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Standard Operating Procedure

LASER CUTTER

DO NOT use this machine unless you have been instructed in its safe use and operation and have been given permission

Personal Protective Equipment and Clothing

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|  Safety glasses must be worn at all times when opening or closing the laser. |  Long and loose hair must be contained. |  Respiratory protection must be used when excessive fumes are produced. |
|  Sturdy footwear should be worn when handling heavy materials. |  Long sleeves should be rolled up to prevent catches on laser mechanism. |  Hearing protection may be worn to reduce fatigue during long jobs. |

Read all safety warnings and all instructions. Failure to follow the warnings and instructions may result in cuts, burns, electric shock, fire and/or serious injury. Refer to this guidance before each use of the Laser Cutter and use them to instruct others who may use this machine. As a MakerSpace we put safety and sharing at the top of our priority list.

All users must sign in the date and time they start using the machine using the “Machine Use Logbook” located in the Machinery Document Index.

WORK AREA SAFETY

- ✓ Keep work area clean and well lit. Cluttered or dark areas can lead to accidents.
- ✓ Do not operate the Laser Cutter in explosive atmospheres, such as in the presence of flammable liquids, gases or dust.
- ✓ The Laser Cutter produces heat and sparks which may ignite the dust or fumes.
- ✓ Children under the age of 18 must not be permitted to operate the Laser Cutter – They may observe a responsible adult who has received the appropriate training and induction and help with the pre/post processing work. They **MUST NOT** be permitted to activate the laser, adjust settings or open/close the hood.

ELECTRICAL SAFETY

- ✓ Only use the supplied power supply to power the Laser Cutter.
- ✓ Never operate the Laser Cutter if the wiring appears to be damaged in any way.
- ✓ If wiring is damaged or loose report it to a Lead Maker immediately, hang an “Out of Use” sign on the machine, remove the power cord.
- ✓ Do not use any adapter plugs with earthed (grounded) power tools.
- ✓ Unmodified plugs and matching outlets will reduce risk of electric shock.
- ✓ Avoid body contact with earthed or grounded surfaces such as pipes, metal benches and metal surfaces.
- ✓ There is an increased risk of electric shock if your body is earthed or grounded.
- ✓ Do not expose the Laser Cutter to wet conditions. Water entering the Laser Cutter will increase the risk of electric shock.
- ✓ Do not abuse the cord. Keep cord away from heat, oil, sharp edges or moving parts. Damaged or entangled cords increase the risk of electric shock and fire.

PERSONAL SAFETY

- ✓ Stay alert, watch what you are doing and use common sense when operating the Laser Cutter.
- ✓ Do not use the Laser Cutter while you are tired or under the influence of drugs, alcohol or medication. A moment of inattention while operating the Laser Cutter may result in serious personal injury.
- ✓ Prevent unintentional starting. Ensure the switch is in the off-position before connecting to power source.
- ✓ Dress properly. Do not wear loose clothing or jewellery. Keep hair, clothing and gloves away from moving parts. Loose clothes, jewellery or long hair can be caught in moving parts.
- ✓ Use protective equipment while operating the Laser Cutter. Always wear the appropriate dust mask, safety glasses and other recommended PPE (See above and signs on the Laser Cutter).
- ✓ Keep hands clear of pinch points when opening and closing the front cover of the Laser Cutter. Also keep hands clear of pinch points within the chamber when adjusting the X, Y and Z axis with the hood open – no hands in chamber during adjustments.

DO NOT ACCESS ANY COVERS, DOORS OR SIDE PANELS ON THE LASER CUTTER. FAILURE TO FOLLOW THIS RULE MAY RESULT IN SERIOUS INJURY OR DEATH FROM HIGH VOLTAGE ELECTRICITY AND WILL RESULT IN A SUSPENSION OF YOUR USER RIGHTS.

THE LASER CUTTER USE AND CARE

- ✓ Do not use the Laser Cutter if the switch does not turn it on and off. Any tool that cannot be controlled with the switch is dangerous and must be repaired.
- ✓ When the Laser Cutter is not in use turn the key switch to the off position and return the key to the Members Safe.
- ✓ Junior members should not be left unsupervised in the Laser Cutter room.
- ✓ Do not allow members who you believe to be unfamiliar with the Laser Cutter and these instructions to operate the machine. The Laser Cutter could be dangerous in the hands of untrained users.

MAINTAIN THE LASER CUTTER

- ✓ Check for misalignment or binding of moving parts, breakage of parts and any other condition that may affect the Laser Cutter's operation. If damaged, have the Laser Cutter repaired before use.
- ✓ Check the mirrors to ensure they are clean and free from dust and smoke build-up.
- ✓ Use the Laser Cutter, water chiller and clean air system in accordance with these instructions, taking into account the working conditions and the work to be performed. Use of the Laser Cutter for operations different from those intended could result in a hazardous situation.

PREOPERATIONAL SAFETY CHECKS

1. Ensure that risk assessment has been read. This can be found in the Laser Cutter Document Pack in the Machinery Document Index.
2. Ensure no slip/trip hazards are present in workspaces and walkways.
3. Locate and ensure you are familiar with the operation of the lockable ON/OFF starter and E-Stop.
4. Keep machine & room clean, free of clutter, combustibles, explosives, or volatile solvents.
5. Always keep a maintained & inspected CO2 Fire Extinguisher at hand.
6. Ensure air assist is switched on.
7. Ensure exhaust is switched on.
8. Always ensure that the water chiller is switched on.
9. Check that the nozzle, auto focus probe and mirrors have no build-up of material on them.
10. Faulty equipment must not be used. Immediately report suspect machinery to workshop staff or Lead Makers.

OPERATION

- ✓ Children under the age of 18 must be supervised by an adult while operating the Laser Cutter.
- ✓ Never operate if there is any damage of incorrect alignment, settings or assembly evident on the Laser Cutter. Doing so may result in injury.
- ✓ Never attempt to bypass the hood interlock switch. This WILL result in you being banned from use of the Laser Cutter and possibly the MakerSpace as a whole.
- ✓ Always check to ensure clearance of the platform (including any grids or materials) when adjusting the vertical axis. Materials that overhang/undercut the frame of the internal chamber may jam the moving platform and result in misalignment and/or damaged drive motors/mechanism.
- ✓ Never operate without using the main extraction system or localised extraction.
- ✓ Never attempt to cut magnesium or any other flammable material.
- ✓ Never attempt to cut vinyl materials. Investigate their composition and confirm that they are safe for your use before trying to use them with the Laser Cutter.
- ✓ Do not use the Laser Cutter with liquid materials or any materials that contain liquids. Explosions or serious injury can result.

OPERATIONAL SAFETY CHECKS

In case of fire, push E-Stop

1. Never leave the laser system unsupervised when in operation.
2. Observe the general cutting machine safety operation, start the laser machine strictly in accordance with the set-up procedure.
3. Ensure that the top cover/lid is closed whilst machine is operating.
4. When operating the laser follow specific laser guidelines.
5. Always monitor cutting during operation.
6. Always use Air assist.
7. Only cut the following PERMISSIBLE MATERIALS – Organic based, wood, plywood, paper, cardboard, leather, acrylic PMMA.

If you are unsure if a material is suitable for laser cutting – DO NOT PROCEED

CLEAN-UP AND COMPLETION

- ✓ All dust, offcuts and smoke build-up must be removed from the Laser Cutter before leaving the machine.
- ✓ All tooling, accessories, fixtures and jigs must be returned to their storage location.
- ✓ The origin for the Laser Cutter should be reset to the top right corner of the bed which should be set level with the main chamber frame.
- ✓ The dust extractor hose should be checked for blockages.
- ✓ Any faults, broken tooling or other issues should be recorded in the "Laser Cutter Log Book" located in the Machinery Document Index.

POTENTIAL HAZARDS

- ✓ Crush and Pinch
- ✓ Fire
- ✓ Radiation burns to eyes or body
- ✓ Fumes and/or Smoke

FORBIDDEN

- ✓ Cutting NON-PERMISSIBLE MATERIALS including - Polypropylene, polyethylene, polycarbonate, polystyrene, PVC, nylon, PVDF, ECTFE, PFA, FEP, PTFE, glass fibre or any reflective materials
- ✓ Removal or modification of safety devices
- ✓ Distracting operator
- ✓ Altering the safety constraints of the laser

All users must sign out with the date and time after finishing their use of the machine using the “Laser Cutter Logbook” located in the Machinery Document Index. Ensure that you record the condition of the machine before and after use – failure to do so may result in you being held accountable for any damage caused by a previous user.

This Standard Operating Procedure does not necessarily cover all possible hazards associated with this equipment and should be used in conjunction with other references. It is designed as a guide to be used to compliment training and as a reminder to users prior to equipment use. Users acknowledge that improper use of equipment increases their risk of harm and that this is a decision they make. Anyone found to be using equipment incorrectly will have their usage rights removed pending a re-induction on the safe use of the equipment; this may incur a charge of £10 for each induction.

A*	<i>For use by Lead Makers and trained staff only. Use by anyone else is strictly prohibited.</i>	A	<i>For use by adult members (18+) who have received and signed the specific induction package. No Lone Working.</i>
B	<i>For use by adult members (16+) who have received and signed the specific induction package. Lone Working Permitted.</i>	C	<i>For use by all members (6+) under the supervision of adult members/Lead Makers who have received and signed the specific induction package. Adult Lone Working Permitted</i>