

Electrical Safe Work Practices Plan

This safety procedure provides guidelines for safely working around electrical hazards. It includes provisions for training, lockout requirements, and specific types of work practices and the required precautionary practices when using portable electric equipment.

It is the responsibility of each exposed employee's immediate supervisor to ensure that the employee has received the training necessary to safely perform his or her duties. This training will be given via classroom and on-the-job instruction and is to be documented. Exposed employees shall be trained in and familiar with the safety related work practices required by MIOSHA General Industry Standards Part 40, and safety related work practices contained within the National Electric Code as they pertain to their respective job assignments. Additional training requirements for Qualified Persons are also mandated.

Employees will be trained in specific hazards associated with their potential exposure. This training will include isolation of energy, hazard identification, premises wiring, connection to supply, generation, transmission, distribution installations, clearance distances, use of personal protective equipment and insulated tools, and emergency procedures.

Qualified Person - Those persons who are permitted to work on or near exposed energized parts and are trained in the applicable electrical safe work practices.

Qualified Persons shall, at a minimum, be trained in and familiar with:

- ▶ The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
- ▶ The skills and techniques necessary to determine the nominal voltage of exposed live parts.
- ▶ The clearance distances specified in Table I and the corresponding voltage to which the qualified person will be exposed.

All electrical energy sources must be locked out when any employee is exposed to direct or indirect contact with parts of fixed electrical equipment or circuits.

Safety related work practices will be used to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts. Safety related work practices will be consistent with the nature and extent of the associated electrical hazards.

Specific types of work practices covered by this safety procedure include:

- ▶ Working with de-energized parts
- ▶ Working with energized parts

- ▶ Vehicular and mechanical equipment near overhead lines and underground lines
- ▶ Illumination
- ▶ Conductive materials and equipment
- ▶ Portable Ladders
- ▶ Housekeeping

Portable Equipment

All portable electric equipment will be handled in such a manner that will not damage or reduce service life. Flexible cords connected to equipment may not be used for raising or lowering equipment and will not be used if damage to the outer insulation is present. Additionally, visual inspections are required

and unauthorized alterations of the grounding protection are not allowed to ensure the safety of employees. Prior to each shift, a visual inspection will be performed for external defects and for possible internal damage. Attachment plugs and receptacles may not be connected or altered in a manner that would prevent proper continuity of the equipment grounding conductor. In addition, these devices may not be altered to allow the grounding pole of a plug to be inserted into slots intended for connection to the current-carrying conductors.

Portable electric equipment and flexible cords used in highly conductive work locations or in job locations where employees are likely to contact water or conductive liquids shall be approved by the manufacturer for those locations. The hazardous locations that employees should be aware of include, wet locations and locations where combustible or flammable atmospheres are present.

For wet locations, employees' hands will not be wet when plugging and unplugging energized equipment. Energized plug and receptacle connections will be handled only with protective equipment if the condition could provide a conductive path to the employee's hand (if, for example, a cord connector is wet from being immersed in water). In addition, ground-fault circuit interrupter (GFCI) protection is required for some equipment/locations and is also recommended for use in all wet or highly conductive locations.

For combustible/flammable atmospheres, all electric equipment and wiring systems in classified locations must meet The National Electric Code requirements for that particular classification.

Protective Equipment

Employees working in confined areas such as electrical vaults or any other area where there are potential electrical hazards will be provided with and use protective equipment that is appropriate for the work to be performed.

Examples of Personal Protective Equipment (PPE) which might be needed for protection against electric shock include but are not limited to:

- ▶ Nonconductive hard-hats, gloves, and foot protection or insulating mats
- ▶ Eye and face protection whenever there is danger from electric arcs or flashes
- ▶ Insulated tools or handling equipment
- ▶ Protective shields and barriers to protect against electrical shock and burns

Additionally, other ways of protecting employees from the hazards of electrical shock will be implemented, including insulation and guarding of live parts. The insulation must be appropriate for the voltage and the insulating material must be undamaged, clean, and dry. Guarding prevents the employee from coming too close to energized parts. It can be in the form of a physical barricade or it can be provided by installing the live parts out of reach from the working surface.

Conductive Materials and Equipment

Conductive materials and equipment (e.g., hand tools) will be handled to prevent contact with exposed energized conductors or circuit parts. Conductive articles of jewelry and clothing (such as watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) will not be worn.

De-energized Parts

All electrical parts exceeding 50 volts will be de-energized before an employee works on or near equipment unless:

- ▶ The de-energizing creates a more hazardous situation
- ▶ The equipment, by design, cannot be shut down
- ▶ The decision to work without de-energizing shall be made by management and documented before work begins

When any employee is exposed to direct or indirect contact with parts of fixed electrical equipment or circuits which have been de-energized, the electrical energy source will be locked out.

Energized Parts

If work must be performed while equipment is energized or if de-energizing is not feasible, additional safety measures will be taken to ensure the safety of the qualified employee and any

other persons who may be exposed. Protection from energized parts will be suitable for the type of hazard involved. Exposed energized parts in areas accessible to the public shall be continuously protected by an authorized attendant. In areas not accessible to the public, employees shall be protected from exposed energized parts by the use of signs or tags. In addition to signs or tags, barricades shall be used where necessary to limit access to areas with exposed energized parts.

Only Qualified Persons will be allowed to perform work directly on energized parts or equipment. Qualified Persons will be capable of working safely on energized circuits and will be familiar with special precautionary techniques, personal protective equipment, insulating and shielding materials and insulated tools. Qualified Persons must also have received the training required in this safety procedure.

Illumination

Employees will be provided with adequate light to work on energized equipment or equipment will be relocated to ensure adequate light is available.

Portable Ladders

Portable ladders will have nonconductive surfaces if they are used where the employee or the ladder could be exposed to electrical shock hazards.

Reclosing Circuits

If circuits are tripped using a protective device such as ground fault circuit interrupter (GFCI), power will not be restored until the reason for the interruption is determined and corrected. Fuses or breakers will not be replaced or reset until it is determined that the circuit is safe to operate. Fuses will not be replaced with higher rated fuses or with makeshift devices to bypass circuit protection as designed. Problems will be identified and promptly repaired by a qualified person.

Vehicular and Mechanical Equipment Near Overhead Power Lines

Overhead power lines will be de-energized and grounded before any work is performed by any vehicle or mechanical equipment near the energized overhead power lines. If the overhead lines can not be de-energized, then the vehicle or mechanical equipment will be operated so that a clearance of 10

feet is maintained. If the voltage of the overhead line exceeds 50 kV, the distance will be increased 4 inches for every 10 kV increase in power. If lines are protected with properly rated insulating devices, the distance may be decreased. If the equipment is an aerial lift insulated for the voltage involved and if the work is performed by a Qualified Person, the clearance may be reduced to a

distance given in Table I. If protective measures such as guarding or isolation are provided, these

measures must protect the employee from contacting such lines directly with any part of the body or indirectly through conductive materials, tools, or equipment.

Electrical Equipment/Machinery

All electrical equipment and machinery must be grounded effectively so that there is no potential difference between the metal enclosures. Use the voltage detector to find discrepancies and other test equipment to determine the corrective action required. Disconnects should be easily identified with the specific machinery they shut off. Disconnects should also be accessible near the machinery for use in an emergency. The disconnects should be activated periodically to be sure they are operable. All electrical connections to the equipment must be secure so that no cord or cable tension will be transmitted to the electrical terminals within the equipment. The wiring installation should be such that it is protected from damage at all times

GFCI Protection

Generally, GFCI protection is not required by the NEC on a retroactive basis. Where there is an employee exposure to potential line-to-ground shock hazards, GFCI protection should be provided. This is especially important in work areas where portable electrical equipment is being used in wet or damp areas in contact with earth or grounded conductive surfaces.

Wiring

Temporary wiring that is being used on a permanent basis should be replaced with fixed wiring. Conduit and/or cable systems must be protected from damage by vehicles or other mobile equipment. All fittings and connections to junction boxes and other equipment must be secure. No exposed wiring can be allowed. Check for missing knockouts and cover plates. Jerry-rigged splices on flexible cords and cables should be correctly repaired. Electrical equipment should be installed in a neat and professional manner. Check for damaged insulation on flexible cords and pendant drop cords.

**Table I: Approach Distance For Qualified Employees
Alternating Current**

300V and less -----	Avoid Contact
Over 300V, but less than 750V-----	1 ft. 0 in. (30.5 cm)
Over 750V, but less than 2kV-----	1 ft. 6 in. (46 cm)
Over 2kV, but less than 15kV-----	2 ft. 0 in. (61 cm)
Over 15kV, but less than 37kV-----	3 ft. 0 in. (91 cm)
Over 37kV, but less than 87.5kV-----	3 ft. 6 in. (107 cm)
Over 87.5kV, but less than 121kV-----	4 ft. 0 in. (122 cm)
Over 121kV, but less than 140kV-----	4 ft. 6 in. (137 cm)