

**Union County Public Schools
Facilities Department**

**Electrical
Safe Work Practices**

Purpose

In accordance with OSHA Standards 1910.331-335, safety-related work practices shall be used by Union County Public Schools employees to prevent electric shock 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 shall be consistent with the nature and extent of the associated electrical hazards.

This program covers servicing and maintenance of machines and equipment which have not been placed in an electrically safe working condition. Conductors and parts of electric equipment that have been de-energized but have not been shut down per lockout/tagout procedures are not considered electrically safe.

Definitions

Qualified Persons – Employees permitted to work on or near exposed energized parts

Unqualified Persons – Employees with little or no such electrical training

Policy

The provisions of this policy cover electrical safety-related work practices for both qualified persons and unqualified persons working on, near, or with the following installations:

- Premises Wiring – Installations of electric conductors and equipment within or on buildings or other structures, and on other premises such as yards, parking, and other lots.
- Wiring for Connections to Supply – Installations of conductors that connect to the supply of electricity.
- Other Wiring – Installations of other outside conductors on the premises.

The content of this policy covers training requirements, procedures for electrical safety-related work practices, equipment use and inspection, personal protective equipment, and proper communication.

Training

The training requirements of this program apply to employees who face a risk of shock that is not reduced to a safe level by the installation as required by the National Electric Code and 29CFR1910 Subpart S, Electrical. Employees who may be affected by such a risk and shall be trained are:

- Electricians
- Electronics Technicians
- HVAC Technicians

Other employees who also may reasonably be expected to face comparable risk of injury due to electric shock or other electrical hazards must also be trained.

Employees who are covered by the scope of this policy, but who are not qualified persons, shall also be trained in and familiar with any electrically related safety practices not specifically addressed but which are necessary for their safety.

The training required shall be of the classroom and/or on-the-job type.

Qualified persons shall, at a minimum, be trained in and familiar with the following:

1. The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
2. The skills and techniques necessary to determine the nominal voltage of exposed live parts.

Procedures

Selection and Use of Work Practices

Safety-related work practices shall be used 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 shall be consistent with the nature and extent of the associated electrical hazards.

1. De-energized parts – Live parts to which an employee may be exposed shall be de-energized before the employee works on or near them, unless the employer can demonstrate that de-energizing introduces additional or increased hazards (such as deactivation of alarm systems) or is unfeasible due to equipment design or operational limitations (such as troubleshooting). Live parts that operate at

less than 50 volt to ground need not be de-energized if there will not be increased exposure to electrical burns or to explosion due to electric arcs.

2. Energized parts - If the exposed live parts are not de-energized, other safety-related work practices shall be used to protect employees who may be exposed to the electrical hazards involved. Such work practices shall protect employees against contact with energized circuit parts directly with any part of their body or indirectly through some other conductive object. When working on energized parts, the appropriate PPE shall be used.

Lockout/Tagout

While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been de-energized the circuits energizing the parts shall be locked out or tagged out or both in accordance with the following requirements:

1. Procedures shall be in place before equipment may be de-energized.
2. Circuits and equipment to be worked on shall be disconnected from all electrical energy sources.
3. Stored electrical energy which poses a hazard to workers shall be released in a safe manner per manufacturer's recommendations.
4. Stored non-electrical energy in devices that could re-energize electric circuit parts shall be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.
5. A lock and a tag shall be placed on each disconnecting means used to de-energize circuits and equipment on which work is to be performed, except as provided below.
6. Each tag shall contain a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.
7. UCPS requires a lock and tag be used for lockout/tagout purposes; however, in the event a lock cannot be applied a tag may be used without a lock.
8. Tags used without a lock as permitted above shall be supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by the use of a lock (removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device).
9. Before any circuits or equipment can be considered and worked as de-energized:
 - a. A qualified person shall operate the equipment operating controls or otherwise verify that the equipment cannot be restarted.
 - b. A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are de-energized.

10. Before circuits and equipment are re-energized, even temporarily, the following requirements shall be met:
 - a. A qualified person shall conduct tests and visual inspections to verify that all tools, electrical jumpers, shorts, grounds, and other devices have been removed so that the circuits and equipment can be safely energized.
 - b. Employees exposed to the hazards associated with re-energizing the circuit or equipment shall be warned to stay clear of circuits and equipment.
 - c. Each lock and tag shall be removed by the employee who applied it.
 - d. There shall be a visual determination that all employees are clear of the circuits and equipment.

Refer to the UCPS Facilities Department Lockout/Tagout written program for full lockout/tagout policies, procedures and requirements.

Working on or Near Energized Equipment

This section applies to work performed on exposed live parts or near enough to them for employees to be exposed to any hazards they represent. This type of work involves either direct contact or contact by means of tools or materials.

Only qualified persons may work on electric circuit parts or equipment that have not been de-energized under the procedures of these standards. Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, PPE, insulating and shielding materials, and insulated tools.

1. Illumination – Employees may not enter spaces containing exposed energized parts unless illumination is provided that enables the employees to perform the work safely. Employees are not to reach blindly into areas which may contain energized parts.
2. Conductive Materials and Equipment – Conductive materials and equipment that are in contact with any part of an employee's body shall be handled in a manner that will prevent them from contacting exposed energized conductors or circuit parts. If an employee must handle long dimensional conductive objects (such as ducts or pipes) in areas with live parts, the hazard must be minimized by the use of insulating, guarding or material handling techniques.
3. Portable Ladders – Portable ladders shall be the non-conductive type (wood or fiberglass) if they are used where the employee or the ladder could contact exposed energized parts.

4. Jewelry and Conductive Apparel – Conductive articles of jewelry and clothing (key chains, necklaces, cloth with conductive thread, etc.) may not be worn if they might contact exposed energized.
5. Housekeeping – Where live parts present an electrical contact hazard, employees may not perform housekeeping duties such close distances to the parts that there is a possibility of contact, unless adequate safeguards (insulating equipment or barriers) are provided. Electrically conductive cleaning materials may not be used in proximity to energized parts unless procedures are followed which will prevent electrical contact.
6. Interlocks – Only a qualified person following the requirements of this section may defeat an electrical safety interlock, and only temporarily while working on the equipment. The interlock system shall be returned to its operable condition when this work is completed.
7. Confined or Enclosed Work Spaces – When an employee works in a confined or enclosed space that contains exposed energized parts, UCPS will provide, and 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 shall be secured to prevent their swinging into an employee and causing the employee to contact exposed energized parts. All procedures for permit-required confined space entry shall be followed pursuant to the UCPS Confined Space Entry Program and OSHA Standard 1910.146.
8. Overhead Lines – UCPS employees shall not work on or within 12 feet of overhead power lines. This 12 foot barrier includes any conductive object in that space such as aerial lifts.

Equipment

Portable electric equipment applies to the use of cord and plug connected equipment, including extension cords.

1. Extension Cord Use
 - a. Employees using extension cords to power tools and/or equipment for the performance of construction, maintenance, repair or demolition shall use GFCI protection when working in conductive locations or where there is likelihood to come in contact with water or other conductive liquids, either indoors or outdoors.
 - b. All extension cords must be grounding type made with UL listed parts and be in good physical condition.
 - c. Extension cords may not be lengthened or “repaired” with tape.

- d. Power outlet strips are for equipment needing surge protection (computers, etc.).
 - e. Extension cords shall not be run through holes in walls, ceilings, or floors.
 - f. Extension cords may not be plugged into power strips. Power strips may not be plugged into each other.
 - g. An extension cord must not be run across areas of high traffic where potential damage may occur or present a trip hazard to others.
 - h. Extension cords shall not be attached to building surfaces or used in lieu of fixed wiring of a structure.
 - i. Extension cords shall not be concealed behind walls, ceilings or floors.
2. Handling – Portable equipment shall be handled in a manner which will not cause damage. Extension cords connected to equipment may not be used for raising or lowering equipment. Extension cords may not be fastened with staples or otherwise hung in such a fashion as could damage the outer jacket or insulation.
 3. Visual Inspection – Portable electric equipment and extension cords shall be visually inspected for external defects and for evidence or possible internal damage before use by any employee. Defective or damaged items shall be removed from service until repaired.
 4. Grounding Type Equipment – An extension cord used with grounding-type equipment shall contain an equipment-grounding conductor.
 - a. Plugs and receptacles may not be altered in a manner which would prevent proper continuity of the equipment grounding conductor at the point where plugs are attached to receptacles. Additionally, 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 type conductors.
 - b. Adapters that interrupt the continuity of the equipment grounding connecting may not be used.
 5. Conductive Work Locations – Portable electric equipment and extension cords used in highly conductive work locations where employees are likely to contact water or conductive liquids shall be approved for those locations.
 6. Connecting Attachment Plugs – Employees' hands may not be wet when plugging and unplugging extension cords and plug-connected equipment if energized equipment is involved.
 - a. Energized plug and receptacle connections may be handled only when insulating protective equipment if the condition of the connection could provide a conducting path to the employee's hand.
 - b. Locking-type connectors shall be properly secured after connection.

Electric and Power Lighting Circuits

1. Routine Opening and Closing of Circuits – Load rated switches, circuit breakers, or other devices specifically designed as disconnecting means shall be used for the opening, reversing, or dosing of circuits under load conditions. Cable connectors not of the load-break type, fuses, terminal lugs, and cable splice connections may not be used for such purposes, except in an emergency.
2. Re-closing Circuits After Protective Device Operation – After a circuit is de-energized by a circuit protective device, the circuit may not be manually re-energized until it has been determined that the equipment and circuit can be safely energized. The repetitive manual re-closing of circuit breakers or re-energizing circuits through replaced fuses is prohibited.

Overcurrent Protection Modification

Overcurrent protection of circuits and conductors may not be modified, even on a temporary basis, beyond that allowed in the installation safety requirements for overcurrent protection.

Test Instruments

1. Use – Only qualified persons may perform testing work on electric circuits or equipment.
2. Visual Inspection – Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall be visually inspected for external defects and damage before the equipment is used. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item shall be removed from service. No employee may use it until the necessary repairs and tests to render the equipment safe have been made.
3. Rating of Equipment – Test instruments and equipment and their accessories shall be rated for the circuits and equipment to which they will be connected and shall be designed for the environment in which they will be used.

Flammable or Ignitable Materials

Where flammable materials are present only occasionally, electric equipment capable of igniting them shall not be used unless measures are taken to prevent hazardous conditions from developing.

Personal Protection

Employees working in areas where there are potential hazards shall be provided with, and shall use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed. Protective equipment shall be maintained in a safe, reliable condition and shall be periodically inspected or tested as required by 29CFR1910.137.

If the insulating capability of protective equipment may be subject to damage during use, the insulating material shall be protected.

Employees shall wear non-conductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts. Protective equipment for the eyes and face shall be worn whenever there is danger of injury to the eyes or face from electric arcs or flashes from flying objects resulting from electrical explosion.

When working near exposed energized conductors or circuit parts, each employee shall use insulated tools or handling equipment if the tools or handling equipment might make contact with such conductors or parts. If the insulating capability of insulated tools or handling equipment is subject to damage, the insulating material shall be protected.

Other personal protection provisions include:

- Fuse handling equipment, insulated for the circuit voltage, shall be used to remove or install fuses when the fuse terminals are energized.
- Ropes and hand lines used near exposed energized parts shall be nonconductive.
- Protective shields, protective barriers, or insulating materials shall be used to protect each employee from shock, burns, or other electrically-related injuries while that employee is working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur. When normally enclosed live parts are exposed for maintenance or repair, they shall be guarded to protect unqualified persons from contact with live parts. Cabinet doors and electrical enclosures should be kept closed. If this is not possible, additional precautions must be taken to minimize the extent of the hazard.

Communication

The following methods shall be utilized to warn and protect employees from hazards which could cause injury due to electric shock, burns or failure of electric equipment parts:

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1. Safety Signs – Signs or tags shall be used where necessary to warn employees about electrical hazards which may endanger them.
2. Barricades – A work zone shall be established in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas exposing employees to uninsulated energized conductors or circuit parts. Conductive barricades may not be used where they might cause an electrical contact hazard.
3. Attendants – If safety signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect employees.

General Safe Work Practices

- Know the equipment and potential hazards (define your scope of work).
- Analyze the hazards and use engineered methods to mitigate them.
- Use barricades or other means to restrict unnecessary or unqualified persons from entering the work area.
- Use insulating barriers to prevent yourself and others from leaning into or falling into live parts and to prevent live parts that might become loose from contacting other employees.
- Wear safety glasses.
- Never wear metallic personal (jewelry, clothing, etc.) items while working on or near live parts.
- Use non-conducting ladders when needed.
- Always assume a conductor is energized until proven otherwise.
- Wear voltage rated gloves when using tools on or near live parts.
- Use only PPE that is approved or certified for the hazard.
- Use only insulated tools when working on or near live parts.
- Use only tools and instruments that are designed for the system voltage.
- Never bypass interlocks or safety devices that protect people against electrical shock except when absolutely necessary and only with permission of the supervisor.
- Whenever possible, do not work alone.
- An attendant is required when deemed so by the supervisor. This person shall be CPR trained and be familiar with removing all sources of power to the device being worked upon and have ready access to a phone to call 911 in case of an emergency.
- Always stand to one side and NEVER directly in front of the device being operated when operating circuit breakers or fuse switches.

- Inspect electrical equipment for defective parts, faulty insulation, improper grounding, loose connections, ground faults and unguarded live parts. Take appropriate remedial action before working on or near live parts.
- Work only where there is adequate clearance.
- Do not work on or near live parts that are in a hazardous location such as wet or damp areas or where there are corrosive or flammable atmospheres.