or equipment, or by normal arcing at switch contacts or in circuit breakers.

Summary of Section 3

Burns are the most common injury caused by electricity. The three types of burns are • • •

- electrical burns,
- arc burns, and
- thermal contact burns.
First Aid Fact Sheet

What Should I Do If a Co-Worker Is Shocked or Burned by Electricity?

Shut off the electrical current if the victim is still in contact with the energized circuit. While you do this, have someone else call for help. If you cannot get to the switchgear quickly, pry the victim from the circuit with something that does not conduct electricity such as dry wood. Do not touch the victim yourself if he or she is still in contact with an electrical circuit! You do not want to be a victim, too!

Do not leave the victim unless there is absolutely no other option. You should stay with the victim while Emergency Medical Services (EMS) is contacted. The caller should come back to you afterwards to verify that the call was made. If the victim is not breathing, does not have a heartbeat, or is badly injured, quick response by a team of emergency medical technicians (EMT’s) or paramedics gives the best chance for survival.
Once you know that electrical current is no longer flowing through the victim, call out to the victim to see if he or she is conscious (awake). If the victim is conscious, **tell the victim not to move.** It is possible for a shock victim to be seriously injured but not realize it. Quickly examine the victim for signs of major bleeding. If there is a lot of bleeding, place a cloth (such as a handkerchief or bandanna) over the wound and apply pressure. If the wound is in an arm or leg and keeps bleeding a lot, gently elevate the injured area while keeping pressure on the wound. Keep the victim warm and talk to him or her until help arrives.

If the victim is unconscious, check for signs of breathing. While you do this, move the victim as little as possible. If the victim is not breathing, someone trained in CPR should begin artificial breathing, then check to see if the victim has a pulse. Quick action is essential! To be effective, CPR must be performed within 4 minutes of the shock.

If you are not trained in CPR or first aid, **now** is the time to get trained—**before** you find yourself in this situation! Ask your instructor or supervisor how you can become certified in CPR. You also need to know the location of (1) electricity shut-offs (“kill switches”), (2) first-aid supplies, and (3) a telephone so you can find them quickly in an emergency.