

# UC Davis Policy and Procedure Manual

## Chapter 290, Health and Safety Services

### Section 85, Electrical Safety

Date: 4/26/15

Supersedes: 1/7/10

Responsible Department: Environmental Health and Safety

Source Document: California Code of Regulations, Titles 8 and 22

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#### I. Purpose

This section supplements State regulations contained in the California Code of Regulations, Titles 8 and 22, and the National Electric Code. Those who direct or perform electrical construction or repair are expected to be familiar with and follow applicable regulations and codes.

This section applies to all electrical work at UC Davis. The Student Health and Counseling Center is also covered by the Accreditation Association for Ambulatory Health Care (AAAHC) standards, and UC Davis Medical Center is also covered by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) regulations.

#### II. Definitions

- A. Authorized person--a qualified person specifically designated in a job description to do electrical work.
- B. Qualified person--a person who by reason of experience or instruction is familiar with the operation to be performed and the electrical hazards involved.

#### III. Policy

- A. Electrical systems and equipment hard-wired to building electrical systems
  - 1. All work with electrical systems and equipment hard-wired to building electrical systems or to the electrical distribution network must be performed by qualified persons managed by Design and Construction Management (DCM), Facilities Management, or Utilities Power & Light.
  - 2. Work must be performed by authorized personnel or will be removed and replaced by Facilities Management at the expense of the department.
  - 3. New electrical installations of conductors to electrical supply and the inspection, operation and maintenance of such systems must conform to NFPA 70e safety-related work practices for employee safety from electrical hazards associated with electrical energy during these activities. This includes arc flash and shock hazard assessments to establish the limited, restricted and prohibited boundaries and PPE requirements and subsequent equipment labeling, plus employee NFPA 70e training.
- B. Repair and fabrication of department-owned electrical equipment

Repair and fabrication of department-owned electrical equipment must be conducted by a qualified individual who is authorized to do the work. Materials and methods must be appropriate for the type of use and the location.
- C. Connections to campus power sources and use of electrical equipment
  - 1. Cord and plug equipment should be plugged directly into a wall outlet. Exceptions for extension cords and multiple outlet strips are noted in V.A-C, below.
  - 2. For equipment that states "Home Use Only", consult UC Davis Fire Department

to determine if such product is acceptable for your application.

3. All equipment, whether personal or University-owned, used on University property or for University projects, including extension cords and multiple outlet strips, must be certified by a national testing laboratory such as Underwriter's Laboratory (UL): use must be consistent with the conditions of certification.

D. Lockout/tagout

1. All electrical components must be assumed energized until positively proven otherwise.
2. Lockout/tagout must be conducted during electrical work, which may involve unexpected movement or release of energy (see Section [290-86](#)).
3. Departments conducting Lockout/Tagout, energy isolation or blockout must have:
  - a. A written Lockout-Tagout program,
  - b. Annual training on this policy and the department lockout program for employees,
  - c. A written SOP or field-written lockout procedure (i.e. permit) for the equipment being lockout accounting for all sources of energy
  - d. LOTO field equipment (i.e. hasps, multi-pole breakers, snap-on and clamp- on breakers, fuse blocks, electric plug locks, tags, kits.)
4. Control circuit devices, such as push buttons, selector switches, and interlocks may not be used as the sole means for de-energizing circuits or equipment.
5. Interlocks for electric equipment may also not be used as a substitute for lockout procedures.

**IV. Responsibilities**

A. Campus departments

1. Department chairs  
Implement these electrical safety policies and procedures as a part of the department's comprehensive health and safety programs, in accordance with Section 290-15.
2. Supervisors and principal investigators
  - a. Assure employees have appropriate electrical safety training.
  - b. Assure that repair and fabrication of department-owned electrical equipment is done by a qualified individual who is authorized to do the work. Environmental Health & Safety (EH&S) can provide assistance with evaluating qualifications to work.
3. Employees
  - a. Perform electrical work only if qualified and authorized.
  - b. Use materials and methods appropriate for the type of use and the location. For example, damp locations may require watertight fittings, and cords exposed to sunlight should be UV-resistant.
  - c. Perform work as trained, using appropriate lockout/tagout equipment, insulated tools, and appropriate personal protective equipment (PPE).
4. Students

- a. Students are not permitted to perform electrical work unless specifically authorized by a faculty or staff member.
  - b. Only students qualified for performing electrical work by virtue of training, experience, or under trained supervision shall perform electrical work.
  - c. Students shall be provided with the appropriate lockout/tagout equipment, insulated tools, and PPE.
- B. Office of Environmental Health & Safety
- With assistance from the Facilities Management BMS, provides electrical safety consultation and assistance to the campus and assists supervisors in evaluating the qualifications of employees to perform electrical work.
- C. Utilities Power and Lights
- Responsible for establishing additional internal policies and procedures for electrical safety including high voltages (>600 volts).

**V. Procedures for Electrical Work and Use of Electrical Equipment**

- A. Appropriate applications for extension cords. Extension cords may be used to supply power to appliances under limited conditions. These include:
1. Temporary situations such as laboratory experiments lasting no longer than 90 days.
  2. Situations in which permanent wiring is inappropriate because equipment is moved frequently.
  3. Power tools or other portable appliances used on a transient basis.
- B. Proper selection and use of extension cords
1. Plug must be three-pronged, in good condition and appropriately sized for the anticipated load
  2. Must be free of splices, repairs, and signs of excessive wear.
  3. Must not pass through doors or windows.
  4. Must not be stapled or attached to a floor, wall, or ceiling.
  5. Must not be connected in series.
  6. Must not create a tripping or other safety hazard.
  7. Must be protected where exposed to foot or wheel traffic to minimize tripping hazards and damage to the cords.
  8. Must have built-in overload protection if there is more than one outlet.
- C. Use of multiple-outlet surge protectors
1. Must be equipped with an automatic circuit breaker. Outlet strips with fuses or without overcurrent protection are not acceptable.
  2. Must be equipped with an indicator light.  
  
If the indicator light is off but the protector's outlets have power, the unit has failed and must be replaced.
  3. Must have a cord no more than 15 feet long and must be directly plugged into a wall receptacle or into a hard-wired (not merely plugged in) overhead corded set of outlets. Hard-wired overhead corded sets of outlets must be fitted with strain

relief fittings at the point of support. Use of surge protector power strip products with cords longer than 15 feet (up to UL's maximum 25 feet) must be approved by UC Davis Fire Department.

4. Must be protected where exposed to foot or wheel traffic, furniture, or equipment to minimize tripping hazards and damage to the cords.
5. Must not be connected in series.
6. Review original packaging to determine whether the power strip may be used for tools or small appliances. Maintain documentation to verify your application is appropriate.
7. Under no circumstances may you plug-in higher wattage appliances such as coffeepots, space heaters, microwave ovens, hot plates, full-size refrigerators, or copy machines.
8. Plug mold or "U" mold style power strips permanently installed on a wall and hard-wired into the campus electrical system are a fixed power strip, installed and maintained by the University, and not subject to the same restriction as portable power strips.

D. Equipment in patient care areas

1. Portable equipment for use in patient care or clinical laboratory areas must have a hospital-grade plug.
2. Personally owned line-powered devices are not allowed in designated patient care areas.

E. Electrophoresis equipment

Electrophoresis equipment must have a lid or cover with safety interlocks to prevent accidental contact with energized electrodes or buffer solutions. The equipment must be labeled "WARNING [OR DANGER]--ELECTRICAL HAZARD." Power supplies must only be operated in accordance with the manufacturer's written directions.

F. Damp or wet locations: greenhouses, animal rooms, around swimming pools and fountains, and similar locations

Equipment in wet areas must be designed and approved for use in damp locations. When it is not possible to ensure protection from contact with water, the equipment must be protected by a ground-fault circuit interrupter (GFCI). Equipment used for large construction projects or for projects outdoors that may be exposed to rain or wet conditions must be protected by ground-fault circuit interrupters.

G. Fire prevention and combustible materials

Place heat-producing equipment at a safe distance from combustible materials such as paper, cardboard, wood, and plants. Combustible containers shall be properly grounded and transfer containers bonded (connected by cable) to the storage equipment (i.e. tank, drum).

H. Tripped circuit breakers

Report all problems with tripped electrical circuit breakers to the Facilities Management at (530) 752-1655. Facilities Management should be the only department working within electrical panels or load-rated switchgear. Tripped circuit breakers can indicate a

serious electrical hazard.

I. Damaged equipment, plugs, and cords

Equipment with damaged plugs or cords or other conditions that constitute an electrical hazard must be removed from service until repaired.

J. Electrical distribution panels, load center panels, safety disconnect switches and distribution transformers.

1. Electrical distribution panels, load center panels, safety disconnect switches and distribution transformers should not be blocked with anything stored on the floor or on the wall beneath the panel. A minimum three foot clearance shall be maintained to the front and sides of panels.

2. No combustible materials such as paper, cardboard, wood and flammable solvents shall be stored on or close to the transformers and other electrical equipment that inherently generate heat.

K. Restrictions on use of UL (or equivalent) listed equipment

1. Use of equipment must be consistent with the restrictions of the certification. In many cases when equipment is certified by a testing laboratory such as UL, there are restrictions on the use of the equipment. The restrictions are listed on the equipment label adjacent to the UL listing. For example, equipment may be certified only for home use or only for use when mounted vertically.

2. Retractable cord reels or any reeled cord must be fully unreeled during use to avoid heat build-up.

3. "Interior Use" rated cords must not be used outdoors.

4. "Exterior Use" rated cords are designed to withstand normal exposure to sunlight and moisture and may be used inside or outside a building.

**VI. Further Information**

For additional information, contact Environmental Health and Safety at (530) 752-1493. For UCDHS contact (916) 734-3355.

**VII. References and Related Policies**

A. California Code of Regulations, Title 8, Subchapter 5. Electrical Safety Orders (<http://ccr.oal.ca.gov/linkedslice/default.asp?RS=GVT1.0&VR=2.0&SP=CCR-1000&Action=Welcome>).

B. California Code of Regulations, Title 22, Division 5. Licensing and Certification of Health Facilities (<http://ccr.oal.ca.gov/linkedslice/default.asp?RS=GVT1.0&VR=2.0&SP=CCR-1000&Action=Welcome>).

C. California Code of Regulations, Title 8, §3314. The Control of Hazardous Energy for the Cleaning, Repairing, Servicing, Setting-Up, and Adjusting Operations of Prime Movers, Machinery and Equipment, Including Lockout/Tagout. (<https://www.dir.ca.gov/title8/3314.html>)

D. NFPA 70E: Standard for Electrical Safety in the Workplace® Current Edition: 2015 ([http://www.nfpa.org/catalog/product.asp?pid=70E15&order\\_src=A381&gclid=CjwKEAjw-8ihBRD2t9qT3NaW7igSJAD3\\_sNVVr3jbtJs-PWcsZmNa7ch9akc4VQipN-94MfhJXE9txoCyfrw\\_wcB](http://www.nfpa.org/catalog/product.asp?pid=70E15&order_src=A381&gclid=CjwKEAjw-8ihBRD2t9qT3NaW7igSJAD3_sNVVr3jbtJs-PWcsZmNa7ch9akc4VQipN-94MfhJXE9txoCyfrw_wcB))

- E. National Electric Code: Latest Edition  
([http://www.nfpa.org/catalog/product.asp?pid=7014SB&order\\_src=D347&cookie\\_test=1&gclid=CiwKEAjw-8ihBRD2t9qT3NaW7igSJAD3\\_sNVQ\\_0yeh6y7iUNZ\\_OKtrida5aY0jJqWq-kqD9ARJ2uJRoCTr\\_w\\_wcB](http://www.nfpa.org/catalog/product.asp?pid=7014SB&order_src=D347&cookie_test=1&gclid=CiwKEAjw-8ihBRD2t9qT3NaW7igSJAD3_sNVQ_0yeh6y7iUNZ_OKtrida5aY0jJqWq-kqD9ARJ2uJRoCTr_w_wcB))
- F. Standards of the Joint Commission on Accreditation of Healthcare Organizations.