LASER CUTTER USER GUIDE

The following is an outline of policies, procedures and precautions associated with the laser cutters available to students and faculty of the College of Art and Design, located in the Design Shop, room 110 Art Building. It is required that all users be familiar with this outline but keep in mind that policies and recommended procedures change regularly and it is the user's responsibility to keep up to date with any changes by checking in with Design Shop staff periodically and looking for changes to procedures posted at the front desk.

Introduction

The College of Art and Design, Design Shop is equipped with 2 Universal Laser Systems X-660 laser engravers. These machines employ high powered CO_2 lasers to engrave and cut a variety of materials. A list of acceptable materials appears later in this document. Over the past several years these machines have changed the way students and faculty at LSU have approached creating architectural models, presentations and artwork, by speeding up laborious processes and expanding the possibilities of various materials. As you read on please remember that the information in this document pertains to the correct and safe use of the machines and does not detail the creation of the documents used with the machines. Your Professors will be able to provide you with the best instruction on using CAD and illustration software.

Safety

- Exposure to the laser beam can cause burns and severe eye damage. Never disable access door sensors or try to operate the laser cutter with access doors open.
- Never leave the laser cutter unattended while it is operating. Most of the materials used with the laser cutter are combustible and can ignite when in contact with the laser beam. If a fire should start inside the machine turn off the orange power switch, turn off the exhaust system, and turn off the compressed air, leave the laser room and alert shop staff. If it is safe to do so try to extinguish the fire with a fire extinguisher and call 911.
- The laser cutters use high voltage. Never touch or tamper with the exposed wiring inside the machine.
- Always operate the laser cutter with the exhaust system on. The Design Shop staff is constantly evaluating the materials being cut with the machines in order to ensure that potentially harmful materials are not being used. That being said you should assume that the smoke produced by cutting could be harmful. Almost all of this smoke is expelled safely when the exhaust system is on. If the amount of smoke being produced seems abnormal stop using the machine and check with shop staff.
- Do not stare at the light produced while the machine is cutting.

Gaining Access, Making Appointments, Policies and Fees

Access

The laser cutters are available to students currently enrolled in the College of Art and Design and faculty of the college only. Before anyone is allowed to work in the Design Shop you must attend a shop orientation and pass the Design Shop Safety Manual Test. Upon completing these requirements you will be given a sticker to be placed on your LSU ID signifying that you have completed Design Shop safety training. **Access to the Design Shop including the laser cutters is strictly limited to students and faculty who have completed these requirements. Effective 7/1/2011 Design Shop stickers must be renewed every Fall semester.**

There is often high demand for the laser cutters. To ensure that projects get finished on time it is advisable that you make reservations for laser use. One laser cutter is always reserved for reservations only.

It may not always be possible to secure a reservation, especially around mid terms and finals. For this reason one of the lasers is reserved to be used on a first come first served basis. **Keep in mind that in the event that 1 machine is not running laser use will be limited to reservations only.**

Reservations

- Reservations require a deposit due at the time the reservation is made. See below for pricing.
- Reservations must be made in person in the shop. No phone calls or emails.
- Reservations can be made for 30 minutes or 1 hour.
- Reservations are limited to 1 hour per day and 2 hours per week per person/group.
- Reservations are transferable only in person prior to the reserved time.
- Be on time and ready to cut. If you are late you forfeit your time and will lose any deposits.

Fees

- The Design Shop can only accept payments through Tiger Cash.
- You may only make a payment with your own card.

Laser Cutting	**$0.25 per minute (minimum charge is $2.50)**
30 minute reservation	**$2.50 deposit (1st 10 min. of cutting)**
1 hour reservation	**$5.00 deposit (1st 20 min. of cutting)**

Pricing may change at any time without notice, for current pricing call the Design Shop 225-578-3770

Other Policies

-Laser cutting fees are charged by the minute. Have your files ready to cut before you arrive. Charges begin when you logon to the computer.
-Only 4 people are allowed in the laser room at a time.
-Keep the doors to the laser room closed at all times. The Design Shop is dusty the doors should remain closed to limit the amount of dust the lasers are exposed to.

Set up and Use of the Machines

The following highlights the most important parts of setup and operation of the laser cutters. More detailed instruction is provided during orientation.

Starting up the Machine
- Turn on the machine (orange switch on the side of the machine)
- Turn on the exhaust (switch on the wall behind the machine)
- Turn on the compressed air. (Red gate valve under the exhaust switch) The compressed air keeps the focusing lens cool during cutting as well as blows debris away from the cutting area

These 3 steps must always be complete before proceeding

Set Up of Laser Cutter
- Check that the focus lens is clean. To do this, unscrew the 3 screws on the front of the red focus carriage. Remove the front cover and inspect the lens and mirror that are attached to its inside face. **Never touch the lens or mirror with your fingers.** If the lens or the mirror is dirty clean them with lens cleaner and lens paper. **Never use paper towels or clothing to wipe the lens. And only clean the lens if it is dirty.** When finished replace the cover to the focus carriage tighten screws finger tight only.
- Place material to be cut on to the cutting bed. The maximum size of the cutting field is 18 x 32 inches. Material must lay completely flat on the bed otherwise it can not be cut.
- Focus the laser beam. This process is covered during orientation and a detailed diagram is posted on the wall above the laser cutter.
- Close the top access door. Now the laser cutter is ready to begin.

Set Up of File to be Cut
The laser cutters will support cutting files created in AutoCAD, Corel Draw and Adobe Illustrator (Illustrator files tend to be problematic) Print screens for each of these programs vary slightly so the following is only a general list of steps for configuring the print job. Design Shop staff are always available to assist you.
- Have your file saved to a memory stick or disc as .dwg , .cdr or .ai
- Open the desired file and click print
- Select the printer (x660)
- Orient printing for landscape
- Click on properties to find details on each color that are in your drawing. Set proper cutting speeds and power of the laser for each color. You will also select the type of cutting the laser will perform (raster or vector) the tips section of this document describes these functions.
- Select the scale you want the drawing cut at.
- **Select print preview** this will allow you to see if your drawing is the correct size as well as see if there were any steps missed during print set up
- If all is correct click print
- The print job will be sent to the laser cutter. The file name, cutting power and speed settings will be on the display screen. If everything is correct press start

AutoCAD Set Up
- Open drawing and select plot
- Select printer (x-660)
- In pop-up select "Use the default paper size User-Defined LANDSCAPE"
- In the "What to plot" dropdown select window. Now select the drawing you want to cut by dragging a box around it.
- In plot scale either check "fit to Paper" or "Custom" if custom select your desired scale in either inches or millimeters
- Under the Plot Options section of the screen be sure that the only box that is checked is "Plot stamp on"
- Click properties, then custom properties. You can now set power and speed assignments for each color as well as the type of cutting (details in tips section) after any changes be sure to click set for each color.
- When finished click OK, then select "save changes to the following file:" on popup window
- Now select "Preview…"
- If everything looks correct click "plot"

Corel Draw Set Up
- Open drawing and select print
- Select printer (x-660)
- Use default landscape paper size
- Click properties, then custom properties. You can now set power and speed assignments for each color as well as the type of cutting (details in tips section) after any changes be sure to click set for each color.
- When finished click OK
- Click "Print preview"
- If everything looks correct click "Print"

Adobe Illustrator Set Up
- Open drawing and select print
- Click "Setup"
- You can now set power and speed assignments for each color as well as the type of cutting (details in tips section)
- Click on "Engraving Field" and select "landscape"
- Click "OK"
- In the preview box to the left of the screen, drag your drawing to the correct part of the page.
- Click "Print"

Clean Up

When you are finished clean all parts and debris from the cutting bed. Pick up all scraps from the floor around the machines and the matte-cutter. Check that the focus lens is clean. Turn off the compressed air, exhaust and laser cutter. Check out with shop staff.

Tips Tricks and Terminology

Terminology
Vector and Raster engraving- These terms apply to how the laser will cut your drawing, understanding them is very important in achieving the results you desire. Vector cutting/engraving means that the laser will follow each line from beginning to end. This method of cutting is advantageous when you are cutting out parts because it produces a smooth clean cut at a fast speed.

Raster engraving means that the laser will move back and forth firing 1 dot at every pixel in your drawing. This method should not be used to cut out parts but is the only way to engrave solid areas, text and intricate patterns and textures.

Compressed Air- This refers to the pressurized stream of air used to assist the laser cut as well as cool the focus lens

Focus Lens- This is the lens that focuses the laser beam onto the material you are cutting. It is important that this lens is focused correctly to achieve accurate cuts and reduce the risk of damage to the machine. It is also important to keep this lens clean because a dirty lens will retain more heat and eventually melt and crack (These are very expensive, be good to them)

Important tips for good results
- The maximum size of material is 18 x 32 inches

-Colors are important. **Always create your files using the RGB color mode.** If not the laser cutter may not recognize the colors in your drawing resulting in missing parts or files that will not work. You tell the laser cutter how to cut your drawing by making each different type of cut with different colors. The laser cutter will always cut through the different colors in your drawing in the order below. It is best to set your drawing up using these colors from the shallowest cuts to the deepest cuts. This way small pieces will not be cut free and blown around while you are asking the laser to engrave them. When setting up you print job you should always set the laser to skip colors that are not being used.

The order of colors is: **BLACK** (this should not be used with AutoCAD)
RED (recommended for engraving)
GREEN (recommended for cutting)
YELLOW
BLUE
MAGENTA
CYAN
ORANGE

Important tips for good results (continued)
-The depth of cut is determined by the power and speed that the laser is set at for each color. Example: for a cut through thick material the power will be very high and the speed very slow or for a light engraving line the power will be low and the speed will be fast. We have samples and recommended settings for the most commonly used materials in the shop but it is always best to plan to do some test cuts to make sure you get the results you want.

-Line weight must be as small as possible Corel Draw = hairline, AutoCAD = 0.00, Adobe Illustrator = 0.001

- Text should always be set as its own color

- Leave a very small space on cut lines so parts stay attached to the larger sheet to make removal from the machine easier. This will also help you not lose small parts.

- Draw an 18 x 32 inch box around your drawing with a color that you will not cut. This is useful for organizing your parts before cutting.

Common Problems
The following are some of the most common problems that occur during cutting. If trying one of the suggested solutions does not work alert shop staff, the problem may be a symptom of a mechanical problem.

-You press start on the machine but nothing happens or the carriage is moving but not cutting.
One of the access doors is not completely closed; make sure that the top and front doors are securely closed

-Cuts are not going all the way through material.
Always check that the lens is clean first. Only if the lens is clean you can increase the power and decrease the speed

-You click plot but nothing is sent to the laser cutter.
AutoCAD users make sure that the only plot option checked is "Plot stamp on"
Adobe Illustrator users be sure that color and line weights are set correctly.

-Parts are not cutting correctly and/or some parts are missing
You did not click "set" after making changes to power and speed settings and/or some colors are checked as "skip"

Tips for AutoCAD users
-Line weight should be 0.00

-If you are using an educational version do not use black lines so you can avoid having the "Educational product" stamp included on your parts. Also the way the laser reads that text can confuse it with other parts of your drawing

-We occasionally have problems with files created using the Mac version of AutoCAD, if possible use a PC

-Intricate textures should be engraved in raster mode even if the texture is composed of lines

Tips for Corel Draw Users
-Line weight should be set to hairline

-All text needs to be converted to curves before cutting

Tips for Adobe Illustrator Users
-Be sure to create your file using RGB mode. Colors usually cause the most problems with the laser cutter, Use the guidelines below to adjust your colors

COLOR	RED	GREEN	BLUE
BLACK	0	0	0
RED	255	0	0
GREEN	0	255	0
YELLOW	255	255	0
BLUE	0	0	255
MAGENTA	255	0	255
CYAN	0	255	255
ORANGE	255	102	0

-Line weight should be set to 0.001

Materials suitable for the Laser Cutters
all cutting is limited to ¼ inch thickness

Chipboard
Matte board
Museum board
Corrugated cardboard
Poster board
Foam core (poor results with small pieces)
Acrylic (cast acrylic is recommended) Plexiglas and Lucite are acrylic
          Leave protective paper on while cutting and engraving
Woods: Bass, balsa, maple, cherry, poplar, walnut, oak, birch are the most common
MDF
Plywood
Hardboard (masonite)
Leather
Cork
Rubber (engraving only)
Glass (engraving only, ¼ inch minimum thickness)

This list is comprised of only the most commonly used materials. There may be any number of additional materials that can be cut and engraved with the laser cutters in the Design Shop. **Any materials not on the above list that you want to cut must be approved by the Design Shop manager prior to cutting. This is strictly enforced and will result in immediate loss of shop access.** To get approval bring a sample of the material and MSDS sheet (if available) to the shop between the hours of 8:00a and 4:30p Monday thru Friday for inspection.

Materials That Are Not Allowed
No polycarbonates (Lexan, mylar, acetate, etc.)
No soft woods and some hardwoods with high resin content
     Examples: Pine, cedar, spruce, fir, cypress
No ABS plastic
No vinyl (this includes PVC and PCV)
No fiberglass
No polyester
These materials are strictly prohibited because they are hazardous to both your health and the equipment. Anyone knowingly using these materials in the laser cutters will immediately lose shop access and be held liable for any damage caused to equipment.