 <p>SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING</p>	<h2 style="text-align: center;">Standard Operating Procedure (SOP)</h2>	
SOP Title: Laser Cutter		
SOP Number: SEEE_015		
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Approved by: Prof. Michael Conlon	Job Title: Head Of School	
Version: 2.1	Date: 29-4-2019	Page 1 of 9

- **PURPOSE**

The laser cutter is to be used for the cutting of materials for academic or research purposes for the staff or students of the School of Electrical and Electronic Engineering.

- **SCOPE**

The Epilog Laser Cutter should be operated only by trained personnel who have read this SOP. The risk assessment and manufacturer's manual are also available locally and trained operators should also make themselves familiar with the contents of same. The overall risk of injury to the user is low once all control measures are implemented, but incorrect operation of the machine may result in damage to the machine which could be prohibitively expensive to repair.

This SOP is compiled with the best and most up to date information available at the time of writing. It is the responsibility of the user to update themselves with the best and most up to date information at the time of use of the device.

- **DEFINITIONS**

The laser cutter refers to the Epilog Laser Cutter

LEV refers to Local Exhaust Ventilation

- **RESPONSIBILITIES**

The technical staff member with responsibility for KE5-11 is responsible for performing or organising the maintenance and upkeep required to ensure the laser cutter is working properly and safely. This maintenance should be logged and a record kept of it.

It is the responsibility of the user that the laser cutter is not left unattended during the cutting / engraving process and to tidy up after they are finished and leave the area as they would hope to find it.

Only staff who have read this SOP and have received training in the use of the laser cutter may operate it. Should a person not feel suitable trained or experienced, it is their responsibility to seek out the technical staff member with responsibility for KE5-11 and a working solution should be found.

It is the responsibility of the technical staff member with responsibility for KE5-11 for the training of the persons who intend to use the laser cutter. This training should be logged and a record kept of it.

The technical staff member who has responsibility for room KE5-11 is Mr. Finbarr O'Meara.

- **HEALTH & SAFETY PRECAUTIONS**

- It is imperative that the laser cutter is not left unattended throughout the cutting / engraving process in order to avoid breakout of fire.
- Users must sign in before they begin to use the laser cutter and out when they are finished in the diary provided.
- It is intended that the laser cutter is only to be used for the cutting, scoring and engraving of acrylic, anodised aluminium, cardboard and wood. Any other materials should be individually risk assessed. Under no circumstances should materials containing chlorine be cut or engraved in the laser cutter. Doing so may result in the release of toxic fumes and severe corrosion or other damage to the equipment. These are: PVC, vinyl, polycarbonate (PC, Lexan), glass, fibreglass, printed circuit board, carbon fibre.
- Before turning on the laser cutter, ensure the fire extinguisher, phone and first aid kit are present and up to date.
- During operation, the laser cutter must be attended at all times by a trained operator.
- The immediate vicinity of the laser cutter should be free of clutter and free of all flammable materials.

- The inside of the laser cutter should be cleared of debris on each use to prevent build-up of waste material, which might otherwise pose a fire hazard.
- Air assist should always be used during cutting to cool the material close to the laser.
- Do not disassemble the laser cutter or remove any of its protective covers while the unit is plugged in.
- Do not attempt to defeat the door interlocks.
- Do not view directly into the beam of the laser diode pointer (red dot pointer).
- Do not operate the laser diode pointer (red dot pointer) without the machine's focus lens in place. If the unfocused beam strikes a reflective surface, it could be directed out of the cabinet.
- Ensure the cooling vents or fans are not blocked or impeded.
- The provided ear protectors and goggles should be used at all times while the laser cutter is in operation. Each trained up user of the laser cutter shall have their own set of ear protectors and goggles kept in Room KE5-11.
- Keep the room door closed during operation to contain noise so as not to effect adjacent offices.
- Once the job is complete, wait for a minimum of 5 minutes with the lid closed and the LEV unit running. Opening the lid before the air within the machine has been sufficiently extracted and filtered could release airborne particles/contaminants into the room.
- The maximum weight of materials to be carried up the stairs by one person is 10KG.
- If materials weighing more need to be carried, team lifting should be employed.
- Staff carrying materials up the stairs must have an up to date manual lifting certificate.
- Staff operating the laser cutter must have an up to date certificate in emergency first-aid training and emergency response training
- **MATERIALS**
 - Materials suitable for cutting, scoring and engraving: wood (cherry, alder, walnut), acrylic, alumamark, anodised aluminium, painted brass, marbleised painted brass, corian or avonite, Delrin seals, glass, laserable plastic, leather, marble, mat board, melamine, stainless steel with cerdec coating, rubber and rubber stamps.

- Materials not suitable for cutting or engraving: Any materials containing chlorine, PVC, vinyl, polycarbonate, fibreglass, carbon fibre, printed circuit board.

- **PROCEDURE**

- Obtain the key for the room and the LEV control panel from the technical staff member with responsibility for KE5-11.
- The immediate vicinity of the laser cutter should be uncluttered and free of any flammable materials.
- The fire extinguisher, phone and first aid kit should be present and up to date.
- On the LEV control panel, insert key and turn, then press <Start>. As the sockets that the laser cutter is plugged into are interlocked to the LEV, the laser cutter will power on when the LEV is running fast enough. The laser cutter will beep when it is initialised.



LEV Control Panel

- Ensure that the air assist pump has come on.



Air Assist Compressor

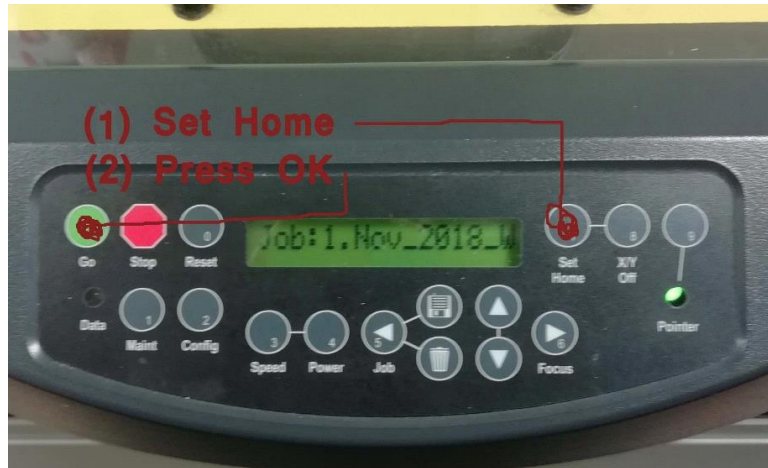
- Switch on and log onto the PC.
- Lay the material to be cut or engraved flat in the bottom left hand corner on the honeycomb bed of the laser cutter and close the lid of the machine.
- Set the laser cutter's carriage at the start position. To do this, press the <X/Y off> button. Then press <OK>:



Laser Cutter Control Panel

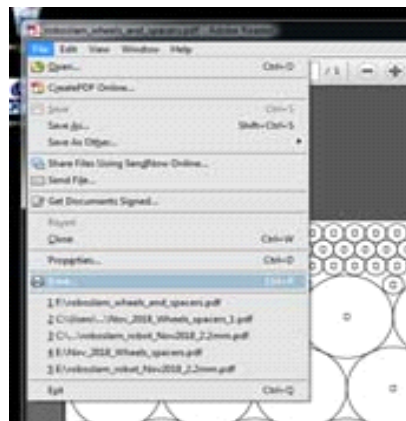
Manually move the laser cutter's carriage to the back-left position as a start point to start cutting.

Press the <Set Home> button and then press <OK>:



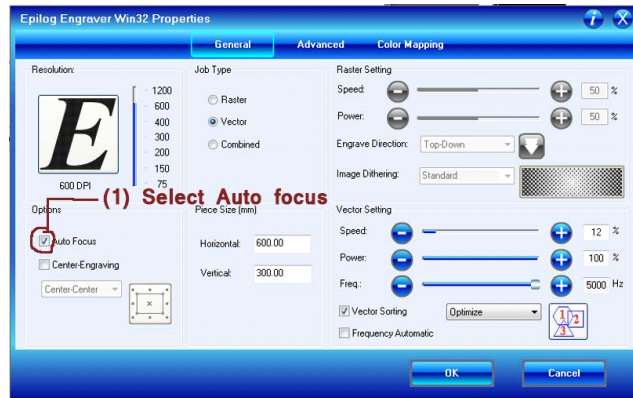
Laser Cutter Control Panel

- On the PC, open the file to be cut or engraved in the appropriate application (e.g. Adobe Reader, Corel Draw, etc.).
- From the <File> menu of the application, select <Print> and ensure that the selected printer is “Epilog Engraver Win32”.



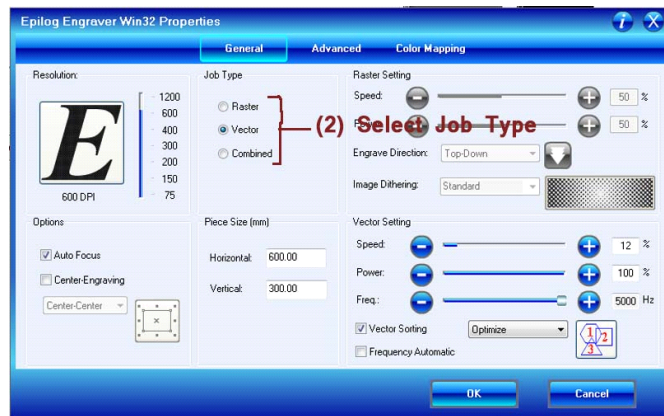
Adobe Acrobat File Menu

- Click <Properties> to open the Epilog Dashboard dialog box to configure the power and speed settings for the laser cutter. Appropriate power and speed settings for different materials are provided on the last page of this SOP.
- Ensure that the <Auto-Focus> check box is ticked. Failure to tick this box may result in damage to the laser cutter if the moving carriage collides with the material being cut or engraved.



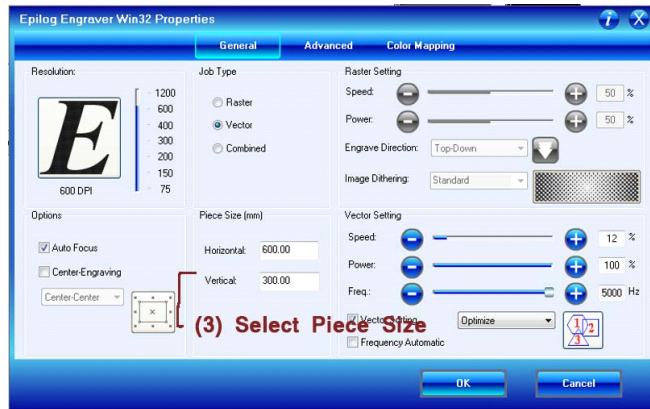
Print Properties

- Select your job type: <Raster>, <Vector> , or <Combined> as according to each individual project. If you click on Raster, the program will grey out the vector section.
 - Raster is for engraving
 - Vector is for cutting
 - Combined, will raster first then vector cut your file



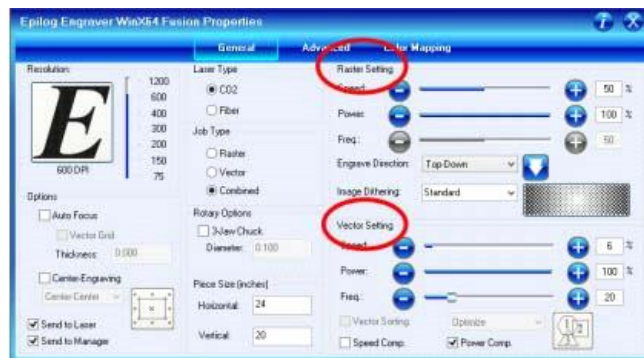
Print Properties

- Set <Piece Size> according to the size of the artboard you are working on in your graphics software document.



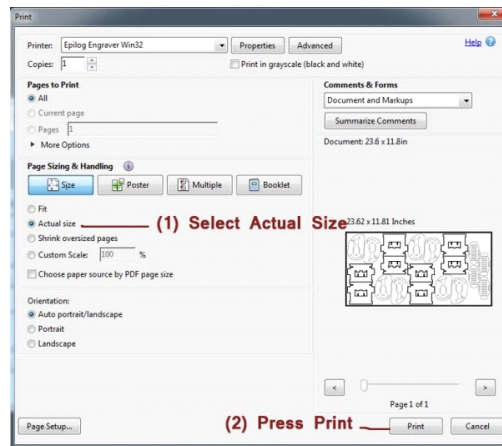
Print Properties

- Use the table on the last page of this SOP to enter the appropriate values for the Raster or Vector Settings. Remember these are recommended settings and can change from job to job depending on, especially in wood, the quality of your material or use on the laser itself. If you are unsure about the material, check with the technical staff. Provide data sheets for unusual materials.



Print Properties

- Set the DPI settings for rastering. Refer to the table on the last page of this SOP for appropriate values for the material being used.
- Once all necessary settings have been selected, click <OK> to exit.
- Select the <Actual Size> option and then click <Print> to send the job to the laser cutter.



Print Options

- If the job has been successfully received by the laser cutter, it will be shown on the laser cutter’s LCD display. For example, a file called “myshape.pdf” might be displayed as “Job:1.myshape.pdf”. If the job does not appear on the LCD display it may need to be resent from the PC.
- Press the green <Go> button on the laser cutter to begin cutting / engraving.

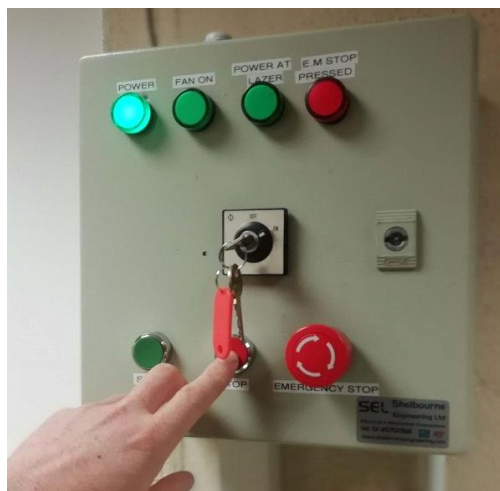


Laser Cutter Control Panel

- Ensure that the laser is actually cutting / engraving the material – in some cases the carriage may begin moving over the material, but the laser incorrectly fails to become active for several seconds. In that case, wait until the laser becomes active, then press <Stop> and <Reset> to cancel the job. It can then be restarted by pressing the <Go> button again.
- Observe the laser cutter throughout the cutting / engraving process to ensure that no problems occur and especially that no flame appears from the material.
- Once the job is complete, wait for a minimum of 5 minutes with the lid closed and the LEV unit running. Opening the lid before the air within the machine has

been sufficiently extracted and filtered could release airborne particles/contaminants into the room.

- Open the lid and remove the finished pieces from the honeycomb bed. Small pieces of waste material may fall through the honeycomb bed onto the waste tray below. This tray should be cleared every few days if the machine is in regular use. Larger pieces of waste material should be removed from the honeycomb bed and discarded in an ordinary dustbin.
- Close the lid of the laser cutter.
- Switch off the power on the LEV control unit. This will shutdown the laser cutter and the air assist pump. Turn and remove the key.



LEV Control Panel

- Shutdown the PC.
 - Sign out in the diary.
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- **REPORTING**
If a user finds an issue with the laser cutter, the LEV, fire extinguisher, phone or first aid kit, this should be reported to the technical staff member with responsibility for KE5-11. The user should cease from using the laser cutter until all repairs have been carried out.
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- **DOCUMENTATION**

The technical staff member with responsibility for KE5-11 should maintain an inspection and maintenance log for the laser cutter. This log should contain the monthly inspections carried out along with the annual maintenance carried out of the laser cutter and the LEV. This log should be kept safe by the technical staff member.

The technical staff member with responsibility for KE5-11 should maintain a training log. In this log should contain the persons who have been trained on the use of the laser cutter and the dates that this training took place. This log should be kept safe by the technical staff member.

The technical staff member responsible for room KE5-11 should maintain a sign in / sign out diary which trained up users of the laser cutter must sign in before they start using the machine and out when they are finished using the machine.

- **REFERENCES**

- <https://www.epiloglaser.com/assets/downloads/manuals/legend-manual-web.pdf>
- <\\bruce\SchoolH&S\RiskAssesments\RA-for-Epilog-laser-Mini-V4-2018.xlsx>
- <http://www.dit.ie/media/electricalengineering/images/School%20of%20Electrical%20%20Electronic%20Engineering%20Draft%20Safety%20Statement%2020%20March%202015.pdf>
- <http://www.dit.ie/intranet/media/digitalcampuslearningtransformation/staffdevelopment/healthsafety/Policy%20on%20Health%20and%20%20Safety%20Training%20for%20Staff%200%20-%20Approved%20by%20DIT%20H&S%20Committee%20-%20%20%20November%202011.pdf>
- SOP - Powered Tools (Battery and Electrical)
- Health & Safety Authority of Ireland <http://www.hsa.ie/eng/>

- **REVIEW**

Following the first year of application, the technical staff member with responsibility for KE5-11 the Senior Technical Officer whom this technical staff member reports to and the users of the laser cutter will review the Laser Cutter SOP.

Thereafter the technical staff member with responsibility for KE5-11, the Senior Technical Officer whom this technical staff member reports to and the users of the laser cutter will review the Laser Cutter SOP every two years.