

XXIII Residential Service Companies

240/120 Volt Single-Phase Electrical Work Safety Program

The 240/120 Volt Single-Phase Electrical Work Safety Program was prepared to increase awareness of the hazards involved in working on or near energized electrical conductors and circuit parts. This program describes precautions that can be taken to minimize the dangers associated with working on energized/hot electrical power. OSHA requires that energized/hot electrical work be avoided unless absolutely necessary for troubleshooting, and only after every alternative means to carry out deenergized work has been considered and eliminated. The basic OSHA requirement for electrical work in 29 CFR Part 1910, Subpart S is deenergization (29 CFR 1910.333(a)(1)). Electric circuits and equipment must always be deenergized before employees work on or near them, except where the work or the nature of the installation requires that the equipment be energized. OSHA does not leave it to the employer's discretion whether to deenergize electric circuits on the basis of convenience, custom, or expediency.

Each company should make its own decision about whether to adopt a policy that permits any energized work under any conditions.

The 240/120 Volt Single-Phase Electrical Work Safety Program was designed for companies working in the residential market.

1. OVERVIEW

1.1. PURPOSE

1.1.1. This 240/120 Volt Single-Phase Electrical Work Safety Program provides safety procedures for professional electrical field employees who are required to work on or near energized electrical conductors and circuit parts.

1.1.2. This program has been established to ensure that electrical work on energized/hot parts is performed only when absolutely necessary for troubleshooting, and only after every alternative means to carry out deenergized work has been considered and eliminated.¹

1.1.3. This program is also designed to help establish safeguards that will identify and control hazards encountered in testing, maintenance or repair services, and all other work involving exposure to energized/hot electrical parts.

1.1.4. This program is designed to provide policies and procedures for contractor employees who must perform work on or near exposed energized/hot electrical conductors and circuit parts rated from 50-volts to 240-volts, single phase.

1.2. GENERAL PROCEDURES

1.2.1. The following procedures shall apply to all work on, or close to, exposed energized/hot electrical conductors or circuit parts. Additional procedures may be needed for specific tasks.

1.2.2. The hazards and the extent of the risk shall be thoroughly examined prior to performing the work.

1.2.3. Ensure the appropriate personal protective equipment (PPE) is used as outlined in the Safety Matrix (see Appendix B).

1.2.4. Manufacturer's instructions and equipment details shall be consulted prior to any work being performed. The manufacturer's recommendations regarding safety of employees and others must be followed.

¹ OSHA requires, in 29 CFR 1910.333(a)(1), that: Live parts to which an employee may be exposed shall be deenergized before the employee works on or near them, unless the employer can demonstrate that deenergizing 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 deenergized if there will be no increased exposure to electrical burns or to explosion due to electric arcs.

1.2.5. To work on energized/hot devices as identified in this program you must be:²

1.2.5.1. A Licensed Residential Electrician or the equivalent in experience and training as determined by your employer;

1.2.5.2. Trained on this 240/120 Volt Single-Phase Electrical Work Safety Program; and

1.2.5.3. Considered an authorized person as defined in this program (see 2.2.1).

1.2.6. Employers shall determine and employees shall use only the appropriate equipment to accomplish an assigned task.

1.2.7. The true effectiveness of any safety program relies upon management commitment and the execution and acceptance of the program by the employees affected. This program shall be audited annually and revised as needed. The employers shall encourage input from all employees concerning safety procedures and policies.

2. 240/120 VOLT SINGLE-PHASE ELECTRICAL WORK SAFETY PROGRAM FOR RESIDENTIAL COMPANIES

2.1. SCOPE

2.1.1. It is recommended that this 240/120 Volt Single-Phase Electrical Work Safety Program for Residential Companies be adopted by electrical contractors.

2.1.2. This program does not permit employers to deviate from the safe work practices of OSHA's Subpart S of 29 CFR 1910 and Subpart R of 29 CFR 1926.

2.1.3. Every attempt shall be made to protect employees from shock, burn, arc-blast and other hazards that are present in this working environment.

2.1.4. Employers are responsible for protecting employees from such hazards.

2.1.5. Employees are responsible for adhering to the policies and procedures set forth in this manual.

2.2. DEFINITIONS

2.2.1. **Authorized Persons:** An authorized person shall meet all of the requirements of a qualified person (see 2.2.6). An authorized person shall be trained in all of the following:

² OSHA requires, in 29 CFR 1910.333(c)(2), that: Only qualified persons may work on electric circuit parts or equipment that have not been deenergized under the procedures of paragraph (b) of this section. Such 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.

- 2.2.1.1. The skills and techniques necessary to distinguish exposed energized/hot parts from other parts of electric equipment;
- 2.2.1.2. The skills and techniques necessary to determine the nominal voltage of exposed energized/hot parts;
- 2.2.1.3. The decision-making process necessary to determine the degree and extent of the hazard and the PPE and job planning necessary to perform the work safely, including protecting unqualified workers for exposed energized parts;³ and
- 2.2.1.4. The Energized Electrical Work Safety Program for Residential Companies.
- 2.2.1.5. In addition, an authorized person may hold a valid journeyman electricians license, or the equivalent in experience and training as determined by the employer.

2.2.2. **Deenergized:** Free from any connection to a source of voltage or from electric charge; and physically locked, blocked, or otherwise prevented from having a potential different than that of the earth.

2.2.3. **Electrical Hazard:** This is recognized to include three separate hazard categories.

2.2.3.1. Electric Shock (a) by simultaneous contact with two energized/hot conductors at different potentials (b) by simultaneous contact with one of the energized/hot conductors and the ground, and (c) by contact with a metallic part that has become energized by an energized/hot conductor while also in contact with the ground.

2.2.3.2. Electric Arc: Arcing faults or “flash” burns are generated as a result of electrical contact or poor insulation, from phase to ground or phase to phase, as short-circuit current surges through vaporized metal and carbon. Arc temperatures can reach 35,000 degrees F. and the length and duration of the arc will vary. Burns are severe and often fatal.

2.2.3.3. Electric Arc Blast: Tremendous air pressure is developed as a result of the instantaneous occurrence of an electric arc, in the form of a shock wave that may cause property damage, injury or death.

2.2.4. **Energized/Hot:** Electrically connected to a source of voltage or otherwise electrically charged with a potential noticeably different than that of the earth.

2.2.5. **Energized/Hot Electrical Work:** Any work on electrical equipment, circuits, devices, systems, or any other energized/hot part(s) where an employee is required to deliberately, or could accidentally, place any part of his body, tool or material into or around such electrical parts where the voltage has been determined to be in excess of 50 volts.

2.2.6. **Qualified Person:** A qualified person is one who has received training in and has demonstrated skills and knowledge in the construction and operation of electric

³ OSHA describes an unqualified worker as one (29 CFR 1910.333) with little or no training in avoiding the electrical hazards of working on or near exposed energized parts.

equipment and installations and the hazards involved (see 29 CFR 1910.399).⁴ A qualified person must be familiar with and trained in:

- 2.2.6.1. The proper use of special precautionary techniques.
- 2.2.6.2. Personal protective equipment.
- 2.2.6.3. Insulating and shielding materials
- 2.2.6.4. Insulated tools and test equipment.

Note 1: Whether an employee is considered to be 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" with regard to certain equipment in the workplace, but "unqualified" as to other equipment. (See 29 CFR 1910.332(b)(3) for training requirements that specifically apply to qualified persons.)

Note 2: An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

2.2.7. **Troubleshooting:** The testing of energized/hot electrical circuits known as troubleshooting shall be confined to the purpose of diagnostic readings of voltage and amperage only.

3. REQUIREMENTS

3.1. Energized/hot electrical work includes working on or near any energized/hot electrical system, whether alternating or direct current, including, but not limited to, service entrance sections, control power transformers, power and lighting distribution panels and panelboards, UPS systems, standby generator systems, and branch circuit wiring, including control circuit wiring operating at 50 volts and above.

3.2. Examples of energized/hot electrical work include:

- 3.2.1. Voltage Testing;
- 3.2.2. Circuit Testing;
- 3.2.3. Troubleshooting;
- 3.2.4. Operating (switching) electric circuits;
- 3.2.5. Removing and reinstalling fuses;
- 3.2.6. Deenergizing and reenergizing procedures;
- 3.2.7. Opening (removing) and closing (reinstalling) covers, including for panels or panelboards, direct-wired motors and appliances, and outlet and switching devices; and
- 3.2.8. Excavations near underground electrical lines.

⁴ OSHA, in 29 CFR 1910.399, defines "qualified person" as: 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.

3.3. All circuits, equipment, devices, and other apparatus must be placed into a deenergized state before any work can be performed.

3.4. If the equipment cannot be placed into an electrically safe condition because additional or increased hazards or reasons of infeasibility,⁵ a Hot Work Permit (see Appendix A) must be completed and approved by the supervisor and reviewed with the Company / Branch office Safety Manager. (The basic OSHA requirement for electrical work in 29 CFR Part 1910, Subpart S is deenergization (29 CFR 1910.333(a)(1)). Electric circuits and equipment must always be deenergized before employees work on or near them, except where the work or the nature of the installation requires that the equipment be energized. OSHA does not leave it to the employer's discretion whether to deenergize electric circuits on the basis of convenience, custom, or expediency.)

3.5. An electrically safe (deenergized) work condition shall be achieved when performed in accordance with the employer's company policy and after the following conditions have been met:

3.5.1. Only authorized persons are permitted to work on or near energized electrical conductors or circuit parts that cannot be deenergized.

3.5.2. Determine all possible sources of electrical supply to the specific equipment; for example UPS or standby generator systems.

3.5.3. Check applicable up-to-date drawings, diagrams, and identification tags and nameplates.

3.5.4. After properly interrupting the load current, open the disconnecting device(s) for each source.

3.5.5. Where possible, visually verify that all blades of the disconnecting devices are fully open.

3.5.6. Apply lockout/tagout devices in accordance with the employer's company lockout/tagout policy.

3.5.7. Use an adequately rated voltage meter (indicator) to test each phase conductor or circuit part to verify they are deenergized. Use a "confirm-test-confirm" procedure, where possible.⁶

⁵ Refer to footnote number 1 regarding additional or increased hazards or reasons of infeasibility. (See also 29 CFR 1910.333(a)(1).)

⁶ Use the three-point, "confirm-test-confirm," test method especially when checking to see if a circuit is dead. First, test a known live circuit to confirm the indicator works. Second, test the target circuit. Third, test the live circuit again. This verifies that the meter (indicator) worked properly before and after the measurement.

3.5.8. Because the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them. Apply ground-connecting devices rated for the available fault current.

4. ENGINEERING CONTROLS

4.1. Minimum required working clearances will be established and maintained for all distribution panels and equipment (see 29 CFR 1910.303(g)(1)).

4.2. Electrical rooms, vaults, and areas containing equipment will be guarded against accidental damage by suitable barriers and structural means (see 29 CFR 1910.303(g)(2)).

4.3. Electrical installations will conform to the requirements of the OSHA and the National Electrical Code (NEC), including support requirements for all conduit and equipment.

4.4. Adequate lighting shall be maintained in all areas where energized/hot work is to be carried out (see 29 CFR 1910.303(g)(1)(v)).

4.5. All enclosures, including junction boxes, switches, panels, and the like as required by the NEC, shall be properly maintained in order to safely contain energized/hot parts (see 29 CFR 1910.303(b)(7)). Shock injuries may be caused by poorly grounded or ungrounded electrical equipment. Close attention must be paid to the condition of all equipment and the integrity of the equipment grounding system. The path to ground from circuits, equipment, and enclosures shall be permanent, continuous, and effective (see 29 CFR 1910.304(g)(5)).

5. ADMINISTRATIVE CONTROLS

5.1. Every electrical conductor or circuit part shall be considered energized/hot until proven otherwise.

5.2. Deenergized conductors and equipment that have not been locked out or tagged shall be treated as energized/hot parts.

5.3. No barehanded contact is to be made with exposed energized/hot electrical conductors or circuit parts above 50 volts to ground. Although voltages between 241 and 600 volts are not covered in this program, Residential Electricians should avoid coming within 0.31 meters (1 foot) of exposed energized/hot parts. In general, unqualified persons should stay back at least 3.05 meters (10 feet). (Residential Electricians unless

they meet the requirements to be considered “qualified persons”⁷ should also stay back at least 3.05 Meters (10 feet).)

5.4. When working in an elevated position near overhead lines, both Residential Electricians and unqualified persons, including the longest conductive object he or she may contact, must stay back at least 3.05 meters (10 feet).⁸

5.5. All employees will follow established electrical safety requirements set forth in this Program and the employer’s safety policy.

5.6. Work on energized/hot parts is limited to Authorized Persons, under the requirements set forth in this Program.

5.7. Access to electrical rooms or energized/hot work permit areas is limited to those employees who are qualified (those who have training in avoiding the electrical hazards of working on or near exposed energized parts) and have a legitimate need to enter.

5.8. Housekeeping duties will not be performed at close distances to energized/hot parts unless adequate barriers and insulating equipment are employed and is limited to those employees who are qualified (those who have training in avoiding the electrical hazards of working on or near exposed energized parts).

5.9. Portable ladders shall have non-conductive side rails if the ladder or employee might be in a position to contact energized/hot electrical parts.

5.10. Violation of the safety policies and work procedures set forth in this program will be considered willful misconduct and subject to disciplinary procedures, up to and including termination.

6. PROTECTIVE EQUIPMENT

6.1. Class 00 approved rubber insulating gloves (rated at 500 volts) and leather protectors shall be used when required (see 29 CFR 1910.137).⁹ Insulating equipment shall be

⁷ Refer to footnote number 4 regarding “qualified persons.” See also the definition of “qualified person” in 1910.399.)

⁸ OSHA has requirements about “unqualified persons” in 29 CFR 1910.333(c)(3)(i):

1910.333(c)(3)(i) "Unqualified persons."

1910.333(c)(3)(i)(A) 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:

1910.333(c)(3)(i)(A)(1) For voltages to ground 50kV or below - 10 feet (305 cm);

1910.333(c)(3)(i)(A)(2) For voltages to ground over 50kV - 10 feet (305 cm) plus 4 inches (10 cm) for every 10kV over 50kV.

inspected for damage before each day's use and immediately following any incident that can reasonably be suspected of having caused damage. Insulating gloves shall be given an air test, along with the inspection (see 29 CFR 1910.137(b)(2)(ii)).

6.2. Only insulated tools that are designed and rated for the appropriate voltages will be used on energized/hot circuits, equipment or systems. Voltage rated tools should be clean and have a smooth finish with no breaks in the insulation. Insulating equipment should be inspected for damage before each day's use and immediately following any incident that can reasonably be suspected of having caused damage.

6.3. Fuse pullers shall be used for removing and inserting fuses (see 29 CFR 1910.335(a)(2)(i)(A)).

6.4. All metal jewelry, key chains, cell phones, pagers, etc., should be removed when working with anything energized/hot.

6.5. Proper Personal Protective Equipment will be worn at all times as indicated in the Safety Matrix (see Appendix B).

6.6. Arc Rated clothing rated at least to 4 cal/cm² shall be used where required.

6.7. Arc Rated face shield rated at least to 4 cal/cm² shall be used where required.

6.8. Hearing protection shall be used when performing energized/hot work.

6.9. If the second person cannot maintain a safe distance of 1.2 meters (4 feet) from the exposed part(s), he or she must be wearing the same PPE as the authorized person performing the work.

6.10. Upon consideration of and prior to doing energized work, complete an Energized/Hot Work Permit (see Appendix A).

⁹ OSHA has requirements about protector gloves in 29 CFR 1910.137:

1910.137(b)(2)(vii) Protector gloves shall be worn over insulating gloves, except as follows:

1910.137(b)(2)(vii)(A) Protector gloves need not be used with Class 0 gloves, under limited-use conditions, where small equipment and parts manipulation necessitate unusually high finger dexterity.

Note to 1910.137(b)(2)(vii)(A): Extra care is needed in the visual examination of the glove and in the avoidance of handling sharp objects.

1910.137(b)(2)(vii)(B) Any other class of glove may be used for similar work without protector gloves if the employer can demonstrate that the possibility of physical damage to the gloves is small and if the class of glove is one class higher than that required for the voltage involved. Insulating gloves that have been used without protector gloves may not be used at a higher voltage until they have been tested under the provisions of paragraphs (b)(2)(viii) and (b)(2)(ix) of section 1910.137.

Note: In completing the justification section of this permit (response to question #9), it is generally realized that deenergization is possible and sensible.

7. MEDICAL SERVICES AND FIRST AID

7.1. The employer shall provide first aid kits and training, including training in cardiopulmonary resuscitation (CPR) when employees are doing work on or associated with exposed conductors or circuit parts energized at 50 volts or more.

8. EMPLOYEE ACKNOWLEDGEMENT

8.1. I understand that I am not allowed to work on any energized/hot electrical circuits except on the rare occasion where this type of work is proven to be necessary by my employer; then, I will perform these duties in accordance with this 240/120 Volt Single-Phase Electrical Work Safety Program. I realize that this program is for my personal safety and welfare **as well as that of my fellow employees** and that failure to comply with this program may result in injury or death (including my fellow employees) and the termination of my employment. In affixing my signature, I am certifying that I meet the requirements of 1.2.5 of this program..

8.2. Where Spanish is my primary language, in affixing my signature, I am certifying that I meet the requirements of 1.2.5 of this 240/120 Volt Single-Phase Electrical Work Safety Program.

Comprendo que no se me es permitido trabajar en circuitos eléctricos por los cuales circula corriente eléctrica, excepto en ocasiones extraordinarias donde mi empleador ha comprobado que este tipo de trabajo es necesario. En estas circunstancias completare mis labores en concordancia con el “240/120 Volt Single-Phase Electrical Work Safety Program,” el cual es un programa que provee protección (a mi y a mis colegas) contra los riesgos eléctricos asociados con este trabajo. El fallo de cumplir con este programa puede resultar en heridas o muerte para mi o mis colegas. Al firmar este documento, certifico que lleno los requisitos de la sección 1.2.5 de dicho programa.

EMPLOYEE - PRINT NAME

WITNESS - PRINT NAME

EMPLOYEE -SIGN NAME

WITNESS - SIGN NAME

DATE SIGNED

DATE SIGNED

Appendix A

| | | | |
|--|----------|--|--|
| RESIDENTIAL ENERGIZED/HOT WORK PERMIT | | EXPLAIN JUSTIFICATION FOR ENERGIZED/HOT WORK: | |
| 1. Residential Electrician performing Energized/Hot Work: | | 2. 2nd Person if Required: | |
| 3. Customer is aware of Energized/Hot Work being performed: YES NO | | 4. Has the procedure been reviewed by all affected employees? YES NO | |
| 5. Job Name and Number: | | | |
| 6. Energized/Hot Work is being performed on: | 7. Date: | 8. Time: | |
| 9. Explain justification for why the circuit/equipment cannot be deenergized or the work deferred until the next scheduled outage: | | | |
| 10. Description of the Safe Work Practices to be employed: | | | |

Description of Work:

| |
|--|
| 11. Description of circuit/equipment/job location: |
| 12. Explain work to be performed (e.g. trouble shooting 120/208, Hot check out, etc.): |

13. Safety Considerations and Personal Protective Equipment (PPE) Required:

(Check all that apply)

| | |
|--|--|
| Hot Work Gloves (Class 0- 500 V, minimum, rated rubber insulating gloves and leather protectors) | Barriers and Guards are in workable condition and are properly placed to isolate hazardous area. |
| Face Shields | Hot Work Tools. <i>(Insulated Tools Required.)</i> |
| Rubber Insulating Blankets | Meters are in operational condition and have been tested. |
| Safety Glasses with side shields | Other employees in the area have been informed of Hot Work being performed. |
| Arc Rated Clothing (4 Cal/cm ² , min.) | All employees assigned to perform work or assist have been briefed. |
| Lockout/Tagout Equipment placed on all other circuits. <i>(If Applicable)</i> | Hearing Protection |

(Note: Refer to the Safety Matrix in Appendix B to determine if a second person is required.)

Identify special conditions or considerations: _____

Supervisor's Signature: _____

Appendix B

240/120 V Single-Phase Energized/Hot Electrical Safety Matrix

| Situation | Non-conductive Hard Hat | Safety Glasses | Hearing Protection | Insulated Gloves w/ Leather Protectors | Arc Rated Face Shield | Insulated and Insulating Tools | 2nd Person † | Hot Work Permit | Minimum Arc Rating |
|--|-------------------------|----------------|--------------------|--|-----------------------|--------------------------------|--------------|-----------------|----------------------------|
| Testing 120v Circuitry* | X (Note 1) | X | X | X | X | X | | | X (4 cal/cm ²) |
| Testing 240v Circuitry* | X (Note 1) | X | X | X | X | X | | | X (4 cal/cm ²) |
| Working on 120v Circuits other than testing ** | X (Note 1) | X | X | X | X | X | X | X | X (4 cal/cm ²) |
| Working on 240v Circuits other than testing ** | X (Note 1) | X | X | X | X | X | X | X | X (4 cal/cm ²) |

* – Testing for verification of deenergized state (deenergizing and reenergizing procedures) and troubleshooting.

** – Working on circuits includes:

Operating (switching) electric circuits;

Removing and reinstalling fuses;

Opening (removing) and closing (reinstalling) covers, including for panels or panelboards, direct-wired motors and appliances, and outlet and switching devices; and

Excavations near underground electrical lines.

† – The second person who is to be trained in CPR is available to assist a fallen employee, including to administer CPR and to use an automated external defibrillator, where available.

NOTES:

1. Arc-rated hard hat liner (4 cal/cm², min.), as required.

Appendix C

Organizations Currently Recognized by OSHA as NRTLs

- [Canadian Standards Association \(CSA\)](#) (also known as CSA International)
- [Communication Certification Laboratory, Inc. \(CCL\)](#)
- [Curtis-Straus LLC \(CSL\)](#)
- [FM Approvals LLC \(FM\)](#) (formerly Factory Mutual Research Corporation)
- [Intertek Testing Services NA, Inc. \(ITSNA\)](#) (formerly ETL)
- [MET Laboratories, Inc. \(MET\)](#)
- [NSF International \(NSF\)](#)
- [National Technical Systems, Inc. \(NTS\)](#)
- [SGS U.S. Testing Company, Inc. \(SGSUS\)](#) (formerly UST-CA)
- [Southwest Research Institute \(SWRI\)](#)
- [TÜV SÜD America, Inc. \(TUVAM\)](#)
- [TÜV SÜD Product Services GmbH \(TUVPSG\)](#)
- [TUV Rheinland of North America, Inc. \(TUV\)](#)
- [Underwriters Laboratories Inc. \(UL\)](#)
- [Wyle Laboratories, Inc. \(WL\)](#)

For more information, see OSHA's National Recognized Testing Laboratories Web page at: <http://www.osha.gov/dts/otpca/nrtl/index.html>.