



**Environment, Health, & Safety
Training Program**

**EHS 0570 QEW Capacitor Safety
Course Syllabus**

Subject Category: Electrical Safety

Course Length: 3 hours
Delivery Mode: Classroom

Course Prerequisites: EHS 0370, EHS 0538 (QEW),
EHS0540 – EHS 0542 (QEW1), EHS0550 – EHS0554 (QEW2)
Medical Approval: None
Frequency: Every 3 years

Course Purpose:

This course builds upon the work covered in previous QEW training, applying ISM and specifically addressing Electrical Hazards and safety controls for Qualified Electrical Workers when working with Capacitors.

Course Objectives: Upon completion of the course the student should be able to:

- Implement the electrical safety requirements of LBNL ESM section 15.
- Explain the hazards related to capacitors, including fibrillation, arc flash, acoustic and short-circuit hazards.
- Explain how to analyze electrical hazards in capacitors:
 - RC charge/discharge circuit
 - Equivalence capacitance (parallel, series)
 - Capacitance in a length of cable
 - Capacitor hazard labeling
 - Determining the correct voltage to be used for electrical hazard analysis
- Calculate the following:
 - Stored energy in joules
 - Time constant
 - Discharge time to non-hazardous voltage (<50V)
 - Peak current and power
- Selecting appropriate PPE and work controls, including requirements for LOTO:
 - Complex LOTO
 - Discharging with a stick
 - Measuring residual voltage
 - Soft grounding vs. hard grounding (low-Z, high-Z)
 - Explain why bleed resistors cannot be trusted
- Proper storage, handling, labeling and disposal.
- Assist non-QEW personnel.

Subject Matter Expert: Mark Scott, Stephanie Collins

Training Compliance Requirements: LBNL Electrical Safety Manual, EHS Safety Manual (formerly PUB-3000)- Chapter 8, *Electrical Safety Program*, 29CFR 1910.147, 29CFR 1910.333, NFPA 70E

Course Instructional Materials: PowerPoint presentation and video

Performance Criteria: Student must pass a written test to demonstrate their ability to use the classroom resources and prove understanding regarding when and how to conduct an electrical hazard analysis; determining the appropriate equipment, tools, metering devices and controls needed to perform work safely on systems with hazardous capacitors in accordance with the Lab's Electrical Safety Program to receive course credit.

Web Resource: <http://electricalsafety.lbl.gov/>