

FAQ LASERS

Our Trotec Laser bed size is 28.7" x 16.7" (Any illustrator file larger than this will cause an error).
Large Boss Laser is 35" x 55" (889 x 1397) / Small Boss Laser is 13" x 19" (330 x 482)
All colours must be 255 or 100% (ex. 255 RGB Red)
Colour mode must be RGB
Lines must be no bigger than 0.18 – 0.2 pt

CNC

Make sure you have scaled your model in inches and that it is at 0,0.
Outline your model with a box and make sure your model is near the top of the material.
Save 2D work as .dxf and/or 3D as a .3dm file.

3D PRINT

Scale down your model to millimeters to the max bed size of 273 x 273 x 248.
Cost is \$0.20 per gram.
Is your model closed geometry?

CAMPUS SECURITY

In an emergency,
call 403-220-5333 then call 911
Complaints/Information (24/7): 403-220-5333
Campus Security Office: MacEwan Student Centre, Room 260

DESIGN GUIDES

2pt 3pt 4pt 5pt 6pt 7pt 8pt 9pt 10pt 11pt 12pt 14pt 16pt 18pt 24pt 30pt

36pt 48pt 60pt 72pt

0.25pt

0.5pt

0.75pt

1pt

2pt

3pt

4pt

5pt

SAPL

WORKSHOP

STUDENT

HANDBOOK

A GUIDE OF SAFE WORKING PRACTICES

THE SAPL WORKSHOP

The School of Architecture, Planning and Landscape (SAPL) recognizes and embraces the essential value of 'making things' as a necessary component of design education. The Faculty enables this through the provision of the SAPL Workshop. The SAPL workshop is a facility for students and faculty to build models and prototypes of their design work. As such it is intended to meet both pedagogical and research aims. The workshop is well equipped and can facilitate fabrication in a variety of media including wood, plastic and metal, as well as provide for different finishing techniques such as painting or sandblasting. Additionally, the workshop provides access to leading edge digital fabrication facilities including laser cutters, two CNC routers and a 3D digital printer.

Safety is a fundamental tenet of workshop use. To this end, access to the workshop is a privilege, contingent upon the safe, clean, and courteous use of these facilities. Access to the workshop will be denied to users who do not use the workshop in a safe and courteous manner.

TECHNICIANS:

Nathan Tremblay – Workshop Supervisor

Joe Sabourin - Technician

Darren Jakal- Technician – Evenings

MANAGER - FACULTY OPERATIONS ADMIN AND FACILITIES:

Tracy Beaugard

STANDARD SHOP HOURS (subject to change):

Monday	8:30am - 12:00pm	1:00pm - 4:30pm
Tuesday	8:30am - 12:00pm	1:00pm - 9:30pm
Wednesday	8:30am - 12:00pm	1:00pm - 9:30pm
Thursday	8:30am - 12:00pm	1:00pm - 9:30pm
Friday	8:30am - 12:00pm	1:00pm - 4:30pm
Weekends	An email will be sent if extended hours are provided.	

All purchases must be made by 4:00pm from the Point of Sales Machine (NO IOU's)

CONTACT

SAPL Workshop
School of Architecture, Planning and Landscape
1130 Professional Faculties Build
University of Calgary
T2N 1N4
Phone: 403-220-8036 / 403-220-8037

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SAFETY.



THE WORK SHOP

There will be no access to high-risk areas without the presence of workshop technicians/supervisors.

HIGH RISK

- a. Woodworking Shop (1131 & 1132)
- b. Metalworking Shop (1109)
- c. Large Laser Machine / Vacuum Forming Room (1109)
- d. CNC Rooms (1110A & 1110B)

LOW RISK

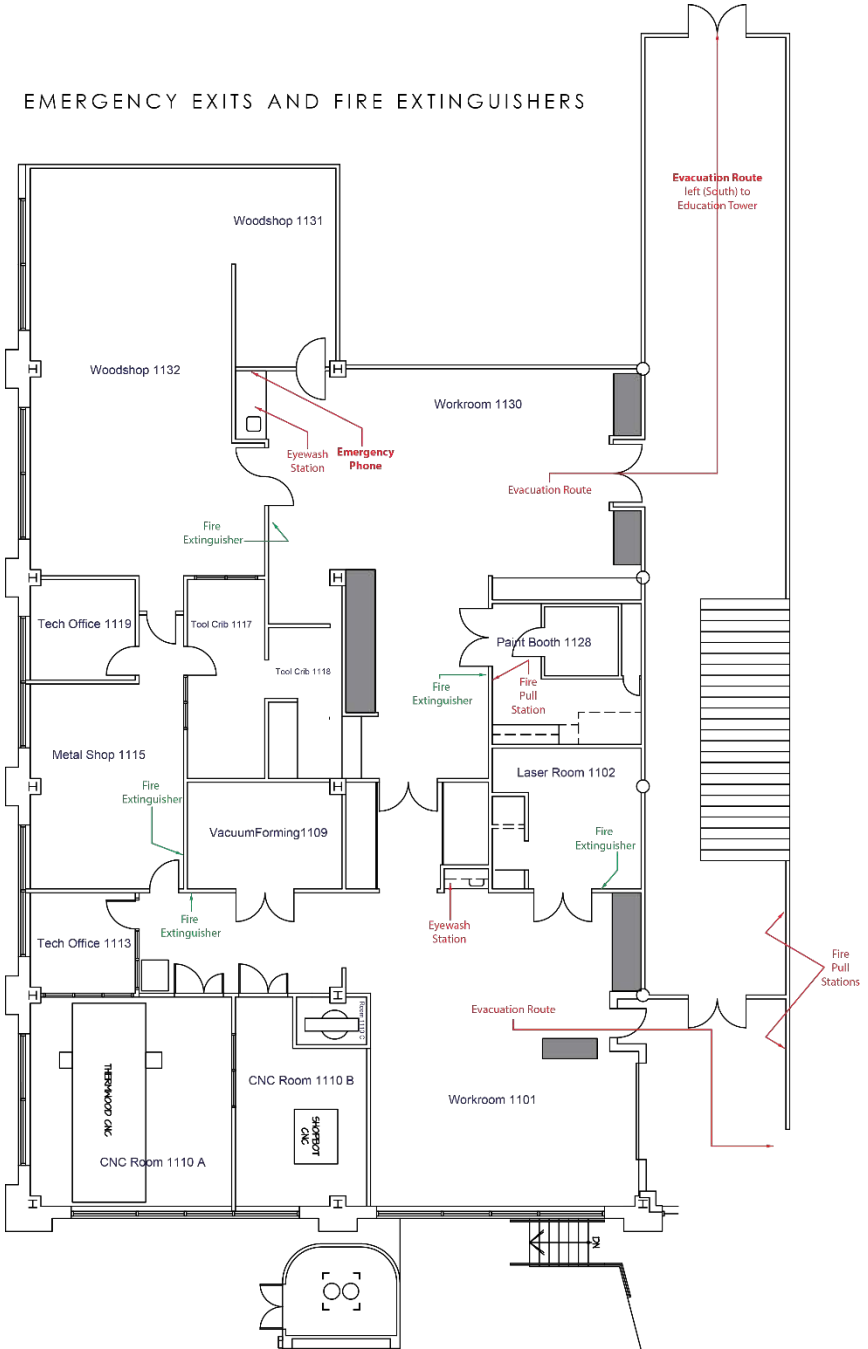
- a. Assembly Rooms (1101 & 1130)
- b. Spray Booth (1128 & 1128A)
- c. Laser room (1102)

The Low Risk areas will remain accessible 24 hours per day with the following conditions:

- No power tools will be permitted after hours or without supervision. (Some exceptions are tolerated, see Technical Staff for authorization)
- SAPL will not loan or sign out any High Risk powered tools overnight
- Under no conditions are users permitted to bring their own powered tools into the workshop after hours
- Failure to comply will be met with disciplinary action and Demerit Points
- Only approved and trained users are permitted to utilize the workshop and its designated spaces.
- No aerosols or hazardous materials are to be used or stored outside of the spray booth and the supplied Flammable cabinets.
- Users must maintain clean and safe working environments:
 - Free of offcuts, material dust and environmental exposure
 - Control and removal of trip, slip and fall hazards
 - Proper material handling and storage
- No students is permitted to work while impaired including sleep deprivation, alcohol or drug consumption and medications
- Appropriate Personal Protective Equipment (PPE) is **mandatory** when entering the workshop facilities. Eye protection is **mandatory** when entering the workshop facilities, if you access the workshop facilities without PPE then you will be asked to leave and potentially receive a demerit infraction.

EMERGENCY LOCATIONS

EMERGENCY EXITS AND FIRE EXTINGUISHERS



EMERGENCY PROCEDURES

Call 220-5333 for any accidents, injuries or emergency situations

All incidents must be reported within 24 hours— injuries, near misses, illness to security and do not call 911 if you call 911 you need to call security so that they can bring the EMS to the incident location.

EVACUATION PROCEDURES

If you discover an emergency situation or are alerted of an emergency that requires an evacuation such as a fire:

- Activate the nearest manual pull station, located inside spray booth or in corridors
- Close door(s).
- Evacuate the building immediately (use stairs - DO NOT USE ELEVATORS)
- If possible, phone Campus Security at 220-5333.
- Give your name, location, and nature of emergency.
- Meet the Fire Department at the main entrance to the building (on the exterior)
if you have information on the nature of the emergency.
- Once you have spoken with the Fire Department (if needed), move away from the building and proceed to emergency Assembly Point and stand by for additional instructions.
- Do not re-enter the building until the “All Clear” is given from the Incident Commander.
- Building Emergency Wardens will assist in the evacuation. Provide any details on the emergency to the Building Senior Emergency Warden or the Incident Commander.
- Proceed to the Building Assembly Point in Education Food Court or just outside of the Education Tower.

Follow the prescribed University Emergency Procedures posted in every building or details found within the respective department Emergency Response Plan.

CHEMICAL STORAGE

Flammable / Explosive Containers should be stored in a flammable storage cabinet. (Located in the Spray Booth) Put your name and year on the container. No flammable storage is permitted in public spaces (Studios, Lockers, Etc.) Read chemical labels and MSDSs for specific storage requirements. Store chemicals in a well-ventilated area; however, do not store chemicals in fume hood/ Spray booth. Return chemical containers to their proper storage location after use. Never store hazardous chemicals in a public area or corridor



Yellow Can - Waste rags or soiled paper products, No hard or rigid debris.

Red Can - Waste spray cans.



Flammable Storage Cabinets for spray-paints, finishes and other solvents.

SHOP RULES + TIPS

- 1. WEAR EYE PROTECTION AT ALL TIMES IN THE WORKSHOP.** Power will safely be cut if anyone is not wearing eye protection regardless of activities. Hearing protection is also recommended even while not on machines.
- 2. NO HEADPHONES** are permitted in workshop/ assembly areas at any time. If you have Headphones on you are not aware of your surroundings and potential emergencies. (No Cell Phones, IPODs, MP3 players, etc.)
- 3.** Keep your workbench and the machines you are using clean. Tripping over scraps or over cords, slipping on sawdust, or accidentally knocking a chisel off your bench are very real dangers.
- 4.** Don't use machinery when you are tired, on medication, or have consumed alcohol or Drugs. Machines and hand tools are dangerous enough when fully alert, why increase the odds against you. Don't be afraid to ask for help.
- 5.** Focus on what you are doing at all times, take a break if your mind starts to wander. This becomes more difficult as the pressure of deadlines approach, but keep in mind that nearly all shop accidents happen near the end of term for this very reason. **Advice:** keep ahead of deadlines so you won't be rushed; have to wait for machines, paint booth, advice, etc.
- 6.** If it doesn't feel good, don't do it. If you are not comfortable making a certain cut, or are not sure if it is safe, get advice from a Technician before you try. **Ask for help.**
- 7.** Be prepared for accidents. Consider these questions: where is the nearest telephone, the first aid kit, and the nearest person who can help. Remember the Campus Security phone number is **220-5333**, and that the Campus Health Services are on the 2nd floor of the MacEwan Student Centre.
- 8.** Breathing sawdust is not healthy; it can be allergenic, toxic and carcinogenic. The sawdust from some woods, such as teak and cedar can be particularly problematic. Wear a dust mask when using machinery, or sanding, or sweeping. Medex and Medite are the preferred alternative to MDF in the SAPL Workshop; please attempt to utilize healthy materials at all times.
- 9.** Some of the solvents and finishes used are allergenic, toxic and carcinogenic. When first using a material, download the SDS (Safety Data Sheet), read and understand the safety precautions, and wear the appropriate Personal Protective Equipment.
- 10.** There is a Spray Booth in the front Assembly area of the workshop (Room 1130). As vapors can be toxic, flammable, or both, all spraying (especially Spray adhesive) must be done in the booth. Always turn on the fan and wear a respirator while spraying. **Do not spray outside on the loading dock.**

- 11.** Tie back long hair, and do not wear loose clothing, jewelry or headphones. As many machines and hand tools have a sharp spinning object, there is a chance of getting caught up and drawn into the machine.
- 12.** Use push sticks, feather boards, or other devices to keep your fingers away from blades and abrasives. It is a good rule to keep your fingers 6" (150mm) away from the cutter. Look for the RED dots on the machines.
- 13.** Never clear chips or debris from a machine while the power is on. Many injuries are caused by accidentally touching a spinning blade, or getting clothing or rags caught in the moving parts.
- 14.** The use of machines is limited to those staff and students who are trained and authorized. All students will be trained and authorized on the table saws, sanders, drill press and bandsaws. To use the other machines, first review the appropriate literature and then make an appointment with a technician. Some of the larger machines, i.e. the jointer, planer, large bandsaw is turned off. No student may use one of these machines without the permission and supervision of a technician.
- 15. It is the responsibility of the students to maintain a clean shop.** Cleaning as you work is mandatory. Plan 15 minutes at the end of each session to clean your workspace, as well as the common areas of the shop.
- 16.** As part of the "University of Calgary Code of Student Behavior," no behavior that is deemed dangerous will be tolerated. Any improper behavior will result in an expulsion from the workshop and any return must be granted in writing from the Program Coordinator in consultation with the Workshop Supervisor and Associate Dean of the individual's program.

STUDIO RULES

- 1. Nothing is to be placed on top of lockers due to fire regulations + OHAS.**
- 2. No small kitchen appliances are to be used in studio spaces** (kettles, coffee makers, hot pots, etc.) If you are not sure what is allowed, please contact a shop technician or the Building Operations Manager.
- 3. No flammable sprays and solvents are to be used or kept in studio spaces.** (spray paints, spray glue, fixative etc.)
- 4. Absolutely no concrete powder is to be stored in studio.**
- 5. No drugs (including cannabis) and alcohol is to be consumed or stored on campus.**
- 6. Freshly cut laser cut plastics are not to be stored in studio, due to off gassing.**
- 7. Do not let anyone you do not know into SAPL after hours, this is how theft and damage occurs.**
- 8. If a single student is building a model, cutting and gluing the lights of studio shall remain on for their safety, regardless of others discomfort.**
- 9. At the end of each semester all models and supplies shall be cleaned and removed from studio and model storage rooms. Anything found after posted dates will be thrown away.**
- 10. No furniture is to be allocated to other parts of the building without permission. Including altering studio layout as given at the beginning of the year unless stated by faculty operations manager.**
- 11. All lockers are allocated for students to use. Students are not to have more than one locker in the faculty.**
- 12. Personal heaters are to be approved by the faculty operations manager.**
- 13. Nothing can be hung from the ceiling except for extension cords for power. If there is not sufficient power distribution at your desk, please talk to a technician or the buildings operations manager.**
- 14. All students must obey fire wardens during evacuations.**

DEMERIT POINTS SYSTEM

The SAPL Workshop has implemented a demerit point system to encourage proper safety measures for anyone who uses the workshop and protect the workshop against the abuse of privileges. It is the responsibility of the individual wishing to utilize the workshop to acquire the training from the workshop staff in addition to understanding the SAPL Workshop Safety Training Guide and following all the safety rules outlined within.

The system is an accumulation of demerit points per term. Demerit points are issued to users who fail to follow proper safety measures that could put themselves and/or others at risk. In the event of infractions, the individual will receive a letter stating the infraction and the allotted number of demerit points associated with the offence. This letter will be also be given to the individuals supervising Professor and the Associate Dean.

If any one individual receives a total of 3 demerit points in a term, they will attend a meeting with the Associate Dean of the program and the workshop supervisor. If any one individual receives a total of 5 demerit points in a term, their workshop privileges will be suspended. In addition, if any individual receives infractions of the same offence 3 times, that individual will also have their workshop privileges suspended.

A meeting will automatically occur upon an individual's accumulation of 5 demerit points and/or 3 offenses of the same infraction and the suspension will last the duration of the term or school year depending on the severity of the offense. Once the term is complete, the suspension will be lifted, and the individuals' demerits are reset.

NOTE: Any individual who is suspended will need to take a refresher safety course and test before their workshop privileges are reinstated.

OFFENSES

- Operating equipment under the influence of drugs or alcohol. **5**
- Freehand cutting material on any table saw. **5**
- Ignoring specific instructions from a shop technician, staff and faculty. **3**
- Improper use of the table saws: **2**
- Cross cutting material on a table saw with the rip fence and ripping material using a crosscut set up, not following the long side against the fence at all times. Not following the proper use and procedures implemented within the safety training.
- Use of an open flame in non-designated areas within the workshop or in studios. **2**
- Disabling a safety guard on machine without authorization by a Technician. **2**
- Use of prohibited personal power tools: **2**
- The workshop only assumes responsibility with equipment supplied by and maintained by the workshop. **The only power tools permitted after-hours includes; approved hand tools, hand drills, Dremel and sanders.**
- Not using Personal Protective Equipment while in the Workshop or assembly areas. (Safety Glasses) **1**
- Not cleaning scrap material and debris from around or on equipment and work areas. **2**
- Improper Workshop Clothing: **1**
- Wearing loose jewelry or clothes and earphones in the Workshop will be considered inappropriate attire as well as not containing or controlling long hair.
- No push-stick when feeding material close to blade: **2**
- All pertinent workshop equipment requires a push-stick. Not following the finger length away rule or the red dots.

OFFENSES

Unauthorized use of materials or supplies.	2
Unauthorized Removal of Lab tools or equipment and late tool returns: All pertinent workshop equipment requires to be signed out from the SAPL tool crib by a Technician for a loan period of 24 hrs, unless otherwise signed out over a weekend when the tool is to be returned first thing the next business day.(First thing is 9 AM.)	2
Instigating or participating in horseplay in the workshop.	2
Disregarding appropriate machine procedures.	2
Improper use or abuse of the workshop facilities.	2
Improper use and abuse include but not limited to:	2
<ul style="list-style-type: none">• Spray glue or paint overspray on tables & equipment including in studio spaces.• X-acto knife cutting on machine and tool surfaces.• Concrete, paint, wax, paint thinner and plaster in the sink.• Painting on tables/equipment & Casting without protective sheets.• Damaging tools or equipment on purpose not by accident.	
Laser cutter practices:	
Not cleaning the laser cutters after use, including the tray, lens, lid and table.	1
Breaking a laser lens	2
Walking away from a laser cutter while in operation.	3
Laser cutting prohibited items and materials.	2

FIRE EXTINGUISHER

A Fire extinguisher serves to functions.

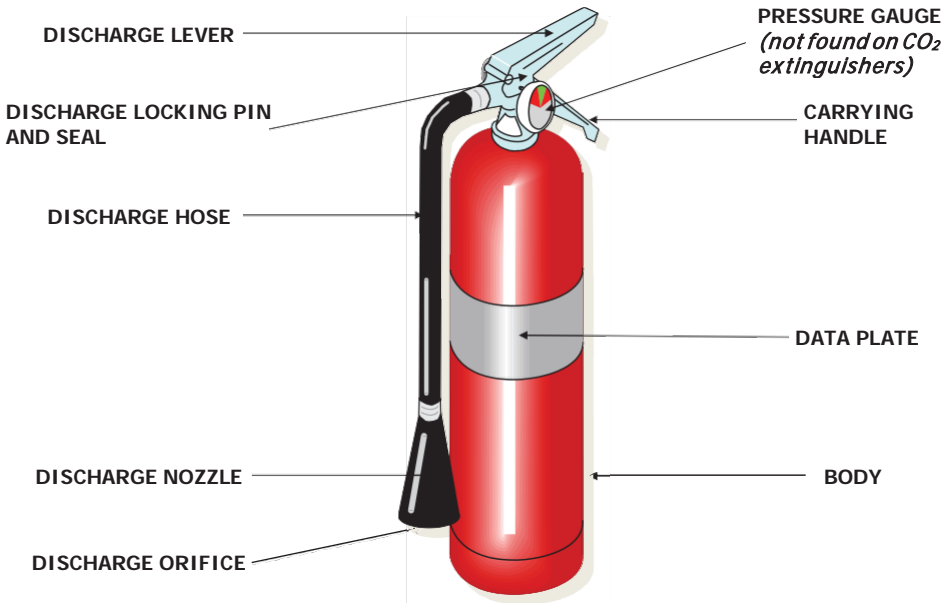
1. To control or extinguish a small fire (means a fire which is in the initial or beginning stage and which can be controlled or extinguished by portable fire extinguishers) and,
2. To protect evacuation routes that a fire may block directly or indirectly with smoke or burning/smoldering materials.





Three things must be present at the same time to produce fire:

1. Enough oxygen to sustain combustion
2. Enough heat to reach ignition temperature
3. Some fuel or combustible material.

Together they produce a chemical reaction that is fire.

Each fire extinguisher has specific fires it can control please look on the fire extinguisher for the symbols on the following page.



<p>A Trash Wood Paper</p>  <ul style="list-style-type: none"> ▪ wood ▪ paper ▪ cloth ▪ etc. 	<p>B Liquids Grease</p>  <ul style="list-style-type: none"> • gasoline • oil • grease • other solvents
<p>C Electrical Equipment</p>  <ul style="list-style-type: none"> • computers • fax machine • other energized electrical equip. 	<p>COMBUSTIBLE</p>  <ul style="list-style-type: none"> • magnesium • sodium • potassium • titanium • other flammable solids

To put out a fire please follow **PASS** steps! AFTER you have pulled the closest fire alarm.

- P**ull the pin,
- A**im low at the base of the flames,
- S**queeze the handle, and
- S**weep side to side.

Remember fires can be very dangerous and you should always be certain that you will not endanger yourself or others when attempting to put out a fire. For this reason, when a fire is discovered

1. Assist any person in immediate danger to safety, if it can be accomplished without risk to yourself.
2. Call 911 or activate the building fire alarm. The fire alarm will notify the fire department and other building occupants and shut off the air handling system to prevent the spread of smoke.

If the fire is small (and Only after having done these 2 things), you may attempt to use an extinguisher to put it out. However, before deciding to fight the fire, keep these things in mind: know what is burning and even if you have an ABC fire extinguisher there may be something in the fire that is going to explode or produce toxic fumes. Chance are you will know what is burning, or at least a good idea, but do not fight the fire if you don't. Is the fire spreading rapidly beyond the point where it started, if so please do not fight the fire. If the fire is already spreading quickly please evacuate the building by pulling the fire alarm. As you evacuate the building, close doors and windows behind you.

TOOLS.



LASER CUTTER FILE PREP: TROTEC

1. Create New Document in Adobe Illustrator using the File menu.
2. Set Custom Page Sizes, each laser has its own size requirements. Create an AI template for each or you may create any page size or to match your material size.
3. Choose Landscape Orientation.
4. Choose RGB Color in Color Mode
5. Orient drawing into the appropriate corner of the document OR to area of available space on your chosen material.
6. To cut or engrave a material you must make the lines a different color. All colors MUST be RGB colors.
7. For all cuts the lines must be Red. Select the R (RGB) and make the values R: 255 G:0 B:0.*For light score lines or to make other cut depths you may make those lines other RGB Colors such as Blue R: 0 G: 0 B: 255 or Green R: 0 G: 255 B: 0. Use cut settings at lower power, speed and pulses per inch (PPI) settings.
8. IE: Power: 30 - Speed: 20 - PPI: 1500 10. For Engraving all lines must be Black and shaded areas in grayscale. In this case make the values R: 0 G: 0 B: 0
9. All lines needing to be cut must be a specific stroke or line weight. To cut, the stroke must be 0.18 - 0.20 Points (hairlines). Any value above or below that will read as an engraving line and not cut properly. Your black or engraving lines are weighted according to your design. Hairlines are not required. *To score those lines must also have the same line weight of 0.18 - 0.20 PT.
10. IMPORTANT: Make sure there are no double or repeating lines. Importing from Autocad or other programs may cause this. Problems include: Overcutting, Material Burning, Poor cut quality, Fire and Machine Damage
11. The laser can accommodate engraving of textures or images. All images must be in grayscale. You may use TIFF, JPEG or Bitmap images to engrave. Not all materials accept the engraving as well as others, so please do tests or consult technicians. You may apply cuts, engraves and photo engraves to the same file.
12. If all the necessary changes are made to your file you may save it as an Adobe Illustrator file. Choose Save or Save As option in File menu. Title your file in a manner, which is recognizable or sequential to your project. Click Save. You will get a box with Illustrator Native Format Options. Please choose an Illustrator version of CS5 or less from the Compatibility dropdown menu. Click OK.

- 13.** Bring your file to laser room on storage medium such as USB Drive or External Hard Drive or via email or cloud.
- 14.** In order to use the Adobe Illustrator file with the laser it must be sent to the laser management software using the Print Dialog on the two computer stations in the laser room. The Trotec Job Control software functions as a printer driver. The Boss Lasers require you to Import your file into the specific software.
- 15.** For the Trotec Lasers, In Illustrator go to File>Print or press Ctrl+P.
- 16.** Choose Trotec Engraver as the Printer Type (this is the default).
- 17.** Click the Setup button at the bottom of the dialog box.
- 18.** Select the Trotec Engraver in Select Printer and then Preferences.
- 19.** Change the Width and Height to match your document size EXACTLY in inches. Document does not need to be the maximum bed size. Maximum bed size is 28" x 16.7" (it cannot be any larger)
- 20.** You may choose your Material Settings, but it can be done in the Trotec Job Control.
- 21.** Do not check any other boxes. Do not click Quick Print. For advanced engraving techniques using Process Mode please consult technicians.
- 22.** Click OK.
- 23.** The preview window should appear exactly as your file does inclusive of color and position. Incorrect colors or scales are due to an issue with your file not the software.
- 24.** If the orientation is incorrect, click the Landscape icon.
- 25.** If the document size appears incorrect, click the Size dropdown and select User Defined Paper.
- 26.** Click Print. Your file is now sent to the Job Control queue and will automatically open Trotec Job Control (If not look for it under programs in the start menu).
- 27.** While the program is opening, begin machine prep on the following page.

LASER CUTTER MACHINE PREP

- 1.** Before you can send your job to the Laser Engraver from the Trotec Job Control you must first physically place your material within the working envelope and then you are required to focus the cutting lens upon your work piece. Improper focal length will cause burning, fire or poor cut quality.
- 2.** First switch on the computer, then the Trotec Speedy 300. It is important that you switch on in this order. Switch the engraver on with the ON / OFF switch, located on the left-hand side at the rear of the machine.
- 3.** Open the protective cover and place your work piece on the honeycomb table.
- 4.** Usually you position the work piece into the upper left-hand corner of the table against the horizontal and vertical rulers.
- 5.** However, any other position on the table is also possible.
- 6.** When the machine is initially turned on, it must go through a homing sequence in which the processing head goes to 0, 0 and the table goes to the bottom of the working envelope.
- 7.** The protective cover must be down to complete this cycle.
- 8.** The machine will not operate or move if this cycle has not completed.
- 9.** Focusing the Laser Beam: For the laser beam in your laser system to be able to engrave and cut precisely, the energy is focused with a lens system, which is mounted on the motion system in a lens holder.
- 10.** For optimal processing the surface of the material, that you want to cut or engrave must be adjusted to a set distance.
- 11.** It is extremely important that your material be flat completely across the entire surface. Surface variations will cause uneven lens focusing and potentially ignite your work piece or cause poor cut quality.
- 12.** Hang the focusing tool on the external right lip of the working head so that the focusing tool does not fall off and the processing head can move unhindered.
- 13.** Move the processing head over the material to be cut or engraved by means of the Positioning Keys. These keys move the laser head on the X and Y axes.
- 14.** Move the working table upwards by pressing the Z Positioning Key. While doing this carefully observe the focusing tool. Before the focusing tool reaches the work piece, move the working table upwards very slowly step by step by briefly tapping the positioning key, until the tool tilts to the side or falls off. You are **focused!**

15. Close the protective cover and go back to the computer to the Trotec Job Control software.

16. Connect the computer to the Trotec Speedy 300 using the Connect icon or pressing Ctrl+L.

17. Double click or drag your file from the queue to the stage. Double clicking will automatically place the file in the top left corner of the stage. This is known as 0,0 (zero-zero) or home. If an error appears stating Cannot position any more jobs on this plate then your file or print dimensions are too large.

18. Double click your file on the stage to preview. It must look exactly as you want. Any colors that are incorrect are due to document type being wrong (CMYK instead of RGB), or from incorrect colors or line weights. Click small X to close preview. Job will not engage in preview mode.

19. Here you will verify your material settings and assure the proper type of cut is selected. Improper settings can harm work piece or cause fire and damage. The Material settings can be accessed via Settings>Material Template Setup or by pressing Ctrl+M. There are 3 setting modes: Cutting, Engraving and Skip. Only select the required mode for the corresponding colour. Click on name to change mode. When not in use it should read Skip. Cutting and scoring are all considered cuts. Users do not need to adjust the settings, as they are preset. Changing them can cause damage. If your work piece will not cut, check lens and mirror for debris first. Check proper lens focus depth. Material setting changes are a last resort and cannot be saved. Trotec automatically resets settings sometimes but you might want to check them every time!

20. To access multiple colours click the More/Less button. Click on name of action (cut, engrave, skip) to change function or to turn off (skip). To create light score lines, use cut settings at lower power, faster speed and lower pulses per inch (PPI) settings. IE: Power: 30 - Speed: 20 - PPI: 1500

21. Save any changes. Click OK.

22. Your file is now ready to send to the machine for cutting. The file should appear black on the stage. Click on file if it is grey instead of black. When the file is completed it will have a crosshatch pattern.

23. STOP and check that your material in the laser machine is focused and exactly where you want it.

24. Press the green PLAY icon or Ctrl+G to begin your cutting

For visual instructions please refer to:

<https://evds.ucalgary.ca/files/evds/evdslasertraining2011.pdf>

LASER CUTTER CLEANING

Cleaning of the laser cutter should be conducted after every job. Not completing this can lead to demerits against you or worse. Most fires are caused due to lack of cleaning and most lens's (\$400+) break because of improper cleaning.

1. Clean the mirror.
2. Clean the lens.
3. Clean the clear hood cover.
4. When cleaning, lower the table to the bottom of the cabinet and lift the honeycomb out of the laser machining through the front door. Then vacuum or sweep all debris from the table and door.
5. Clean the square ventilation holes on the backside of the inside of the machine. Use the small bristle brush to clean the square holes.
6. Open the red cabinet and clear any materials and debris. (important for fire prevention)

TIPS

1. Never clean the mirror or lens when they are hot or warm.
2. The lenses should always be clear if you cannot get them clear then you are to report the lens to a tech as it will break if used.
3. **Never clean the lens or the mirror with anything other than the pink lens cleaning fluid provided by the techs.**
4. Never touch the lens or mirror surface with your fingers, only use a cotton swab.
5. Do not over wet your swab as this will leave streaks on the lens and mirror.
6. Best to always leave a dry side of the cotton swab to clean off any excess liquid.
7. Be sure to secure the mirror back in the correct orientation and that the screw is tight! The corner of the lens should match the mitered corners of the laser head.

LASER CUTTER ALLOWED MATERIALS

Material choice can greatly alter your product quality. Testing materials can reduce future challenges. Please use only the permissible materials. The list of non-permissible materials is determined by characteristics of those materials that may damage the parts. *If you are unsure of a material please reference the SDS or consult technicians. Several materials can instantly crack or break lenses from a chlorine off gas. Some materials can cause filter and exhaust deterioration that reduces the efficacy of the system and exposes users to unsafe fumes. Other materials may have low flash points that are a fire hazard. Acceptable Materials for use with the laser cutter up to 1/4" (6mm) thick are listed below. Any violation can lead to demerits or worse. If you see misuse it is your duty to report it to a tech as soon as possible.

1. Acrylic
2. Polysheet / PetG
3. Rubber
4. Hardwoods
5. Softwoods
6. Plywood (No OSB, hardboard or MDF)
7. Cardstock / matte board
8. Cardboard
9. Paper
10. Fabric
11. Leather
12. Mylar / Vellum
13. Glass (engraving only)
14. Anodized aluminum (engraving only)



LASER CUTTER FILE PREP: BOSS

- 1.** Set Custom Page Sizes, each laser has its own size requirements. Create an AI template for each or you may create any page size or to match your material size.
- 2.** Choose Landscape Orientation.
- 3.** Choose RGB Color in Color Mode
- 4.** Orient drawing into the appropriate corner of the document OR to area of available space on your chosen material.
- 5.** To cut or engrave a material you must make the lines a different color. All colors MUST be RGB colors.
- 6.** For all cuts the lines must be Red. Select the R (RGB) and make the values R: 255 G:0 B:0.*For light score lines or to make other cut depths you may make those lines other RGB Colors such as Blue R: 0 G: 0 B: 255 or Green R: 0 G: 255 B: 0. Use cut settings at lower power, speed and pulses per inch (PPI) settings.
- 7.** IE: Power: 30 - Speed: 20 - PPI: 1500 10. For Engraving all lines must be Black and shaded areas in grayscale. In this case make the values R: 0 G: 0 B: 0
- 8.** All lines needing to be cut must be a specific stroke or line weight. To cut, the stroke must be 0.18 - 0.20 Points (hairlines). Any value above or below that will read as an engraving line and not cut properly. Your black or engraving lines are weighted according to your design. Hairlines are not required. *To score those lines must also have the same line weight of 0.18 - 0.20 PT.
- 9.** IMPORTANT: Make sure there are no double or repeating lines. Importing from Autocad or other programs may cause this. Problems include: Overcutting, Material Burning, Poor cut quality, Fire and Machine Damage
- 10.** The laser can accommodate engraving of textures or images. All images must be in grayscale. You may use TIFF, JPEG or Bitmap images to engrave. Not all materials accept the engraving as well as others, so please do tests or consult technicians. You may apply cuts, engraves and photo engraves to the same file.
- 11.** If all the necessary changes are made to your file you may save it as an Adobe Illustrator file. Choose Save or Save As option in File menu. Title your file in a manner, which is recognizable or sequential to your project. Click Save. You will get a box with Illustrator Native Format Options. Please choose an Illustrator version of CS5 or less from the Compatibility dropdown menu. Click OK.

LASER CUTTER CLEANING- BOSS L

Cleaning of the laser cutter should be conducted after every job. Not completing this can lead to demerits against you or worse. Most fires are caused due to lack of cleaning and most lens's (\$400+) break because of improper cleaning.

1. Cleaning the lens and mirror will be done by Technicians only.
2. Clean the clear hood cover with the supplied cleaner in the spray bottle.
3. When cleaning, lower the table so that you do not damage the laser head while vacuuming the debris. Open the front small door and pull out the drawer, dump into the garbage or vacuum the debris out.
4. Clean / Vacuum the interior of the cabinet and the metal honeycomb table to remove all laser cutting debris.
5. If you have issues talk to a Technician.

CNC CHECKLIST

DESIGN PREPARATIONS

- Is your model in inches?
- Did you consider the benefits of using pink or blue polystyrene rather than MDF - for example deeper cavities and faster processing?
- Did you pick and prepare your material making sure that your design model fits into it?
- Did you draw a box representing your actual material dimensions as cut, with your design model positioned within it?
- Did you try to position the top of your design model as close to the top of your material as possible?
- Is your design models' "0" origin at the bottom left hand corner of your material box?
- If your model needs to be cut out around its' outer perimeter, did you leave at least 1.5" from the outer edge of your model to the outer edge of the material for a boundary?
- Have you made sure there are no dangling extra models/bits or unnecessary lines, double lines on top of each other or unconnected lines? If so, delete all unnecessary details, don't just hid them. Export the model that is needed.
- If your design needs detail on the top and bottom side, did you split the model horizontally and flip the bottom side detail up, positioning it beside the top half? The upper and lower halves can be glued together after milling. (If it must be flip milled, please see Frank).
- Is each group members' name and the material length, width, and thickness in inches written on the material?
- Did you bring your material to the shop near the CNC routers?
- Have you tried to avoid tiny slots/cuts that require the use of tiny router bits in your design?
- Have you designed your model taking into consideration the limitations of the CNC routers' cutting bits (shown below)?
- If your model is a 3D design, did you avoid multiple small flat faces on curved surfaces (this slows down machining operations)?
- Is your 2D design model saved as a dxf file, and/or your 3D design model saved as a 3dm?
- Did you export only the model part that needs to be milled? Do not bring all your models in a file, only bring the most crucial parts.

ROUTER BIT LIMITATIONS FOR MDF

- Slots and/or pockets that require 1/16" (.0625") diameter router bits cannot be deeper than 1/4"
- Slots and/or pockets that require a 1/8" (.125") diameter router bit cannot be deeper than 7/16"
- Slots and/or pockets that require a 3/16" (.188") diameter router bit cannot be deeper than 3/4"
- Slots and/or pockets that require a 1/4" (.250") diameter router bit cannot be deeper than 1"

- Slots and/or pockets that require a 3/8" (.375") diameter router bit cannot be deeper than 1-1/4"
- Slots and/or pockets that require a 1/2" (.5") diameter router bit cannot be deeper than 2", (3" in certain situations)
-

ROUTER BIT LIMITATIONS FOR STYROFOAM

- Slots and/or pockets that require a 1/8" (.125") diameter router bit cannot be deeper than 1"
- Slots and/or pockets that require a 3/16" (.188") diameter router bit cannot be deeper than 1-1/4"
- Slots and/or pockets that require a 1/4" (.250") diameter router bit cannot be deeper than 2-1/4"
- Slots and/or pockets that require a 3/8" (.375") diameter router bit cannot be deeper than 2"
- Slots and/or pockets that require a 1/2" (.5") diameter router bit cannot be deeper than 4-1/2"
- Slots and/or pockets that require a 3/4" (.75") diameter router bit cannot be deeper than 10-1/2"

When you have checked off each of the 14 design preparations, bring it to Frank. After that, please email your files to one of the Technicians. This will open the line of communications, once your material is prepared properly and waiting you will be position in the cue. Once your files are in the cue, any changes to the file or unprepared material will bump you to the bottom of the list again. If your job is going to require many hours, holding up others from completing their work, you may be shifted back in the cue. If any of your check marks are not actually true, you may also lose your position in the cue. We thank you for your cooperation in helping to streamline the process and make things more efficient for everyone.

3D PRINTER

3D printing is becoming more prevalent in the design industry. SAPL is proud to own over 10 printers of varying sizes that can be used. SAPL machines are FDM or plastic deposition machines; extrusion plastic methods. Printing costs for the FDM machines are \$0.20 a gram and can only be calculated by a tech just before they print. You are to pay this amount prior to the tech starting the print job. No printing will be placed until a receipt is given to the tech printing your prints.

FILE PREP

- 1.** Think logically how your model will be printed. 3D printers build your model layer by layer starting from the bottom. Any overhanging structure will require scaffolding which the 3D printer will automatically build for you but can be a real pain to remove and make presentable. The more detail you want the longer the print will take and the more material you will have to pay for. Is it easier to make this in the shop? 3D printing can print the things you cannot make by hand because of complex geometries but should not be your main model making method.
- 2.** Talk to a tech early about your design to see if it will be printable or if any adjustments need to be made. Also the earlier you can get onto the 3D printing queue the more time you will have if anything goes wrong before a final crit. Techs will do their very best to get the print you desire but cannot guarantee when your print will be finished or if it will be successful.
- 3.** Scale down your model to millimeters with a tolerance to the max bed size of W11"x L11"x H9.8".
- 4.** Ensure that your model is a closed and solid geometry. If there is any holes in your model or just surfaces the print will run into issues or not print. Everything needs a thickness of no less than 1 mm.
- 5.** Ensure that your model has wall thickness of at least 1mm but to a more successful approach would be to make it larger than that.
- 6.** Please export your files and ensure that all files are in a .stl file type.

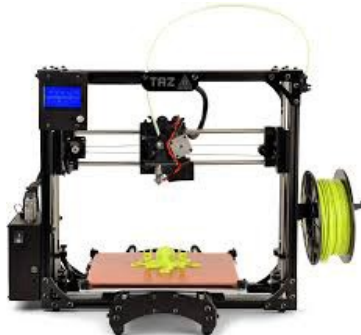


TABLE SAW

BEFORE YOU START WORK

1. Familiarize yourself with the hazards and control measures of the space by referring to the applicable Hazard Assessment and Control form
2. Familiarize yourself with tool/equipment, identify controls and determine all are in place and functional, carefully inspect equipment for damage
3. If defects or damage is found notify technician immediately.
4. Properly secure work piece
5. Secure loose-fitting clothing and hair and assume correct operating position

STEP BY STEP PROCEDURES FOR TASK

1. Determine if support person is needed based on length of material
2. Select correct blade for material
3. As applicable install / set up any fences, jigs or fixtures to the equipment
4. Make sure to use and remember, **LONG SIDE AGAINST THE FENCE** rule.
5. Set blade height and angle
6. Power on equipment
7. Cut material with push stick until material is clear of blade
8. Clear fence from table
9. Power off equipment
10. Make sure the machine is turned off before leaving it. Never walk away from a machine with it running.



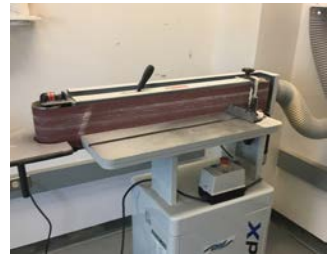
SANDERS

BEFORE YOU START WORK

1. Familiarize yourself with the hazards and control measures of the space by referring to the applicable Hazard Assessment and Control form
2. Familiarize yourself with tool/equipment, identify controls and determine all are in place and functional, carefully inspect equipment for damage
3. If defects/damage is found notify technician immediately.
4. Properly secure work piece
5. Secure loose-fitting clothing and hair and assume correct operating position

STEP BY STEP PROCEDURES FOR TASK

1. Select appropriate tool and sanding medium for the task
2. As applicable insert spindle tool into collet and firmly tighten
3. As applicable adjust and set fence, fixtures, jigs or guides
4. As applicable ensure dust collection is attached and running while using a sanding device.
5. As applicable activate dust extraction system
6. Turn on device
7. Sand a corner (belt sander and disc) use miter gauge to help achieve an accurate angle for your part.
8. Turn off tool when you are finished.
9. Clean debris often from work area, on the machine, and the surrounding area (floor surface), this is a safety hazard.



DRILL PRESS

BEFORE YOU START WORK

1. Familiarize yourself with the hazards and control measures of the space by referring to the applicable Hazard Assessment and Control form
2. Familiarize yourself with tool/equipment, identify controls and determine all are in place and functional, carefully inspect equipment for damage
3. If defects/damage is found notify technician immediately.
4. Properly secure work piece to the table.
5. Secure loose-fitting clothing and hair and assume correct operating position

STEP BY STEP PROCEDURES FOR TASK

1. Install fixture or work fastening or holding device
2. Secure work piece
3. Select drill/cutting tool, install and tighten
4. Turn on machine
5. Turn off machine and remove tooling after the device has stopped spinning.
6. Clean up after you are done and return drill bits and cutters to the appropriate location or technician.



CHOP SAW

BEFORE YOU START WORK

1. Familiarize yourself with the hazards and control measures of the space by referring to the applicable Hazard Assessment and Control form
2. Familiarize yourself with tool/equipment, identify controls and determine all are in place and functional, carefully inspect equipment for damage
3. If defects/damage is found notify technician immediately.
4. Properly secure work piece
5. Secure loose-fitting clothing and hair and assume correct operating position
6. Make sure the area around you is clean and safe to proceed.

STEP BY STEP PROCEDURES FOR TASK

1. Determine if a support person is needed based on length of material
2. As applicable install / set up any fences, jigs or fixtures to the equipment
5. Set blade angle most cuts are 90°
6. Move your material into position.
7. Hold onto your material with your left hand, **away from the no hand-zone.**
8. Pull the trigger and slowly pull the saw down into the material.
9. Let go of the trigger and return to starting position.
10. Remove debris with your cut piece of material never reach in and remove with your hand.
11. Power off equipment



BAND SAW

BEFORE YOU START WORK

1. Familiarize yourself with the hazards and control measures of the space by referring to the applicable Hazard Assessment and Control form
2. Familiarize yourself with tool/equipment, identify controls and determine all are in place and functional, carefully inspect equipment for damage
3. If defects/damage is found notify technician immediately.
4. Properly secure work piece
5. Secure loose-fitting clothing and hair and assume correct operating position
6. Make sure the area around you is clean and safe to proceed.

STEP BY STEP PROCEDURES FOR TASK

1. Where applicable, adjust the blade guard height to 6mm or 1/4 inch above the top of the material being cut
2. As applicable set and adjust any fixtures jigs or fences
3. As applicable clamp round stock to prevent rotation
4. Turn on device.
5. Keep hands on either side of the blade – not in line with the intended cut and blade, use push sticks.
6. Keep hands braced against the table holding the stock firmly and flat to prevent turning and drawing your fingers against the blade
7. Use a push stick when removing cut pieces from between the fence and saw blade or when hands are close to the blade
8. Cut material using push stick
9. Turn off saw and wait for it to stop moving before leaving the device.



STUDENT TOOLBOX

MEASURE AND LAYOUT

Cork backed ruler
Tape measure
Try Square
Combo Square
Framing Square

ABRASIVES

Wood Files
Pin or Needle Files
Sanding Blocks
Sandpaper

SAFETY

Safety Glasses
Ear Plugs
Smock / Apron
Hair Ties
Surgical Gloves

CUTTING

Utility knife (Olfa, X-Acto)
Coping Saw
Dozuki Saw/Backsaw
Wood chisels

BINDING

Wood Glue
Supper Glue
Epoxy (5 and 15 minute)
Hot Glue Gun
Masking Tape
Double Sided Tape
Spring Clamps
C-Clamps

ASSORTED

Toolbox
Screwdrivers
Hammer
Tweezers
Dental Tools

MATERIALS

The material is likely oversized, rough-cut, warped, scuffed or damaged upon purchase. It will need to be prepared before fabrication by cutting to more manageable sizes, planning and jointing or sanding out imperfections.

To maximize your material and enhance your fabrication design and strategy, it is useful to know several material options including the quality, finish and physical format at time of purchase. To optimize your project, undertake research regarding the material properties and common uses. A material choice can greatly affect your project quality, ease of production and final product. The most convenient material may not be the appropriate material so please consider alternative materials for every project.

MATERIAL FORMATS	FINISH	AVERAGE SIZE
Sheet Materials	Finish Varies	48"x 96", 60" x 60" (thickness varies)
Hardwood	Rough or Milled	Varies (avg. thickness 1-2" x 8" x 96")
Cardstock	White/Mill(Grey)/Chip	30" x 40" (thickness varies)
Model Making Woods	Finished	(Thickness varies)

DESIGN DEVELOPMENT

PMENT.

COMMUNICATION + PLANNING

Slowing the process down

Planning helps design, promotes safety and increases efficiency

Consider multiple processes and approaches

Drawings, sketch models and iterations key to strategy

Ask questions: IE: How would the project be produced in industry? What tools?

What is the safest method of production? Is the structural design appropriate?

Does it translate when scaled? What material best communicates the concept?

The most productive and informative methodology during the design and planning stages is ideation. This can take several forms including writing, drawing, sketch models and testing. Alternatively, a process informs your final design as well as your fabrication strategy. The generation of sketch models or drawings can aid in solving design problems and manufacturing dilemmas.

Drawing is one of the best tools for both overall and fabrication design ideation. Drawing can aid in understanding the structural, connective or formal elements before making models or final production.

Creating low quality tectonic models can be an extremely informative step in the resolution of your project. You can fabricate using wood or plywood to quickly understand form. For more immediate sketches use paper, cardboard, cardstock and masking tape to create iterations that can act as suggestions of your model and problem areas.

The most significant role of the projects you will generate through the workshop is that of communication. Consider how to successfully express your concept physically through form, emotive response and intent. Every decision you make, every piece you place has purpose. Be aware of the repercussions of all formal decisions. TIP: Let the material and artisanship tell the story. Your choices will have impact.

There is limited space to store items in the studios and workshop. If things are left in the shop for long periods, then they risk being thrown out. This is especially true for items left on the floors, work benches, or leaning against tables. Students may share the cubbyholes with trays inside the workshop and in the studios. Put your name and year of study on a piece of tape on the front of them. One per person, if not sharing. There is a small standing sheet good storage unit (Make sure your Name is clearly depicted on your goods, and cabinets for free materials. The RED wheeled bins are not garbage cans they are for useful materials.

In the both the 4th floor studio and the 2nd floor studios there are shelving units and cabinets for your use.

IMPORTANT:

WHEN PROJECTS ARE COMPLETE, YOU ARE TO TAKE YOUR ITEMS HOME OR THROW THEM OUT. IE: MODELS, DRAWINGS, ETC.

SUPPLIERS + VENDORS

PLASTICS AND CASTING SUPPLIES

Polymershapes	403-250-1670
Laird Plastics	403-250-9298
Industrial Plastics and Paint	403-252-8368

SOLID WOOD AND SHEET GOODS

PJ White Hardwoods	403-243-4747
Windsor Plywood	403-202-3132
Mountain View Building	403-242-0404
Upper Canada Forest Products	
Timber Town	

GENERAL HARDWARE

Home depot	
Hillhurst Hardware	
Lowe's	403-283-3333
Rona	
Princess Auto	
Lee Valley Tools	

METAL	403-253-2066
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Metal Super Market	
UofC Engineering Stores	403-720-2267
	403-220-4511

HOBBY SHOPS

PM Hobbycraft	
	403-291-2733

3D PRINTING MATERIAL

Print Your Mind 3D	
3D Printing Canada	

