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Applicable OSHA Standard: 29 CFR 1910.332-333

## 1. Purpose

- 1.1. Absolute Pipeline Maintenance & Consulting has designed and adopted this electrical safety program to prevent electrically related injuries to personnel resulting from either direct or indirect electrical contacts, or damage to company property and client facilities when work is performed near or on equipment or circuits which are or may be energized.
- 1.2. This program also provides for proper training of site supervisors to ensure they have the required knowledge and understanding of electrical work practices and procedures. Employees shall be trained in and familiar with the safety-related work practices that pertain to their respective job assignments.
- 1.3. Only employees who are qualified to perform electrical work, knowledgeable about this program, and authorized by the company are allowed to repair or replace electrical components or electrically powered tools or equipment.
- 1.4. Electricity has long been recognized as a serious workplace hazard, exposing employees to such dangers as electric shock, electrocution, fires and explosions. References: NFPA 70E, Electrical Safety Requirements for Employee Workplaces, National Electrical Code (NEC) and OSHA Standard (Electrical Safety) 29 CFR 1910 Subpart S - Electrical.
- 1.5. Safe work practices regarding electricity shall be followed by employees as they relate to specific job assignments. Specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards.

## 2. Responsibilities

### 2.1. Management

- 2.1.1. Provide training for qualified and unqualified employees
- 2.1.2. Conduct inspections to identify electrical safety deficiencies in facilities and at job sites
- 2.1.3. Guard and correct all electrical deficiencies promptly
- 2.1.4. Ensure all new electrical installations meet codes and regulations

### 2.2. Employees

- 2.2.1. Report electrical deficiencies immediately
- 2.2.2. DO NOT work on electrical equipment unless authorized and trained

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- 2.2.3. Properly inspect all electrical equipment prior to use

### 3. Training

#### 3.1. Unqualified persons

- 3.1.1. Employees who face a risk of electric shock that is not reduced to a safe level by electrical installation requirements and who are not qualified persons shall also be trained in and be familiar with any electrically related safety practices that are necessary for their safety.

#### 3.2. Qualified persons

- 3.2.1. Qualified persons (i.e. those permitted to work on or near exposed energized parts) shall, at a minimum, be trained in and familiar with the following:
  - 3.2.1.1. The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
  - 3.2.1.2. The skills and techniques necessary to determine the nominal voltage of exposed live parts, and
  - 3.2.1.3. The clearance distances specified in 1910.333(c) and the corresponding voltages to which the qualified person will be exposed.
- 3.2.2. An employee must have successfully completed the training required in this program for a qualified person in order to be so considered.
- 3.2.3. Qualified persons whose work on energized equipment involves either direct contact or contact by means of tools or materials shall also have training to make them capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.
- 3.2.4. The required training shall be of the classroom or on-the-job type. The degree of training provided shall be determined by the risk to the employee.
- 3.2.5. For purposes of general comparison, typical occupational employee categories that face a higher than normal risk of electrical accident include blue collar supervisors; electrical and electronic engineers; electrical and electronic equipment assemblers; electrical and electronic technicians; electricians; industrial machine operators; material handling equipment operators; mechanics and repairers; painters; riggers and roustabouts; stationary engineers; and welders.

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- 3.3. Workers in these groups or with comparable job assignments do not need to be trained if their work or the work of those they supervise does not bring them or the employees they supervise close enough to exposed parts of electric circuits operating at 50 volts or more to ground for a hazard to exist.

#### **4. De-Energized Parts**

- 4.1. If an employee is exposed to “live” energized parts or components, these shall be de-energized before the employee begins work on or near them. An exception will be if it can be demonstrated that de-energizing these parts or components will present additional or increased hazards, or if de-energizing is not feasible due to equipment design or operational limitations.
- 4.2. 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. Examples of increased or additional hazards include tasks such as deactivation of emergency alarm systems, shutdown of hazardous location ventilation equipment, or removal of illumination for an area.
- 4.4. Examples of work that may be performed on or near energized circuit parts because of infeasibility due to equipment design or operational limitations include:
- 4.5. Testing of electric circuits that can only be performed with the circuit energized, and
- 4.6. Work on circuits that form an integral part of a continuous industrial process in a chemical plant that would otherwise need to be completely shut down in order to permit work on one circuit or piece of equipment.

#### **5. Energized Parts**

- 5.1. If the exposed “live” parts or components are not de-energized for reasons of increased or additional hazards or infeasibility, other safety-related work practices shall be used to protect employees who may be exposed to the electrical hazards involved.
- 5.2. Such work practices shall protect employees against direct contact with energized circuit parts with any part of their body, or indirectly through some other conductive object.
- 5.3. 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 exposed electric conductors or circuit parts.

#### **6. Working On Or Near Exposed De-Energized Parts**

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- 6.1. This paragraph applies to work on exposed de-energized parts or near enough to them to expose the employee to any electrical hazard they present.
- 6.2. Conductors and parts of electric equipment that have been de-energized but have not been locked out or tagged in accordance with paragraph (b) of this section shall be treated as energized parts, and paragraph (c) of this section applies to work on or near them.

## **7. Lockout and Tagout**

- 7.1. 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 or both in accordance with the company's written safety procedures for the control of hazardous energy.
- 7.2. For the purposes of this safety policy, "fixed equipment" refers to equipment fastened in place or connected by permanent wiring methods.
- 7.3. The company shall maintain a copy of the written procedures for control of hazardous energy (lockout and tagout procedures). These shall be made available for inspection by employees and by the Assistant Secretary of Labor and the Assistant Secretary's authorized representatives.

## **8. De-Energizing Equipment**

- 8.1. Safe procedures for de-energizing circuits and equipment shall be determined before circuits or equipment is de-energized. These procedures shall be machine-specific, system-specific or circuit-specific, in accordance with the company's procedures for control of hazardous energy (lockout and tagout program procedures).
- 8.2. The circuits and equipment to be worked on shall be disconnected from all electric energy sources. Control circuit devices, such as push buttons, selector switches, and interlocks, may not be used as the sole means for de-energizing circuits or equipment. Interlocks for electric equipment may not be used as a substitute for lockout and tagging procedures.
- 8.3. Stored electric energy which might endanger personnel shall be released.
- 8.4. Capacitors shall be discharged and high capacitance elements shall be short-circuited and grounded, if the stored electric energy might endanger personnel. If the capacitors or associated equipment are handled in meeting this requirement, they shall be treated as being energized.
- 8.5. 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.

## **9. Application of Locks and Tags**

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- 9.1. 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. For purposes of the company's program, lockout only and tagout only shall not be permitted as a safe work procedure, except in accordance with the company's written program for the control of hazardous energy for when a lock cannot be applied.
- 9.2. Locks shall be attached so as to prevent persons from operating the disconnecting means unless they resort to undue force or the use of tools.
- 9.3. Each tag shall contain a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.
- 9.4. Selection and use of locks and tags shall be in accordance with the company's written program for the control of hazardous energy.
- 9.5. If a lock cannot be applied, work shall not continue until a specific safe work procedure for the situation at hand is agreed upon between the employee and his or her on-site supervisor with approval prior to continuance of work from the company's Safety Coordinator.
- 9.6. When a lock cannot be applied, the on-site supervisor and company Safety Coordinator may allow use of a tagout only when tagout is supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by use of a lock. Examples of additional safety measures include the removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.

## **10. Verification Of De-Energized Condition**

- 10.1. The requirements of this section shall be met before any circuits or equipment can be considered and worked upon as being de-energized.
- 10.2. A qualified person shall operate the equipment operating controls or otherwise verify that the equipment cannot be restarted.
- 10.3. 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.
- 10.4. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage back feed even though specific parts of the circuit have been de-energized and presumed to be safe.
- 10.5. If the circuit to be tested is more than 600 volts, nominal, the test equipment shall be checked for proper operation immediately after this test.

## **11. Re-Energizing Equipment**

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- 11.1. These requirements shall be met, in the order given, before circuits or equipment are re-energized, even temporarily.
- 11.2. A qualified person shall conduct tests and visual inspections, as necessary, to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed, so that the circuits and equipment can be safely energized.
- 11.3. Employees exposed to the hazards associated with reenergizing the circuit or equipment shall be warned to stay clear of circuits and equipment.
- 11.4. Each lock and tag shall be removed by the employee who applied it or under his or her direct supervision. However, if this employee is absent from the workplace, then the lock or tag may be removed by a qualified person designated to perform this task provided that:
  - 11.4.1. The on-duty supervisor ensures that the employee who applied the lock or tag is not available at the workplace, and
  - 11.4.2. The employer ensures that the employee is aware that the lock or tag has been removed before he or she resumes work at that workplace.
- 11.5. There shall be a visual determination that all employees are clear of the circuits and equipment.
- 11.6. All of the above procedures for reenergizing shall be done in compliance with the company's written program for the control of hazardous energy.

## **12. Working On Or Near Exposed Energized Parts**

- 12.1. This section applies to work performed on exposed live parts (involving either direct contact or by means of tools or materials), or work performed near enough so that employees are exposed to these hazards and potential exposures.
- 12.2. Regarding work on energized equipment, only qualified persons may work on electric circuit parts or equipment that have not been de-energized under the procedures explained in this program. Such qualified persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.
- 12.3. If work is to be performed near overhead lines, the lines shall be de-energized and grounded, or other protective measures shall be provided before work is started. If the lines are to be de-energized, arrangements shall be made with the person or organization that operates or controls the electric circuits involved to de-energize and ground them. If protective measures, such as guarding, isolating, or insulating, are provided, these precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.

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12.4. The work practices used by qualified persons installing insulating devices on overhead power transmission or distribution lines shall be in accordance with 1910.269 and not by 1910.332 through 1910.335.

12.5. Unqualified persons are specifically prohibited from performing this type of work.

### **13. Unqualified Persons**

13.1. When an unqualified person is working in an elevated position near overhead lines, the location shall 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:

13.1.1. For voltages to ground 50kV or below - 10 feet (305 cm);

13.1.2. For voltages to ground over 50kV - 10 feet (305 cm) plus 4 inches (10 cm) for every 10kV over 50kV.

13.2. When an unqualified person is working on the ground in the vicinity of overhead lines, the person may not bring any conductive object closer to unguarded, energized overhead lines than the distances given in this section.

13.3. For voltages normally encountered with overhead power line, objects which do not have an insulating rating for the voltage involved are considered to be conductive.

### **14. Qualified Persons**

14.1. When a qualified person is working in the vicinity of 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 the table Approach Distances For Qualified Employees - Alternating Current contained in this section unless:

14.1.1. The person is insulated from the energized part (gloves, with sleeves if necessary, rated for the voltage involved are considered to be insulation of the person from the energized part on which work is performed), or

14.1.2. The energized part is insulated both from all other conductive objects at a different potential and from the person, or

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

**Approach distances for qualified employees -- alternating current**

<b>Voltage range (phase to phase)</b>	<b>Minimum approach distance</b>
300V and less	Avoid Contact
Over 300V, not over 750V	1 ft. 0 in. (30.5 cm).
Over 750V, not over 2kV	1 ft. 6 in. (46 cm).
Over 2kV, not over 15kV	2 ft. 0 in. (61 cm).
Over 15kV, not over 37kV	3 ft. 0 in. (91 cm).
Over 37kV, not over 87.5kV	3 ft. 6 in. (107 cm).
Over 87.5kV, not over 121kV	4 ft. 0 in. (122 cm).
Over 121kV, not over 140kV	4 ft. 6 in. (137 cm).

**15. Vehicular And Mechanical Equipment**

- 15.1. 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 ft. (305 cm) is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10kV over that voltage. However, under any of the following conditions, the clearance may be reduced:
  - 15.2. If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. (122 cm). If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10 kV over that voltage.
  - 15.3. If insulating barriers are installed to prevent contact with the lines, and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.
  - 15.4. If the equipment is an aerial lift insulated for the voltage involved, and if the work is performed by a qualified person, the clearance (between the un-insulated portion of the aerial lift and the power line) may be reduced to the distance given in table Approach Distances for Qualified Employees - Alternating Current.
  - 15.5. Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments, unless:
    - 15.5.1. The employee is using protective equipment rated for the voltage; or

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15.5.2. The equipment is located so that no un-insulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the line than permitted under this section.

15.6. If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding may not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions, such as the use of barricades or insulation, shall be taken to protect employees from hazardous ground potentials, depending on earth resistance and fault currents, which can develop within the first few feet or more outward from the grounding point.

## **16. Illumination**

16.1. Employees may not enter spaces containing exposed energized parts, unless illumination is provided that enables the employees to perform the work safely.

16.2. Where lack of illumination or an obstruction precludes observation of the work to be performed, employees may not perform tasks near exposed energized parts.

16.3. Employees may not reach blindly into areas that may contain energized parts.

## **17. Confined Or Enclosed Work Spaces**

17.1. When an employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed energized parts, the employer 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.

## **18. Conductive Materials And Equipment**

18.1. 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 conductors or circuit parts. If an employee must handle long dimensional conductive objects (such as ducts and pipes) in areas with exposed live parts, the employer shall institute work practices (such as the use of insulation, guarding, and material handling techniques) which will minimize the hazard.

## **19. Portable Ladders**

19.1. Portable ladders shall have nonconductive side rails if they are used where the employee or the ladder could contact exposed energized parts. Use of portable ladders shall comply with the company's written safety procedures for working with ladders.

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## 20. **Conductive Apparel**

20.1. Conductive articles of jewelry and clothing (such a 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.

## 21. **Housekeeping Duties**

21.1. Where live parts present an electrical contact hazard, employees may not perform housekeeping duties 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 silicon 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.

## 22. **Interlocks**

22.1. Only a qualified person, who is following established safe work procedures in accordance with OSHA requirements, 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.