

Electrical Safety

1 PURPOSE

This applies to all mine employees and mine contractors. The purpose of this is to ensure that electrical hazards are recognized and controlled through identification of roles and responsibilities, purchasing and use, grounding, inspections, electrostatic grounding, power lines, work on live equipment, safe design and control, lightning detection and protection, electric hand tools, training and qualifications, and audits and reviews.

2 DEFINITIONS

Cable - Is a conductor with insulation, or a stranded conductor with or without insulation and other coverings (single conductor cable), or a combination of conductors insulated from one another (multiple conductor cable).

Clearance Distance - It is the minimum distance between the overhead power line and any equipment or machine and the ground:

- Line voltage not exceeding 66 kV, minimum safe distance is 3.0 meters/9 feet.
- Line voltage exceeding 66 kV, minimum safe distance is 5.0 meters/ 15 feet.
- The minimum distance from an overhead power line to the ground shall not be less than: 6 meters/ 18 feet across public and normal roads for lines not exceeding 300 volts AC (600 volts DC)
- 5.0 meters/ 15 feet across other roads for lines not exceeding 300 volts AC (600 volts DC)
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Complete assessment against NFPA 70E Standard for Electrical Safety in the Workplace - NFPA 70E, titled “Electrical Safety in the Workplace,” is the heart of U.S. arc flash regulations. It outlines the specific practices and standards to be followed in protecting a workplace from arc flash and other electrical hazards.

Conductor - Is a material, usually in the form of a wire, cable, or bus bar, used for carrying an electrical current.

De-energized - Means to be free from any electrical connection to a source of potential difference and from electric charge; not having a potential different from that of the earth.

Energized - Means to be electrically connected to a source of potential difference, or electrically charged so as to have a potential significantly different from that of earth in the vicinity.

Energized Electrical Work - Is repair, maintenance, troubleshooting, or testing on electrical circuits, components, or systems while energized (i.e., live). Only Qualified Electrical Workers are permitted to work on energized circuitry of 50 volts to ground or greater. Repair and maintenance can only be completed using an Energized Electrical Work Permit.

Energy Isolating Device - Is a physical device that prevents the transmission or release of energy, including, but not limited to, the following: a manually operated electric circuit breaker, a disconnect switch, a manually operated switch, a slide gate, a line valve, blocks, and any similar device with a visible indication of the position of the device. (Push buttons, selector switches, and other control circuit type devices are not energy isolating devices).

Energized Electrical Work Permit - Required when working on energized electrical conductors or circuit parts that are not placed in an electrically safe work condition (de-energized and tested).

Exposed - means not isolated or guarded.

Ground - Is a connection between an electric current circuit or equipment and the earth or to some conducting body that serves in place of the earth.

Group Lock-out - The group lockout procedure is used to lock out more than one piece of equipment when isolation of multiple pieces of equipment is necessary to assure employee safety.

Guarded - Means covered, fenced, enclosed, or otherwise protected, by means of suitable covers or casings, barrier rails or screens, mats, or platforms, designed to minimize the possibility, under normal conditions, of dangerous approach or accidental contact by persons or objects.

Insulated - Means to be separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current.

Insulation - Is that which is relied upon to insulate the conductor from other conducting parts or from ground.

Lockout / Tagout - Is a positive means for rendering electrical equipment inoperative and a means to warn others that the equipment has been locked out and de-energized.

Lines - Are conductors used to transmit electric energy and their necessary supporting structures.

Overhead Power Line - Any above ground live or dead conductor that is not fully voltage sheathed or enclosed. Poles, guy wires, underground anchors and any such structural member that contributes to the structural integrity of the power line shall be included as part of the power line.

Qualified Electrical Worker - Is a qualified person trained and knowledgeable of construction and operation of equipment or a specific work method and is trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method. They are familiar with the proper use of the special precautionary techniques, PPE, including arc-flash, insulating and shielding materials, and insulated tools and test equipment. A person can be considered qualified with respect to certain equipment and methods but is unqualified for others. An employee who is undergoing on-the-job training and who, in the course of such training, has performed duties safely at his or her level of training and who is under the direct supervision of a qualified person shall be considered to be qualified.

3 RESPONSIBILITIES

General Foreman/ Superintendents

- A current record of personnel authorized to isolate the equipment shall be maintained.
- Ensure that all flow charts and plans detailing systems are available for the supervisor.

Foreman/ Supervisor

- Ensure that all employees are trained and take actions as documented in the task procedure.
- Complete pre-task briefing and hazard assessment before the task is started.
- Complete required permits and sign it accepting responsibility for the safe execution of the work.
- Shall remain on the work site or assign a responsible supervisor to provide oversight for all people and equipment activities.
- Shall take immediate corrective measures, including stopping work, to correct hazardous conditions.
- Utilization of protective safety systems such as warning signs and barricades.

HSLP Manager

- Ensure compliance with this standard through audits.
- Ensure regular and routine inspections are conducted throughout the work being undertaken
- In cooperation with designated site personnel establish a schedule for the facility to implement work standards to protect workers from arc flash/blast hazards while working on or near electrical hazards.

All Employees

- Are responsible to comply with the requirements of this procedure.
- Attend the pre-task briefing.
- Must notify the responsible area supervisor of any potential unsafe condition, and alert others in the area.

4 STANDARD REQUIREMENTS

Purchasing and Intended Use

- Purchasing specifications of all electrical equipment, including welding equipment, shall define and ensure compliance with the US Electrical Code
- Only equipment that complies with the above specifications shall be purchased and used on site.
- Electrical equipment shall only be used for the purpose in which it was designed and intended, and in accordance with the manufacturer's instructions.
- A formal Risk Assessment of the designated equipment and work area will be undertaken prior to the purchase and installation of electrical components in accordance with standard operating procedures.

Grounding – Earth Leakage Protection

- Grounding Earth leakage protection shall be installed on all circuits where there is a risk of persons coming into contact with energized equipment.
- Grounding systems shall be tested in accordance with the more stringent of governmental standards, local standards, or site requirements.
- Records shall be maintained of all grounding tests conducted.
- Continuity/resistance testing and record keeping shall be conducted in accordance with the more stringent of governmental standards, local standards, or site requirements.
- Grounding shall be installed in every circuit where risk of contact between people and electrical lines exist.
- Grounding shall meet or exceed MSHA or NFPA standard requirements.

Inspection Testing and Maintenance

- Facilities shall implement a formal system of inspection, testing and maintenance for electrical equipment (major and minor). The frequency of inspections and methods of testing shall be in accordance with the more stringent of governmental standards, local standards, or site requirements.
- The results of inspections and tests conducted shall be documented and recorded.
- Equipment which fails testing shall be tagged Out of Service.
- All Inspection, testing and maintenance activities shall be designed to progress in a manner to meet or exceed MSHA or NFPA standards for electrical safety in the workplace.

Electrostatic Grounding

- Grounding of sources of electrostatic energy and natural hazards shall be provided for all situations where sparking may present a hazard, or for structures which may be subject to a lightning strike.
- Grounding shall be tested and inspected regularly.

Power Lines

- Warning signs and/or other visual indicators shall be posted at all road crossings where there is a potential for contact with overhead power lines (e.g. by cranes, mobile work platforms, etc.).
- Power line to ground distances shall be posted at each road crossing.
- Facilities shall have a permit system controlling work around overhead power lines.
- Facilities shall have a permit system controlling excavations with the potential for unearthing buried power lines.
- Procedures shall be in place for work on energized power lines. Work on energized power lines shall only be conducted by competent personnel.

Work on Electrical Equipment

- Workers near energized, or potentially energized electrical circuitry of fifty (50) volts to ground or greater, shall be trained in energized electrical safe work practices and procedures necessary for their safety and retrained as necessary. Workers must be able to recognize the hazards of electricity, know the safety-related work practices and procedures for protection against electrical hazards, and be able to recognize potential hazards and injuries. They must also be trained on the care, use, inspection and testing of PPE.
- All electrical equipment shall be positively locked out, tested to be de-energized, appropriately tagged, and disconnected prior to the commencement of any work on the equipment, where possible. If not possible, a permit system must be in place to address the hazards and confirm that the appropriate controls are functioning.
- HIGH VOLTAGE- High voltage switching (600 volts nominal or higher per 2008 US National Electric Code) shall be done using a formalized plan. All personnel involved in high voltage work must have required protective equipment to protect against high-flash arcing. Only qualified electrical workers authorized by the department electrical supervisor/foreman or designee.
- There shall be an arc flash protection program in place to determine incident energies and define the appropriate PPE and associated procedures to mitigate a hazard. All facilities shall undertake arc flash studies and implement NFPA minimum protective clothing standard.

Safe Design and Control of Electrical Hazards

Facilities shall establish the following minimum requirements of electrical safety in the design and control of permanent and temporary electrical installations or locations:

- Labeling of breakers, panels, etc.
- All labeling of breakers, panels and electrical components shall meet or exceed MSHA and NFPA requirements post review and implementation except for installations underground where incident energy levels change often and labeling is not accurate.
- Protection of fixed and temporary electrical installations from water, process fluids, the elements, and other conductive materials
- Grounding protection against natural hazards such as lightning
- Conductivity design specifications for materials of construction which minimize or eliminate the hazards of electrical potential
- Electrical installations near flammable materials shall be evaluated, designed, and installed to control the hazard of explosion and fire.
- Electrical boxes, conduits, wiring, trays, and junction points shall be designed and constructed to a local set of electrical standards that are also utilized for compliance review in the first instance.

- Current schematics and drawings of electrical circuits shall be maintained and available at all times.
- Signs warning of electrical hazards, including underground electrical hazards shall be posted and visible in accordance with site risk assessment and signage protocol.

Procedures shall be in place that control access to, work in and the maintenance of high voltage areas and include but are not limited to the following:

- Practices controlling entry to high voltage areas to authorized personnel only
- Identifying required PPE, the wearing of fire and flash protective clothing, and rules/practices necessary when working in high voltage areas
- Requirements controlling housekeeping and the use of high voltage areas for storage

Electric Hand Tools

- Procedures shall be in place to control the use, care and inspection of electrical hand tools to prevent electric shock.

Training and Qualifications

Employees who are required to work on electrical equipment (including newly hired employees) shall be trained and be assessed competent in the following:

- Work Permit system
- MSHA standard's or relevant equivalent jurisdictional codes
- Site specific procedures (e.g. high voltage switching)
- The use and inspection of personal protective equipment, including the wearing of fire and flash protective clothing
- Emergency response procedures
- First aid treatment of electrical shock (including CPR & AED)
- Training plans for induction, refresher, and task specific training shall include electrical safety and lightning safety, where appropriate.
- Electrical testing and maintenance work shall be conducted only by competent personnel in accordance with the relevant statutory requirements for qualifications.
- All training shall be documented and maintained in the employee training file.