

15. ELECTRICAL SAFETY-RELATED WORK PRACTICES

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15.1. INTRODUCTION

This section establishes safe work practices and procedures to be used by SPR employees and subcontractors when conducting electrical work. Required electrical work practices include the following.

- a. De-energizing electrical equipment as the primary way to protect workers.
- b. Locking and tagging electrical sources to prevent equipment from being accidentally turned on or from discharging stored energy.
- c. Use of Energized Electrical Work Permit (AAA7012.9) and a Pre-Job Briefing and Planning Checklist (AAA7012.10) for work on energized equipment.
- d. Limiting work on energized equipment to qualified employees.
- e. Prohibiting the use of portable metal ladders around exposed energized parts.

15.2. REQUIREMENTS

15.2.1. General

All employees working on SPR facilities will use safety-related work practices to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts when work is performed near or on equipment or circuits that are or may be energized. Specific safety-related work practices will be consistent with the nature and extent of the associated electrical hazards.

- a. Before an employee works on or near live parts, all the live parts will be de-energized, unless the employer can demonstrate that de-energizing introduces additional or increased hazards, or that de-energizing is not possible due to equipment design or operational limitations.
 1. 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.
- b. If equipment cannot be locked out and work must be done on energized equipment, an Energized Electrical Work permit must be issued and a Job Planning and Briefing Checklist will be reviewed.

WARNING

Serious and/or fatal consequences may result if the following is not recognized and adhered to: A circuit is energized until it is **opened, locked, tagged** per approved procedures, and **verified** by an approved testing device known to be in proper working order.

1. Examples of increased or additional hazards include:
 - a) Deactivating emergency alarm systems,
 - b) Shutting down hazardous location ventilation equipment,
 - c) Removing light from an area.
2. The following types of work may be performed on or near energized circuit paths when an equipment design deficiency or operational limitations exist:
 - a) Testing electrical circuits that can only be performed with the circuit energized,
 - b) Working on circuits that form an integral part of a continuous industrial process that would otherwise require complete shutdown in order to permit work on one circuit or piece of equipment,
 - c) For voltages below 50 volts, the decision to de-energize should include consideration of the capacity of the source and any over-current protection between the energy source and the worker.
- c. When protective devices trip, such as circuit breakers, the cause of the trip will be determined and corrected before the device is reset. Trained Operations personnel shall not attempt to make electrical repairs but may reset molded case breakers that are 480 volts and below. They may reset a breaker only one time.
- d. If exposed live parts are not de-energized because of additional or increased hazards, or if de-energization is not possible, employees will use other safety-related work practices to protect against exposure to electrical hazards, against direct body contact with energized circuit parts, and against indirect body contact through some other conductive object. These work practices will suit both the work conditions and the voltage level of the exposed electric conductors or circuit parts.

15.2.2. Basic Safeguards

Identifying electrical hazards is the first step in preventing them. Once identified, a qualified employee must correct the hazards. The following safeguards will improve workplace safety:

- a. Maintain good housekeeping and cleanliness.
- b. Identify potential hazards and methods of controlling them.
- c. Using an Energized Electrical Work Permit for live work.
- d. Recognize and anticipate problems.
- e. Resist pressure to "hurry up."
- f. Plan and analyze for safety in each step of the task to be performed
- g. Identify work on the Safe Work Permit.
- h. Ensure independent verification of safety-related work.
- i. Become trained and maintain CPR and first aid certifications.
- j. Know and conduct drills on applicable emergency procedures.
- k. Use properly rated test equipment and verify the condition and operation of equipment before use.
- l. Use only nonconductive equipment in the vicinity of exposed live electrical equipment.
- m. Maintain safe work clearance and practices as prescribed in the National Electrical Code (NEC).
- n. Inspect extension cords, electrical power tools, cords, GFCI, and other such items before each use.
- o. Monitor tools and equipment for operational problems, including signs of overheating or excessive sparking.
- p. When working with live equipment, always barricade the area so that unqualified individuals will not enter.

15.2.3. Work Practices

Qualified employees performing electrical repairs, modifications, testing, and similar functions on energized electrical systems, parts, and equipment will comply with the following procedures:

NOTE

Service technicians that are factory trained or otherwise considered qualified by the manufacturer to perform troubleshooting, preventative maintenance, or repair of equipment, such as treadmills, x-ray machines, and other specialized equipment possess the necessary core competencies and are considered qualified employees.

- a. Equipment cannot be energized when work is being performed on it unless de-energizing creates an increased hazard. Examples of an increased hazard that may be caused by tests, adjustments, or troubleshooting include removing necessary lighting, deactivating alarms, shutting down ventilation in a hazardous area, or shutting down a process creating a greater hazard.

WARNING

Serious and/or fatal consequences may result if the following actions are not taken:

- Use proper lockout/tagout procedure when de-energizing equipment.
1. Use a positive disconnect. Don't rely on push button, selector, or panel door interlock switches.
2. Discharge stored energy devices, such as capacitors or certain parallel cable installations.
3. Block or relieve stored energy that could re-energize circuit

- b. Employees may work on energized electrical systems and equipment only if the supervisor, or safety professional and personnel performing the work determine that it can be completed safely. An Energized Electrical Work Permit (AAA7012.9) and Job Briefing and Planning Checklist (AAA7012.10) shall be used if live parts are not placed in electrically safe condition (i.e., for reason of increased or additional hazards or infeasibility). Work to be performed under these conditions shall be considered energized electrical work.

NOTE

Exemption to use of Energized Electrical Work Permits. Work performed on or near live parts by qualified persons related to tasks such as testing, troubleshooting, voltage measuring, etc., may be performed without an energized electrical work permit, provided appropriate safe work practices and personal protective equipment is used as identified in the JHA and PPE hazard assessment.

- c. While working on energized circuits, employees should not rely on insulated tools alone for complete protection, but will use double protection combining insulated tools with protective equipment such as gloves, blankets, sleeves, or mats.
 - 1. Each live-line tool will be wiped clean and visually inspected for defects before use each day. If there are any defects that could adversely affect insulating qualities or mechanical integrity, the tool will be removed from service and tested.
 - 2. Live-line tools used for primary employee protection will be removed from service and tested every 2 years and the results documented.
- d. Employees who face a risk of electrical hazard that is not reduced to a safe level by the applicable electrical installation requirements, as well as emergency response personnel (ERT) shall be trained to understand the specific hazards associated with electrical energy.
 - 1. They shall be trained in safety-related work practices and procedural requirements, as necessary, to provide protection from the electrical hazards associated with their respective job or task assignments.
 - 2. They shall be trained to identify and understand the relationship between electrical hazards and possible injury.
 - 3. They shall be trained in methods of release of victims from contact with exposed energized electrical conductors or circuit parts.
 - 4. Emergency Response Team (ERT) members shall be trained to provide Emergency Medical Responder (DOT First Responder Equivalent), and American Heart Association – Health Care Provider CPR / AED, care as per ASL 5500.25 ERT Organization Manual.
 - 5. Non-ERT personnel having the potential for exposure to electrical hazards (including escorts) shall receive annual training in “hands only” CPR / AED.
- e. When measuring voltage, qualified employees will use protective equipment that is appropriate for the voltage levels involved. In addition, when verifying lockouts, the live, dead, live method will be used to verify the reliability of the test instrument.
- f. A ground fault circuit interrupter will be used when equipment is used outside or in wet locations. Regarding ground-fault interrupters:
 - 1. All 120-volt, single-phase 15- and 20-ampere receptacle outlets that are not a part of the permanent wiring of the building or structure and are in use by

- employees shall have approved ground-fault circuit interrupters for personnel protection.
2. If receptacle(s) are installed or exist as part of the permanent wiring of the building or structure and are used for temporary electric power, ground-fault circuit-interrupter protection for personnel shall be provided.
 3. Cord sets or devices incorporating listed ground-fault circuit-interrupter protection for personnel identified for portable use shall be permitted.
- g. Receptacles on a two-wire single-phase portable or vehicle-mounted generator rated not more than 5kW, where the circuit conductors of the generator are insulated from the generator frame and all other grounded surfaces, need not be protected with ground-fault circuit interrupters.

NOTE

Circumstances may arise when a service provider may only send one technician to repair, troubleshoot, or maintain specialized equipment. These technicians, although considered “qualified,” must be escorted by an employee trained in CPR and AED use, and what to do in the event of an electrical injury. The SMTR or responsible supervisor will ensure that the JHA details the role of the escort should an electrical injury occur. The following details must be specified on the JHA:

1. How to safely turn off the source of electricity, if possible.
2. The escort will carry a radio at all times and fully understand how to notify emergency response personnel.
3. Treat victims of electrical shock **ONLY** when certain that an electrical current is not running through their body, and **ONLY** provide treatment at the level of care for which they have been trained and currently certified to provide.

15.2.4. Safe Work Procedures

15.2.4.1. Prior to Beginning Work

- a. Hold a pre-job planning meeting.
 1. Before starting each job, the employee in charge shall conduct a job briefing with the employees involved. The briefing shall cover such subjects as hazards associated with the job, work procedures involved, special precautions, energy source controls, and personal protective equipment requirements.
 2. If work or operations to be performed during the work day or shift are repetitive and similar, at least one job briefing shall be conducted before the start of the first job of the day or shift. Additional job briefings shall be held if significant changes that might affect the safety of employees occur during the course of the work.
 3. On routine work, a brief discussion will be satisfactory if the employee(s), by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job.
- b. Fill out the electrical safety requirements of the task on the Safe Work Permit, the Energized Electrical Work permit and the Job Briefing and Planning Checklist when equipment is going to be worked on live and not locked out.
- c. Verify that work will be performed according to written procedures.

15.2.4.2. Beginning Work

- a. As work begins, the authorized qualified employee will perform work according to electrical procedures. Work will be performed:

1. as directed by a qualified supervisor,
2. based on analysis of the job and hazards,
3. using specific procedures and required PPE for the tasks to be performed, and
4. while identifying, reporting, and correcting hazards.

15.2.4.3. Testing Instruments and Equipment

- a. Only qualified employees may perform testing work on electrical circuits of equipment.
- b. Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors; these will be visually inspected for external defects and damage before use.
 1. Damaged equipment will be identified, tagged, and segregated until repaired.
- c. Test instruments, test equipment, and all accessories will be rated for the circuits and equipment to which they will be connected and will be designed for the environment in which they will be used.
- d. Where flammable materials might exist, do not use electric equipment capable of igniting them unless measures are taken to prevent a hazardous condition from developing.
- e. Equipment will be calibrated as specified in MOC's Calibration Master Plan, ASL4330.8, Version 2.0

15.2.5. Personal Protective Equipment

- a. MOC will provide employees with insulated protective equipment and tools that have been rated for the circuits and equipment for which they will be used or connected with, and the equipment and tools will be suitable for the environment in which they will be used.
- b. Employees shall only use equipment and tools they have been trained to use.
- c. When working with live equipment, employees will wear the PPE identified in the most recent revision of the NFPA 70-E as identified in Tables 15-1 and 15-2 of this chapter and the PPE Hazard Assessment.
- d. All PPE will be of safe design and construction for the work to be performed
- e. All PPE required testing will be up to date
- f. Additional PPE requirements are outlined in the Personal Protective Equipment section of this Accident Prevention Manual.

15.2.5.1. PPE Requirements

- a. Design requirements of insulating blankets, matting, covers, line hose, gloves, and sleeves made of rubber will meet the following requirements:
 1. The manufacturing process and product marking will meet industry standards.
 2. Blankets, gloves, and sleeves will be produced by a seamless process.
 3. Each item will be clearly marked with its electrical class (for example, Class 0 will be marked Class 0).
 4. Electrical PPE will be capable of withstanding the AC proof-test voltage specified in Table 15-1, or the DC proof-test voltage specified in Table I-2 in 29 CFR 1910.137.
 5. Equipment will be free from any harmful physical irregularities.
- b. Electrical protective equipment will be tested at the following intervals:
 1. Rubber insulating line hose and covers will be tested when indications show that its insulating value seems inadequate.
 2. Rubber insulating blankets will be tested before first issue and every 12 months thereafter.

3. Rubber insulating gloves will be tested before first issue and every 6 months thereafter.
4. Rubber insulating sleeves will be tested before first issue and every 12 months thereafter.

NOTE

Insulating equipment, including newly purchased equipment, must have been electrically tested within the previous 12 months.

15.2.5.2. Use of PPE

- a. Appropriate PPE will be used to perform any of the following actions:
 1. Verifying operational shutdown
 2. De-energizing circuits
 3. Applying lockout/tagout
 4. Installing personnel safety grounds
 5. Testing/verifying for de-energized circuit
 6. Attempting operation of equipment
 7. Establishing a standby/safety watch
 8. Performing safe energized (live) work, if required
 9. Conducting de-energize tests
 10. At release for operational restart.

15.2.6. Portable Electric Tools and Equipment**15.2.6.1. Inspection and Maintenance**

- a. Portable cord-and-plug connected equipment and extension cords 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 possible internal defects or damages (such as pinched or crushed outer jacket).
- b. Any defective cord or cord-and-plug connected equipment must be removed from service, and replaced.

15.2.6.2. Conditions of Use

- a. Portable electric tools, equipment, and GFCIs shall not be used in hazardous locations unless marked to indicate suitability for use.
- b. Portable electric tools and equipment shall not be handled or suspended by their cords. Tools and equipment shall be used only for their intended purpose, and when guards are required, such guards shall be in place and functional.
- c. Portable electric powered tools shall be double insulated or properly grounded, and shall not be used when the ground pin is damaged or missing.
- d. All tools and equipment shall either be grounded via the case, double-insulated, specially approved, low-voltage types or self-contained, battery-operated types.
- e. Tools and equipment used in damp areas shall be approved for such use. Generally, electrical tools are not approved for use in wet or damp areas without some means of protection.

15.2.6.3. Use of Extension Cords

- a. Use of extension cords shall be minimized.

- b. Extension cords shall be suitable for the intended use, such as waterproof connectors for wet or damp areas, and are subject to the same conditions as the tool or equipment cord.
- c. Generally, “daisy chaining” (attaching one cord to another) of extension cord set is prohibited unless specially allowed by manufacturer and listed for this application.
- d. Extension cords shall be visually inspected before each use.
- e. Extension cords used with portable metal electric tools and appliances on construction sites shall be of the three-wire type and shall be designed for hard or extra-hard usage.
- f. OSHA-recognized hard service cord (types S, ST, SO, and STO) and junior-hard service cord (SJ, SJO, SJT, and SJTO) shall be used as appropriate for extra-hard and hard use.

NOTE

Extension cords approved for outdoor use must be identified by “outdoor” or “W-A” on the jacket.

- g. Flexible cords sets will be listed as an assembly by a nationally recognized testing laboratory.
 - 1. The cords shall be hard use or extra-hard use as specified in the NEC.
 - 2. Flexible cords used with temporary and portable lights shall be designed for hard or extra-hard use.
 - 3. Flexible cord sets used on construction sites shall contain the number of conductors required for the circuit plus an equipment grounding conductor.

15.3. ELECTRICAL TRAINING AND QUALIFICATION OF QUALIFIED EMPLOYEES**15.3.1. Requirements****NOTE**

Specialized equipment, such as treadmills and x-ray machines require the use of outside vendors and manufacturers who may send a service technician to troubleshoot, repair, or maintain that equipment at the SPR. Although these technicians may not meet all of the electrical training requirements outlined in this section, they possess the necessary core competencies and are to be considered “qualified employees.” If in doubt about a specific piece of equipment contact the New Orleans Safety staff.

Only qualified employees shall work on electrical equipment and systems. Qualification training can be obtained on the job or in the classroom. Training will include:

- a. Safety-related work practices of 29 CFR 1910.331 through 1910.335.
- b. Skills and techniques necessary to distinguish exposed live parts and other electrical equipment.
- c. Skills and techniques necessary to determine:
 - 1. Nominal voltage of exposed live parts,
 - 2. Clearance distances specified in 29 CFR 1910.333(c), and
 - 3. Corresponding voltages to which a qualified employee might be exposed.
- d. Procedures on how to perform electrical tasks safely and properly.

- e. Procedures on how to protect unqualified employees on jobs that require close proximity to exposed parts of electrical circuits operating at 50 volts (V) or more to ground.
- f. Lockout/tagout procedures per the Lockout/Tagout section of this manual.
- g. Other types of training:
 - 1. Standard for Electrical Safety in the Workplace (NFPA-70E),
 - 2. National Electrical Safety Code (NFPA 70),
 - 3. Use of personal protective grounds 29 CFR 1926.954,
 - 4. Use of testing and measuring equipment 29 CFR 1910.334(c),
 - 5. Safe Work Permit and work authorization procedures (Section 30),
 - 6. Use and care of personal protective equipment 29 CFR 1910.335(a) and 1910.137, and
 - 7. Proper clothing required for arc flash and arc blast protection.
- h. CPR and first aid.
- i. If involved in the generation, transmission, and distribution systems of an electrical system, training on 29 CFR 1910.269 (for example, work on electrical substations).

NOTE

Electrical training for MOC does not include 1910.269; however, the SPR facility at Big Hill does work on their substation.

15.4. ELECTRICAL EQUIPMENT APPROVAL**15.4.1. Requirements**

Electrical equipment components and conductors must be approved for their intended use through the following methods:

- a. If equipment is not “listed” by a Nationally Recognized Testing Laboratory (NRTL), an authority knowledgeable for enforcing National Electrical Codes (NECs) can determine that the equipment complies with NEC standards.

WARNING

MOC procurement of portable heaters for personal comfort is permitted provided that the heaters are UL-listed and Government procured. MOC Employees are prohibited from bringing privately owned heaters to work.

- b. Custom-made equipment can be approved if the "authority having jurisdiction" (AHJ) determines that the equipment is safe for its intended use.
- c. On site AHJ authority is based on Electrical Safety Committee's (ESC's) approval of written program documentation, evaluation methods, and procedures.
- d. All appliances for personal use in the workplace, such as coffee pots, refrigerators, and radios, will be listed by the National Recognized Testing Laboratory (NRTL).

15.5. CLASS I REQUIREMENTS

MOC requires the use of “approved for use in the area” classified equipment in electrical Class 1 (Division 1 or 2) areas whenever possible. When equipment or operations require hot work within these areas, and no other practical alternative is possible, the hot work will be kept

to a minimum, and employees will follow special hazard controls in accordance with hot work permit requirements.

15.6. ELECTRICAL SAFETY PROGRAM

15.6.1. Purpose

- a. The purpose of the Electrical Safety Program for the SPR is:
 1. to promote a safe workplace, free from electrical hazards, for all employees and subcontractors, and
 2. to implement all MOC and DOE electrical policies and procedures, and to achieve compliance with all federal, state, and local regulations.
- b. The electrically safe workplace will be achieved by:
 1. mandating and implementing the electrical subparts of 29CFR1910 and 29CFR1926,
 2. applying the National Electrical Code (NFPA 70) and Standard for Electrical Safety in the Workplace (NFPA 70E) and any additional requirements mandated by applicable state and local laws or regulations or DOE for the design, construction, operation, and maintenance of SPR facilities,
 3. applying SPR design and construction criteria and standard specifications,
 4. complying with MOC electrical policies and safe work procedures,
 5. implementing the Electrical Safety Program, which meets the minimum requirements of the DOE Model Electrical Program,
 6. encouraging employee participation in program development, implementation, and ongoing improvement,
 7. using the Energized Electrical Work Permit and Job Planning and Briefing Checklist for work that must be done on energized equipment, and use the specified arc flash clothing, labeling and distance specified in Tables 15.1 and 15.2.

15.6.2. Scope

The electrical safety program applies to all site organizations, both at the operating sites and in New Orleans, and to all contractors and subcontractors.

- a. Requirements for visitors, contractors and subcontractors.
 1. Meet all applicable, current OSHA requirements.
 2. Conform to the sites' electrical safety requirements by documenting that each employee has received and understands the training required for electrical work.
 3. Prepare a record that contains the identity of the employee, the date of training, and the means used to verify the employee understood the training.
 4. Conform to local, city, county, parish, or state jurisdictional requirements.
- b. Ownership.
 1. Each site director shall appoint an electrical safety committee to be program owner at the site.
 2. The committee will include craftsmen, the site engineer, and supervisors, as well as management representatives.
 3. The purpose of the committee is not to make electrical design decisions; those will be left to Engineering and Construction, as appropriate.
 4. The purpose of the committee is to have a trained group ready to make day-to-day safety decisions.

5. The chain of command for design work and professional interpretation is already established.
6. New Orleans Occupational Safety and Health will own the MOC (corporate) program, plan, and implementation guidance. The ultimate, final AHJ is the SPR Project Management Office (SPRPMO).

15.6.3. Performance Objectives

The Electrical Safety Program has the following objectives.

- a. Establishing the AHJ for initially interpreting OSHA, NFPA 70, NFPA 70E and other requirements for electrical work at the sites.
- b. Establishing criteria, matrices, and documentation for self-assessment of the Electrical Safety Program.
- c. Providing continuous opportunity for improvement.
- d. Evaluating the Electrical Safety Program on an annual basis on AAA.9020.546, SPR Electrical Safety Program Annual Self Assessment form; evaluation will be followed by action plans that respond to findings, if any.
- e. Establishing requirements and controls for implementing the program.
- f. Providing guidance to all departments, as well as assistance in developing and implementing safe operating and maintenance procedures, which include electrical requirements.
- g. Ensuring a safe workplace with the lowest reasonable risks from electrical hazards by:
 1. Establishing a training program that meets the requirements of initial and refresher training for "qualified" and "unqualified" electrical workers as defined by OSHA, and establishes safe work practices for all personnel engaged in or exposed to electrical work, in accordance with 29CFR1910.331-335 and NFPA 70E "Electrical Safety in the Workplace."
 - a) Note: The SPR definition of "qualified personnel" in the context of this program plan is "an individual who, by virtue of training, education, and experience, is familiar with the construction and operation of the involved electrical equipment and associated hazards."
 2. Establishing minimum training requirements for electrical supervisors or foremen.
 3. Complying with all applicable electrical requirements of the codes listed below.
 - a) Electrical Equipment Maintenance (NFPA 70B)
 - b) National Electrical Code (NEC) NFPA 70
 - c) Electrical Safety Requirements for Employee Workplaces (NFPA 70E)
 - d) American National Standards Institute (ANSI) C.2, National Electrical Safety Code (NESC)
 - e) 29CFR1926, subparts K and V
 - f) R1910, subparts S and 1910.269
 - g) State, county, parish, and local versions of the requirements
 - h) DOE orders and design criteria
 - i) SPR orders, and design and performance criteria
 - j) MOC policies and procedures
 4. Requiring that resources be allocated for implementing this program.
 5. Requiring documented approval of alternative electrical hazard controls, such as the "approved for use in the area" classification equipment required by Class I, Division 1 or 2 areas in compliance with the Hot Work Permit Procedure section of the APM. Documentation must include the alternate hazard controls that will provide adequate protection. The proposed, temporary process configuration will be reviewed and concurred with by the site Electrical Safety Council and physically

inspected by the supervisor signing the permit and the site safety professional.
(The Hot Work Permit Procedure section of this APM provides specific controls for using alternative controls in Class I areas.)

15.7. ELECTRICAL INCIDENT REPORTING

All electrical incidents -- including electrical shock, unplanned employee exposure, or “near miss” -- will be reported in accordance with the Reporting –Recording Procedures outlined in Section 38.

15.8. ELECTRICAL ARC FLASH HAZARDS AND REQUIREMENTS

15.8.1. Arc Flash Requirements

- a. Equipment must be put in a “safe working condition” (NFPA 70E) and the lockout/tagout procedures used to keep workers safe. Verifying the absence of energy potential is required in both NFPA 70E and OSHA 1910.333b.
- b. The process of de-energizing the electrical equipment and putting it into a safe condition introduces employees to risk. Since testing for the absence of potential is considered working on live parts according to OSHA 1910.333(b) and NFPA 70E, personal protective equipment is required. An arc flash analysis has been performed to determine the amount of arcing fault energy that equipment has and the boundary at which injury can be sustained by working on this equipment. The SPR will provide arc flash protection for employees working on live equipment in accordance with NFPA 70E.
- c. The M&O contractor will mark all switchboards, panel boards, industrial control panels, and motor control centers in other than dwelling occupancies, that are likely to require examination, adjustment, servicing, or maintenance, in order to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons.
- d. The required label (Figure 15-2) will be placed on the above equipment and the PPE worn will be the maximum required for flash hazards based on the Tables 15-1 and 15-2 in the most recent version of NFPA 70-E.
- e. For most equipment calculations have not been done within the past five years, therefore, Table 15-1 and Table 15-2 must be used to establish the:
 1. Flash Boundary Protection
 2. PPE Required
 3. Voltage shock hazard
 4. Limited shock approach boundary
 5. Restricted shock approach boundary
 6. Prohibited approach boundary

15.8.2. Limits of Approach

Figure 15-1 is an example of the limits of approach.

15.8.2.1. Shock Hazard Boundary Distances

- a. The Limited Approach Boundary is the distance from an exposed live part within which an electrical shock hazard exists.

- b. The Restricted Approach Boundary is the distance from an exposed live part within which there is an increased risk of electrical shock, due to electric arc combined with inadvertent movement, for personnel working in close proximity to live parts.
- c. The Prohibited Approach Boundary is the distance from an exposed live part within which work is considered the same as making contact with the energized part.

15.8.2.2. Flash Hazard Boundary Distances

- a. The Working Distance is the dimension between the possible arc point and the head and body of a worker positioned in place to perform a task on the energized part.
- b. The Flash Protection Boundary is the distance from exposed live parts within which a person could receive a second degree burn on unprotected skin if an electrical arc flash were to occur.

15.8.2.3. Limited Spaces

- a. The area within the limited approach and the restricted approach boundaries is designated the limited space.
- b. The area within the restricted approach and the prohibited approach boundaries is designated the restricted space.
- c. The area within the prohibited approach boundary and the energized live part is designated the prohibited space.
- d. The area within the arc flash boundary and the exposed live parts is designated the flash hazard space.

15.8.3. Unqualified Persons

- a. Unqualified persons shall maintain a safe approach distance outside of the Limited Approach Boundary unless continuously escorted by a qualified person
- b. Unqualified persons shall not cross the Flash Protection Boundary unless they are wearing appropriate personal protective clothing and are under the close supervision of a qualified person.

CAUTION

Under no circumstances may an unqualified person cross the Restricted Approach Boundary, where special shock protection techniques and equipment are required.

15.8.4. Qualified Persons

- a. A person qualified to perform a job/task is allowed to cross the Limited Approach Boundary and enter the limited space.
- b. A person qualified to perform a job/task is allowed to cross the Restricted Approach Boundary and enter the Restricted Space, if:
 - 1. personal protective equipment is used that is appropriate for working near exposed energized conductors or circuit parts, and is rated for the voltage and energy level involved,
 - 2. they are certain that no part of the body enters the prohibited space, and
 - 3. they have a documented and approved work plan.
- c. A person qualified to perform a job/task is allowed to cross the Prohibited Approach Boundary and enter the Prohibited Space if:
 - 1. the employee has specialized training in work on energized conductors or circuit parts, i.e., an electrician.

2. they use personal protective equipment that is appropriate for working on exposed energized conductors or circuit parts and is rated for the voltage and energy level involved, and
3. they have a documented and approved JHA and work plan justifying the work. An Energized Electrical Work Permit must be issued and meet the work plan requirement.

15.8.5. Personal Protective Equipment (PPE) Requirements for Arc Flash

Employees working in areas where electrical hazards are present shall be provided with, and shall use, protective equipment that is designed and constructed for the specific part of the body to be protected and for the work to be performed. A Personal Protective Equipment Hazard assessment shall be performed before any work is performed on electrical equipment. See the tables at the end of this chapter to decide what PPE is required.

CAUTION

Conductive articles of clothing and jewelry **shall not be worn** in conjunction with the electrical safety personal protective equipment or clothing. Such articles include: metal headgear, metal frame glasses, metal aprons, cloth with metal buttons or conductive thread, metal watchbands, bracelets, rings, key chains and necklaces.

15.8.5.1. General

When an employee is working within the Flash Protection Boundary, he/she shall wear arc flash clothing and other personal protective equipment in accordance with NFPA 70E Tables 15.1 and 15.2. A PPE hazard assessment shall be done before working on electrical equipment.

15.8.5.2. Movement and Visibility

When arc flash clothing is worn to protect an employee, it shall cover all ignitable clothing and shall allow for movement and visibility.

15.8.5.3. Head, Face, Neck, and Chin Protection

Employees shall wear nonconductive head protection whenever there is a danger of head injury from electric shock or burns due to contact with live parts or from flying objects resulting from electrical explosion. Employees shall wear nonconductive protective equipment for the face, neck, and chin as specified on the arc flash equipment tables whenever there is a danger of injury from exposure to electrical arcs or flashes or from flying objects resulting from electrical explosion.

15.8.5.4. Eye Protection

Employees shall wear protective equipment for eyes whenever there is danger of injury from electrical arcs, flashes, or flying objects resulting from an electrical explosion.

15.8.5.5. Body Protection

Qualified employees shall wear arc flash clothing wherever there is possible exposure to an electrical arc flash above the threshold incident-energy level for a second degree burn, 5J/cm² (1.2 cal/cm²).

CAUTION

Generally, a higher degree of protection is provided by heavier weight fabrics and/or by layering combinations of one or more layers of arc flash clothing. In some cases, one or more layers of arc flash clothing are worn over flammable non-melting clothing. The arc flash clothing must always be the outermost layer.

15.8.5.6. Hand and Arm Protection

Employees shall wear rubber insulating gloves where there is a danger of hand and arm injury from electric shock due to contact with live parts. Hand and arm protection shall be worn where there is possible exposure to arc flash burn. When rubber Insulating gloves are not required, suitable work gloves should be worn while handling materials and equipment to prevent the possibility of slivers, cuts, and skin irritation.

15.8.5.7. Foot and Leg Protection

Where insulated footwear is used as protection against step and touch, potential dielectric overshoes shall be required. Insulated soles shall not be used as primary electrical protection.

15.8.5.8. Protective Clothing When Hazard/Risk Category Identified

Once the Hazard/Risk Category has been identified, Tables 15.1 and 15.2 shall be used to determine the required personal protective equipment for task. NFPA 70-E Table 130.7(C) (10) lists the requirements for protective clothing and other protective equipment based on Hazard/Risk Category numbers 0 through 4. This clothing and equipment shall be used when working on or near energized equipment within the Flash Protection Boundary.

15.8.5.9. Protective Clothing Use

Clothing and equipment that provide the worker protection from shock and arc flash hazards shall be worn. Clothing and equipment required for the degree of exposure shall be permitted to be worn alone or integrated with flammable non-melting apparel. If arc flash clothing is required, it shall cover associated parts of the body as well as all flammable apparel while allowing movement and visibility. Wearing arc flash clothing does not eliminate the need for other PPE based upon the hazards of the work to be performed.

NOTE

Protective arc-flash clothing includes shirts, pants, coveralls, jackets, and parkas worn routinely by workers who, under normal working conditions, are exposed to momentary electrical arc and related thermal hazards.

WARNING

While Arc flash clothing meets the Flame Resistant Clothing requirements, FRC **does not** provide arc flash protection.

15.8.5.10. Layering

Non-melting, flammable fiber garments shall be permitted to be used as under layers in conjunction with arc flash garments in a layered system for added protection. If non-melting, flammable fiber garments are used as under layers, the system arc rating shall be sufficient to prevent break-open of the innermost arc flash layer at the expected arc exposure incident

energy level to prevent ignition of flammable under layers. (Note: A typical layering system might include cotton underwear, a cotton shirt and trouser, and an arc flash rated coverall.

Special tasks might call for additional flame-resistant layers to achieve required protection level.)

- a. Outer Layers: Garments worn as outer layers over arc flash clothing, such as jackets or rainwear, shall also be arc flash rated.
- b. Under Layers:
 1. Meltable fibers such as acetate, nylon, polyester, polypropylene, and spandex shall not be permitted in fabric under layers (underwear) next to the skin.
 - a) Exception: An incidental amount of elastic used on non-melting fabric underwear is allowable.
 2. Flame-resistant underwear or undergarments used as under layers generally provide a higher system arc rating than non-melting, flammable fire underwear or undergarments used as under layers.
 3. Clothing shall cover potentially exposed areas as completely as possible. Shirt sleeves shall be fastened at the wrists, and shirts and jackets shall be closed at the neck.
- c. Tight-fitting Clothing:
 1. Tight-fitting clothing shall be avoided.
 2. Loose-fitting clothing provides additional thermal insulation because of air spaces.
 3. The garment selected shall result in the least interference with the task but still provide the necessary protection.
 4. The work method, location, and task will influence the protective equipment selected.

15.9. STORAGE BATTERIES

Storage batteries are considered a live source and appropriate precautions must be taken by personnel working around them.

15.9.1. Spacing

- a. Adequate space shall be provided around storage batteries for safe inspection, maintenance, testing, and cell replacement.
- b. Space shall be left above cells to allow for operation or lifting equipment when required, for addition of water and for taking measurements.

15.9.2. Location

- a. Storage batteries shall be located in a protective enclosure or area accessible to qualified persons.
- b. A protective enclosure can be a battery room, a control building, or a case, cage, or fence that can protect the contained equipment and minimize the possibility of inadvertent contact with energized parts.

15.9.3. Ventilation

- a. The battery storage area must be ventilated by either a natural or powered ventilation system to prevent accumulation of hydrogen.
- b. The ventilation system must limit the hydrogen accumulation to less than explosive levels.

15.9.4. PPE for Battery Storage and Handling

- a. PPE capable of protecting employees from acid splashes shall be used by those working on or servicing batteries
- b. The minimum acceptable PPE shall include acid resistant gloves, aprons, and chemical goggles with a full face shield to protect the face.
- c. The design and use of PPE for wear when servicing batteries shall comply with OSHA requirements.
- d. Safety showers are required in close proximity and eyewash stations which can be reached within no more than 10 seconds or immediately adjacent to work using strong acid or caustic materials

15.9.5. Tools

- a. Tools used for working on batteries shall be equipped with handles listed as insulated for the maximum working voltage and non-sparking.

15.9.6. Additional Information

- a. Other information about storage batteries and battery banks is in DOE-HDBK-1092-2004 (DOE Handbook for Electrical Safety).

15.10. TABLES: ELECTRICAL SAFETY-RELATED WORK PRACTICES

TABLE 15.1. HAZARD/RISK CATEGORY CLASSIFICATION AND USE OF RUBBER INSULATING CLOVES AND INSULATED AND INSULATING HAND TOOLS-DIRECT CURRENT EQUIPMENT			
Tasks Performed on Energized equipment	Hazard/Risk Category	Rubber Insulating Gloves	Insulated and Insulating Hand Tools
Panel boards or other Equipment Rated 240 V and Below Parameter: Maximum of 25 kA short circuit current available Maximum of 0.03 sec (2 cycle) fault clearing time minimum 18 in. working distance Potential arc flash boundary with exposed energized conductors or circuit parts using above parameters: 19 in.			
Perform infrared Thermography and other non-contract inspections outside the restricted approach boundary	0	N	N
Circuit breaker (CB) or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	0	N	N
Work on energized electrical conductors with circuit parts including testing	1	Y	Y
Remove/Install CBs or fused switches	1	Y	Y
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	1	N	N
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	0	N	N
Work on energized electrical conductors and circuit parts of utilization equipment fed directly by a branch circuit of the panel board	1	Y	Y

TABLE 15.1. HAZARD/RISK CATEGORY CLASSIFICATION AND USE OF RUBBER INSULATING CLOVES AND INSULATED AND INSULATING HAND TOOLS-DIRECT CURRENT EQUIPMENT			
Tasks Performed on Energized equipment	Hazard/Risk Category	Rubber Insulating Gloves	Insulated and Insulating Hand Tools
Panel boards or other equipment rated > 240 V and up to 600 V Parameter: Maximum of 25 kA short circuit available; maximum of 0.03 sec (2 cycle) fault clearing time; 18 in. working distance Potential arc flash boundary with exposed energized conductors or circuit parts using above parameters: 30 in.			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	1	N	N
Circuit breaker (CB) or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	1	Y	N
Work on energized electrical conductors and circuit parts, including voltage testing	2	Y	Y
Remove/install CBs or fused switches	2	Y	Y
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	1	N	N
Open hinged covers (to expose bare, energized electrical conductors and circuit parts)	0	N	N
Work on energized electrical conductors and circuit parts of utilization fed directly by a branch circuit of the panel board	2	Y	Y
600 V class motor control center (MCCs) Parameter: Maximum of 65 kA short circuit current available; maximum of 0.03 sec (2 cycle) fault clearing time; minimum 18 in. working distance Potential arc flash boundary with exposed energized conductors or circuit parts using above parameters; 53 in.			
Perform infrared thermography and other non-contact inspection outside the restricted approach boundary	1	N	N

TABLE 15.2. PROTECTIVE CLOTHING AND PPE	
Hazard/Risk Category	Protective Clothing and PPE Required
0	Protective Clothing, Non-melting or Untreated Natural Fiber (i.e., untreated cotton, wool, rayon, or silk, or blends of these materials) with a Fabric Weights of at Least 4.5 oz/yd ² Shirt (long sleeve) Pants (Long) Protective Equipment Safety glasses or safety goggles (SR) Hearing Protection (ear canal inserts) Heavy duty leathers gloves (AN) See Note 1
1	Arc-Rated Clothing, Minimum Arc Rating of 4 cal/cm ² (See Note 3) Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated face shield (see Note 2) or arc flash suit hood Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts)

TABLE 15.2. PROTECTIVE CLOTHING AND PPE

Hazard/Risk Category	Protective Clothing and PPE Required
	Heavy duty leather gloves (see Note 1) Leather Work Shoes
2	Arc-Rated Clothing, Minimum Arc Rating of 8 cal/cm ² (See Note 3) Arc-rated long - sleeve shirt and pants or arc-rated coverall Arc-rated flash suit hood or arc-rated face shield (See Note 2) and arc-rated balaclava Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Heavy duty leather gloves (See Note 1) Leather Work shoes
3	Arc-Rated Clothing Selected so That the system Arc Rating Meets the Required Minimum Arc Rating of 25 cal/cm ² (See Note 3) Arc-rated long sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves (See Note 1) Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Leather Work shoes
4	Arc-Rated Clothing Selected so That the system Arc Rating Meets the Required Minimum Arc Rating of 40 cal/cm ² (See Note 3) Arc-rated long sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves (See Note 1) Arc-rated jacket, parka, rainwear, or hard hat liner (AN) Protective Equipment Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Leather Work shoes

1. If rubber gloves with leather protection are required by Table 130.7(c)(9), additional leather or arc-rated gloves are not required. The combination of rubber insulating gloves with leather gloves is not required. The combination of rubber insulating gloves with leather protectors satisfies the arc flash requirement.
2. Face shield are to have wrap-around guarding to protect not only the face but also the forehead, ears, and neck, or, alternatively an arc-rated flash suit hood is required to be worn.
3. Arc rating is defined in article 100 and can be either the arc thermal performance value (ATPV) or energy of break open threshold (E_{bt}). ATPV is defined in ASTM F 1959 *Standard Test Method for Determining the Arc Thermal Performance Value of Materials for Clothing*, as the incident energy on a material, or a multilayer system or materials, that results in 50 percent probability that sufficient heat transfer through the tested specimen is predicted to cause the onset of a second degree burn injury based on the Stoll curve, in cal/cm². E_{bt} is defined in ASTM F 1959 as the incident energy on a material or material system that results in 50 percent probability of break open. Arc rating is reported as either ATPV or EBT, whichever is lower value.

TABLE 15.3. ELECTRICAL SAFETY-RELATED WORK PRACTICES AND RESPONSIBILITIES

Position or Department	Responsibility
New Orleans Maintenance	a. Develop and implement an electrical preventive maintenance program with safe work practices for electrical work. b. Provide changes to related operating and maintenance procedures that safely control electrical hazards. c. Provide procedures that include adequate CAUTIONS and WARNINGS to identify all hazards related to the operation of the equipment/facility. d. Provide technical assistance in electrical accident investigations, root cause analysis, and similar functions.
Instrumentation & Electrical (I&E) Supervisors and Leads	a. Implement safe work practices for electrical tasks in their work areas by performing the following actions: <ol style="list-style-type: none"> 1. Identify and document all electrical hazards. 2. Ensure that all personnel are aware of identified hazards. 3. Ensure that all personnel follow safe work practices when performing electrical tasks. 4. Ensure that electrical safety awareness training and other task-specific electrical safety training are provided as required by law, codes, and standards, including 29 CFR 1910.332 and 137. 5. Conduct periodic inspections of work areas to ensure that employees are following safe electrical work practices. 6. Ensure that direct supervisors are adequately trained and qualified in safe electrical work practices. 7. Document and correct all electrical deficiencies using the Assessment Tracking System (ATS) or the work order system. 8. Conduct or attend electrical safety committee meetings at least twice a year and when needed. 9. Ensure that subcontractors under their daily supervision use safe work practices.
Engineering	a. Verify that all new or changed equipment/facilities are designed to comply with OSHA, ANSI, NEC, state, local, and DOE requirements. b. Verify that purchased electrical equipment and appliances are listed by an NRTL, such as UL when available. c. Provide operating/maintenance procedures as requested by O&M during the design review process. d. Review electrical operating and maintenance procedures for compliance. e. Ensure that vendors provide the manufacturer’s operating and maintenance procedures for electrically-powered equipment before use. f. Ensure that flash hazard analysis is done on new or modified electrical equipment and the information is provided to the site. g. Ensure that the flash hazard analysis is validated (and revised if need be) every three years.
Configuration Management (CM)	a. Enforce CM policies and procedures for physical changes to equipment and facilities. b. Assess compliance with CM procedures and include the timeliness of procedural changes in the assessment.

TABLE 15.3. ELECTRICAL SAFETY-RELATED WORK PRACTICES AND RESPONSIBILITIES

Position or Department	Responsibility
Site Director	a. Select the Electrical Safety Committee chairperson, and approve the site committee’s charter and membership. b. Ensure equipment that presents an arc flash hazard is labeled. c. Approve and sign Energized Electrical Work Permit for work done on energized equipment. d. Approve site Technical Competent Persons in writing.
Operations Manager or Designee	a. Review and issue Safe Work Permits verifying that electrical equipment has been made safe for work to be performed. b. Ensure that Operations personnel working with or in the proximity of energized equipment receive electrical safety awareness training. c. Approve temporary alternate controls for Class 1, Divisions 1 and 2 areas for maintenance, testing, workover, or repair that involves equipment that is not approved for use in the area classification. This includes permitting, stipulating and documenting extraordinary hazards controls and a physical inspection and acceptance with SPR policy, in compliance with the Hot Work Permits section of this APM. For example, continuous monitoring may be required. d. Approve and sign Energized Electrical Work Permit for work done on energized equipment.
Maintenance Manager	a. Ensure that a Job Safety Analysis or Job Hazard Analysis and a PPE Hazard Assessment are performed on all electrical tasks. b. Verify that modifications in the work area comply with 29 CFR 1910. Subpart S, NFPA 70, and SPR Configuration Management requirements. c. Ensure that equipment that presents a flash hazard has the required warning labels. d. Approve and sign Energized Electrical Work Permit for work done on energized equipment. e. Maintain a log of work completed under the Exemption to the Energized Electrical Work Permit showing date, job description, and hazard controls used.
Supervisors	a. Review Safe Work Permit requirements with employees before the tasks are started. During this review, discuss the hazards and the controls that will be in place (example: lockout/tagout). Encourage employee feedback and participation. b. Review the Job Hazard Analysis and PPE Hazard Assessment with employees. c. Review specific lockout/tagout and safe electrical work practices before the task is started. d. Ensure that employees assigned to tasks are trained on the equipment and are trained in and understand safe electrical work practices. e. Provide and oversee on-the-job training and job hazard analysis. f. Inspect employees’ work areas daily to make sure safe electrical work practices are used. g. Ensure that employees do not work with live electrical equipment unless de-energizing presents a greater danger or unless de-energizing is not possible. Ensure that if equipment must be worked

TABLE 15.3. ELECTRICAL SAFETY-RELATED WORK PRACTICES AND RESPONSIBILITIES

Position or Department	Responsibility
	<p>on live, an Energized Electrical Safe Work Permit is issued and reviewed by employees or that an Exemption to the EESWP has been approved and documented.</p> <ul style="list-style-type: none"> h. Review temporary alternate hazard controls for Class I, Divisions 1 and 2 areas for maintenance or repair that involves equipment that is not approved for use in the area classification. This includes stipulating and documenting extraordinary hazard controls, issuing a safe work permit, a physical inspection and acceptance, in accordance with SPR policy. i. Ensure that the buddy system is used when work requires it, such as when working with live equipment at 50 volts and above. The buddy must be a qualified electrician trained to OSHA standards, familiar with equipment and how to release the affected individual from the power. j. Ensure that Energized Electrical Work Permit and Job Briefing and Planning checklist (Figure 15-5) is reviewed with employees performing the task. k. Ensure that training is duly recorded and documented. The employee’s supervisor must sign the documentation certifying the employee as qualified and must periodically check the employee’s job performance and knowledge to maintain qualifications. This periodic check will also be documented. The performance-based training checklist may be used to accomplish this task.
Site ES&H Manager	<ul style="list-style-type: none"> a. Assist in the development of and oversee site-specific electrical procedures. b. Approve and sign an Energized Electrical Work Permit for work done on live equipment (AAA7012.9).
Site Safety Specialist	<ul style="list-style-type: none"> a. Assist the site line safety organization in developing site operating procedures, in reducing the requirement for work on live electrical circuits as much as possible, and in specifying adequate hazard controls when working with live circuits. b. Investigate electrical accidents and incidents to determine and document the root cause, and recommend corrective action. Also, help identify and disseminate lessons learned. c. Conduct assessments of electrical programs at least annually. d. Provide technical expertise to operators and craftsmen performing JSAs/JHAs on the electrical tasks. e. Assist in conducting electrical safety training. f. Periodically review site procedures for operating and maintaining electrical equipment to ensure the adequacy of hazard controls and appropriate CAUTIONS and WARNINGS. g. Informally observe electricians performing tasks to determine if they are practicing safe behavior while working with electrical equipment. h. Review and bring the Energized Electrical Work Permit to Electrical Safety Committee to ensure that live work was required and electrical safe practices were followed.
Technically Competent Person	<ul style="list-style-type: none"> a. Approve and sign the Energized Electrical Work Permit for work done on energized equipment.

TABLE 15.3. ELECTRICAL SAFETY-RELATED WORK PRACTICES AND RESPONSIBILITIES

Position or Department	Responsibility
Electrical Safety Committee	<p>b. Review and sign the safe work permit for work done on 480 volts and above to ensure that electrical safe work practices are followed.</p> <p>a. Act as the local AHJ for enforcing electrical codes and regulations at the site. (Note: This responsibility primarily applies to reviews of hazard controls, work procedures, and other tasks related to code compliance. The design AHJ is MOC Engineering and, ultimately, DOE.) The ultimate AHJ is the SPR Project Management Office (SPRPMO).</p> <p>b. Maintain and oversee the Electrical Safety Program, adapting the MOC program to site conditions while complying with the structure and requirements of this section.</p> <p>c. Develop and maintain site-specific electrical safety procedures that comply with MOC policies and are based on standards, regulations, and the DOE program. The SPR project manager has directed that the SPR program meet the DOE-national requirements of a “model” program.</p> <p>d. Assist departments in interpreting the electrical requirements of OSHA, DOE orders, and other codes, standards, and site practices.</p> <p>e. Maintain a copy of all interpretations issued.</p> <p>f. The committee shall meet at least twice a year and more frequently when needed to address electrical problems at the site. Publish Electrical Safety Committee minutes and forward a link of the same to the NOLA Safety Manager.</p> <p>g. Transmit unresolved electrical issues beyond the technical expertise of the site to MOC Electrical/Control Systems Engineering and ultimately to DOE as final AHJ, if required.</p>
Subcontract Manager’s Technical Representative	<p>a. Verify that the requirements established by codes and regulations are enforced during construction of all facilities by requiring that qualified personnel oversee electrical inspections.</p> <p>b. Verify that designated, qualified personnel received training in the NEC (NFPA 70) and electrical safety awareness and are qualified (as defined in this program) to perform electrical inspections.</p> <p>c. Provide subcontractor oversight to ensure that subcontractors comply with all site-specific safety requirements, including electrical safety, as required by 29 CFR 1910.119.</p> <p>d. Provide reports of electrical injuries and “near misses” to MOC ES&H.</p>
Qualified Person	<p>a. Ensure that live parts are de-energized, unless de-energizing introduces additional or increased hazards, or that de-energizing is not possible due to equipment design or operational limitations.</p> <p>b. Report every electrical accident/incident and all hazards contributing to occurrence.</p> <p>c. Report any electrical shock to the supervisor</p> <p>d. Read, understand, and follow all applicable procedures that have electrical requirements.</p> <p>e. Use appropriate controls such as lockout/tagout, personal protective equipment, or other devices when performing tasks.</p> <p>f. Only perform work on equipment after appropriate training and qualifications are obtained.</p>

TABLE 15.3. ELECTRICAL SAFETY-RELATED WORK PRACTICES AND RESPONSIBILITIES

Position or Department	Responsibility
	<ul style="list-style-type: none"> g. Review procedures, hazards, and controls before performing an electrical task. h. Attend appropriate electrical safety awareness training and other training as required by 29 CFR 1910.332 and demonstrate satisfactory performance after training. i. M&O subcontractor will participate in developing electrical maintenance operating procedures to comply with 29 CFR 1910.119, "Process Safety Management." j. Work only on equipment equal to level of training achieved. k. Participate in the identification and use of appropriate PPE as required by 1910.132 and 1910.137. l. O&M will address concerns and interface with their representatives on the Electrical Safety Committee. m. When equipment has to be worked on live, review the Energized Electrical Work Permit & Job Briefing and Planning Checklist to ensure that all the controls will be in place and the proper PPE shall be worn.
Employees	<ul style="list-style-type: none"> a. Be aware of the electrical hazards in their work areas. b. Before use on any shift, visually inspect portable cord and plug connected equipment for external defects (such as loose parts, deformed and missing pins) and for evidence of possible internal damage (such as pinched or crushed outer jacket). c. Inspect extension cords for damage before use and tagout if damaged.

Figure 15.1. Limits of Approach.

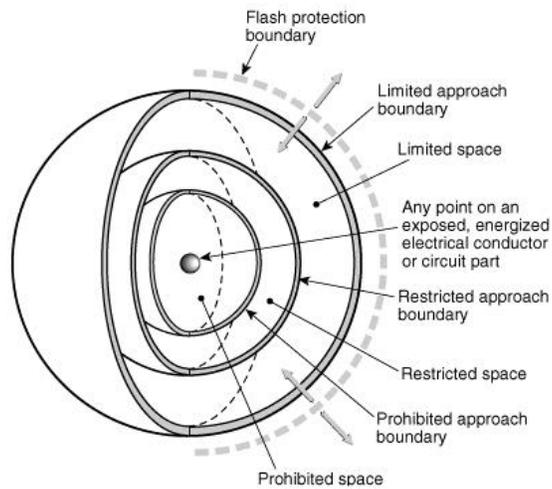


Figure 15-2. Arch Flash Label

