Hazcom Standard (29 CFR 1910.1200) and OSHA Lab Standard (29 CFR 1910.1450)

- **Hazcom Standard (29 CFR 1910.1200)** - Established in the early 1980s to develop protocols for long-term exposure in chemical production workplaces.
  - Industry-wide GHS labeling of chemicals and Safety Data Sheets (SDS)
  - Ventilation protocols
  - Storage protocols

- **Lab Standard (29 CFR 1910.1450)** - Established in the early 1990s recognized laboratory workplaces where mass production does not occur. These settings, such as high school science labs often deal with a wide range of chemical exposures and physical hazards
  - The Lab Standard includes some aspects of the Hazcom Standard (ex: Industry-wide GHS labeling and SDS sheets)
  - Requires a **Chemical Hygiene Plan (CHP)**
    - Includes personal protective equipment protocols (PPE), Administrative Protocols, and Engineering protocols.
    - Requires periodic employee training in the content of the Chemical Hygiene Plan
    - Has a designated person(s) to execute all aspects of the CHP

"Connecticut High School Science Safety: Prudent Practices and Regulations." *CT.Gov*, Connecticut State Department of Education, portal.ct.gov/en/SDE/Science/Safety/Science-Safety. Accessed 9 Nov. 2023.

Chemical Hygiene Plan

- **Chemical hygiene plan** is a written program developed and implemented by an employer that sets forth procedures, safety equipment, personal protective equipment and work practices that are capable of protecting employees from the health and physical hazards in that particular workplace. In schools, employees can be faculty, staff, students, and visitors, and the workplace can be a classroom laboratory.
  - Adheres to the Hazardous Communication Standard (29 CRF 1910.1200)
  - Adheres to the Laboratory Standard (29 CFR 1910.1450)
  - Additional OSHA standards and national consensus standards relative to laboratories or laboratory equipment may also apply (**Duty or Standard of Care)**.

- The **chemical hygiene officer** provides technical support in developing, updating, and implementing the chemical hygiene plan.

"Connecticut High School Science Safety: Prudent Practices and Regulations." *CT.Gov*, Connecticut State Department of Education, portal.ct.gov/en/SDE/Science/Safety/Science-Safety. Accessed 9 Nov. 2023.

Duty or Standard of Care "Laboratory Behaviors"

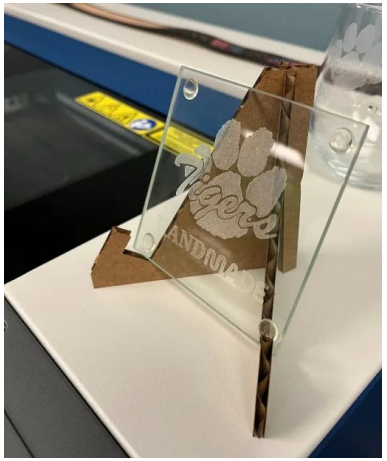
Duty or Standard of Care is defined as an obligation, recognized by law, requiring conformance to a certain standard of conduct to protect others against unreasonable risk (Prosser et al., 1984).

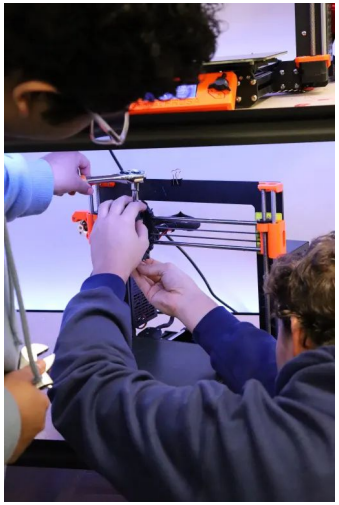
Duty of Care focuses on three overarching responsibilities on the part of the teacher and school:

- Duty of instruction
- Duty of supervision
- Duty to properly maintain facilities and equipment

Admin. "NSTA Statement on Duty or Standard of Care: Science Safety." *Science Safety | Online Science, STEAM, CTE and Lab Safety*, 20 Jan. 2023.

The FabLab



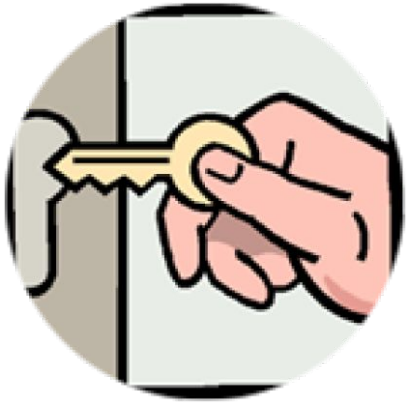


"Hand Fabrication Lab." *Madison Public Schools*, www.madison.k12.ct.us/daniel-hand-high- school/parents/ recent-news/ fabrication-lab.

- The FabLab is a small-scale digital fabrication *laboratory* that provides access to a variety of tools and machines for digital fabrication, such as 3D printers, laser cutters, and CNC mills. FabLabs are usually associated with *education* and research, and are generally perceived as limited to *mass production*.

Wikipedia contributors. "Fab lab." *Wikipedia, The Free Encyclopedia*. Wikipedia, The Free Encyclopedia, 26 Sep. 2023. Web. 10 Nov. 2023.

Additions to CHP (pp 46-47)



- **General Guidelines**
  - The Fab Lab must remain locked when not in use or no adult is present.
  - Students are not permitted in the Fab Lab without adult supervision.
  - Machine operators should avoid wearing loose fitting clothing that can drape into Fab Lab machinery.
  - Machine operators should wear impact resistant (ANSI Z87+) rated goggles as recommended in Appendix E, or in the machine's operating manual.

- **General Machine Operation Guidelines**
  - Students must only operate machinery in the presence of an adult who understands the operational procedures, shutdown procedures, and risks of the specific machine.
  - Before running any machine, ensure that it is in proper working order.
  - Before running any machine, ensure that the emergency response equipment is present and ready to use. (ex: the Halotron fire extinguisher when using the laser)

Additions to CHP (pp 46-47)

>Safety Considerations for the Operation of Specific Machines / Tools:

- **60W Fusion Edge 12”x24” || laser cutter/engraver**
  - Laser unit must have one of two venting methods active during operation:
    - Self-contained air filtration unit that meets or exceeds the manufacturer specifications, with replaceable filters (changed as required)
    - Venting through dedicated ductwork that moves all smoke and off-gassing directly outside of the building. This system should meet or exceed the minimum cubic feet per minute in the laser manufacturer’s specifications.

Filter

Additions to CHP (pp 46-47)

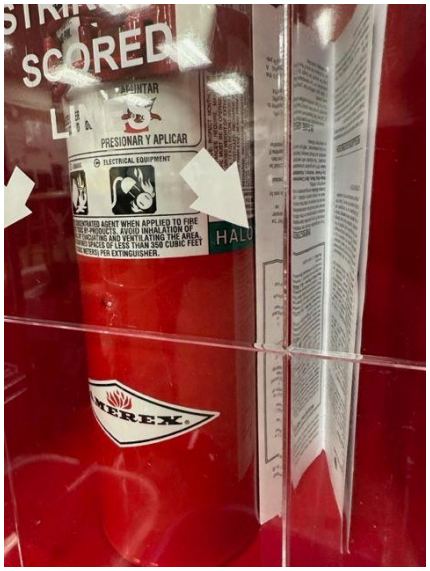
- **60W Fusion Edge 12”x24” || laser cutter/engraver**
  - A fire extinguisher (Halotron type) for use with the laser should be accessible within 30 feet of the laser
    - Users should be within 10 feet, and line-of-sight of the laser during the entire operation of the engraving / cut
    - Regular replacement and/or maintenance of the laser’s lens should be followed

Type of Fire Extinguishers

SAFETYNOTES.IN
SAFETY RULES ARE YOUR BEST TOOLS

Fire Extinguisher Type

Fire Type		Powder	Foam	CO^2	Water	Wet Chemical
CLASS A	Solids (e.g. wood, plastic, paper)	✓	✓	✗	✓	✗
CLASS B	Flammable Liquids (e.g. solvents, paint, fuels)	✓	✓	✓	✗	✗
CLASS C	Gases (e.g. butane, propane, LPG)	✓	✗	✗	✗	✗
CLASS D	Metals (e.g. lithium, magnesium)	✓	✗	✗	✗	✗
ELECTRICAL	Equipment (e.g. computers, servers, TVs)	✓	✗	✓	✗	✗
CLASS F	Cooking Oils (e.g. cooking fat, olive oil)	✗	✗	✗	✗	✓



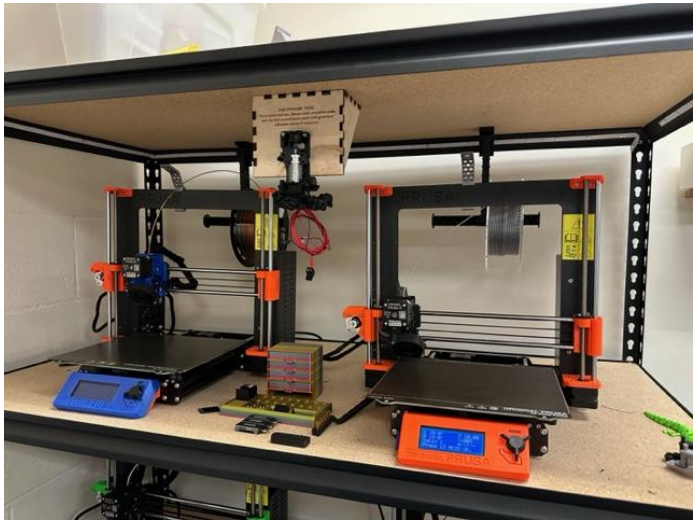
Halotron is a dry agent that leaves no residue after application, and consequently inflicts little to no collateral damage on equipment in the vicinity of the fire.

Additions to CHP (pp 46-47)

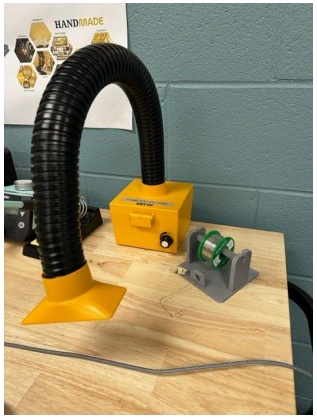
- **Carbide3D ‘Nomad3’ || desktop CNC**
  - Users should be within 10 feet, and line-of-sight of the enclosed cutting tool during the entire operation of the engraving or cut
  - As an added measure, users are encouraged to wear ANSI Z87+ rated impact resistant goggles during the operation of the cutting tool
  - The power shut-off button should be clearly labeled on the machine
  - A sharps container must be mounted nearby to accommodate broken endmills

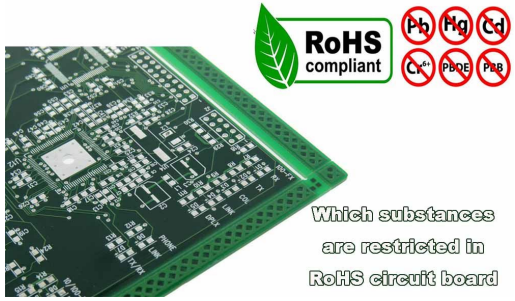
Additions to CHP (pp 46-47)

- **Prusa i3 MK3S+ || 3D printer**
  - 3D printers must have thermal runaway protection enabled at all times (often the default in firmware)
  - Temperature sensor failures require a replacement sensor part that is shown to work before 3D printer can resume unattended printing operation
  - Only Polylactic Acid (PLA) filament will be supplied for use. PLA filament is a recyclable, natural thermoplastic that is derived from renewable resources such as corn starch or sugar cane. It is particularly safe and its use and temperature profiles are well suited for classroom applications.



Additions to CHP (pp 46-47)





- **Weller WE1010NA Digital Soldering Station & simple soldering pens || soldering iron**
  - Only lead-free solder is permitted for use in the school. No exceptions.
  - Restriction of Hazardous Substances (RoHS), focuses on six specific materials that should no longer be used, or should have limited use in printed circuit boards. RoHS compliant circuit boards are important because the products that use these materials will likely end up in a landfill or other trash reclamation process. The six specific materials include lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenylether.
  - A simple solder smoke absorber should be located on the desk with the soldering station, nearby and powered on at all times soldering is happening on the desk.
  - A heat-resistant, antistatic mat to protect static sensitive components from electrostatic discharge (ESD) is required at the soldering station.