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

or any member of the line management of the organization.

- On the other hand, the *employee* is the electrician or other worker. A first or second line supervisor, then, has two roles. He or she might be a representative of the company, operating as an employer, in addition to being an employee.
- The term *owner* has still a different twist. Rather than a person, the owner is the entity that *owns* the equipment or facility. The owner has a role and responsibility that is somewhat different from either employer or employee.

In The Act, OSHA is chartered to establish requirements for *employers*. It has no jurisdiction to assign responsibilities to employees. Therefore, meeting requirements defined by OSHA is the responsibility of the employer (management of the company). It is the employer who must:

- provide for a safe workplace
- establish and implement a safety program
- establish an enforcement policy to ensure that employees follow established practices

In the case where a *contractor* is performing work on a site or facility owned by someone else, some inherent responsibilities must be assumed by the *owner*. Perhaps the most important of those responsibilities is to make sure that the contractor is fully apprised of all hazards existing that might impact the work.

National consensus standards are not similarly constrained. As a result, *NFPA 70E* also assigns responsibility. Responsibility assigned to the employer is the same as in 29 CFR 1910, Subpart S. The employer's responsibilities include the development and implementation of an electrical safety program, and the development of safety procedures and guidelines for an employee safety training program on proper implementation of those procedures.

*NFPA 70E* suggests that employees are responsible for implementing the program and procedures provided by the employer. The standard goes on to suggest that although responsibility of employer and employee are distinct and clear, the most effective process is to establish a close working relationship between employer and employee in which each has value for the other as they work together.

## IX. Electrical Incident and Hazard Prevention

### *A. Not working on or near*

According to OSHA 1910.333(a)(1) and *NFPA 70E* 130.1, workers shall not work on or near exposed live parts except for two demonstrable reasons:

1. De-energizing introduces additional or increased hazards (such as cutting ventilation to a hazardous location) or
2. Infeasible due to equipment design or operational limitations (such as when performing diagnostics and testing for startup or troubleshooting and this work can only be done when circuits are energized).

So, for circumstances other than the two exceptions, the circuits/equipment shall be put in **an electrically safe work condition** prior to commencing electrical work.

### *B. Electrically safe work condition*

An *electrically safe work condition* is a concept first introduced in *NFPA 70E*. This term is now defined in *NFPA 70E* Definitions and the steps to put a circuit in an electrically safe work condition are detailed in 70E-120.1.

The concept embraces several ideas and suggests that six different steps must be taken before an electrical circuit is safe to approach or touch without PPE. Electricians and other workers tend to believe that a circuit is safe to approach or touch if it is de-energized. The fact that injuries continue rather frequently, based upon this belief, proves that additional steps are needed.

Some people also believe that if a lock and tag are placed on a labeled disconnecting means, the equipment is safe to work on. However, other issues must be considered. For example, labels can be marked incorrectly, equipment can be supplied from more than one source, or a temporary conductor could have been installed. It also is feasible that an unrelated energized circuit conductor could contact the conductor leading to the work area.

In other instances, workers outside the area or complicated systems can affect the work area. Often it is assumed that if the contact point is tested for absence of voltage, the point is safe for executing the task. But this only proves that no voltage is present at the time of the voltage test. Voltage could be absent due to a process interlock being open, or a second source of energy could simply be turned off for the moment. Avoiding incidents and injury requires training, planning, and preparation.

*NFPA 70E* 120.1 requires a process of six discrete and independent steps be executed prior to declaring the existence of an electrically safe work condition. Only after the following steps have been executed can work begin without possible exposure to an electrical hazard.

1. Determine all possible sources of energy. Review all reliable and up-to-date drawings, documentation, and identification tags and labels. Drawings must include ***all*** energy sources, including temporary and back up power sources.