Electrical Safety

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Research Safety Office of Research UNIVERSITY OF GEORGIA

I. Purpose & Scope

This document provides an overview of the University's requirements and recommendations for the safe use of electrical equipment, including power strips, surge protectors, and extension cords. Improper use of these items can cause fires in the labs and adherence to these established procedures is essential. Please note that individual research areas may have additional requirements not detailed in this document.

II. Definitions

Collectively, the following three items will be called "flexible cords and cables" throughout this SOP.

A. Extension Cords

An elongated power supplying device that allows for the safe distribution of power usually to a single piece of equipment located from a standard wall outlet.

B. Power Strips (Relocatable Power Tap)

Similar to an extension cord but typically capable of powering more than one device. It should not be assumed that these items are providing surge protection unless otherwise indicated on the device itself.

C. Surge-Protective Device (SPD)

Defined by electrical code as a device for limiting transient voltages by diverting or limiting surge current. The most common type of SPD used in labs is a Type 3 which provides surge protection at the point of use. A surge protected power strip with multiple outlets is commonly a Type 3. To tell if your device is an SPD, you will need to consult the packaging or look at the raised lettering or adhesive label on the bottom of the device. Note that the device may also say Transient Voltage Surge Suppressor and this is sufficient as well.

III. General Safety Guidelines

- Electrical panels and breaker boxes located in the lab should not be obstructed by equipment or lab supplies.
- Particular care should be given not to subject wiring or equipment to deteriorating agents such as gases, fumes, vapors, liquids, foot traffic, sharp edges, or damp environments that may compromise the protective features of a piece of equipment of electrical cord powering a device.
- Any portion of an electrical device that during the course of normal operation may produce arcs, sparks, flames, or molten metal shall be enclosed or separated and isolated from all combustible material.
- Any wiring or electrical equipment used in a lab should have a label or tag indicating the voltage, current (amps), wattage, and other ratings as necessary.
- To minimize condensation, limit the use of electrical equipment in cold rooms or large refrigerators. Cold rooms pose a particular risk in this respect because the atmosphere is frequently at a high relative humidity. Electrical equipment should only be used in these areas temporarily. If permanent or long-term storage is required, precautions should be taken to mount the equipment on a wall or vertical panel to minimize (though not eliminate) the effects of condensation.
- Always unplug electrical equipment before undertaking any adjustment, modification, or repair.
- Ensure that all personnel know the location and operation of power shutoffs located in the lab.
- If a person comes into contact with a live electrical conductor, disconnect the power source before removing the person from the contact and administering first aid.

IV. Wall Outlets

- All outlets within a laboratory should be grounded (three-pronged) outlets and all electrical equipment used in a laboratory should be outfitted with a grounding prong. No modifications should be made to either the outlet or the electrical cord to either add or remove a grounding wire or bypass a grounding receptacle.
- Any outlet that is within six feet of a water source must be outfitted with a ground fault circuit interrupter (GFCI). These GFCI outlets will usually have small Test/Reset buttons to test the functionality of the GFCI. These devices significantly reduce the risk of fatal electric shock.
- Outlets and light switches located underneath or near safety showers in particular may need additional protection of a plastic cover. When these items are in place, they should never be removed by laboratory personnel under any circumstances.

V. Use of Extension Cords, Power Strips, and Surge Protectors

- Only flexible cords and cables that have been certified by one of OSHA's Nationally Recognized Testing Laboratories (NRTL) are allowed to be used in UGA laboratories. The most common NRTLs are UL and ETL. Both testing laboratories will place their symbol on the equipment that they have certified.
- Flexible cords and cables that are supplying power to operations within a fume hood should be plugged into power sources located outside of the fume hood. This location prevents the production of electrical sparks inside the hood when a device is being plugged in or disconnected and it also allows lab personnel to disconnect equipment from outside of the hood in the event of an accident. Additionally electrical cords should be placed in such a way that they do allow for the full closure of the sash.

When closed, the sash should always come into full contact with the airfoil.

- Keep these flexible cords and cables out of aisles or other high traffic areas.
 Install overhead racks or floor channel covers if wires must pass over or under walking areas.
- SPDs should be used in areas where the consistency of electrical current is vital (e.g, computers). Commonly, laboratories are found to be using power strips that do not provide surge protection. Ensure that the device you are using is rated as an SPD if current consistency is preferred.

Limitations of Flexible Cord & Cable Use

- Extension cords should be limited to temporary use (90 days or less). They are not intended to permanently replace the fixed wiring of the building. If a lab determines that new fixed outlets may be needed in order to avoid utilizing extension cords for longer than 90 days, place a work order with FMD.
- Flexible cords and cables should not be run through holes in walls, structural ceilings, suspended ceilings, dropped ceilings, floors, doorways, windows, or similar openings. They should not be concealed by walls, floors, ceilings, or located above suspended or dropped ceilings.
- Cords should be visually inspected monthly, especially in wet areas or in areas subject to flooding. Electrical equipment and flexible cords and cables where the insulating wire casing is frayed or ripped open should not be utilized. Electrical tape is not an acceptable repair solution. If the lab would like the cord replaced or repaired, please contact the UGA Instrument Design and Fabrication Shop.
- Flexible cords and cables should never be connected in series (i.e., multiple extension cords or power strips plugged into one another). Doing so can overload the device causing a fire hazard.
- Flexible cords and cables should never be overloaded. This can be a particular concern with power strips because of the likelihood that multiple pieces of equipment could be plugged into each device. Large pieces of equipment (e.g., refrigerators and freezers) that pull high amperage are not allowed to be plugged into power strips in most cases. If your lab needs the addition of wall

outlets or some other solution to prevent having to use a power strip for these purposes, the lab will need to place a work order with FMD.

Lithium-Ion Battery Safety Protocols

A. General Handling Guidelines

- Inspection Before Use: Ensure all lithium-ion batteries are inspected for signs of physical damage (e.g., cracks, bulges, or leaks). Do not use damaged batteries.
- Proper Labeling: Ensure all batteries are clearly labeled with their capacity, charging requirements, and disposal procedures.
- Handling: Avoid dropping, crushing, or puncturing batteries. Handle them with care to prevent mechanical damage, which can lead to a thermal event.

B. Charging and Use Guidelines

- Approved Chargers Only: Always use manufacturer-recommended chargers and follow the specified voltage and current limits. Never use a damaged or incorrect charger.
- Monitoring While Charging: Batteries should be charged in a well-ventilated area and under constant supervision to detect any potential issues such as overheating or abnormal swelling.
- Avoid Overcharging: Set clear limits, based on manufacturer recommendations, to avoid overcharging by using equipment that stops charging once the battery reaches full capacity.

C. Storage Requirements

- Temperature Control: Store batteries in a cool, dry place, at room temperature. Do not charge them at temperatures below 32°F(or 0°C) or above 105°F (40°C). Avoid exposing batteries to extreme temperatures, which may cause degradation or fire hazards.
- Isolation of Batteries: Store lithium-ion batteries separately from flammable materials and in non-conductive containers to reduce the risk of short circuits or fires.

D. Emergency Procedures

- Overheating/Fire Risk: In case of smoke, heat, or unusual smells during charging or use, immediately disconnect the power supply (if safe to do so) and evacuate the area. Contact emergency services.
- Battery Fires: Use water (if safe to do so) to extinguish a lithium-ion battery fire.
- First Aid for Exposure: In case of exposure to battery chemicals, rinse the affected area with plenty of water for at least 15 minutes and seek medical attention.
 E. Disposal Procedures
- Designated Collection Areas: Dispose of used or damaged (unusual odor, discoloration, excessive heat, deformation, leakage, or strange noises) lithium-ion batteries by placing them into a plastic bag, and then into a designated battery disposal container located in a specified battery disposal collection area. To locate a battery disposal container near you, please visit the <u>ESD website</u>.

VII. Contacts

- Environmental Safety Division: 706-542-5801
- Office of Research Safety: 706-542-5288
- Instrument Design and Fabrication Shop: 706-542-5993
- FMD Work Request Center: 706-542-7456

VIII. References

- Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011
- NFPA 45: Standard on Fire Protection for Laboratories, National Fire Protection Agency, 2015
- NFPA 70: National Electrical Code, National Fire Protection Agency, 2011
- NFPA. "New Lithium-Ion Battery Resources from NFPA Help Better Educate Consumers about Associated Fire Risks during National Electrical Safety Month: NFPA." NFPA.org, May 1, 2024. https://www.nfpa.org/aboutnfpa/press-room/news-releases/2024/new-lithium-ion-batteryresourcesfrom-nfpa-help-better-educate-consumers.
- NFPA. "Lithium-Ion Battery Safety". https://www.nfpa.org/education-and-research/home-fire-safety/lithium-ion-batteries#electric-vehicles.