



1. Purpose: Virginia Commonwealth University Department of Safety and Risk Management (SRM) has developed the Electrical Safety Program in order to outline the practices and procedures that protect VCU and contract employees from the hazards of electrical shock associated with live electrical equipment. The program was created in accordance with the Occupational Safety and Health Administration (OSHA) standards contained in 29 CFR 1910.303 and 331-335.
2. Scope / Applicability: This program shall apply to all qualified and unqualified personnel on all VCU properties located in the state of Virginia while working on, near, or with any electrical equipment and/or installations.
3. Table of Contents:

Purpose	<i>Page 1</i>
Scope/Applicability	<i>1</i>
Definitions	<i>1</i>
Background	<i>2</i>
Responsibilities	<i>2</i>
Application	<i>3</i>
References	<i>7</i>

#### 4. Definitions:

- Circuit protection devices: fuses, breakers, and ground fault indicators (GFI) designed to open or break circuit in the event of ground fault, overload, or short circuit to prevent injury and damage to equipment.
- Current: movement of electrical charge measured in amperes
- Limited approach boundary: a shock protection boundary to be crossed by only qualified persons (at a distance from a live part) which is not to be crossed by unqualified persons unless escorted by a qualified person
- Prohibited approach boundary: an approach limit at a distance from exposed energized electrical conductors or circuitry within which work is considered the same as making contact with those components
- Qualified worker: an employee who is trained and authorized to perform work on electrical equipment and components and understands the hazards

involved, and have the abilities to determine nominal voltage and assign corresponding clearance distances

- Restricted approach boundary: an approach limit at a distance from exposed energized electrical conductors or circuitry within which there is an increased risk of arcing associated with inadvertent movement in the vicinity of those components
- Resistance: opposition to current flow measured in ohms
- Unqualified worker: an employee who has not been trained or authorized to perform electrical work
- Voltage: measure of electrical force measured in volts

5. Background: Electricity is a serious work place hazard, capable of causing both employee injury (shocks, electrocution, falls, and burns) as well as serious property damage (fires and explosions). Providing maintenance personnel with these safe work practices shall ensure the employees can predict, identify, and mitigate electrical hazards encountered while performing assigned duties.

6. Responsibilities:

a. Safety and Risk Management (SRM) is responsible for:

- developing and updating basic training and standard guidelines
- maintaining basic electrical safety training records along with department supervisors
- validating program implementation
- assisting the revising and updating department specific programs as necessary

b. Departments involved in hazardous energy tasks covered in this program are responsible for:

- developing equipment-specific energy control procedures and testing the equipment or machine to verify the effectiveness of the energy controlling measure
- maintaining basic electrical safety training records along with SRM
- Assigning employees to qualified or unqualified status and maintaining a list of current qualified employees.



c. Employees involved in tasks covered by this program are responsible for:

- complying with all aspects of this program
- attending basic electrical safety training
- notifying their supervisor of any unsafe condition

7. Application: Safe work practices shall be utilized to prevent electric injuries resulting from either direct or indirect electrical contacts, when work is performed on, near, or with equipment or circuits which are or may be energized. The specific measures shall be consistent with the type and degree of the associated electrical hazards.

a. Prevention: Electrical hazards can be avoided through safe design, installation and maintenance as specified in 29 CFR 1910.302 and 308; NFPA 70E, ed. 2009, Chapter 2; as well as the 2012 Virginia Building Code.

- Insulation: conductors must be encased within material of composition and thickness as prescribed by manufacturer. Tools and equipment that show wear of insulation shall be repaired or removed from service. Insulated cords shall be protected from unnecessary wear and heat when possible.
- Guarding: live parts of electrical equipment operating at 50 volts or more shall be guarded against accidental contact by use of approved cabinets or other approved enclosures and equipped with secure access panels or doors. Enclosures shall be designed with such strength and arrangement to also prevent damage to electrical equipment
- Grounding: creating a low-resistance path that connects to the earth providing energy a more efficient route than the human body preventing injury and damage to equipment
- Circuit protection devices: Open slots in electrical panels shall be covered by approved material
- Arc-fault circuit interrupters: devices provide protection from the effects of arc-faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc-fault is detected.



- b. De-Energization: Work on energized equipment is prohibited, unless the supervisor can demonstrate that deenergizing introduces additional or increased hazards or is infeasible due to equipment designs or operational limitations. Live parts that operate at less than 50 volts to the ground need not be deenergized if there will be no increased exposure to electrical burns or to explosion due to electric arcs.
  - Fuses and Breakers: the location of electrical panels and shut-off switches shall be known for de-energization before work where possible and/or quick disconnect in the event of an emergency
  - Lockout/Tagout (LOTO): Proper LOTO procedures protect employees from the dangers of accidental or unexpected start-up of electrical equipment and the VCU LOTO program is strictly enforced. This program includes procedures to ensure that electrical equipment is de-energized before it is repaired or inspected and protects against the electrical hazards of live parts
  
- c. Planning: Electrical work shall be pre-planned and communicated prior to those activities.
  - Job briefing: a brief discussion of hazards, procedures, precautions, energy source control, and personal protective equipment required shall be conducted before each job.
  - Work space: enough access and working space shall be maintained around electrical equipment to allow for safe work operation.

Nominal voltage to ground	Minimum clear distance for condition					
	Condition A		Condition B		Condition C	
	m	ft	m	ft	m	ft
0-150	0.9	3.0	0.9	3.0	0.9	3.0
151-600	0.9	3.0	1.0	3.5	1.2	4.0

Condition A -- Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts.

Condition B -- Exposed live parts on one side and grounded parts on the other side.

Condition C -- Exposed live parts on both sides of the work space (not guarded as provided in Condition A) with the operator between.

- d. Hazard identification and risk assessment: electrical equipment that is likely to require inspection, adjustment, servicing, or maintenance while energized, shall be field marked/labeled to warn qualified employees of potential shock and arc flash hazards
- Markings: electrical equipment shall be field marked with a label containing the available incident energy or required level of PPE, and shall be clearly visible to qualified employees if access is necessary
  - Risk assessment: indicators such as tripped circuit protection devices, abnormally hot electrical equipment, or worn/frayed insulation around conductor may indicate an electrical hazard exists.
- e. Personal Protective Equipment and Tools: PPE shall be used when contact with exposed electrical sources is likely and only after a thorough inspection of the PPE has been performed. Properly Insulated tools shall be used when handling any energized conductor
- Insulated hand tools: ensure insulated tools are designed to withstand the voltages and stresses to which is will be exposed.
  - Gloves: non-conductive gloves shall be provided to authorized employees for electrical work
  - Power tools: inspect tools before operation and use only tools that are properly equipped with three-wired cord with ground or double insulation.
  - Safety Shoes: electrically-rated safety shows shall be provided to authorized employees for electrical work
- f. Training: All employees (qualified and unqualified) shall be trained to accomplish assigned electrically related tasks safely in accordance with this program. Qualified workers shall be certified as tradesman by the Virginia Department of Professional and Occupational Regulation.
- Qualified work: work within limited approach boundary of exposed, live electrical conductors and circuitry operating at 50 volts or higher. Qualified employees, at a minimum, will be trained and knowledgeable in:



1. Construction and operation of equipment or a specific work method
  2. Identify and avoid the electrical hazards that might be present with respect to that equipment or work method
  3. Familiarity with the proper use of special precautionary techniques, applicable electrical policies and procedures, PPE, insulating and shielding materials, and insulated tools and test equipment
- Unqualified work: all other work involving electrical components including use of power tools, work on de-energized equipment, and work exterior to the limited approach boundary. Unqualified employees will be trained and familiar with any of the electrical safety-related practices necessary for their safety including:
    1. Not to perform housekeeping duties inside the limited approach shock boundary
    2. Not to leave hinged doors to electrical equipment opened
    3. Not to use damaged electrical equipment
    4. To have basic understanding of the relationship between exposure to potential electrical hazards and possible bodily injury

### 8. Violations

- Employees performing or allowing unauthorized/unsafe work practices contrary to this program not only put themselves or others at risk of injury or death, but would be subject of disciplinary action up to and including termination.
- If an issue is found that is immediately dangerous to life and health, the SRM staff will respond as follows:
  1. Direct the individuals in the area to stop the unsafe operation immediately.
  2. Notify the supervisor and Assistant Vice President (AVP) of SRM. The AVP of SRM shall notify the appropriate university officials of the risk to the university community.
  3. Send an electronic notification the day of the occurrence to the supervisor or principal investigator, with a copy to the chair or director of the unit, with the noncompliance finding(s) and with a request for immediate corrective actions.



# VCU

Safety and Risk  
Management

## Electrical Safety Program

4. Work with the supervisor or principal investigator to develop a reasonable corrective plan that ensures the safety of the university community and satisfies all applicable requirements.
5. Conduct a follow-up inspection the next day or before the operation resumes verifying corrective actions are implemented.
6. Send an electronic notification to the dean or vice president of the area if the unsafe situation is not corrected.
7. Refer the case to the appropriate cabinet level member for further action.

### 9. References:

- OSHA Regulations 29 CFR 1910.301-308, 331-335, 339
- National Fire Protection Association Guidelines: NFPA 70E, ed. 2009
- 2012 Virginia Building Code and 2012 Virginia Statewide Fire Prevention Code
- VCU Safety Manual: located at [Safety and Risk Management webpage](#)
- Environmental Health and Safety and Risk Management policy: located in VCU [Policy Library](#)
- VCU Control of Hazardous Energy (Lockout/Tagout) Program