Laser Cutting

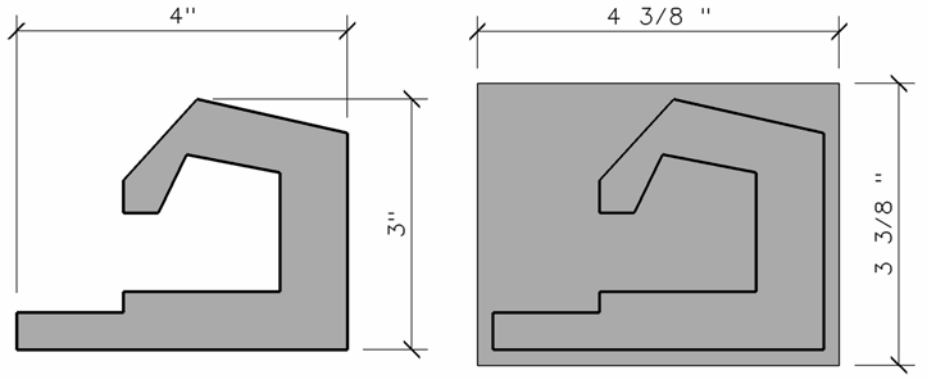
DESCRIPTION: The *laser cutter* cuts lines, shapes and patterns into flat material, including chipboard, museum board, cardstock paper and basswood. It can also cut *score lines* and *engrave* the surface of these materials. Laser cutting is used to perform a variety of cutting tasks, and it is ideal for curved shapes, intricate structural systems, and delicate curtainwall mullions. It can also speed the process of making base models, site models, and a variety of other architectural model parts and pieces.

COST: charged by minute of cutting time.

Students and Faculty = $0.70 / minute
Campus and Professionals = $1.50 /minute

DRAWING SIZE: The maximum cuttable drawing area is 11 5/8" x 23 5/8". You should not draw any lines outside a region this size in your digital drawing file.

MATERIAL SIZE: The largest sheet of chipboard or other material that fits onto the bed of the laser cutter is 11 7/8" x 23 7/8". The material to be cut must be a minimum of 3/16" larger than the drawing on all sizes. See the diagram below for an example.



Desired Shape *Minimum Sheet Size*

Rapid Prototyping Lab UWM School of Architecture and Urban Planning

General Procedures

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PROCEDURE:

Note: The laser cutter only processes flat drawings, not 3D models.

1. ***Prepare Sheet Material***
   Only approved materials are allowed – refer to the *Laser Cutter Settings* chart. Cut sheet material to the appropriate size for loading into the laser cutter. Maximum sheet size is 11 7/8" x 23 7/8". Small material is allowed.

2a. ***Prepare Drawing File – Procedure for MicroStation***
   A. Maximum drawing area is 11 5/8" high x 23 5/8" wide.
   B. Always work in a backup copy of your file, not the original.
   C. In the Cut File, remove duplicate lines. Go to the *Utilities* menu and select *Data Cleanup*. In the box, click the *Apply* button.
   D. Use the appropriate line colors for the material to be cut, as specified on the *Laser Cutter Settings* chart. To do this, you need to see the same colors that the laser cutter sees. Go to the *Settings* menu and select *Color Table*… In the *Color Table Box*, go to the *File* menu and select *Open…* Find the file called "acadcolor.tbl" and click *OK*. Then click the *Attach* button.
   E. Go to the *Edit* menu and choose *Select All*. Then go to the *Drop Element* tool and make sure you select the option called "Linestrings/shapes". Drop everything in the drawing.
   F. Go to the *File* menu and select *Save As*… Save the file in DWG format.

2b. ***Prepare Drawing File – Procedure for AutoCAD***
   A. Maximum drawing area is 11 5/8" high x 23 5/8" wide.
   B. Always work in a backup copy of your file, not the original.
   C. In the Cut File, remove duplicate lines to minimize file size. Type *Overkill* at the command line and then press the *Enter* key.
   D. Use the appropriate line colors for the material to be cut, as specified on the *Laser Cutter Settings* chart.
   E. Type "explode" on the command line and click *Enter*. Choose the option to explode all.

3. ***Copy the Drawing File into the RP Lab network folder***
   Folder location: *R:\RPLab*
   The filename must include your first and last name. (If you have trouble accessing this folder, you can also take the files with you to the RP Lab on a flash drive or CD.)

4. ***Go to the RP Lab during Open Hours***
   Give the sheet material to the Technician and pay with your *UWM Gold Card*. Wait for the cutting job to complete and take your cuts.

   For open hours, please refer to the RP Lab schedule posted in the SARUP room 150 Computer Lab or in the basement on the door of the RP Lab.

3D Printing

DESCRIPTION: The *3D printer* converts digital objects into material artifacts. Printed objects are made out of a natural starch powder, which is bonded with water-based glue. 3D printing is an ideal way to produce complex or curved objects. It is ideal for representing mass customized structural or curtainwall components, and other component-scale parts. Printed parts can be easily interfaced with traditionally constructed models. Printed parts can be sawed, sanded and painted. In most cases, 3D printing requires a one day turn-around, in which a student drops off a digital model on one day and picks up a material artifact the next day.

STUDENT COST: $2.00 per cubic inch of powder used Each object is priced according to its volume. The larger the object, the more it costs to print. Hollow cavities in objects do not contribute to its cost as long as the powder can be evacuated through a slot or hole.

PROFESSIONAL COST: $3.00 per cubic inch of powder used Each object is priced according to its volume. The larger the object, the more it costs to print. Hollow cavities in objects do not contribute to its cost as long as the powder can be evacuated through a slot or hole.

PROCEDURE

1. ***Make the STL File***
   See the instructions under *Making STL Files*.

2. ***Copy the STL File into the RP Lab network folder***
   Folder location: *R:\RPLab*
   The filename must include your first and last name. (If you have trouble accessing this folder, you can also take the files with you to the RP Lab on a flash drive or CD.)

3. ***Go to the RP Lab during Open Hours***
   The Technician will open your STL file and calculate the volume of your object. The Technician will evaluate the object and give you a price quote. Pay the technician with your *UWM Gold Card*.

   For open hours, please refer to the RP Lab schedule posted in the SARUP room 150 Computer Lab or in the basement on the door of the RP Lab.

4. ***Go back to the RP Lab the next day to get your printed object***
   Your object will be on the worktable. Carefully de-powder your object. Take your object to studio and harden it. Ask the technician for assistance with de-powdering and hardening.

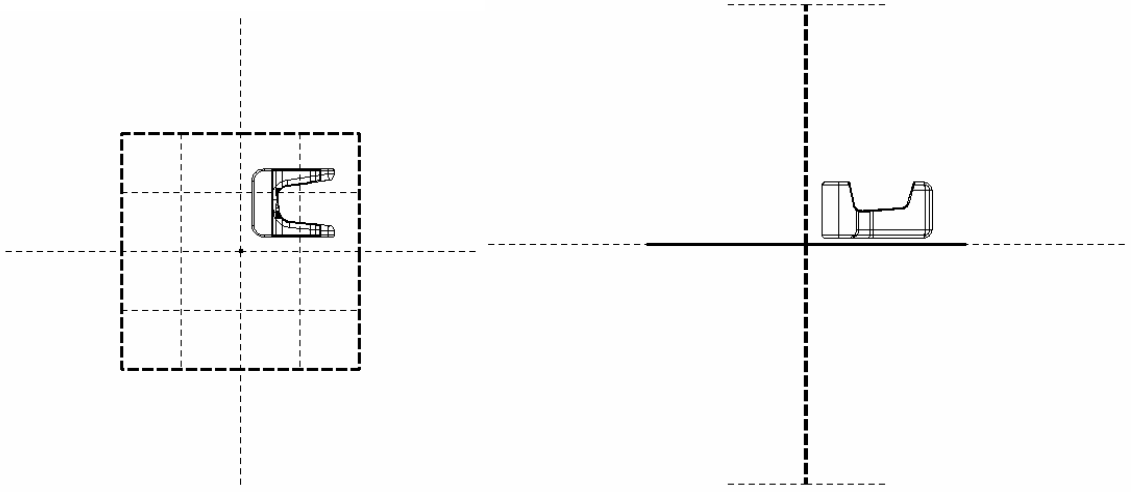
Making STL Files

1. ***Isolate each digital object in its own file***
   Each STL file only holds *one object*. So, begin by fusing together parts of the digital model to be printed as a single object. Separate each object into its own file, and delete everything else in the file.

   STL files have a limited size. If an object gets too complex, it will not fit in a single STL file. It must be split into more than one object. Each object must then be converted into a separate STL file.

2. ***Scale the digital object to the desired print size***
   The digital object must be scaled to the desired print size before converting it into an STL file.

4. ***Position the digital object in positive space***
   The STL file format only recognizes positive coordinates, so each object must sit in the correct quadrant of digital space. See the diagram below for correct MicroStation positioning. The object should be positioned close to (but not touching) the Spatial Origin (0,0,0).



5. ***Export to STL format***

If you are modeling in MicroStation, go to *File>Export>STL*.
If you are modeling in AutoCAD, go to *File>Export…* and export the component in an STL format.

If you have trouble producing the STL file, ask an RP Lab Technician for assistance.