

Current Check: Electrical Safety in Labs

Purpose

This job aid provides an awareness-level overview of common electrical safety hazards encountered in research and laboratory environments. It highlights typical risk conditions, basic preventive practices, and electrical threshold values to determine when additional controls, training, or review may be required.

Why Electrical Safety Matters

Electrical hazards can result in shock, burns, arc flashes, fires, and significant equipment damage. In research and laboratory environments, these risks are often elevated due to custom-built equipment, frequent equipment modification, high-energy devices, experimental setups, and wet processes.

Common Electrical Safety Concerns in Labs

Be alert for the following conditions:

- » Exposed energized parts (e.g., missing covers, open panels)
- » Damaged cords, plugs, or insulation
- » Improper use of extension cords or power strips
- » Overloaded outlets or daisy-chained power strips
- » Electrical equipment used near water or wet processes without protection
- » Improper grounding or missing ground pins
- » Custom-built, modified, or experimental electrical devices
- » Capacitors or batteries capable of storing hazardous amounts of energy
- » Bypassed interlocks or defeated safety features

Basic Electrical Safety Practices

- De-energize equipment before servicing
- Apply lockout/tagout when necessary
- Keep electrical equipment dry and away from liquids
- Inspect cords and plugs before use; remove damaged equipment from service
- When using power strips/surge protectors, make sure they are NRTL certified
- Verify if the power strip/surge protector is rated for the equipment to be plugged
- Use GFCI protection where required (e.g., wet locations)
- Ensure covers, guards, and enclosures are in place
- Do not perform electrical work beyond your knowledge or authorization
- In the event of an electrical-related fire, use a fire extinguisher suitable for class C
- Consult Research Safety before modifying electrical systems or equipment

Electrical Shock Hazard Threshold Values (Awareness Level)

The threshold values below are used to identify conditions that may present an electrical shock hazard and warrant additional controls, training, or qualified personnel.

Shock Hazard Thresholds

Electrical Source	Threshold Value
Alternating Current (AC, 50–60 Hz)	≥ 50 volts and ≥ 5 mA
Direct Current (DC)	≥ 100 volts and ≥ 40 mA
Capacitors (Stored Energy)	< 100 volts and > 100 joules
	≥ 100 volts and > 1 joules
	≥ 400 volts and > 0.25 joules
Batteries (including lead-acid and lithium ion systems)	≥ 100 volts

Important: Voltage alone does not determine risk. Shock severity depends on available current, duration of contact, pathway through the body, and environmental conditions.

Contact Research Safety if:

- » Work has exposed energized parts that exceed the threshold values listed above
- » Equipment is custom-built, modified, or experimental
- » Stored energy (e.g., capacitors or batteries) cannot be readily discharged
- » You are unsure whether a task requires a qualified electrical worker

Important Note

This job aid is intended for general electrical safety awareness only and does not replace training or applicable regulatory requirements.

References:

- Lawrence Berkeley National Laboratory (LBNL), Electrical Safety Manual
- U.S. Department of Energy (DOE), Electrical Safety Handbook
- NFPA 70 – National Electrical Code (NEC)
- NFPA 70E – Standard for Electrical Safety in the Workplace
- OSHA 29 CFR 1910 Subpart S – Electrical
- University Electrical Safety Programs (e.g., University of California system, Stanford University, University of Pennsylvania)