Laser Cutter Safety

Introduction

LASER cutting devices are very versatile tools that can be used to cut or drill wood, plastics, and metals. These devices are often very economical, efficient and can easily be automated. Due to these features, these devices have found their way to campus and before purchasing this type of equipment, there are some things to consider.

Laser Hazard Classification

Typically, LASER cutters are classified by the American National Standards Institute (ANSI) as Class 1 LASERs. Class 1 LASERs emit low levels of energy that are not hazardous to the eyes or skin. However, enclosed within these devices are often Class 3B or 4 LASERs, which are capable of emitting high levels of energy, and are hazardous to the eyes and skin. Therefore, the beams generated by these devices are safe when operated according to manufacturer’s instructions, but only trained personnel should perform maintenance and other procedures that involve breaching the enclosure.

Laser Generated Air Contaminants (LGAC)

While LASER cutters typically pose little hazard from the beam itself, these devices can pose a hazard when the beam is used to cut or drill certain metals, plastics, and other materials. As the beam strikes these materials, there is potential to produce Laser-Generated Air Contaminants (LGAC). These contaminants may be gaseous or particulate and can, under certain conditions, pose health risks to those exposed to them. The contaminant generated will depend on the type of material that is being cut or drilled. Cutting or drilling of some materials can generate airborne benzene, toluene, hydrochloric acid, isocyanates and other by-products, which may be hazardous.

Filtration and Ventilation Requirements

To control the LASER-generated air contaminants associated with cutting or drilling certain metals, plastics, and other materials, filtration and/or exhaust systems must be used to reduce or eliminate personnel exposures. In addition to reducing or eliminating personnel exposures, proper removal of contaminants is essential to ensure a properly functioning LASER cutter, as well as producing a quality product.

The choice of whether to use filtration or exhaust systems will be specified by the manufacturer and these specifications should be followed. A summary of filtration and exhaust systems is highlighted below:

Filtration Systems
- Air from the LASER cutter is passed through one or more filters.
- Contaminants filtered will depend on what types of filters are used
  - High Efficiency Particulate Air (HEPA) filters are used to filter out dust and metal fumes.
  - Charcoal filters are used to filter out chemical gases and vapors.
- Filters must be changed according to frequency of use and/or as specified by the manufacturer.
- Filters can be safety disposed of via ordinary trash.

Exhaust Systems
- Air from the LASER cutter is exhausted via duct work outside of the building through the use of a blower.
- Exhaust systems must be installed by an HVAC professional. Contact FMS at 8-2910 for more information.
- Exhaust systems must be cleaned and maintained as specified by the manufacturer.
Fire Hazards

In addition to LGAC, LASER cutters also pose a fire hazard. LASER cutters use a high intensity beam of LASER light that can produce extremely high temperatures as it comes into contact with the materials it is engraving, marking or cutting. To further increase risk, some of the materials used in the LASER cutter are flammable and can ignite inside the cutter. The following tips will help reduce fire hazards when using LASER cutters:

- **NEVER** operate the system unattended.
- Always keep the area around the cutter free of debris, clutter and flammable materials.
- Always keep a properly maintained and inspected fire extinguisher in the area. Typically, Carbon Dioxide (CO2) chemical fire extinguishers should be used.
- Always use the “air assist” feature when vector cutting.
- Keep the interior of the laser cutter, including the table tray, clean and free of debris. To clean the table tray, remove the vector grid and clean out the tray using a cloth, small brush or vacuum cleaner.
- Ensure your filtration or exhaust systems are properly cleaned and maintained.

**TRAINING**

All users of LASER cutter systems should be trained as to its use and how to use it safely. In addition, written procedures should be present and reviewed by users prior to use. These procedures should include steps to take in the event of fire or other emergency. Fire extinguisher training is also required. Please visit: [http://www.cmu.edu/ehs/training/index.html](http://www.cmu.edu/ehs/training/index.html) to complete this training. Finally, the LASER cutter manual should be read and understood prior to use.

**LASER REGISTRATION**

LASER cutters must be registered with EH&S upon purchase. To register your laser, please visit: [http://www.cmu.edu/ehs/radiological/laser-safety.html](http://www.cmu.edu/ehs/radiological/laser-safety.html) or contact Andrew Lawson at alawson@andrew.cmu.edu or at 8-8405.

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