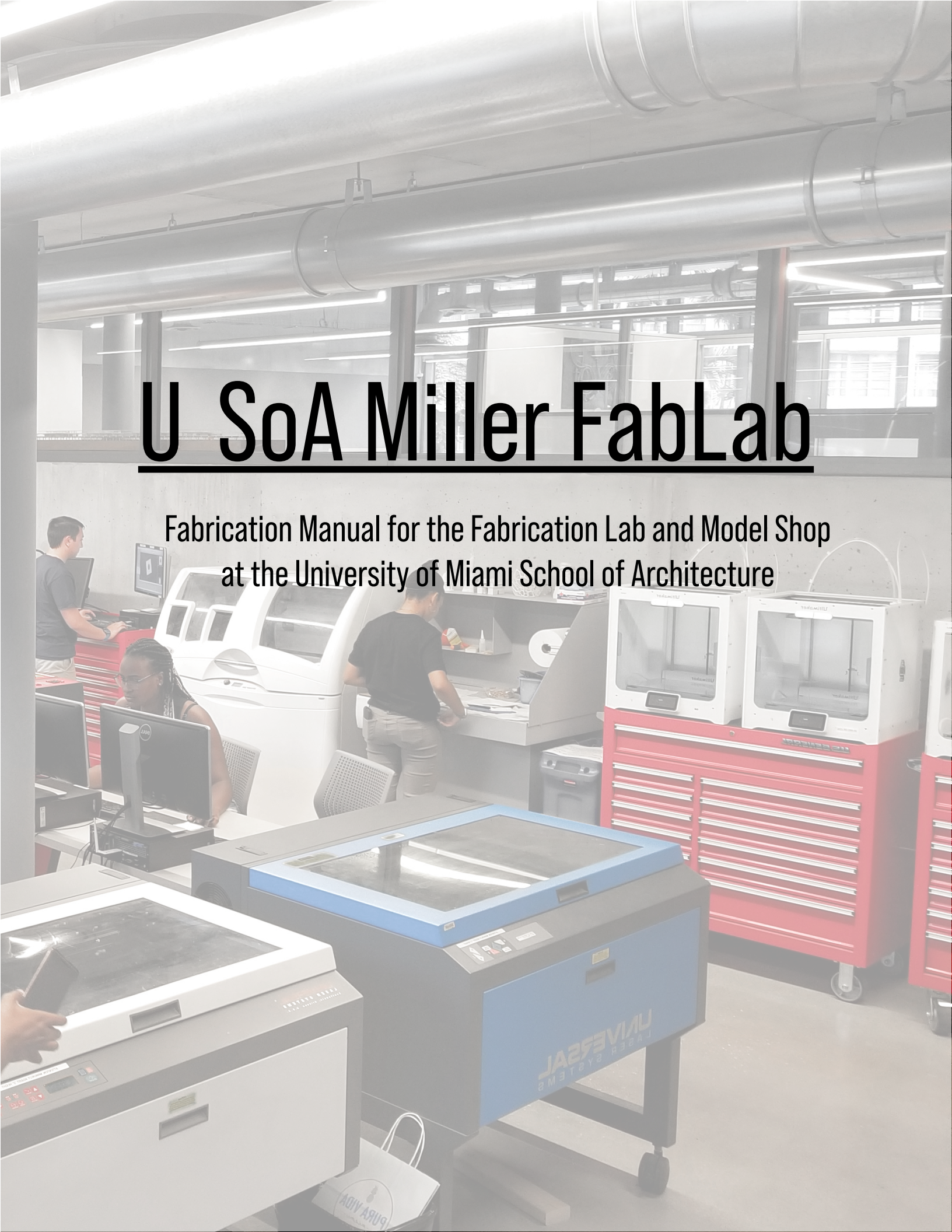

U SoA Miller FabLab

Fabrication Manual for the Fabrication Lab and Model Shop
at the University of Miami School of Architecture

People

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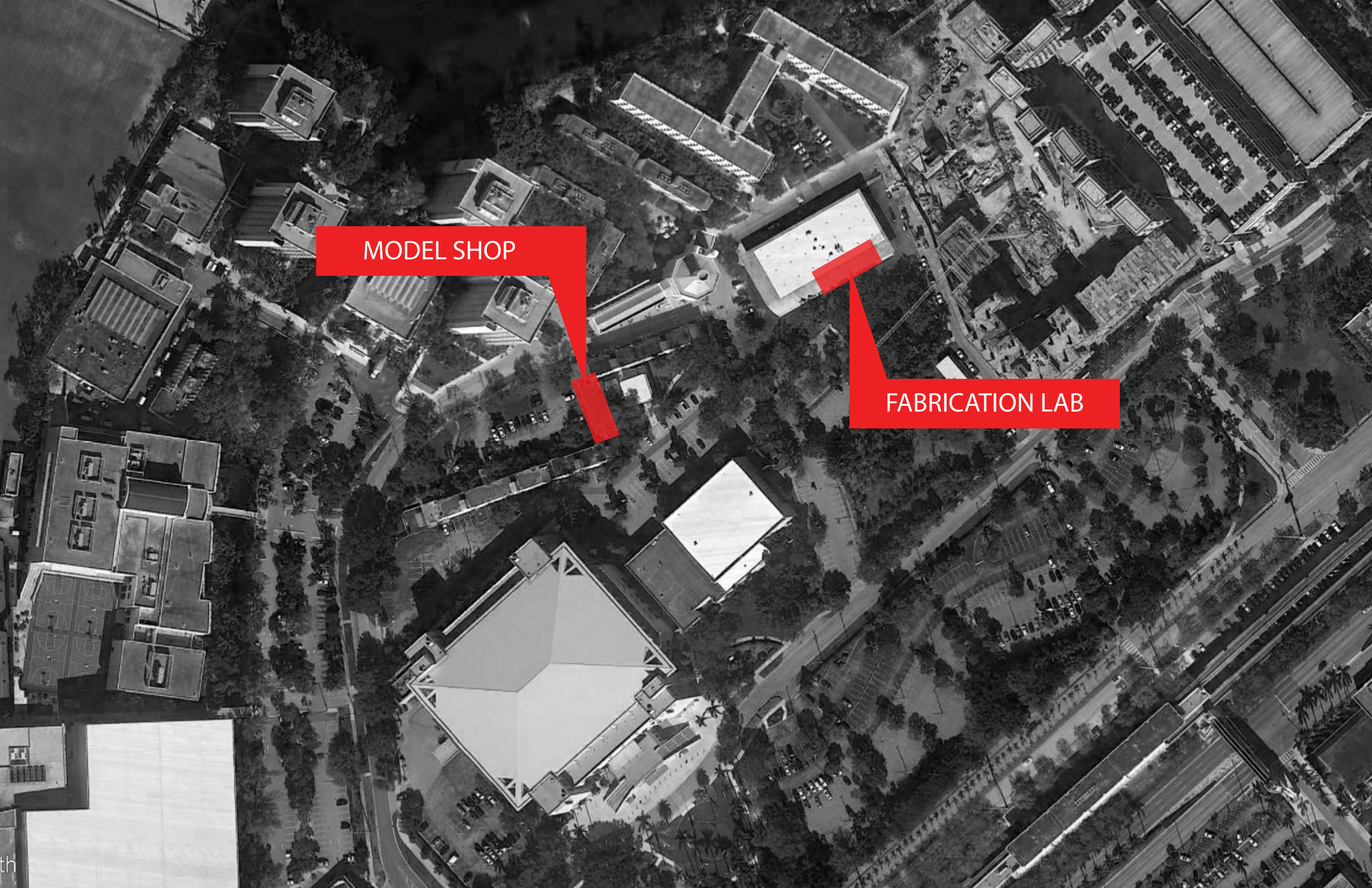
Instagram: @UM_SoA_Fab
Youtube: @UM_SoA FabLab

Table of Contents

Mission Statement

The U-SoA Fabrication Lab will foster a culture of learning through making. Its principal purpose is to serve students and faculty in existing and future research pursuits, by providing robust training and broad access to a host of digital and analog tools. The Lab aims to continually improve, incorporating new technologies and expanding its capacities, growing into a resource equal to the substantial ambitions of a top-tier architecture program.


MODEL SHOP
FABRICATION LAB

TRAINING AND GENERAL USAGE POLICY

The Fabrication Lab and Model Shop are open to all students and staff at the University of Miami and limited access may be available to other users outside of the University of Miami. It is the aim of the Fabrication Lab and Model shop to be as open as possible to promote access to equipment and expertise needed in fabricating their projects.

All users are required to sign all needed Model Shop and Fabrication Lab Safety Waivers and complete any required training needed prior to equipment use. All Architecture students entering First Year will be provided training integrated into their courses. All others must schedule training prior to using any of the equipment. Any user who lies about their completed training or signed waivers will release the University of Miami for any liability of injury.

The training protocal consists of:

Signing Appropriate Safety Waiver

60 Minute Model Shop Training

Extended machine training may also be needed varying on skill and comfort level

Additional Training is required for:

Level 2 Equipment

CNC Mill Equipment

Robotic Arm Equipment

Student Usage

All University of Miami students who have completed their training and satisfied all lab requirements may use the Model Shop and Fabrication Lab for any projects that they are working on. For any equipment in which the University of Miami is provided material or expenses, students may only use the equipment for school related projects.

Faculty Usage

All University of Miami faculty who have completed their training and satisfied all lab requirements may use the Model Shop and Fabrication Lab for any projects they are working on. However, faculty members must additional submit and have a signed Fabrication Lab Use form from the lab to use the resources. This form requires the faculty to submit the purpose of the

TRAINING AND GENERAL USAGE POLICY

work they are using the Fabrication Lab for. Any projects that are related to their career at the University of Miami or additionally as part of their creative practice development is allowed, free of charge. For any projects that are outside of this scope, faculty members must pay for the resources they are using , based on the estimate of the Fabrication Lab Manager.

Staff Usage

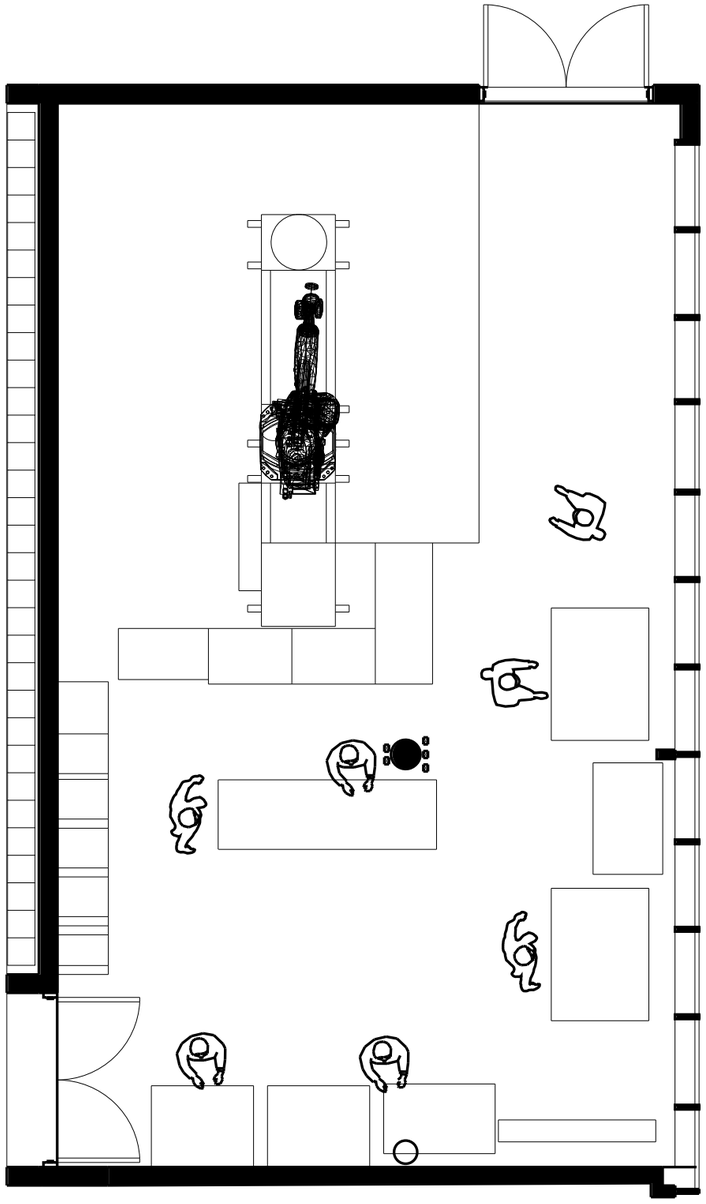
All University of Miami staff who have completed their training and satisfied all lab requirements may use the Model Shop and Fabrication Lab for any projects they are working on. However, staff members must additional submit and have a signed Fabrication Lab Use form. from the lab to use the resources. This form requires the faculty to submit the purpose of the work they are using the Fabrication Lab for. Any projects that are related to their career at the University of Miami or additionally as part of their creative practice development is allowed, free of charge. For any projects that are outside of this scope, faculty members must pay for the resources they are using , based on the estimate of the Fabrication Lab Manager. University of Miami affiliates will have a reduced fee compared to non University of Miami affiliates.

Non University of Miami Affiliate Usage

Any non University of Miami affiliates may use the lab with approval from the Fabrication Lab Manager and must have the proper training and appropriate forms signed. All non University of Miami affiliates using the lab must pay a standard hourly fee estimated by the Fabrication Lab Manager as well as filling out a Fabrication Lab Use form.

Lab Computer Usage

All lab computers are meant solely for the execution of equipment. These computers are not lab computers for students use in working on coursework or preparing files. All files should be prepared prior to entering the lab. The lab computers should only be used to download the prepared files and do any necessary steps on the computers to send the file to the equipment. Students will be asked to vacate the computers if they are working on the computers and someone else needs to use the equipment.



B.E. and W.R. Miller Fabrication Lab

U-SoA's modeling and fabrication facilities provide students the opportunity to turn their conceptual design projects into physical representations, allowing them to elaborate on the techniques learned in design courses. The fabrication facilities serve as an augmented area for exploration, prototyping, and design thinking through making. Studio assignments and research projects are pursued during the staffed lab hours under the supervision of a full time Fabrication Director and Student Lab Monitors.

A KUKA KR240-r2700 prime robotic arm. It can lift up to 500 lbs of material with an 8' working diameter and is capable of manufacturing parts made out of plastic, wood and cement. The current configuration allows students to use a spindle to mill architectural projects out of plastics, wood and foam with a variety of cutters. Additionally students have access to a 48 inch hot wire cutter that allows them to carve large blocks of foam. Additionally, the arrival of the robotic arm will promote and develop opportunities for students interested in fabrication, robotics, automation, coding and manufacturing.

Four Universal Laser machines. These machines include higher watt, large format machines that have cutting beds (24" x 36") and two with a smaller 24" x 18" cutting bed.

Four new Ultimaker F.D.M. 3D printers. Two are Ultimaker 3 Extended and two are Ultimaker S5, the largest FDM printer-to-date by Ultimaker. All have dual extruders and will have white PLA as printing material and PVA as support material. Additionally 3 Sindoh 3D printers have been located outside the Fabrication Lab for student use (students must provide their own filment on these printers).

For fine grain resolution models students will also have access to the Z-350 powder printer at the Fab Lab. The ZCorp 350 Powder Printer uses a fine powder in combination with a binder to create models of extreme precision and detail. Additionally students have access to a Formlabs 3B Resin Printer.

There is also a 53" vinyl cutter that allows students to cut vinyl, adhesives, papers, and circuit boards out of spools of material without a machine limit in length.

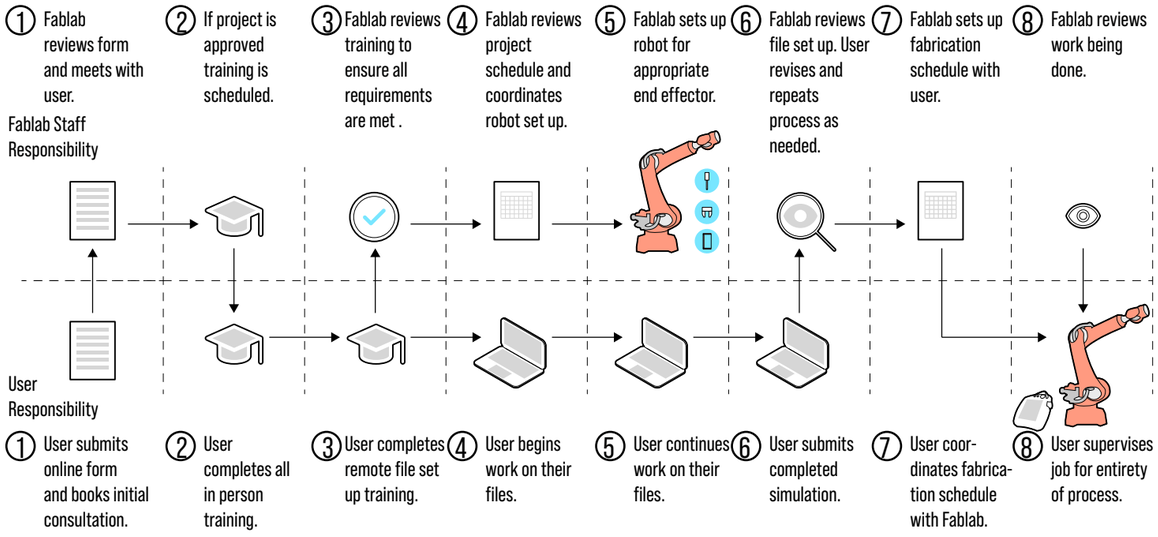
Robotic Arm

The robotic arm will create opportunities for students and faculty interested in fabrication, robotics, automation, coding and manufacturing. The robotic arm offers a tremendous amount of versatility in fabrication processes such as cutting, moving, milling, machining, and printing. The specific robotic arm at the U_SoA can lift up to 500 lbs of material within an 8’ working diameter and is capable of manufacturing parts made out of a variety of mediums. TThe robotic arm will primarily be taught in courses developed specifically around the use robotic fabrication techniques.

GENERAL USAGE

Due to the complexity and safety hazards of the robotic arm, its use will be limited to trained faculty and students only. The fabrication lab will provide only the primary robotic training as included with our intial set-up and any end effector that is created specifically through University of Miami School of Architecture Model Shop designated funds (e.g. The Model Shop purchases a new end effector and program to run the robotic arm, training will be made available for its use to all). Please see the following diagram to demonstrate the general process for use of the robotic arm (note - other processes will be described on subsequent pages).

General robotic arm usage diagram:



While the fabrication lab aims for all equipment to be open use for all faculty, staff, and students the robotic arm has certain complex requirements that will limit its usage. Due to the expected high demand of usage, high barriers to entry, long preparation and production times, and potential issues with authorship the following policies will apply to the use of the robotic arm:

Prioritized Classroom Use:
With the complexity of knowledge required for a university to build a collective knowledge base for continually operating a robotic arm, all courses taught will have priority over individual or small research project use. This policy aims to bolster the amount of taught content related to the robotic arm so that knowledge will inherently pass through students across multiple years at the University of Miami.

GENERAL USAGE (cont.)

Training Program:
Faculty members and students approved to move forward with training on the robotic arm must commit to two training workshops for basic training, each consisting of a continous four hour session. The sessions will cover the following:

Session A(4 hours):
- -Initial Introduction to Robotics
- -Manual Movement
- -Basic Operation
- -Setting a Base
- -Safety Training
- -Troubleshooting
- -Introduction to Powermill

Session B(4 hours):
- -Powermill Training Session

As new workflows are developed, additional and alternative training sessions will become available for Session B (or Sessions C and onward if needed for multiple end effectors), such as KUKA PRC training session. Due to the length of the sessions and limited initial staff available for training, training sessions may not meet all project deadlines. The fabrication lab recommends moving forward with project inquiries and training, months in advance of project deadlines.

Additional Training Requirements:
The operation of the robot can cause potential serious damages to the equipment and surroundings, which are critical in the project and file set-up. All users must demonstrate their understanding of these dangers in their file set-up including safe transitions and safe movement (e.g. no collisions or singularities). Training is dependent on user background and skill set and could take between a couple weeks and multiple months. The fabrication lab will provide training as listed above, but users must submit a completed file set-up as an additional remote training requirement to demonstrate their full comprehension and understanding of key robotic procedures and safety factors in project set-up. The user is responsible for the production of all of their files including running the simulation to ensure safety of movement.

Intellectual Property:
Robotic fabrication is at the forefront of emerging technology and unique research may create issues of authoriship. To avoid authorship and copyright issues within the school and larger academic community, all files must be generated by the user and not the fabrication lab staff. Just as architects have ownership over their drawings, fabricators have ownership over all production files, code, and product therefore it is the sole responsibility of the user to complete the files and code they will run on the robotic arm. Any intellectual property created in the preparation of files or products built by the fabrication staff is owned per the University of Miami Intellectual Property Guidelines and appropriate credit must be granted in all communications, exhibitions, and images.

Time Frames:
The use of the robotic arm contains extended time frames required for set-up and operation. The fabrication lab staff cannot maintain all equipment and safe usage across all lab spaces while simultaneously creating files and operating the robotic arm for users. While staff will be responsible for training and assistance, users must create their own files and be present for the length of the entire job. File set-up can take from multiple hours to multiple semesters depending on setup and process. Additionally, many processes could result in multi-day jobs which must be separated and run only during times of operation of the fabrication lab. All files must be ran with one trained user operating and one trained staff member in the same room.

Alternate Modes of Fabrication:
Any processes that can be completed by other simpler processes should be completed on other equipment, with the exception of building knowledge for future portions of the process (e.g. student test cuts with the hot wire cutter on small strips that could be hand cut, but will eventually cut larger pieces that can only be cut by the robotic arm is allowed, if the student is only aiming to cut at that scale they will be required to use the hand hot wire cutter).

User Roles and Responsibility:
All users are responsible for completing all training requirements and submitting all required forms prior to using the robotic arm. The users files must all be approved by the Fabrication Lab Manager prior to being run on the equipment. During the operation of the robotic arm, the user must wear all proper PPE and be present and focused on the equipment the entire duration of the project run time.

Fabrication Lab Staff Roles and Responsibility:
Similar to other equipent in the Fabrication Lab the staff's primary responsibility is to help train students on how to use equipent, provide maintenance on equipment, and ensure safe processes are being performed on all equipment. Processes on the robotic arm are too complex and time consuming for student workers to produce the files and run the equipment for users. Additionally, unfair usage concerns may arise out of one particular user being provided file service and while others are not. (Please note, not all fabrication lab employees are trained on the robotic arm so there may be limited access to assistance).

Trained Staff in the Lab will provide the following service related to the Robotic Arm:

-Training Workshops for Faculty and Students (scheduled in advance of use, after robotic arm use form has been submitted and approved).
-Ensure proper PPE is worn.
-Monitor the use of the equipment for any issues.

Safety:
The robotic arm is an extremely dangerous piece of equipment and must be treated as such. To ensure student, staff, and faculty safety, all safety guidelines must be met:

-All proper PPE must be worn.
-Two trained people must be in the room at all times during use of the robotic arm (one primary user and a second trained staff member of the fabrication lab).
-All files must be reviewed prior to sending.
-All files must have run a complete environment and collision simulation.
-Entrance to the robotic arm cage during files or manual movement is restricted.
-All files must be started in T2 mode, with a maximum of 30% speed and must remain for the first 5 minutes to ensure proper set-up.
-User must monitor job during the fabrication, no phones or computers are allowed during the use of the robotic arm forfabrication.

Installation Schedule
During the initial set up, testing, and early usage of the robotic arm will be restricted to projects specifically researching the use of the robotic arm and it's workflow (e.g. faculty member researching how to use the robotic arm to wrap carbon fiber structures would be allowed, faculty member requesting to mill something that only requires 3 axis machining would not be allowed). The robotic arm was installed in Spring of 2020 and due to its complexity will require a longer amount of time to reach critical use compared to other equipment. Training and workflows are currently still being developed for the arm. The lab aims to operate under the following schedule:

-Spring 2020 - Initial Set-Up, Restricted Availability

-Fall 2020 - Initial Testing, Restricted Availability

-Spring 2021 - Continued Testing, Limited Training, Restricted Availability

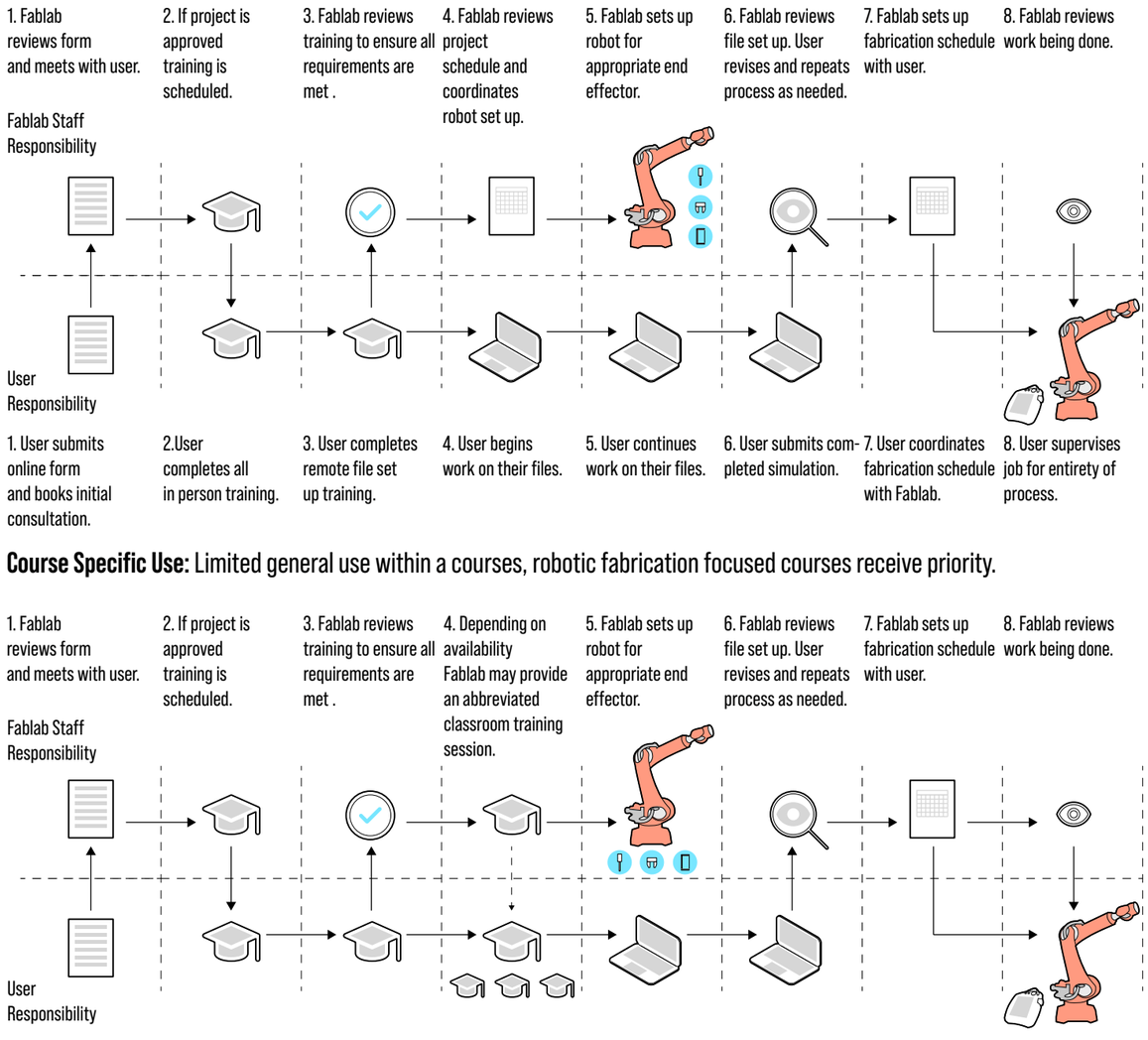
-Fall 2021 - Expanded Training and Increased Availability

This extended installation is required due to the limited amount of existing trained staff and faculty members and aims to give time to produce a larger community of users at which point training and use of the robotic arm will become increasingly available to the broader community. Any school closures or continuity issues may delay this process further.

USAGE TYPES

The Digital Fabrication Committee has created four systems for use of the robotic arm that provide offer different levels of committment and lab support based on funding and research interests. Those four systems are:

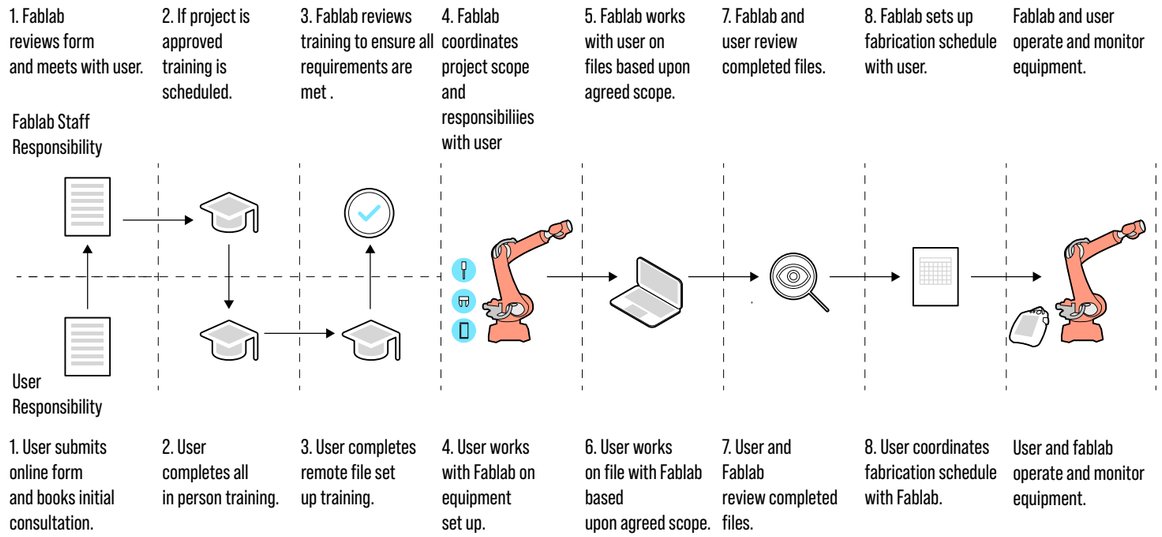
General Use: Student research related to coursework or Faculty Creative Practice Work



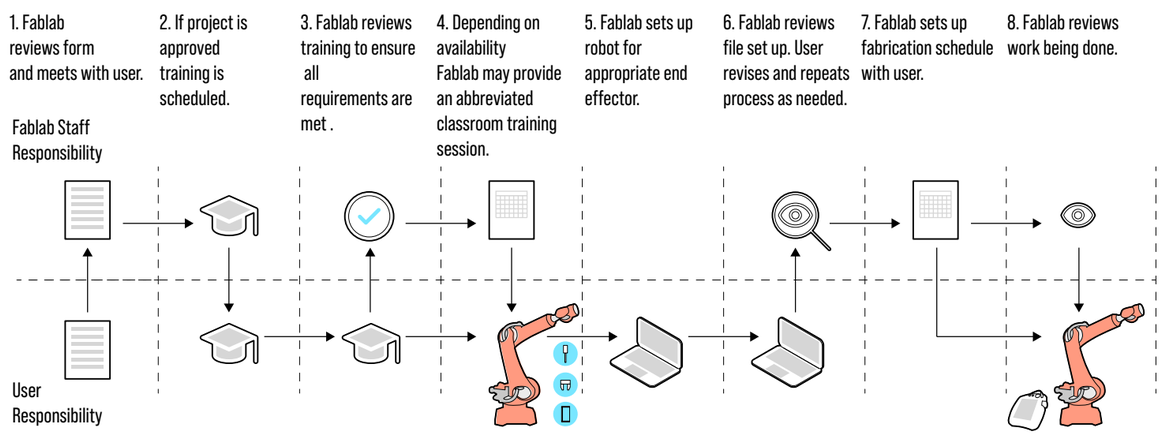
Course Specific Use: Limited general use within a courses, robotic fabrication focused courses receive priority.

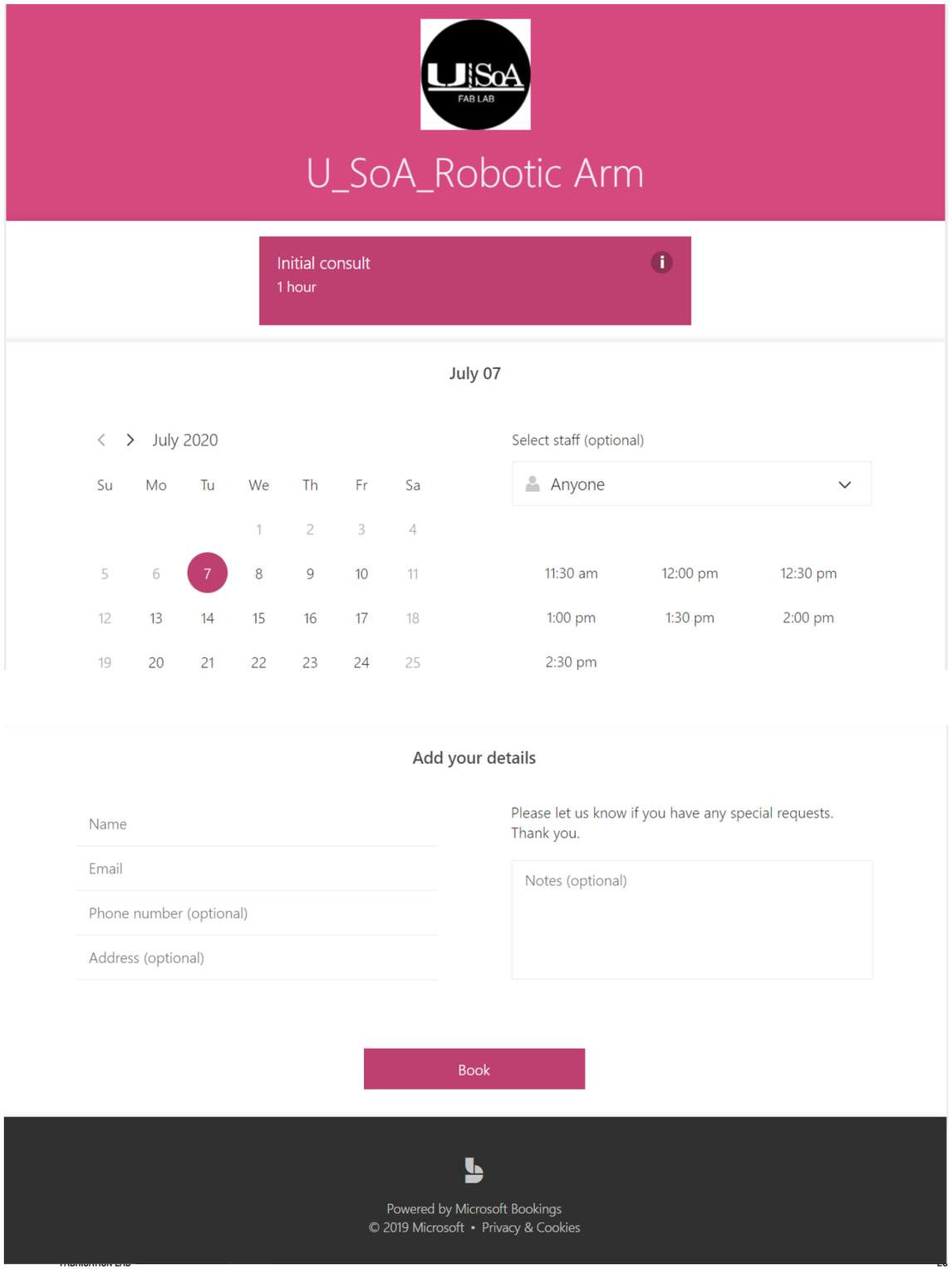
USAGE TYPES (cont.)

Funded Research: Research covering costs for extended Fabrication Lab Involvement (dependent on lab capacity, availability and agreement on scope sharing).



Research Requiring Special End Effector: End effectors developed or owned by faculty/students outside the Fabrication Lab.





Initial Consultation and Use Approval:

Faculty members and students can reserve an initial project appointment via the School of Architecture's website to consult on their intended project. The purpose of this meeting is to gauge viability, project responsibility, timeline, and fabrication process. If the project is approved to move forward, the faculty member or student will schedule a training workshop with a trained user approved by the Fabrication Lab Manager. To complete the booking appointment, follow the steps below:

Open the booking page through the School of Architecture website.

Click Initial Consult.

Select a staff member who is able to provide the consultation from the drop down menu under "Select Staff"

Click a date and time that is available via through their schedule.

FIll in all additionall details at the bottom of the page.

Click "Book", the user should receive an immediate confirmation. If no confirmation was received the appointment was not created.

This initial appointment is only to discuss project details and viability. At this point the Fabrication Lab Manager will approve or rejects the project and schedules training sessions directly with user. The user must complete all training and file preparation before they will be allowed to operate the robotic arm. All operation will be scheduled once the Fabrication Lab has approved that the training requirements have been met and reviewed all project files that will be run on the equipment. Only approved files shall be run and any changes require Fabrication Lab approval before being resent to the Robotic Arm.

Robotic Arm Project Request Form

In addition to booking an initial project consultation, users must submit a Robotic Arm Project Request form (shown on next page). The form requires users to fill out their name, project modality (as descrived on previous page), existing training level, specific end effectors required, project description, project timeline, funding information and scope of Fabrication Lab's role. Additionally the project incorporates items from the Faculty Project Acknowledgment Form to reduce the submittal process to a single page. The Fabrication Lab will provide justification for any accepted or rejected processes. Any errors or emissions of project scope will result in a project rejection. Project request forms must be filled out and brought to the initial consultation.

Robotic Arm Project Request Form

Name:

Modality:

☐ General Use ☐ Course Specific Use ☐ Funded Research ☐ Research Requiring Special End Effector

Existing training/skill level on digital fabrication equipment(specific):

Robotic arm end effectors to be used:

Project description (specific robotic processes):

Desired project schedule and time frame:

If funded research, describe funding sources, allocation, and project scope (e.g. user+fabrication lab specific roles and responsibilities):

Project type (Check One):

☐ Academic ☐ Creative professional development (related to academic position) ☐ University of Miami affiliated personal project* ☐ Non-University of Miami affiliated personal project*

Accepted: ☐ Declined: ☐

Justificaton:

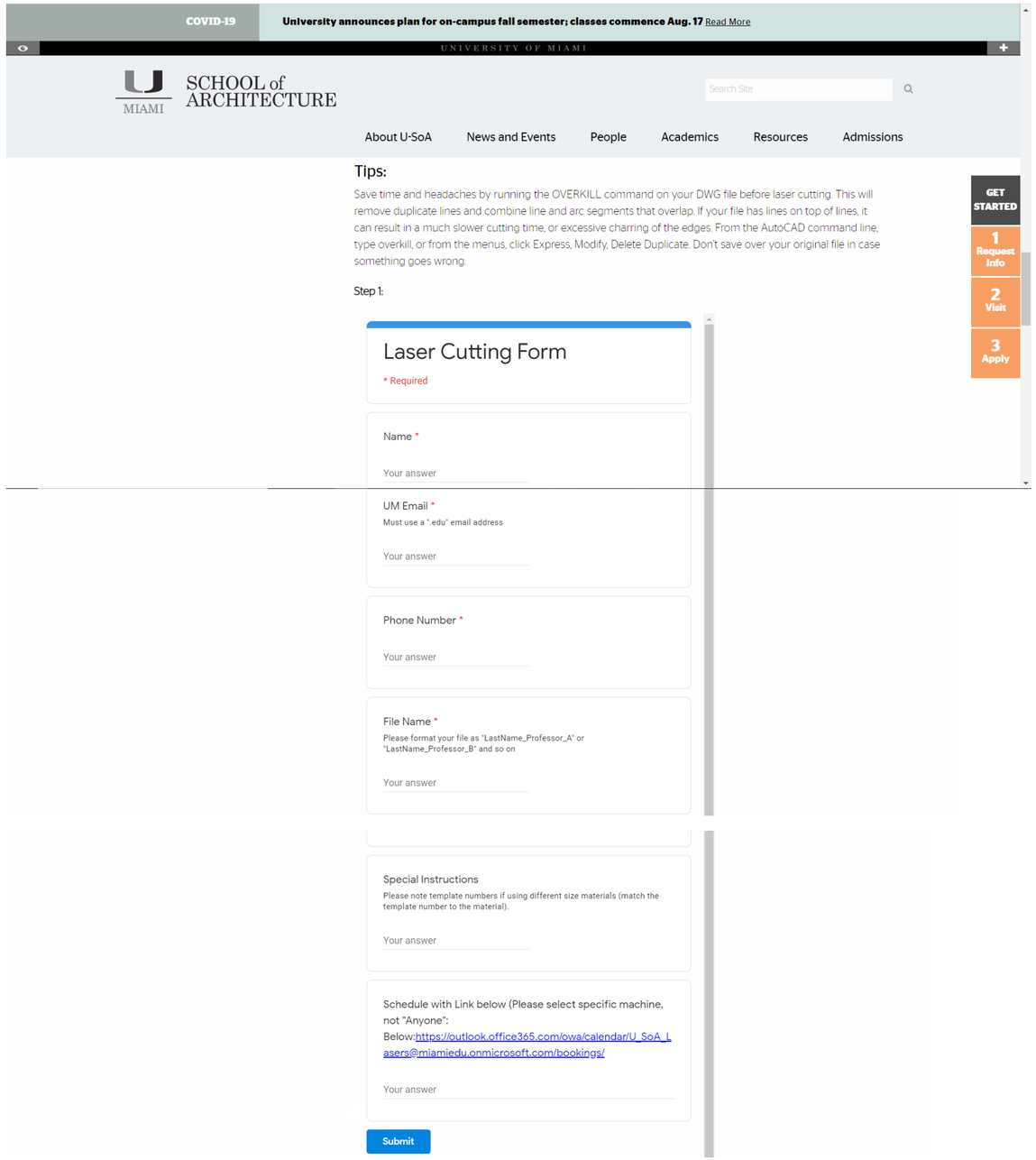
User signature: _____ Date: _____

Manager signature: _____ Date: _____

UNIVERSITY OF MIAMI
SCHOOL OF ARCHITECTURE
FABRICATION LAB

Laser Cutters

The U-SoA Fabrication Lab will foster a culture of learning through making. Its principal purpose is to serve students and faculty in existing and future research pursuits, by providing robust training and broad access to a host of digital and analog tools. The Lab aims to continually improve, incorporating new technologies and expanding its capacities, growing into a resource equal to the substantial ambitions of a top-tier architecture program.



USAGE

The laser cutters are available to all faculty and students and appointments to use the equipment are made via the School of Architecture website (more information below). To use the equipment all users must submit a form through the School of Architecture website as shown to the right. These forms allow the lab to monitor the amount of cutting across semester and track increases in use. At the end of the form there is a link that will take students to reservation page.

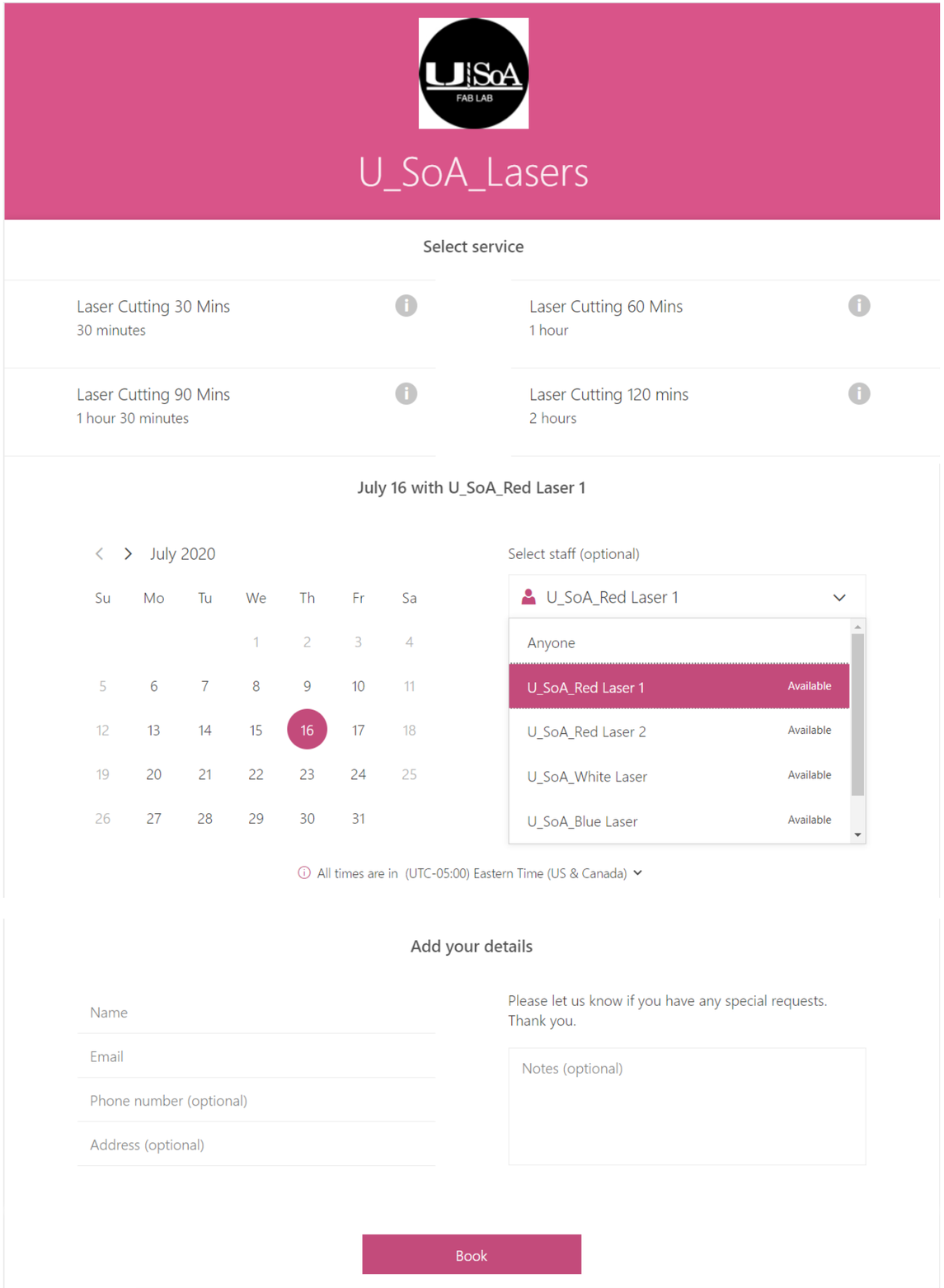
There is no limit to the amount of time a user may book on the equipment, but we ask that all users be respectful of others need for the equipment, especially around midterms and finals. Students must be at the desk with the laser cutting within 5 minutes of their scheduled time or they will forfeit their slot to the first available user who is ready to start cutting. The work-stations are meant for sending the file only, not as a place to work on the files. The files must come ready to cut, with limited adjustments as needed while sending the files.

All users should send a test cut file first, predrawn into their template and test the settings on the laser cutter to ensure proper cutting. This small task will save time by preventing a long file that doesn't cut all the way through and save money by preventing wasted material. The fabrication lab staff is available to help adjust the settings as needed during the testing process to ensure proper settings are being used. Please ask if you need assistance during this process. Additionally, users must run the time estimation process during set-up to ensure their cut will finish in their time slot.

The fabrication lab is not liable for any damages to student material or delays associated with or caused by the machines. It is the users responsibility to test the settings before sending their final file to cut. If a user runs over their alloted time period, they may only continue cutting if the user in the appointment afterwards allows them to use their time. The user allowing this to happen will not receive any extra cut time in return and must ensure they will not go over their time slot as well. If the next user does not wish to forgo any of their time, the initial user must cancel their job and finish immediately.

All users are required to stay for the entire length of their cut time and must be monitoring their cut the entire time. Due to the length of time and limited risk for fire, users may work on their laptops or use their phones while cutting, but must continually monitor the laser while doing so.

Users are fully responsible for cleaning out the machine including all cut pieces and the removal of scraps. The machine bed should be completely cleared out when a user has finished using the machine and no material should remain. The fabrication lab does not accept scraps and the user must remove everything that they brought into the lab. Cleaning is considered part of your appointment and the user should ensure their appointment covers enough time to set-up, cut, and clean the equipment when finished.



Reservations

Faculty members and students can reserve the machines directly through the laser cutting site on theSchool of Architecture website. Users must select the time duration that they will cut within as well as which machine they will be using. Students are not limited to the amount of time they wish to use the equipment for. Students are required to fill out and submit the form online as well as the online reservation system which is attached in a link. To book an appointment follow the steps below:

Access the booking page through the School of Architecture website.

Click the amount of time you would like to schedule your cut for (e.g. 30 minutes, 60 minutes, etc) from the top row of selection boxes.

Next select a machine under the “Select Staff” box. If users do not select a specific machine and only select “anyone” their appointment will be cancelled. The four options are Red Laser 1, Red Laser 2, White Laser, Blue Laser.

Once a machine has been selected, the days and time slots available according to the length of time selected in step 2 will appear. Users should select their choice of date and time.

After choosing the date and time, fill out all additional details at the bottom of the page and click “Book”.

Appointments are only official once the student has received an email confirmation, confirming that their appointment was created. This should happen immediately, if the user does not receive this, their appointment was not booked.

Students must be at the desk with the laser cutting within 5 minutes of their scheduled time or they will forfeit their slot to the first available user who is ready to start cutting.

Procedures

Laser Cutting and Engraving from AutoCAD
Red Lasers (ILS9.150D) and Blue Laser (VLS 6.60)

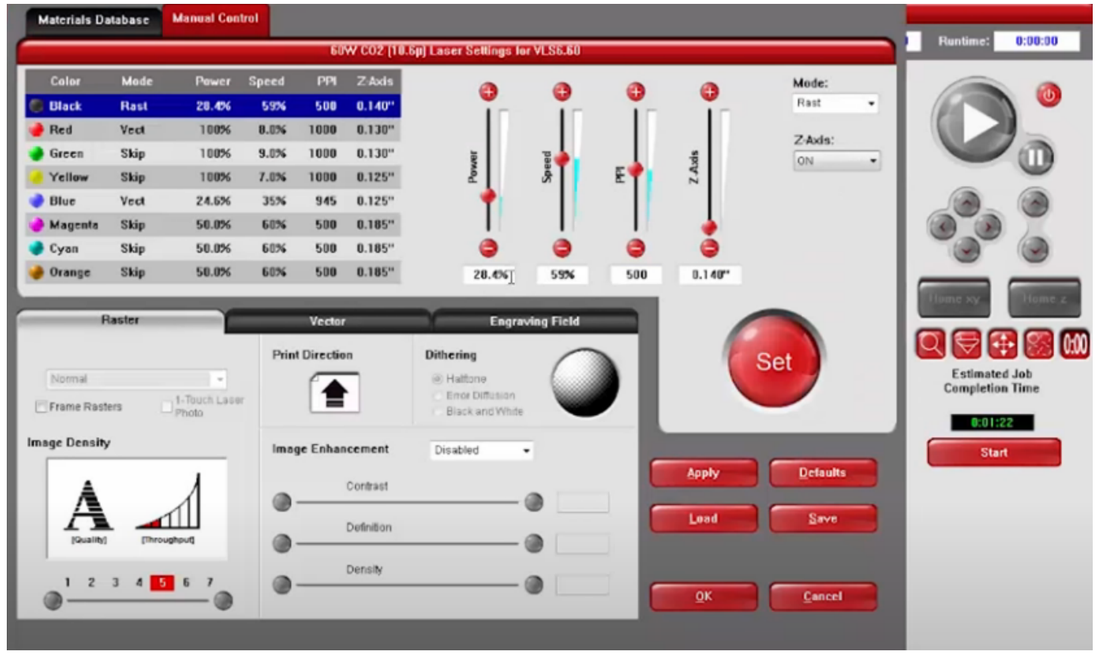
Before sending the file:
Make sure the laser is turned on; this can be done in UCP or using the button/switch on the laser).
Open the blast gates that connect the laser to the exhaust pipes, and make sure the fan for the laser is on.
Adjust the laser height by selecting "Z" in the menu on the Red lasers or by pressing the "Z" button on the Blue laser. Use the white plastic tool to correct the height.

Before coming to the lab, prepare the file using either the 24" x 36" for the Red lasers or the 18" x 32" template for the Blue laser, making sure to follow the layer conventions described in the example.
Once the file is ready, use **OVERKILL** to remove duplicate lines, then use the **PLOT** command or **CTRL+P** to send the file to the laser engraver.

Note: The file must be sent using the computer next to the laser in use.
Once in the **Plot menu**:
-Under **Printer/plotter**, select ILS9.150D (Red) or VLS 6.60 (Blue).
-Under **Paper size**, select "User Defined Landscape".
-Under **Plot area** - What to plot: select "Window" and click the "Window" button to the right.
-The menu will hide to enable a box to be drawn around the box representing the laser bed.
-Select along the outermost corners of the box.
Under **Plot scale - Scale**, select 1:1.
-Click **OK.**

Open **UCP** (check the desktop or the taskbar to find the program).
Click the **Settings** button in the bottom right corner.
In the **Manual tab**, click the **Load button**. The File Explorer should open with settings for the available materials; make sure to select the correct thickness.

Procedures (cont.)



After selecting the material, click the **Apply** button, then **OK**.
The Green "Play" button in the top right should be lit. **Click** to begin the engraving.

Other UCP Functions:
Zoom: The "  " button allows the user to zoom in on details of the drawing before sending.

Focus View: The "  " button allows the user to select a new position for the laser while the door is open.

Move: The "  " button allows the user to move the drawing in UCP.

Duplicate: The "  " button allows the user to duplicate the drawing.

Time Estimate: The "  " button allows the user to view a time estimate based on the drawing.

Procedures

In the Settings Window:
Power: Adjusting the power of a specific line color can increase/decrease the intensity of the laser.
Speed: Adjusting the speed of a specific line color can increase/decrease the speed of the laser.
A combination of higher power and lower speed may correct issues with cutting through materials (Ask for help).

Editing Layers:
Creating Dashed Lines: This is useful for indicating fold lines on materials. While on the desired engraving layer in AutoCAD, select the Layer Properties button in the Layers section. When the properties window opens, click the Linetype of the current layer and change it to DASHED to create a dashed line. Keep the lineweight the same.

White Laser (X-660)
Before sending the file:
Make sure the laser is turned on; this can be done in UCP or using the button/switch on the laser).
Open the blast gates that connect the laser to the exhaust pipes, and make sure the fan for the laser is on.

Adjust the laser height by pressing the **"Z" button** on the laser. Use the white plastic tool to correct the height.
Before **coming to the lab**, prepare the file using the 18" x 32" template for the White/Blue laser, making sure to follow the layer conventions described in the example.
Once the file is ready, use **OVERKILL** to remove duplicate lines, then use the **PLOT** command or **CTRL+P** to send the file to the laser engraver.

Note: The file must be sent using the computer next to the laser in use.
Once in the **Plot menu**:
Under **Printer/plotter** - Name, select **X-660**.
Under **Paper size**, select **"User Defined Landscape"**.
Under **Plot area** - What to plot: select **"Window"** and click the **"Window" button** to the right.
The menu will hide to enable a box to be drawn around the box representing the laser bed.
Select along the outermost corners of the box.

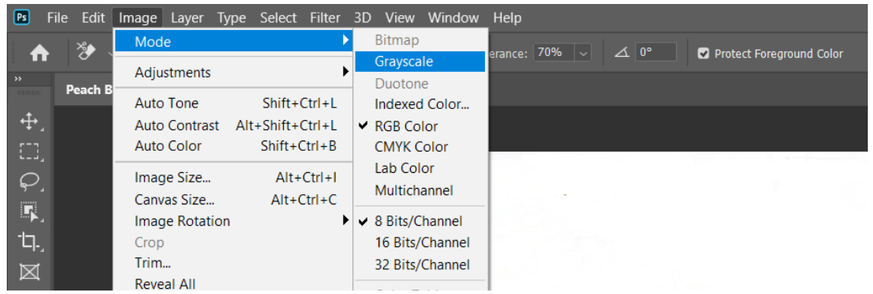
Follow the same steps in UCP from the Red/Blue Lasers above.

Procedures (cont.)

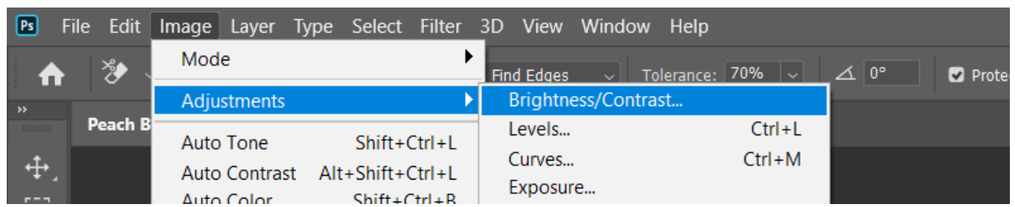
Advanced Uses
Raster Engraving

Although the template provided includes options for Deep/Light Engraving and Interior/Exterior Cuts, the lasers are capable of engraving photos and images (See example below). The file is sent to the lasers the same way, but the file preparation differs:
Choose or Take a high quality image to edit in Photoshop, Illustrator, or another program of choice; an image of a single subject is the most simple to edit.

Remove the background of the image, and convert the colors to grayscale.



Increase the sharpness of the image and adjust the contrast. High contrast images, or images with clear gradients will appear the best. This may take several attempts; sending the file to UCP after editing will provide an idea of the final product.

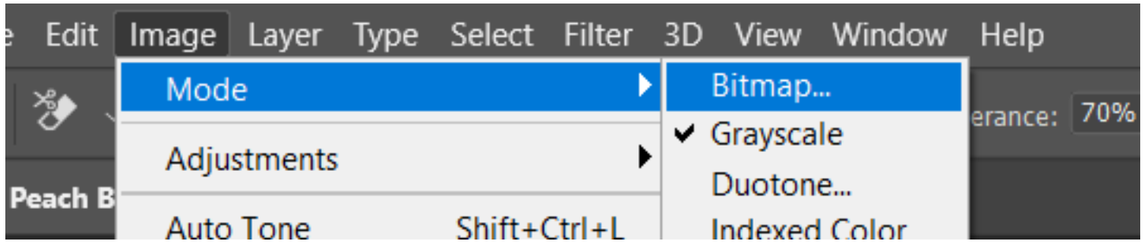


Once the edits are complete, convert the file to a bitmap (.bmp), and insert that file to the AutoCAD laser cutting template.

Change the layer of the image to "Grayscale (RASTER)."
Scale the image to the desired dimensions, and send to the laser (see above directions).
When adjusting the material settings, make sure that the settings for the Black lines are changed to "RAST," and adjust the Power, Speed, and PPI settings to match those of the Green settings (small adjustments can be made to match preferences).

Procedures

It is recommended that several tests are done to ensure that the image quality and engraving depth match expectations. Ask for help if needed.

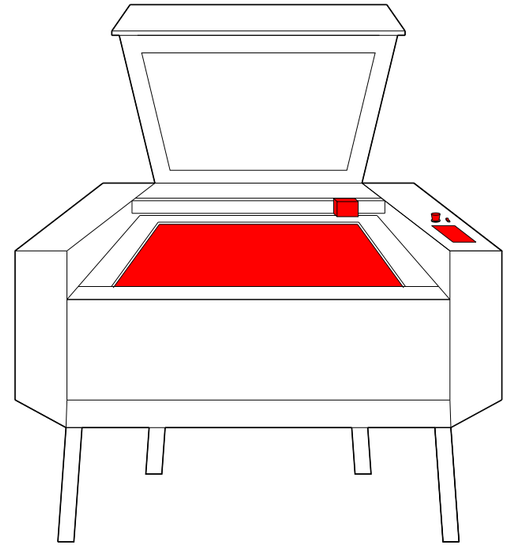


Reliefs:
This process is very similar to Raster Engraving, however the powers will need to be adjusted from the green settings to something closer to blue. This may take trial and error, and thicker materials are recommended. Remember to ask staff members if a particular material/thickness is safe to engrave.

Troubleshooting:
Lines not appearing in UCP/"This file contains no data..."
Use the PROPERTIES tool to ensure that the properties of all lines in the drawing are labeled "By Layer."
Use the Layers from the original Laser Cutting Template. Custom layers may not contain the information needed to send the file to the laser.
Splines often need to be joined for some shapes to appear properly

Laser Not Cutting Through Material:
Alert staff before adjusting laser settings; an employee can confirm any desired changes in power or speed settings.
If changing settings does not work, double check the stage height.
Finally, the lens may need cleaning or replacing; an employee will have to switch the lens.
Cutting Lines Across Material
The laser has about a quarter-inch margin around the perimeter of the material. Thus, vertical and horizontal lines may not reach the full width or length of the board.
Importing Line Art from Other Programs (Photoshop, Illustrator, etc.)
Line Art from Illustrator, etc. not appearing in UCP/"This file contains no data..."
Before importing to AutoCAD and sending a file to print:
Make sure the lineweight in the original program matches that of the layers in AutoCAD (use Layer properties to check).
Use the RGB color swatches to match colors in Illustrator to the layers in AutoCAD
RGB Blue color swatch for cuts, Green for deep engraving, etc.
Don't forget to run overkill before starting!
The first section under Troubleshooting also applies

Safety



The laser cutters are relatively safe pieces of equipment as they will not operate when the machine is open, however there are some important safety measures to follow.

-Never run the machine with the lid open.

-Be cautious of finger and limb locations when closing the lid.

-Do not slam the lid shut.

-Do not stare directly at the laser while it is cutting as this may damage your eyes.

-Always watch the machine while it is running, as there is a small risk of fire.

-If your material generates a lot of smoke or colored gas, do not open the lid. Immediately shut the machine off and notify the lab monitor. The off gas may be toxic and should be vented through the exhaust system and not exposed to the room.

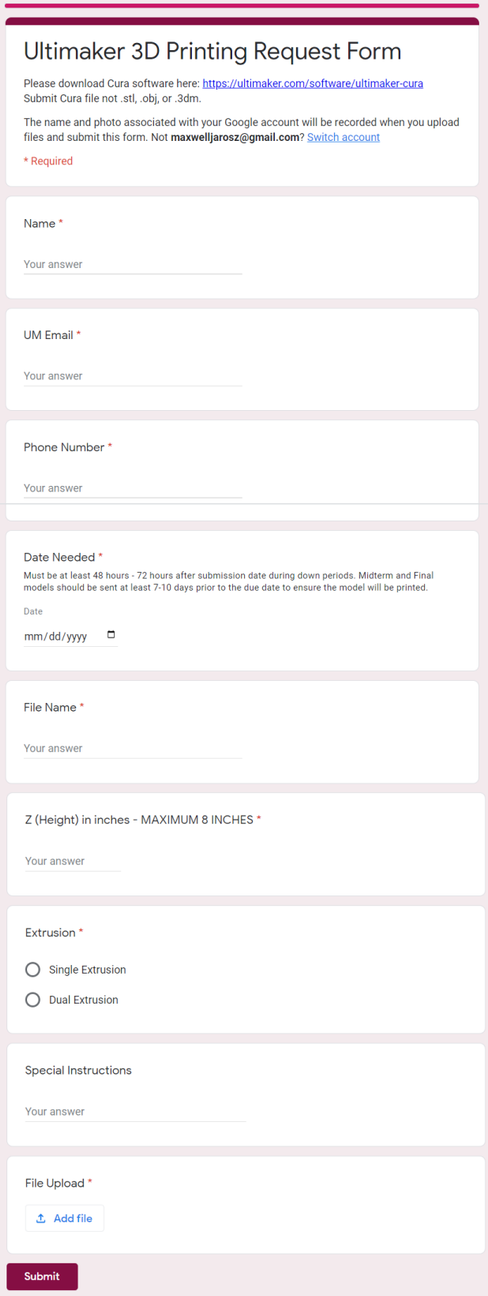
-If your material combusts but is not showing any signs of toxic gasses being released, open the lid and spray the material with the spray bottle located immediately adjacent to the equipment. Most laser fires are extremely small and under alert monitoring should be able to quickly extinguished.

-If the fire combusts quickly into a large flame, alert the lab monitor and evacuate the room.

Ultimaker Printers

The U-SoA Fabrication Lab will foster a culture of learning through making. Its principal purpose is to serve students and faculty in existing and future research pursuits, by providing robust training and broad access to a host of digital and analog tools. The Lab aims to continually improve, incorporating new technologies and expanding its capacities, growing into a resource equal to the substantial ambitions of a top-tier architecture program.

FORM



Ultimaker 3D Printing Request Form

Please download Cura software here: https://ultimaker.com/software/ultimaker-cura
Submit Cura file not .stl, .obj, or .3dm.

The name and photo associated with your Google account will be recorded when you upload files and submit this form. Not **maxwelljarosz@gmail.com**? Switch account

* Required

Name *

Your answer

UM Email *

Your answer

Phone Number *

Your answer

Date Needed *

Must be at least 48 hours - 72 hours after submission date during down periods. Midterm and Final models should be sent at least 7-10 days prior to the due date to ensure the model will be printed.

Date

mm/dd/yyyy

File Name *

Your answer

Z (Height) in inches - MAXIMUM 8 INCHES *

Your answer

Extrusion *

Single Extrusion

Dual Extrusion

Special Instructions

Your answer

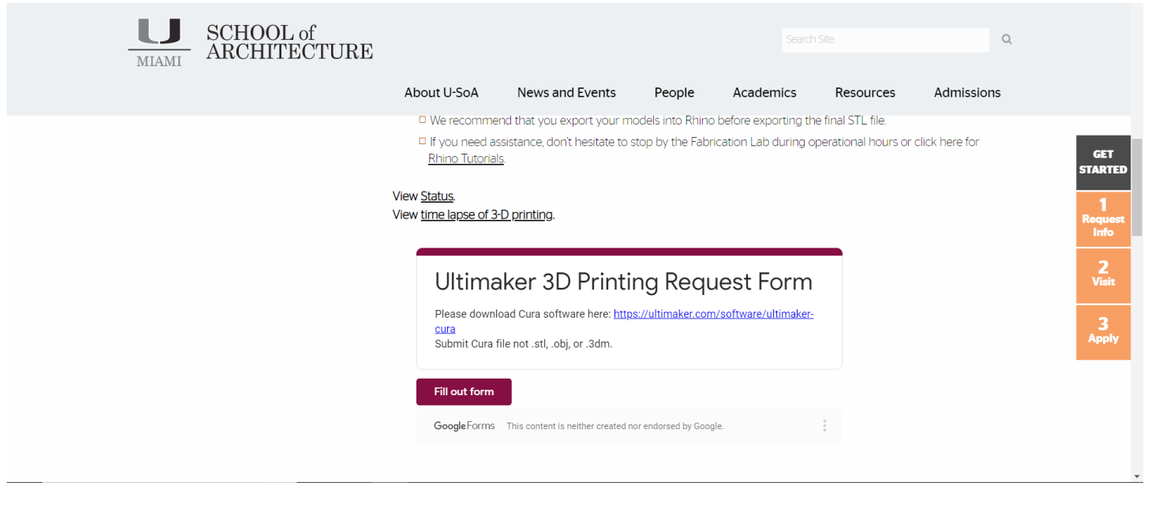
File Upload *

Add file

Submit

Usage

The Ultimaker 3D printers in the Fabrication Lab are free of charge to all users in the School of Architecture. To use the equipment, students must create their own 3d models, produce the appropriate Cura files, and submit the form (shown to the left) via the School of Architecture website (shown below).



MIAMI SCHOOL of ARCHITECTURE

Search Site

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- We recommend that you export your models into Rhino before exporting the final STL file.
- If you need assistance, don't hesitate to stop by the Fabrication Lab during operational hours or click here for Rhino Tutorials.

View Status.
View time lapse of 3-D printing.

GET STARTED
1 Request Info
2 Visit
3 Apply

Ultimaker 3D Printing Request Form

Please download Cura software here: https://ultimaker.com/software/ultimaker-cura
Submit Cura file not .stl, .obj, or .3dm.

Fill out form

Google Forms This content is neither created nor endorsed by Google.

Once students have submitted the form, the Fabrication Lab staff will verify the model set up and reach out to users with any issues they might see. Students must come to the lab to confirm their place in the queue. Once their file has been queued, it will be printed in the order of the queu. 3D prints do not always print perfectly and many issues may arise with prints in the queue. The fabrication lab is not responsible for meeting project deadlines and can only offer a rough estimation of when they believe the print will be done, without accounting for potential issues that may arise from other student prints.

If the users print fails, the fabrication lab will reach out to the user to notify them of the failure and what they believe the cause may be. If file adjustments are needed, the user must adjust their file as necessary and resubmit the file. Resubmitting the file will be the same as sending the file for the first time. The user must resubmit and come to the lab to reconfirm their place in the queue. If the user print fails due to a machine issu (e.g. running out of filament or clogged printhead) the fabrication lab will resend that print as the next print sent.

Once a user's file has been successfully printed, they must come to the fabrication lab to pick up the print within one week of printing. All prints left for over one week, will be thrown away at the end of that week.

The fabrication lab only supplies white pla, if a user would like to print on the machines with an alternate color, they may do so but must provide the material they will be printing with. A user should submit a note with their form saying they will supply their own material and bring that material to the lab when they confirm their print.

Procedures

How To Prepare A Model For Printing:

Models are created in 3D programs such as Rhino and must be saved in STL format. Use the following steps to prepare your model in Rhino and Cura.

- Make sure your model unit scale is in millimeters.

- When working with surfaces, use BooleanUnion to combine the objects into one polysurface. Click Solid > Union If the union doesn't work, you will likely have errors and other problems later. Rework the model so that the union is successful before going on to the next step.

- After the Union command has been applied, create a Polygon Mesh. Highlight the object, select Mesh > From NURBS Object. With highly curved surfaces, increase the number of triangles in the mesh. Straight surfaces need less.

- Next, click the object to select the Polygon Mesh. With the mesh selected, drag it off the surfaces. Don't forget to do this otherwise you may export the surfaces as well.

- Issue the command CheckMesh to see if you have a good mesh. If you have a bad mesh, search Rhino help for 'check/repair meshes'. This will give you many fix-it commands. A common problem is naked or unjoined edges, which are revealed with the command ShowEdges, and usually fixed with MatchMeshEdge. FillMeshHoles will repair holes, but is more likely to change the shape of the model. ExtractDuplicateMeshFaces will separate identical faces for easier removal, but be aware it could generate naked edges. It may be helpful to make a copy of the mesh before using these tools in order to check the results.

-When done fixing the model, export the Polygon Mesh as an STL file (export only the mesh and not the surfaces as well otherwise it will be harder to edit if any errors occur). Select the mesh, then click File > Export Selected change the Save As Type to STL. When the File Type Options appears, choose BINARY. Export each model to a separate STL—don't combine them in one STL.

- We recommend that you export your models into Rhino before exporting the final STL file.

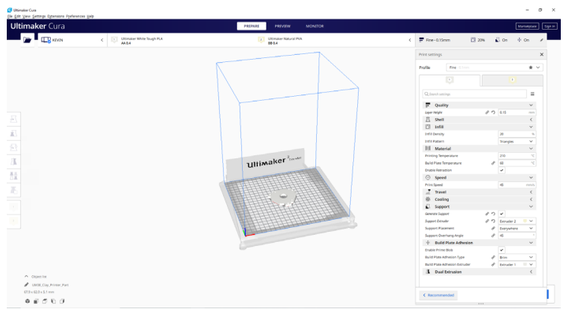
- If you need assistance, don't hesitate to stop by the Fabrication Lab during operational hours.

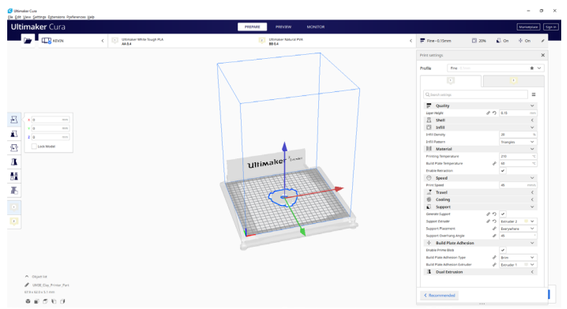
-You can check the status of your print by visiting the 3D printing section of the School of Architecture website.

SETTING UP PRINTS IN CURA

PRE EXPORT CHECKLIST:
Check that the model space has been set to millimeters so that when imported into Cura the file is correctly scaled.
Check to ensure that the model has no naked edges and is completely closed.
Check to ensure that all models exported are not colliding or single surfaces.

Open Cura:





You can use the buttons below to scale, rotate, mirror, and adjust the settings of your print.

Scale: The " " button allows the user to adjust the scale of the model.

Rotate: The " " button allows the user rotate the position of their model.

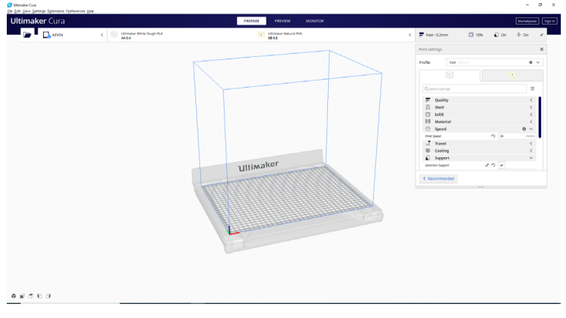
Mirror: The " " button allows the user to mirror their model.

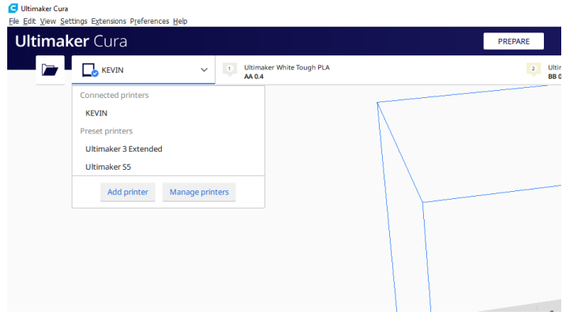
Infill: The " " button allows to select the infill for the print.

Procedures

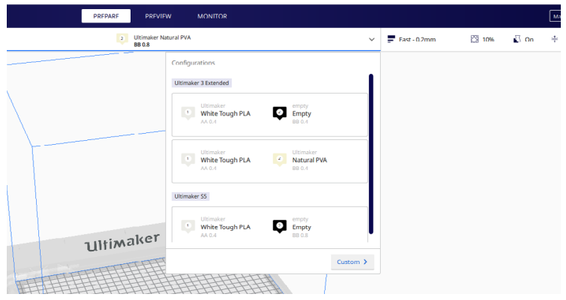
SETTING UP PRINTS IN CURA

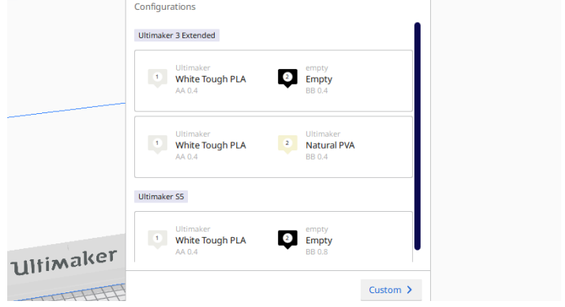
Selecting Configuration: In the upper left hand corner select Kevin as the Configured Printer.



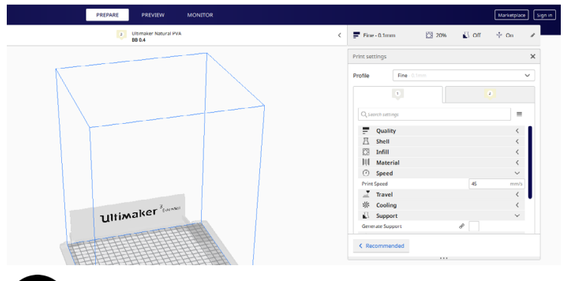


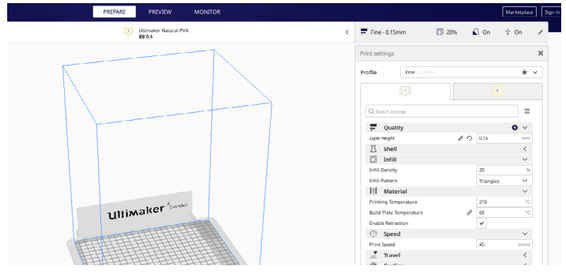
Select Specific Printer: After selecting Kevin, use the drop down menu to select a configuration for the 3 extended or 5S printer. These configurations will adjust the size of the printer in Cura to match the printer's cability. The 5S printer has a larger print bed than the 3 Extended. Make sure the configuration you are choosing (e.g. White Tough, Natural PVA) match the material loaded into the printer. If it does not match perfectly, the print will have an error when sending it to print.





Setting: The printers should have default settings set-up for printing. You may want to decrease or increase layer height to adjust the quality and time of the print. If using supports make sure the support material is set to the second print head, otherwise make sure it is set to the first print head.

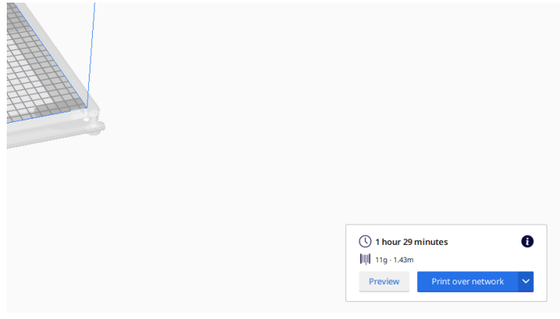


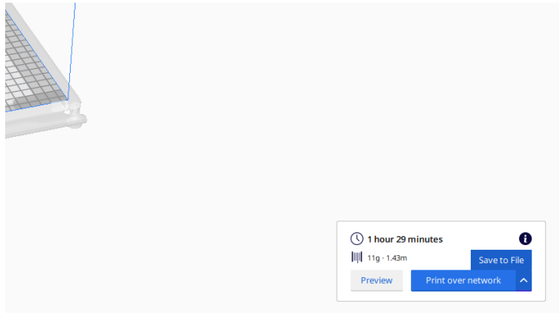


Procedures (cont.)

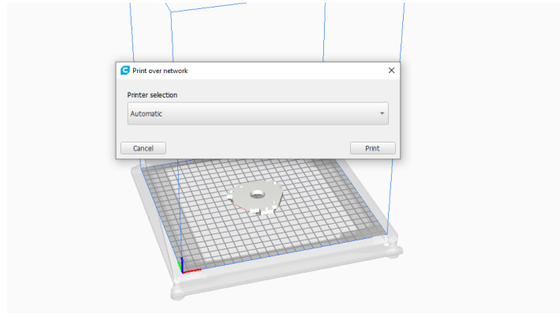
SENDING PRINTS TO THE PRINTER:

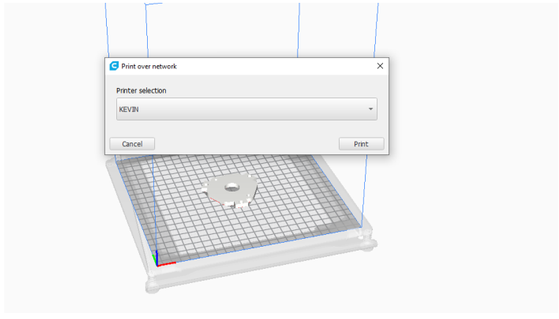
To Send Prints: Click Slice in the bottom right hand corner. Next click "Print Over Network"





Selecting a Printer: After clicking to send over the network a pop-up box will appear asking you to select the printer. Do not use "Automatic". Click the drop down box and select a printer that matches your configuration. Alejandro and Daniela are 3E and Vicky and Kevin are 5S printers. If these do not match the selection you made in the initial print set up, the print will cause an error when send.





After Sending: Verify that the print has started to print and that there are no issues created when sent. The most common issues are:

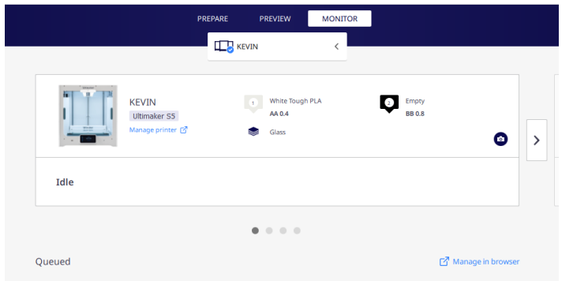
The print configuration doesn't match the set up. This is caused either by sending a print to the wrong type of printer based on the configuration you chose, or the material set up does not match what the printer currently has loaded.

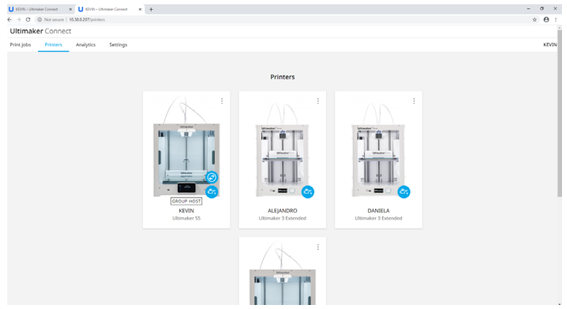
Often times, this is caused by the wrong filament choice (white instead of tough white) or when the printer does not have PLA loaded and dual extrusion was chosen.

Procedures

MONITORING PRINTS:

Monitor Screen: In the center tab of CURA click “Monitor”. This will bring up a menu to see prints that have been sent. If you click “Manage in Browser” it will load a browser menu that shows all the printers connected to the network. If you are experiencing an issue with a printer not showing up on the network, it can be added here by clicking “Add Printer”. Make sure the printer is connected to the LAN cable and that the computer is connected to the UM network and the computer should show up.





STUDENT MONITORING:

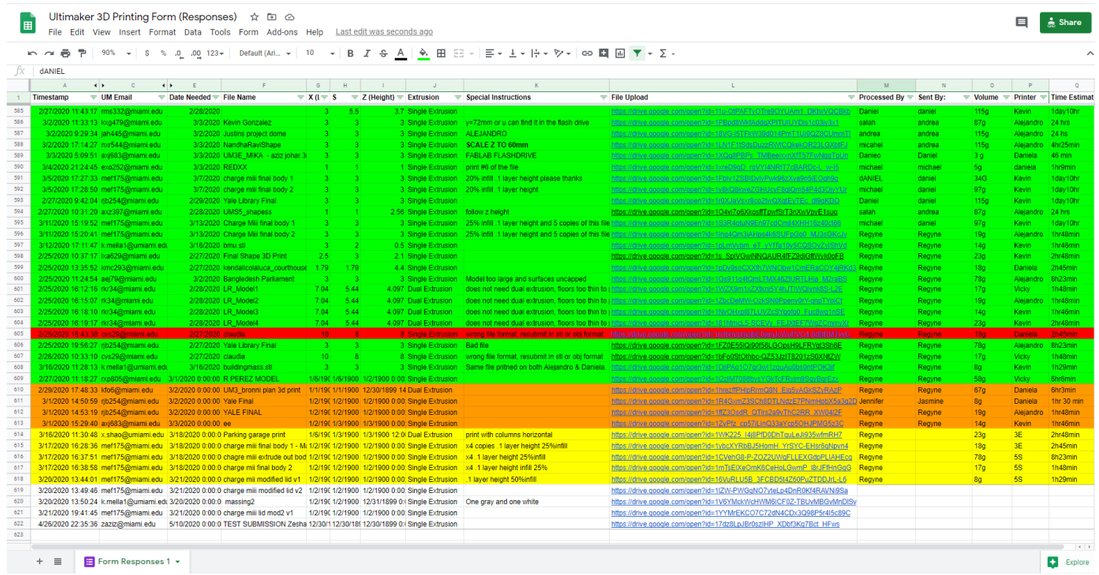
Print Queue: If students return to the School of Architecture website and navigate to “Labs and Centers” - “Fabrication Lab” - “3D Printing” and scroll to the bottom of the page, there is a link that will load a Google Sheet that shows the print queue.
The color system is as follows:

Green - Print complete
Orange - Currently printing
Yellow - Print in queue
White - Print has not been processed yet.
Red - Print failed

Procedures

Print Queue Management

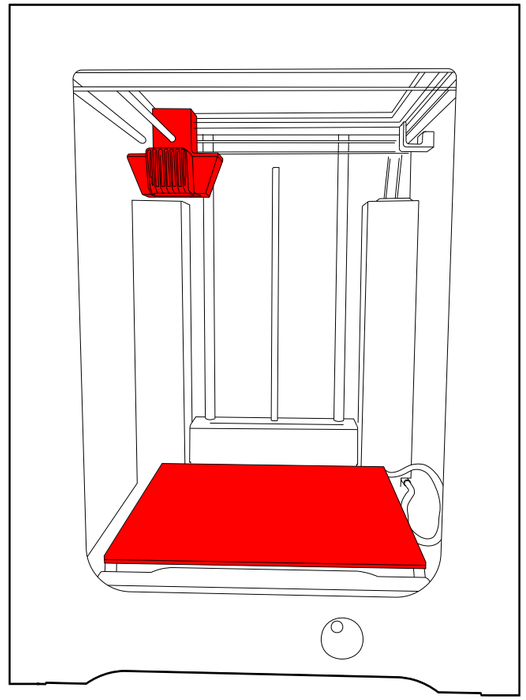
Lab Monitors: Lab Monitors are responsible for managing the print queue. During their shift, the list should be monitored. When files are submitted monitors should check the file to ensure the student has submitted a cura model. If not, monitors should email the students and ask them to submit a cura file. This ensures the model is scaled appropriately by the student. If the student has submitted a Cura file, it should be processed following the previous steps and saved into the desktop 3D printing folder in either the 5S or 3E folder based on it’s configuration.



Print Queue: Once a model has been set up and saved into the desktop folder, the monitor should highlight the row in yellow, and move it behind the last yellow row above it. Monitors need to then fill out their name, the weight, the configuration (3E or 5S) and the expected print time. When sending a print, the monitor should change the row to orange, and fill in their name as well as overwriting the configuration to fill in the specific printer they sent the print to. When a print is complete, the student should highlight the row in green and move the print to the print storage area. Please ensure the active prints highlighted in orange, match the existing prints on the printer. This is the main source of confusion in the printing process and should be checked at the beginning and end of every shift.

	M	N	O	P	Q
	Processed By	Sent By:	Volume	Printer	Time Estimat
5OHJPMG5z3C	Regyne	Regyne	14g	Kevin	1hr46min
eJi935wfmRH7	Regyne		23g	3E	2hr48min

SAFETY



SAFETY DURING PRINTING:

PRINT HEAD: The print head heats to extreme temperatures and should not be touched when heated. The heat will cause painful burns. The indicators lights on the print core signal orange and blue when the print core is heating up and when it is hot. Please be extremely cautious with your hands and ensure the print cores and head has fully cooled before handling the unit. The print head also moves can can cause harm if a hand is placed inside the print area while the machine is active. Do not stick your hand in the machine for any reason while the printer is active.

PRINT BED : The print bed heats to a lesser degree than the print cores but caution should be taken when it is heated. Avoid touching the build plate at any point once it has begun heating. The print bed also moves rapidly up and down in the machine, this movement can crush your hand and cause serious harm. Do not stick your hand into the machine for any reason when the machine is active.

Formlabs Printer

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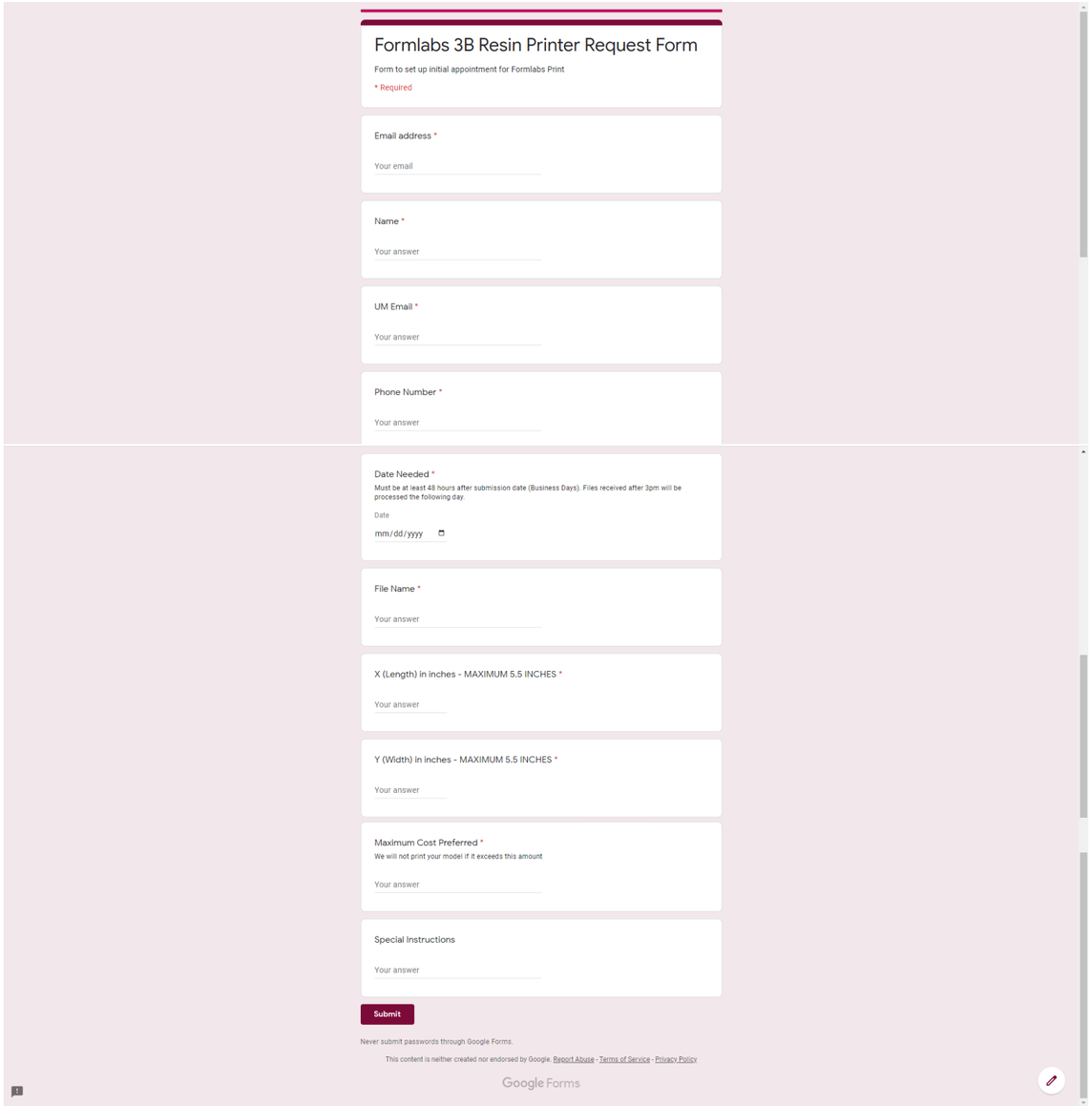
FORM



Usage

The Formlabs 3B printer is available to all within the School of Architecture. To use the equipment, users must create their own 3d models, set up their preform files, and pay for the materials. Fabrication lab staff will send the materials and handle the machines. The printing process requires the handling of toxic chemicals and should only be handlded by trained Fabrication Lab staff.

To use the equipment, users should submit the form located on the website and schedule appointment for an initial consultation with the trained staff members. To do this follow the steps below:

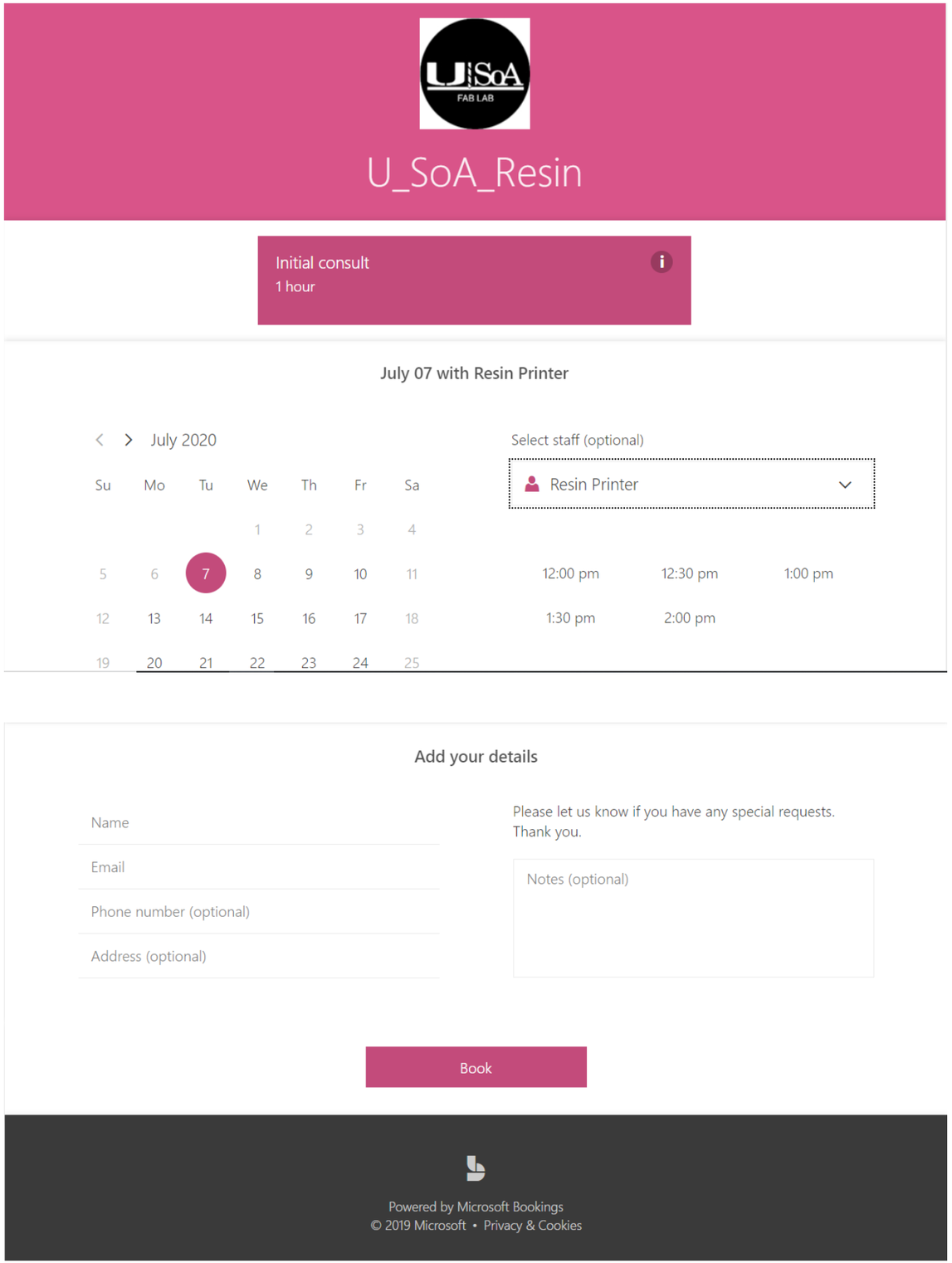
- Access the University of Miami School of Architecture website.

- Access the page for resin printing.

- Fill out the form and click the link to “Booking”

- The form provides the lab staff the ability to review your project requirements. For more directions on booking the appointment see the next page.

COST: The Formlabs printer costs 20 centers per milliliter of volume for standard resins and 40 cents for speciality resins. The Fabrication Lab will supply standard grey and clear resin for student use. Speciality resins may be ordered on a project basis with approval by the Fabrication Lab Manager. Please note - ordering speciality resins may take time to process and ship so please plan well in advance if you would like to use a certain type of non standard resin. Students may also purchase their own resin catridges and tanks to be used on the printer. Those cartridges and tanks will be returned to the student after use along with their print.



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To use the equipment, users should submit an appointment for an initial consultation with the trained staff members. To do this follow the steps below:

-Access the University of Miami School of Architecture website.

-Access the page for resin printing.

-Fill out the form and click the link to “Booking”

-Click initial Consultation.

-Select a trained staff member from the dropdown “Select Staff List”

-Select an appointment date and time based upon availability.

-Fill out all additional information and click “Book”. Users should get an immediate confirmation when clicking book. If they did not, the appointment was not successfully created.

The user should show up to the appointment with the model they would like to print complete, set up in preform, and an idea of what type of resin they would like to use. If the Fabrication Lab has the type of resin available, the print will be sent during the appointment. If the Fabrication Lab does not have the resin available the student may have to wait for the shipping of the resin and a new tank before the model can be sent to the printer.

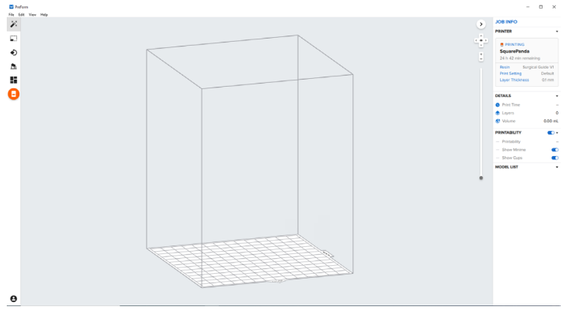
UM_FabLab_3D Printing Cost Estimator

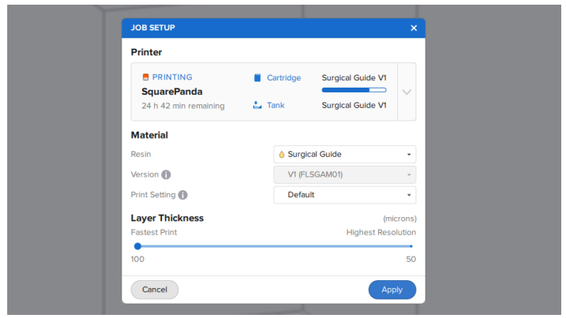
FormLabs Resin Printer	Volume (MLs) from PreForm (Including Supports)				Price Per ML	Print Cost
Standard Resin	16				0.2	$3.20
Advanced Resin	9				0.4	$3.60
ZCorp Powder Printer	**Model Volume (In^3) from ZEdit**	**Binder ML from Z-Edit**	**Price Per Cubic Inch**	**Price Per ML Binder**	**Price Per ML Print Head**	**Print Cost**
Powder	1	3	$2.00	$0.30	$0.07	$3.11

Procedures

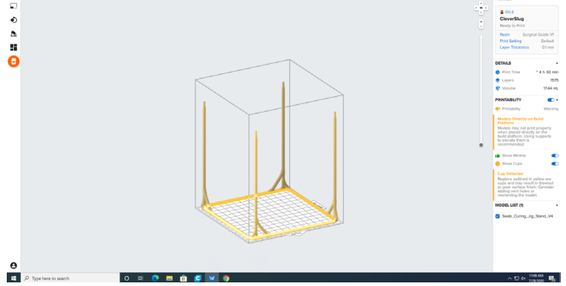
SETTING UP PRINTS IN PREFORM

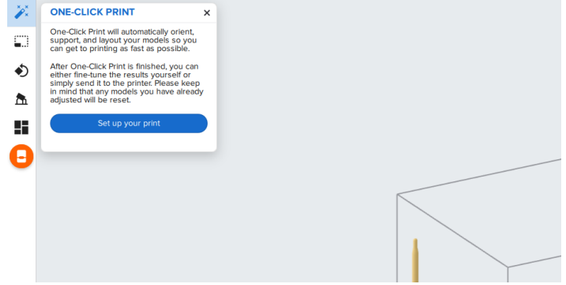
Selecting Configuration: Select SquarePanda as the printer, ensure the resin loaded in the printer matches the selected resin.





Set-Up: Next adjust the print as needed to solve issues of printability, cupping, or minimas. One option is to use “One-Click” print. This will automatically generate the supports and adjustments to make the print ready for sending. However, it does not always work. Alternativetly, you can go through each step and set up the print in an optimum setting for your file.



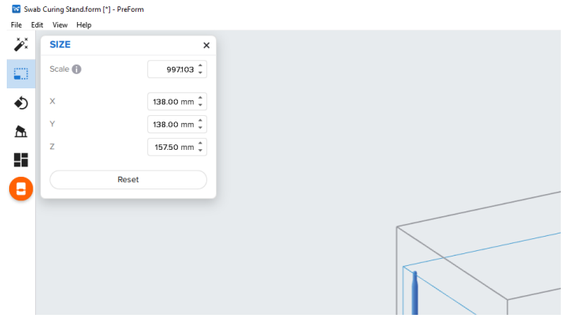


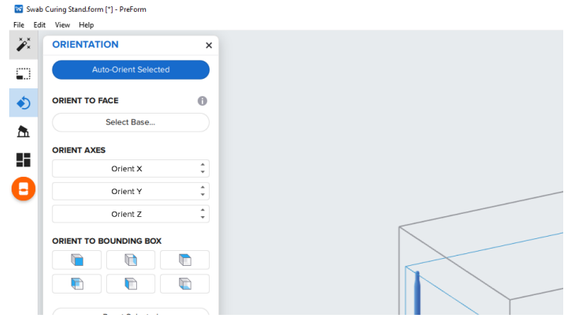
Setting: The printers should have default settings set-up for printing. You may want to decrease or increase layer height to adjust the quality and time of the print. If using supports make sure the support material is set to the second print head, otherwise make sure it is set to the first print head.

Procedures (cont.)

SENDING PRINTS TO THE PRINTER:

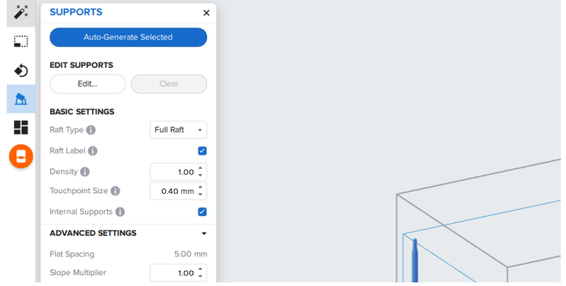
Size: In the size panel you can adjust the size of your print. In orientation, you can select how you want to orient your model.

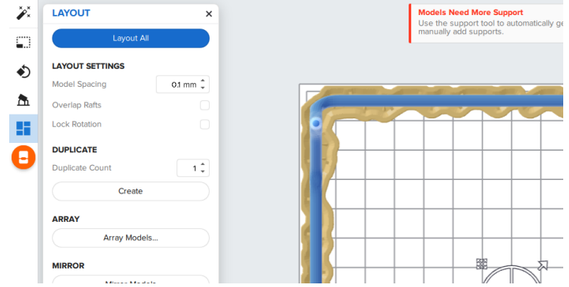




Orient Face: This command allows you to select one side of the model which will automatically be orientated normal to the build plate.

Supports: Are required to make the print printable. There are many options including touch point, raft, and internal/external.



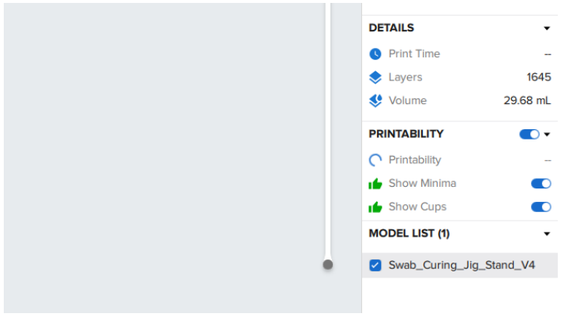


Supports: Select the type of raft. Mini rafts will create a small raft around each support where it touches the build plate, and in dense location it will create a shared raft. A full raft will create one large raft for the model covering the space between all supports. This will increase the print time and resin use but can improve reliability of the print. Next select the density and touchpoint size for the print. Density controls how many support piles are generated and touchpoint size controls the size of the tip supporting the model. Smaller and less dense supports create higher quality models but also increase risk of failure.

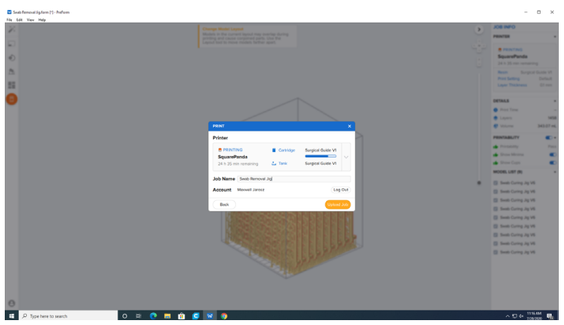
Procedures

SETTING UP PRINTS IN PREFORM

Ready to Print: Review the “printability”tab on the lower right hand corner. Prints should have green “thumbs-up” next to all rows.

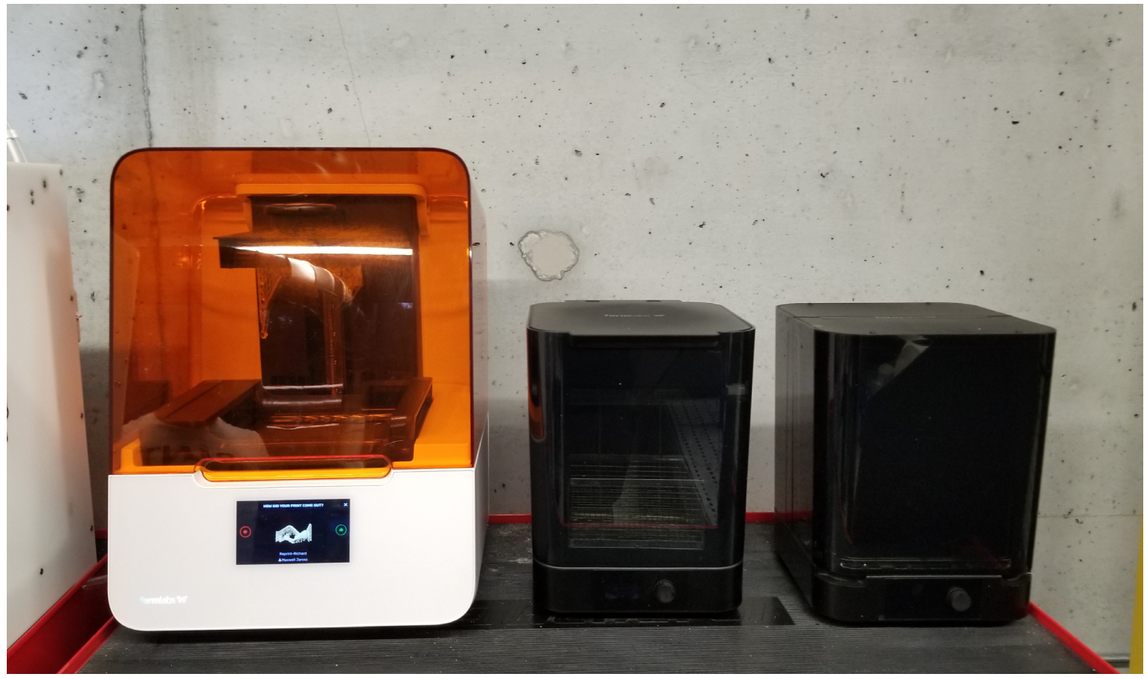


Send Print: Click the orange “print” button on the left hand side of the screen, a dialogue box will pop up, ensure all the settings are correct and click “upload job”.



Tip: If producing many duplicate models, only import a single model and use the “Layout” - “Array” function after creating the supports on the first model. This will duplicate the model into as many pieces as needed and will operate much faster than trying to generate support for all models at once.

Physical Set-Up



Printer Washing Machine Curing Machine

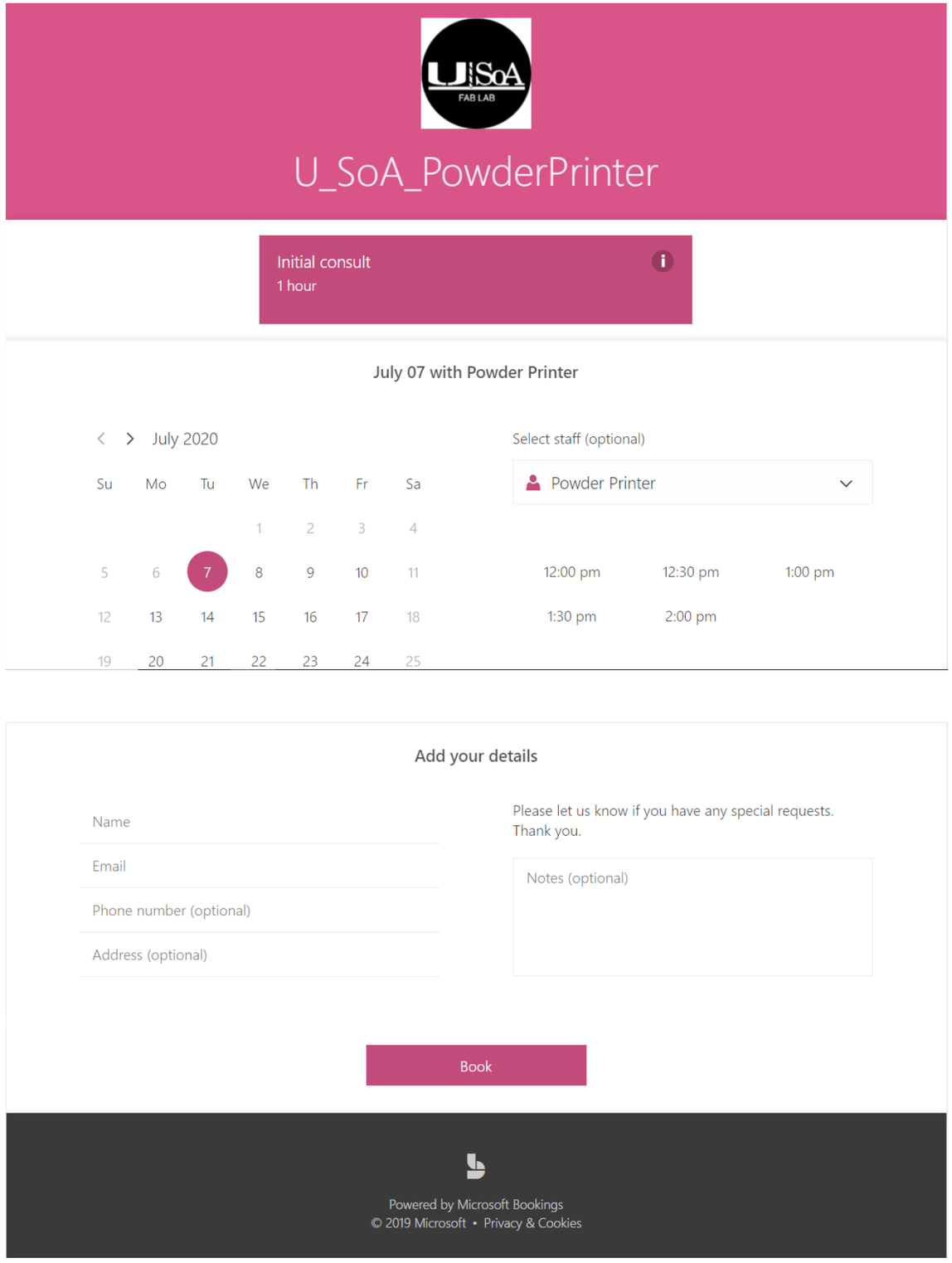
After Sending: Resin prints must be washed and cured (use gloves during this entire process).

To wash the print - place the build plate into the washing machine and run for 30 minutes.

To cure the print - remove the print from the build plate and dry for 15 minutes. Set the curing machine to the appropriate temperature and time based on the resin used. Once the curing machine is heated to the proper temperature place the print inside.

ZCorp Powder Printer

The U-SoA Fabrication Lab will foster a culture of learning through making. Its principal purpose is to serve students and faculty in existing and future research pursuits, by providing robust training and broad access to a host of digital and analog tools. The Lab aims to continually improve, incorporating new technologies and expanding its capacities, growing into a resource equal to the substantial ambitions of a top-tier architecture program.



Usage

The ZCorp Powder printer is available to all within the School of Architecture. To use the equipment, users must create their own 3d models and pay for the materials. Fabrication lab staff will send the materials and handle the machines. The printing process requires the handling of toxic chemicals and should only be handlded by trained Fabrication Lab staff. Since this printer typically will be sent with multiple prints and software is unavailable, the Fabrication Lab staff will handle file set up for this machine.

To use the equipment, users should submit an appointment for an initial consultation with the trained staff members. To do this follow the steps below:

-Access the University of Miami School of Architecture website.

-Access the page for powder printing.

-Fill out the form and click the link to “Booking”

-Click initial Consultation.

-Select a trained staff member from the dropdown “Select Staff List”

-Select an appointment date and time based upon availability.

-Fill out all additional information and click “Book”. Users should get an immediate confirmation when clicking book. If they did not, the appointment was not successfully created.

The user should show up to the appointment with the model they would like to print complete. The Fabrication Lab will decide based on current demand if the print will be sent during the appointment or if they will wait for a few more prints to be grouped together and sent in one print.

The Fabrication Lab staff will provide excavation services to retrieve and remove the print from the machine. Any damages to the model during this process will result in the Fabrication Lab resending the print for the user. Once the print has been removed, the user will be responsible for applying any type of adhesive or protective coating to the model. Any damages to the model during this stage will result in the user needing to pay for an additional print.

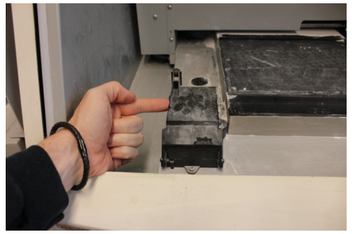
As a general note, the powder printer cannot handle thicknesses under 1/8” and for long span surfaces 1/4”. Any damages to prints that are sent with any dimensions lower than this will not be covered by the Fabrication Lab.

Physical Set-Up

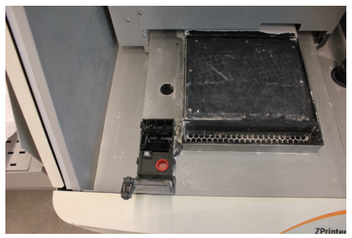
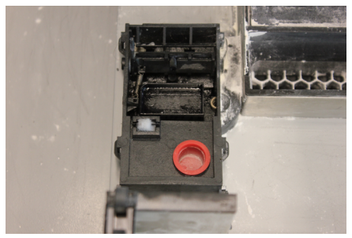
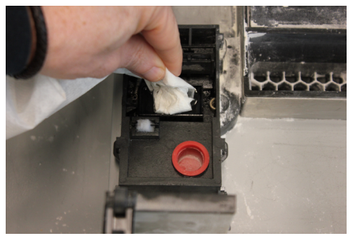
Prepairing the Z Corp Powder Printer for Use:

1. Open the door to the printer. Inspect the build tray and carraige. Make sure there is nothing blocking the carraige from moving.

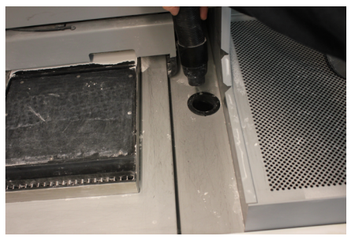
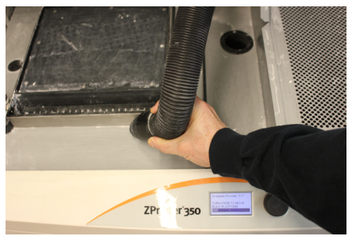
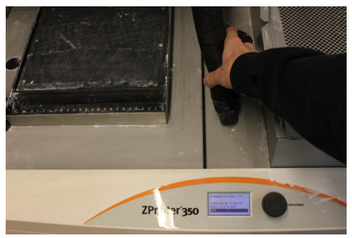




2. Open and empty the resevoir to the left that looks like it has a liquid in it. This liquid is the glue the machine uses to glue the powder in the correct shape. Use a paper towel and soak up the liquid as much as possible. DO NOT allow any liquid or powder to get on the piece of cotton on the lower left, this cotton cleans the print head after each layer of glue.

3. Vacuum out any powder that might still be in the chamber. If there is anything on the build tray (dust, hair, etc) it will become part of the print.

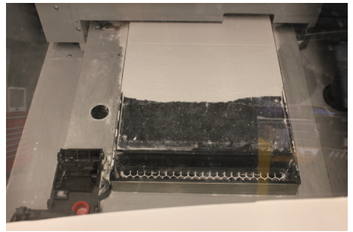
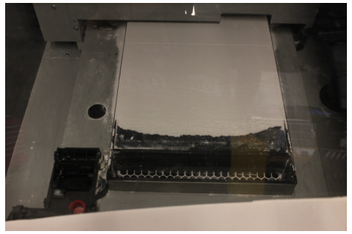
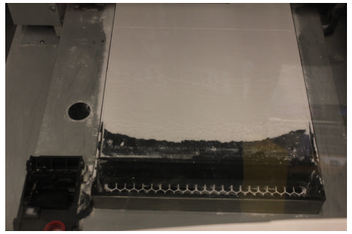
Physical Set-Up

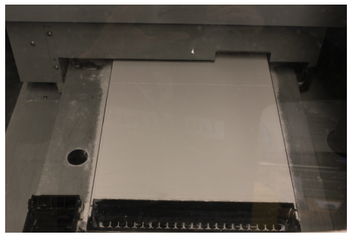
4. Close the door. Press the circular black button on the front of the machine to get into the menu. Scroll down using the black wheel (button) until you see “Prep Build Tray”. Select that menu item by highlighting it and pressing the black wheel and it will raise the build tray to the highest point it can go. Next, select fill bed. This will spread out powder, in multiple layers, over the build area. It is important to do this step before the print is sent so that the machine does not print directly onto the build tray. If that occurs, the model will be glued to the tray. Now, the machine is ready for use, the next steps will be done on the computer.







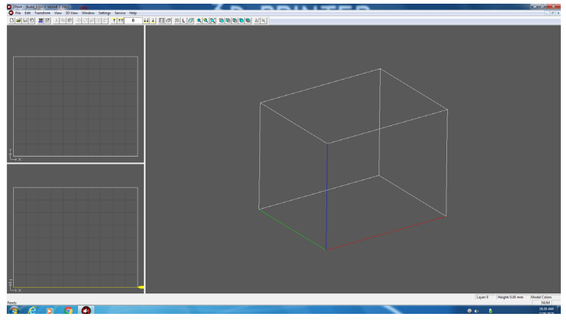




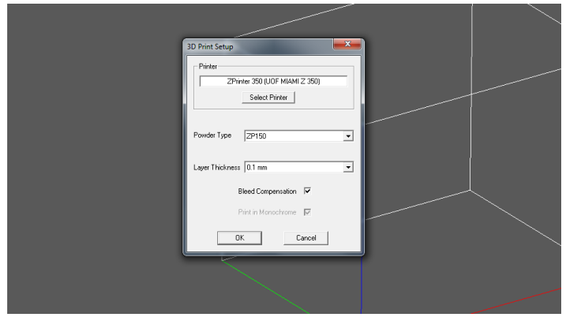



Procedures

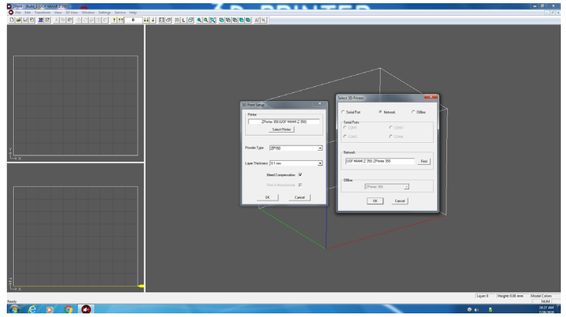
SETTING UP PRINTS IN Z-Edit

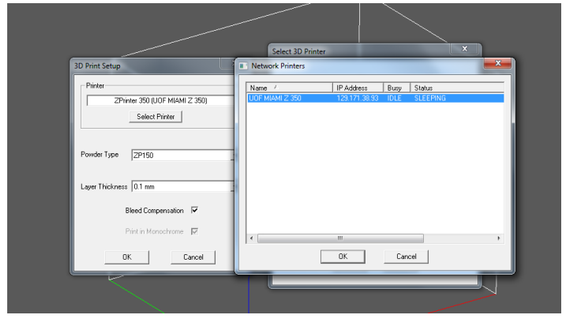
Set up Printer: When opening the program it will ask you to select the printer and powder type. Select ZCorp 150 for powder.





Finding the Printer: Click Select Printer, on the next box select find by network. The printer shown below should be automatically configured to the network and show up. Select the printer and click okay. Navigate back and click okay to complete set-up.

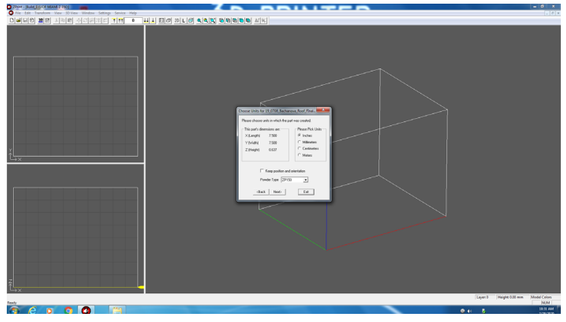


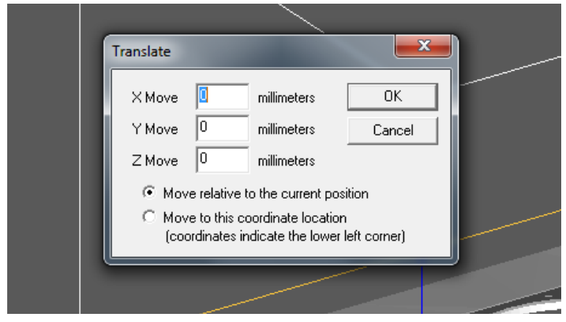


Procedures (cont.)

SENDING PRINTS TO THE PRINTER:

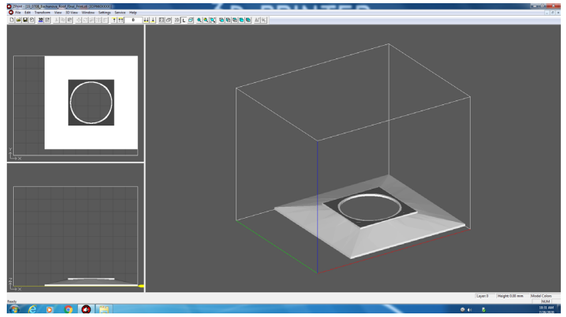
Translate: You can click to move the file around or you can click translate to move specific increments in each axis.

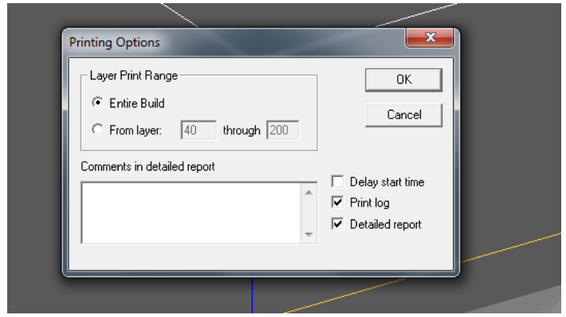




Multiple Models: You can import multiple stls into the program by clicking - import - 3d model - navigating to your file location. Arrange all models with space between so that they can be safely excavated after they have been printed.

Print: Navigate to File - 3D Print.



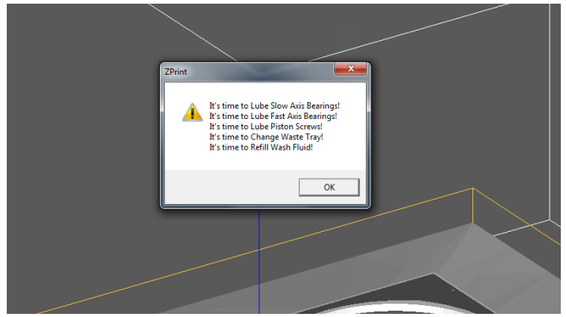


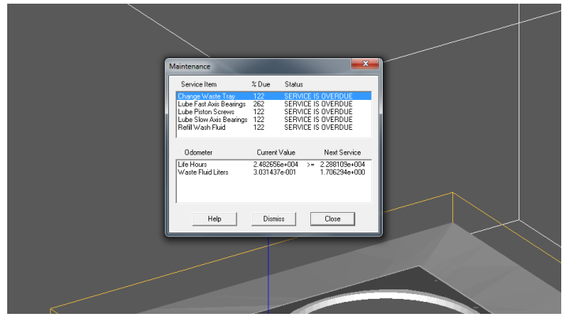
Print Options: A menu will pop up and let you select specific layers you would like to print or if you would like to send the entire build. Select entire build.

Procedures

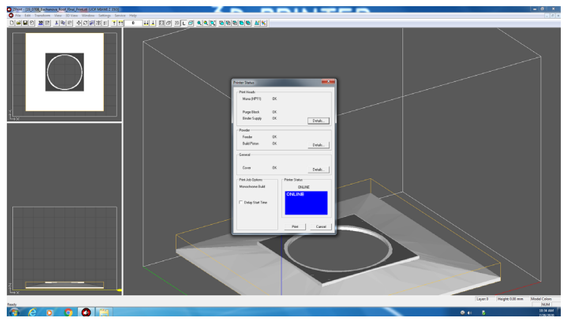
Maintenance

Maintenance: Once “Print” has been clicked the machine will check if there is any maintenance needed.





Click OK: Notify the fabrication lab manager or a trained monitor and let them know that the machine needs to be maintenanced. If no maintenance needs to be done click “Okay”.

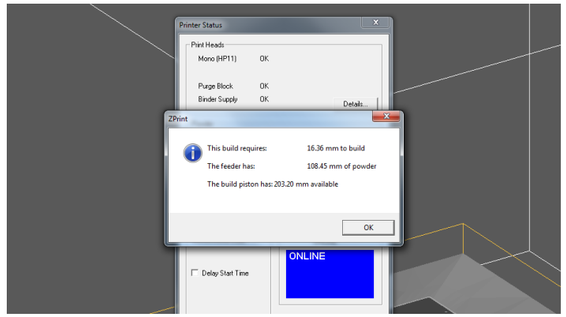


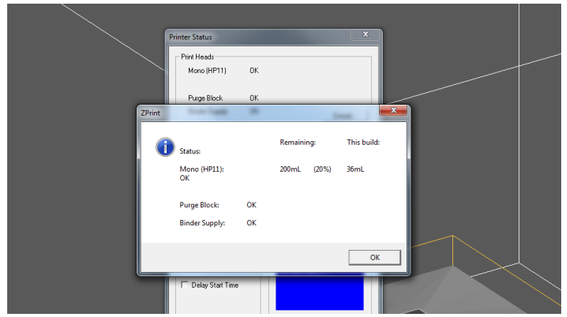
Machine Status: A menu will pop-up showing the status of the consumables. Consumables must meet the minimum needed to ensure the entire print will print. Notify the **fabrication lab manager or a trained monitor and let them know that the consumables need to be replaced.**

Safety

SENDING PRINTS TO THE PRINTER:

Consumables: Clicking through the next to pop-ups will show the amount of powder and binder used in the printer.





Record these values as they are used in calculating the cost of the printer. Once these values are recorded, use the estimator on the Fabrication Lab Google Drive to calculate the cost of the print. Charge the student in the fabrication lab prior to printing.

UM_FabLab_3D Printing Cost Estimator

FormLabs Resin Printer	Volume (MLs) from PreForm (Including Supports)					Price Per ML	Print Cost
Standard Resin	16					0.2	$3.20
Advanced Resin	9					0.4	$3.60
ZCorp Powder Printer	**Model Volume (In^3) from ZEdit**	**Binder ML from Z-Edit**		**Price Per Cubic Inch**	**Price Per ML Binder**	**Price Per ML Print Head**	**Print Cost**
Powder	1	3		$2.00	$0.30	$0.07	$3.11

Coating: Students are responsible for coating their model, employees should safely and delicately excavate the models and set them on the finishing platform next to the machine. Students should then come to the lab with their choice of coating and coat the model. If the model is broken during excavation the Fabrication Lab will reprint free of charge, if it is damaged during the coating process the students must pay for another print.

Do not print anything with a thinness of 1/8” or under. If a portion of the model under 1/8” thickness breaks the Fabrication Lab will not be responsible for reprints.

Vinyl Cutter

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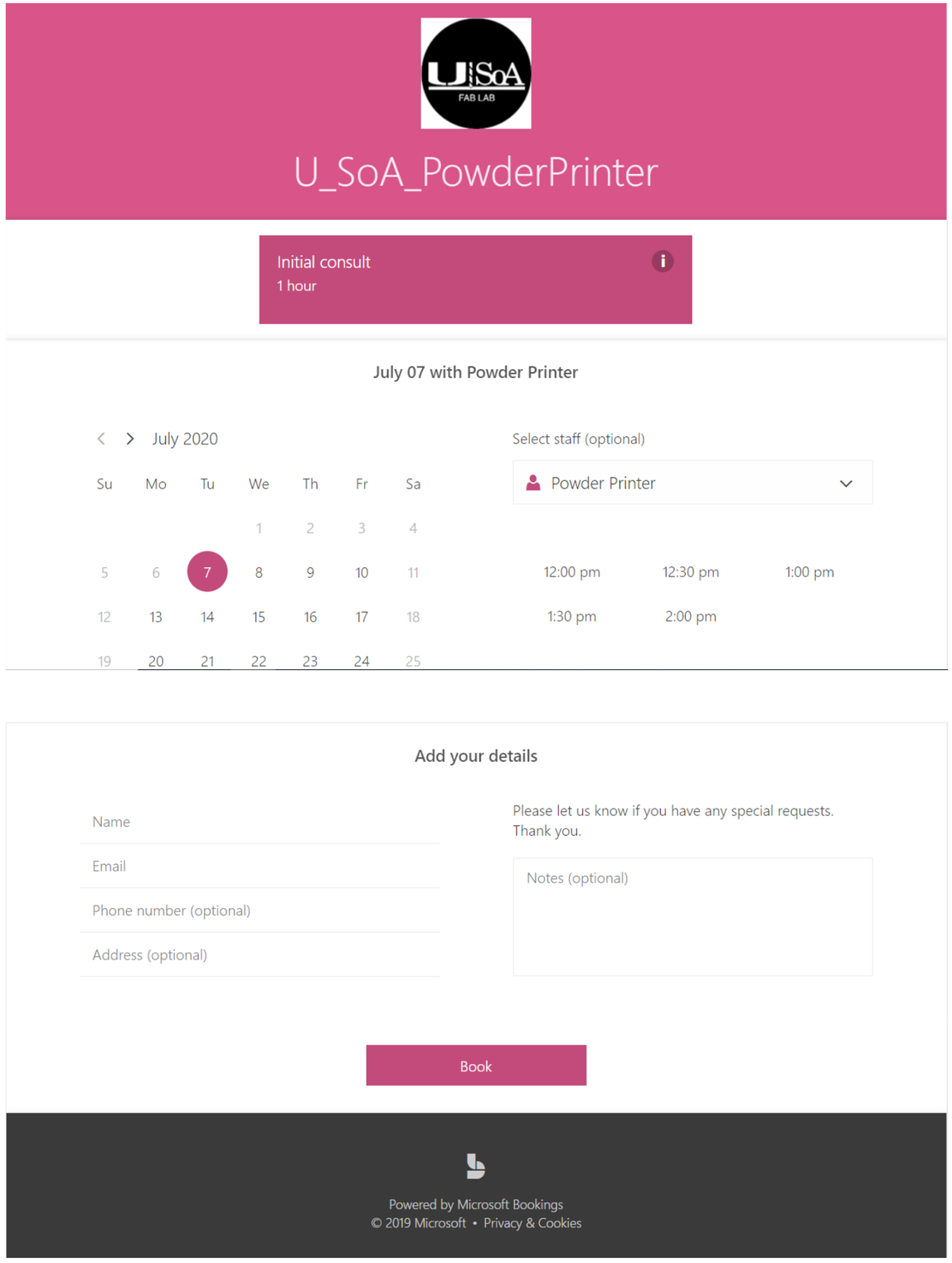

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-Select an appointment date and time based upon availability.

-Fill out all additional information and click “Book”. Users should get an immediate confirmation when clicking book. If they did not, the appointment was not successfully created.

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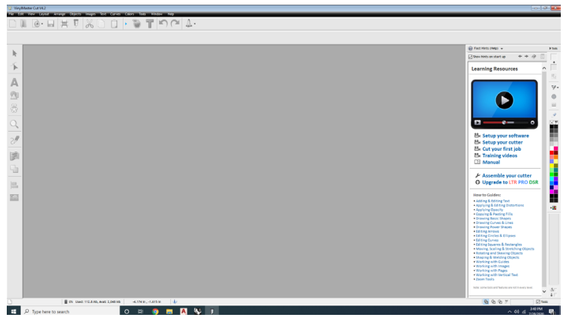
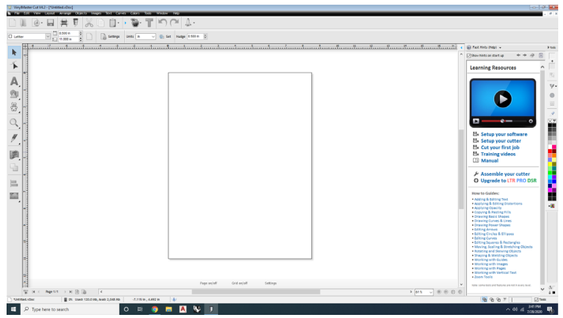
As a general note, the powder printer cannot handle thicknesses under 1/8” and for long span surfaces 1/4”. Any damages to prints that are sent with any dimensions lower than this will not be covered by the Fabrication Lab.

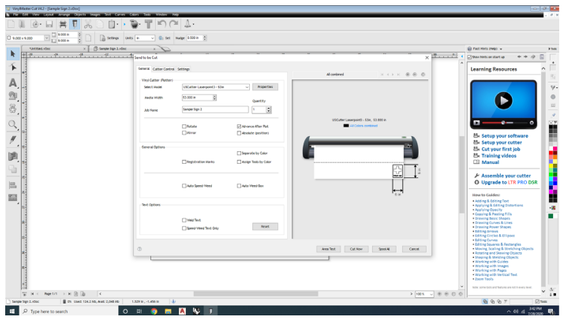
Reservations: Students Should Reserve the White Laser Cutter Space When Wanting to Use the Vinyl Cutter.

Open Master Cut: Create a new page, with media dimensions matching the vinyl that will be cut. Maximum width is 51”.





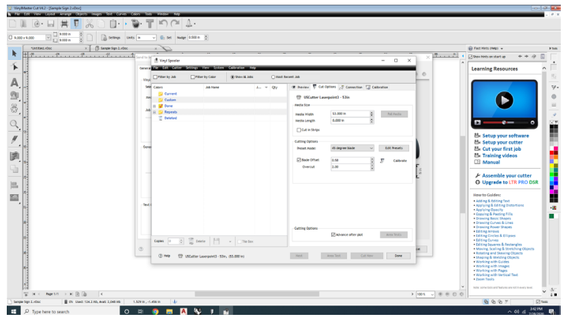
Load File: Import illustrator file with vector work that will be cut. You may need to downsave to an Illustrator 8 or an eps file if you are having issues importing the file. The program can only cut vector files, and treats strokes as a single line so they will not have thickness. To have the stroke thickness cut - convert stroke to a path.

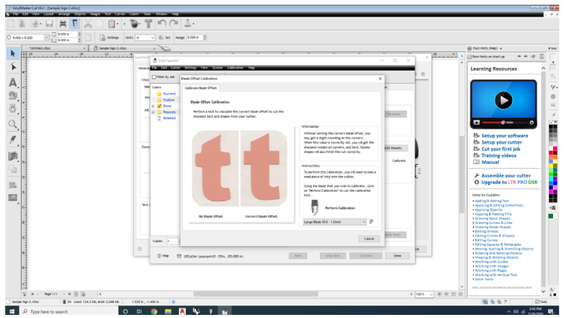


Setting: When ready to cut - click cut - and adjust the settings to match your media.

SENDING PRINTS TO THE PRINTER:

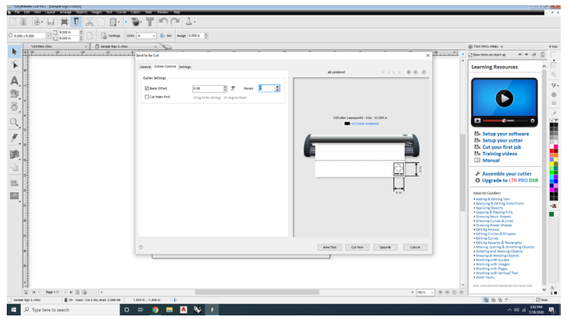
When sending the cut you will see the queue. Under “Cut Options” you can adjust the settings of the blade.

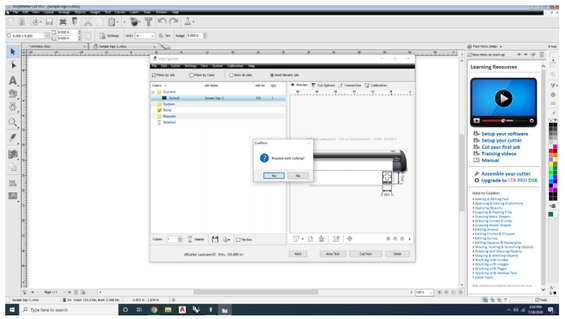




Calibration: The vinyl cutter is very sensitive so you may need to run a calibration on the machine prior to cutting. Click the calibration tab next to cut options and run the calibration. The machine will cut a series of letters, select the clearest row.

Send: After calibration click cut - a dialog box will pop up and ask to proceed with cutting - click okay.





Selling Material Process Sheet

When a student requests to buy material from our stock, please follow the steps below:

1. Student should select the material they would like to purchase.

2. Make sure student has funds on their card by running an inquiry on the card machine. To do so, press “INQ.” button and swipe the student card.

2. Locate the material cost sheet at the front desk and charge the student.

-Press “Sales F1” on the card reader.

-Enter the amount in including the values for the cents (e.g. $10.50 = 1050).

-Press the Green Button

-Swipe Student Card

3. Once the receipt is printed, write down which materials were sold on the receipt.

4. Open google drive and open the material price google sheet.

5. Record the student name, date, and put the quantity of each material sold under the correct tab, the total cost of the sale, and your name under the correct tabs.

6. Please put the receipt into the laser cutter receipt folder in the file cabinet next to the desk.

7. To issue a refund, go to the home menu. To get back to the home menu, hit the red x button.

-Press “Refunds F2” on the card reader.

-Enter the amount in including the values for the cents (e.g. $10.50 = 1050).

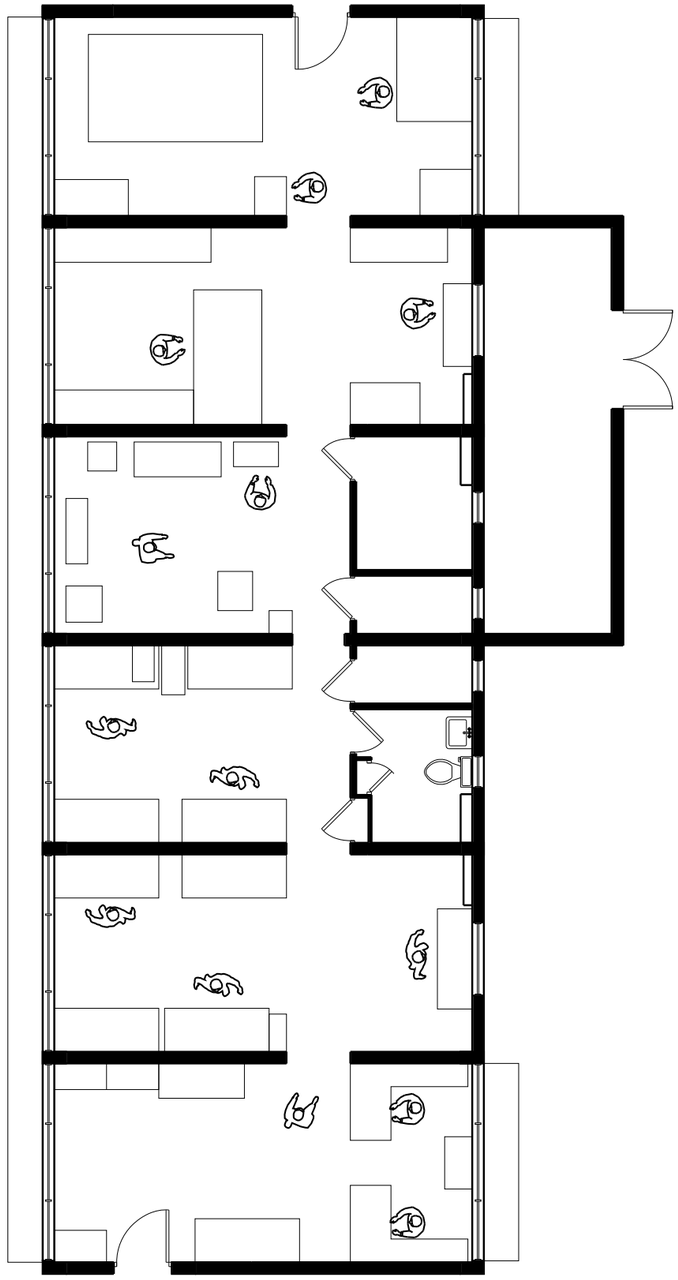
-Press the Green Button

-Swipe Student Card

8. Please put the receipt into the laser cutter receipt folder in the file cabinet next to the desk.

Typical Material Stock

1/4”	Acrylic 36” x 24”
1/4”	Acrylic 32” x 18”
1/8”	Acrylic 36” x 24”
1/8”	Acrylic 32” x 18”
1/16”	Acrylic 36” x 24”
1/16”	Acrylic 32” x 18”
2 Ply	Museum Board 30” x 20”
1 Ply	Museum Board 30” x 20”
1 Ply	Museum Board Black (28” x 22”)
1/8”	Carboard 36” x 24”
1/8”	White Cardboard 24 “x 36”
Double Ply (.10”)	Chipboard 36” x 24”
Double Ply (.10”)	Chipboard 32” x 18”
Singly Ply (.03)”	Chipboard 36” x 24”
24 Ply	Crescent Board 30” x 20”
Single Ply	Bristol Board 28” x 22”
1/4”	Bass Wood 8” x 36”
1/8”	Bass Wood 8” x 36”
1/16”	Bass Wood 8” x 36”
1/4”	Baltic Birch 36” x 24”
1/4”	Baltic Birch 32” x 18”
1/8”	Baltic Birch 36” x 24”
1/8”	Baltic Birch 32” x 18”
Double Ply (.10”)	Chipboard 36” x 30”



Model Shop at La Gorce House

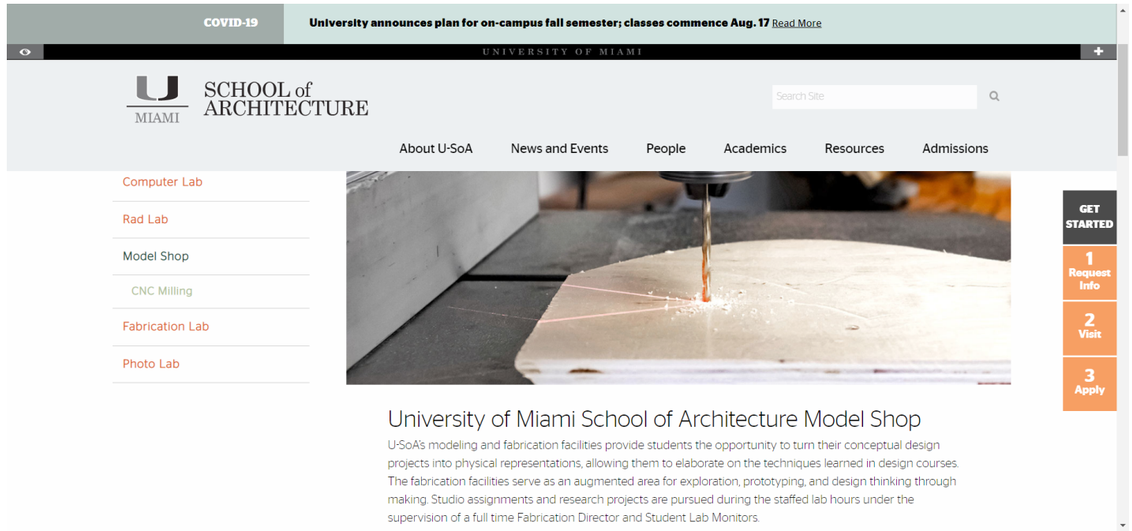
U-SoA's modeling and fabrication facilities provide students the opportunity to turn their conceptual design projects into physical representations, allowing them to elaborate on the techniques learned in design courses. The fabrication facilities serve as an augmented area for exploration, prototyping, and design thinking through making. Studio assignments and research projects are pursued during the staffed lab hours under the supervision of a full time Fabrication Director and Student Lab Monitors.

Immediately adjacent to the design studios, the modeling and fabrication facilities occupy approximately 3,300 square feet and include both digital and analog fabrication equipment. Along with traditional woodworking tools and machinery, students have access to 3D printers, powder printers, laser cutters, vinyl cutters and CNC milling.

At the Model Shop, students have access to individual and group workstations that give students an additional area to work on larger projects. Each area is equipped with a panel of hand tools located on the wall adjacent to the work station.

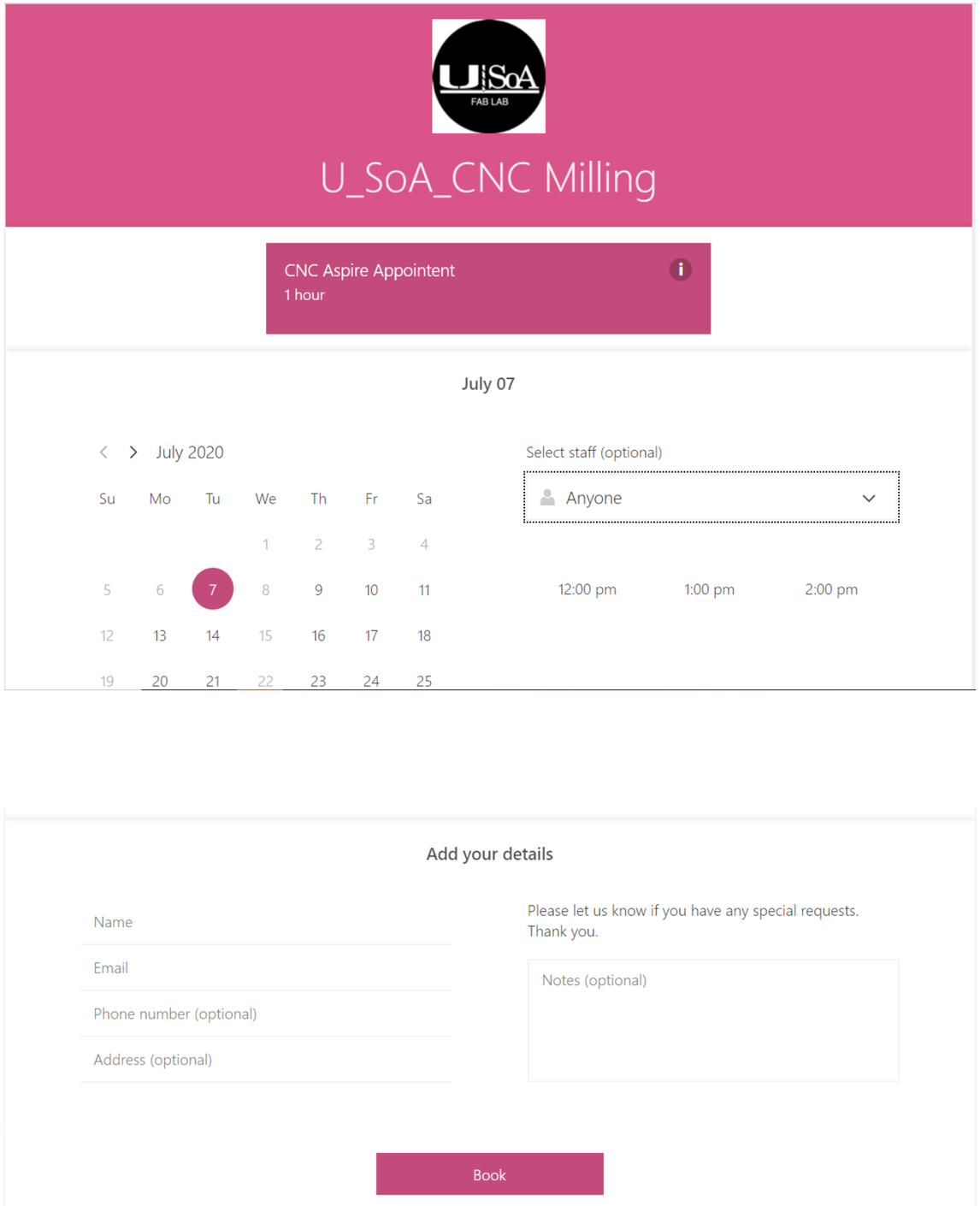
Students will also have access to CNC Milling Equipment with a ShopBot PRS Alpha CNC in addition to a ShopBot Buddy CNC. The PRS Alpha has a 48" x 96" bed, a 14" Z axis, a more powerful spindle and faster travel speeds. It is also equipped with an automatic 10 tool changer and a hold down vacuum system. The ShopBot Buddy has a bed size of 24" x 48".

Additionally students have full access to a series of physical prototyping machines including, two bandsaws, table saw, panel saw, planer, jointer, lathe, belt and disc sanders for wood working. For more information, review the website on the University of Miami School of Architecture website.



CNC Mill

The U-SoA Fabrication Lab will foster a culture of learning through making. Its principal purpose is to serve students and faculty in existing and future research pursuits, by providing robust training and broad access to a host of digital and analog tools. The Lab aims to continually improve, incorporating new technologies and expanding its capacities, growing into a resource equal to the substantial ambitions of a top-tier architecture program.



Usage

The Formlabs 3B printer is available to all within the School of Architecture. To use the equipment, users must create their own 3d models, set up their preform files, and pay for the materials. Fabrication lab staff will send the materials and handle the machines. The printing process requires the handling of toxic chemicals and should only be handlded by trained Fabrication Lab staff.

To use the equipment, users should submit an appointment for an initial consultation with the trained staff members. To do this follow the steps below:

-Access the University of Miami School of Architecture website.

-Access the page for resin printing.

-Fill out the form and click the link to “Booking”

-Click initial Consultation.

-Select a trained staff member from the dropdown “Select Staff List”

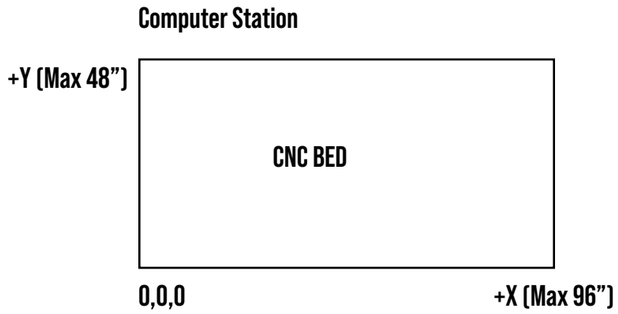
-Select an appointment date and time based upon availability.

-Fill out all additional information and click “Book”. Users should get an immediate confirmation when clicking book. If they did not, the appointment was not successfully created.

The user should show up to the appointment with the model they would like to print complete, set up in preform, and an idea of what type of resin they would like to use. If the Fabrication Lab has the type of resin available, the print will be sent during the appointment. If the Fabrication Lab does not have the resin available the student may have to wait for the shipping of the resin and a new tank before the model can be sent to the printer.

Setting Up Aspire Files

Before starting Aspire, it will be helpful to make sure your model is orientated in the correct direction and close to the X, Y, Z datum point. In Rhino and AutoCAD, the X, Y, Z datum point is how the program lines your model up in Aspire. So if you create your model 10 miles away from that point (usually there is some sort of marker on the screen where it is) then that is how far it will be away from the X, Y, Z datum point in Aspire. This generally causes people to not be able to see their models. Even if you zoom to extents, it will be hard to find. It is much easier to make a bounding box the size of your virtual work piece and have the bottom left hand corner align to 0,0,0 (the datum point). Remember: the bed of the CNC is a rectangle (4'x8') and the lower left corner is the 0,0,0 position. This is how your model should be orientated in your programs (Rhino, Aspire, or AutoCAD).



HOW TO INPUT A 2D MODEL INTO ASPIRE

Step 1: Open Aspire from desktop

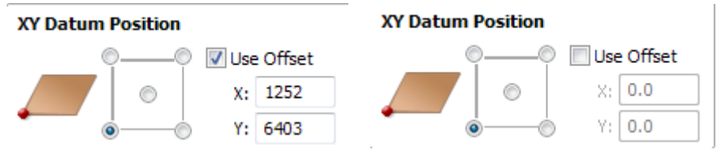
Step 2: Select "Create a new file"

Step 3: Job Setup Panel

Job Size (X & Y): Input values. Overall material length and width of work piece.
-Refer to "X" and "Y" labels on ShopBot surface to ensure your material orientation will correctly align with the "X" and "Y" values you input to aspire. (For PRS Alpha – X has a max of 96" and Y has a max of 48")

Material (Z): Input value. Thickness of material. Ensure the lower bubble below "Z Zero" is selected. This will ensure the project is zeroed from the spoil board and not the surface of the material. This is very important as it determines where the machine starts in a vertical position.

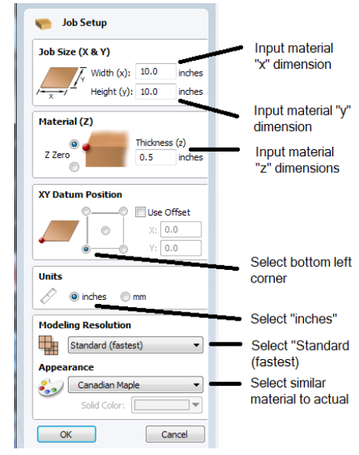
XY Datum Position: Selecting position that has a positive X and Y axis.



Units: Select "inches".

Model Resolution: Select "Standard (fastest)"

Appearance: Use default, "Canadian Maple".
Click "OK" when finished.



Step 4: Import Project/Model

Note: If you need to return to "Job Setup" page, select "Edit" in toolbar then "Job Size and Position" or go to the drawing tab, look at the top group of buttons and click on the one on the second row all the way to the left.

- Select File in toolbar, then select Import -> Import Vectors...
- Locate the 2D model file on computer and open file. i.e. Box or thumb drive

Setting Up Aspire Files

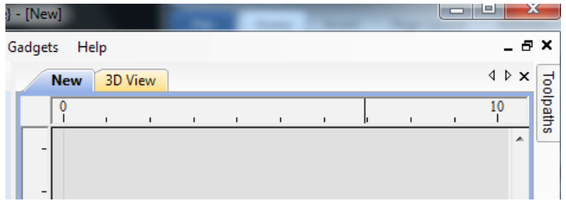
Step 5: Model Orientation

If model needs to be rotated, select all of the vectors that need to be rotated and then click on the rotate button (It is on the drawing tab, in the Transform Objects group, the third button from the left).

HOW TO PREPARE TOOLPATHS FOR A 2D MODEL

Step 1: Select the element you wish to cut. Element should be highlighted in red.

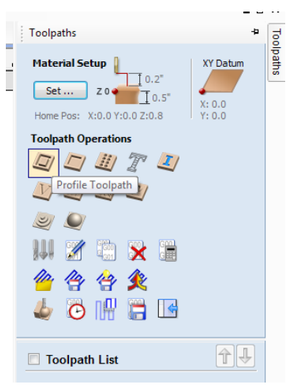
Step 2: Click "Toolpaths" tab located in top right corner of Aspire. Note - clicking the pin icon will lock the toolpath menu to an open position.



Step 3: Select the toolpath you wish to use. See below steps for instructions using each toolpath

PROFILE CUT

Step 1: Select the profile toolpath from the tool path operations



Step 2: Specify your cut depth.

- When cutting through your material, set the cut depth as the thickness of the material. Only go deeper if it does not cut all the way through (remember, not all materials are a consistent thickness throughout).

Step 3: Select the size and type of bit used to make the cut: endmills, ballnose, and engraving (text done as a profile toolpath) are the most commonly used bits for this type of toolpath. Go to the endmill, ballnose, and engraving bit info sheet more info on them.

-S elect the correct bit based off how deep you have to cut (not every bit can cut as deep as what might be needed, measure the cutting head portion of the bit if you are unsure if it is the right size bit for the job).

- The tool database should already have the correct "depth per pass" if you have to change this setting or any other setting in the tool database, DO NOT HIT APPLY, just hit ok. Hitting Apply will change the values in the database permanently.

Step 4: Select the orientation of the cut. Set direction to climb.

-Outside/Right will cut outside the perimeter of the selected element and will leave the area of that element intact.
-Inside/Left will cut along the inner perimeter of the selected element.
-On will cut on the line of the element

Step 5: Tabs (only for small parts or if the vacuum table is down)

d) Click on Edit Tabs
e) Enter the number of tabs needed and click Add Tabs. Note tabs can be moved, added, and removed by clicking on the selected element vectors.

Step 6: Name the cut and click Calculate.

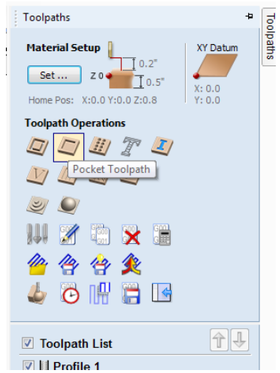
Note: If cut depth is set greater than the material thickness, a warning will pop up. Review the cut depth is not too much larger than the material thickness and click OK.

Step 7: Previewing Toolpath

-See instructions on previewing toolpath in the Preview Toolpaths section below.

POCKET CUT

Step 1: Select the pocket toolpath from the tool path operations.



Step 2: Specify your cut depth.

Step 3: Select the size and type of bit used to make the cut: endmills are the most common bit used for this toolpath. Go to the endmill info sheet for more info.

-Select a bit that has a cutting head that is long enough to handle the depth needed to be cut. Remember – endmills are the preferred bit of choice for this since they will leave a flat surface wherever it cuts. BOTH UPCUT AND DOWNCUT BITS CAN BE USED, BUT DOWNCUT BITS WILL GO MUCH SLOWER AND SHALLOWER DEPTHS.

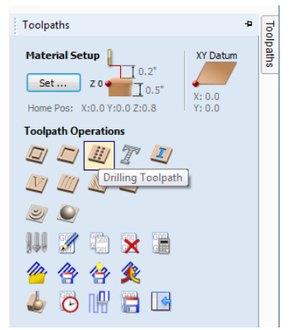
Step 4: Select Offset and Climb for the direction of the cut.

Step 5: Name the cut and click Calculate.

Step 6: Previewing Toolpath - See instructions on previewing toolpath in the Preview Toolpaths section below.

DRILLING

Step 1: Select the drilling toolpath from the tool path operations.



Step 2: Specify your cut depth.

When cutting through your material, set the cut depth slightly more than the thickness of the material to ensure holes are drilled completely through the material.

Step 3: Select the size and type of bit used to make the cut.

DO NOT CHOOSE A DOWNCUT BIT OR A COMPRESSION BIT FOR THIS TASK. Upcut endmills or ballnose are most commonly used for this toolpath. Go to the endmill and ballnose info sheet for more info.

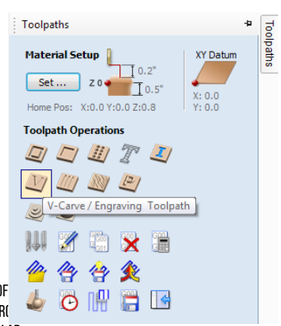
Note - Downcut and compression bits WILL start a fire if used for this task.

Step 4: Name the cut and click Calculate.

Step 5: Previewing Toolpath -See instructions on previewing toolpath in the Preview Toolpaths section below.

V-CARVING

Step 1: Select the V-Carve toolpath from the tool path operations.



Step 2: Select the size and type of bit used to make the cut: V-bits, engraving, and ballnose bits are most commonly used for this toolpath. Go to the v-bit, engraving, and ballnose info sheets for more info.

-For text with thin vector lines, V-bits and engraving bits are best to use

-For drawing lines, or thicker text, a narrow ball-nosed bit can be used

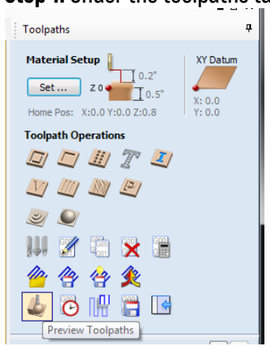
Step 3: Name the cut and click Calculate.

Step 4: Previewing Toolpath

-See instructions on previewing toolpath in the Preview Toolpaths section below.

PREVIEWING YOUR TOOLPATH(S)

Step 1: Under the toolpaths tab select Preview Toolpaths.



Step 2: Select the toolpath(s) you want to preview under the Toolpath List.

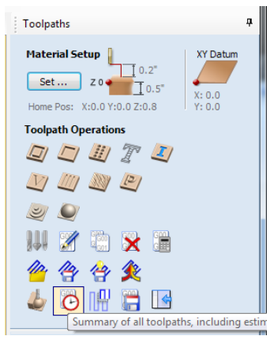
Step 3: Select Preview Visible Toolpaths to watch a preview of the cuts selected.

-Speed can be adjusted with the sliding bar.

-Hit Reset Preview to reset the model.

TOOLPATH SUMMARIES

Step 1: Under the toolpaths tab select Summary of all Toolpaths.



Step 2: Select all the tool paths to be cut in the Toolpath List.

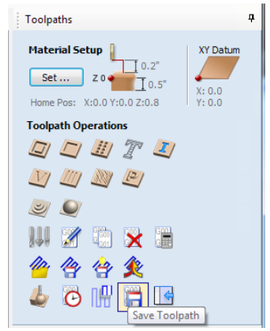
Step 3: Record the total running time to complete all cuts on the project sheet.

-Account for time changing bits and setting up material when estimating the total project time.

-Times for each individual cuts are also shown.

SAVING TOOLPATHS FOR SHOPBOT

Step 1: Under the toolpaths tab select Save Toolpath.



Step 2: Check Output all visible toolpaths to one file. If not using the tool changer, the files can be saved individually, then run one at a time.

Step 3: Under Post Processor, select ShopBotTC (inch)(*sbp). (TC stands for tool changer, if it is not selected, it will run every file using the same bit and not change in between toolpaths)

Step 4: Select the cuts to be saved. Cuts to be selected will show under Toolpaths to be saved...

Step 5: Review everything to make sure the correct cuts have been selected. Click Save Toolpaths. Place the files in the same folder as the main file.

HOW TO INPUT A 3D MODEL TO ASPIRE

NOTE: CNC Operator should become familiar with customer's project to assist with orientation of material.

Step 1: Open Aspire from desktop

Step 2: Select "Create a new file"

Setting Up Aspire Files

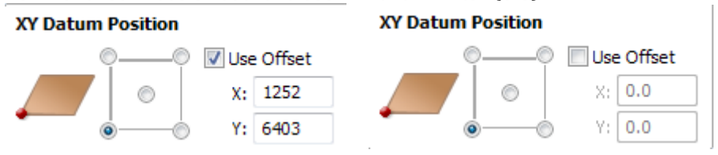
Step 3: Job Setup Panel

Job Size (X & Y): Input values. Overall material length and width to be cut by CNC.
-Refer to “X” and “Y” labels on ShopBot surface to ensure your material orientation will correctly align with the “X” and “Y” values you input to aspire.

Material (Z): Input value. Thickness of material.

XY Datum Position: Selecting position that has a positive X and Y axis.

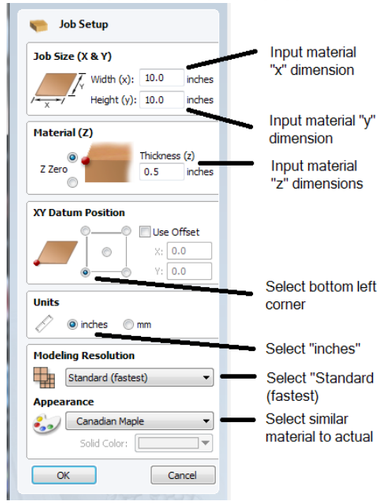
NOTE: Uncheck “Use Offset” and set “X:” and ”Y:” to “(0.0)”.



Units: Select “inches”.

Model Resolution: Select “Standard (fastest)”

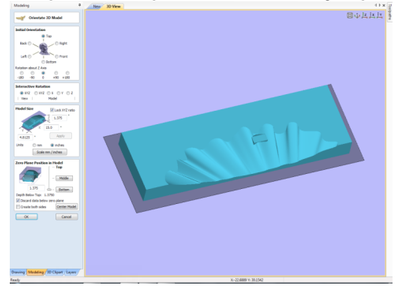
Appearance: Use default, “Canadian Maple”.
- Click “OK” when finished.



Step 4: Import Project/Model

Note: If you need to return to “Job Setup” page, select “Edit” in toolbar then “Job Size and Position”.

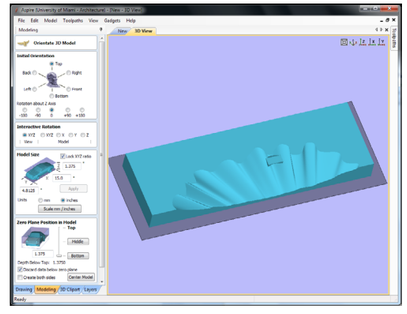
- Select “File” in toolbar, then select “Import Component/ 3D Model” function- Locate the 3D model file on computer and open file. i.e. Box or jump drive



Step 5: Orientate 3D Model Panel

Initial Orientation: Select “Center Model” to get model centered on the “virtual work piece” Depending on the file, you might have to rotate the project, look below for those directions.
Model Size: Select “Lock XYZ ratio”. This feature locks the projects proportions for scaling purposes.
- “x”, “y”, and ”z” measurements should automatically appear.
- Select “inches”

Zero Plane Position in Model:
- Unselect “discard data below zero plane”.
- Click “OK” when finished.



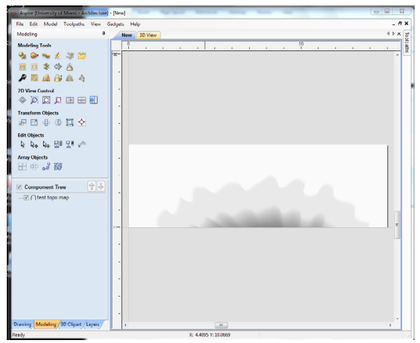
Setting Up Aspire Files

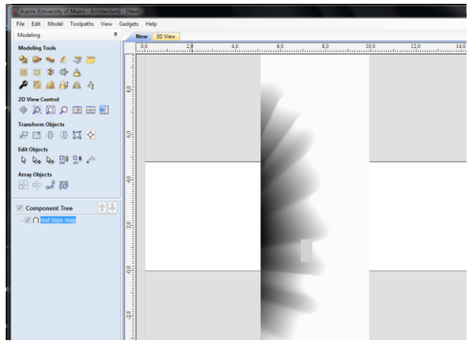
Step 6: Determining Proper Orientation

-Click “New” tab

-If project is orientated on virtual work piece and facing desired direction continue to “How to prepare Toolpaths for a 3D model” in directions. See image on left,

-If project is NOT orientated above virtual work piece and/or NOT facing the desired direction continue to Step 7. See image on right.





Step 7: Orientate project to desired cutting position

-Within “Transform Objects” select “Rotate Selected Objects”

-Click on model in view port/ model space to activate rotation functions.

-See Image 6

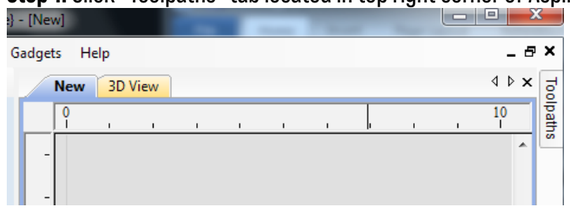
Rotate Panel

-Anchor: Select center circle.

-Angle: Enter “90”

HOW TO PREPARE TOOLPATHS FOR A 3D MODEL

Step 1: Click “Toolpaths” tab located in top right corner of Aspire.



Step 2: Select “3D Roughing Toolpath” tool

Step 3: Toolpaths Panel for Rough Machining Toolpath

Tool: Click “Select” to choose bit type. See step 4 and Image 3 for information on inputting values for bits.

Machine Allowance: Set between .04 - 0. This determines material remaining for the “Finishing toolpath”.

Roughing Strategy: For best results, repeat step 3 multiple times with a different “Roughing Strategy” and compare outcome for desired method.

- Z Level: Default toolpath option. Renders toolpath as a series of layered 2D pocket toolpath cuts. “Raster X” removes material by moving the spindle parallel to the x-axis, “Y-Axis removes material by moving the spindle parallel to the Y axis. “Profile” concerns with a profile toolpath cut that follows the pocket toolpath at each level to clean up the perimeter. “Last performs this action after the pocket toolpath, first does it before, none does not perform this action.

-“3D Raster”: 3D rendered toolpath. Recommended only in special cases in which a shallow cut is desired. Will leave more material than “Z Level”. Can select which direction the spindle will generally remove material in, “Along X” or “Along Y”

-Boundary Vector Offset: Set to zero “0”. This determines material remaining around model.

Setting Up Aspire Files

- Click “Calculate”

- Click “Close”

Step 4: Tool Database Panel: DO NOT CHANGE ANY OF THE BIT INFORMATION IN THE DATABASE UNLESS YOU ARE EXPERIENCED. PLEASE ASK FOR HELP WITH THIS IF YOU ARE UNSURE OF WHAT TO DO.

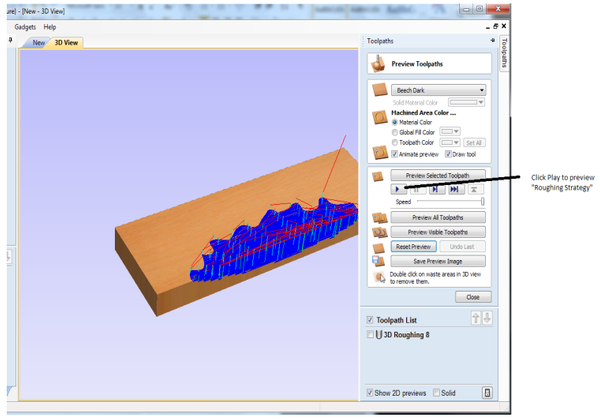
*The most commonly used bits for roughing tool paths are endmills or ballnose bits. Choose the biggest one that gets your first pass close to the finished model as possible in a decent timeframe. Go to the endmill and ballnose info sheets for more info.

-Click “OK”

- Complete Step 3

Step 5: Preview Toolpath

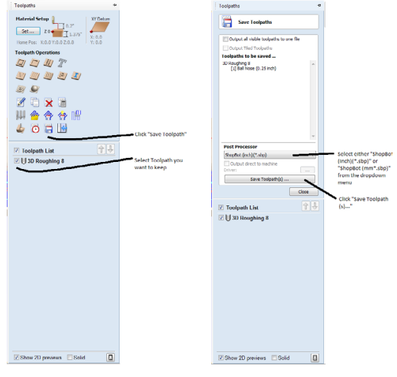
- Click the Play Button Under the “Preview Toolpath” panel



Step 6: If satisfied with preview, Select Toolpath that you will use for the ShopBot under “Toolpath List” and click “Save Toolpath” tool (See image 5). Otherwise repeat toolpath process from step 1 and make necessary changes.

Step 7: Set File type as “ShopBotTC (inch)(*.sbp)”

Step 8: Click “Save Toolpath(s) ...” and save to desired location on computer.



HOW TO PREPARE SHOPBOT HARDWARE

Step 1: Activate ShopBot

i. Turn red on/off switch on front panel clockwise into ‘on’ position

ii. Turn interlock key also located on front panel into ‘engaged‘ position

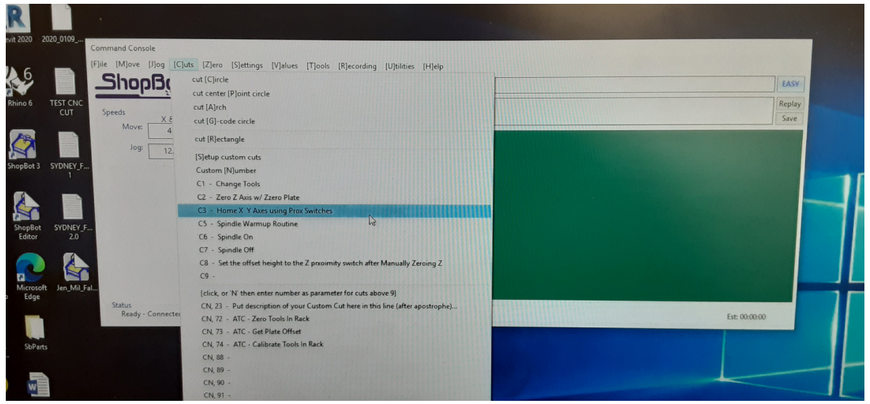
Step 2: Open the ShopBot application on the attached desktop computer. Three windows will open (“ShopBot Preview”, “ShopBot Console” and “Position”)

*Pop up will say “a port is open and do you wish to proceed?”. Click ok.

HOW TO PREPARE SHOPBOT HARDWARE

Step 3: Before putting your material on the work surface of the spoil board, you need to home the machine using the x and y proximity switches.

- Click on the “cuts” tab on the ShopBot screen. Click on “home x y using prox switches”.



-After the machine moves and completes the homing sequence, ensure that the x and y 0,0 position is at the corner of the spoil board. If it is not, please ask for assistance.

Step 4: Zero the bit to the surface of the spoil board

-Using the yellow keypad, move the bit over clean area of the spoil board and lower the bit to 2 – 3” above the zero plate. Attach the alligator clip to the bit.

-Click on the “cuts” tab on the ShopBot screen. Click on “zero z axis with zero plate”.

-Once the menu pops up, click “Ok”. The machine will go through the zero process and make sure to remove the alligator clip and return it and the zero plate back to where they belong.

Step 5 – Use vacuum table to attach work piece to the spoil board

- Place your work piece on the spoil board in the correct orientation

- If the work piece does not fill the entire quadrant of the vacuum table, place scraps of wood around the perimeter to block off the unfilled areas . The vacuum will not hold to be cut otherwise

- Under the spoil board, ensure that only the main valve is open, press the green button on the vacuum panel on the wall. Once you hear the suction coming from the main valve, open the valve for the quadrant you will be using and then close the main valve. Ensure the work piece is secure to the table before moving forward. Repeat the process until it works.

Step 6 – If vacuum table cannot be used to secure work piece, use screws.

- Place work piece on table in desired location

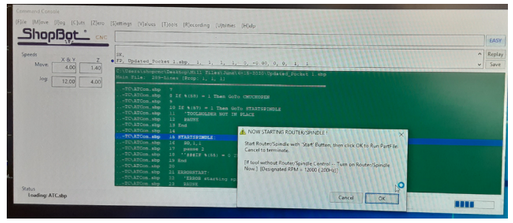
- Using the prepared ShopBot file, place screws in areas where the bit will not be cutting. Make sure the screws are flush or below the surface of the wood just in case.

HOW TO PREPARE SHOPBOT HARDWARE

Step 1: With ShopBot hardware connected and zeroed. Press large green “Cut Part” on the red “Position” windows

Step 2: Navigate and open desired file from computer, a window emulating a yellow memo pad will open, leave all settings as default and select “Start”

Step 3: A window will open labelled “NOW STARTING SPINDLE !”, DO NOT SELECT “OK” UNTIL SPINDLE IS ACTIVE !!!



Step 4: Activate Spindle by pressing the green “START” button on the ShopBot remote.

- Wait a few seconds for the spindle to reach its top speed and then select “OK” to begin the cut.

- The remaining process is automated including bit changes. Remain attentive for this process, at any sign of trouble press the left-mouse button (automatically restricted to stop button on “Position” window), hit the spacebar, or press the red Stop button on the Remote if it is an emergency. Troubleshoot accordingly by zeroing axes, checking the toolpath in Aspire, or other situation specific adjustment.

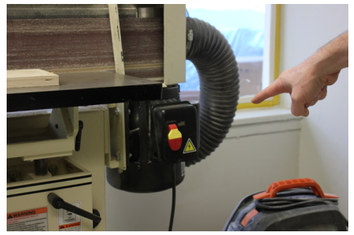
UNIVERSITY OF MIAMI
SCHOOL OF ARCHITECTURE
FABRICATION LAB

Wood-Working Equipment

The U-SoA Fabrication Lab will foster a culture of learning through making. Its principal purpose is to serve students and faculty in existing and future research pursuits, by providing robust training and broad access to a host of digital and analog tools. The Lab aims to continually improve, incorporating new technologies and expanding its capacities, growing into a resource equal to the substantial ambitions of a top-tier architecture program.

Edge Sander

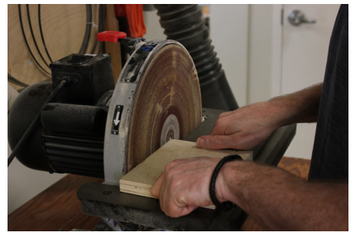
Belt Sander – Turn the dust collector on. Turn the belt sander on. Press down on the board as you are pressing it evenly onto the belt sander. If you need to round the corner of the board. press it in slowly and rotate the board. DO NOT press the face of a board on the sander unless it fits entirely on the belt. If you let go of the board the belt will send it flying into the wall and can break or damage your work piece.



DO NOT HOLD YOUR WORK PIECE AS SHOWN BELOW:


Disc Sander

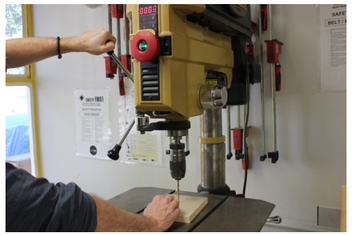
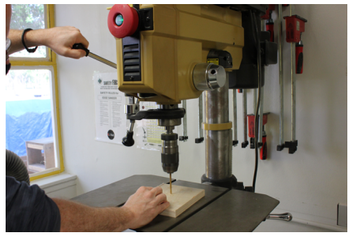
Disc Sander – Turn the dust collector on. Turn the disc sander on. Press down on the board as you are pressing it evenly onto the disc sander. Make sure to only use the left half of the disc. If you need to round the corner of the board. press it in slowly and rotate the board. DO NOT use the right half of the disc or press the face of a board on the sander unless it fits entirely on the disc. Use the red break to stop the disc before walking away.

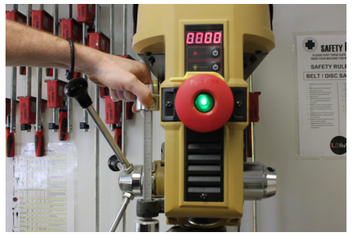
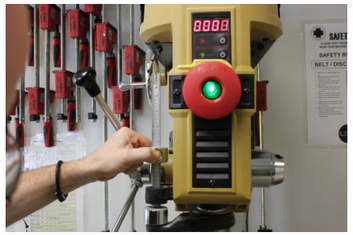




DO NOT HOLD YOUR WORK PIECE AS SHOWN BELOW:


Drill Press

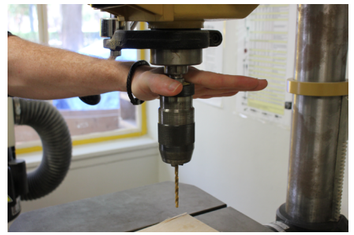
Drill Press – To turn the drill press on, press the red button. To change the bit, grab and hold the upper serrated portion and twist the lower serrated portion until the bit falls out, then put the new bit in and tighten. To adjust the table height, loosen the lever on the left of the main post, then crank the handle down or up to the desired height. To set the safety stop (to prevent you from drilling too far down) adjust the chrome stop by pressing the button and sliding to the desired height. Finally, move your work piece into the correct position below the bit, press the red button to turn the press on, then use the handles on the left to lower the bit to the work piece.

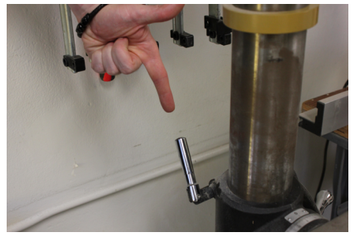
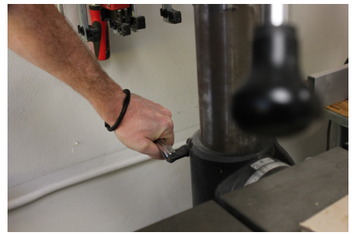
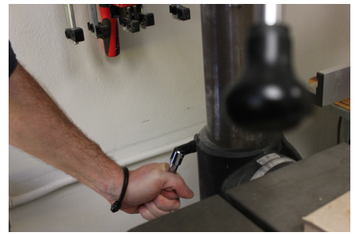




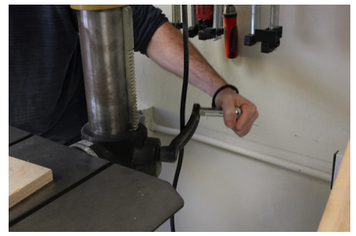



Drill Press

To change the bits, turn the machine off and hold the collar while rotating counter clockwise.
To adjust the position of the table, loosen the lever on the back left side of the machine.
To adjust the height of the table, rotate the handle on the back right side of the machine.

Grizzly Band Saw

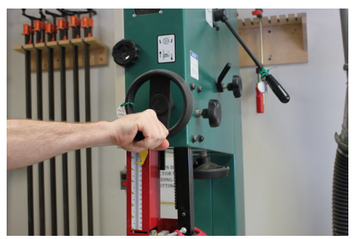
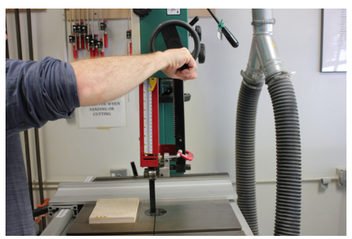
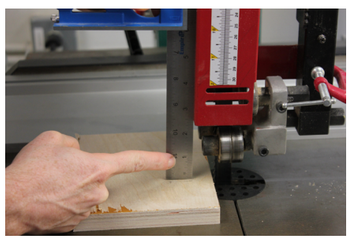
Grizzly Band Saw – Turn the dust collector on. First, adjust the fence so it is the correct distance away from the blade by lifting the handle up and sliding the fence. If you need the fence verticle, use the adjustment knob on the left to loosen it, slide the fence off, place fence in the desired direction and retighten knob. Next, The red blade guide needs to be lowered to within 1”-2” of the work piece. Loosen the knob behind the guide, then crank the handle in either direction until it is at the correct height, then retighten the knob. Once all the adjustments are made and you are ready to cut, place your hand on the sides of your work piece (or at least in an area where they will not make contact with the blade) and push the work piece into the blade. DO NOT put your hands in any area that can make contact with the blade, be cautious where your thumbs are.





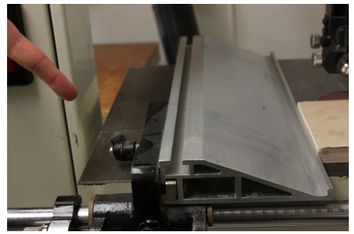
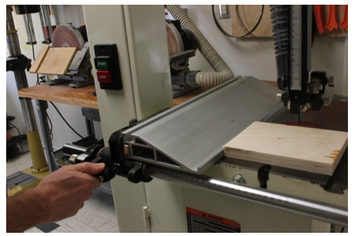
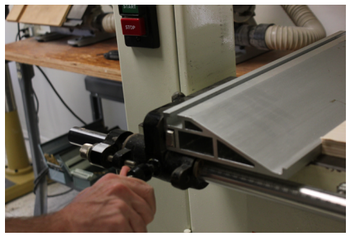
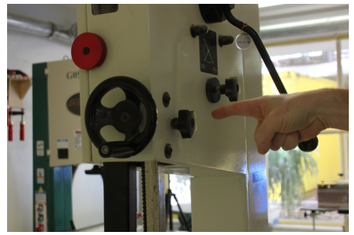


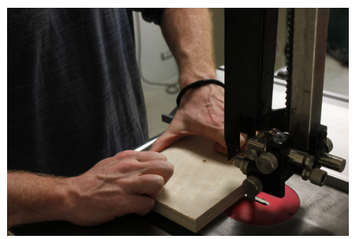
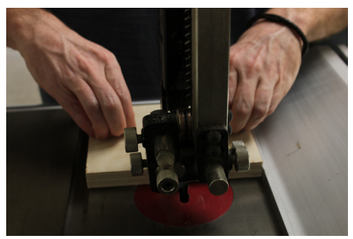


Jet Band Saw

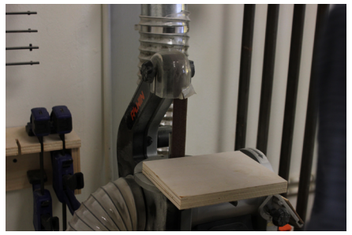
Grizzly Band Saw – Turn the dust collector on. First, adjust the fence so it is the correct distance away from the blade by lifting the handle up and sliding the fence. If you need the fence verticle, use the adjustment knob on the left to loosen it, slide the fence off, place fence in the desired direction and retighten knob. Next, The red blade guide needs to be lowered to within 1”-2” of the work piece. Loosen the knob behind the guide, then crank the handle in either direction until it is at the correct height, then retighten the knob. Once all the adjustments are made and you are ready to cut, place your hand on the sides of your work piece (or at least in an area where they will not make contact with the blade) and push the work piece into the blade. DO NOT put your hands in any area that can make contact with the blade, be cautious where your thumbs are.

Grizzly Band Saw

Mini Belt & Disc Sander – Turn the dust collector on. Turn the sander on. Press down on the board as you are pressing it evenly onto the disc or belt. Make sure to only use the left half of the disc. If you need to round the corner of the board. press it in slowly and rotate the board. DO NOT use the right side of the disc.


Spindle Sander

Spindle Sander – Turn the dust collector on. Turn the sander on. Press down on the board as you are pressing it evenly onto the spindle. This sander is best used for sanding smooth curves DO NOT touch the spindle as it is moving.

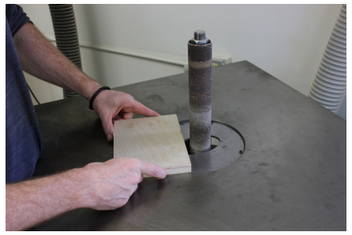
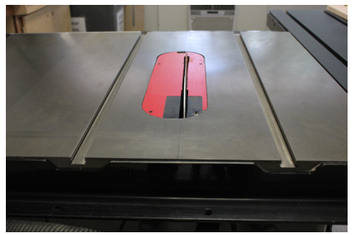
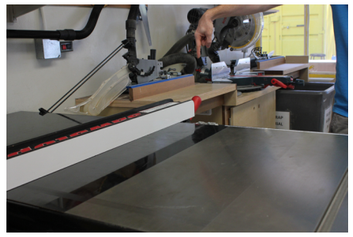



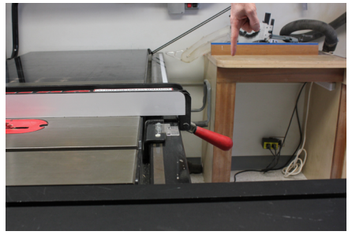
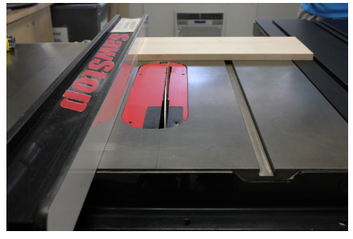
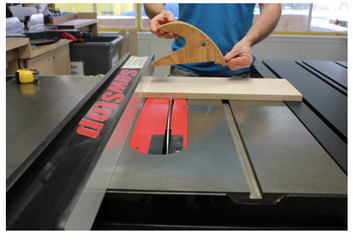
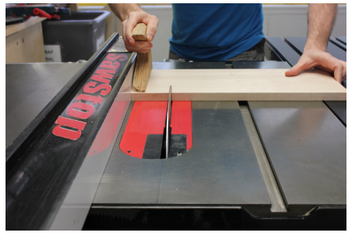
Table Saw

Table Saw – First ensure the power is turend on to the machine and the dust collector. The On/Off switch is the big red paddle. Make sure the blade is set to the correct angle. Ensure that the blade is at the correct height for your materail (It should only be high enough to completely cut the material). Lift the red handle on the fence to set it to the correct measurement needed. Use the wooden push guides if there is not enough room for your hands. You can also use the slilding fance. DO NOT put your hands near the blade or in the way of the blade. This machine is equipped with a saw stop, so it will destroy the blade if it detects your hand or body part near the blade.





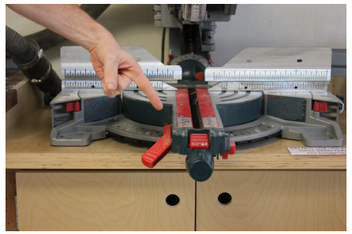
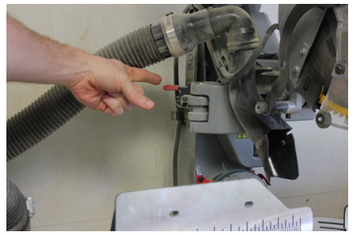
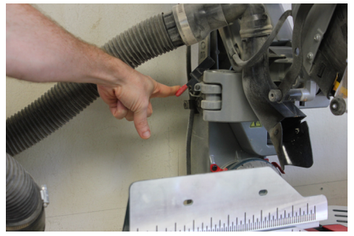





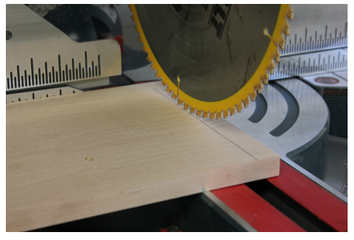
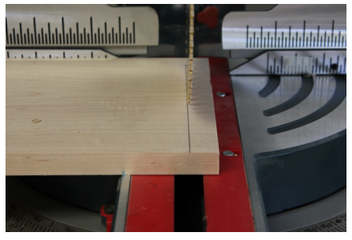

Cross Cuts - Always use a sled to make cross cuts on the table saw to fully support the piece while it cuts across the saw.



Chop Saw

Chop Saw – First ensure the chop saw is at the correct angle and not set up for a mitre or something similar. Then, check to see if you need to extend the arm to fully cut your piece. If you need to, release the arm so you can extend it further forward. Ensure the blade is lined up correctly on the proper side of your mark. Squeeze the trigger and the red button on the handle at the same time to turn the saw on. While holding both those buttons, bring the saw down to your material to cut it. DO NOT put your hands where the blade is going to be.

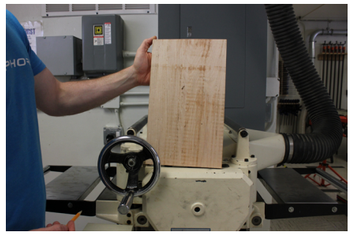
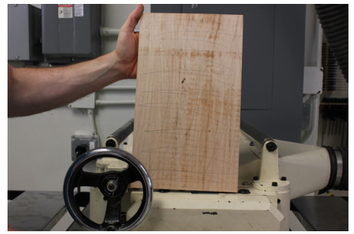
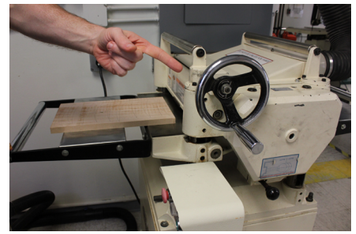





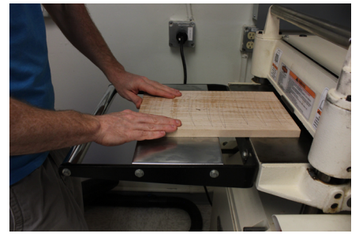


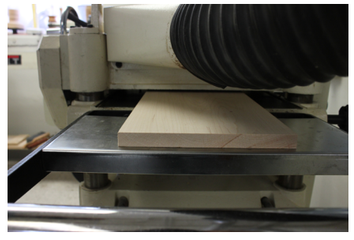
Planar

Planer – First, using pencil, mark the side of the board you will be planing (This will let you know if any spots were missed with each pass). Then set the height of the machine so that it is either 1/64th or 1/32nd below the height of your material. Turn the dust collection system on. Turn the machine on by pressing the green button. Push the board forward until the rollers grab it. It will feed itself through. If spots were missed, set the height down lower by 1/64th or 1/32nd and repeat until the board has no pencil marks. Then turn off the machine with the red button. DO NOT put your hands inside of the machine while it is on or plugged in.

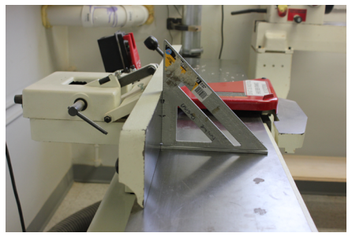


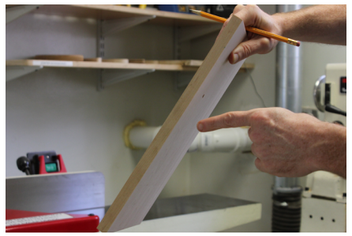
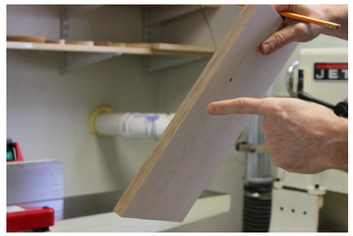
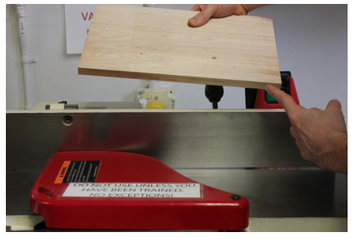


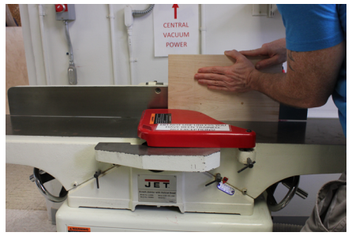


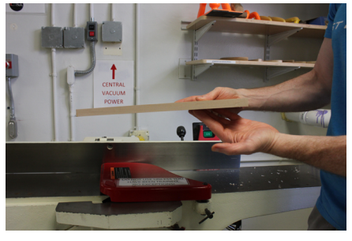

Jointer

Jointer – First, using pencil, mark the edge of the board you will be jointing (This will let you know if any spots were missed with each pass). Ensure the fence is at 90 degrees using a speed square. Turn the machine and dust colllector on. Place the marked edge down and press the board down and into the fence at the same time. Slide the board past the red guard. Repeat the process if the pencil marks have not all gone away. DO NOT move the red guard with your hands while the machine is running. DO NOT adjust the blade height unless you have spoken to the manager.

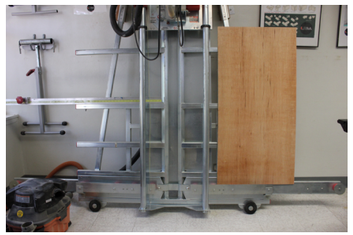
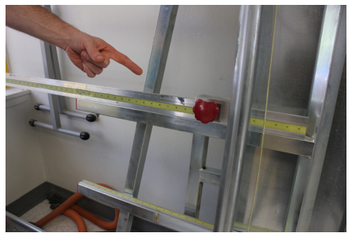




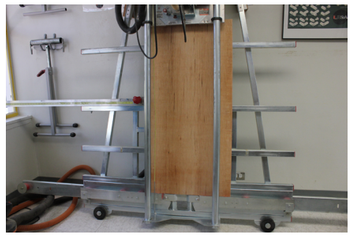


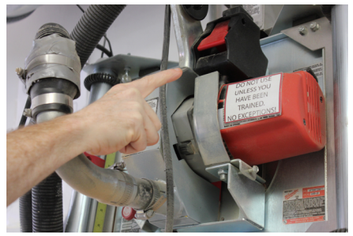


Panel Saw

Panel Saw – Locate and move the stop with the red knob to the desired measurement. Then load your material on the red rollers. Turn on the vacuum since it is not hooked up to the dust collection system. Turn the saw on by lifting the red paddle. Pull the saw down to the ground and then turn the saw off. Let the blade come to a complete stop before lifting the saw again. DO NOT put your hand or body parts in the way of the blade.



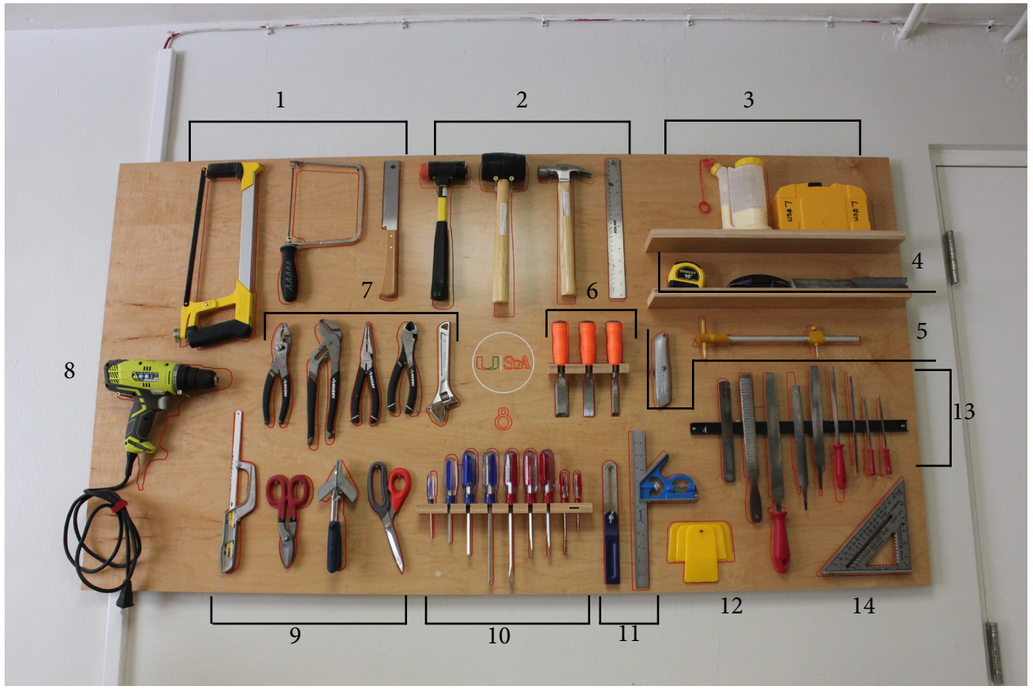





Hand Tools

The U-SoA Fabrication Lab will foster a culture of learning through making. Its principal purpose is to serve students and faculty in existing and future research pursuits, by providing robust training and broad access to a host of digital and analog tools. The Lab aims to continually improve, incorporating new technologies and expanding its capacities, growing into a resource equal to the substantial ambitions of a top-tier architecture program.

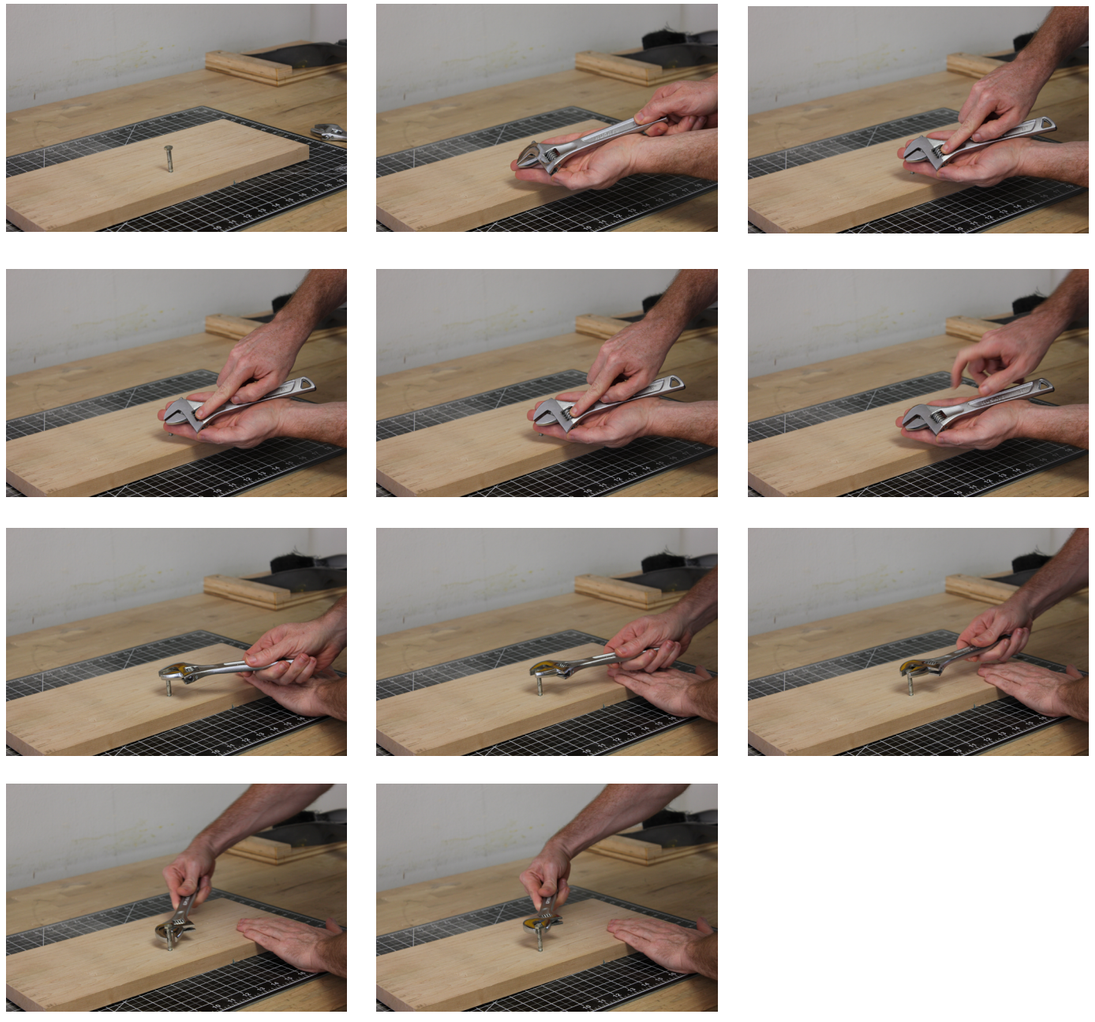
Tool Board



Section 1 - Hack Saw, Coping Saw, Flush Cut Saw
Section 2 - Plastic Mallet, Rubber Mallet, Hammer, Ruler
Section 3 - Wood Glue, Drill bits
Section 4 - Tape Measure, Rubber Sanding Block, Foam Sanding Block
Section 5 - Box Cutter, Compass
Section 6 - 1” Chisel, 3/4” Chisel, 1/2” Chisel
Section 7 - Pliers, Adjustable Pliers, Needle Nose Pliers, Wire Cutters, Adjustable Wrench
Section 8 - Chorded Drill
Section 9 - Mini-Hack Saw, Tin Snips, Dowel Cutter, Scissors
Section 10 - Phillips Head Screwdrivers, Straight Slot Screwdrivers
Section 11 - Angle Finder, Sliding Square
Section 12 - Glue Spreaders
Section 13 - Files (Flat, Round, Triangle)
Section 14 - Swanson Speed Square

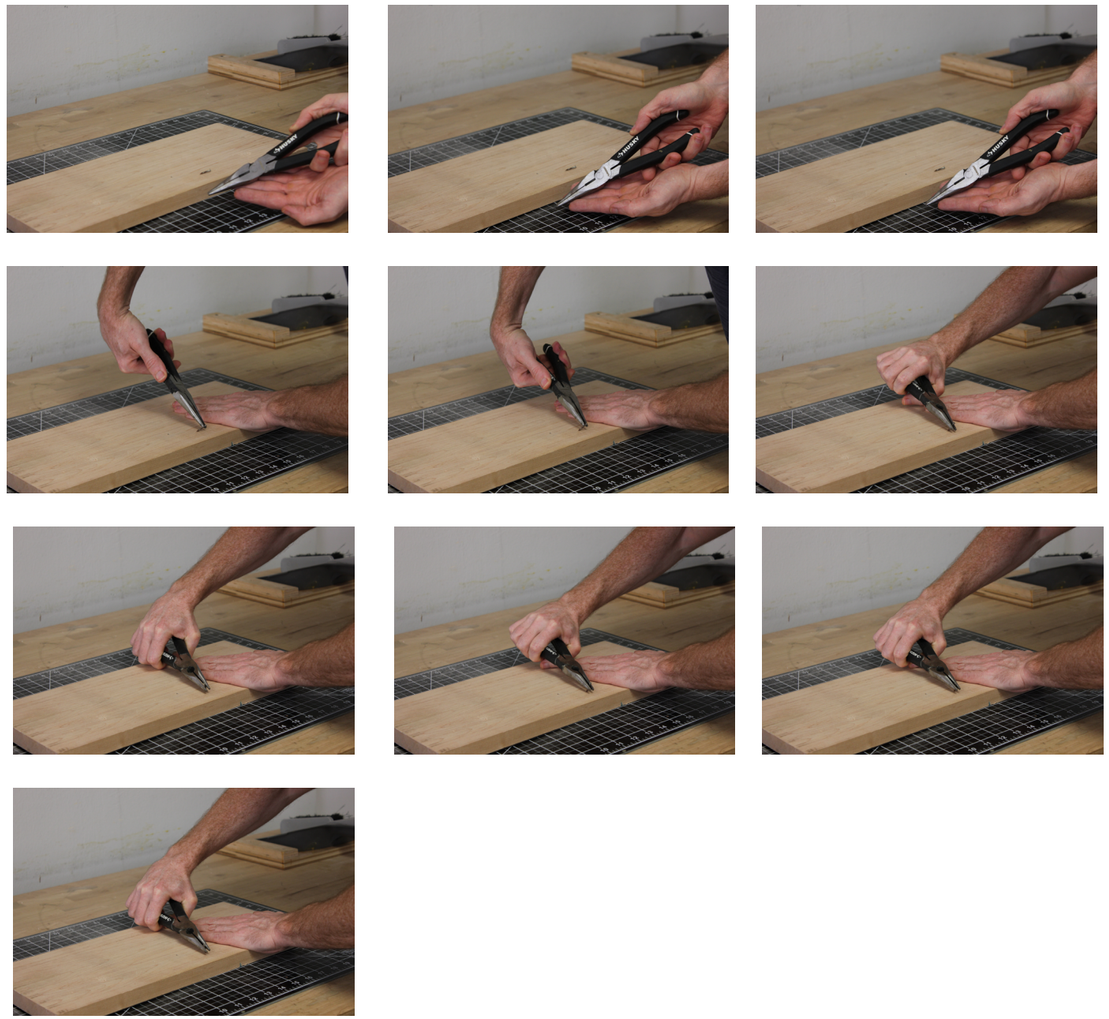
Adjustable Wrench

Section 7 – Adjust the wrench to the appropriate size and then use to remove a bolt.



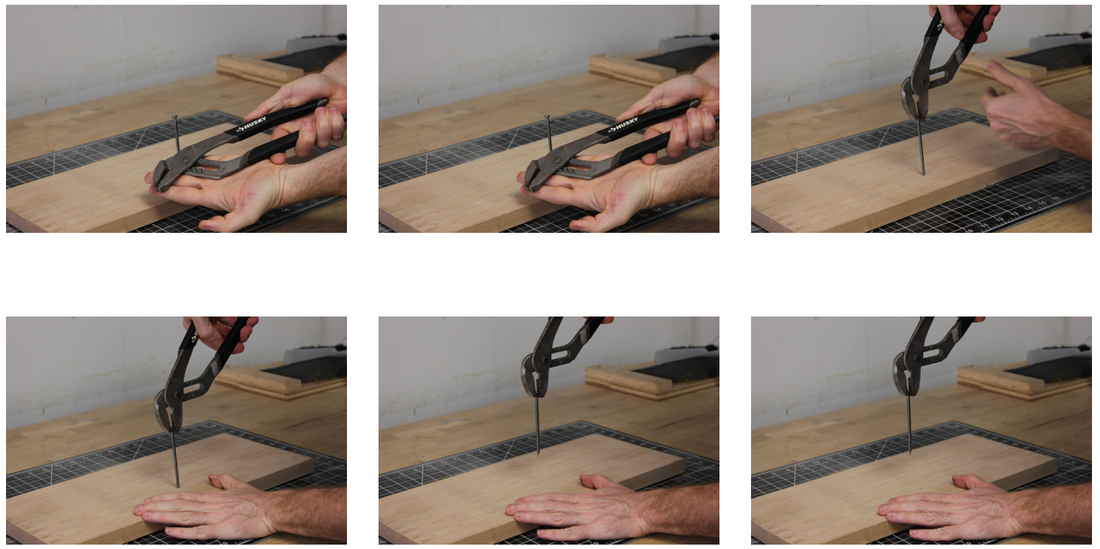
Needle Nose Pliers

Section 7 - Use pliers to remove smaller items or items that cannot be reached by a normal set of pliers.



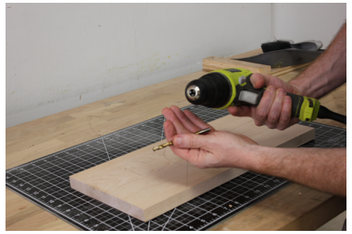
Adjustable Pliers

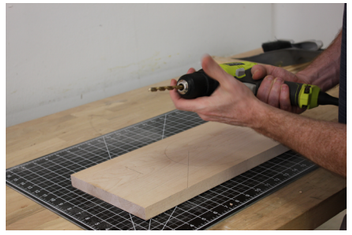
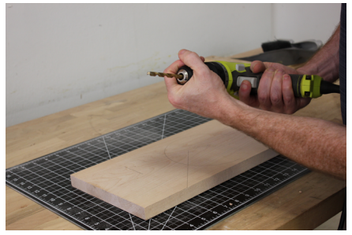
Section 7 - Open the pliers up to adjust them to be wider or narrower depending on the item being pulled.

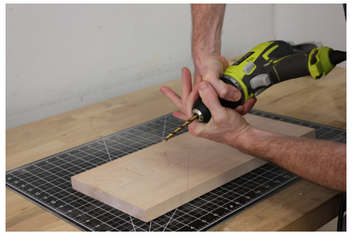


Corded Drill

Chorded drill – Section 8 - Open the drill head to insert a drill bit, then use to drill a hole.

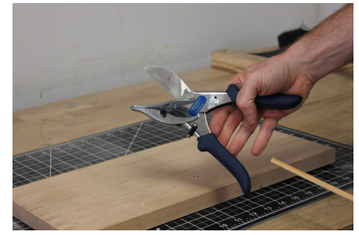
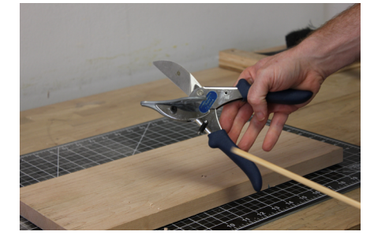


Dowel Cutter

Dowel cutter – Section 9 - Open the cutter to cut a dowel at a 45 degree angle.









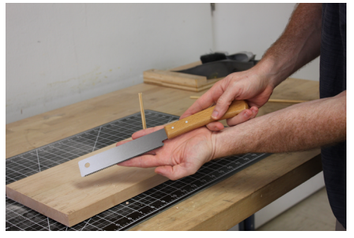
Mallet

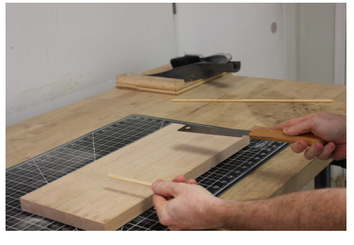
Section 2 - Use the mallet to hammer dowel into hole already made.







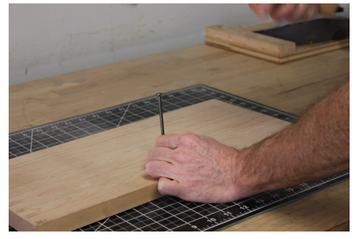
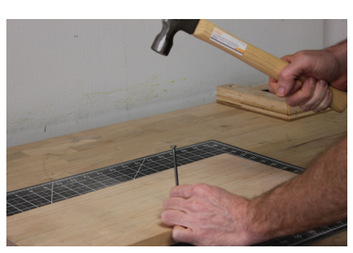
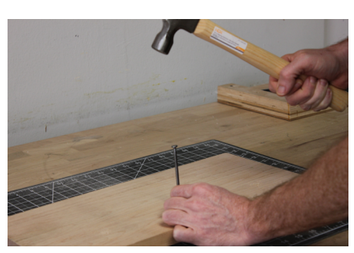
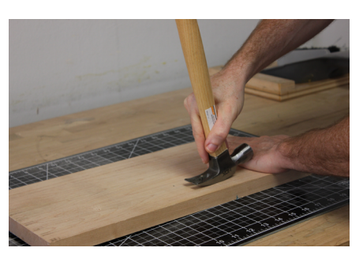



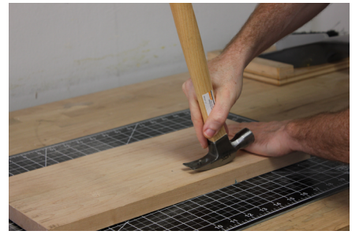

Hammer

Section 2 - Use the hammer to hammer a nail into a board. Then use the claw side of the hammer to remove a nail.



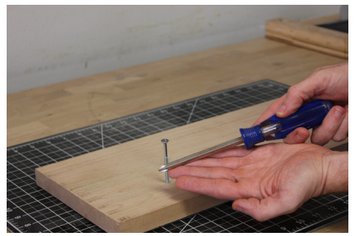
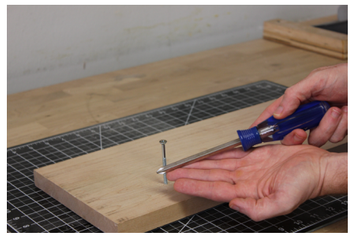
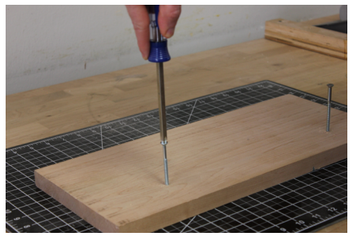
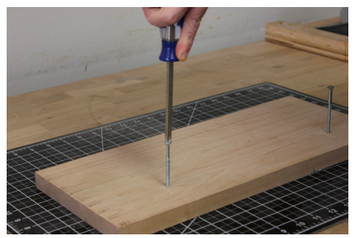
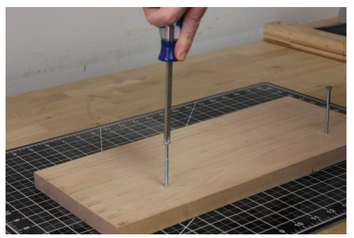


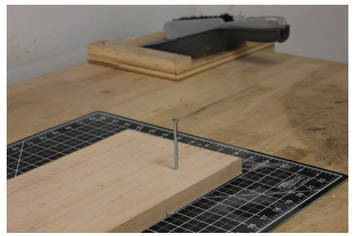
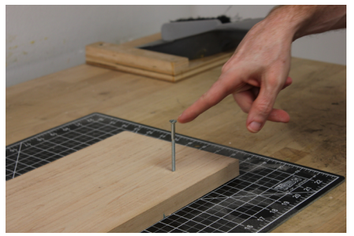
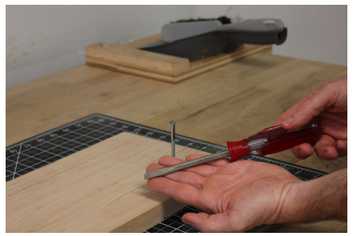
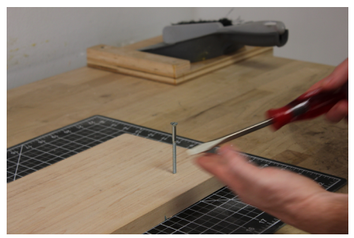
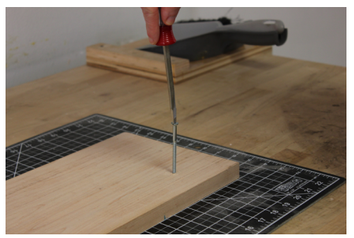
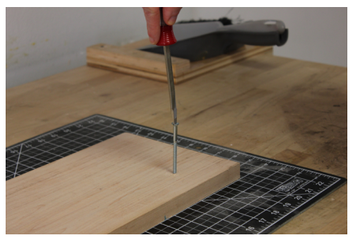
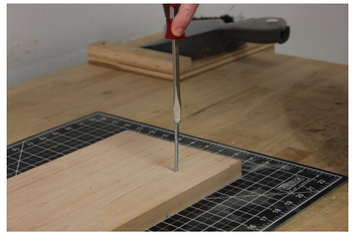
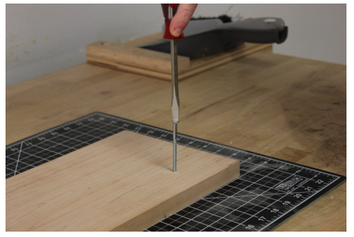
Phillips Head Screwdriver

SSection 10 - Use phillips head screwdriver to remove phillips head screws.

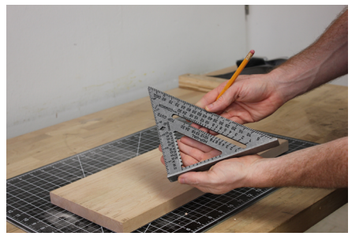
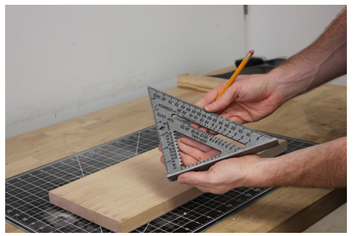
Straight Slot Screwdriver (Flathead)

Section 10 - Use the straight slot screwdriver to remove straight slot screws.

Swanson Speed Square

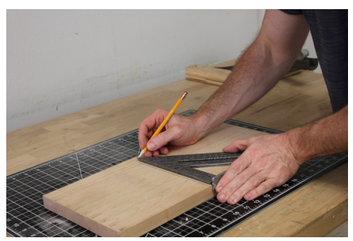
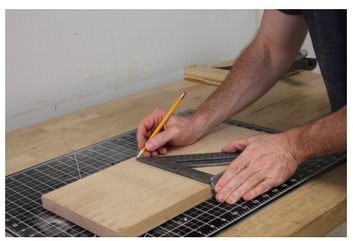
Section 14 - Use the speed square to make a line that is orthagonal to the edge of the board and then at a 45 degree angle to the edge of the board.

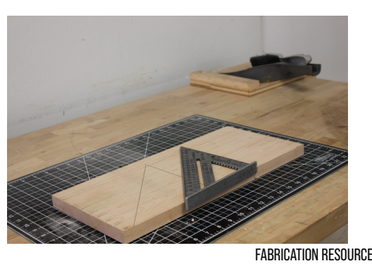










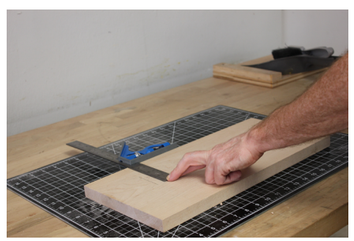
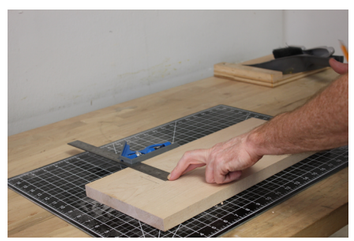
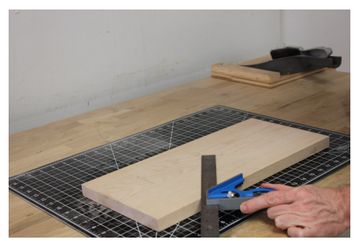
Sliding Square

Section 11 - Use the sliding square as a ruler and then to find a 45 degree angle.

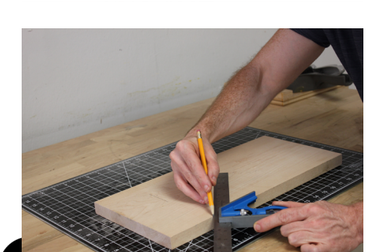










Compass

Section 5 - Use the compass to make a circle.