

Commonwealth Scaffold, LLC
Electrical Work Practices
Program and Training
Materials

Effective Date: 12/14/2012
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Electrical Work Practices Program

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Reference Standard

Occupational Safety and Health Administration:

- 29 CFR 1910.332 – Training
- 29 CFR 1910.333 – Selection and Use of Work Practices

Purpose

This program establishes safe work practices to be used to prevent electrical shock or other injuries resulting from either direct or indirect contacts, when work is performed near or on equipment or circuits which are or may be energized.

Scope

This procedure applies to all company employees, contractors and vendors performing work on company property, and all other individuals who are visiting or have business with our company.

Responsibilities

- Management and supervisors are responsible for enforcement of this program.
- Management will ensure that required training is conducted.
- Employees, Contractors and vendors are required to comply with all procedures outlined in this policy.

Definitions

De-energized: Free from any electrical connection to a source of potential difference and from electrical charge.

Energized: Electrically connected to a source of potential difference.

Insulated: Separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current.

Qualified person: One who has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and the hazards involved.

Procedure

De-energized parts

Live parts to which an employee may be exposed must be de-energized before the employee works on or near them, unless the employer can demonstrate that de-energizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations.

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.

Energized parts

If the exposed live parts are not de-energized (i.e., for reasons of increased or additional hazards or infeasibility), other safety-related work practices must be used to protect employees who may be exposed to the electrical hazards involved. Such work practices must protect employees against contact with

energized circuit parts directly with any part of their body or indirectly through some other conductive object. 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.

Working on or near exposed de-energized parts

This applies to work on exposed de-energized parts or near enough to them to expose the employee to any electrical hazard they present. Conductors and parts of electric equipment that have been de-energized but have not been locked out or tagged must be treated as energized parts.

Lockout and tagging: 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 or both in accordance with the requirements below.

De-energizing equipment

Safe procedures for de-energizing circuits and equipment must be determined before circuits or equipment are de-energized.

- The circuits and equipment to be worked on must 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.
- Stored electric energy which might endanger personnel must be released. Capacitors must be discharged and high capacitance elements must be short-circuited and grounded, if the stored electric energy might endanger personnel. Note: If the capacitors or associated equipment are handled in meeting this requirement, they must be treated as energized.
- Stored non-electrical energy in devices that could reenergize electric circuit parts must be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.
- Application of locks and tags
 - o A lock and a tag must be placed on each disconnecting means used to de-energize circuits and equipment on which work is to be performed. The lock must be attached so as to prevent persons from operating the disconnecting means unless they resort to undue force or the use of tools.
 - o Each tag must contain a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.
 - o If a lock cannot be applied, or if the employer can demonstrate that tagging procedures will provide a level of safety equivalent to that obtained by the use of a lock, a tag may be used without a lock.

If a tag is used without a lock it must be 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.

- o A lock may be placed without a tag only under the following conditions:
 - Only one circuit or piece of equipment is de-energized, and
 - The lockout period does not extend beyond the work shift, and
 - Employees exposed to the hazards associated with reenergizing the circuit or equipment are familiar with this procedure.

The requirements of this paragraph must be met before any circuits or equipment can be considered and worked as de-energized.

A qualified person must operate the equipment operating controls or otherwise verify that the equipment cannot be restarted. They also must use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and must verify that the circuit elements and equipment parts are de-energized. The test must also determine if any energized condition exists as a result of

inadvertently induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been de-energized and presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment must be checked for proper operation immediately after this test.

Reenergizing equipment

These requirements must be met, in the order given, before circuits or equipment are reenergized, even temporarily.

- A qualified person must 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.
- Employees exposed to the hazards associated with reenergizing the circuit or equipment must be warned to stay clear of circuits and equipment.
- Each lock and tag must 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:
 - o The employer ensures that the employee who applied the lock or tag is not available at the workplace, and
 - o 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.
- There must be a visual determination that all employees are clear of the circuits and equipment

Working on or near exposed energized parts

This applies to work performed on exposed live parts (involving either direct contact or by means of tools or materials) or near enough to them for employees to be exposed to any hazard they present.

Work on energized equipment

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

Overhead lines

If work is to be performed near overhead lines, the lines must be de-energized and grounded, or other protective measures must be provided before work is started. If the lines are to be de-energized, arrangements must 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 must prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools or equipment.

Unqualified persons

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

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

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 Table 1.

Qualified persons

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 Table 1 unless:

- 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).
- The energized part is insulated both from all other conductive objects at a different potential and from the person.
- The person is insulated from all conductive objects at a potential different from that of the energized part.

TABLE 1 - APPROACH DISTANCES FOR QUALIFIED EMPLOYEES - ALTERNATING CURRENT

Voltage range (phase to phase)	Minimum approach distance
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)

Vehicular and mechanical equipment

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines must be operated so that a clearance of 10 ft. (305 cm) is maintained. If the voltage is higher than 50kV, the clearance must be increased 4 in. (10 cm) for every 10kV over that voltage. However, under any of the following conditions, the clearance may be reduced:

- 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 must be increased 4 in. (10 cm) for every 10 kV over that voltage.
- 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.
- 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 1.

Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments, unless:

- The employee is using protective equipment rated for the voltage.
- 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 in the opening paragraph of this section.

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, must be taken to protect employees from hazardous ground potentials, depending on earth resistivity and fault currents, which can develop within the first few feet or more outward from the grounding point.

Illumination

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

Where lack of illumination or an obstruction affects clear visibility of the work to be performed, employees may not perform tasks near exposed energized parts. Employees may not reach blindly into areas which may contain energized parts.

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, the employer must provide, and the employee must use, protective shields, protective barriers or insulating materials as necessary to avoid inadvertent contact with these parts. Doors, hinged panels and the like must be secured to prevent their swinging into an employee and causing the employee to contact exposed energized parts.

Conductive materials and equipment

Conductive materials and equipment that are in contact with any part of an employee's body must 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 must institute work practices (such as the use of insulation, guarding and material handling techniques), which will minimize the hazard.

Portable ladders

Portable ladders must have nonconductive siderails 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 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.

Training

Employees will be trained in and familiar with the safety-related work practices required by this program that pertain to their respective job assignments.

Qualified persons (i.e. those permitted to work on or near exposed energized parts) must, at a minimum, be trained in and familiar with the following:

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

- The clearance distances specified in Table 1 and the corresponding voltages to which the qualified person will be exposed.

Training can be either classroom or on-the-job, or a mixture of both. The degree of training provided is determined by the risk to the employee.

Revision History Record:

Revision Number	Section	Revised By	Description
0	NA	NA	Original document.

PLAYING IT SAFE

Be safe and healthy on the job at Commonwealth Scaffold, LLC with these helpful tips provided by Allied Insurance Brokers, Inc.



Follow Safe Electrical Work Practices

Essential steps to minimize electrocution hazards

De-energized parts

Any live parts that you may come into contact with need to be de-energized before you work on or near them.

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.

Lockout/tagout of de-energized parts

Whenever you are 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 or both.

- Disconnect circuits and equipment 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.
- Release stored electric energy. Capacitors must be discharged and high capacitance elements must be short-circuited and grounded, if the stored electric energy might present a hazard.
- Block or relieve all stored non-electrical energy in devices that could reenergize electric circuit parts.

Re-energizing equipment

These requirements must be met, in the order given, before circuits or equipment are re-energized, even temporarily.

- A qualified person must 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.

- Any employees exposed to the hazards associated with reenergizing the circuit or equipment must be warned to stay clear of circuits and equipment.
- Each lock and tag must 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:
 - The employer ensures that the employee who applied the lock or tag is not available at the workplace, and
 - 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.
- There must be a visual determination that all employees are clear of the circuits and equipment



Energized Parts

If the exposed live parts are not de-energized (i.e., for reasons of increased or additional hazards or infeasibility), other safety-related work practices must be used to protect against contact with the energized circuit parts directly, with the body, or indirectly, through some other conductive object.

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ELECTRICAL WORK PRACTICES

INSTRUCTOR NOTES

The following provides a useful preparation outline for use by trainers presenting the Electrical Work Practices presentation to employees. The presentation is available from Allied Insurance Brokers, Inc..

Training Objective

- Review electrical work hazards and safety so that employees proactively follow safety procedures

Before Training

- Review and understand CFR 1910.332 – Training and 29 CFR 1910.333 – Selection and Use of Work Practices

Introduction for Training

- Begin by stressing the overall importance of safety in your facility
- Review with employees that these materials can cause injury to the operator as well as significant accidents that impact the entire facility and beyond
- Give examples of possible applications for safe electrical work practices in your facility
- As a ground breaker, you can ask employees what experience they have had working with electrical systems.

General Guidelines

- Stress the importance of the bullet points on these slides
- Stress the importance of the individual employee being committed to his or her own safety
- Be sure to be open to questions or comments

Conclusion

- Review the potential hazards and facility requirements for electrical work
- Review the handout for further training

Employee Exercise

- Have the employee explain and/or demonstrate how she or he will perform job duties utilizing safe electrical work practices

ELECTRICAL WORK PRACTICES QUIZ

Name: _____ Date: _____ Score: _____

Place a check mark on the line with the best answer for each of these 10 questions:

1. You must de-energize live parts operating at less than 50 volts:
a. ___ True
b. ___ False
2. Conductors and parts of electric equipment that have been de-energized but have not been locked out or tagged must be treated as energized parts:
a. ___ True
b. ___ False
3. Can a lock or tag ever be removed by someone other than the person who originally placed it?
a. ___ No, locks and tags can only ever be removed by the person who originally set it.
b. ___ Yes, but only by a qualified person who ensures that the employee who originally set the lock or tag is not at the workplace.
4. No one can work on energized parts unless:
a. ___ They are wearing nonconductive clothing
b. ___ They are considered a "qualified person" according to OSHA's definition
5. If work is to be performed near overhead lines:
a. ___ the lines must be de-energized and grounded.
b. ___ protective measures such as guarding, isolating or insulating must be used.
c. ___ either a or b.
6. Unqualified persons working in an elevated position near overhead lines with voltages to ground over 50kV must stay 10 feet away from lines, plus ___ for every 10kV over 50kV.
a. ___ 4 inches
b. ___ 6 inches
c. ___ 1 foot
d. ___ 10 feet
7. When working in dark areas:
a. ___ All live parts must be de-energized.
b. ___ The area must be properly illuminated to increase visibility.
8. When working in a confined space containing exposed energized parts:
a. ___ All energized parts must be de-energized by a qualified person.
b. ___ All parts must be guarded using protective shields, barriers or insulating materials.
9. For safe use around energized parts, ladders must have:
a. ___ Nonconductive siderails.
b. ___ OSHA approved, nonslip foot pads.
c. ___ Both a. and b.
10. General housekeeping duties cannot be performed around energized parts unless:
a. ___ Safeguards are provided to prevent accidental contact.
b. ___ They are done by a "qualified person."

