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1.0 Purpose

The Electrical Safety Program is developed in accordance with Federal OSHA and Cal OSHA Standards (29 CFR 1910 Subpart S; CCR, Title 8, Sections 2299-2974, *Low Voltage, Electrical Safety Orders*) and NFPA 70E, *Standard for Electrical Safety in the Workplace, 2012 Edition*, and applicable SOPs and Standard Work Practices.

The purposes of this program are to define standard work practices and procedures to be followed when performing work on electrical equipment, and to provide employees with a consistent system to perform electrical work correctly and safely.

5. Verify employees have the appropriate Personal Protective Equipment (PPE) and tools to perform the work.
6. Report any electrical incident, near miss, shock, or injury to the Worker's Compensation Coordinator and EHS.
7. Lead incident investigations involving electrical work and their employees.
8. Review Energized Electrical Work Permit to ensure the work can be safely done while energized and all necessary safety precautions are in place.
9. Approve Energized Electrical Work Permit.
10. Conduct annual field audits to ensure the requirements and

6. Inspect test equipment, tools and PPE before use.
7. Use appropriate PPE.
8. Contact their supervisor or manager if they are unclear on a procedure.
9. Complete and submit an Energized Electrical Work Permit to the department Manager for approval prior to starting energized work (except where exempt under the Program).

3.5 Environmental Health and Safety

1. Lead and facilitate Electrical Safety Team meetings for periodic program review.
2. Work with departmental managers as needed in carrying out the responsibilities described in Section 3.2.
3. Review and approve Energized Electrical Work Permit.
4. Distribute and send out electrical/rubber insulating gloves for electrical testing.
5. Maintain training records.

4.0 Training, Skills and Experience Requirements

4.1 General Training Requirements for Unqualified Employees

1. *Unqualified* personnel are employees who have not received specific training to perform a given task or those who are not qualified personnel as defined in Section 4.2. This includes:
 - a. Employees who do not perform electrical work, but who work in areas with exposed circuits and face a risk of injury from this exposure.
 - b. Authorized and affected employees in the Hazardous Area (general) (9.065

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3. Staff in the plumbing department does not perform electrical work, but may on occasion lockout/tagout a motor for repair. In addition to the training topics described in Section 2 above, they shall receive training in proper lockout/tagout methods and procedures.
 - a. They shall contact the University electricians for all electrical-related work.

4.2 General Training Requirements for Qualified Employees

1. Only qualified personnel can work on electrical equipment or systems. An employee is qualified to perform only specific electrical work for which he/she has training and experience.
2. Qualified personnel are employees “who by reason of experience or instruction has demonstrated familiarity with the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved.”
3. The department management will evaluate and assess the training and experience of new employees to determine their qualifications.
4. Qualified employees will be trained and must be familiar with the following practices and techniques:
 - a. Safety-related work practices to protect from electrical hazards associated with respective tasks or equipment, including arc flash and shock hazards and protection; use of precautionary techniques; and selection, use and inspection of insulating tool and shielding materials, and personnel protective equipment (PPE).
 - b. Selection, use, inspection and limitation of test equipment, including how to select an appropriate voltage detector and verify for absence of voltage.
 - c. Skills and techniques necessary to distinguish exposed parts from other parts of electrical equipment.
 - d. Skills and techniques necessary to determine the nominal voltage of exposed parts, clearance distances, and corresponding voltages to which the qualified person will be exposed.
 - e. Procedures for performing the jobs safely and properly.
 - f. Methods of releasing victims from contact with exposed energized conductors or circuits.
 - g. Procedure for safe lockout/tagout of electrical circuits and equipment.
 - h. CSUEB Procedures for performing energized work.
 - i. Approach distances/boundaries.
 - j. Job planning.
 - k. First aid and CPR.

4.3 Training Requirements for Job Functions

In addition to the general training requirements described in Section 4.2, qualified employees shall receive additional training based upon their job assignments or functions. The training shall be cla

4.3.3 *Building Services Engineer, Refrigeration Mechanic and Control Specialist*

Employees must have the training, skills, and experience to independently diagnose, troubleshoot, install and repair for non-hazardous locations electrical systems $\leq 480V$, pertaining to HVAC and refrigeration equipment/system.

1. Classroom training or experience in the following areas:
 - Operation, design and construction of HVAC and/or refrigeration equipment/system
 - Low voltage electrical safety
 - Meter types, safety and proper usage
 - Single-phase and 3-phase voltages and distribution systems
 - Operation, maintenance and troubleshooting of VFDs
 - Troubleshooting electrical control circuits
 - Electrical diagrams

2. On-the-job experience:
 - Reset breakers
 - Reset heaters
 - Troubleshoot, calibrate and repair 3-phase motors, VFDs, process controllers, and other control devices
 - Replace motors

4.3.4 *Electrician*

Employees must have the training, skills, and experience to diagnose, troubleshoot, and repair electrical systems up to 600V.

1. Classroom training or experience in the following areas:
 - National Electric Code
 - Low voltage electrical safety
 - Safe switching practices
 - Meter types, safety and proper usage
 - Single-phase and 3-phase voltages and distribution systems

Install bus switches and motor control center (MCC) buckets

4.4 Training Documentation and Certification

1. When an employee completes off-site training, he/she must submit a copy of the course completion certification to EHS and his/her department.
2. Records of training conducted onsite or by the department will be maintained by the department. A copy of the training outline or course content and the attendance rosters will be submitted to EHS.
3. Training documentations will be maintained by the employee's department and EHS for the duration of the employee's employment.

4.5 Retraining

An employee shall receive additional training or refresher training:

1. When there is new technology, new types of equipment or changes in procedures that necessitate additional training.
2. When he/she must employ safety-related work practices that are not normally used during regular job duties.
3. When there is reason to believe 3678(i)1.58017(n)-5.07072(g)4.94842()-2.53u42

2. Electrical conductors or circuits shall be considered energized until tested and proven otherwise.

5.2 Energized Work

1. Exposed electrical conductors or circuit parts, operating at 50 volts and higher, shall be de-energized before performing work on or within the Limited Approach Boundary, unless it can be shown that de-energizing creates additional hazards, or is not feasible due to design or operational limitations.
2. Energized electrical work shall be performed only under an *approved written work permit*. The permit serves as a checklist to help ensure hazards are considered and mitigations are in place. Prior to starting the work, the employee shall evaluate the hazards associated with the task involved and submit the permit to the appropriate manager for approval.
 - a. Exception to work permit: Work that involves testing,

methods for energized work shall be followed until it is proven that the system is de-energized.

2. When work needs to be performed within the Arc Flash Protection Boundary, employees shall wear the appropriate arc flash PPE.
 - a. Arc flash PPE is required for testing, troubleshooting and voltage measuring.
 - b. Arc flash PPE shall consists of arc-rated (FR) clothing and/or clothing made of untreated natural fibers, safety glasses, hard hat with arc-rated face shield and liner, rubber insulating gloves with leather protector, arc blast rated earplugs, and all leather safety shoes.
 - c. Selection of PPE shall be based upon Emerson Arc Flash Study and NFPA 70E Table 130.7(C)(16) (see Appendix A1).
 - d. Arc-rated (FR) clothing shall cover potentially exposed parts of the body as completely as possible and all flammable garments underneath. Shirt sleeves shall be fastened at the wrists and shirts and jackets shall be closed.

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- g. Shock Protection PPE shall consist of rubber insulating gloves with leather protectors. The gloves shall be rated for the voltage in which the gloves will be exposed.
- h. Leather protectors/gloves shall not be worn alone to provide shock protection.
- i. Where finger dexterity is needed to manipulate small equipment and parts requires the use of rubber insulating gloves without leather protectors, extra care must be taken by the user to prevent puncture, abrasion or other damages to the gloves.
- j. Bare-hand contact is permitted only under approval of an Energized Electrical Work Permit. No bare-hand contact is to be made with exposed energized electrical conductors or circuits above 250 volts to ground.
- k. To assure the continued integrity, rubber insulating gloves must be inspected on their inside and outside surfaces and a pinhole leak test must be performed before each use.

Boundary to provide immediate assistance, he/she shall wear the same PPE as the employee performing the work.

5.5 Emergency Plan

1. Employees shall evaluate the hazards associated with the work involved and, if necessary, work with their supervisor and/or manager to develop an appropriate emergency response plan.
2. The following are general procedures to be followed in the event of an incident:
 - b. In an event of a shock, determine whether the person is “hung up” on a live circuit. Always assume that the circuit is energized, and never attempt to remove the person from the live circuit with bare hands.
 - c. If possible and safe to do so, de-energize the circuit by shutting off the power.
 - d. Use an insulated device to pull the person free from the circuit (do not use device such as rope, dry wood, etc. in a high voltage system).
 - e. Immediately call UPD and ask them to summon for medical assistance.
 - f. Notify manager and EHS of the incident.

5.6 Alerting Techniques and Barricades

1. Appropriate alerting techniques shall be used to warn and protect personnel from hazards that could cause injury from electric shock, burns, or failure of electrical equipment parts.
2. Use safety signs, safety symbols, or accident prevention tags to warn personnel from electrical hazards that might endanger them or where necessary to warn employees about electrical hazards (i.e. danger or caution sign affixed to the equipment).
3. Barricades shall be used in conjunction with safety signs where necessary to prevent or limit access to work areas with uninsulated energized conductors or circuit parts (i.e. posting sign at door entrance warning unqualified personnel to keep out).
 - a. If an employee is working alone or there is no standby person, signs and barricades must be used to warn unqualified personnel of the hazards and from entering the area.
 - b. Appropriate warning signs and/or barricades must be placed where vehicle and pedestrian traffic may pass adjacent to the working area.
4. Where barricades are used, it shall not be placed closer than the Limited Approach boundary. Do not use conductive barricades where they might cause an electrical contact hazard.

5. If signs and barricades do not provide sufficient warning and protection from electrical hazards, station an attendant outside the Limited Approach boundary to keep other personnel from the area.

5.7 Insulated Tools, Test Instruments and Equipment

1. Employees shall use insulated tools and equipment when working inside the Limited Approach Boundary if the tools and/or equipment might contact or accidentally contact exposed energized conductors or parts.
2. Insulated tools, test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors must be

2. The briefing shall include the following topics: hazards associated with the job, work procedures involved, special precautions and safeguards, energy control sources, PPE, and work zones.
3. A brief discussion is satisfactory if the work i

exposed energized parts. Secure doors, hinged panels, and the like to prevent from swinging into an employee and causing the employee to contact exposed energized parts.

13. Over-current protection of circuits and conductors may not be modified, beyond that allowed per OSHA 1910.304(e), the installation safety requirements for over-current protection.

5.10 Working at Heights

1. When work is performed in locations containing uninsulated energized overhead lines that are not guarded, precautions shall be taken to prevent employees from contacting these lines. If contact with the overhead line is possible, the lines shall be de-energized and visibly grounded at the point of the work or properly guarded.
2. When an unqualified person is working near overhead lines, whether on the ground or in an elevated position (i.e. aerial lift), ensure that the employee and the longest conductive object he or

1. After a circuit is de-energized by a circuit protective device, do not manually reenergize the circuit until it has been determined that the equipment and circuit can be safely energized.
2. When it can be determined from the design of the circuit and over-current protective devices involved that the automatic operation of a device was caused by an overload rather than a fault condition, examination of the circuit or connected equipment is not required before reenergizing the circuit.
3. The repetitive manual closing of circuit breakers or reenergizing circuits through replaced fuses is prohibited.

5.13 Ground Fault Circuit Interrupter

1. To ensure that a GFCI is operating properly, test it regularly and according to the manufacturer's instructions.
2. In construction areas, use either GFCI or an assured grounding program (see OSHA regulations, 1926.404).

5.14 Electric Cords

1. Inspect cords regularly. Do not use if there are signs of stretching, insulation damage, and kinking.
2. Keep cords and cables clean and free from kinks. Kinking can damage both the cord's insulation and the internal wire.
3. Never carry a tool by its cord.
4. Portable electrical equipment must either be double insulated or have a third wire (equipment) ground prong.
5. When using tools that require a third wire ground, use only three-wire extension cords with three-pronged grounding plugs and three-hole electrical outlets. Never cut off the grounding plug from a cord.
6. Pulling on electric cords can damage the cord insulation and cause electric sparks. Always remove the cord at the plug.
7. Extension cords may present a tripping hazard. Make sure that cords are not located in walking paths or that a non-trip cover is placed over the cords.
8. Always use the correct extension cord for the job. An undersized cord can cause a drop in tool power and overheating. Check the manufacturer's recommendations for the wire gauge (or thickness) and length of the cord based on the application.

9. Portable electrical equipment and flexible cords used in highly conductive work locations (such as those in water or other conductive liquids), or in job locations where employees are likely to contact water or conductive liquids, must be approved for those locations.
10. Hands and feet must be dry when plugging and unplugging flexible cords and cord-and plug-connected equipment, whenever energized equipment is involved. Use an insulated tool at a safe distance to unplug equipment in wet areas.

5.15 Use of Portable Electric Equipment

1. Handle portable equipment in a manner that will not cause damage.
2. Do not raise and lower the equipment using the flexible electrical cord.
3. Do not fasten the flexible electrical cord with staples or handle in a manner that could damage the outer jacket or insulation.
4. Before use, visually inspect the portable cord and plug-connected equipment and flexible cord sets (extension cords) for external damage.

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5.16 Underground Utilities

1. Before digging, view appropriate maps and drawings to identify locations of underground utilities.
2. If it is possible that electrical lines or equipment might be contacted, a hazard analysis shall be performed to determine appropriate safe work practices to be followed during excavation.

6.0 Contractors

1. Contractors or outside personnel are required to perform their work in compliance with CSUEB's safe work practices and

9. An emergency plan and standby person are required for energized work. The standby person shall be certified in first aid and CPR.

7.0 Document History



Appendix A-NFPA 70E Tables

A1: Table 130.7(C)(16) Protective Clothing and PPE

Hazard/Risk Category	Protective Clothing & PPE
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A2: Approach Boundaries for Shock Protection

Table 130.4(C)(a)

A3: Hazard/Risk Category Classifications

Table 150.2 (15) (3) Continued

Task	Tasks Performed on Energized Equipment	Hazard/Risk Category	Dielectric Involvement Gloves	Dielectric Involvement Hand Tools
	Removal of bolts from energized equipment (to expose bare, energized electrical conductors and circuit parts) using above parameters: 33 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 ringed 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 grounds			
	Installation		Y	N

Appendix B - Electrical Procedures & Forms

B1: Safe Switching Practices

B2. Electrical Procedures: Energized Ballast Replacement

Note: Work on energized equipment requires a signed Energized Electrical Work Permit.

Brief description of work:

Replacement-in-kind of an energized 120 or 277 volt ballast

List of tools and equipment:

- Caution tape
- Safety-insulated tools
- Fiberglass ladder
- All leather safety shoes
- Class "0" gloves w/ leather protector
- Safety glasses
- Arc-rated face shield
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B4. Electrical Procedures: Voltage, Current, and Phase Measurements

Brief description of work:

B5. Energized Electrical Work Permit
