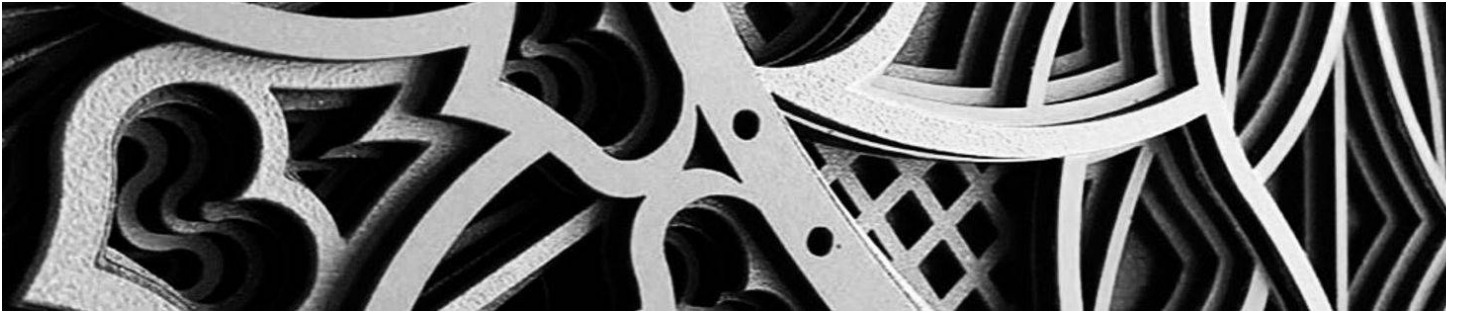


nontoxicprint

Health in the Arts

LASER-CUTTING-SAFETY 3D PRINTING



a burnt out laser cutter
(Boise State University)

<https://www.boisestate.edu/coen-mbe/2021/03/11/cool-heads-contain-eis-fire/>

excerpt from the incident report:

"A fire started in the bed of the laser cutter that operates in the welding room and was cutting plastic at the time. The alarms went off, the sprinkler above the machine kicked in and the student employees in the studio responded properly and efficiently. After an attempt to put out the fire themselves (3 extinguishers worth), they vacated the building. The fire department arrived, quickly stopped the fire, and turned off the sprinkler. The state fire marshal is investigating, but it seems that the scrap material collected under the cutting bed of the machine caught fire."

Laser Cutting Safety



Laser Cutters in Art and Craft Making

Uses and Safety

Laser cutting machines have been used in industry and in research for decades, but until recently the technology was unavailable for popular use.

Rapid new developments that occurred over the past ten years quickly changed this, and propelled the technology from a specialist niche market into one of the

most commonly used making and fabrication technologies.

Everyone is now familiar with the look of precision cut shapes and repeat patterns in acrylic or wooden craft objects or furniture items such as lamps or ornaments.

Many items that would previously have been hand cut with electric wood or metal working saws are now made with laser cutting machines instead, and the robotic methods are quickly gaining larger shares of the fabrication market.

Laser cutting is now a huge global enterprise, and increasingly hobbyists, private artists, as well as art schools operate laser cutting machines. While even a few years ago machines cost over 10000 dollars, now just a few hundred dollars can buy a basic laser cutting setup.

But is the process safe?

Compared to many other forms of making, machining, and material shaping, laser cutting needs to be regarded as intrinsically UNSAFE.

The fact that a laser generated energy stream is used to burn away ('vaporize') material in order to shape objects is at the heart of a high risk process.

The internet is full of reports of burnt out laser cutting machines and problems with materials catching fire during regular use, and it is likely that frequently this equipment leads to larger fires in studios or making facilities.

Below are basic recommendations for how to minimize the risks in operating these machines:

- never come into eye contact with the laser energy source, as this could result in eye damage.
- always place a fire extinguisher right next to the laser cutting equipment
- if possible use equipment that has a air or nitrogen stream 'fan assisted' cutting laser, as the method reduces the fire risk and results in cleaner cuts. (e.g. cheaper machines may be more unsafe)
- venting (and filtration) of cutting fumes and burnt particles is of great importance to safeguard against toxic fume exposures
- laser cutters typically emit carbon monoxide, formaldehyde, acids, toxic monomers, or heavy metals
- ensure only manufacturers recommended materials are cut
- materials deemed as 'safe' for cutting on most types of machine are typically limited to:
 - acrylic sheeting
 - plywood
 - paper and card
 - MDF sheets
- the use of other types of material can cause very hazardous fume emissions, cause fires more easily, and is likely to quickly damage the electronics, mechanics or optics of the equipment.
- in any case, some form of VOC emissions (also chlorine or metal fumes) are likely in any laser cutting process, so even with extraction systems users should consider wearing organic vapor mask or respirator while equipment is working, and good ventilation and air flow in the work space is essential.

Certain types of plastic such as PETG sheeting is often mistaken for pure acrylic sheeting! This material cuts badly, and can destroy a machine.

This usually happens when power settings are set too high and the laser cuts through the material and then concentrates on the case bottom. The easiest way to ensure fire or melting never happens is to always attend jobs while

A NIOSH / CDC study found ethyl acrylate vapors in excess of 10 times the safe limit when laser cutting plexiglass sheets.

"The qualitative samples collected for organic vapor analysis identified ethyl acrylate as the major component produced during laser cutting of four types of plastics. Significant levels of ethyl acrylate were detected when cutting plexiglass, acrylic, and lucite. Short-term area sampling results for ethyl acrylate ranged in concentrations from non-detectable to 149 ppm. These results are above the OSHA short-term exposure limit of 25 ppm. Two long-term area samples (two hours) detected 0.4 to 1.0 ppm of ethyl acrylate. NIOSH considers ethyl acrylate to be a potential carcinogen and recommends workplace exposure be reduced to the lowest feasible level."

NIOSH INVESTIGATORS:

E. Moss, A. Fleeger

[click here for the full CDC report:](#)

PHOTON DYNAMICS

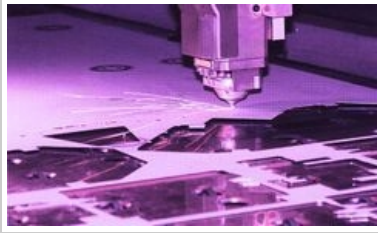


basic laser cutters can be purchased for a few hundred dollars.

the laser is on. If an operator needs to take a break from monitoring a job, always have another operator to take their place. Of course, it goes without saying that all workshops must always have properly inspected fire extinguishers within easy access.

<https://fslaser.com/blog/five-safety-tips-for-laser-cutters/>

There are many reports of laser cutting machines that catch on fire when left unattended. It is crucial that anyone operating a laser cutter is present throughout the entire cutting process, as fires can develop unexpectedly and at any time. This may be due to imperfections in material, hot studio conditions, faulty mechanics, stuck lasers that focus energy on one spot, or finished projects causing the laser to cut into the casing of the machine. etc.



material is vaporized in controlled ways by high energy laser light

Many of you have probably heard that we had a fire in the Engineering Innovation Studio last week. The good news is that no one was hurt and the damage was contained. A fire started in the bed of the laser cutter that operates in the welding room and was cutting plastic at the time. The alarms went off, the sprinkler above the machine kicked in and the student employees in the studio responded properly and efficiently. After an attempt to put out the fire themselves (3 extinguishers worth), they vacated the building. The fire department arrived, quickly stopped the fire, and turned off the sprinkler. The state fire marshal is investigating, but it seems that the scrap material collected under the cutting bed of the machine caught fire.