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Laser Induction

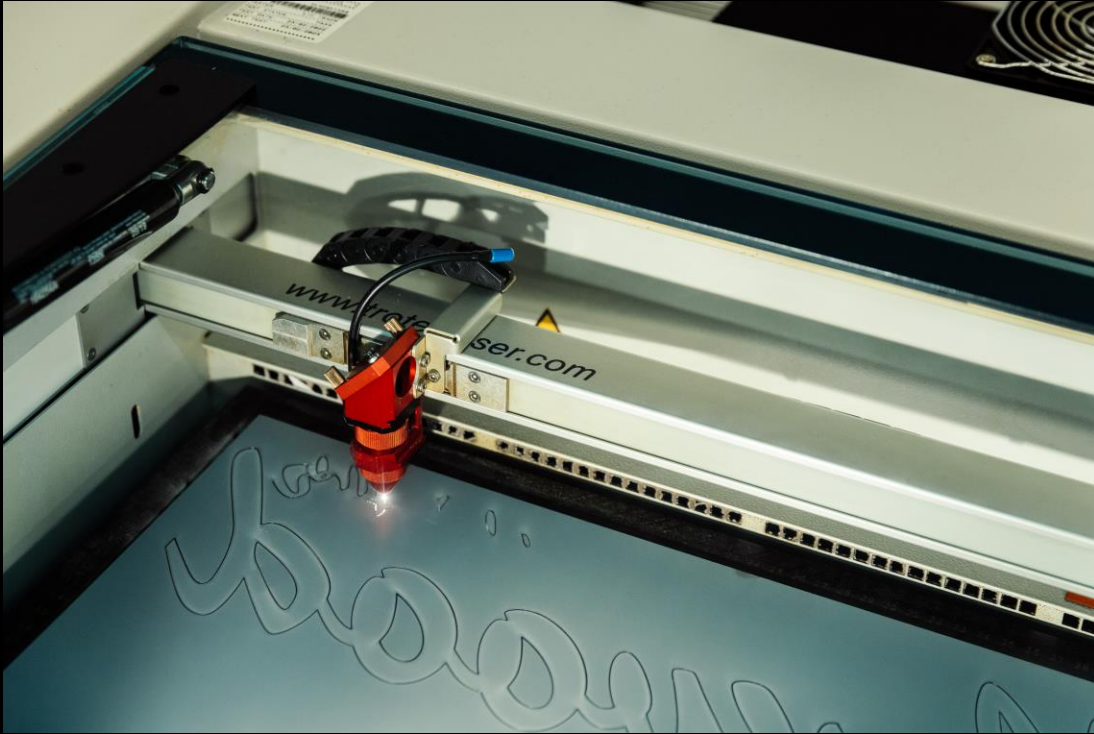
The Edge



Acknowledgement of country

We acknowledge Aboriginal and Torres Strait Islander peoples and their continuing connection to land and as custodians of stories for millennia.

We respectfully acknowledge the land on which we all meet today, and pay our respects to elders past, present and emerging.



INDUCTION SUMMARY

Our Trotec Speedy 300 lasers can cut and etch wood, plastics, paper, cloth and leather quickly and accurately. In this induction you will learn what software you can use, how to prepare design files and how to operate the machine safely.

Once you've completed the induction you can book and use the State Trotec Library of Queensland's lasers at The Edge during Open lab.

Open Lab sessions are a chance to meet up with like-minded makers and tinkerers at The Edge with facilitators to support your creative needs in the space.

Bookings are required to use the equipment and you will be able to book with your SLQ account once you have completed the relevant induction.

Wednesday 12pm – 5pm

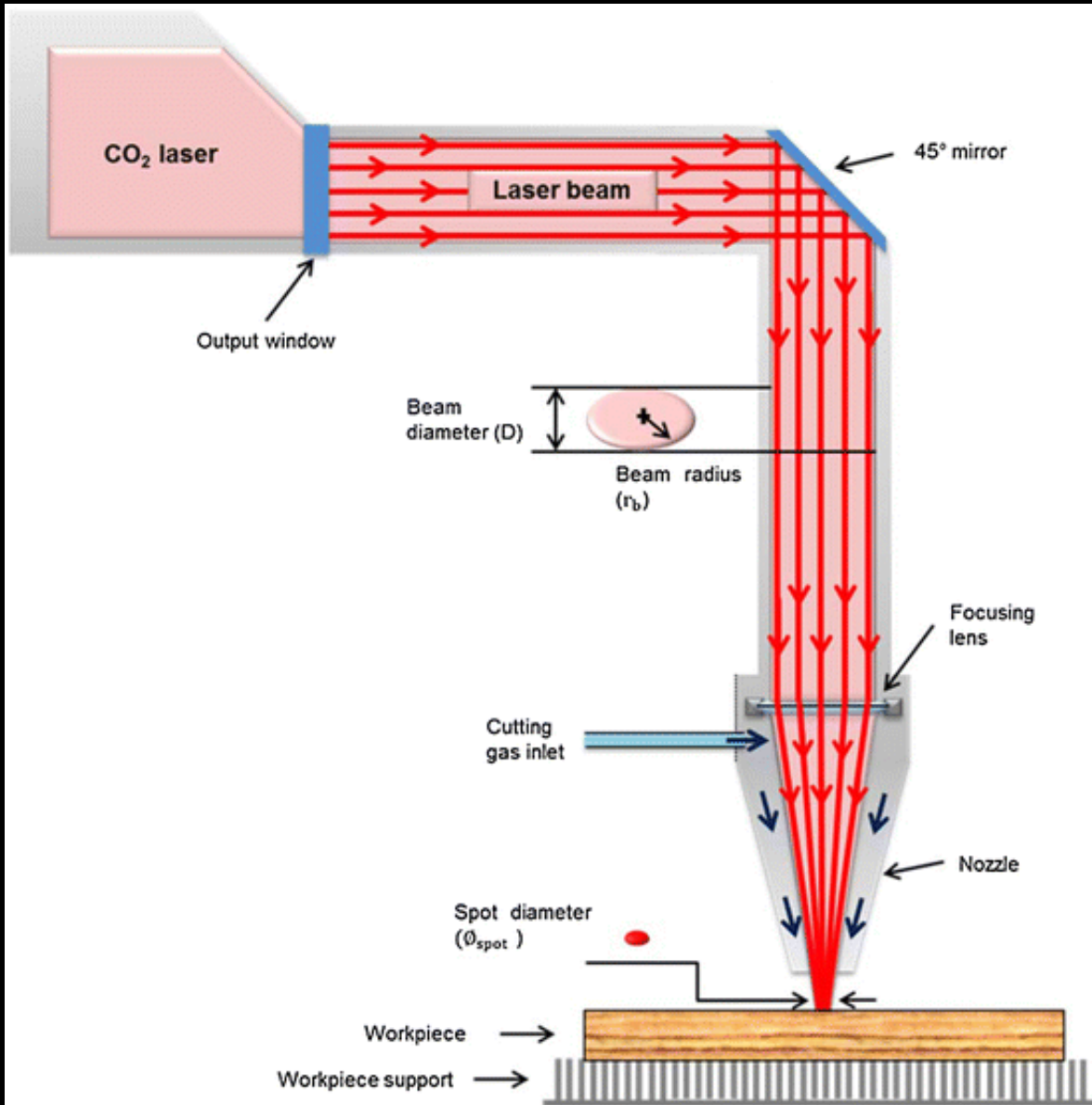
Thursday 1.30pm – 8pm

Saturday 12pm – 5pm

For more info and to book, head to <https://www.slq.qld.gov.au/visit/spaces/edge>

Laser History

- **Invention of the Laser (1958):** The concept of the laser (**Light Amplification by Stimulated Emission of Radiation**) was first introduced by Arthur Schawlow and Charles Townes in 1958.
- **Theodore Maiman's Ruby Laser (1960):** Theodore Maiman developed the first working laser using a synthetic ruby crystal, marking a significant milestone in laser technology.
- **CO2 Lasers (1964):** The development of carbon dioxide (CO2) lasers by Kumar Patel opened up new possibilities for industrial applications due to their high power and efficiency.
- **Emergence of Laser Cutters (1970s):** CO2 lasers became integral in the creation of the first laser cutters, which revolutionized manufacturing processes by providing precise and efficient cutting capabilities.
- **Advancements in Fiber and Solid-State Lasers (1980s-1990s):** Innovations in fiber and solid-state laser technologies expanded the range of laser applications, enhancing reliability and reducing maintenance.
- **Integration of Computer Numerical Control (CNC) (1990s):** The combination of laser technology with CNC systems allowed for automated and highly precise control over the cutting process.
- **Diverse Applications (2000s-2020s):** Laser cutters found widespread use in various industries, including manufacturing, aerospace, and healthcare, owing to their versatility in cutting various materials with minimal waste.
- **Ongoing Technological Advancements:** Continuous research and development have led to improvements in laser cutter speed, precision, and affordability, ensuring their continued evolution in diverse fields.

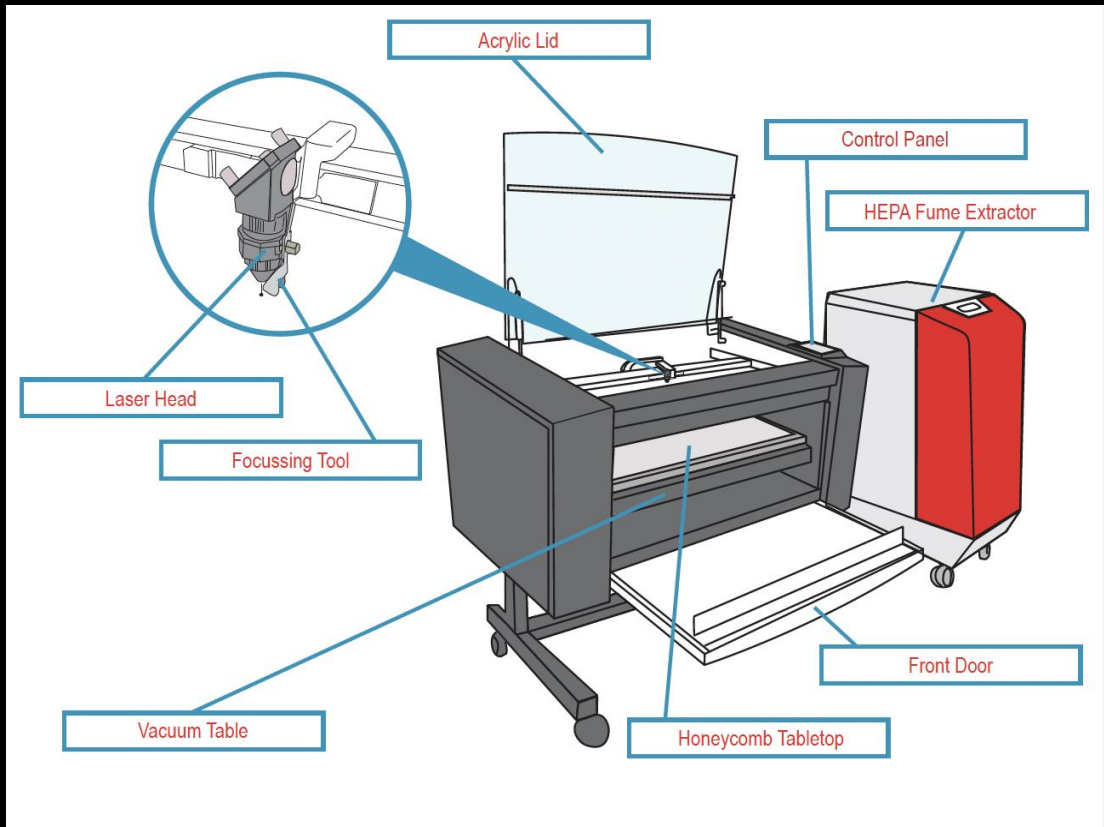


Laser Technology

What is Laser Cutting?

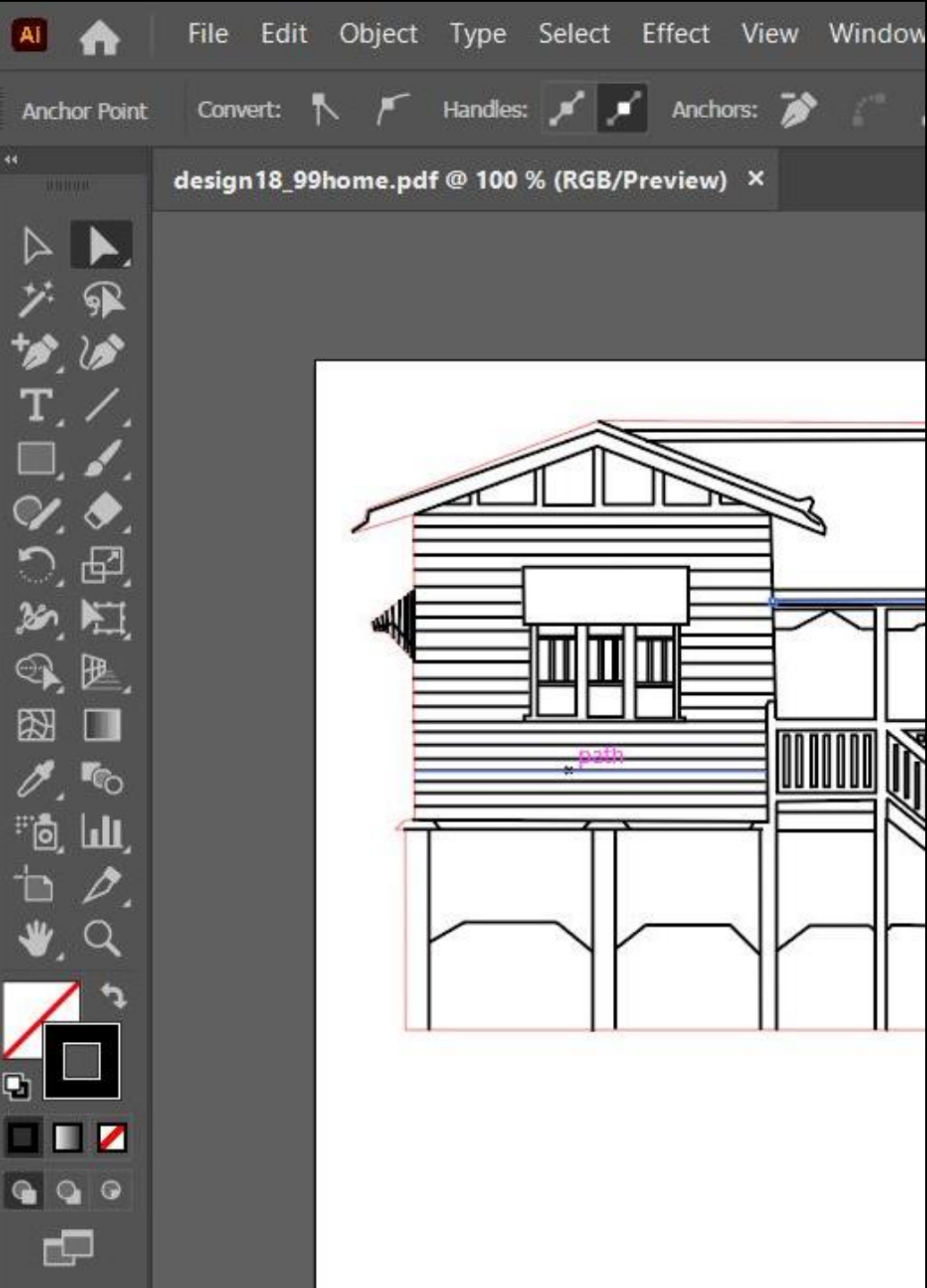
Laser cutters use a focused beam of light, called a laser, to cut through materials. The laser beam is generated in a laser tube and directed by mirrors to the cutting head. The intensity of the laser beam is controlled to melt, burn, or vaporize the material, creating a precise and clean cut.

Equipment overview



What is a Laser Cutter?

- Motorised mirror on an X, Y axis
- Trotec 80W Carbon Dioxide Laser
- Follows vector line work
- Can cut paper, card, wood, and acrylic. Selection available at The Edge.
- Metal: anodised aluminium can be etched only
- Wood: must check with the supervisor first
- Other Materials: see supervisor



Design

Laser cutters direct a coherent, focussed beam at a material to selectively vaporize it with high precision.

Laser cut files generally start life as a [vector](#) file, which is converted into machine code through special software.

Design software

Some of the most common programs laser users use to create their design files include;

- Adobe Illustrator (available at The Edge)
- Inkscape (available at The Edge)
- Corel Draw (available at The Edge)
- Other vector programs



Start guide

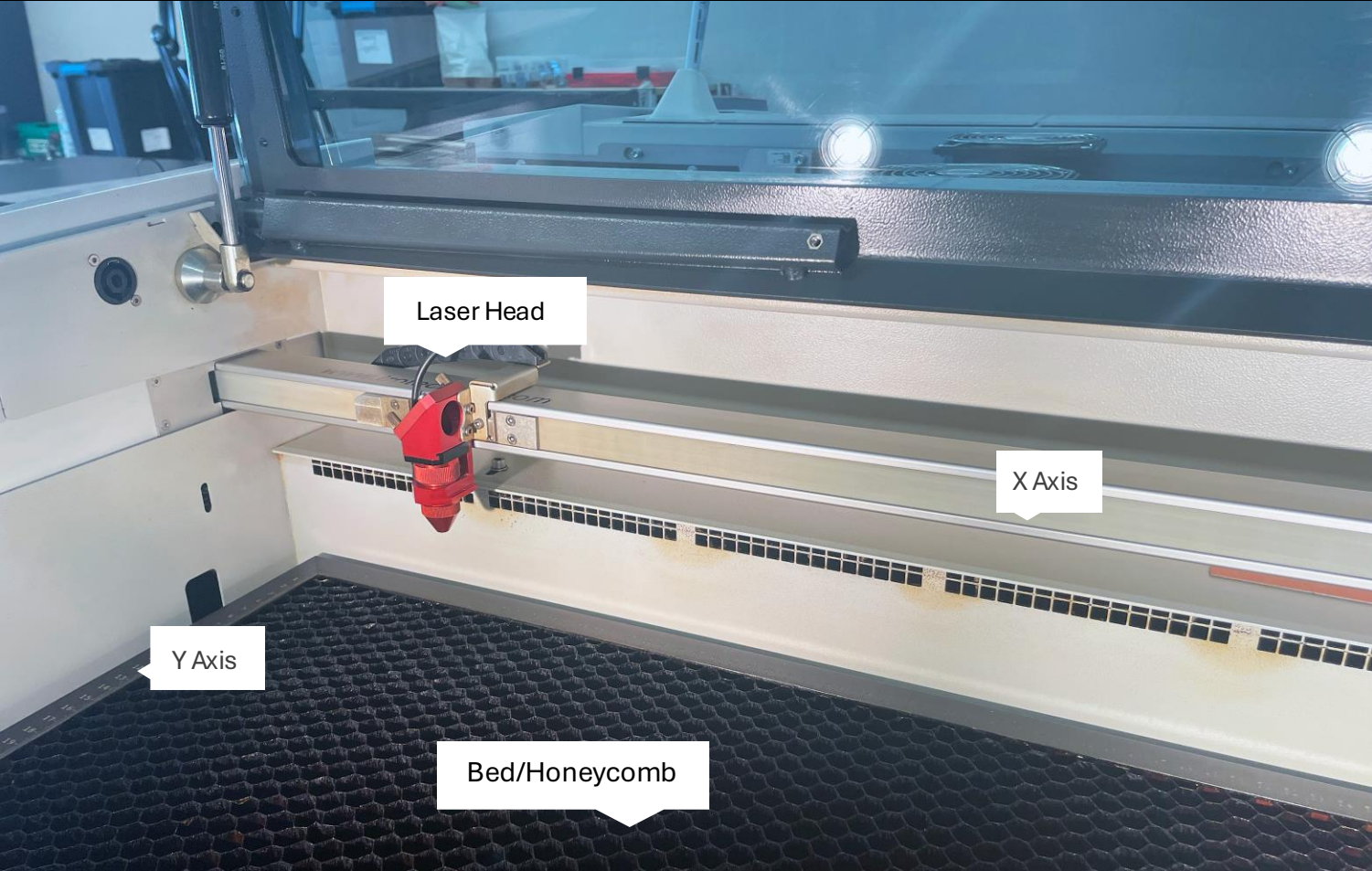
Before you start

- Let the supervisor know you have booked and are ready to use the Laser Cutter.
- Let them know about any the material you want to cut and the size if not using The Edge material. We will need to sight an SDS for new materials.
- No cutting can be done until a Hot Work Isolation Permit has been obtained (the supervisor will have organised one before the start of Open lab).
- To stop the machine:
 - Press the pause button (can press again when ready to re-start)
 - lift the lid (this will abort the job)
 - Press the stop button in the Ruby app

Keep watch at all times:

- Keep an eye on the laser cutter in case of fire or other issues.
- In an emergency, lift the lid to stop the laser and call over a supervisor.

Inside the Machine



Control panel

Focal Distance

Using the buttons on the control panel, move the laser head out over the sheet to be engraved/cut.

Take the laser focusing tool and carefully hang it on the side of the laser head as pictured. It will balance there.

Raise the bed carefully. As the bed approaches the focusing tool, use rapid button clicks to raise the bed incrementally until you see the tool move, indicating contact with the sheet. The tool may fall off its perch, but it doesn't need to.



The focussing tool lives on the front ledge within the laser enclosure as shown. Always return it to this location. Each laser has its own focussing tool. Do not interchange them.

4mm Plywood settings example

Rast Engrave 0.3mm

P: 90% V: 90%

R: 0% G: 0% B: 0%



Rast Engrave 0.5mm

P: 90% V: 60%

R: 0% G: 0% B: 255%



Rast Engrave 0.7mm

P: 90% V: 45%

R: 3% G: 255% B: 0%



Rast Engrave 1.0mm

P: 90% V: 30%

R: 255% G: 0% B: 255%



Vector Engrave

P: 20% V: 3%

R: 3% G: 255% B: 255%



Thru Cut

P: 100% V: 0.9%

R: 255% G: 0% B: 0%



Intro to Ruby

Ruby is the web-based laser software that we use with the laser machines at The Edge.

- Ruby has an RGB 16-colour palette which can have each colour relating to a different laser setting.
- All imported objects must have a **standard stroke colour** - if your object has no stroke colour, it will not import.
- Text should be converted to paths

Vector cutting:

- The stroke width can be set to anything (including zero) as the cut will just follow the centre of the line, using hairline in your design prep can help, particularly if you are making boxes and joins.

Engraving:

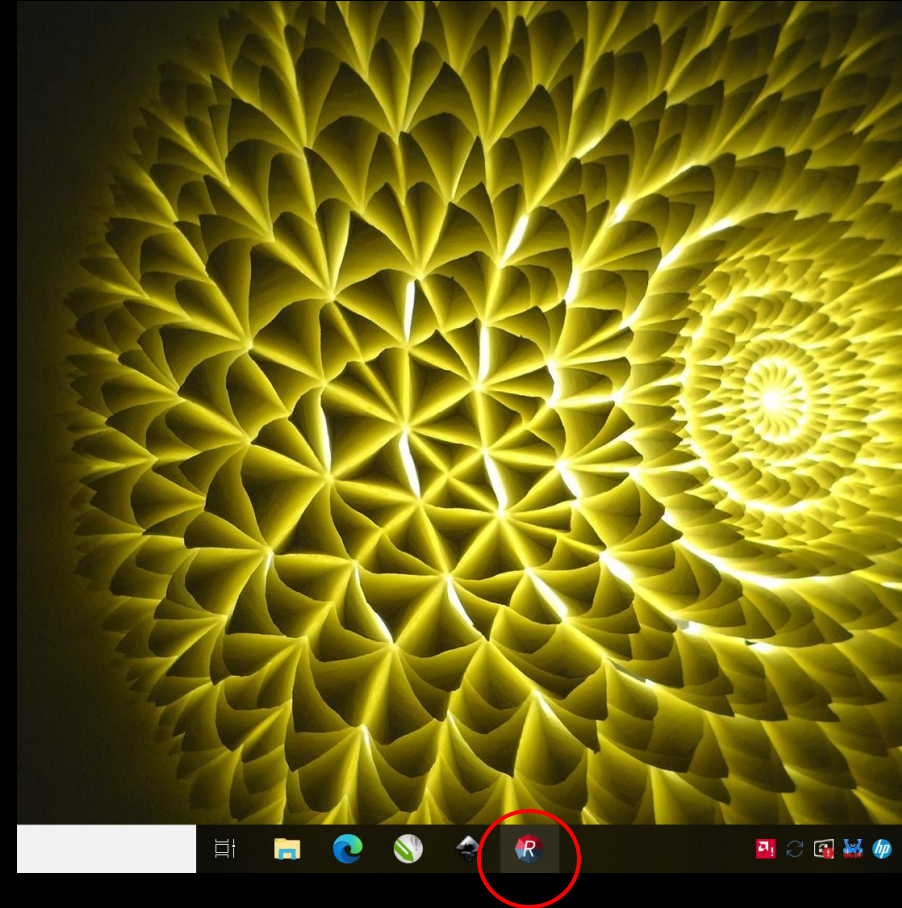
- The laser can do a vector engrave (stroke size doesn't matter) or a raster engrave.
- If the stroke has a colour and a thickness, the LINE will be engraved at that thickness.
- If the object has a fill, the OBJECT will be engraved.
- If the stroke and fill colours are different, then the line and the object can have different engrave settings.

Getting Started

Power up the laptop associated with the laser you intend to use and enter the default username <edgeuser> and password <edgeuser>.

Open Ruby by clicking on the icon in the tray at the bottom of the screen and log in with the default username and password that appears.

If you are prompted to change the password, **do not** do so, since all laser users must log-in using this account. The email address associated with the account appears in the upper right of the screen.



Setting up a job

There are FOUR tabs or sections of the Ruby software.

1. MANAGE

2. DESIGN

3. PREPARE

4. PRODUCE

The screenshot displays the Trotec Ruby software interface in a web browser. The browser address bar shows the URL `https://localhost:2402/app/manage`. The interface features a navigation bar with the Trotec logo and several icons, including a grid icon circled in red. Below the navigation bar, there are tabs for 'Designs', 'Jobs', 'Profiles ^{Beta}', and 'Fonts ^{Beta}'. The 'Designs' tab is active, showing a table of design files. The table has columns for 'Name', 'Created', and 'Import file'. The files listed are:

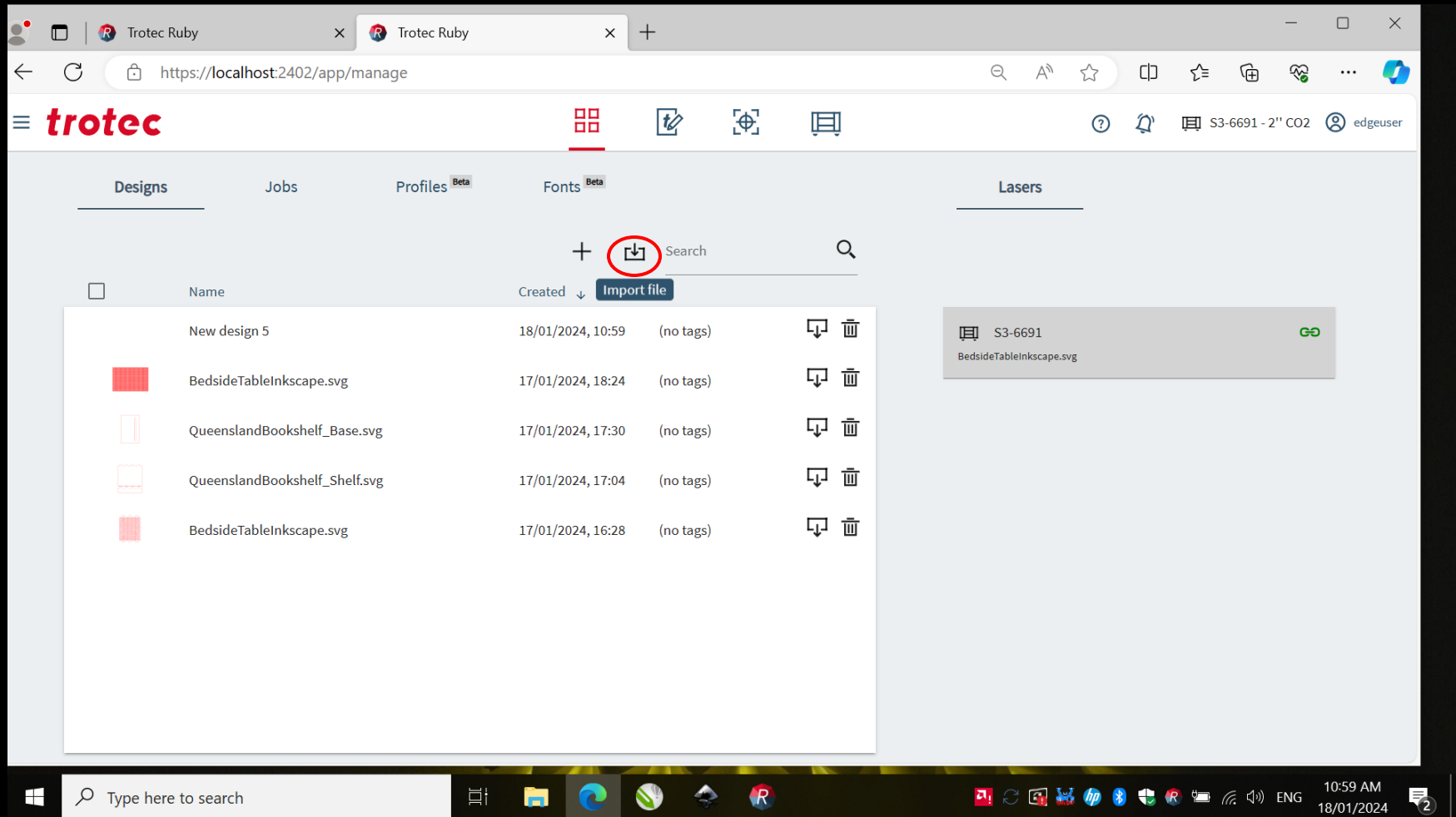
Name	Created	Import file
New design 5	18/01/2024, 10:59	(no tags)
BedsideTableInkscape.svg	17/01/2024, 18:24	(no tags)
QueenslandBookshelf_Base.svg	17/01/2024, 17:30	(no tags)
QueenslandBookshelf_Shelf.svg	17/01/2024, 17:04	(no tags)
BedsideTableInkscape.svg	17/01/2024, 16:28	(no tags)

On the right side of the interface, there is a 'Lasers' section with a card for 'S3-6691' and 'BedsideTableInkscape.svg'.

Setting up a job

1. MANAGE

- Import your design
- The queue is usually cleared regularly
- You can download a saved Ruby file if you've got a set-up you want to keep



The screenshot shows the Trotec Ruby web application interface. The browser address bar displays `https://localhost:2402/app/manage`. The application header includes the Trotec logo and navigation icons. The main content area is divided into sections: Designs, Jobs, Profiles ^{Beta}, Fonts ^{Beta}, and Lasers. The Designs section is active, showing a table of designs. A red circle highlights the 'Import file' button in the top right of the design list. The table contains the following data:

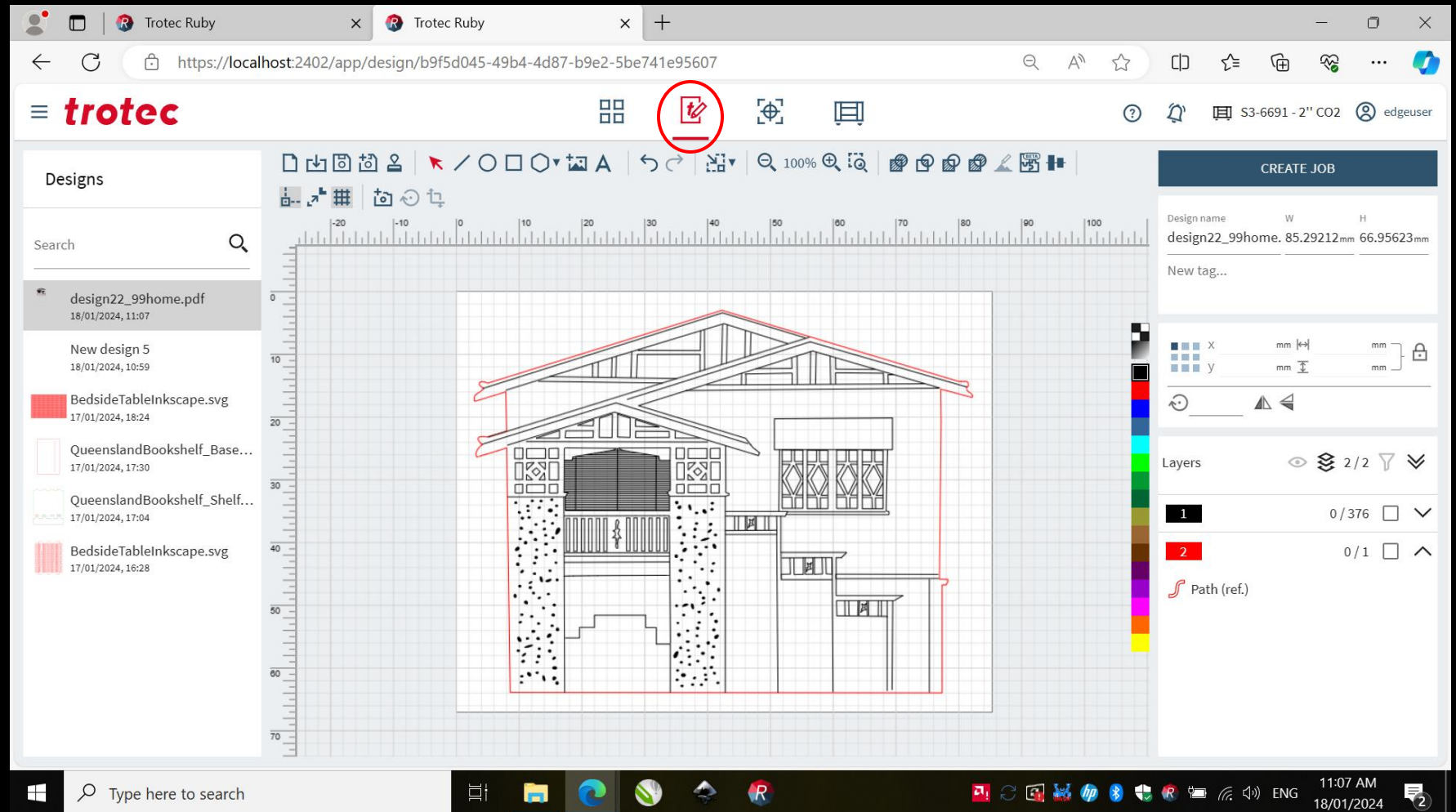
<input type="checkbox"/>	Name	Created	Tags	Actions
<input type="checkbox"/>	New design 5	18/01/2024, 10:59	(no tags)	Download, Delete
<input checked="" type="checkbox"/>	BedsideTableInkscape.svg	17/01/2024, 18:24	(no tags)	Download, Delete
<input type="checkbox"/>	QueenslandBookshelf_Base.svg	17/01/2024, 17:30	(no tags)	Download, Delete
<input type="checkbox"/>	QueenslandBookshelf_Shelf.svg	17/01/2024, 17:04	(no tags)	Download, Delete
<input type="checkbox"/>	BedsideTableInkscape.svg	17/01/2024, 16:28	(no tags)	Download, Delete

The Lasers section shows a single laser job: S3-6691, BedsideTableInkscape.svg, with a green status indicator.

Setting up a job

2. DESIGN

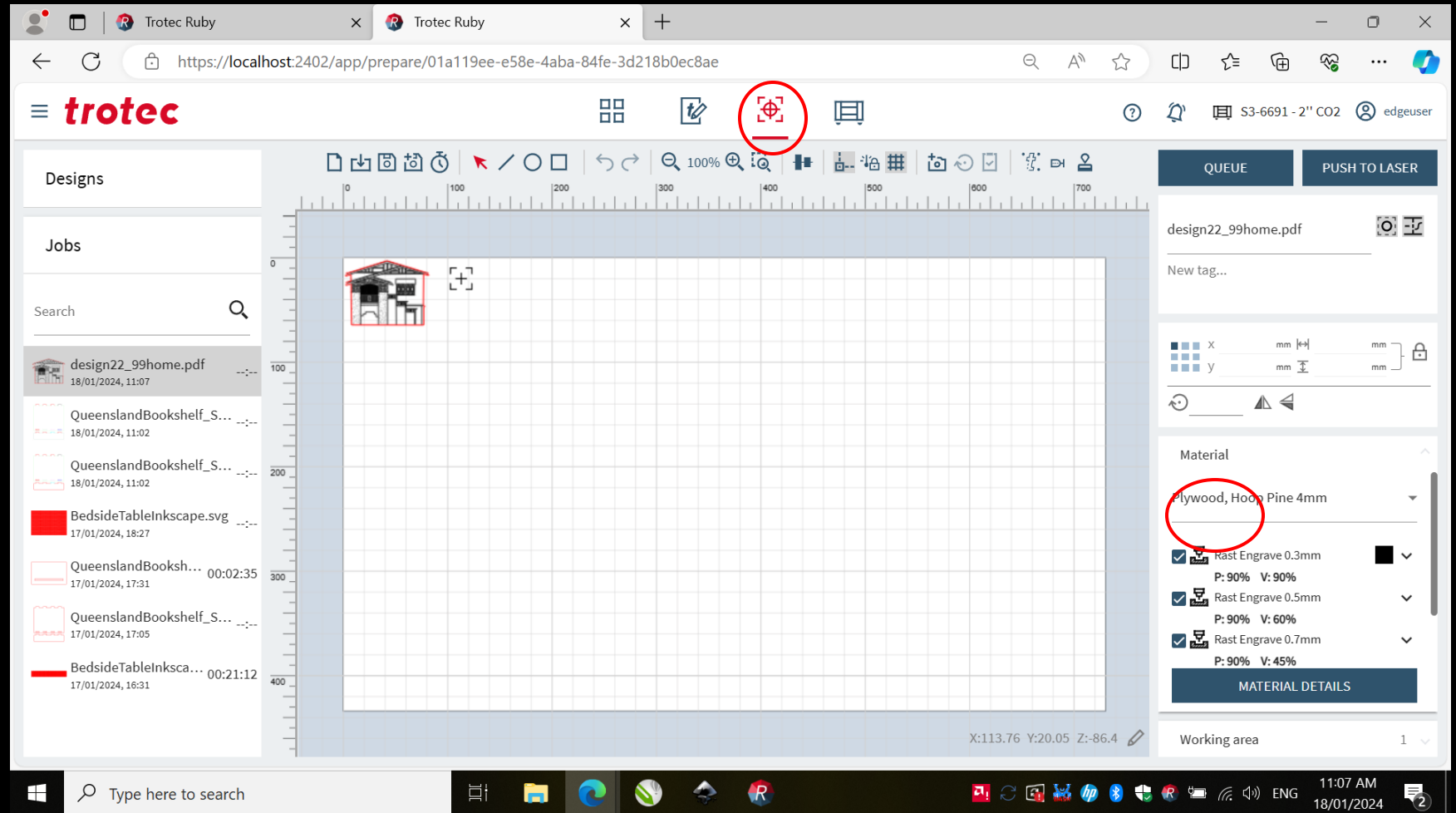
- This is the stage where you will assign your colours or check they are correct
- You can add simple shapes and lines, plus set array and more
- Once you have your design ready, click the border button which will set a 3mm bleed
- Hit the Create Job button when ready



Setting up a job

3. PREPARE

- This screen represents the laser bed, position your design to your material size
- The most important thing you need to do is choose the correct material!
- Click the timer to calculate the length of your job
- Call over a supervisor to get approval to run the machine
- Hit the Push To Laser button when approved



Setting up a job

4. PRODUCE

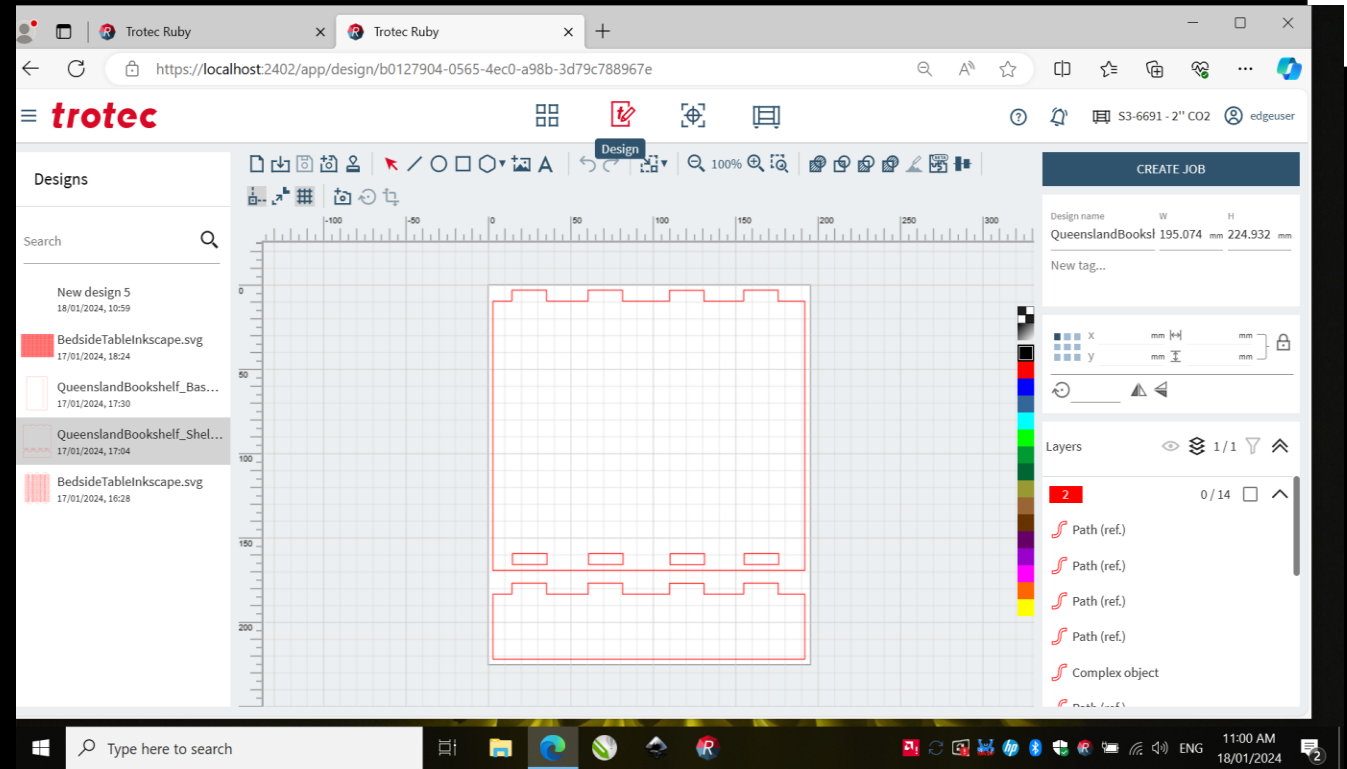
- You should double check this screen to ensure the correct material is assigned
- To start your job we recommend hitting the go button on the laser itself, as it's the best way to see how your job starts and quickly stop if any issues. You can hit the Play button in Ruby as well to start a job.
- If you have clicked the countdown timer in the previous window, you will see the countdown.

The screenshot displays the Trotec Ruby software interface for job production. The browser address bar shows `https://localhost:2402/app/produce`. The top navigation bar features the Trotec logo and several icons, with the 'Go' button (a red square with a white play symbol) circled in red. The main content area is titled 'design22_99home.pdf' and shows material settings for 'Plywood, Hoop Pine 4mm' with parameters: P: 90%, V: 90%, P: 100%, and V: 0.9%. The status is 'Ready to run' with a toggle for 'Remove completed job from queue'. A sidebar on the left contains four job thumbnails, each with a red material preview and a title: '1. BedsideTableInks...', '2. BedsideTableInks...', '3. QueenslandBook...', and '4. BedsideTableInks...'. At the bottom, a large digital display shows 'Time 00:02:35' and a large '00:00' timer. The Windows taskbar at the bottom shows the search bar and various system icons, including the date and time '11:10 AM 18/01/2024'.

Setting up a job

When you set up a job for the laser remember these steps!

- **Assigning colours**
 - Remember to assign one of the 16 colours to your design with the desired effect of what you would like the laser to do e.g. cut, engrave, etc.
- **Creating job**
 - This will turn the imported design into a job to then be cut on the laser.
 - Before hitting create job ensure you have added a 3mm border via the “Fit to Design” button.
- **Creating array**
 - An array can be used to cut a design multiple designs.
 - In the Prepare screen you can select your design and click on the square button to enter the array feature.



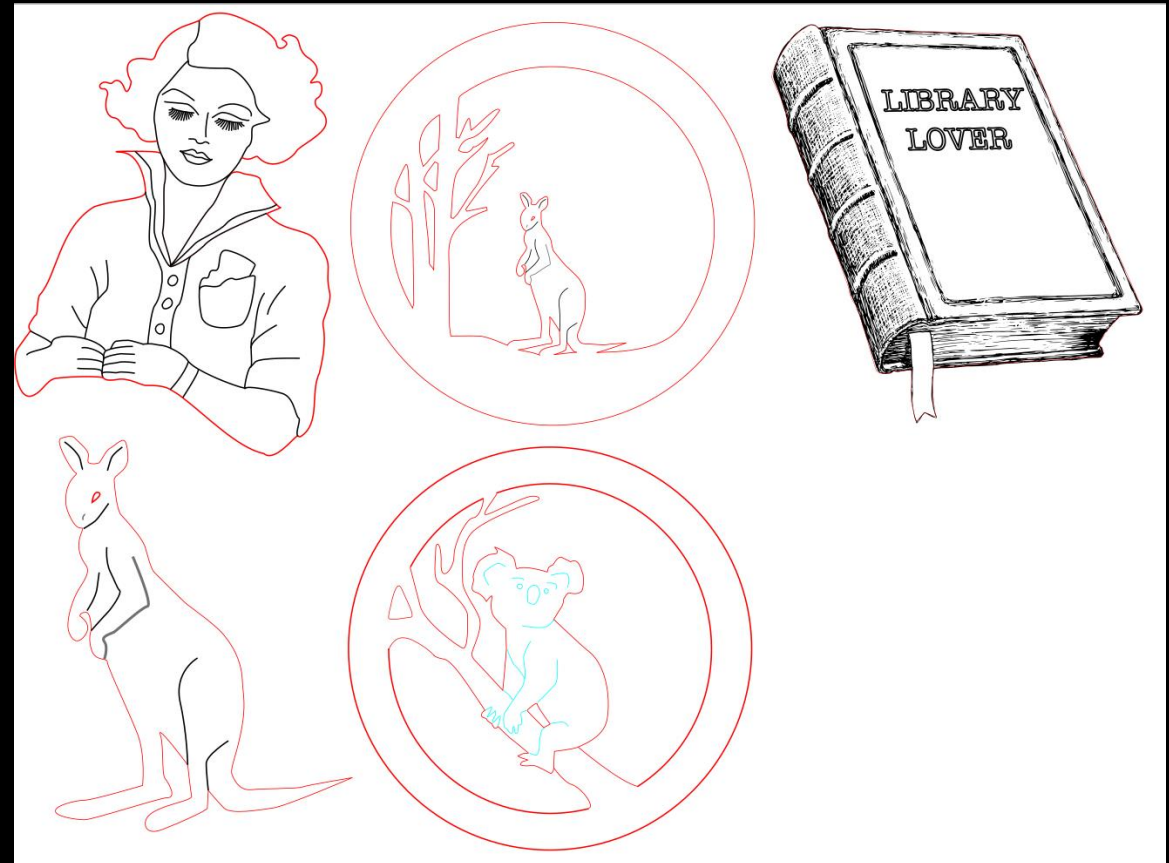
- **Assigning material**
 - Ensure you assign a material before sending to laser.
 - Ensure you have a facilitator check the job as well!

Choose a design

Time to run your own test cut!

Choose from one of the designs on the Wiki page your web browser (which will be open, or your facilitator will navigate you to the page).

You can modify the design using free vector design software, Inkscape. We can turn our test cuts into magnets or keychains, you will need to add a cut hole for a keychain.



Let's do the Quiz!

https://inductions.slq.qld.gov.au/view_course/2

Question

1

Correct

Mark 1.00 out of
1.00

When using a Laser Cutter/Engraver, you should always do the following (select all CORRECT answers):

- a. Have an Open Lab Facilitator check your job before you press start ✓
- b. Open the lid immediately after the job is finished
- c. Wear fully enclosed shoes as a requirement for entry to the Lab ✓
- d. Leave the laser unattended while cutting/engraving
- e. Regularly check the SOP (Safe Operating Procedure) to ensure you are using the laser correctly ✓

Question

2

Correct

Mark 1.00 out of
1.00

When bringing your own material into the lab to cut/engrave you don't need to let a facilitator know, as all materials are safe and approved for processing on the lasers.

- True
- False ✓

Step by step guide

LASER WORKFLOW

Wake the laser from standby mode

- Do this by pressing the button in the top row on the control panel that is showing an amber light
- Ensure the exhaust plenum is placed in the doorway to direct fumes to the outdoors (staff will have done this but alert them if not).
- Make sure the honeycomb bed is correctly located on the vacuum table - or remove it if you are cutting/engraving lightweight materials (eg. paper, fabric) directly on the vacuum table.

Load your material into the laser

- Place your sheet against the rulers in the top left corner of the honeycomb table.
- If you have removed the honeycomb bed, place the material on the vacuum table. Most of the holes in the table will need to be covered to ensure sufficient suction to keep your material flat.
- Sheets that aren't flat can risk head impact. Tape can help to restrain warped material, but badly warped sheets will not be approved for engraving/cutting.

Focus the laser

- Refer to slide 8 "Focal Distance"

Ruby Workflow

Open Ruby & import design

- Turn on the laptop and open the Ruby software (shortcut on the desktop and in the taskbar).
- Import your file or drag & drop the file into the Ruby window.
- If you encounter a problem with one file format, try importing another. There are multiple drawing programs available on the laser laptops if you need to convert your file.

Set up your job file

- Assign the correct palette colours corresponding to the effects you want, then select 'Create Job'.
- Select the material and place your job appropriately for your chosen material, ensuring it fits.

Seek a final check from the facilitator

- Before pushing your job to the laser, you are required to get a final check from a supervisor for safety reasons.
- **Do not** ever start the job without having your settings checked (even if you're just cutting the same design again).

Frequently asked questions

- Materials
 - We stock a small range of plywood, acrylic, boxboard and PETG for sale via The Brink (Edge Café).
 - If you want to purchase your own material, we approve acrylic bought from Trotec or Acrylics Online for use on our lasers, and plywood purchased from Trotec or Plyco. If you want to cut and/or engrave a material sourced elsewhere, send an email enquiry to appliedcreativity@slq.qld.gov.au that includes a Safety Data Sheet (SDS). We will assess your request and let you know if we approve the material for processing on our lasers.
- Best file types
 - We recommend exporting your file in both PDF and SVG formats. Usually if there is a problem with one file type, having a back-up can ensure the design can be cut.

THANKS FOR ATTENDING

Please complete our survey that will be sent out via
Eventbrite.

Tag us on socials @statelibraryqld

Contact us on appliedcreativity@slq.qld.gov.au



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