Electrical Safety Work Practices

I. SCOPE

This program covers any SOUTHWESTERN COMMUNITY COLLEGE employee that may work or be exposed to exposed electrical systems:

To assure that employees are not exposed to potentially hazardous conditions in the work place by establishing mandatory guidelines that will minimize the possibility of electric shock or electrocution when:

- Maintaining, repairing or installing or working around electrical system components and utilization equipment.
- Working on "other" equipment in close proximity to certain electrical system equipment and/or conductors.

In no case will work be permitted on energized electrical equipment and/or conductors. Where a deenergized condition is required for permitted work to be performed, qualified personnel will accomplish the deenergization procedure.

II. APPLICABILITY

All SOUTHWESTERN COMMUNITY COLLEGE operations and facilities.

III. REFERENCE

29 CFR 1910.301 Subpart S

29 CFR 1926.400 Subpart K

IV. DEFINITIONS

1910.399 of Subpart S and 1926.449 of Subpart K lists the definitions applicable to electrical safety related work practices and. A **Qualified Person** is one familiar with the construction and operation of the equipment and hazards involved." Determination of a person's qualifications is based on a specific task. Employees must be considered as either "Qualified" or "Unqualified" regarding a specific task. All SOUTHWESTERN COMMUNITY COLLEGE maintenance employees are trained as a “qualified person.”

V. GENERAL

Subpart S for General Industry and Subpart K of the Construction Standards address the electrical safety requirements that are necessary for the practical safeguarding of employees involved in construction work. Four main categories are involved:

- Installation safety requirements
- Safety related work practices
- Safety related maintenance and environmental conditions
- Safety requirements for special equipment

VI. TRAINING

SOUTHWESTERN COMMUNITY COLLEGE employees that face the potential of electric shock shall be trained in safety related work practices found in General Industry 1910.332 and for Construction 1926.416-417 and 1926.431-432. This training shall be sufficient to ensure all SOUTHWESTERN COMMUNITY COLLEGE maintenance employees are classified as "qualified" and shall include, at a minimum, the following:

- Skills and techniques to distinguish live parts from other parts of electrical equipment
- Skills and techniques to determine nominal voltage of exposed live parts
- Knowledge of acceptable clearance distances and the corresponding voltages
- How to implement safety related work practices as outlined in Subpart S and Subpart K of the standards and the SOUTHWESTERN COMMUNITY COLLEGE safety programs currently in place

A general subject category is presented as follows:

A. Hazards Associated with Electricity
   1. Definition
   2. Result

B. Nature of Electrical Accidents
   1. Definition
   2. Causes of electrical accidents
      a. Unsafe conditions
      b. Unsafe acts

c. Combination of both

3. Description of unsafe conditions and acts

C. Protective Measures

1. Insulation of cable
   a. Electrical barrier
   b. Insulation sizing
   c. Physical requirements of cable
      i) Undamaged
      ii) Clean
      iii) Dry
2. Guarding of equipment
   a. Physical barricade
   b. Locating energized parts away from work surface
3. Grounding and GFCI
4. Safe work practice
   a Keep prescribed distance
   b Only perform work when you and equipment is dry
   c Lockout and tagout procedures
   d Protective equipment
      i) Rubber gloves
      ii) Rubber mats
      iii) Annual inspection of equipment and instruments

VII. SELECTION AND USE OF WORK PRACTICES

Safety-related work practices shall be employed to prevent electric shock or other injuries from direct/indirect electrical contacts, when working on or near equipment/circuits that are or may be energized. The work practices must be consistent with the nature and extent of the hazard.

Deenergized parts

a Live parts that create exposure shall be deenergized before work is accomplished on or near equipment/circuits unless the deenergizing introduces additional or increased hazard or it is infeasible due to design or operational limitations.

b Live parts operating at less than 50 volts to ground need not be deenergized if no increased exposure to electrical burns or there is no increased exposure to explosion due to electrical arcs.

*Lockout and tagging (*SOUTHWESTERN COMMUNITY COLLEGE LOTO Program)

Lockout/tagout procedures are described in 1926.417 and 1910.147. In addition, the following provisions are required to fully comply with the provisions of 1926.417 and this procedure:

A tag used without a lock as permitted shall be supplemented by at least one additional safety measure that provides a safety equivalent to the use of a lock such as:

1. Removal of an isolating circuit element
2. Blocking of a controlling switch
3. Opening of an extra disconnecting device

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 elements and parts are deenergized and also determine if energized condition exists because of inadvertently induced voltage, or unrelated voltage back feed even though deenergized and presumed safe. If the circuit to be tested is over 600 volts nominal, test equipment must be checked for proper operation before and immediately after the test.

Working On or Near Exposed Energized Parts

Any part of an electrical apparatus that normally conducts electrical energy and is not protected by a grounded or insulated barrier is to be considered to be energized unless that part is grounded with a visible ground or is tested to determine that is not energized.

Only qualified persons may work on energized equipment electric circuit parts or equipment that have **not** been deenergized. They shall be capable of working safely and familiar with:

- Proper precautionary techniques
- Personal protective equipment
- Insulating and shielding materials
- Insulated tools

Overhead Service Lines

When working near overhead service lines the minimum elevation between lines and SOUTHWESTERN COMMUNITY COLLEGE employees shall be maintained at the distances specified in 1910.333(c) and 1926.403(j)(3)(iii).

Illumination

Do not enter spaces containing exposed energized parts, unless illumination is provided that enables a safe work environment.

Where lack of illumination or an obstruction precludes observation of the work to be performed. Do not perform tasks near exposed energized parts. Do not reach blindly into areas that may contain energized parts.

Additional Considerations

Confined or enclosed work spaces: When an employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed energized parts, SOUTHWESTERN COMMUNITY COLLEGE shall provide, and the employee shall 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. Other provisions of confined spaces entries shall also be observed.

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 long dimensional conductive objects (such as ducts and pipes) must be handled in areas with exposed live parts, work practices (such as the use of insulation, guarding, and material handling techniques) that will minimize the hazard shall be used.

Portable ladders: Portable ladders shall have nonconductive side rails if they are used where the employee or the ladder could contact exposed energized parts.

Conductive apparel: 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. However, such articles may be worn if they are rendered nonconductive by covering, wrapping, or other insulating means.

Housekeeping duties: Where lives parts present an electrical contact hazard, housekeeping duties may not be performed at such close distances to the parts that there is a possibility of contact, unless adequate safeguards (such as insulating equipment or barriers) are provided. Electrically conductive cleaning materials (including conductive solids such as steel wool, metalized cloth, and silicone carbide, as well as conductive liquid solutions) may not be used in proximity to energized parts unless procedures are followed which will prevent electrical contact.

Interlocks: Only a qualified person following the requirements for lockout and tagging may defeat an electrical safety interlock, and then only temporarily while he or she is working on the equipment. The interlock system shall be returned to its operable condition when this work is completed.

VIII. USE OF EQUIPMENT

Portable Electric Equipment

This applies to the use of cord and plug connected equipment, including extension cords. Equipment shall be handled so as not to cause damage. Examples include but are not limited to the following. SOUTHWESTERN COMMUNITY COLLEGE employees will not:

- Use cords connected to equipment to raise or lower the equipment
- Fastened flex cords (extension cords) by staples
- Hang equipment in a manner that causes the outer jacket or insulation to be damaged

Visual inspection

Inspect portable cord and plug and extension cords before use for evidence of external damage. If defect or damage is noted, the cord is removed from service and is not used until repairs and tests have been made.

Attachment plug and receptacle must be checked for proper mating configurations.

Grounding-type equipment

Flex cord used with grounding-type equipment shall contain an equipment-grounding conductor.

Attachment plugs and receptacles may not be connected or altered in any manner that would prevent proper continuity at the point of attachment or be altered to allow ground pole to be inserted into slots intended for current-carrying conductors. Adaptors that interrupt the continuity of the grounding connection may not be used and ground poles shall not be removed from the plug.

Ground Fault Circuit Interrupter (GFCI)

GFCI protected systems, either internal to the extension cord, electrical generator, or electrical system will be assured in order to provide additional employee safety.

Conductive work locations

Equipment and flex cords used in highly conductive work locations (inundated with water or likely to contact liquids) shall be approved for those conditions.

Connecting attachment plugs

Hands must not be wet when plugging/unplugging. Energized plug/receptacle connections must be handled only with insulating protective equipment if condition of the connection would provide a conductive path, i.e. wet from immersion in water. Locking-type connectors shall be properly secured after connection.

Where flammable materials are present only occasionally, electric equipment capable of igniting them shall not be used, unless measures are taken to prevent hazardous a condition from developing. Such materials include, but are not limited to: flammable gases, vapors, or liquids; combustible dust; and ignitable fibers or flyings.

IX. SPECIAL SYSTEMS 1910.308 AND 1926.408

1910.308

1926.408

Refer to these sections of the standards for information regarding the following:

Systems Over 600 Volts Nominal

Emergency Power Systems

Class 1, Class 2, and Class 3 Remote Control, Signaling, and Power Limited Circuits

Fire Protective Signaling Systems

Communication systems

X. SAFEGUARDS FOR PERSONNEL PROTECTION

Use of Protective Equipment

Personnel Protective Equipment (PPE)

- If work is required in areas where there is potential electrical hazard, electrical protective equipment will be provided and must be used for the specific parts of the body to be protected for work to be performed.
- PPE must be maintained in a safe, reliable condition and inspected and tested as required by 1910.137.
- If the insulating capability of protective equipment may be subject to damage during use, the insulating material shall be protected. (For example, an outer covering of leather is sometimes used for the protection of rubber insulating material.)
- Nonconductive head protection shall be worn 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 or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion.

General protective equipment and tools

- 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 conducts or parts. If the insulating capability of

insulated tools or handling equipment is subject to damage, the insulating material shall be protected.

- Fuse handling equipment, insulated for the circuit voltage, shall be used to remove or install fuses when the fuse terminals are energized.
- Ropes and handlines 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 the live parts.

Alerting techniques.

The following alerting techniques shall be used to warn and protect employees from hazards that could cause injury due to electric shock, burns, or failure of electric equipment parts:

1. **Safety signs and tags**. Safety signs, safety symbols, or accident prevention tags shall be used where necessary to warn employees about electrical hazards that may endanger them as required by §1910.417.
2. **Barricades**. Barricades shall be used 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 signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect employees.

XI. ENFORCEMENT

Constant awareness of and respect for electrical systems and operations and compliance with all safety rules are considered conditions of employment. The supervisor, as well as the Coordinator of Buildings and Grounds, reserves the right to issue disciplinary warnings to employees, up to and including termination, for failure to follow the guidelines of this program. The Disciplinary Action Policy can be found at www.southwesterncc.edu/policies

Additional Information

Training

- National Electrical Safety Foundation (NESF)
- Electrical. 3.7 MB ZIP. This material is designed to assist trainers conducting OSHA 10-hour General Industry outreach training for workers. Since workers are the target audience, the material emphasizes hazard identification, avoidance, and control — not standards. No attempt has been made to treat the topic exhaustively.
- For electrical training information related to **construction**, please refer to the Construction: Electrical Technical Links page.

Electrical Technical Links
Assured Grounding Equipment Checklist
Basic Electrical Safety In The Workplace
Electric Shock
Electrical Equipment Fact Sheet
Electrical Grounding Fact Sheet
Electrical Inspection Checklist
Electrical Inspection
Electrical Personal Protective Equipment
Electrical Safety At Work
Electrical Safety Audit
Electrical Safety in the Workplace
Electrical Safety Reminders
Electrical Safety
Employees Qualified for Electrical Work
Fatality air powered chipping gun
GFCIs
Groundfault Protection
Personal Fall Arrest Systems Links
Qualified Electrical Training Cert
Supervisor Safety Checklist
Temporary Power Checklist PDF