SAFETY IN LABORATORIES ISSUE

In Case You Haven't 'HERD' About...

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Not Enough Electrical Outlets in the Lab?

THE BEST SOLUTION IS TO ADD MORE PERMANENT ELECTRICAL CIRCUITS WITH WIRING BACK TO THE MAIN ELECTRICAL PANEL FOR THE LAB, BUT…IN THE MEANTIME, THERE ARE "RELOCATABLE POWER TAPS" OR "POWER STRIPS".

Many people (with the best intentions) unknowingly violate the MA Fire Code/NFPA1 (2015 Ed) due to their use of extension power cords as "permanent" wiring. The Code prohibits the use of extension cords as permanent wiring. A simple solution to make the electrical power connection safer, and to comply with the Code is to select and use a Relocatable Power Tap. While the Fire Code logically restricts the usage of simple "extension cords" because these cords do not have any built-in safeguards (other than power capacity associated with wire gauge), the Code *does allow* for Relocatable Power Taps. Unlike an extension cord, a relocatable power tap extends the wall outlet closer to the power need of several electrical devices AND has overcurrent protection built in to the device.

As defined in *NFPA 1* (2015 Ed): **3.3.220 Relocatable Power Tap**. *A device for indoor use consisting of an attachment plug on one end of a flexible cord and two or more receptacles on the opposite end, and has overcurrent protection.*


Ex. of relocatable power tap

Reset button/overcurrent protection

Status window/power switch


UL listing stamp/status window instructions

Relocatable Power Taps are commonly available at most hardware stores or online, and for reasonable prices; however, beware of low-cost devices that do not display a notice of compliance with UL or other electrical safety testing organizations. Be aware that there are fake UL labels being used, usually found on low-cost devices.

What are some of the most common Fire Code requirements that are associated with "extension cords" and "relocatable power taps?"

Relocatable Power Taps

Relocatable power taps shall be of the polarized or grounded type with overcurrent protection and shall be listed. (By a testing organization – Underwriters Laboratory UL, ETL-SEMKO, OR CSA.)

The relocatable power taps shall be directly connected to a permanently installed receptacle. (Not an extension cord or another power strip.)

Relocatable power tap cords shall not extend through walls, ceilings, or floors; under doors or floor coverings; or be subject to environmental or physical damage.

OSHA states "Power strips are designed for use with some low power (amperage) devices such as computers, peripherals, and AV components. Power strips are NOT designed for space heaters, refrigerators, or microwave ovens which can easily exceed the ampere ratings of many power strips." (OSHA Standard INT 24631)

Extension Cords

If you place an electrical device in a location and do not intend to move it routinely, then it is a permanent location (freezer, microwave, centrifuge). An extension cord may be used TEMPORARILY (90 days or less) until an electrical outlet is installed. A reasonable period for installation would be less than 90 days. However, these devices must be capable of handling the power (amperage) demand without overheating the circuit or circuit breaker.

Extension cords shall be plugged directly into an approved receptacle, power tap, or multiplug adapter and shall, except for approved multiplug extension cords, serve only one portable appliance.

The ampacity of the extension cords shall not be less than the rated capacity of the portable appliance supplied by the cord.

The extension cords shall be maintained in good condition without splices, deterioration, or damage. (Repairs must be made by a person qualified to safely repair electrical equipment – check with Tufts EHS if you want to be qualified.) Extension cords shall be grounded (using the three-wire plug into a grounded outlet) when servicing grounded portable appliances.

Extension cords and flexible cords shall not be affixed (stapled, nailed, taped) to structures; extend through walls, ceilings, or floors, under doors or floor coverings; or be subject to environmental or physical damage.

Extension cords shall not be used as a substitute for permanent wiring. As always, inspect cords for damage before use, and pull on the plug, NOT the cord to unplug.

For additional fire safety information please visit:
https://publicsafety.tufts.edu/firesafety/
https://publicsafety.tufts.edu/ehs/fire-safety/

Under What Conditions Can I Wear a Respirator in the Lab?

Should I be wearing a respirator in the laboratory?

The primary method for protecting laboratory workers from airborne contaminants is to minimize the amount of such materials from entering the air in the laboratory.

There is a reason that laboratory (fume) hoods almost define a space as a laboratory. All processes that generate liquid or solid aerosols or gases and vapors should be conducted in a laboratory hood, a biological safety cabinet or under the influence of a local exhaust ventilation system. In addition to these local exhaust controls, general laboratory ventilation systems are designed to dilute small amounts of airborne chemicals or biologicals to safe levels. There is also more air removed from the laboratory than there is delivered, which prevents airborne agents from leaving the laboratory and filling the hallway.

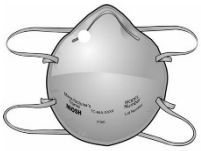
Respirators may be worn in the laboratory under four conditions:

A. **Special Operations**. To provide protection from hazardous airborne contaminants that enter the air in quantities greater than the ventilation rate can reduce to safe concentrations or in such a manner that the contaminant is not safely diluted below hazardous concentration before being inhaled. Everyone entering the laboratory would need to wear respirators during these periods.

B. **Backup in the Event of Containment Failure**. To provide secondary or back up lung protection in the event of the failure of the laboratory (fume) hood or biosafety cabinet or other local exhaust ventilation device to contain the hazardous airborne materials. *Persons handling Risk Group 3 agents are frequently required to wear respirators in the event of the failure of the biosafety cabinet or in the event of a spill of an agent outside of the biosafety cabinet.*

C. **Improve user comfort**. To provide protection from odorous, irritating, or allergenic air contaminants in the laboratory air that are at safe concentrations but create discomfort. The respirator is worn voluntarily for comfort reasons.

D. **Abnormal sensitivity to airborne contaminant**. Some laboratory workers have medical conditions including heightened allergic sensitivity or asthmatic reaction to specific airborne agents and require respirators to reduce the concentration of airborne agents to no-effect levels. Persons with underactive or overactive immune systems require special guidance and should contact Tufts EHS staff.



Tufts University permits staff and students to voluntarily select and use respirators; however, this option is limited to protection from aerosols **by filtering facepiece respirators often called N95 respirators or dust masks.**

Please contact Tufts EHS if you think you need respiratory system protection using an elastomeric reusable half-face or full-face respirator, powered air purifying respirator, airline respirator, or self-contained breathing apparatus (SCBA). Workers *whose job functions require them to wear a respirator*, such as the ones mentioned above or an N95, must be medically cleared and fit-tested annually. Workers should also be trained on the proper use, maintenance, and storage of the respirator they use.

References:

1. Section 6.F.2.4 Respiratory Protective Equipment. Prudent Practices in the Laboratory. NRC/NAS USA 2011
2. Tufts Respiratory Protection Program (OSHA 1910.134) available on the Tufts Environmental Health and Safety webpage. https://publicsafety.tufts.edu/ehs/files/Tufts-University-Respiratory-Protection-Program.pdf

Avoiding the Top 10 Causes of Injuries and Disease in the Laboratory: Scientists Need Data, Not Rules, So…

Scientists and science students frequently question SOPS, or standard operating practices, that require wearing laboratory coats, protective gloves, protective eyewear, and more restrictions such as on the use and handling of hypodermic needles. The following statistics provide the scientific basis for these "rules".

In 2012, UCLA Center for Lab Safety surveyed about 2,500 scientists working in research laboratories to ask about their experience with lab accidents and the cause of each. About 46% of respondents had at least one laboratory injury, while 25% of these had more than one. Hence laboratory injuries and disease are not rare. In 2016, Iowa State University (ISU) published its record of laboratory injuries for 2001-2014 with similar findings:

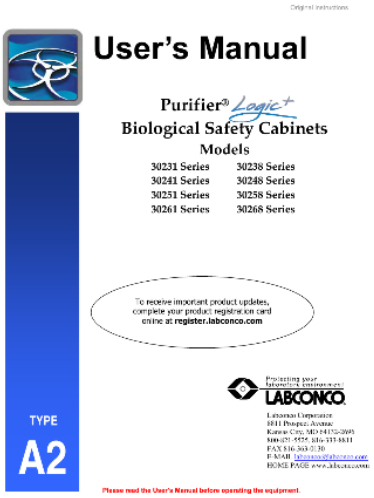
The top 10 types of injuries in order of frequency:

1. Lacerations/bites
2. Needle stick
3. Thermal burn (hot and super cold)
4. Chemical burn
5. Chemical inhalation
6. Laceration severe enough to need stitches
7. Repetitive motion injury
8. Falls due to slips or trips
9. Injuries from lifting objects
10. Bone bruise or fracture

Please take the time to think about the "rules" that have been adopted to prevent these all too common - but preventable - accidents.

More information on laboratory health and safety can be found on our website at:
https://publicsafety.tufts.edu/ehs/laboratory-safety/

Laboratory Equipment Manuals and User's Guides = Valuable Safety Tools



Many people tend to open their new electronic device and start using it immediately! Sometimes they read the quick start guide – a one to two-page document provided with a product.

That may work for a new iPhone X, but in a laboratory or clinical environment the user's guide should be thoroughly read and understood before doing so. The user's guide (also called an instruction manual, operation manual, or owner's manual) is an instructional book or booklet that is supplied with almost any piece of equipment purchased for the laboratory. They now often come on a CD-ROM or on a USB flash drive. These documents provide valuable safety information to prevent injuries to end users, damage to property, and releases to the environment, if applicable. Some of the information guidelines for hazards are obvious. An example would be don't touch the inside surface of an oven since it is hot. Others are not that obvious just by looking at a piece of equipment. For instance, certain ceramic ovens contain a warning on not to manipulate the refractory insulation.

"Many lab accidents are due improper maintenance or use of lab equipment."
-Prudent Practices in the Lab-Chemical Hazards, 2011

Helpful tips for getting the most of the User's Guide:

1) Understand the difference in the verbiage used to describe the level of hazard in guidelines:
   - The **CAUTION** symbol or notation indicates information that, if ignored, could result in minor personal injury or physical damage due to incorrect handling.
   - The **WARNING** symbol indicates information that, if ignored, could result in major personal injury or even death due to incorrect handling.
   - The **DANGER** symbol indicates information that, if ignored, will result in major personal injury or even death due to incorrect handling.
   - The **NOTICE** symbol indicated important guidelines to follow that are not hazard-related.

2) Many user's guides have an appendix for safety related information. This section may also describe and define the warning symbols on the equipment itself. Ideally user's guides will include internationally recognized ISO 7010 symbols such as the hot surface warning sign on the right.

3) Keep electronic copies of all equipment user's guides on a shared drive on your applicable network with backup on a USB thumb-drive. Tufts Environmental Health and Safety (TEHS) or a regulatory agency may ask for the user's guide when doing an incident or accident investigation.

4) Use the user's guide to confirm if particular hazards exist while using the *Experiment Hazard Assessment Tool* for a new piece of equipment or experiment. https://publicsafety.tufts.edu/ehs/tufts-university-experiment-hazard-assessment-tool/

5) When something in the user's guide is unclear, TEHS recommends contacting the manufacturer's technical support staff.

Other References:

1) **ANSI Z535.6** American National Standard for Product Safety Information in Product Manuals, Instructions

2) **ISO 7010:2011** Graphical symbols -- Safety colours and safety signs -- Registered safety signs

OSHA 1910.1450 Use of chemicals in the laboratory, AKA Chemical Hygiene

Tufts EHS has recently revised the Tufts Chemical Hygiene Plan to simplify its use by scientists in the lab and to work together with the A to Z of Laboratory Safety at Tufts University. Note that in the back of the A to Z booklet there is an Experiment Hazard Assessment Tool. This tool is intended to guide the scientist planning an experiment by identifying potential hazards and suggesting ideas to minimize or control those hazards.

For additional information please visit:
https://publicsafety.tufts.edu/ehs/a-z-guide/
https://publicsafety.tufts.edu/ehs/chemical-safety/chp/