



Electrical Safe Work Practices

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Administering Division/Department: Facilities Management

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Policy Sections:

- I. Purpose
- II. Working On Or Near Energized Parts
- III. Portable Electrical Equipment
- IV. Electric Power & Lighting Circuits
- V. Personal And General Protective Equipment
- VI. Use Of Ground Fault Circuit Interrupters (GFCI)
- VII. Dielectric Testing Schedules For Electrical Safety Equipment
- VIII. Medical Services and First Aid – 1910.269(B)(1) OSHA
- IX. Safety Steps For Electrical Workers
- X. Effect on Performance Evaluations
- XI. Disciplinary Action
- XII. Revision History
- XIII. Glossary

I. Purpose

To promote a safe work environment when working on or near energized parts and equipment.

II. Working On or Near Energized Parts

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

1. Work on Energized Equipment
 - Only qualified persons may work on electric circuit parts or equipment that has not been de-energized. Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials and insulated tools.
2. Overhead Lines
 - If work is to be performed near outdoor overhead lines, the lines shall be de-energized and grounded or other protective measures shall be provided before work is started. If the lines are to be de-energized, arrangements shall be made with the person or organization that operates or controls the electric circuits involved to de-energize and ground them. If protective measures are provided such as guarding, isolating, or insulating, these precautions shall help prevent employees from being harmed contacting such lines directly or indirectly through conductive materials, tools or equipment.

3. Unqualified Persons

- When an unqualified person is working in an elevated position near overhead lines or on the ground in the vicinity of overhead lines, the location shall be such that the person and the longest conductive object he or she may be using shall not come closer to any unguarded, energized overhead line than the following distances:
 - a) For voltages to ground 50kV or below: 10 feet (305 cm)
 - b) For voltages to ground over 50kV: 10 feet (305 cm) plus 4 inches (10 cm) for every 10kV over 50kV.

4. Qualified Persons

- When a qualified person is working in the vicinity of outdoor overhead lines, whether in an elevated position or on the ground, he/she may not approach or take any conductive object without an approved insulating handle closer to exposed energized parts as shown in Table 1 unless:
 - a) The person is insulated from the energized part (i.e., using gloves with sleeves, rated for the voltage involved).
 - b) The energized part is insulated from all other conductive objects.
 - c) The person is insulated from all conductive objects at a potential different from that of the energized part.

TABLE 1: APPROACH DISTANCES FOR QUALIFIED EMPLOYEES (ALTERNATING CURRENT)

VOLTAGE RANGE (PHASE TO PHASE)	MINIMUM APPROACH DISTANCE
0 to 300V and less	Avoid contact
300V to 750V	1 ft. 0 in. (30.5 cm)
750V to 2kV	1 ft. 6 in. (46 cm)
2kV to 15kV	2 ft. 0 in. (61 cm)
15kV to 37kV	3 ft. 0 in. (91 cm)
37kV to 87.5kV	3 ft. 6 in. (107cm)
87.5V to 121kV	4 ft. 0 in. (122cm)
121kV to 140kV	4 ft. 6 in. (137cm)

5. Vehicular and Mechanical Equipment

- Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of at least 10ft. (305 cm) is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10kV over 50kV. However, under any of the following conditions, the clearance may be reduced:
 - a) If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. (122 cm). If the voltage is higher than 60kV, the clearance shall be increased 4 in (10cm) for every 10kV over 50kV.
 - b) If insulation barriers rated for the voltage of the line being guarded are installed to prevent contact with the lines, and if these barriers are not part of or an attachment to the vehicle or its raised structure the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.
 - c) If the equipment is an aerial lift insulated for the voltage involved, and if a qualified person performs the work, the clearance (between the uninsulated portion of the aerial lift and the power line) may be reduced to the distance given in the Table 1.
- Employees standing on the ground shall not come in contact with the vehicle, mechanical equipment, or any of its attachments unless:
 - a) The employee is using protective equipment rated for the voltage.

b) The equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to the employees on the ground) comes closer to the line than a clearance of at least 10 ft. (305 cm). The clearance shall be increased 4 in. (10 cm) for every 10kV over 50kV.

- If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding shall not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions (i.e. barricades or insulation), shall be taken to protect employees from hazardous ground potentials, taking into account earth resistance and fault currents which can develop within the first few feet or more outward from the grounding point.

6. Illumination

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

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

7. Confined or Enclosed Work Spaces

- When an employee works in a confined or enclosed space such as a manhole or vault that contains exposed energized parts, the employer shall provide and the employee shall use, protective shields, protective barriers, and/or insulation materials as necessary to avoid inadvertent contact with these parts. Doors, hinged panels, and the like shall be secured to prevent their swinging into an employee causing the employees to contact exposed energized parts.

8. Conductive Materials & Equipment

- Conductive materials and equipment that are in contact with any part of an employee's body shall be handled in a manner that will prevent them from contacting exposed energized conductors or circuit parts. If an employee must handle long dimensional conductive objects (i.e. ducts and pipes) in areas with exposed live parts, the employer shall institute work practices such as the use of insulation, guarding, and material handling techniques, which will minimize the hazard.

9. Portable Ladders

- Portable ladders shall have nonconductive side rails if they are used where the employee or the ladder could contact exposed energized parts.

10. Conductive Apparel

- Conductive articles of jewelry and clothing (i.e. watch bands, bracelets, rings, key chains, necklaces, metallic aprons, cloth with conductive thread, or metal headgear) may not be worn if they might contact exposed energized parts. However, such articles may be worn if they are rendered non-conductive by covering, wrapping, or by other insulating means.

11. Housekeeping Duties

- Where live parts present an electrical contact hazard, employees shall not perform housekeeping duties at such close distances to the parts that there is possibility of contact, unless adequate safeguards (such as insulating equipment or barriers) are used. Electrically conductive cleaning materials (including conductive solids such as steel wool, metalized cloths, silicon carbide, and conductive liquid solutions) may not be used in proximity to energized parts unless procedures are followed which will prevent electrical contact.

III. Portable Electric Equipment

This paragraph applies to the use of cord and plug-connected equipment including flexible cord sets (extension cords).

1. Handling

- Portable equipment shall be handled in a manner which will not cause damage. Flexible electric cords connected to equipment shall not be used for raising or lowering equipment. Flexible cords shall not be fastened with staples or otherwise hung in such a fashion as could damage the outer jacket or insulation.

2. Visual Inspection

- Portable cord and plug-connected equipment and flexible cord sets (extension cords) shall be visually inspected before use on any shift for external defects (such as loose parts, deformed and missing pins, or damage to outer jacket or insulation) and for evidence of possible internal damage (such as pinched or crushed outer jacket). Cord and plug-connected equipment and flexible cord sets (extension cords) which remain connected once they are put in place and are not exposed to damage need not be visually inspected until they are relocated.

If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item shall be removed from service, and no employee may use it until necessary repairs and tests to render the equipment safe have been made.

When an attachment plug is to be connected to a receptacle (including any on a cord set) the relationship of the plug and receptacle contacts shall first be checked to ensure that they are of proper mating configurations.

3. Grounding-type Equipment

- A flexible cord used with grounding-type equipment shall contain an equipment-grounding conductor.

Attachment plugs and receptacles may not be connected or altered in a manner that would prevent proper continuity of the equipment-grounding conductor at the point where plugs are attached to receptacles. Additionally, these devices may not be altered to allow the grounding pole of a plug to be inserted into slots intended for connection to the current carrying conductors.

Adapters which interrupt the continuity of the equipment grounding connection may not be used.

4. Conductive Work Locations

- Portable electric equipment and flexible cords used in highly conductive work locations or in job locations where employees are likely to contact water or conductive liquids shall be approved for use in those locations.

5. Connecting Attachment Plugs

- Employees' hands must be dry when plugging and unplugging flexible cords and plug-connected equipment, if energized equipment is involved.

Energized plug and receptacle connections may be handled only with insulating protective equipment if the condition of the connection could provide a conducting path to the employee's hand (if, for example, a cord-connector is wet). Locking type connectors shall be properly secured after connection.

IV. Electric Power & Lighting Circuits

1. Routine Opening & Closing of Circuits

- Load-rated switches, circuit breakers, or other devices specifically designed as disconnecting means shall be used for the opening, reversing, or closing of circuits under load conditions. Cable connectors not of the load-break type, fuses, terminal lugs, and cable splice connections may not be used for such purposes, except in an emergency.

2. Reclosing Circuits After Protective Device Operation

- After a circuit is de-energized by a circuit protective device, the circuit may not be manually re-energized until it has been determined that the equipment and circuit can safely be energized. The repetitive manual reclosing of circuit breakers or re-energizing circuits through replaced fuses is prohibited.

When it can be determined from the design of the circuit and the overcurrent devices involved that the automatic operation of a device was caused by an overload rather than a fault condition, no examination of the circuit or connected equipment is needed before the circuit is re-energized.

3. Overcurrent Protection Modification

- Overcurrent protection of circuits and conductors may not be modified, even on a temporary basis beyond that allowed by the installation safety requirements for overcurrent protection.

4. Test Instruments and Equipment

- Only qualified persons may perform testing working on electric circuits or equipment.

5. Visual Inspection

- Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall be visually inspected for external defects and damage before the equipment is used. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item shall be removed from service, and no employee may use it until necessary repairs and test to render the equipment safe have been performed.

6. Rating of Equipment

- Test instruments, equipment and their accessories shall be rated for the circuits and equipment to which they will be connected and shall be designed for the environment in which they will be used.

7. Occasional Use of Flammable or Ignitable Materials

- Where flammable materials are present, electric equipment capable of igniting them shall not be used unless measures are taken to [prevent hazardous conditions from developing. Such materials included but are not limited to: flammable gases, vapors or liquids, combustible dust, and ignitable fibers and flyings.

V. Personal and General Protective Equipment

Please also refer to [Appendix A: Personal Protective Equipment \(PPE\) Compliance Chart](#) at end of this policy

1. Employees working in areas where there are potential electrical hazards shall be provided with, and shall use, appropriate electrical protective equipment for the work to be performed.
2. Protective equipment shall be maintained in a safe, reliable condition and shall be periodically inspected and/or tested. All equipment will be approved by the American National Standards Institute (ANSI).
3. If the insulating capability of protective equipment may be subject to damage during use, the insulating material shall be protected. (e.g., an outer covering of leather is sometimes used for the protection of rubber insulating material.)
4. Employees shall wear non-conductive head protection whenever there is danger of head injury for electric shock or burns due to contact with exposed energized parts.
5. Employees shall wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion.
6. When working near exposed energized conductors or circuit parts, each employee shall use insulated tools or handling equipment if the tools or handling equipment might make contact with such conductors or parts. If the insulating capability of insulated tools or handling equipment is subject to damage, the insulating material shall be protected.
7. Fuse handling equipment, insulated for the circuit voltage, shall be used to remove or install fuses when the fuse terminals are energized.
8. Ropes and handlines used near exposed energized parts shall be non-conductive.
9. Protective shields, protective barriers, or insulating materials shall be used to protect each employee from shock, burns, or other electrically-related injuries while that employee is working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur. When normally enclosed live parts are exposed for maintenance repair, they shall be guarded to protect unqualified persons from contact with the live parts.
10. The following alerting techniques shall be used to warn and protect employees and others from hazards which could cause injury due to electric shock, burns, or failure of electric equipment parts:
 - Safety Signs and Tags. Safety signs, safety symbols or accident prevention tags shall be used where necessary to warn employees about electrical hazards.
 - Barricades. Barricades shall be used in conjunction with safety signs where it is necessary to prevent or limit access to work areas. Conductive barricades may not be used where they might cause an electrical contact hazard.
 - Attendants. If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect others.

VI. Use of Ground Fault Circuit Interrupters (GFCI)

The GFCI is a fast-acting circuit breaker which senses small imbalances in the circuit caused by leakage to ground and, in a fraction of a second (1/40), shuts off the electricity. The GFCI continually matches the amount of current going to an electrical device against the amount of current returning from the device along an electrical path. Whenever the amount “going” differs from the amount “returning” by approximately 5 milliamps, the GFCI cuts the electric power in less than a second.

Flexible extension cords are used extensively by Facilities Management (FM) on the Emory Campus at construction sites and in other outdoor work activities where electrical power is required. Because flexible cords are subject to more damage than fixed wiring, OSHA requires the use of GFCI at all 120 volt, single phase 15 and 20 ampere outlets at work sites which are not part of the permanent wiring of a building. Receptacles on the ends of extension cords are not part of the permanent wiring therefore, must be protected by GFCI whether or not the extension cord is plugged into permanent wiring inside a building.

In addition to using GFCI as protection against electrical accidents, the following steps must also be taken:

1. Inspect all extension cords prior to use to insure there are no breaks in the cord, and the receptacles and plugs are in good condition.
2. Have all electrical tools maintained and inspected according to manufacturer’s instructions. A Zone Electrician or Department Supervisor can assist in this area.
3. Use only extension cords that are listed by a recognized testing laboratory such as Underwriters Laboratories (UL).
4. Do not use extension cords with grounding prongs missing or cut off. The three-prong grounding plug must be used on all extension cords.
5. Extension cords for outdoor use must be listed and marked by the manufacturer for such use.
6. Never run an extension cord through standing water or extremely wet areas.
7. Avoid rigging extension cords with splices and tape. Check with a Zone Electrician or Department Supervisor for assistance.

It is important to remember that a GFCI does not prevent shock, it merely limits the duration so that the heart is not affected. A shock that lasts 1/40 of a second (0.025 seconds) can be intense enough to knock a person off a ladder or drop a tool. It is important to take all of the above precautions when using electricity, and to contact the Department Supervisor if there are questions or concerns regarding equipment or a work situation.

VII. Dielectric Testing Schedules for Electrical Safety Equipment

In addition to the care and maintenance of electrical safety equipment, the following test schedule will be adhered to:

1. Rubber gloves, sleeves, rubber blankets and hot sticks shall be tested every six months by a certified testing laboratory. This laboratory shall follow the OSHA approved ANSI testing procedures and schedules.

2. The bucket truck will be tested in accordance with ANSI Specification A92.2-1900 by a certified testing laboratory. The frequency of this test will be in accordance with the manufacturer's recommendations for the bucket truck (mobile unit) in use. In the event there is any question regarding the testing schedule, the testing laboratory will be contacted for assistance.
3. Electrical safety equipment that is damaged or modified must be tested by the testing laboratory prior to use.
4. All electrical safety equipment will receive daily visual inspection prior to use

VIII. Medical Services and First Aid – 1910.269(b)(1)OSHA

1. Cardiopulmonary Resuscitation (CPR)
 - When employees are performing work on or associated with exposed lines or equipment energized at 50 volts or more, persons trained in CPR shall be available.
 - For field work involving two or more employees, at least two CPR certified persons shall be available.
 - For fixed work locations there should be enough trained persons to ensure CPR can be started within a four (4) minute period.
2. First Aid
 - Inform immediate supervisor
 - Proceed to Employee Health for evaluation (1364 Clifton Road, NE (EUH: H-Wing, subbasement, Room HB53)

IX. Safety Steps for Electrical Workers:

1. Think and be aware of surroundings and actions.
2. Understand procedures and proceed with care.
3. Follow procedures and ensure safety.
4. Use appropriate safety equipment and clothing.
5. Ask questions for clarification.
6. Assist others by answering their questions.

X. Effect on Performance Evaluations

Compliance to the safety standards stated in this policy will be considered when rating an employee's overall job performance.

XI. Disciplinary Action

Failure to comply with these procedures may result in disciplinary action up to and including termination of employment.

XII. Revision History

September 13, 1990

September 1, 2005

XIII. Glossary

Qualified Person:

An Individual that:

- a. Has knowledge related to the construction and operation of electrical equipment/devices
- b. Has been trained to recognize the hazards associated with the energized electrical work
- c. Has been trained in electrical safety-related work practices
- d. Has been trained in the methods to establish safe working conditions
- e. Has been trained to recognize and determine the degree and extent of the electrical hazard along with the requirements for entrance inside the shock / arc-flash boundaries and the precautionary measures to prevent entrance from unqualified persons.
- f. Has been trained in the proper selection and use of protective clothing
- g. Has been trained in the proper selection and use of personal protective equipment (PPE)
- h. Has been trained and demonstrated the skills required to perform the specific work task being contemplated. An individual may be qualified to work on certain equipment / devices, but unqualified to work on other equipment / devices. An individual may be qualified to perform certain duties if the employee undergoing on-the-job training demonstrates an ability to perform duties safely at his/her level of training.

Unqualified Person:

An individual that has had no training to recognize the hazards associated with electrical equipment/ devices or has not the demonstrated skills required to perform work on certain equipment/devices. Unqualified persons shall not be permitted to enter inside the limited or arc-flash boundary.

PERSONAL PROTECTIVE EQUIPMENT (PPE) COMPLIANCE CHART

ADAPTED FROM THE NFPA 70E COMPLIANCE GUIDE

This guide shall only be used in conjunction with performing the necessary calculations contained in a flash hazard analysis to determine the proper cal/cm². If the results of the calculations exceed the cal/cm² that correspond to the HRC found on this guide, you must use clothing that complies with the calculation.

Panelboards Rated 240 V and Below - Notes 1 and 3			
TASK (equipment is energized & work is done within the flash protection boundary)	V-Rated Gloves	V-Rated Tools	HRC
Circuit Breaker (CB) or fused switch operation with covers on			0
CB or fused switch operation with covers off			0
Opening hinged covers (to expose bare, energized parts)			0
Removal of bolted covers (to expose bare, energized parts)			1
Remove or install CB's or fused switches	Y	Y	1
Work on energized parts, including voltage testing	Y	Y	1
Panelboards / Switchboards Rated 240 V to 600 V (with molded case or insulated case CB's) - Notes 1 & 3			
TASK (equipment is energized & work is done within the flash protection boundary)	V-Rated Gloves	V-Rated Tools	HRC
CB or fused switch operation with covers on			0
CB or fused switch operation with covers off			1
Work on energized parts, including voltage testing	Y	Y	2*

600 V Class Switchgear (with power circuit breakers or fused switches) - Notes 5 and 6			
TASK (equipment is energized & work is done within the flash protection boundary)	V-Rated Gloves	V-Rated Tools	HRC
CB or fused switch operation with enclosure doors closed			0
Reading a panel meter while operating a meter switch			0
Work on control circuits with energized parts 120 V or below, exposed	Y	Y	0
CB or fused switch operation with enclosure doors open			1
Insertion or removal (racking) of CB's from cubicles, doors closed			2
Opening hinged covers (to expose bare, energized parts)			2
Application of safety grounds, after voltage test	Y		2*
Work on energized parts, including voltage testing	Y	Y	2*
Work on control circuits with energized parts >120 V exposed	Y	Y	2*
Insertion or removal (racking) of CB's from cubicles, doors open			3
Removal of bolted covers (to expose bare, energized parts)			3

NEMA E2 (fused contactor) Motor Starters, 2.3 kV through 7.2 kV			
TASK (equipment is energized & work is done within the flash protection boundary)	V-Rated Gloves	V-Rated Tools	HRC
Contractor operation with enclosure doors closed			0
Reading a panel meter while operating a meter switch			0
Work on control circuits with energized parts 120 V or below, exposed	Y	Y	0
Insertion or removal (racking) of starters from cubicles, doors closed			2
Contractor operation with enclosure doors open			2*
Insertion or removal (racking) of starters from cubicles, doors open			3
Opening hinged covers (to expose bare, energized parts)	Y		3
Application of safety grounds, after voltage test	Y	Y	3
Work on control circuits with energized parts > 120 V exposed	Y	Y	3
Work on energized parts, including voltage testing	Y	Y	3
Removal of bolted covers (to expose bare, energized parts)			4

600 V Class Motor Control Centers (MCC's) - Notes 2 (except as indicated) and 3			
TASK (equipment is energized & work is done within the flash protection boundary)	V-Rated Gloves	V-Rated Tools	HRC
CB or fused switch or starter operation with enclosure doors closed			0
Reading a panel meter while operating a meter switch			0
Work on control circuits with energized parts 120 V or below, exposed	Y	Y	0
CB or fused switch or starter operation with enclosure doors open			1
Opening hinged covers (to expose bare, energized parts)			1
Removal of bolted covers (to expose bare, energized parts)			2*
Application of safety grounds, after voltage testing	Y		2*
Work on energized parts, including voltage testing	Y		2*
Work on control circuits with energized parts > 120 V exposed	Y	Y	2*
Insertion or removal of individual starter "buckets" from MCC - Note 4	Y	Y	3

Other 600 V Class (277 V to 600 V, nominal) Equipment - Lighting or small power transformers (600V Max) - Note 3			
TASK (equipment is energized & work is done within the flash protection boundary)	V-Rated Gloves	V-Rated Tools	HRC
Opening hinged covers (to expose bare, energized parts)			1
Removal of bolted covers (to expose bare, energized parts)			2*
Application of safety grounds, after voltage test	Y		2*
Work on energized parts, including voltage testing	Y	Y	2*
Other 600 V Class (277 V to 600 V, nominal) Equipment - Revenue meters (kWh at primary voltage & current) - Note 3			
TASK (equipment is energized & work is done within the flash protection boundary)	V-Rated Gloves	V-Rated Tools	HRC
Cable through or tray cover removal or installation			1
Miscellaneous equipment cover removal or installation			1
Application of safety grounds, after voltage test	Y		2*
Insertion or removal	Y		2*
Work on energized parts, including voltage testing	Y	Y	2*

Metal Clad Switchgear, 1 kV and Above			
TASK (equipment is energized & work is done within the flash protection boundary)	V-Rated Gloves	V-Rated Tools	HRC
Reading a panel meter while operating a meter switch			0
CB or fused switch operation with enclosure doors closed			2
Work on control circuits with energized parts 120 V or below, exposed	Y	Y	2
Opening hinged covers (to expose bare, energized parts)			3
CB or fused switch operation with enclosure doors open			4
Insertion or removal (racking) of CB's from cubicles, doors open			4
Removal of bolted covers (to expose bare, energized parts)			4
Opening voltage transformer or control power transformer compartments			4
Application of safety grounds, after voltage test	Y		4
Work on energized parts, including voltage testing	Y	Y	4
Work on control circuits with energized parts >120 V exposed	Y	Y	4

Minimum Clothing Requirements			
HRC	PROTECTIVE CLOTHING	Minimum Cal/cm ²	PPE (SAFETY GLASSES, LEATHER SAFETY SHOES ALWAYS REQUIRED)
-1	Natural fiber short-sleeved shirt and long pants	N/A	
0	Natural fiber long-sleeved shirt and pants	N/A	
1	Denim jeans and FR long sleeved shirt OR FR coveralls	4	Hard Hat, Arc-Rated Face Shield
2	FR long-sleeved shirt and pants OR FR coveralls	8	Hard Hat, Arc-Rated Face Shield
2*	FR long-sleeved shirt and pants OR FR coveralls	8	Hard Hat, Hearing Protection, Arc-Rated Face Shield and 8 cal/cm ² + Stocking Hood* OR Multi-Layer Switching Hood
3	Multi-Layer flash suit over FR long-sleeved shirt and pants over natural fiber short sleeved T-shirt and pants OR Multi-Layer suit over FR coveralls over natural fiber short-sleeved T-shirt and pants	25	Hard Hat, Multi-Layer Switching Hood, Hearing Protection, OR Arc-rated Goggle and Stocking Hood*
4	Multi-Layer flash suit over FR long-sleeved shirt and pants over natural fiber short sleeved T-shirt and pants OR Multi-Layer suit over FR coveralls over natural fiber short-sleeved T-shirt and pants	40	Hard Hat, Multi-Layer Switching Hood, Hearing Protection, OR Arc-rated Goggle and Stocking Hood*

Note 7 ASTM Recommendations are noted with the *

*If the notes cannot be satisfied, work must be performed de-energized.

- Note 1 Maximum of 25 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
 - Note 2 Maximum of 65 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
 - Note 3 For < 10 kA short circuit current available, the HRC required may be reduced by one category.
 - Note 4 Maximum of 42 kA short circuit current available, 0.33 second (20 cycle) fault clearing time.
 - Note 5 Maximum of 35 kA short circuit current available, ≤ 0.5 second (30 cycle) fault clearing time.
 - Note 6 For < 25 kA short circuit current available, the HRC required may be reduced by one category.
- *Circuits over 40cal/cm² should only be worked de-energized.

Other Equipment 1 kV and Above - Metal clad load interrupter switches, fused or unfused			
TASK (equipment is energized & work is done within the flash protection boundary)	V-Rated Gloves	V-Rated Tools	HRC
Switch operation, doors closed			2
Outdoor disconnected switch operation (gang-operated, from grade)			2
Insulated cable exam, in open area	Y		2
Opening hinged covers (to expose bare, energized parts)			3
Outdoor disconnect switch operation (hookstick operated)	Y	Y	3
Removal of bolted covers (to expose bare, energized parts)			4
Insulated cable examination, in manhole or other confined space	Y		4
Work on energized parts, including voltage testing	Y	Y	4

Definitions: Y=Yes (Required)

V-Rated Gloves: gloves rated and tested for the maximum line to line voltage upon which work will be done. Leather protectors must be worn externally if v-rated rubber gloves could be damaged.

V-Rated Tools: tools rated and tested for the maximum line-to-line voltage upon which work will be done.

HRC: Hazard Risk Category

FR: Flame Resistant

Appendix A Page 2

Hazard Risk Category (HRC) Levels by Job Title*

FM Operations & Maintenance (O&M) Zone Shops & Preventative Maintenance (PM) Shop	
HRC	Job Titles
0	Tradesworker; Tradesworker Sr; Building Mech; Building Mech Sr; Electrician; Electrician Sr; Plumber Pipefitter; Plumber Pipefitter Sr
1	Building Mech; Building Mech, Sr; Electrician; Electrician, Sr; Plumber Pipefitter; Plumber Pipefitter Sr
2	Electrician; Electrician, Sr
2*	Electrician; Electrician, Sr
3	Electrician; Electrician, Sr
4	Electrician; Electrician, Sr

FM Operations & Maintenance (O&M) Steam Shop, HVAC Shop, Controls Shop, High Voltage Shop	
HRC	Job Titles
0	Maintenance Mech (HVAC); Steam Plant Mech; Steam Plant Mech Sr; Steam Plant Tradesworker; Stationary Engineer; Stationay Engineer Lead; Steam Plant Boiler Control Mech Sr; HVAC Mech; HVAC Mech Sr; HVAC Lead; CtrlS Sys Op/Tech I; CtrlS Sys Op Tech II; High Voltage Electrician
1	Maintenance Mech (HVAC); Steam Plant Mech; Steam Plant Mech Sr; Steam Plant Tradesworker; Stationary Engineer; Stationay Engineer Lead; Steam Plant Boiler Control Mech Sr; HVAC Mech; HVAC Mech Sr; HVAC Lead; CtrlS Sys Op/Tech I; CtrlS Sys Op Tech II; High Voltage Electrician
2	Steam Plant Mech; Steam Plant Mech Sr; Steam Plant Tradesworker; Stationary Engineer; Stationay Engineer Lead; Steam Plant Boiler Control Mech Sr; HVAC Mech; HVAC Mech Sr; HVAC Lead; CtrlS Sys Op/Tech I; CtrlS Sys Op Tech II; High Voltage Electrician
2*	Steam Plant Mech; Steam Plant Mech Sr; Steam Plant Tradesworker; Stationary Engineer; Stationay Engineer Lead; Steam Plant Boiler Control Mech Sr; HVAC Mech; HVAC Mech Sr; HVAC Lead; High Voltage Electrician
3	Steam Plant Boiler Control Mech Sr; Ghulami Haqqani (HVAC); High Voltage Electrician
4	Steam Plant Boiler Control Mech Sr; Ghulami Haqqani (HVAC); High Voltage Electrician

FM Exterior Services	
HRC	Job Titles
0	There are no job titles within Exterior Services that are authorized to perform tasks on energized equipment
1	
2	
2*	
3	
4	

FM Building & Residential Services (B&RS)	
HRC	Job Titles
0	There are no job titles within B&RS that are authorized to perform tasks on energized equipment
1	
2	
2*	
3	
4	

*Please refer to page 1 of this Appendix for definition of HRC Levels and associated personal protective equipment (PPE) requirements