

UNIVERSITY OF ROCHESTER
ENVIRONMENTAL HEALTH & SAFETY

Policy No.: OS001	Approved by: Mark Cavanaugh
Title: Energized Electrical Safety Program	Date: 8/24/2020
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I. PURPOSE

Electricity is a serious workplace hazard, capable of causing both employee injury and property damage. It is the policy of the University of Rochester (the University), to protect all individuals from potential electrical hazards. This will be accomplished through compliance with the work practices along with effective application of engineering controls, administrative controls, and the use of personal protective equipment described herein.

The University’s Energized Electrical Safety Program is founded on the *principle of avoiding and not permitting energized work unless it is absolutely necessary*. Energized electrical conductors or circuit parts will be de-energized before an employee works on or near them unless one of the following conditions applies:

1. **De-energizing introduces additional or increased hazards.** Examples of “additional or increased” hazards would include interruption of life support equipment, 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. **Live 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.**

Energized electrical conductors or circuit parts are to be de-energized in accordance with the University’s Lockout/Tagout Program. If live parts are not placed in an electrically safe condition, the work practices described in this document must be used to protect employees. Work on live parts or circuits requires the issuance of a *Live Work Permit*, except as noted in Section V.B.2, Limited Long Term Energized Electrical Work Permit.

II. PERSONNEL AFFECTED

This program applies to all properties owned by the University, and work performed by university employees and contractors regardless of job site location.

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III. DEFINITIONS

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

1. **Arc Flash Hazard:** A dangerous condition associated with the possible release of energy caused by an electric arc.
2. **Arc Flash protection boundary:** 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. See Appendix B.
3. **Arc rating:** The maximum incident energy resistance demonstrated by a material (or a layered system of materials) prior to “breaking open” or at the onset of a second-degree skin burn. This rating is assigned to electrical protective clothing and is normally expressed in calories per square centimeter (cal/cm²).
4. **Electrically safe work condition:** A state in which the conductor or circuit part to be worked on or near has been disconnected from energized parts, locked/tagged in accordance with the University policy, tested to ensure the absence of voltage, and grounded if determined necessary.
5. **Energized:** Electrically connected to or having a source of voltage.
6. **Energized Electrical Work Permit:** Used for all approved non-routine live work.
7. **Exposed (as applied to live parts):** Capable of being inadvertently touched or approached from closer than a safe distance by a person. It is applied to parts that are not suitably guarded, isolated, or insulated.
8. **Flash hazard analysis:** A study investigating a worker’s potential exposure to arc-flash energy, conducted prior to commencing work for the purpose of injury prevention and the determination of safe work practices along with appropriate levels of PPE.
9. **Flash suit:** A complete Fire Resistive (FR) clothing and equipment system that covers the entire body, except for the hands and feet. (Such a suit typically includes pants, jacket, and a “bee-keeper” style hood fitted with a face shield).
10. **FR apparel:** Flame-resistant apparel; describes a broad category of clothing designed to protect employees from electrical arc events during completion of energized tasks.
11. **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/cm²).
12. **Limited approach boundary:** An approach limit at a distance from an exposed live part within which a shock hazard exists. See Appendix B.
13. **Limited Long Term Energized Electrical Work Permit:** Allows specified live work to be performed by a qualified individual. The permit is good for up to one year and will be renewed annually, as appropriate. Routine work only.
14. **Live parts:** Energized conductive components.
15. **Prohibited approach boundary:** An approach limit at a distance from an exposed live part within which work is considered the same as making contact with the live part. See Appendix B.

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16. **PPE:** An acronym for “Personal Protective Equipment”.
17. **Qualified person:** Through training and experience understands the requirements of this program plus, OSHA and NFPA 70E. A person who:
- Has demonstrated skills and knowledge related to the construction and operation of the electrical equipment and installations
 - Has received safety training to recognize and avoid the hazards involved
 - Has received training to recognize the appropriate level of PPE required
 - Has shown competency in inspecting and maintaining PPE.
 - Has exhibited proficiency for specific procedures, i.e. Lock Out Tag Out
 - Has worked on the specific voltage or calorie level before
 - Can distinguish exposed live parts from other parts
 - Can determine the nominal voltage of live parts
 - Understands clearance distances for the voltages he/she will be exposed to
- Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, PPE, insulating and shielding materials, and insulated tools. A person may be “task qualified” – qualified to use certain equipment, but not on equipment of a different nature. The supervisor must determine if someone is qualified.
18. **Restricted approach boundary:** An approach limit at a 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.
19. **Unqualified person:** Any person who does not meet the definition of a qualified person.
20. **Working On:** (energized electrical conductors or circuit parts). Coming in contact with energized electrical conductors 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.

IV. RESPONSIBILITIES

A. UNIVERSITY FACILITIES DIRECTORS

1. Shall be responsible for the ownership, rollout and implementation of the Energized Electrical Safety Program within their departments.
2. Shall function as the Host Employer in relationship with contractors and shall:
 - Attend all required training.
 - Inform contractors of known hazards covered by this standard.
 - Provide adequate information about the facility so the contractor can make informed safety assessments.
 - Provide the contractor with a copy of this program and require a copy of the contractor’s electrical safety program and training.

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- Report observed contract-employer-related violations of this standard to their manager and/or director.
3. Support the general regulatory compliance programs, and assure that Facility/Departmental Policies are followed.
 4. Provide resources and personnel necessary to develop, maintain, and annually verify and update this program as a whole, including a database system to maintain written procedures.
 5. Provide resources and personnel to assure all of their employees have received necessary training and instruction regarding their assigned roles and responsibilities to comply with this program.

B. SUPERVISOR

1. Determine the applicability of the electrical safety program to activities conducted within their respective areas of jurisdiction
2. Designate individuals responsible for the implementation of the electrical safety program within their areas.
3. Actively support this program as part of the University of Rochester overall safety effort.
4. Oversee the Limited Long Term Energized Electrical Work Permit process.
5. Identify tasks that require Live/Energized Work Permits and submit permit requests.
6. Issue Limited Long Term Energized Work Permit based on operational needs and route to the area manager and then the Electrical Safety Committee for review and approval.
7. Maintain records of all electrical work permits
8. Determine if a person and/or contractor is qualified to perform electrical work.
9. Ensure employees comply with all provisions of the electrical safety program.
10. Conduct periodic site inspections and document observations.
11. Ensure employees receive training appropriate to their assigned electrical tasks and maintain documentation of such training.
12. Develop and maintain a listing of all qualified employees under their supervision,
13. Ensure employees are provided with and use appropriate protective equipment.
14. Conduct annual assessments/audits of each employee under their responsibility in the program.
15. Perform job hazard assessments, develop work plans and conduct safety meetings.
16. Report unsafe conditions and seek mitigation assistance.
17. Attend all required training.

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C. CONTRACT EMPLOYER

1. Must follow the electrical safety program
2. Provide a copy of their company's electrical safety program
3. Communicate all potential hazards to the hiring and/or project manager
4. Ensure employees follow safe work practices.
5. Alert host employer of unique or unanticipated hazards presented by contractor's work.
6. Inform host employer of any hazards encountered that host employer did not mention.
7. Correct reported violations.
8. Provide documentation on qualifications of contract staff who will be working on electrical equipment.

D. ENVIRONMENTAL HEALTH & SAFETY OCCUPATIONAL SAFETY UNIT

1. Provide program update awareness.
2. Assist with training annually.
3. Periodically review and update this written program.
4. Provide general training for work units on the content of this program and work with training contractor to include the University specific program.
5. Assist university facility work units in implementing the provisions of this program.
6. Conduct a program audit at least every three years.

E. OPERATIONS and AREA MANAGERS

1. Determine the applicability of the electrical safety program to activities conducted within their respective areas of jurisdiction.
2. Designate individuals responsible for the implementation of the electrical safety program within their areas.
3. Actively support this program as part of the University of Rochester overall safety effort.
4. Oversee the Limited Long Term Energized Electrical Work Permit process.
5. Maintain records of all electrical work permits.

F. TRADES SUPERVISORS

1. Determine if a person and or contractor is qualified to perform electrical work.
2. Attend all required training.
3. Ensure employees comply with all provisions of the electrical safety program.
4. Conduct periodic site inspections and document observations.
5. Ensure employees receive training appropriate to their assigned electrical tasks and maintain documentation of such training
6. Develop and maintain a listing of all qualified employees under their supervision.

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7. Ensure employees are provided with and use appropriate protective equipment.
8. Identify tasks that require Live/Energized Work Permits and submit permit requests.
9. Issue Limited Long Term Energized Electrical Work Permit based on operational needs and route to the area manager and then the Electrical Safety Committee for review and approval.
10. Conduct annual assessments/audits of each employee under their responsibility in the program.
11. Perform job hazard assessments, develop work plans and conduct safety meetings.
12. Report unsafe conditions and seek mitigation assistance.

G. EMPLOYEES

1. Consistently demonstrate safe workman like practices.
2. Maintain a safe work environment for yourself and others.
3. Adhere to the guidelines and work practices as described in OSHA, NFPA 70e and this written program.
4. Attend all training required relative to this program.
5. Immediately report any concerns related to electrical safety to supervision.

H. ELECTRICAL SAFETY COMMITTEE CHAIRPERSON

1. The responsibility for designating the Electrical Safety Committee Chairperson resides jointly with the EH&S Chief Safety Officer and the Sr. Associate Vice President of Facilities.
2. Shall be a Director level employee.
3. Shall be responsible for organizing the team, scheduling the semiannual program review meetings, taking meeting minutes and assigning tasks to perform updates to the program.
4. Shall be responsible for ensuring that the program review and updates are completed by the Electrical Safety Committee and EH&S.

I. ELECTRICAL SAFETY COMMITTEE

1. Shall be comprised of members from River Campus, Medical Center, Utilities & Energy Management and Environmental Health & Safety.
2. Meet semiannually to review program, its implementation, new and existing issues.
3. Review all Live Energized Electrical Work Permits submitted for approval.
4. Promote consistency in how electrical tasks are completed within the various work units at the University.
5. Ensure that this electrical safety program is audited on a frequency as determined appropriate by the committee. Where discrepancies are found, the committee shall agree on appropriate revisions and corrections.

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6. Establish and follow through on all initiatives, including, but not limited to training.
7. Investigate and debrief any electrical safety injury/incident or near miss to identify root cause and any improvement opportunities.

V. PROCEDURES

A. TRAINING

1. Employees must perform all electrical work within the guidelines for their training at all times.
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 receive technical training upon initial assignment and at least every three years thereafter. Program refresher training shall be conducted annually. They shall be trained and knowledgeable in all of the following topics:
 - a. Construction and operation of equipment on which work is assigned.
 - b. Emergency Procedures. Employees exposed to shock hazards shall be trained in methods of release of victims from contact with exposed energized electrical conductors or circuit parts. Employees shall be trained and certified in First aid, AED CPR, in accordance with the American Heart Association recommended frequency.
 - c. Proper use of insulating tools and test equipment, including selection of an appropriate voltage-detector and demonstration on how to use the device to verify absence of voltage, including interpretation of indications provided by the device. The training shall include device limitations.
 - d. Proper use of PPE, including arc flash, insulation, and shielding materials.
 - e. Ability to distinguish exposed energized conductors and circuits from other parts of equipment, by demonstrating the proper use of a meter.
 - f. Ability to determine nominal voltage of exposed live parts.
 - g. Understanding of the required approach distances, of both arc flash and shock.
4. A person can be considered qualified with respect to certain equipment and methods but still be considered unqualified for others. The supervisor shall maintain appropriate documentation of the employee’s qualifications.
5. Although not qualified in this program, an “unqualified person” shall be trained in the inherent hazards of electricity and any related work practices that are necessary for their safety. Affected personnel shall receive annual awareness training. Awareness training does not qualify these people to do any electrical work of any type.
6. Occupational Safety will assist the work unit supervisor in coordinating

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training for qualified and unqualified persons. Training for employees, whether experienced or new to the job, must be provided before duties are assigned that involve work near or on electrical systems.

7. Each employee shall receive additional training (or retraining) under any of the following conditions:
 - a. If supervision or annual inspections indicate that the employee is not complying with the proper safety related work practices.
 - b. If new technology, equipment, or changes in procedure necessitate changes in safety-related work practices.
 - c. If work practices not normally used during regular job duties must be employed.
 - d. For tasks that are performed less often than once a year.
8. Each University work unit shall maintain a record of all electrical training provided to their employees along with a listing of all employees classified as qualified persons.

B. WORKING ON OR NEAR LIVE PARTS

1. Live/Energized Electrical Work Permit
 - a. When live parts are not placed and verified to be in an electrically safe condition, work to be performed on them shall be considered energized electrical work and will be performed by written permit only, unless the work is authorized by that person's *Limited Long Term Energized Electrical Work Permit*
 - b. 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.
 - c. The permit is to be originated by the supervisor requesting that the energized work be completed. The requestor is responsible for completing Section I of the permit.
 - d. The qualified persons completing the task are responsible for completing Section II of the permit.
 - e. All Energized Work Permits should be initiated by the Trades Supervisor, who then reviews it with the operations/area manager followed by a cross departmental review. The supervisor then reviews the permit with the individual(s) doing the work before work commences.
 - f. In the event of an emergency condition requiring an Energized Work Permit, and the review requirements above cannot be met, the on-call supervisor and the on-call manager will then notify the director and with approval initiate the permit, review the work plan, and discuss it with another member of the Electrical Safety Committee, who will provide verbal authority to conduct the work and sign off on the

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permit the next business day. The manager and supervisor will sign the permit as will the individual(s) performing the work.

- g. The permit must be posted in the area where the energized work is taking place for the duration of the task. Copies of all energized electrical work permits must be kept on file in the individual's department.
- h. Work related to testing, troubleshooting, and voltage measuring may be completed without a permit provided appropriate safe work practices and PPE are used. The individual performing such work must have a Limited Long Term Energized Electrical Work Permit on file (see next section).

2. Limited Long Term Energized Electrical Work Permit (see Appendix H)

- a. Allows specified live work to be performed by a qualified individual.
- b. It includes the performance of routine tasks including testing, troubleshooting, voltage measuring and repairs provided appropriate safe work practices and PPE are used, as specified on the individual's long term permit.
- c. Copies of all limited long term energized electrical work permits must be kept on file in the individual's department.
- d. The permit is good for up to one year.

3. Approach Boundaries to Live 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 live parts increases, the potential for an electrical injury decreases.
- b. Before setup, safe approach distances will be determined by the qualified person for all tasks in which approaching personnel are exposed to live parts. See Appendix B, "*Approach Boundaries to Live Parts for Shock Protection*".
- c. Unqualified 3rd party persons are not allowed to cross the restricted approach boundary.
- d. 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 live parts and no un-insulated part of the qualified person's body crosses the Prohibited Approach Boundary.
 - ii. The live parts are insulated from the qualified person and from any other conductive object at a different potential.
- e. 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:

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- i. The qualified person has specific training to work on energized parts.
- ii. The qualified person has obtained an approved Energized Electrical Work Permit.
- iii. The qualified person uses PPE appropriate for working on energized parts that are rated for the voltage and energy level involved.

4. Other Precautions to Ensure Staff Safety

- a. Lockout/Tagout shall be implemented at all times.
- b. Employees shall not reach blindly into areas that might contain exposed live parts. i.e. switch gear, panels etc.
- c. Employees shall not enter spaces containing live parts unless illumination is provided and permits to perform live work have been issued that allow the work to be performed safely.
- d. Conductive articles of PPE, jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses, etc.) shall not be worn whenever and wherever work is performed on electrical equipment or circuits.
- e. 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 live 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.
- f. When an employee works in a confined space or enclosed space (such as a manhole or vault) that contains exposed live 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.
- g. When working in a confined space, the University Confined Space Program shall be adhered to.
- h. Only properly rated and approved tools shall be used. Non-rated tools, including 4 in 1 screwdrivers are prohibited. See Appendix J for approved tool

C. PERSONAL PROTECTIVE EQUIPMENT (PPE)

These items and their reasoning must be reviewed with all participants in the program.

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1. General Requirements

- a. Employees working in areas where electrical hazards are present shall be provided with, and shall use, protective equipment (Arc Flash Gear) that is designed and constructed for the specific body part to be protected and for the work to be performed.
- b. Such equipment shall be a minimum of 12 calorie rated, and 40 calorie rated Arc Flash apparel only, eye protection, head protection, hearing protection, hand protection, insulated footwear, and face shields as necessary.
The University is not responsible for providing under layers, but the employee must wear compatible under layers made of white cotton. See Appendix E.
- c. The employee to whom it is issued shall maintain all protective equipment in a safe, reliable condition. Employees shall store arc flash gear in the special storage bag provided.
- d. Any additional electrical PPE purchased by employees must be approved by the supervisor.
- e. Employees shall wear nonconductive protection for the head, eyes, face, neck, chin, hand and arms whenever there is danger of contact with live parts or from injury from exposure to electric arcs or flashes or from flying objects resulting from an electrical explosion.
- f. Employees shall wear hearing protection whenever performing live work.
- g. Heavy-duty electrically rated boots or dielectric overshoes (per ANSI Z41 and ASTM F2413-05) provide some arc flash protection to the feet and shall be used for all tasks involving energized electric. Insulated soles shall not be used as primary electrical protection.
- h. Face shields with an arc rating will be used for electrical work. Safety glasses with side shields or goggles must always be worn underneath face shields.
 - i. Additional illumination may be needed when using tinted face shields as protection during electrical work.

2. Flash Protection Boundary

- a. Personal protective equipment shall be provided to and used by all qualified employees working within the “Flash Protection Boundary”.
- b. For systems that are above 600 volts, the Flash Protection Boundary shall be determined through engineering analysis. Arc Flash consulting firms will be employed as necessary.
- c. For systems that are 600 volts or less there are three methods for determining the Flash Protection Boundary. The preferred order of which method shall be utilized is:
 - i. Incident Energy Analysis method, as part of the overall arc flash

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- study. The analysis shall be performed by a qualified person. Arc Flash consulting firms may be employed.
- ii. The PPE category method, utilizing the tables in Appendix E.
 - iii. Calculating the boundary using the formula in Appendix C.
- d. The specific protective equipment to be worn within the Flash Protection Boundary shall be determined by using Incident Energy Analysis Method and selecting the PPE with NFPA Table 130.5, shown in Appendix D.
- i. Complete a detailed flash hazard analysis utilizing an engineering consulting firm or under engineering supervision that determines the incident exposure energy of each employee. Appropriate protective clothing will be selected based on the calculated exposure level.
 - ii. It is the Project Manager's responsibility to ensure new buildings and installations have an arc flash study performed and documented. The project manager is also responsible for ensuring all installations are below 40 calories, anything greater than that will need approval from the Senior Associate Vice President of University Facilities and Services.
 - iii. The detailed arc flash hazard analysis shall be reviewed and performed every 5 years, or earlier whenever a major system change occurs.
- e. As an alternative secondary method, for systems that are 600 volts or less, the specific protective equipment to be worn within the Flash Protection Boundary can be determined by using the Arc Flash PPE Category Method using NFPA Tables 130.7(C)(15)(a), 130.7(C)(15)(b), 130.7(C)(15)(c), shown in Appendix E. This method can only be used if the specific task to be performed appears in the tables and the system meets the listed criteria for short circuit current magnitude and fault clearing times.
- i. To utilize Table 130.7(C)(15)(a), fault current at the equipment must be known. To determine the fault current without a system model/engineering analysis, the fault current can be calculated at the transformer secondary lugs and assumed as the fault current for the whole system. This can be calculated using the calculation in Appendix E.
 - ii. The Arc Flash PPE Category table shall be reviewed re-utilized every 5 years, or earlier whenever a major system change occurs.
- f. The University work units shall develop and maintain a listing of the specific PPE requirements for each energized electrical task conducted by their employees using the form found in Appendix F of this

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document.

3. Arc Flash Labels

- a. Arc Flash Labels shall be posted at all major electrical equipment that are likely to require examinations, adjustment, servicing, maintenance or operation while energized.
- b. Arc Flash labels shall be created in accordance with the example labels in Appendix M. Examples are shown for both the Incident Energy Analysis and PPE Category Methods.

4. Flame-Resistant (FR) Apparel & Under layers

- a. FR apparel shall always be a minimum of 12 calorie rated. And rated for 40 calories when required for arc flash levels.
- b. FR apparel (See Appendix E of this document) shall be visually inspected before each use. FR 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.
- c. The garment manufacturer's instructions for care and maintenance of FR apparel shall be followed.
- d. When FR apparel is worn to protect an employee, it shall cover all ignitable clothing and allow for movement and visibility.
- e. FR apparel must cover potentially exposed areas as completely as possible. FR shirtsleeves must be fastened and FR shirts/jackets must be closed at the neck.
- f. Non-melting, flammable garments (i.e. cotton, wool, rayon, silk, or blends of these materials) should be used as under layers beneath FR apparel.
- g. Fibers such as acetate, nylon, polyester, polypropylene, and spandex shall not be permitted in fabric under layers next to the skin.
- h. Garments containing metal or other conductive materials shall not be worn.
- i. FR garments worn as outer layers over FR apparel (i.e. jackets or rainwear) must also be made from FR material.

5. 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. Where the insulating capability of protective equipment is subject to damage during use, an outer covering of leather or other appropriate material shall protect the insulating material.
- d. Rubber insulating equipment must be tested according to the schedule contained in Appendix G.

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- e. 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.
- f. No repairs to rubber insulating equipment shall be attempted.
- 6. **Electrically insulated tools and materials (provided by the University)**
 - 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. Fuse or fuse holder handling equipment, insulated for the circuit voltage, shall be used to remove or install a fuse.
 - e. Ropes and hand lines used near exposed energized parts shall be nonconductive.
 - f. Portable ladders shall be nonconductive.
- 7. **Test and Inspection Protocol for PPE Equipment**
 - a. All PPE clothing and equipment must be visually inspected by the user before each use and taken out of service if any defects are noted.
 - b. A physical inspection and air test must be performed on rubber insulating gloves before each use. Each person in the program must be trained in this by their supervisor.
 - c. 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.
 - d. Equipment, tools, and clothing will be subjected to annual inspection. These inspections shall be documented on the *Test and Inspection Protocol* standard form used at the University. See Appendix K.

D. ALERTING TECHNIQUES

- 1. Barricades shall be used in conjunction with safety signs to prevent or limit access to work areas containing live parts. If a barricade must be used within the limited approach boundary it must be non-conductive. Barricades shall be placed no closer than the Limited Approach Boundary.
- 2. If signs and barricades do not provide sufficient protection, attendants will be assigned to warn and protect pedestrians. The primary duty of the attendant shall be to keep nonessential people 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. The attendant shall remain outside of the Limited Approach Boundary.

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E. CONTRACT EMPLOYEES

1. Contractor safety programs must at a minimum meet the requirements of the University Electrical Safety program.
2. Contractors will be required to comply with all applicable University, Federal, State and local environmental, safety and health regulations.
3. Contractors are required to meet the training requirements of NFPA 70E prior to beginning work at the University of Rochester and provide documentation to show compliance.
4. Contractors are required to submit copies of their Safety Program to PPM upon request.

VI. REFERENCES

1. NFPA 70E, “Standard for Electrical Safety in the Workplace”, 2018 edition
2. OSHA, 29 CFR 1910.331 through 1910.335, “Electrical Safety-Related Work Practices”
3. OSHA, 29 CFR 1910.147, “The Control of Hazardous Energy”
4. OSHA, 29 CFR 1910.132, “Personal Protective Equipment”
5. OS002 Control of Hazardous Energy (Lockout/Tagout)
6. IH009 Confined Space Program
7. Personal Protective Equipment Program

VII. APPENDICES/FORMS

- Appendix A: Energized Electrical Work Permit – All Non Routine Tasks
- Appendix B: Approach Boundaries to Live Parts for Shock Protection:
NFPA 70E Tables 130.4 (D)(a), 130.4(D)(b)
- Appendix C: Incident Energy and Arc Flash Boundary Calculations
NFPA 70E Informative Annex D
- Appendix D: Incident Energy Analysis Method PPE Selection:
NFPA 70E Table 130.5 (G)
- Appendix E: Arc Flash PPE Category Method & PPE Selection:
NFPA Tables 130.7(C)(15)(a), 130.7(C)(15)(b), 130.7(C)(15)(c)
- Appendix F: PPE Requirements for Energized Tasks
- Appendix G: Inspection Schedule for Rubber Insulating Equipment
- Appendix H: Limited Long Term Energized Electrical Work Permit –
Routine Tasks
- Appendix I: Flame Resistant Clothing Care and Maintenance
- Appendix J: Arc Flash PPE and Insulated Tools
- Appendix K: Test and Inspection Protocol for PPE Equipment
- Appendix L: Resources
- Appendix M: Arc Flash and Shock Risk Assessment Labels

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VIII. REVISION HISTORY

Date	Revision No.	Description
2/06/2008	New	New Policy
1/25/2012	1	Policy revised and updated
6/1/2012	2	Appendix H changed, Appendix M updated
8/14/2013	3	Policy reviewed and revised
8/26/2019	4	Policy updated to reflect new 70e standard
11/8/2019	5	Edit references and appendices to match
6/15/2020	6	PPE Cat method details added
8/24/2020	7	Responsibilities expanded