## Electrical Safety

1. **Purpose**

This section provides information and requirements for basic electrical safety. Work operations shall be conducted in a manner which, at a minimum, complies with applicable health and safety laws and regulations, including OSHA 29 CFR 1910.301-.399, Subpart S Electrical, and National Fire Protection Agency (NFPA) 70E *“Standard for Electrical Safety in the Workplace*”*.*

1. **Safe Work Practices**

Safety-related work practices will be employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits which are or may be energized. The specific safety-related work practices will be consistent with the nature and extent of the associated electrical hazards and as follows:

* Non-qualified personnel are prohibited from working on or near exposed energized electrical circuits or systems. Non-qualified personnel will be trained in the recognition and avoidance of electrical hazards in the work area.
* Any exposed electrical systems will be de-energized and lockout/tagout procedures adhered to before unqualified personnel are allowed access to the work areas. The circuits energizing the parts shall be locked out, tagged out or both. Conductors and parts of electrical equipment that have been deenergized but not been locked or tagged out shall be treated as live parts.
* Only qualified persons may work on electric circuit parts or equipment that has not been deenergized. Such persons shall be made familiar with the use of special precautionary techniques, PPE, Insulating & shielding materials and insulated tools.
* If work is to be performed near overhead lines, the lines will be de-energized and grounded, or other protective measures such as insulating shielding will be provided before work is started.
* Vehicles or equipment working near overhead lines will be required to maintain a safe working distance of at least 10 feet. If the voltage is higher than 50 kV, the clearance will be increased 4 inches for every 10 kV over that voltage.
* Employees may not enter spaces containing exposed energized parts or work on energized parts unless illumination is provided that enables the employee to perform the work safely. Employees may not reach blindly into areas which may contain energized parts.
* When an employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed energized parts the employee will use, protective shields, protective barriers, or insulating materials as necessary to avoid inadvertent contact with these parts. Doors, hinged panels, and the like will be secured to prevent their swinging into an employee and causing the employee to contact exposed energized parts.
* Conductive materials and equipment such as long dimensional conductor objects will be handled in a manner to prevent them from contacting exposed energized conductors or circuit parts, or will be shielded to prevent conduction of electrical energy. Conductive articles of jewelry and clothing (such as watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) may not be worn if they might contact exposed energized parts while performing work.
* Portable ladders will have nonconductive side rails if they are used where the employee or the ladder could contact exposed energized parts. The employee will ensure that the placement of any ladder will allow a safe working distance from any energized parts or equipment.
* Synthetic clothing such as nylon or polyester should not be worn. Clothing worn while working on electrical systems should meet the risk requirements of the system being worked on and at a minimum be flame-resistant (cotton).

1. **Approach Distances**

When an unqualified person is working in an elevated position near overhead lines, the location shall be such that the person and the longest conductive object he or she may contact cannot come closer to any unguarded, energized overhead line than the following distances:

* 10 ft. for voltages to ground 50 kV or below.
* 10 ft. for voltages to ground over 50 kV. Add 4 inches of distance for every 10 kV over 50 kV.

When an unqualified person is working on the ground in the vicinity of overhead lines, the person may not bring any conductive object closer to unguarded, energized overhead lines than:

* 10 ft. for voltages to ground 50 kV or below.
* 10 ft. for voltages to ground over 50 kV. Add 4 inches of distance for every 10 kV over 50 kV.

When a qualified person is working in the vicinity of overhead lines, whether in an elevated position or on the ground, the person may not approach or take any conductive object without an approved insulating handle closer to exposed energized parts unless:

* The person is insulated from the energized part (gloves, with sleeves if necessary, rated for the voltage involved are considered to be insulation of the person from the energized part on which work is performed); or
* The energized part is insulated both from all other conductive objects at a different potential and from the person; or
* The person is insulated from all conductive objects at a potential different from that of the energized part.

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| **Approach Distances for Qualified Employees – Alternating Current** | |
| **Voltage Range (Phase to Phase)** | **Minimum Approach Distance** |
| 300V and less | Avoid contact |
| Over 300V, not over 750V | 1 ft 0 in (30.5 cm) |
| Over 750V, not over 2 kV | 1 ft 6 in (46 cm) |
| Over 2 kV, not over 15 kV | 2 ft 0 in (61 cm) |
| Over 15 kV, not over 37 kV | 3 ft 0 in (91cm) |
| Over 37 kV, not over 87.5 kV | 3 ft 6 in (107 cm) |
| Over 87.5 kV, not over 121 kV | 4 ft 0 in (122 cm) |
| Over 121 kV, not over 140 kV | 4 ft, 6 in (137 cm) |

1. **Ground-fault circuit interrupters (GFCI)**

* Ground-fault protection will be provided for personnel on construction sites on all 120-volt single phase, 15 and 20 ampere receptacle outlets, which are not a part of the permanent wiring and which are in use by employees.
* Ground fault circuit interrupters will be used when an outlet is near a water source, or when damp or wet conditions exist and portable electrical equipment is being used.
* GFCIs shall be tested periodically to ensure their operability.

1. **Training**

The degree of training provided will be determined by the employee's respective job assignments.

Qualified employees who are allowed to work within the Limited Approach Boundary shall, at a minimum, be trained in and familiar with the skills and techniques necessary to:

* Distinguish exposed energized electrical conductors and circuit parts from other parts of electric equipment.
* To determine the nominal voltage of exposed energized electrical conductors and circuit parts.
* The approach distances and the corresponding voltages to which they will be exposed.
* The decision making process necessary to determine the degree and extent of the hazard and the personal protective equipment and job planning necessary to perform the task safely.

All other employees who may face a risk of injury due to electric shock or other electrical hazards will also be trained in and familiar with the safety related work practices and approach distances that pertain to their respective job assignments. Employees shall be trained to identify and understand the relationship between electrical hazards and possible injury.

Documentation shall be made when the employee demonstrates proficiency, be maintained for the duration of the employee's employment, and contain each employee's name and date of training.