1. PURPOSE
   1.1 To establish and implement an Electrical Safety program in compliance with the requirements of 29 CFR 1910.331 through 1910.335 as promulgated by the Occupational Safety and Health Administration (OSHA).

2. SCOPE
   2.1 Covered work under this policy includes work performed by Qualified and Unqualified persons who work on, near, or with the following installations:
      2.1.1 Premises Wiring
          2.1.1.1 Installations of electric conductors and equipment within or on buildings or other structures, and on other premises such as yards, parking lots, and industrial substations.
      2.1.2 Wiring for connection to supply
          2.1.2.1 Installation or conductors that connect to the supply of electricity.
      2.1.3 Other Wiring
          2.1.3.1 Installations of other outside conductors on the premises.
      2.1.4 Optical Fiber Cable
          2.1.4.1 Installations of optical fiber cable where such installations are made along with electric conductors.
   2.2 This policy also covers work performed by Unqualified persons on, near or directly associated with the:
      2.2.1 Generation, transmission, and distribution installations.
   2.3 Work by qualified persons on Telecommunications or Electric Power Generation, Transmission and Distribution is covered in 29 CFR 1910.268 through 1910.269, respectively, and is not within the scope of this policy.

3. RESPONSIBILITIES
   3.1 Department of “Risk Management, Safety and Sustainability” (RMSS)
      3.1.1 Be responsible for ensuring the development and implementation of this policy.
      3.1.2 Provide necessary resources as available to carry out the program.
      3.1.3 Assist supervisors in defining hazardous operations, designating safe work practices, and selecting proper application of devices.
      3.1.3.1 Reviewing and approving standard operating procedures.
      3.1.3.2 Assistance with evaluation of electrical hazards in the workplace.
      3.1.4 Provides general Electrical Safety training as required by the Environmental Health and Safety training policy and as may be required to inform employees of safe work practices as necessary.
3.2 Supervisors
3.2.1 Ensure employees receive training appropriate to their assigned tasks.
3.2.2 Ensure employees in their charge will comply with the requirements and responsibilities of this electrical safety policy and procedures.
3.2.3 Ensure that repair and fabrication of department-owned electrical equipment is done by a qualified individual who is authorized to perform the work.
3.2.4 Determine the work each employee is qualified to perform and direct work assignments accordingly.
3.2.5 Ensure employees are provided with and use the appropriate protective equipment and/or materials as necessary.

3.3 Employees
3.3.1 Read and understand this policy.
3.3.2 Attend the Electrical Safety training as required by (RMSS).
3.3.3 Perform all electrical work activities in accordance with all safety guidelines and procedures.
3.3.4 Notify supervisors of electrical hazards that they see are not adequately addressed in the workplace.
3.3.5 Take department-owned electrical equipment out of service if it is known to be malfunctioning and report it to the shop supervisor.

4. PROGRAM COMPONENTS
4.1 Definitions
4.1.1 Qualified Person* means a person who is familiar with the construction and operation of the equipment and the hazards involved, and who has been trained to avoid electrical hazards when working on or near exposed energized parts; and has been trained and is familiar with:

4.1.1.1 The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment.
4.1.1.2 The skills and techniques necessary to determine the nominal voltage of exposed live parts.
4.1.1.3 The knowledge, skills & techniques to work safely around energized circuits.
4.1.1.4 The knowledge of proper use of PPE and insulated tools.

* Note: Whether an employee is considered a “qualified person” will depend upon various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered “qualified” about certain equipment in the workplace, but “unqualified” to other equipment.

a. Only Facilities Electricians, or qualified electrical contractors, will be considered qualified to install, alter, or remove any building electrical distribution wiring, including any hardwired power feeds to equipment.
b. Only Facilities Electricians, or qualified electrical contractors, will be considered qualified to perform any electrical work on systems or equipment operating at voltages more than 150 volts to ground, except as allowed in item c, below.

c. Power Plant and Mechanical shop employees may be appropriately trained and considered qualified on specific systems or equipment operating at voltages not to exceed 277 volts to ground. When such equipment has been de-energized, they may perform troubleshooting procedures and make in kind emergency replacement of components.

4.1.2 Unqualified Person means a person with little or no training in avoiding the electrical hazards that may be encountered while working on or near exposed energized parts.

4.2 General Safe Work Practices

4.2.1 Working Clearances

4.2.1.1 Sufficient access and working space shall be provided, around electrical equipment at 600 volts, nominal, or less; and maintained as necessary to permit ready, safe operation, and maintenance of such equipment.

4.2.1.2 The equipment likely to require examination, adjustment, servicing, or maintenance while live shall have a working space in the direction of access not less than indicated in the following table.

**OSHA Table S-1 & S-2: Minimum Working Clearances**

<table>
<thead>
<tr>
<th>Nominal Voltage to Ground</th>
<th>Minimum Clear Distance for Condition 3 (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condition (A)</td>
</tr>
<tr>
<td>0 to 150 Volts</td>
<td>3 (1)</td>
</tr>
<tr>
<td>151 to 600 Volts</td>
<td>3 (1)</td>
</tr>
<tr>
<td>601 to 2,500 Volts</td>
<td>3</td>
</tr>
<tr>
<td>2,501 to 9,000 Volts</td>
<td>4</td>
</tr>
<tr>
<td>9,001 to 25,000 Volts</td>
<td>5</td>
</tr>
</tbody>
</table>

**Notes:**

(1) Minimum clear distance may be 2’ 6” for installations built prior to April 16, 1981.

(2) Minimum depth of clear working space in front of electrical equipment with a nominal voltage to ground above 25 kV may be the same as for 25 kV under Conditions A, B, and C for installations built prior to April 16, 1981.

3 Conditions:

A. Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated busbars operating below 300 volts are not considered live parts.

B. Exposed live parts on one side and grounded on the other side.

C. Exposed live parts on both sides of the workspace not guarded as per condition (A), with the operator between.
4.2.1.3 The workspace may not be less than 30 inches wide in front of the electrical equipment (measured from the live parts if they are exposed, otherwise from the front of the enclosure or opening of enclosed parts).

4.2.1.4 A minimum of three (3) feet clearance is required in front of equipment that contains normally exposed live parts.

4.2.1.5 Adequate illumination shall be provided for all working spaces.

4.2.1.6 Working spaces shall have a minimum of 6 feet 3 inches of headroom.

4.3 Selection and use of Safe Work Practices

4.3.1 De-Energized Parts: Live parts to which an employee may be exposed will be de-energized before an employee works on or near equipment unless:

4.3.1.1 The de-energizing creates a more hazardous situation. The job activities that increase or create additional hazards include:
   a. The deactivation
   b. The shutdown of hazardous location
   c. The removal of illumination for an area
   d. The equipment, by design, cannot be shut down.

4.3.1.2 Live parts that operate at less than 50 volts to ground need not be de-energized if there will be no increased exposure to electrical burns or to explosion due to electric arcs.

4.3.2 Energized Parts

4.3.2.1 If the exposed live parts are not de-energized, for reasons of increased or additional hazards, other safety related work practices must be used to protect employees who may be exposed to electrical hazards.

4.3.2.2 The work practices must protect employees against contact with energized circuit parts directly with any part of their body or through some other conductive object.

4.3.2.3 The work practices that are used must be suitable for the conditions under which the work is to be performed and for the voltage level of the exposed electric conductors or circuit parts. Specific work practice requirements are detailed in Sections 4.4 & 4.5 of this policy.
4.4 Working on or near Exposed De-Energized Parts
   4.4.1 Employees must use the following safe work practices when working on de-energized
   parts or while near enough to expose the employee to an electrical hazard:
   4.4.1.1 Conductors and parts of electric equipment that have been de-energized but
   have not been properly locked out/tagged out must be treated as energized.
   4.4.1.2 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 must be locked out or tagged out or both. (Refer to the (RMSS)
   Lockout/Tagout Policy for specific procedures).
   4.4.1.3 Capacitors must be discharged and high capacitance elements short-circuited
   and grounded, if the stored electric energy might endanger personnel.
   4.4.1.4 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.
   4.4.1.5 Verification of De-Energized Condition: Before any circuit or equipment is
   considered de-energized or worked on as de-energized:
   a. Qualified person must verify that the equipment cannot be restarted.
   b. Qualified person must test circuit elements and electrical parts of
      equipment to verify that they are de-energized.
   c. To test and determine if any energized condition exists because of
      inadvertently induced voltage or unrelated voltage back feed.
   d. When circuits over 600 volts’ nominal are tested, the test equipment
      must be checked.

4.5 Working on or Near Exposed Energized Parts
   4.5.1 This section applies to work performed on exposed live parts (involving either direct
   contact or contact by means of tools or materials) or near enough to them for
   employees to be exposed to any hazard they present.
   4.5.2 Work on Energizing Equipment
   4.5.2.1 Only Qualified Persons may work on energized circuits, and they must be
   familiar with the proper use of special precautionary techniques, personal
   protective equipment, insulating and shielding materials, and insulated tools.
   See Appendix A. Control Measures for Electrical Work Process Diagram.
4.6 Control Measure when FAUL-FINDING on or near live parts or equipment

4.6.1 Before starting and during work, all electrical hazards shall be identified:

4.6.1.1 Make an initial survey of the equipment or machine to identify all energy sources.

4.6.1.2 Inspect and ensure that the test instruments to be used are functioning properly before starting and during work.

4.6.1.3 Place safety LO/TO devices to prevent other persons from entering the vicinity of exposed live parts or exposed equipment that could become live during testing.

4.6.1.4 Safe working procedures relevant to each activity must be maintained and coordinated with co-workers who may have to assist the fault-finding process, such as procedures related to switching circuits or equipment on and off during the fault-finding or testing process.

4.6.1.5 If the equipment or machine is capable of being isolated from all energy sources, the following procedures shall be completed:
   a. Verify that the equipment is un-plugged, turned off, and set at zero.
   b. Prepare equipment for shut down.
   c. Disconnect the energy-isolating devices.
   d. Verify that all stored or residual energy has been dissipated.
   e. Apply LO/TO devices to the power supply and tag the points of disconnect properly.
   f. Verify the isolation and de-energization of machine or equipment.

4.6.2 If the equipment or machine is not capable of being isolated from all energy sources, the following contingency plans must be completed:

4.6.2.1 Identify exposed conductive parts that could become live while using test instruments.

4.6.2.2 Use only approved insulated tools, testing probes and isolation barriers to isolate all employees from contact with exposed conductive parts that could become live during testing.

4.6.2.3 Conduct periodic review of the situation to ensure that no new hazards are created during the process.

4.6.2.4 Visual inspection, possibly in combination with an appropriate drawing and equipment manual.

4.6.2.5 Ensure a written risk assessment has been completed and determined how the work can be done safely.

4.6.2.6 Obtain authorization from the immediate supervisor or a person who has more knowledge in control of the premises.

Note: Procedures such as testing, troubleshooting, voltage measurement, etc., DO NOT need a written assessment or a work permit if appropriate safe work practices and PPE are used.
4.6.3 Monitor and Review – Evaluate and monitor electrical hazard controls during inspections, routine maintenance, and other activities to a safe condition.

4.6.3.1 Ensure that safe work practices and control measures have been implemented, as planned.

4.6.3.2 Ensure that safe work practices and control measures are being used correctly.

4.6.3.3 Ensure that all electrical hazards are eliminated or adequately reduced.

4.6.3.4 Carry out work based on safe working procedures as determined.

4.6.3.5 Continue to work safely on the equipment and return it to service.

4.7 Control Measure to be taken WHILE working on Live Parts

4.7.1 While working on live parts or equipment, the qualified employee should ensure that all precautions outlined above (Section 4.5 & 4.6) have been taken.

4.7.1.1 The work is done carefully and in an unhurried, considered manner.

4.7.1.2 The safe working procedures are followed.

4.7.1.3 All exposed conductors or equipment are assumed to be live.

4.7.1.4 The work practices that are used shall be suitable for the conditions under which the work is to be performed and for the voltage level of the live parts or equipment.

4.7.1.5 Safe working distances shall be used. (See Appendix B, Limit of Approach).

4.7.2 Overhead Lines

4.7.2.1 If work is performed near overhead lines, the lines shall be de-energized and grounded (by the organization that operates or controls the electric circuits involved), or other protective measures shall be provided before work is started.

4.7.2.2 If protective measures, such as guarding, isolating, or insulating are provided, these precautions shall prevent employees from contacting lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.

4.7.2.3 Whenever an Unqualified employee is working in elevated positions, or on the ground near overhead lines, the location will be such that the person and the longest conductive object he or she may contact cannot come closer to any unguarded, energized overhead line than the following distances:
   a. Voltages to ground 50kV or below – 10 feet.
   b. Voltages to ground over 50kV – 10’ plus 4” for every 10kV over 50kV.
4.7.2.4 When a Qualified person is working near overhead lines, whether in an elevated position or on the ground, the person may not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in table following, below unless:

a. The person is insulated from the energized part by gloves, with sleeves, if necessary, rated for the voltage involved, or

b. The energized part is insulated from all other conductive objects and from the person, or

c. The person is insulated from all conductive objects at a potential different from that of the energized part.

OSHA Table S-5: Approach Distances for Qualified Employees

<table>
<thead>
<tr>
<th>Voltage Range (Phase to Phase, RMS)</th>
<th>Approach Distance (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 V and less</td>
<td>Avoid Contact</td>
</tr>
<tr>
<td>Over 300V, not over 750V</td>
<td>12&quot;</td>
</tr>
<tr>
<td>Over 750V, not over 2kV</td>
<td>18&quot;</td>
</tr>
<tr>
<td>Over 2kV, not over 15kV</td>
<td>24&quot;</td>
</tr>
<tr>
<td>Over 15kV, not over 37kV</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

4.7.2.5 Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 feet is maintained, (if the voltage exceeds 50kV, the clearance shall be increased 4 inches for every 10kV over that voltage).

a. Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments unless they are using appropriate protective equipment rated for the voltage.

b. If a vehicle or mechanical equipment that can have contact with energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding shall not stand at the grounding location.

4.7.3 Illumination

4.7.3.1 Employees may not perform work in spaces unless there is adequate illumination to perform the work safely.

a. Employees may not reach blindly into areas which may contain energized parts.
4.7.4 Confined or Enclosed Workspaces
4.7.4.1 Whenever an employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed energized parts, they must be provided with, and they must use, protective barriers, or insulating materials as necessary to avoid inadvertent contact with those parts.
   a. Doors and hinged panels shall be secured to prevent their swinging into an employee causing the employee to contact exposed energized parts.

4.7.5 Conductive Materials and Equipment
4.7.5.1 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 parts or conductors.
   a. If an employee must handle long dimensional conductive objects (such as ducts and pipes) in areas with exposed live parts, appropriate work practices (such as the use of insulation, guarding and material handling techniques) shall be instituted to minimize the risk of electrical hazards.

4.7.6 Portable Ladders
4.7.6.1 Only ladders with nonconductive side rails should be used at locations where they or the employee could encounter exposed energized parts.

4.7.7 Conductive Apparel
4.7.7.1 Conductive articles of jewelry and clothing (such as watch bands, bracelets, rings, key chains, necklaces, cloth with conductive thread, or metal headgear) may not be worn if they might contact exposed energized parts.
   a. Such articles may be worn if they are rendered nonconductive by covering, wrapping, or other insulating means.

4.7.8 Housekeeping Duties
4.7.8.1 Where live parts present an electrical contact hazard, employees may not perform housekeeping duties at close distances to these parts where there is possible contact, unless adequate safeguards (such as insulating equipment or barriers) are provided.
4.7.8.2 Electrically conductive cleaning materials (including conductive solids such as steel wool, metalized cloth, and silicon carbide, as well as conductive liquid solutions) may not be used in proximity to energize parts unless procedures are followed that will prevent electrical contact.

4.7.9 Interlocks
4.7.9.1 Only a qualified person 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.
4.8 Use of Equipment: This section applies to the use of cord and plug connected equipment, including extension cords.

4.8.1 Portable Electric Equipment

4.8.1.1 Handling

a. Portable equipment shall be handled in a manner that will not cause damage.

b. Flexible electric cords attached to equipment may not be used to raise or lower the equipment.

c. Flexible electric cords may not be fastened with staples or otherwise hung in such fashion as could damage the outer jacket or insulation.

4.8.1.2 Visual Inspection

a. Portable equipment must be visually inspected before use on any shift for external defects (such as loose parts, deformed and missing pins, or damage to outer jacket or insulation) and for evidence of possible internal damage (such as pinched or crushed outer jacket).

b. Cord and plug connected equipment and extension cords which remain connected once they are put in place and are not exposed to damage need not be visually inspected until they are relocated.

c. If inspection reveals a defect or evidence of damage that might expose an employee to injury, the equipment or extension cord must be removed from service, and no employee may use it until it has been repaired, tested, and found to be safe.

4.8.1.3 Grounding Type Equipment

a. A flexible cord used with grounding type equipment shall contain an equipment grounding conductor.

b. Attachment plugs and receptacles may not be connected or altered in a manner that would prevent proper continuity of the equipment grounding conductor at the point where plugs are attached to receptacles. Additionally, those 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.

c. Adaptors which interrupt the continuity of the equipment grounding connection may not be used.

4.8.1.4 Conductive Work Locations

a. Portable electric equipment and flexible cords used in highly conductive work locations (such as those inundated with water or other conductive liquids), or in job locations where employees are likely to contact water or conductive liquids, shall be approved for those locations.
4.8.1.5 Connecting Attachment Plugs
   a. Employee's hands may not be wet when plugging and unplugging flexible
cords and cords and plug-connected equipment.
   b. Insulating protective equipment must be used if handling a plug or
receptacle that could provide a conducting path to the employee's hand
(i.e., a cord connector that is wet from being immersed in water).
   c. Locking type connectors shall be properly secured after connection.

4.8.2 Electric Power and Lighting Circuits
4.8.2.1 Load rated switches, circuit breakers, or other devices specifically designed
as disconnecting means should be used for the routine opening, reversing, or
closing of circuits under load conditions.
4.8.2.2 Cable connectors not of the load-break type, fuses, terminal plugs, and cable
splice connections should not be used for such purposes, except in an
emergency.
4.8.2.3 After a circuit is de-energize by a circuit protective device, the circuit should
not be manually re-energized until it has been determined that the
equipment and circuit can be safely energized.
4.8.2.4 Repetitive resetting of circuit breakers or re-energizing circuits through
replaced fuses is prohibited.

4.8.3 Test Instruments and Equipment
4.8.3.1 Only qualified persons may perform testing work on electric circuits or
equipment.
4.8.3.2 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.
4.8.3.3 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, and no
employee may use it until it has been repaired, tested, and found to be safe.
4.8.3.4 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.

4.8.4 Occasional use of Flammable or Ignitable Materials
4.8.4.1 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. Such materials include, but
are not limited to:
   a. Flammable gases, vapors, or liquids.
   b. Combustible dust.
   c. Ignitable fibers or flyings
4.9 Electrical Circuit Breaker Reset

4.9.1 Employees should recognize that a tripped circuit breaker is an indication of a current overload condition on the tripped circuit. This is a potentially hazardous condition which could cause personal injury or property damage if not handled correctly.

4.9.2 Department managers, electricians, and designees shall have permission to reset a tripped circuit breaker.

4.9.2.1 All other employees must contact the Facilities if a circuit breaker has tripped.

4.9.3 When a circuit breaker has tripped, the following actions must be taken in this order:

4.9.3.1 Inspect all equipment and loads on the affected circuit.

4.9.3.2 If the circuit breaker operation appears to have been caused by an identified overload condition, remove the causative load.

4.9.3.3 If an overload condition cannot be identified, STOP, and call the Facilities at 715-836-3411, as the circuit breaker operation may have been due to a fault.

4.9.3.4 A circuit breaker should only be closed to re-energize a circuit if the trained employee has confirmed or personal knowledge, that the circuit breaker in question is the one controlling the circuit which was de-energized.

4.9.3.4.a If there is ANY doubt about the correct breaker to operate, STOP, and contact the Facilities at 715-836-3411.

4.9.3.5 Reset the Circuit Breaker

4.9.3.5.a Identify and fix problems before finally resetting the breaker.

4.9.3.5.b Open the cover and look inside the tripped circuit breaker switch that has flipped to the “off” position or in a middle position between “on” and “off”.

4.9.3.5.c When resetting a breaker, use only one hand and stand to the side to avoid electrical arcing if the breaker should malfunction.

4.9.3.5.d Once you have restored power to the specific circuit, then you should be able to operate electrical devices without circuit breaker problems.

4.9.3.6 Breaker Re-trips

4.9.3.6.a If the breaker immediately trips again, STOP, and contact the Facilities at 715-836-3411.

4.9.4 If a circuit breaker is ever to be used to de-energize a circuit for maintenance or repair work, the (RMSS) Lockout/Tagout Policy for specific procedures must be implemented and followed.

4.9.5 After a circuit is de-energized by a circuit breaker operation, the circuit shall not be manually re-energized until it has been determined that the equipment and circuit can be safely energized.
4.10 Safeguards for Personnel Protection

4.10.1 Use of “Personal Protective Equipment” (PPE)

4.10.1.1 Employees working in areas where there are potential electrical hazards shall be provided with, and shall use, electrical protective equipment that is appropriate for the specific parts of the body to be protected from electrical hazards (See NFPA 70E for more information).

4.10.1.2 Protective equipment shall be maintained in a safe, reliable condition. See (RMSS) Personal Protective Equipment policy for more information.

4.10.1.3 If the insulating capability of protective equipment is damaged during use, the insulating material should be protected. (For example, an outer covering of leather could be used for the protection of rubber insulating material).

4.10.1.4 Non-conductive head protection is required wherever there is a danger of head injury from electric shock due to contact with exposed energized parts.

4.10.1.5 Employees shall wear 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 electric explosion.

4.10.2 General Protective Equipment and Tools

4.10.2.1 Insulated tools or handling equipment shall be used when working near exposed energized conductors or circuit parts.

a. Fuse handling equipment, insulated for circuit voltage, shall be used to remove, or install fuses when the fuse terminals are energized.

b. Ropes used near exposed energized parts shall be non-conductive.

4.10.2.2 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.

4.10.2.3 When normally enclosed live parts are exposed for maintenance or repair, they shall be guarded to protect unqualified persons from contact.

4.10.3 Alerting Techniques: They used to warn and protect employees from electrical hazards that could cause injury due to electric shock, burns, or failure of electric equipment parts.

4.10.3.1 Safety Signs, Tags, and Barricades

a. Safety signs and safety symbols are to be used where necessary to warn employees about electrical hazards which may endanger them.

b. Barricades shall be used in conjunction with safety signs where necessary to prevent or limit employee access to work areas exposing employees to un-insulated energized conductors or circuit parts.

c. Conductive barricades may not be used where they might cause an electrical contact hazard.

4.10.3.2 Attendants

a. If signs and barricades do not provide sufficient warning from electrical hazards, an attendant shall be stationed to warn and protect employees.
5. TRAINING

5.1 All employees who face a risk of electric shock that is not reduced to a safe level, shall be trained in and familiar with the safety-related work practices of this policy that pertain to their specific job assignments that includes:

5.1.1 Electricians and welders, as well as shop supervisors, mechanics, repair workers, carpenters, painters, locksmiths, and custodians.

(Note: Unless they, or the people they supervise, do not work close enough to exposed parts of electric circuits operating at 50 volts or more to ground for a hazard to exist).

5.2 Unqualified employees shall have an Electrical Safety Awareness Training annually.

5.2.1 Proper use and care of electrically operated equipment (vacuum cleaners, extension cords, office equipment, for example).

5.2.2 Precautions to take when specific work assignments may expose them to a known limited electrical hazard (i.e., custodian cleaning around electric fixtures or changing light bulbs).

5.2.3 Precautions to take when work might involve casual exposure to live parts (for example, material handlers, custodians, office workers or material handlers).

5.3 Qualified employees (those permitted to work on or near exposed energized parts) may have an additional training from the Certified Electrical Safety Contractor to be trained in and familiar with:

5.3.1 Skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.

5.3.2 Skills and techniques necessary to determine the nominal voltage of exposed live parts, clearance distances, and the corresponding voltages to which the qualified person will be exposed.

5.3.3 Clearance distances specified in this policy and voltages to which the qualified person will be exposed.

5.3.4 Safe work practices for working on energized circuits and the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.
APPENDIX A. Control Measures for Electrical Work Process Diagram

1. Considering Live work

2. Identify Electrical Hazards

   YES
   - Isolated all Energy Sources
     - De-energization all sources properly at the lockout points
     - Define Contingency Plans
     - Apply Lockout and Tagout Devices
     - Carry out work based on safe working procedures as determined
   - Monitor and Review
     - Obtain Authorization & ensure a written assessment has been complete.
     - Note: Procedures such as testing, troubleshooting, voltage measurement, etc., DO NOT need a written assessment or a work permit if provided safe work practices & PPE

   NO
   - Define Contingency Plans

3. Continue to work safely on the equipment & return to services

4. End
Limits of Approach Boundary Definition:

1. The **FLASH PROTECTION BOUNDARY** might be a greater distance than the limited approach boundary and the greater distance shall be utilized to trigger the need for PPE.
   - Voltage levels at 600 volts and below, the flash protection boundary shall be 4.0 feet.
   - This boundary must be increased for specific conditions, and higher voltages.

2. The **LIMITED APPROACH BOUNDARY** is the closest distances an unqualified person can approach, unless accompanied by a qualified person.
   - Unqualified person shall remain at a safer distance from open, energized conduction.
   - Qualified person shall advise the unqualified person of the possible hazards and ensure the unqualified person is safeguarded if there is a need for an unqualified person to perform a minor task or assess equipment.

3. The **RESTRICTED APPROACH BOUNDARY** is the closest distance to expose live parts a qualified person can approach which requires the use of shock protection techniques and equipment when crossed.
   - Under no circumstances shall an unqualified person be permitted to cross the restricted approach boundary.
   - To cross the restricted approach boundary, the employee must:
     - Be a "qualified person" and have an approved plan.
     - Use PPE suitable for working near exposed live parts or equipment and rated for the voltage and energy level involved.
     - Position his/her body in a way that minimizes risk of inadvertent contact.

4. The **PROHIBITED APPROACH BOUNDARY** is the minimum approach distance to exposed live parts or equipment to prevent flashover.
   - To cross the prohibited approach boundary, the qualified person must:
     - Have specified training to work on energized conductors or circuit parts.
     - Have a documented plan with proper written procedures and justifying the need to work inside the prohibited approach boundary and perform a written risk analysis.
     - Have a documented plan and a written risk analysis above approved by the immediate supervisor.
     - Use PPE appropriate for working near exposed live parts and rated for the voltage and energy level involved.

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### Table B – 1 Minimum Working Distances

<table>
<thead>
<tr>
<th>Nominal System Voltage Range</th>
<th>Minimum Approach Distance Alternating Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>50V to 300V</td>
<td>Avoid Contact</td>
</tr>
<tr>
<td>300V to 750V</td>
<td>1 ft. 0 in.</td>
</tr>
<tr>
<td>750V to 2kV</td>
<td>1 ft. 6in.</td>
</tr>
<tr>
<td>2kV to 15kV</td>
<td>2 ft. 0 in.</td>
</tr>
<tr>
<td>15kV to 37kV</td>
<td>3 ft. 0 in.</td>
</tr>
</tbody>
</table>