



The University of
Montana

**ELECTRICAL
&
ARC FLASH
SAFETY PROGRAM**



**Arc Flash and Shock Hazard
Appropriate PPE Required**

Equipment type	480 V	MCC and Panels
Grounding	Grounded	
Working distance	14 inches	
Limited approach boundary	42 inches	
Restricted approach boundary	12 inches	
Prohibited approach boundary	1 inches	
Incident energy at work distance	1.48 cal/cm ²	
Flash protection boundary	14 inches	
Hazard Risk Category	1	
Protective clothing	FR shirt and pants, safety glasses, hard hat, V-rated gloves	
Center Loop, NOT interconnected to other loops.		
Label Expires No Later than:	3/1/2017	
Equipment name	Panel 1H1	

*ADOPTED VERSION 2, SEPTEMBER 26, 2012
Supercedes all prior versions*

A. COMMITTEE OVERSIGHT OF PROGRAM

The University of Montana (“University”) recognizes the importance of establishing a formal safety program to safeguard its personnel from injuries. An Electrical & Arc Flash Safety Program Oversight Committee (“Oversight Committee”) was formed to:

1. Create, review and update this Electrical & Arc Flash Safety Program (“Program”);
2. Assure that the Program complies with the provisions of all applicable codes and standards;
3. Implement the Program quickly, smoothly and comprehensively across all necessary departments;
4. Educate the necessary personnel about the Program;
5. Enforce the Program’s provisions and procedures.

B. APPLICABLE LAWS

The University is a State of Montana (“State”) agency and must comply with all applicable State codes. The State’s legislature meets every two years and adopts building code updates at that time. At the time of this Program’s development, the applicable electric code that has been adopted by the State was the 2008 edition of the National Fire Protection Association (“NFPA”) 70 standard, also known as the National Electric Code (“NEC”). As of the date of this program, the most recent edition of the NEC is 2011. Technically, since the State has not yet adopted the 2011 NEC edition and will not do so until the 2013 legislative session, UM is not bound to comply with its provisions. The Oversight Committee, however, believes that the current edition of the NEC incorporates the most recent safety research and best practices and it therefore chose to base this document on the most recent edition of the NEC (2011) and also the most recent edition of the NFPA 70E standard (2012), Electrical Safety in the Workplace.

C. INTRODUCTION

Electricity is a serious workplace hazard, capable of causing both personal injury and property damage. It is the policy of University to protect all persons including employees, students, visitors, contractors and other personnel from potential electrical hazards. This will be accomplished through compliance with the work practices described in this policy along with effective application of engineering controls, administrative controls, and the use of personal protective equipment. This program is based on principles and procedures contained in the 2012 edition of the National Fire Protection Association (“NFPA”) 70E standard.

This Electrical & Arc Flash Safety Program is founded on the principle of avoiding energized work unless it is absolutely necessary. Energized electrical conductors or circuit parts will be de-energized before personnel work on or near them unless one of the conditions applies:

1. De-energizing introduces additional or increased hazards. Examples of additional or increased hazards would include deactivation of emergency alarm systems or shutdown of hazardous location ventilation systems.
2. De-energizing is not possible due to equipment design or operational limitations. Examples of this situation would include testing and troubleshooting of electrical circuits that can only be performed with the circuit energized and work on circuits that form an integral part of a continuous process that would otherwise need to be completely shut down in order to permit work on one circuit or piece of equipment.
3. Energized electrical conductors or circuit parts are operating at less than 50 volts to ground

and there is no increased exposure to electrical burns or to explosion due to electrical arcs.

D. PURPOSE

This program has been established in order to:

1. Ensure the safety of personnel who may work on or near electrical systems.
2. Ensure that personnel understand and comply with safety standards related to electrical safety.
3. Ensure that personnel follow uniform practices during the completion of electrical work.
4. Reduce the risk of electrical hazards, equipment damage, and fire.

E. RESPONSIBILITIES

1. Facilities Services

- a. Assist shops in implementing the provisions of this program.
- b. Provide or assist in task-specific training for electrical work qualifications.
- c. Periodically review and update this written program.
- d. Provide or coordinate general training for shops on the content of this program.
- e. Audit the principles and procedures of this Electrical & Arc Flash Safety Program for compliance with the latest edition of the NFPA 70E standard on a periodic basis not to exceed 3 years. The results of the audit will be documented. The audit will review the following characteristics of the program:
 - i. Are employees implementing and abiding by the program?
 - ii. Does the program adequately address electrical hazards?
 - iii. What is the revision process?
 - iv. How are revisions incorporated and communicated?

2. Supervisors/ Shop Foremen

- a. Determine the applicability of the Electrical & Arc Flash Safety Program to activities conducted within their respective areas.
- b. Responsible for the implementation of the Electrical & Arc Flash Safety Program within their areas.
- c. Ensure personnel comply with all provisions of the Electrical & Arc Flash Safety Program.
- d. Ensure personnel receive training appropriate to their assigned electrical tasks and maintain documentation of such training (see Appendix H).
- e. Develop and maintain a listing of all qualified personnel in their areas.
- f. Ensure personnel are provided with and use appropriate protective equipment.

3. Personnel

- a. Follow the work practices described in this document, including the use of appropriate protective equipment and tools.
- b. Attend all training required relative to this program.
- c. Store, maintain, clean and check assigned PPE in accordance with this program.
- d. Immediately report any concerns related to electrical safety to supervision.

F. DEFINITIONS

The following terms are defined in order to allow a better understanding of this program:

1. **Arc flash boundary:** When an arc flash hazard exists, an approach limit at a distance from a prospective arc source within which a person could receive a second-degree burn if an electrical arc flash were to occur
2. **Arc flash hazard analysis:** A study investigating a worker's potential exposure to arc-flash energy, conducted for the purpose of injury prevention and the determination of safe work practices, arc flash boundary, and the appropriate levels of personal protective equipment ("PPE").
3. **Arc flash suit:** A complete arc-rated clothing and equipment system that covers the entire body, except for the hands and feet
4. **Arc rating:** The value attributed to materials that describe their performance to exposure to an electrical arc discharge. The arc rating is expressed in cal/cm^2 and is derived from the determined value of the arc thermal performance value ("ATPV") or energy of breakopen threshold (E_{BT}) (should a material system exhibit a breakopen response below the ATPV value). Arc rating is reported as either ATPV or E_{BT} , whichever is the lower value.
5. **Electrically safe work condition:** A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with University policy, tested to ensure the absence of voltage, and grounded if determined necessary.
6. **Energized:** Electrically connected to or having a source of voltage.
7. **Exposed (as applied to energized electrical conductors or circuit parts):** Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to electrical conductors or circuit parts that are not suitably guarded, isolated, or insulated.
8. **Incident energy:** The amount of energy impressed on a surface, a certain distance from the source, generated during an electrical arc event. One of the units used to measure incident energy is calories per square centimeter (cal/cm^2).
9. **Incident energy analysis:** A component of an arc flash hazard analysis used to predict the incident energy of an arc flash for a specified set of conditions.
10. **Limited approach boundary:** An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists.
11. **Prohibited approach boundary:** An approach limit at a distance from an exposed energized electrical conductor or circuit part within which work is considered the same as making contact with the electrical conductor or circuit part.
12. **PPE:** An acronym for "Personal Protective Equipment."
13. **Qualified person:** One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved.
14. **Restricted approach boundary:** An approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased risk of shock, due to electrical arc-over combined with inadvertent movement, for personnel working in close proximity to the energized electrical conductor or circuit part.
15. **Unqualified person:** Any person who does not meet the definition of a qualified person.
16. **Working near (energized electrical conductor or circuit parts):** Any activity within a Limited Approach Boundary.
17. **Working on (energized electrical conductor or circuit parts):** Intentionally coming in contact with energized electrical conductor or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment regardless of the personal protective equipment a person is wearing. There are two categories of "working on": *Diagnostic (testing)* is taking readings or measurements of electrical equipment with approved test equipment that does not require making any physical change to the equipment; *repair* is any physical alteration of the electrical equipment (such as making or tightening connections, removing or replacing components, etc.).

G. TRAINING

1. Employees who are exposed to an electrical hazard that is not reduced to a safe level by the installation must be trained. Training could consist of classroom, webinars, on-the-job training, or any combination thereof.
2. The level of electrical safety training provided is dependent on whether the employee is classified as a “qualified person” or “unqualified person.”
3. A qualified person shall be trained and knowledgeable in all of the following topics:
 - a. Construction and operation of equipment on which work is assigned.
 - b. Skills and techniques necessary to distinguish exposed energized parts from other parts of electrical equipment.
 - c. Skills and techniques necessary to determine the nominal voltage of exposed energized parts.
 - d. The approach distances specified in this document and the corresponding voltages to which the qualified employee will be exposed.
 - e. The process necessary to determine the degree and extent of electrical hazards along with the PPE and job planning necessary to perform the task safely.
4. A person can be considered qualified with respect to certain equipment and methods but unqualified for others.
5. An unqualified person shall be trained in the inherent hazards of electricity and any related work practices that are necessary for their safety.
6. Training must be provided before the employee is assigned duties that involve work near or on electrical systems.
7. Each supervisor shall maintain a record of all electrical training provided to their employees along with a listing of all employees classified as qualified persons. Training documentation will include content of the training, employee names, and date(s) of the training.
8. An employee shall receive additional training (or retraining) under the following conditions:
 - a. If the supervisor or annual inspections indicate that the employee is not complying with the safety-related work practices.
 - b. If new technology, new types of equipment or changes in procedures necessitate the use of safety-related work practices that are different from those that the employee would normally use.
 - c. If he or she must use safety-related work practices that are not normally used during his or her regular job duties.
9. All employees will be retrained at intervals not to exceed 3 years.
10. Employees exposed to shock hazards and those employees responsible for taking action in case of emergency shall be trained in methods of release of victims from contact with exposed energized electrical conductors or circuit parts. Employees will be regularly instructed in methods of first aid and emergency procedures if their duties warrant such training. Training of employees in CPR and AED use will be reviewed by the employer annually.

H. WORKING ON OR NEAR ENERGIZED ELECTRICAL CONDUCTOR OR CIRCUIT PARTS

When intentionally working within the limited approach boundary or the arc flash boundary of exposed energized electrical conductors or circuit parts that are not placed in an electrically safe work condition, work to be performed is considered energized electrical work and must be performed by written permit only.

1. Energized Electrical Work Permit

- a. A copy of the University's Energized Electrical Work Permit can be found in Appendix A of this document. The intent of this permit is to ensure that all appropriate safety precautions are taken prior to starting energized electrical work.
- b. The permit is to be originated by the individual requesting that the energized work be completed. (This will normally be the supervisor of the employee who will be completing the work).
- c. All Energized Electrical Work Permits should be submitted to the Foreman or his/her designee and/or the Assistant Director for Maintenance for approval.
- d. The permit must be posted in the area where the energized work is taking place for the duration of the task.
- e. Energized electrical work permits must be kept on file by the supervisor upon completion of the task.
- f. **Exceptions to Work Permit:** Work performed within the limited approach boundary of energized electrical conductors of circuit parts by qualified persons related to tasks such as testing, troubleshooting, and voltage measuring shall be permitted to be performed without an energized electrical work permit, if appropriate safe work practices and PPE are used. If the purpose of crossing the limited approach boundary is only for visual inspection and the restricted approach boundary will not be crossed, then an energized electrical work permit is not required.

2. Approach Boundaries to Energized Electrical Conductor or Circuit Parts

- a. Observing a safe approach distance from exposed energized parts is an effective means of maintaining electrical safety. As the distance between an individual and energized electrical conductors or circuit parts increases, the potential for an electrical injury decreases.
- b. Safe approach distances will be determined for all tasks in which approaching personnel are exposed to energized electrical conductors or circuit parts.
- c. Safe approach distances to fixed energized electrical conductors or circuit parts can be determined by referring to Appendix B, "Approach Boundaries to Energized Electrical Conductors or Circuit Parts for Shock Protection". This appendix can be used to identify the Limited, Restricted, and Prohibited Approach Boundaries associated with various system voltages.
- d. Unqualified persons may only cross the Limited Approach Boundary when they are under the direct supervision of a qualified person.
- e. Qualified persons may not cross or take any conductive object closer than the Restricted Approach Boundary unless one of the following conditions apply:
 - i. The qualified person is insulated or guarded from the energized electrical conductors or circuit parts and no un-insulated part of the qualified person's body crosses the Prohibited Approach Boundary.
 - ii. The energized electrical conductors or circuit parts are insulated from the qualified person and from any other conductive object at a different potential.
- f. Crossing the Prohibited Approach Boundary is considered the same as making contact with energized parts. Qualified persons may only cross this boundary when all of the following precautions have been taken:
 - i. The qualified person has specific training to work on energized parts.
 - ii. The qualified person uses PPE appropriate for working on energized parts, which are rated for the voltage and energy level involved.

3. Other Precautions for Personnel Activities

- a. Employees shall not reach blindly into areas that might contain exposed energized electrical conductors or circuit parts.

- b. Employees shall not enter spaces containing energized electrical conductors or circuit parts unless illumination is provided that allows the work to be performed safely.
- c. Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn where they present an electrical contact hazard with exposed energized electrical conductors or circuit parts. University master keys must be removed and placed in a secure location.
- d. Conductive materials, tools, and equipment that are in contact with any part of an employee's body shall be handled in a manner that prevents accidental contact with energized electrical conductors or circuit parts. Such materials and equipment include, but are not limited to, long conductive objects such as ducts, pipes, tubes, conductive hose and rope, metal-lined rules and scales, steel tapes, pulling lines, metal scaffold parts, structural members, and chains.
- e. When an employee works in a confined space or enclosed space (such as a manhole or vault) that contains exposed energized electrical conductors or circuit parts, the employee shall use protective shields, barriers, or insulating materials as necessary to avoid contact with these parts. Doors, hinged panels, and the like shall be secured to prevent them from swinging into employees.

I. PERSONAL PROTECTIVE EQUIPMENT

1. General Requirements

- a. Employees working in areas where electrical hazards are present shall be provided with, and shall use, PPE that is designed and constructed for the specific body part to be protected and for the work to be performed.
- b. Facilities Services will provide electrical PPE required by this program at no cost to employees. Such equipment shall include arc-rated apparel, eye protection, head protection, hand protection, insulated footwear, and face shields where necessary. Facilities Services is not responsible for providing under layers of clothing nor for typical everyday workplace apparel.
- c. All PPE shall be maintained in a safe, reliable condition by the employee to whom it is issued.
- d. Employees shall wear nonconductive head protection whenever there is a danger of a head injury from electric shock or burns due to contact with energized electrical conductors or circuit parts or from flying objects resulting from an electrical explosion.
- e. Employees shall wear nonconductive protection for the face, neck, and chin whenever there is danger of injury from exposure to electric arcs or flashes or from flying objects resulting from an electrical explosion.
- f. Employees shall wear protective equipment for the eyes and face whenever there is a danger of injury from electric arcs, flashes, or from flying objects resulting from an electrical explosion.
- g. Employees shall wear rubber-insulating gloves where there is a danger of hand and arm injury due to contact with energized electrical conductors or circuit parts or possible exposure to arc flash burn.
- h. Employees shall wear hard-soled leather shoes as provided by Facilities Services.
- i. Face shields without an arc rating will not be used for electrical work. Safety glasses or goggles must always be worn underneath face shields.
- j. Additional illumination may be needed when using tinted face shields as protection during electrical work.

2. **Arc Flash Boundary**

- a. PPE shall be provided to and used by all employees working within the arc flash boundary.”
- b. Employees shall wear hearing protection whenever working within the arc flash boundary.
- c. An arc-rated balaclava shall be used with an arc-rated face shield when the back of the head is within the arc flash boundary. An arc-rated hood is permitted to be used instead of an arc-rated faceshield and balaclava.
- d. An arc-rated hood must be used when the anticipated incident energy exposure exceeds 12cal/cm^2
- e. For systems that are above 600 volts, the arc flash boundary shall be determined through engineering analysis.
- f. The specific protective equipment to be worn within the arc flash boundary can be determined by either of the following two methods:
- g. Complete an arc flash hazard analysis that determines the incident exposure energy of each employee. Appropriate protective clothing can then be selected based on the calculated exposure level.
- h. Determine the Hazard/Risk Category of the task by referring to NFPA 70E Tables 130.7 (C)(15)(a) or (b) which are reproduced in Appendices C and D. Once the Hazard/Risk Category of the task has been determined, the required PPE can then be ascertained from NFPA 70E Table 130.7 (C)(16) “Protective Clothing and PPE ” reproduced in Appendix E.

3. **Arc-Rated Apparel & Under Layers**

- a. Arc-Rated apparel shall be visually inspected before each use. Arc-Rated apparel that is contaminated or damaged shall not be used. Protective items that become contaminated with grease, oil, flammable liquids, or combustible liquids shall not be used.
- b. The garment manufacturer’s instructions for care and maintenance of Arc-Rated apparel shall be followed.
- c. When Arc-Rated apparel is worn to protect an employee, it shall cover all ignitable clothing and allow for movement and visibility.
- d. Arc-Rated apparel must cover potentially exposed areas as completely as possible. Arc-Rated shirtsleeves must be fastened and Arc- Rated shirts/jackets must be closed at the neck.
- e. Non-melting, flammable garments (i.e. cotton, wool, rayon, silk, or blends of these materials) may be used as under layers beneath Arc-Rated apparel.
- f. Meltable fibers such as acetate, nylon, polyester, polypropylene, and spandex shall not be permitted in fabric under layers next to the skin. (An incidental amount of elastic used on non-melting fabric underwear or sock shall be permitted).
- g. Arc-Rated garments worn as outer layers over Arc-Rated apparel (i.e. jackets or rainwear) must also be made from Arc-Rated material.
- h. Arc flash suits must permit easy and rapid removal by the user.

4. **Rubber Insulating Equipment**

- a. Rubber insulating equipment includes protective devices such as gloves, sleeves, blankets, and matting.
- b. Insulating equipment must be inspected for damage before each day’s use and immediately following any incident that could have caused damage.
- c. An air test must be performed on rubber insulating gloves before each use. Fill the glove with air, either manually or by an inflator, and then check for leakage by either listening for escaping air or holding the glove against the tester’s cheek to sense any air being released.

- d. Insulating equipment found to have defects that might affect its insulating properties must be removed from service until testing indicates that it is acceptable for continued use.
- e. Where the insulating capability of protective equipment is subject to damage during the use, the insulating material shall be protected by an outer covering of leather or other appropriate material.
- f. Rubber insulating equipment must be tested according to the schedule contained in Appendix G.
- g. Rubber insulating equipment must be stored in an area protected from light, temperature extremes, excessive humidity, ozone, and other substances and conditions that may cause damage.

5. Insulated Tools and Materials

- a. Only insulated tools and equipment shall be used within the Limited Approach Boundary of exposed energized parts.
- b. Insulated tools shall be rated for the voltages on which they are used.
- c. Insulated tools shall be designed and constructed for the environment to which they are exposed and the manner in which they are used.
- d. Insulated tools shall be protected from damage and degradation of the integrity of the insulation.
- e. Fuse or fuse holder handling equipment, insulated for the circuit voltage, shall be used to remove or install a fuse if the fuse terminals are energized.
- f. Ropes and hand lines used near exposed energized parts shall be nonconductive.
- g. Portable ladders used for electrical work shall have nonconductive side rails.

J. ALERTING TECHNIQUES

1. Barricades

- a. Barricades shall be used in conjunction with safety signs to prevent or limit access to work areas containing energized electrical conductors or circuit parts. Conductive barricades shall not be used where they might cause an electrical hazard. Barricades shall be placed no closer than the Limited Approach Boundary.
- b. Barricades, such as plastic fencing, must be in place if workers have to leave energized parts exposed over 600 volts.
- c. If signs and barricades do not provide sufficient protection, an attendant will be assigned to warn and protect pedestrians. The primary duty of the attendant shall be to keep unqualified persons out of the work area where an electrical hazard exists. The attendant shall remain in the area as long as there is a potential exposure to electrical hazards.

2. Equipment Labeling

Switchboards, panelboards, industrial control panels, meter socket enclosures and motor control centers that are likely to require examination, adjustment, servicing or maintenance while energized must be field-marked with a label containing all of the following information:

- a. Nominal System Voltage
- b. Arc Flash Boundary
- c. Available incident energy and the corresponding working distance
- d. Available 3 phase bolted current
- e. Hazard/Risk Category (0 through 4)
- f. The date that the label was applied
- g. Other explanatory information as desired
- h. **Exception:** Labels applied prior to September 30th, 2011 are acceptable if they contain the available incident energy or required level of PPE.

K. CONTRACT EMPLOYEES

1. Contractors will be required to comply with applicable Safety and Health regulations such as OSHA, NFPA, EPA, etc.
2. Contractors may be required to submit copies of their Safety Program to the University upon request.
3. There must be a documented meeting between the University and the contract employer.
4. The University will inform contract employers of the following:
 - a. Known electrical hazards that are related to the contract employers work and that might not be recognized by the contract employer or its employees
 - b. Information about the University's installation that the contract employer needs to make the appropriate assessments before beginning work
5. The University shall report observed contract employer-related violations of this program to the contract employer.
6. The contract employer shall ensure that each of his or her employees is instructed in the hazards communicated to the contract employer by the University.
7. The contract employer shall ensure that each of his or her employees follows the work practices required by NFPA 70E and safety-related work rules of the University.
8. The contract employer shall advise the University of any unique hazards presented by the contract employers work; any unanticipated hazards found during the contractors work that the University did not mention; and the measures the contractor took to correct any violations reported by the University and to prevent reoccurrence of the violation

L. STANDARD OPERATING PROCEDURES

It is the goal of the University to mitigate the arc flash hazard which could occur during the maintenance of electrical building components throughout campus. Standard operating procedures will eliminate or control arc flash events to reduce the hazard to employees.

1. To reduce the potential for arc flash occurrences, the following standard operating procedures will be applied:
 - a. De-energize all circuits before performing any maintenance on them.
 - b. Ensure that all possible sources of supply are found and open disconnecting devices for each source.
 - c. Apply Lockout/Tagout devices in accordance with the University's Lockout/Tagout procedures.
 - d. Test voltage on each conductor to verify that it is de-energized.
 - e. Apply grounding devices where stored energy or induced voltage could exist or where de-energized conductors could contact energized electrical conductors or circuit parts.
2. If it is necessary to work on energized equipment; the following procedures will be applied:
 - a. Execute **Energized Electrical Work Permit** procedures.
 - b. Establish boundaries keeping those not involved with the work ten feet away.
 - c. Use insulated tools.
 - d. Consider using insulated floor mats.
 - e. Wear safety glasses.
 - f. Wear voltage rated gloves.
 - g. Wear hard-soled leather work shoes or dielectric overshoes.
 - h. Wear appropriate arc flash PPE as determined by information provided by the specific arc flash and shock hazard field labels on equipment.
 - i. **If no equipment label with specific arc hazard information is present**, use NFPA 70E (2012 Edition) Tables 130.7(C)(15)(a) & (b) – reproduced in Appendices C and D -

- to determine the Hazard Risk Category and therefore the PPE to be used for the given work tasks.
- j. If the above paragraphs h and i do not adequately address the intended task and each of the following conditions apply, the task may be considered to be hazard risk category 1:
 - i. Equipment is 240 volt or less.
 - ii. Equipment is fed with a 100 amp or smaller breaker.
 - iii. Equipment is fed from a panelboard or load center rated 225 amp or less.
 - iv. Equipment is fed from a panelboard or load center that has a calculated arc flash and shock hazard label with the voltage and short circuit current available.
 - v. The “short circuit current available” as shown on the panelboard’s label is 25,000 amps or less.
 - k. **If the conditions specified in above paragraphs h, i and j DO NOT apply, STOP THE WORK** and seek further direction from the supervisor.
 - l. An arc flash hazard decision tree is given in Appendix I.

M. ARC FLASH HAZARD ANALYSIS

1. The two methods recommended by NFPA 70E of determining arc flash hazards are:
 - a. **Method 1:** Individually calculate the incident energy for each piece of equipment using the empirical formulae based on the unique existing field conditions that have been researched, documented and verified.
 - b. **Method 2:** Utilize NFPA 70E (2012 Edition) Tables 130.7(C)(15)(a) & (b). See Appendices C and D for reproductions of these tables.
2. Due to the complex electrical distribution system serving the University’s campus buildings and the unique circumstances of each building’s internal wiring, electrical protection and load elements, the Oversight Committee has chosen to evaluate arc flash hazards by Method 1. Further, since Method 1 calculations require an assumption of working distances, the Oversight Committee herewith adopts the standard working distances used in NFPA 70E (2012 edition) for Method 2.
3. The Oversight Committee also acknowledges that it will take time to complete such arc flash hazard analyses for all UM facilities. In the interim, the Oversight Committee has decided to utilize Method 2 for any equipment that has not yet been evaluated by Method 1.
4. The Oversight Committee has interpreted language from the NEC and NFPA 70E to require hazard analysis and labeling for all equipment, including small snap switches. The Oversight Committee acknowledges that such analyses are impractical and unnecessary and will therefore limit arc flash hazard analysis to the following:
 - a. All distribution equipment (switchboards, panelboards, load centers, but NOT transformers) regardless of voltage.
 - b. All equipment that operates at 240 volt or above.
 - c. Large equipment that operates below 240 volts.
5. The Oversight Committee has determined that equipment that does not meet the specifications detailed in Section M.4 above will be labeled with a non-specific (generic) label that warns personnel of potential arc flash and shock hazards but which does not contain any calculated arc flash information. See Appendix F for an example generic label.

Appendix A: Energized Electrical Work Permit

<u>Energized Electrical Work Permit</u>	
PART 1: TO BE COMPLETED BY THE REQUESTOR:	
Work Order Number:	
Description of Circuit & Equipment:	Job Location:
Description of Work to be Done:	
Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next scheduled outage:	
Requester/Title:	Date:
PART 2: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS DOING THE WORK:	
Detailed job description procedure to be used in performing the above work:	Check as completed <input type="checkbox"/>
(2) Description of safe work practice to be employed:	<input type="checkbox"/>
(3) Results of the shock hazard analysis: Limited approach boundary Restricted approach boundary Prohibited approach boundary Necessary shock PPE to safely perform task	 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
(4) Results of the arc flash hazard analysis: Available incident energy or hazard/risk category Necessary arc flash PPE to safely perform task Arc flash boundary	 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
(5) Means employed to restrict the access of unqualified persons from the work area:	<input type="checkbox"/>
(6) Evidence of completion of a job briefing, including discussion of any job-related hazards:	<input type="checkbox"/>
(7) Do you agree the above-described work can be done safely? <input type="checkbox"/> Yes <input type="checkbox"/> No (If No , return to requestor)	
Qualified Person: _____ Date: _____ Qualified Person: _____ Date: _____	
PART 3: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:	
(Signatures and Date)	
Electrical Foreman: _____ Assist. Director of Maintenance: _____ Other Approval: _____	
Note: A supervisor must approve all energized work before starting.	

Appendix B: Approach Boundaries to Energized Electrical Conductors or Circuit Parts for Shock Protection

(All dimensions are distance from energized part to employee)

Nominal System Voltage (phase to phase)	Limited Approach Boundary		Restricted Approach Boundary (includes inadvertent movement adder)	Prohibited Approach Boundary
	Movable Conductor	Fixed Circuit Part		
Less than 50V	Not specified	Not specified	Not specified	Not specified
50V to 300V	10 feet	3 feet 6 inches	Avoid contact	Avoid contact
301V to 750V	10 feet	3 feet 6 inches	1 foot	1 inch
751V to 15 kV	10 feet	5 feet	2 feet, 2 inches	7 inches
Over 15 kV	See NFPA 70 E Table 130.4 (C)(a)			
Direct Current Systems	See NFPA 70 E Table 130.4 (C)(b)			

Limited Approach Boundary: Distance from an exposed live part within which a shock hazard exists. An unqualified person may not cross this boundary unless they are continuously escorted by a qualified person.

Restricted Approach Boundary: Distance from an exposed live part within which there is an increased risk of shock (due to electrical arc-over combined with inadvertent movement) for personnel working in close proximity to the live part. This boundary may only be crossed by a qualified person who is safely insulated or guarded from the energized electrical conductors or circuit parts.

Prohibited Approach Boundary: Distance from an exposed live part within which work is considered the same as making contact with the live part. This boundary may only be crossed by a qualified person who has specific training to work on energized parts; has obtained an approved Energized Electrical Work Permit; and uses PPE appropriate for working on energized parts which are rated for the voltage and energy level involved. (Note: A permit is not required for work related to testing, troubleshooting, and voltage measuring).

Arc Flash Boundary (not listed in this table): Distance from exposed energized electrical conductors or circuit parts within which a person could receive a second-degree burn if an electrical arc flash were to occur. This boundary may only be crossed by a qualified person wearing the appropriate PPE. An analysis must be performed to determine the Flash Protection Boundary for systems that are above 600 volts.

**Appendix C:
NFPA 70E Table 130.7(C)(15)(a)
Hazard/Risk Categories for Energized Tasks**

Tasks Performed on Energized Equipment	Hazard/ Risk Category	Rubber Insulating Gloves	Insulated Hand Tools
Panelboards or other equipment rated 240 V and below Parameters: Maximum of 25 kA short circuit current available; maximum of 0.03 sec (2 cycle) fault clearing time; minimum 18 in. working distance Arc flash boundary using above parameters: 19 in.			
Perform infrared thermography and other non-contact 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 and circuit parts, including voltage 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 panelboard	1	Y	Y
Panelboards or other equipment rated > 240 V and up to 600 V Parameters: Maximum of 25 kA short circuit current available; maximum of 0.03 sec (2 cycle) fault clearing time; minimum 18 in. working distance Arc flash boundary 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
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 panelboard	2	Y	Y

**Appendix C (continued):
NFPA 70E Table 130.7(C)(15)(a)
Hazard/Risk Categories for Energized Tasks**

Tasks Performed on Energized Equipment	Hazard/ Risk Category	Rubber Insulating Gloves	Insulating Hand Tools
600 V class motor control centers (MCCs) Parameters: Maximum of 65 kA short circuit current available; maximum of 0.03 sec (2 cycle) fault clearing time; minimum 18 in. working distance Arc flash boundary using above parameters: 53 in.			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	1	N	N
CB or fused switch or starter operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch or starter operation with enclosure doors open	1	N	N
Work on energized electrical conductors and circuit parts, including voltage testing	2	Y	Y
Work on control circuits with energized electrical conductors and circuit parts > 120 V, exposed	0	Y	Y
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	2	Y	Y
Application of temporary protective grounding equipment, after voltage test	2	Y	N
Work on energized electrical conductors and circuit parts of utilization equipment fed directly by a branch circuit of the motor control center	2	Y	Y
600 V class motor control centers (MCCs) Parameters: Maximum of 42 kA short circuit current available; maximum of 0.33 sec (20 cycle) fault clearing time; minimum 18 in. working distance Arc flash boundary using above parameters: 165 in.			
Insertion or removal of individual starter “buckets” from MCC	4	Y	N
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	4	N	N
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	1	N	N

**Appendix C (continued):
NFPA 70E Table 130.7(C)(15)(a)
Hazard/Risk Categories for Energized Tasks**

Tasks Performed on Energized Equipment	Hazard/ Risk Category	Rubber Insulating Gloves	Insulating Hand Tools
600 V class switchgear (with power circuit breakers or fused switches) and 600 V class switchboards Parameters: Maximum of 35 kA short circuit current available; maximum of 0.5 sec (30 cycle) fault clearing time; minimum 18 in. working distance Arc flash boundary using above parameters: 233 in.			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	2	N	N
CB or fused switch operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch or starter operation with enclosure doors open	1	N	N
Work on energized electrical conductors and circuit parts, including voltage testing	2	Y	Y
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized electrical conductors and circuit parts > 120, exposed	2	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open or closed	4	N	N
Application of temporary protective grounding equipment after voltage test	2	Y	N
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	4	N	N
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	2	N	N
Other 600 V class (277 V through 600 V, nominal) equipment Parameters: Maximum of 65 kA short circuit current available; maximum of 0.03 sec (2 cycle) fault clearing time; minimum 18 in. working distance (except as indicated) Arc flash boundary using above parameters: 53 in.			
Lighting or small power transformers (600 V maximum)			
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	2	N	N
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	1	N	N
Work on energized electrical conductors and circuit parts, including voltage testing	2	Y	Y
Application of temporary protective grounding equipment, after voltage test	2	Y	N
Revenue meters (kW-hour, at primary voltage and current) – insertion or removal	2	Y	N
Cable trough or tray cover removal or installation	1	N	N
Miscellaneous equipment cover removal or installation	1	N	N
Work on energized electrical conductors and circuit parts, including voltage testing	2	Y	Y
Application of temporary protective grounding equipment, after voltage test	2	Y	N
Insertion or removal of plug-in devices into or from busways	2	Y	N

**Appendix C (continued):
NFPA 70E Table 130.7(C)(15)(a)
Hazard/Risk Categories for Energized Tasks**

Tasks Performed on Energized Equipment	Hazard/ Risk Category	Rubber Insulating Gloves	Insulating Hand Tools
NEMA E2 (fused contactor) motor starters, 2.3 kV through 7.2 kV Parameters: Maximum of 35 kA short circuit current available; maximum of 0.2 sec (12 cycle) fault clearing time; minimum 36 in. working distance Arc flash boundary using above parameters: 422 in.			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	3	N	N
Contactor operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
Contactor operation with enclosure doors open	2	N	N
Work on energized electrical conductors and circuit parts, including voltage testing	4	Y	Y
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized electrical conductors and circuit parts > 120, exposed	3	Y	Y
Insertion or removal (racking) of starters from cubicles, doors open or closed	4	N	N
Application of temporary protective grounding equipment after voltage test	3	Y	N
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	4	N	N
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	3	N	N
Insertion or removal (racking) of starters from cubicles of arc-resistant construction, tested in accordance with IEEE C37.20.7, doors closed only	0	N	N
Metal clad switchgear, 1 kV through 38 kV Parameters: Maximum of 35 kA short circuit current available; maximum of 0.2 sec (12 cycle) fault clearing time; minimum 36 in. working distance Arc flash boundary using above parameters: 422 in.			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	3	N	N
CB operation with enclosure doors closed	2	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB operation with enclosure doors open	4	N	N
Work on energized electrical conductors and circuit parts, including voltage testing	4	Y	Y
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	2	Y	Y
Work on control circuits with energized electrical conductors and circuit parts > 120, exposed	4	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open or closed	4	N	N
Application of temporary protective grounding equipment after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	4	N	N
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	3	N	N
Opening voltage transformer or control power transformer compartments	4	N	N

**Appendix C (continued):
NFPA 70E Table 130.7(C)(15)(a)
Hazard/Risk Categories for Energized Tasks**

Tasks Performed on Energized Equipment	Hazard/ Risk Category	Rubber Insulating Gloves	Insulating Hand Tools
Arc-resistant switchgear Type 1 or 2 (for clearing times of <0.5 sec with a perspective fault current not to exceed the arc-resistant rating of the equipment) Parameters: Maximum of 35 kA short circuit current available; maximum of 0.2 sec (12 cycle) fault clearing time; minimum 36 in. working distance Arc flash boundary using above parameters: 422 in.			
CB operation with enclosure doors closed	0	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	0	N	N
Insertion or removal of CBs from cubicles, doors open	4	N	N
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	2	Y	Y
Insertion or removal (racking) of ground and test device with door closed	0	N	N
Insertion or removal (racking) of voltage transformers on or off the bus door closed	0	N	N
Other equipment 1 kV through 38 kV Parameters: Maximum of 35 kA short circuit current available; maximum of 0.2 sec (12 cycle) fault clearing time; minimum 36 in. working distance Arc flash boundary using above parameters: 422 in.			
Metal-enclosed interrupter switchgear, fused or unfused			
Switch operation or arc-resistant-type construction, tested in accordance with IEEE C37.20.7, doors closed only	0	N	N
Switch operation, doors closed	2	N	N
Work on energized electrical conductors and circuit parts, including voltage testing	4	Y	Y
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	4	N	N
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	3	N	N
Outdoor disconnect switch operation (hookstick operated)	3	Y	Y
Outdoor disconnect switch operation (gang-operated, from grade)	2	Y	N
Insulated cable examination, in manhole or other confined space	4	Y	N
Insulated cable examination, in open area	2	Y	N

Y=Yes (required). N=N0 (not required)

Notes:

- (1) Rubber insulating gloves are gloves rated for the maximum line-to-line voltage upon which work will be done.
- (2) Insulated and insulating hand tools are tools rated and tested for the maximum line-to-line voltage upon which work will be done, and are manufactured and tested in accordance with ASTM F 1505, Standard Specification for Insulated and Insulating Hand Tools.
- (3) The use of "N" does not indicate that rubber insulating gloves and insulated and insulating hand tools are not required in all cases. Rubber insulating gloves and insulated and insulating hand tools may be required by 103.4, 130.8 (C) (7), and 130.8(D).
- (4) For equipment protected by upstream current limiting fuses with arcing fault current in their current limiting range (1/2 cycle fault clearing time or less), the hazard/risk category required may be reduced by one number.
- (5) For power systems up to 600V the arc flash boundary was determined by using the following information: When 0.03 second trip time was used, that indicated MCC or panelboard equipment protected by a molded-case circuit breaker. Working distance used was 18 in. Arc gap used was 32mm for switchgear and 25mm for MCC and protective device type 0 for all. When 0.33 or 0.5 second trip time was used that indicated a LVPCB (drawout circuit breaker) in switchgear. Working distance was 24 in. Arc gap used was 32mm and protective device type 0 for all. All numbers were rounded up or down depending on closest multiple of 5.

**Appendix D:
NFWA 70E Table 130.7(C)(15)(b)
Hazard/Risk Categories for Energized Tasks – Direct Current**

Tasks Performed on Energized Equipment	Hazard/ Risk Category ^a	Rubber Insulating Gloves ^b	Insulating Hand Tools
Storage batteries, direct-current switchboards and other direct-current supply sources >100V <250 V Parameters: Voltage: 250 V Maximum arc duration and working distance: 2 sec @ 18 in.			
Work on energized electrical conductors and circuit parts, including voltage testing where arcing current is ≥ 1 kA and < 4 kA Arc flash boundary using above parameters at 4 kA: 36 in.	1	Y	Y
Work on energized electrical conductors and circuit parts, including voltage testing where arcing current is ≥ 4 kA and < 7 kA Arc flash boundary using above parameters at 7 kA: 48 in.	2	Y	Y
Work on energized electrical conductors and circuit parts, including voltage testing where arcing current is ≥ 7 kA and < 15 kA Arc flash boundary using above parameters at 15 kA: 72 in.	3	Y	Y
Storage batteries, direct-current switchboards and other direct-current supply sources ≥ 250V ≤ 600 V Parameters: Voltage: 600 V Maximum arc duration and working distance: 2 sec @ 18 in.			
Work on energized electrical conductors and circuit parts, including voltage testing where arcing current is ≥ 1 kA and < 1.5 kA Arc flash boundary using above parameters at 1.5 kA: 36 in.	1	Y	Y
Work on energized electrical conductors and circuit parts, including voltage testing where arcing current is ≥ 1.5 kA and < 3 kA Arc flash boundary using above parameters at 3 kA: 48 in.	2	Y	Y
Work on energized electrical conductors and circuit parts, including voltage testing where arcing current is ≥ 3 kA and < 7 kA Arc flash boundary using above parameters at 7 kA: 72 in.	3	Y	Y
Work on energized electrical conductors and circuit parts, including voltage testing where arcing current is ≥ 7 kA and < 10 kA Arc flash boundary using above parameters at 10 kA: 96 in.	4	Y	Y

Notes:

Y: Yes (required).

^aIf acid exposure is possible, the clothing is required to be protected from acid and arc rated to the hazard according to ASTM F 1891 or equivalent and evaluated by ASTM F 1296 for acid protection.

^bIn clean rooms or other electrical installations, that do not permit leather protectors for arc flash exposure, ASTM F 496 is required to be followed for use of rubber insulating gloves without leather protectors, and the rubber gloves chosen are required to be arc rated to the potential exposure level of the hazard/risk category.

**Appendix E:
NFPA 70E Table 130.7(C)(16)
Personal Protective Equipment for Hazard/Risk Categories**

Hazard/Risk Category	Protective Clothing and PPE
0	<p>Protective Clothing, Nonmelting or Untreated natural Fiber (i.e. untreated cotton, wool, rayon, or silk, or blends of these materials) with a Fabric Weight of at Least 4.5 oz/yd² Shirt (long sleeve) Pants (long)</p> <p>Protective Equipment Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Heavy duty leather gloves (AN) (See Note 1.)</p>
1	<p>Arc-Rated Clothing, Minimum Arc Rating of 4 cal/cm² (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)</p> <p>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 (AN)</p>
2	<p>Arc-Rated Clothing, Minimum Arc Rating of 8 cal/cm² (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)</p> <p>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 (AN)</p>

**Appendix E (continued):
NFPA 70E Table 130.7(C)(16)
Personal Protective Equipment for Hazard/Risk Categories**

Hazard/Risk Category	Protective Clothing and PPE
3	<p>Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 25 cal/cm² (See Note 3.)</p> <p>Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated 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)</p> <p>Protective Equipment</p> <p>Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Leather work shoes (AN)</p>
4	<p>Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 40 cal/cm² (See Note 3.)</p> <p>Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated 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)</p> <p>Protective Equipment</p> <p>Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Leather work shoes (AN)</p>

Notes:

AN: as needed (optional). AR: as required. SR: selection required.

(1) If rubber insulating gloves with leather protectors 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 protectors satisfies the arc flash protection requirement.

(2) Face shields are to have wrap-around guarding to protect not only the face but also the forehead, ears, and neck, or, alternatively, an arc-rated arc flash suit hood is required to be worn.

(3) Arc rating is defined in Section F.4 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 of materials, that results in a 50% 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 a 50% probability of breakopen. Arc rating is reported as either ATPV or E_{BT}, whichever is the lower value.

**Appendix F:
Example of Generic Arc Flash Hazard Label**



Appendix G:
Inspection Schedule for Rubber Insulating Equipment

Type of Equipment	Testing Schedule
Rubber insulating line hose	Whenever insulating value is suspect
Rubber insulating covers	Whenever insulating value is suspect
Rubber insulating blankets	Before 1 st issue and every 12 months
Rubber insulating sleeves	Before 1 st issue and every 12 months
Rubber insulating gloves	Before 1 st issue and every 6 months

**Appendix H
University of Montana
Employee Training Record**

Employee Name: _____

Job Position: _____

Date of Hire: _____

Please complete this training record, estimate all training hours, use additional paper if necessary. Sign, date and return to supervisor.

List all technical and professional certifications:

- 1) _____
- 2) _____
- 3) _____
- 4) _____

List all safety, technical, or vendor classroom training:

Hours

- | | |
|----------|-------|
| 1) _____ | _____ |
| 2) _____ | _____ |
| 3) _____ | _____ |
| 4) _____ | _____ |

List all computer-based safety, technical or vendor training:

- | | |
|----------|-------|
| 1) _____ | _____ |
| 2) _____ | _____ |
| 3) _____ | _____ |
| 4) _____ | _____ |

List on-the-job training sessions for specific equipment or procedures:

- | | |
|----------|-------|
| 1) _____ | _____ |
| 2) _____ | _____ |
| 3) _____ | _____ |
| 4) _____ | _____ |

Report any other specific skills or training:

- | | |
|----------|-------|
| 1) _____ | _____ |
| 2) _____ | _____ |
| 3) _____ | _____ |
| 4) _____ | _____ |

Signed Name: _____ Date: _____

Appendix I Arc Flash Hazard Decision Tree

