

FABLAB SAFETY

SAFETY GUIDELINES OF
FABLAB SEOUL

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FAB LAB SAFETY MANUAL

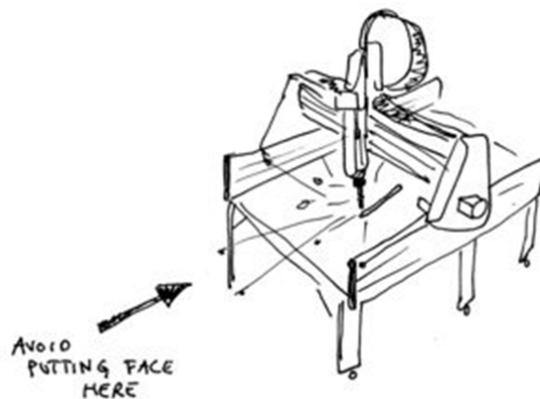
In general, fablabs are safe, fun places. However, there are certain safety precautions that should be taken when handling fast, loud, hot, corrosive and otherwise dangerous things.

In this manual, you will find general information about staying safe in a fablab, including common accidents and dangers to watch out for, as well as some basic first-response information.

NOISE EXPOSURE

Milling machines, dust collectors and other machines found in the fablab **can be really loud**. If you have to shout to a colleague who is less than 2 meters away, or if you hear ringing in your ears/ experience temporary hearing loss after leaving the fablab, **you are experiencing preventable hearing damage**.

Sound insulation in the fablab (like giving machines rubber feet, putting machines in separate spaces) is a preferred solution. However, sometimes it is unavoidable to be in the same space as a loud machine. In that case, you should wear ear protection-- ear muffs or ear plugs.



SAFETY GLASSES

A broken bit can fly off the bed as fast as a bullet!



When using milling machines, chemicals, soldering irons and the like, ALWAYS WEAR SAFETY GLASSES. Even if you are wearing safety glasses, keep in mind they are not indestructible, nor do they fully seal your eye socket from the

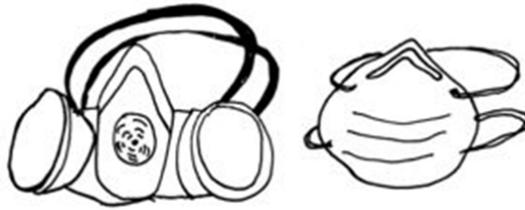
outside. You should avoid things like being eye-level with a spinning bit or flying sparks.

RESPIRATORY PROTECTION

Particles and fumes can disrupt our respiratory system, with particles getting lodged in our lungs or fumes causing allergic reactions. To keep the air quality at acceptable levels in fablabs, precautions can be taken to initially contain air contaminants, and personal protection devices (air-purifying respirators) can be worn to protect from air contaminants that cannot be immediately removed.

Note that not all air-purifying respirators protect from both fumes and particles - most only protect from particles.

For the ShopBot and Modela, the amount of dust generated can be contained with an enclosure around the machine, as well as a vacuum system.



Different types of respirators

Some types of dust are worse than others-- fiberglass and carbon fiber dust can cause long-term respiratory damage.

Note that although the circuit boards that we have to mill in fablabs do not have fiberglass in them like other circuit boards, but they are still an epoxy-based plastic and the dust created from milling them is toxic.

All epoxy glues and casting resins should come with a Material Safety Data Sheet (MSDS) that alerts you to the dangers of working with that substance. Some plastics only require basic ventilation, others require fully ventilated hoods. Constant exposure to epoxies and urethanes leads to sensitization and eventually acute allergic reactions, so be aware when MSDSs warn about 'prolonged exposure'.

For laser cutting polymers, here is a good guide: [Identification of Polymers \(by David A. Katz\)](#)

3D printing based on heated thermoplastic extrusion and deposition (PLA or ABS) has been found to increase the ultrafine particle (UFP) concentrations (nano particles) by a factor 1 to 4 for PLA (2 printers operating) and 9 to 56 for a setting with 2 PLA printers and 3 ABS printers in the same room (<http://www.sciencedirect.com/science/article/pii/S1352231013005086>) compared to the base rate with no printers operating.

SKIN PROTECTION



You never know how a chemical might react with your body. Be careful!

When dealing with chemical substances, always wear gloves. Glues and casting resins are not only difficult to wash off, they contain molecules that can closely mimic human hormones and disrupt your endocrine signaling system. These problems may only become apparent years later, or even manifest in your offspring. If you get chemicals on any other part of your body, wash immediately according to the instructions in the material safety data sheet (MSDS).

Similarly, certain types of dust can be irritants to your skin, and appropriate protection should be worn when sanding or otherwise dealing with dust.

HOT THINGS ARE HOT

There are many hot things in fablabs-- soldering irons, ovens, heat guns. When someone burns themselves, cool the affected skin ***AS FAST AS POSSIBLE***. If the heat has to dissipate into the surrounding flesh, it will cook more of the body.

HOT THINGS LEAD TO FIRES

On putting out small fires in fablabs: there are fire extinguishers available especially for electronics. These have non-conductive extinguishing substances, so that after the fire is out, you can still use electrical equipment that is undamaged.

Soldering irons and ovens: Turn off soldering irons and ovens if you leave! Besides being a fire hazard, leaving the soldering iron on with no solder on the tip will oxidize the tip and make it harder to solder with in the future.

LASER CUTTER

Never leave the laser cutter while it is running.

If you must be in another room, make a video-link to monitor the bed. Once fires start, they can quickly go out of control.

If your material is burning too much in the laser cutter, try increasing the speed and/or lowering the power. If you cannot cut all the way through at a higher speed, try increasing the PPI or cutting in two passes.

It is very very easy to start a fire in the laser cutter



SHOPBOT

On the ShopBot fires can start due to dull end-mills or too-high spindle speeds. Make sure your end-mills are sharp and your cuts are not leaving behind charred or discolored edges.

Friction can also be reduced by reducing the cutting depth (increasing the number of passes) or reducing the number of cutting flutes on the end-mill (i.e. a 2-flute end mill instead of a 4-flute).

Once a fire starts on the ShopBot bed, it quickly jumps to the dust collector due to embers being vacuumed up. Sawdust is extremely flammable and can make a big fireball out of your fablab.

BAD! Never leave the ShopBot while it is running for these reasons.

Other: Electrical fires due to overloading extension cords (daisy-chaining) or damaged wires can occur even when you are not actively using anything in your lab. Make sure your machines are plugged into outlets that are rated for the power consumption of your machine. Keep all machines on surge protectors to make sure they are not damaged in lightening storms or other electrical crazines

Even with the vinylcutter, only one person at a time!



GENERAL SAFETY

Many accidents occur because two people are using the same machine at the same time. Do not put your hands near the tool path unless you are sure that the machine is not going to move!

THROWING THINGS AWAY IN A FAB LAB:

Many casting resins, paints, batteries and other chemicals should be thrown away as special chemical trash. Also electronics are often considered dangerous trash.