CAMD Makerspaces

Laser Cutter User Guide

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Overview

Our laser cutters can perform 3 operations:

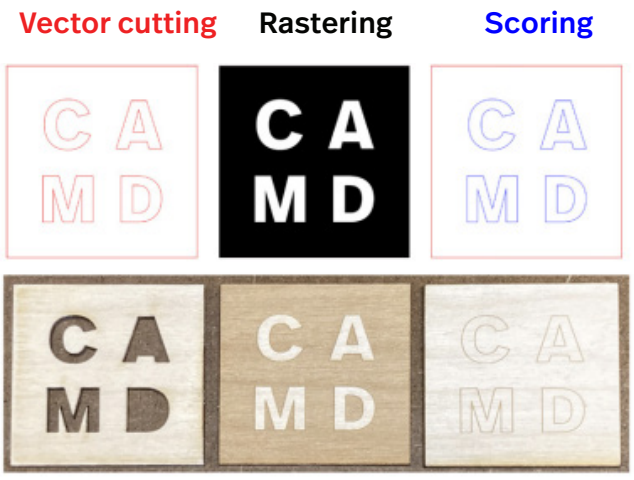
vector cutting (cutting all the way through your stock along vector geometry)
vector scoring (etching part-way through your stock along vector geometry)
rastering (engraving a field within specific enclosed geometry to a desired depth)

The operation performed is determined by the color of your lines as shown below. In AutoCAD, these are represented as index colors.

Cutting vs. Scoring vs. Rastering

In order to do **vector cutting**, **scoring**, and **rastering**, the difference between them must be understood. Vector cutting cuts all the way through. Scoring is fast and etches lines to your work, and is great if you want to outline a drawing or work with vectors. Rastering takes the longest amount of time, where the machine burns away an entire area of material to a desired depth and contrast and is good for filled in geometry.

Here are some examples and what they look like.



Notice here the letters have been cut away in the first one. In the second one, the inner part of the letters is untouched but the material itself has been darkened and an entire layer of the wood (surrounding the letters) has been lasered away. Finally, in the third, the letters outline has been lightly colored and outlined.

Follow this chart to determine colors for each specific operation within your design:

Type	Color	Hex code	RGB
Vector cut	Red stroke	#ff0000	255, 0, 0
Rastering	Black fill	#000000	0, 0, 0
Scoring	Blue stroke	#0000ff	0, 0, 255

NOTE:

Rastering takes significantly longer for the machine to do than **scoring** so please keep this in mind for any large quantities of rastering.

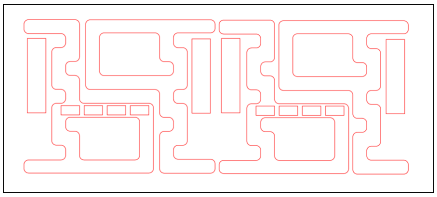
Because **rastering** essentially burns away an entire area layer of material, how much is burned away (how deep in thickness into the material is burned) can be customized but it is not necessary.

Nesting & File Types

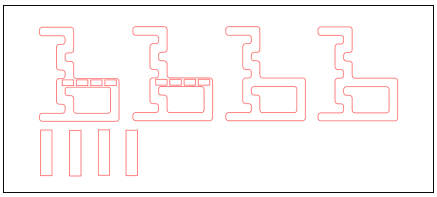
The laser cutters accept .dwg, .dxf, .ai, .svg, and .pdf files. When creating your file, make sure you nest your parts together to save material.

Once you're completely done with your design and would like to cut in the Ryder Makerspace exclusively, save it on your computer as an acceptable file format (see Nesting & File Types), and send it **rydermakerspace@northeastern.edu** (see Email Etiquette).

Good nesting



Bad nesting



Email Etiquette (Ryder)

When sending your email to the Ryder makerspace, please add your First and Last Name in the subject line so we can easily find your file submission in our queue.

In the body of the email, please provide the following information about what you're trying to cut:

Material:
Thickness:
Cutting, Scoring, Rastering?:
Notes:

Here is an example of this body filled out:
(You can write N/A for "Notes" if there is there is nothing custom)

Material: MDF
Thickness: 1/8th inch
Cutting, Scoring, Rastering?: Cutting, Scoring
Notes: I'm bringing my own piece of wood. Thanks!

NOTE:

Though you may be sending the file to be cut in the Ryder Makerspace, **you must be present in order for us to actually cut it.** We do simply process files on your behalf.

Of the materials available for laser cutting, we can cut wood, chipboard, bristolboard, acrylic, and much more. Please check the Tech Info website (see pg. 8) to get the full list of thicknesses and materials we can safely lasercut. Materials provided by the Makerspace are all pre-approved, however any materials brought in by users must be easily identifiable or have a label, as unknow materials can be unsafe to laser cut.

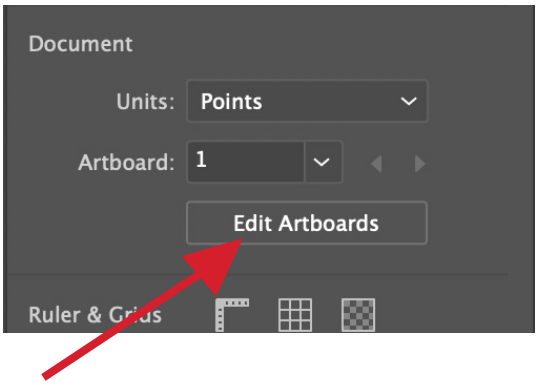
Laser Cutting in Illustrator

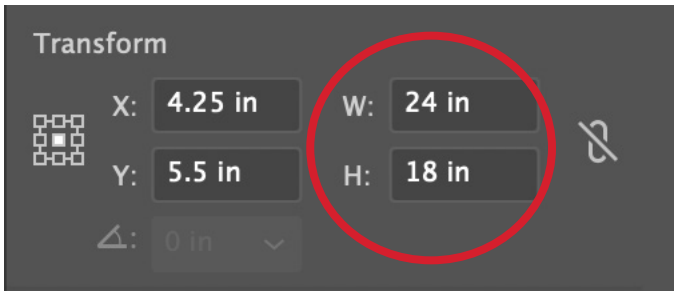
Laser cutting in Illustrator is the optimal choice if you have some Illustrator experience with designing and making basic shapes or lines.

Document Setup

In your Illustrator file, follow these steps to make sure your document is set up properly.

1) Make sure your document is set to RGB.
2) Check to be sure that your document units is set to inches.
3) Set your artboard dimensions to 18" x 24" (Ryder) or 18" by 32" (Ruggles).





NOTE:

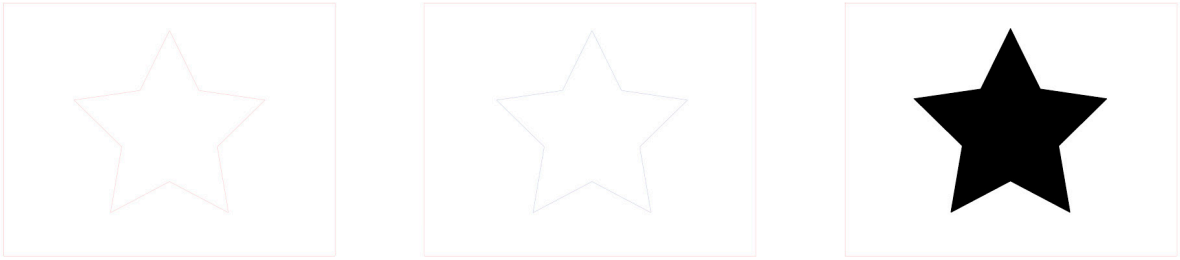
If you have text in your document that has a specific, downloaded font from Adobe or other source, turn your text into outlines (Cmd/Ctrl + Shift + O) before submitting your document. This will convert your text to vector geometry. Make a copy of your text before turning it into an outline if you plan on changing it later, as the new vector geometry will not be editable as font/text after you do this.

Designing and Finish

Next, you are ready to start designing what you want to be cut in Illustrator!

4) Using the chart from the previous page for coloring, set your stroke width to 0.001. You'll know you did it right when you can barely see the faint outline of your shape on the page.

Here are some examples:



From left to right:

1) A cut out rectangle
2) A cut out rectangle with a star lightly outlined in the center
3) A cut out rectangle, with a star heavily "filled in" in the center

How much is rastered can be customized. If you're interested in the different levels of rastering, please reference the Laser Cutting board in the Ryder Makerspace under the "Speed and Power" section. The default is roughly about 70 power, 30 speed (and is applicable to most projects). Consult a makerspace monitor if you would like to use a custom setting for rastering to increase contrast or customize the result for your material or project.

Once you're completely done with your design, save it on your computer as an Illustrator file (.ai), and email it to **rydermakerspace@northeastern.edu**.

Laser Cutting in AutoCAD

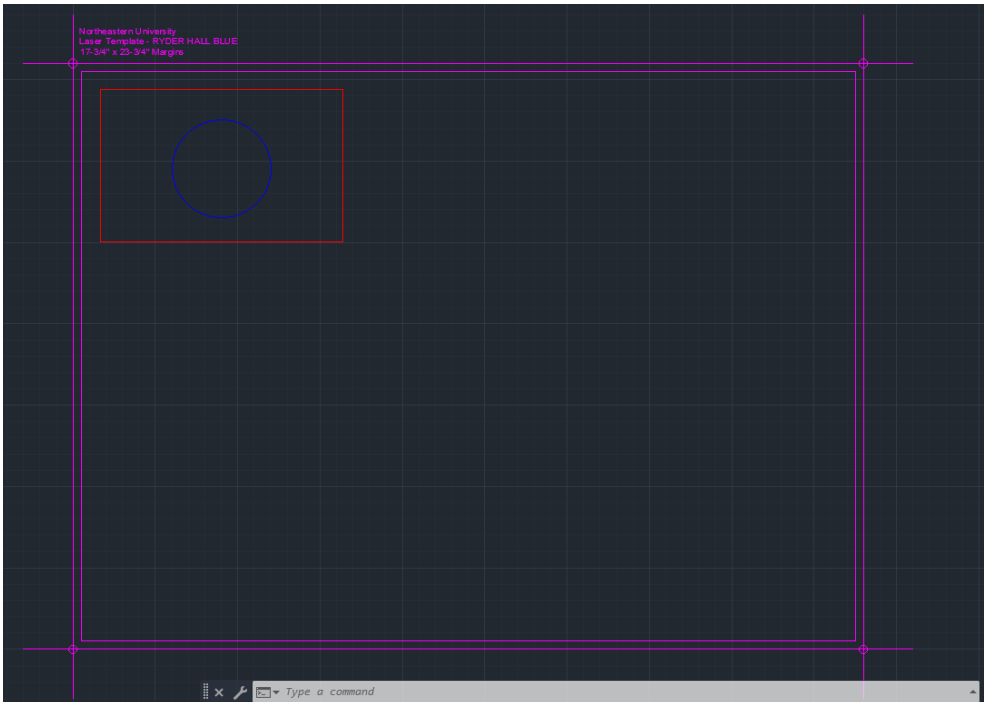
Laser cutting in AutoCAD is the optimal choice if you have basic knowledge of using AutoCAD in creating your geometry.

Document Setup

First, you must download a template file from **https://bit.ly/camdmakerhub**. There are two different templates, one for Ruggles (18” x 32”) and one for Ryder (18” x 24”). Download the template for the location that you will be laser cutting in; they are not interchangeable. This template gives you the exact bed size of the laser cutter, so make sure your pieces fit inside the inner rectangle. Nesting (see pg. 4) rules apply here.

1) Under “CAMD Makerspace Guides”, go to “Laser Cutting”
2) Scroll down to “Workflow & Process” and download CAMD Laser Cutting.zip
3) Open the zip on your computer and select 18” x 32” for Ruggles or 18” x 24” for Ryder.

Your workspace will look like this:



See here a cut-out rectangle with a scored/etched circle in the middle of the rectangle.

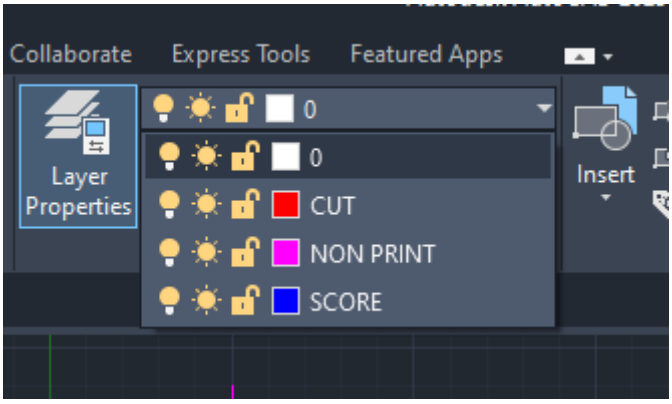
The pink border is for scale ONLY, and will not affect your cut.

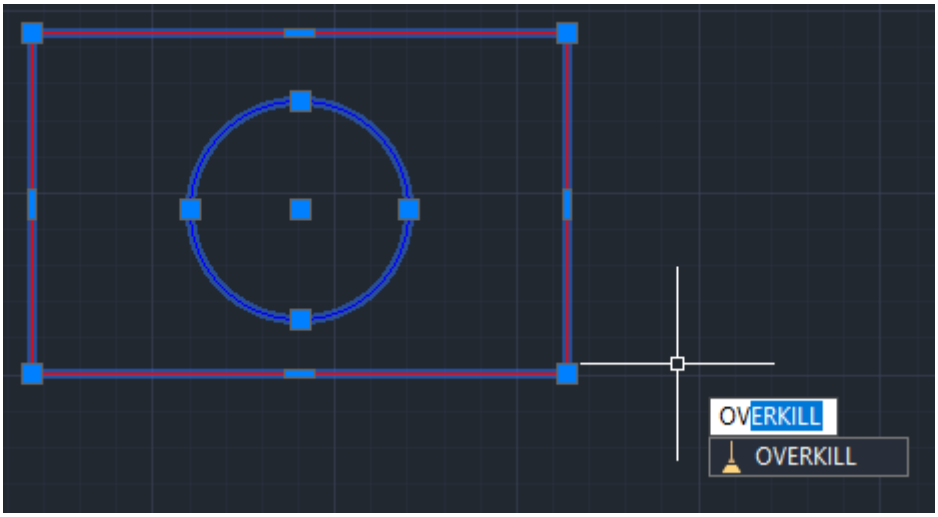
Place all pieces inside the inner pink rectangle, leaving margin for error.

Designing and Finish

Next, you are ready to start designing in AutoCAD.

1) When designing what you want cut and score, use the pre-made Layer Properties to select the appropriate layer.
2) After creating your design, be sure to OVERKILL your lines, which is caused by having overlapping shapes or objects. OVERKILL will delete duplicate lines, which otherwise can be a fire hazard while cutting.





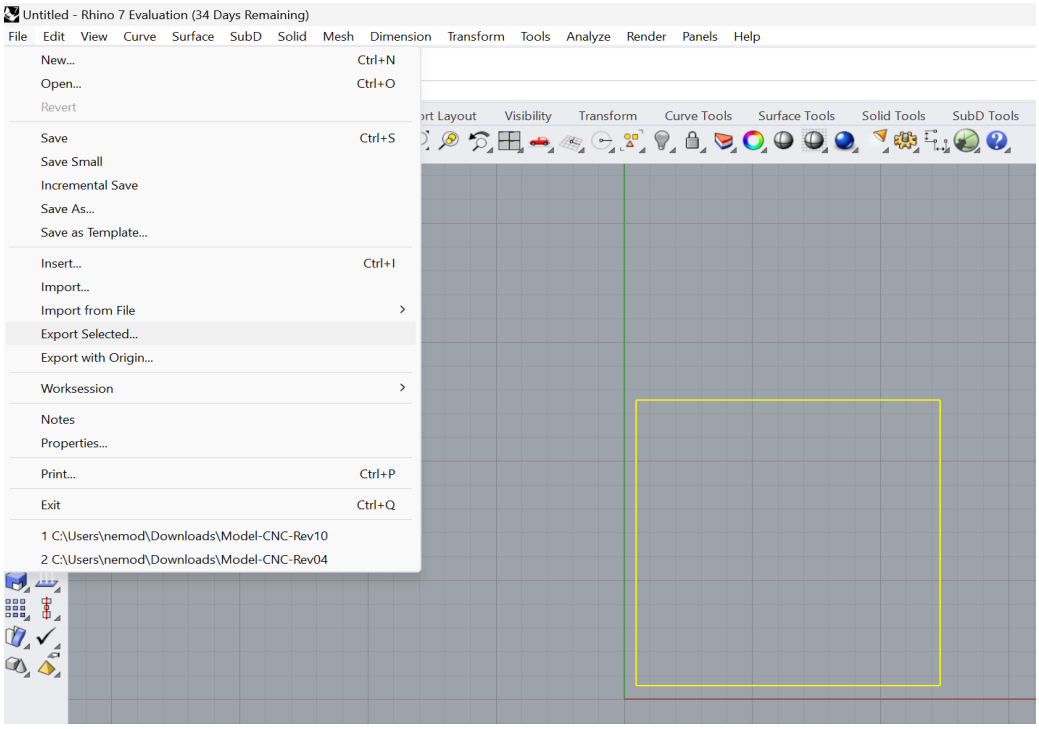
If you are laser cutting in Ryder, export your file as either an AutoCAD file or .dxf once you're done and email it to **rydermakerspace@northeastern.edu**.

Importing from Rhino

Oftentimes, when exporting in Rhino for the purposes of laser cutting from Illustrator or AutoCAD, duplicate overlapping lines may occur. There is no easy way to fix this in Rhino, but in AutoCAD you can OVERKILL your lines (see pg. 9) so that this doesn't occur.

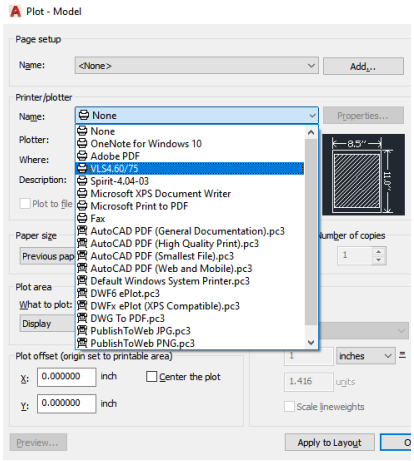
These are the steps for exporting from Rhino:

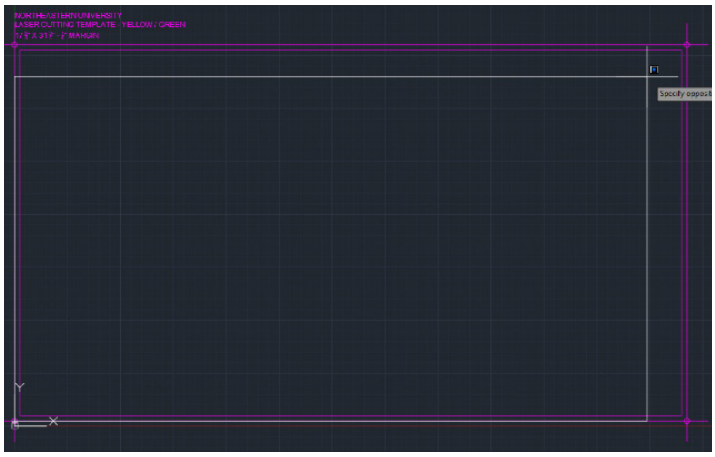
1) Select your completed object and go to "File" -> "Export Selected.."
2) Save your object as a .dwg or .dxf. This file type will allow it to be opened in both Illustrator and AutoCAD, but for the purpose of deleting overlapping lines, AutoCAD is far more suitable.
3) Open in AutoCAD to delete overlapping lines and double-check that your design is suitable to laser cut or use AutoCAD for further editing.



Using UCP from AutoCAD (Architecture Only)

1) Ensure that all lines have the correct weights and colors as defined above.
2) Select “Plot” and select the printer titled VLS4.60/75.
3) When prompted, select “User-defined landscape.”
4) In the “What to plot” section, select “Window” and click and drag one circle to the opposite corner. Correct window selection ensures proper scaling and registration of your design geometry.





UCP Configuration

1) Turn on the machine and the air compressor.
2) Insert material into machine. Align upper left corner of material at 0”, 0” location. Ensure honeycomb table is focused to lens manually or with the Auto-Z function enabled.
3) Open Settings and select “Materials Database”
   a) Select CAMD Makerspace, and then select the material you are using.
   b) Press “apply” then “OK.”
   c) Press the green button to begin your cut.
   d) Users must remain near the laser during the full operation in case of error.