

Electrical Safety

Electrically powered equipment can pose a significant hazard to workers, particularly when mishandled or not maintained. Many electrical devices have high voltage or high power requirements, carrying even more risk.

Electrical Shock Hazards

The major hazards associated with electricity are electrical shock, fire and arc flash. Electrical shock occurs when the body becomes part of the electric circuit, either when an individual comes in contact with both wires of an electrical c

Electrical Safety-Related Work Practices

Only qualified workers who have been trained in the avoidance of electrical hazards are permitted to work on or near exposed energized parts. Safety related work practices are employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contact when work is performed near or on equipment or circuits which are or may be energized. The specific safety-related work practices must be consistent with the nature and extent of the associated electrical hazards.

Qualified Personnel vs. Unqualified Personnel

For the purposes of electrical safety related work practices, there are two types of employees in the work place that may come in contact with electrical equipment on a jobsite: qualified and unqualified. A Qualified employee is defined as a worker who

- Has been trained to avoid electrical hazards when working on or near exposed energized parts.
- Is familiar with the safety related work practices as required by OSHA standards.
- Is able to distinguish exposed live parts of electrical equipment.
- Is knowledgeable of the skills and techniques used to determine the nominal voltages of exposed parts and components.

An Unqualified employee is defined as a worker who has little or no training regarding electrical hazards. Even though unqualified persons should not be exposed to energized parts, they should be provided with information and training necessary to perform their job in a safe manner and understand the following:

- Be familiar with any electrical hazards in the workplace.
- Understand procedures to follow and to protect themselves when they work around electricity.
- Understand which tasks that can only be performed by qualified workers (e.g. maintenance and repairs).
- Know when and how to report electrical problems.
- Know what to do in the event of emergency involving electricity.
- Know how to inspect electrical tools and equipment before use to make sure insulation and wiring are in good condition.

Live parts to which an employee may be exposed must be deenergized before the employee works on or near them unless deenergizing the parts introduces additional or increased hazards or is unfeasible due to equipment design or operational limitations. Examples of increased or additional hazards include interruption of life support equipment, deactivation of emergency alarm systems, shutdown of hazardous location ventilation equipment, or removal of illumination for an area. Live parts that operate at less than 50 volts to ground need not be deenergized if there are no increased exposures to electrical burns or to explosions due to electric arcs

Working On or Near Energized Circuits

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Deenergized Parts

When employees work on deenergized parts or near enough to them to expose the employees to any electrical hazard they present, the following safety related work practices must be followed:

- Treat as energized any conductors and parts of electrical equipment that have been deenergized, but have not been properly locked out or tagged.
- While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts shall be locked out or tagged or both. In addition, electrical hazards must be controlled; a qualified person must test the circuit to verify deenergization from all voltage sources.
- Safe procedures for deenergizing circuits and equipment must be determined before circuits or equipment are deenergized. All electric energy sources must be disconnected. Control circuit devices, such as push buttons, electric switches, and interlocks must not be used as the sole means of deenergizing circuits or equipment. Interlocks must not be used as a substitute for lockout and tagging procedures.

Energized Parts

Employees are considered working on or near exposed energized parts when working on exposed live parts either by direct contact or contact by means of tools or materials or when working near enough to energized parts to be exposed to any hazard they present. Only qualified persons are permitted to work on electric circuit parts or equipment that have not been deenergized (lockout/tag out). Qualified persons are capable of working safely on energized circuits and are familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.

Approach distances for qualified person to alternating current

Voltage Range (Phase to Phase)	Minimum Approach Distance
300V and less	Avoid contact
Over 300V, not over 750V	1 foot
Over 750V, not over 2kV	1 ft. 6 in.
Over 2kV, not over 15kV	2 feet
Over 15kV, not over 37kV	3 feet
Over 37kV, not over 87.5kV	3 ft. 6 in.
Over 87.5kV, not over 121kV	4 feet

Overhead Lines

When work is to be performed near overhead lines, the lines must be deenergized and grounded, or other protective measures taken before the work is started. Such protective measures, such as guarding, isolating or insulating, shall prevent the qualified person performing the work from contacting the lines with any part of their body or indirectly through conductive material, tools, or equipment.

Unqualified persons working in an elevated location near overhead lines are not allowed to come closer or to handle the conductive objects which may contact or come closer to any unguarded, energized overhead line than the following distances:

Voltage to Ground	Distance
50kV or below	10 feet
Over 50kV	10 feet (plus 4 in. for each 10kV over 50kV)

Unqualified persons working on the ground in the vicinity of overhead lines are not allowed to bring a conductive object or any insulated object which does not have the proper insulating rating closer to unguarded, energized overhead lines than the distance specified above.

Qualified persons working in the vicinity of overhead lines, whether in an elevated position or on the ground, are not allowed to approach or take any conductive object without an approved insulating handle closer to exposed energized parts than in the table above, Approach Distance for Qualified Persons, unless a.) The person is insulated from the energized part by using the proper gloves, with sleeves if necessary, rated for the voltage involved, or b.) The energized part is insulated from all the person, or c.) The person is insulated from all conductive objects at the potential different from the energized part.

Electrical Safety Protective Methods

Use of Protective Equipment

Employees working in areas where there are potential electrical hazards must be provided with and use electrical protective equipment appropriate to the hazard.

This Personal Protective Equipment provides protection after an arc flash incident has occurred and should be viewed as the last line of protection. Selection of the appropriate PPE for the task to be performed is based upon hazard categories found in _____ which should appear on labeled electrical panels and equipment.

The following table is provided as a quick reference. Workers must ensure that they have reviewed all appropriate safety requirements before work begins.

Personal Protective Equipment Requirements for Arc Flash Protection

Category	Energy Level	PPE Requirements
0	0.4 cal/cm ²	Non-melting or untreated natural fiber
1	1.2 cal/cm ²	Fire Resistant (FR) shirt and pants
2	4.0 cal/cm ²	Fire Resistant shirt and pants