

VII. Attending to Electrical Incident Victims

A. Preparedness

Site personnel should be trained in CPR and first-aid techniques to prepare for possible electrical incidents. CPR training and periodic retraining of site personnel must be carefully planned and documented.

First-aid supplies approved by the consulting physician should be easily accessible when required. The first-aid kit should consist of materials approved by the consulting physician, in a weatherproof container with individually sealed packages for each type of item. The contents of the first-aid kit should be checked weekly to ensure that all supplies are present and in good order.

Plans must be in place for transporting incident victims to a physician or hospital. Recovery of electrical incident victims can be greatly enhanced if they are quickly transported to a burn center or other medical facility that specializes in electrical trauma. Employers should evaluate medical facilities in their area and determine in advance where such victims should be taken and how they will be transported. Emergency telephone numbers and specific instructions should be conspicuously posted. All employees should be thoroughly familiar with the procedures.

Locations of eyewash stations and safety showers must be posted so that they are easily found to cool and flush the burn victim after an incident.

B. Effects of electrical incidents

Electrical incidents and the complexities of the trauma they cause to the human body historically have been surrounded by mystery and lack of understanding. As more knowledge is gained about electrical trauma, strategies for effectively handling the emergency and ways to improve hospital treatment of victims become more apparent. In addition, research suggests ways in which workplace supervisors and responders can help an incident victim's caregivers provide appropriate medical attention.

In the case of an electrical incident, the extent of injury to the victim often is not immediately apparent. Some symptoms might be masked by the more readily apparent thermal effects of the injury (burns). Caregivers must be aware of additional possible biological effects of electric shock.

In an arc-flash or arc-blast energy incident, the victim's skin, ears, eyes, lungs, internal organs, and nervous, muscular, and skeletal systems can be affected not only by the direct effects of electrical current, but also by the following:

- Radiant heat from an electrical arc that produces extremely high temperatures
- Disturbance of the heart's electrical conduction, causing changes in the heart rhythm or possible cardiac arrest
- Barotrauma from the acoustic and vibratory forces around arc-blast
- Inhaled or deposited vapors released through an arc explosion

Incident victims also are subject to the following types of injury related to contact with electricity:

- Low-voltage contact wounds
- High-voltage contact wounds of entry and exit of electrical current
- Burns
- Respiratory difficulties (The tongue might swell and obstruct the airway, or vaporized metal or heated air might have been inhaled.)
- Infectious complications
- Injury to bone through falls, heat necrosis (death of tissue), and muscle contraction (Shoulder joint injuries and fracture of bones in the neck are common injuries caused by muscle contraction.)
- Injury to the heart, such as ventricular fibrillation, cardiac arrest, or stoppage
- Internal organ injuries
- Neurological (nerve) injury
- Injury to the eyes (Cataracts from electrical injury have been reported up to three years after an incident.)

C. Enhancement of chances for recovery

In most electrical incidents, the inability to diagnose the extent of injury at the time of admission to the hospital can delay the patient's treatment. Recovery can be enhanced by more detailed information about the incident, including the system voltage, amount of available current, length of contact with current, and possibility of arc-flash. Recovery can be maximized by transporting the victim as quickly as possible to a burn center or other facility that specializes in treatment of electrical trauma.

Procedures

In response to an electrical incident, the following procedures should be followed immediately:

- Remove the immediate hazard; turn off the power. If you are a witness to an electrical incident, exercise great caution that you do not sustain injury as well. Always assume that the source of electricity is still energized unless you or another qualified person determines that

the power has been turned off. Unless you are using insulated equipment (e.g., voltage-rated gloves, hot sticks, or a rubber blanket) to dislodge a victim, you must delay the rescue effort until the circuit can be interrupted.

Note: Sites must establish a training policy and plan to cover electrical rescue methods, approved rescue devices, and CPR training.

- Realize that speed is essential. The victim's potential for injury increases with contact time. The resistance of the body is mostly in the skin. If the skin breaks down electrically, only the low internal body resistance remains to impede current.
- Call for help. Delegate someone else to get help, if possible. Make sure that an ambulance or emergency medical service is on the way.
- Begin CPR. If the victim's pulse or breathing has stopped, cardiopulmonary resuscitation (CPR) is essential to avoid brain damage, which usually begins in four to six minutes. If CPR is needed, make sure assistance is on the way but do not wait for help to arrive.

Make sure you and the victim are in a safe zone (not in contact with any electrical source and out of reach of any downed or broken wires). If the person is unconscious, begin the CPR sequence.

- Apply first aid to the victim.
 - If the person's clothing is on fire, remind him/her to drop and roll, or tackle him/her, if necessary, to smother the flames.
 - Cool the burn with water or saline for a few minutes or until the skin returns to normal temperature. (For flash-burn victims, safety showers might be the best method, due to the possibility of wide-spread surface burns on the body.) Do not attempt to remove clothing that is stuck to a burn.
 - Remove constricting items such as shoes, belts, jewelry, and tight collars from the victim.
 - Elevate burned limbs to reduce swelling.
 - Handle the victim with care, being aware that he or she might have broken bones or spinal injuries.
 - Treat for shock: maintain body temperature, do not give anything by mouth. Administer high concentrations of oxygen, if available.
 - Keep the victim warm and as comfortable as possible while awaiting transport to the medical facility. Cover him or her with clean, dry sheets or blankets. Cover burn wound(s) with sterile dressings or clean sheets.

Additional Information

After the victim's immediate needs are met, note as many details of the incident as possible. The details can help an incident victim's caregivers provide appropriate medical attention.

It is especially important that hospital personnel know the cause of the victim's injuries. They need to know if the victim had contact with electricity or if arc-flash caused the injuries.

While the victim of electrical contact might suffer some surface burns where the current entered the body, he or she often suffers additional, less visible (internal) damage because of the path of the current through the body.

The flash burn victim is more likely to have greater evident burn damage on the surface of the body, due to the extremely high temperatures from arc-flash. He or she is likely to suffer first, second, and third-degree burns, especially on the face, wrists, ears, back of the head, neck, and ankles. Any skin surface that is not covered adequately by protective clothing or equipment is at risk.

In addition to burns to the skin, the flash burn victim also might have inhaled metal vapor (such as copper) into the lungs or suffered adverse effects (such as damage to the eardrum) due to the pressure wave caused by arc-blast.

Advance Help for Incident Victims

Each site should prepare a checklist in advance that will provide detailed information about an incident (see the sample checklist in the Annex A). This list should be a part of a site's emergency response plan for electrical injuries. This checklist should be readily available on site, and its existence should be communicated to all employees. A completed copy should accompany the victim to the hospital or treatment center, if at all possible.

The information can help to ensure the best possible evaluation and treatment by initial medical caregivers.

VIII. Who Is Responsible for Safety?

In most instances, three distinctly different entities are associated with a project or site: the employer, the employee, and the owner. When discussing responsibility, it is important to understand the existence of these different roles.

- The *employer* can be thought of in terms of a person who represents the *company*. The employer, then, can be the owner of the company