Are You Shocked Without Safety?"

SAFE SCI: Be Protected!
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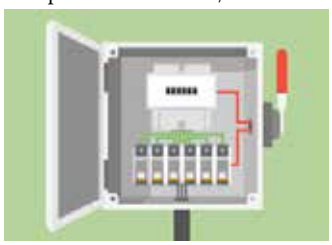
I. Potential Electrical Hazards

Science/STEM labs can be unsafe places resulting from a variety of potential hazards and resulting risks. One of the hazards that sometimes is overlooked is electricity! Use of extension cords crossing floors create tripping and shock hazards, plugs with broken grounds, strip receptacles ("Plug Mold") across the front of a chemical fume hood below the work surface, water sources and accidental spills near electrical receptacles, storage of flammables near electrical receptacles and electrical panels and more are potential issues which can lead to electrical incident in the lab. Additional electrical protocols for electrical safety in laboratory design features can be found at: https://lsdm.ucop.edu/sections/general-design-guidelines.

II What You Need To Know!

Circuit breakers protect the science/STEM labs and the rest of the school building but not the teachers or students! Breakers are designed to prevent electrical fires by tripping if too much electricity tries to flow through the circuit's wires. Too much electricity means too much resistance. Too much resistance means too much heat. Too much heat means the potential for fire!



Electric Shock Avoid the possibility of electric shock. Never use electrical equipment around water, or when the equipment is wet or your hands are wet. Be sure cords are untangled and cannot trip anyone. Disconnect the equipment when it is not in use.

The human body is a poor c[illegible] electricity. However, a wet surface and as little as 1/5-Amp can cause serious injury in the right situation to the body. The good news is teachers and students can be protected by ground fault circuit interrupters (GFCI or GFI). This device works constantly by comparing current flowing from the "Hot" wire to "Neutral" wire. If the GFCI senses an imbalance of approximately 5 milliAmps in the current flow, the switch is open and the current stops flowing in about 1/40 of a second.

There is however one flaw with this system. GFCIs if not "exercised" on a scheduled basis, may corrode and not "trip" if called on to do their task over time. Preventative maintenance is important in this situation. This can easily be done by simply flipping the breaker several times every month or two. Users of the circuit should be advised, in case computers or other technologies are being operated during the exercising of the breaker.

One other issue with GFCI systems is you never should touch both prongs on plugs being inserted into a GFCI protected electrical receptacle. There will be a shock produced! Users should understand that the GFIC does not protect the individuals from line-to-line contact hazards. This is what happens when a person holds two "hot" wires or a "hot" and a "neutral" wire at the same time. In the case of the student, he had his fingers on the metal prongs of the plug when pushing it into the wall receptacle. This constituted a line-to-line contact. Students and teachers need to be made aware of this danger in safety training workshops. Additional information on GFCI safety protocols can be found at the Lab Manager Lab Health and Safety - Ground-Fault Circuit Interrupters (GFCI) - https://www.labmanager.com/lab-health-and-safety/ground-fault-circuit-interrupters-gfci-19255.

III. Required Laboratory Electrical Protection!

Occupational Safety and Health Administration or OSHA has the electrical standard **Section 29 CFR part 1910.303(b)** which states the following: "Electrical equipment shall be free from recognized hazards that are likely to cause death or serious physical harm to employees." It is this standard that is the basis of required GFCI protection for science/STEM labs in middle and high schools. Teachers and supervisors involved with renovations or new science laboratory facilities need to insure that such protection is provided. Existing laboratory facilities should also have such protection for teachers and students.

There are three options for GFCI protection. A regular wall receptacle can be replaced with a GFCI receptacle. The second option is to install a GFCI circuit breaker in the service panel. The third option (though temporary) is a "portable" GFCI device, which can be placed between the wall receptacle and the electrical device. It plugs

receptacle. Remember however that the GFCI will only provide protection downstream from the GFCI to the end of the circuit.

IV. Is Your Lab Covered?

Do you know if your lab is GFCI protected? If not, here are a few recommendations to follow ASAP! First, the supervisor of facilities can be contacted and asked to survey the lab for GFCI protection. Secondly, hardware or electrical stores usually carry GFCI test devices for about $10.00. They are very simple to operate and a whole lab can be tested within a few minutes.

GFCI protection is a legal safety standard and must be enforced for the protection of teachers and students from being shocked or electrocuted.

Be an advocate and work with administration to bring your lab into code compliance. It is highly recommended that either the teacher, administrator or facility director check with a licensed electrician or local building inspector for applications of the National Electrical Code and OSHA standards in your school facility.

The OSHA 29 CFR Part 1910.303(b) electrical code can be found at: https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.303.

V. Final Thoughts!

Before any lab activities or demos are done, make sure you have the appropriate electrical protection in place,have inspected GFCI and electrical receptacles, and students have had appropriate training for working with electricity

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