3D Printing Tips

Software:
Avoid using SketchUp when dealing with complex geometries if possible.
Rhino and 3DS Max work best for making models to 3D print.

Machine Constraints:
Minimum thickness of 1/8" to avoid model breaking on excavation from printer.
Avoid slender columns, especially those that support parts of the print.
Thin sheets will sag and/or break under their own weight.
The more intricate a model is, the harder it is to get out of the 3D printer.
Very small models have a chance of being lost during excavation (could get vacuumed away).
Avoid knife edges on models, they will not come out well, usually break off.
The machine prints in layers, thin vertical elements are much weaker that thin horizontal elements. If you have thin elements try to have them in one direction so that we can orient the model in the strongest manner.
Machine is 10"x15"x8", but cannot print the full size of the bed. Limit any model to less than 9.5"x14.5"x7.75"
A full build of the machine can take up to 30 hours with drying and excavation. Give minimum of 2 days from the time you submit to the time you need the model. Models submitted the night before they are needed have no guarantee to be done by the next day.
Each model has to be in a separate file. Helps decrease the build time.

Cost:
Shell or Hollow models to save money (No thinner than 1/8").
You can shell in Rhinoceros.
You can Hollow and drain a model in ZEdit.
Check your volume before you submit a request.
You can check volume in Rhinoceros and ZEdit before you submit. Multiply volume by $3 to get how much it will cost in black & white and by $4 for color.
No need for extra detail on inside of a building model. Leave out furniture, and extra walls on inside, especially if you have no openings to see them.

Curing/Sealing Prints:
Make sure all excess powder is removed before curing.
ZAP is one of the best ways to seal a 3D print.
ZAP can slightly darken or yellow the color of the 3D print.
ZAP should be used in accordance to the instructions on the bottle.
Print will still be breakable after sealing so still take caution when handling a sealed 3D print.
Hair spray works as a sealer but doesn't penetrate the model so it will not be as strong as sealing with ZAP.
Rhinoceros to STL:

1. Select object that you would like to export

2. Then go File>Export Selected... and a window will pop up.
Exporting to STL Format

3. Change the save as type to an STL (.stl) (Stereolithography)

4. Name your file as lastname_firstname_1, with your first and last name.
5. Chose the file location that you want and save the file.
6. A new window will pop up as seen below, click OK
7. Another new window will open up, as seen below. Click OK.
Exporting to STL Format

Sketchup to STL:

1. Select the object you wish to export.

2. Go to File>Export STL.. and click on it.
3. A window will pop up, you will need to change the file format from ASCII to Binary.

4. After Changing that, click the Export Button. Model units should be okay, make sure your model is in inches and that you know how big the model is.

5. Name your file as lastname_firstname_1, with your first and last name.

6. Choose the file location that you want and save the file.

7. Your file is now in an STL format, you can check to make sure it works by coming down to the RP Lab and opening the file in ZEdit. The program is only on the computers in the RP Lab.
Exporting to STL Format

If there is no Export to STL option for your version of SketchUp, you can open the SketchUp file right in Rhinoceros 5.

1. Open the SketchUp file from Rhinoceros 5.
2. A window will open up with options for opening the file. Make sure Trimmed Planes is selected and uncheck the box of (Embed textures in model)

3. Click OK and the model will open in Rhinoceros 5. If it is a closed poly surface it is good to export as an STL from Rhino (see Exporting from Rhinoceros 5 to STL). If it is an open polysurface you have some work to do. Later in this document there is a walkthrough of how to see which edges are open or non-manifold.

If that doesn't result in a working 3D model in ZEdit, there may be some issues with your model. One way to try and fix them is exporting to STL just as above, and then opening that STL in Rhinoceros 5 and editing it in that software.
Exporting to STL Format

3DS Max to STL:

1. Once you have your model completed. Select what you would like to export. It will become outlined in a white mesh and have local axis.

2. Once selected open the main 3DS Max menu.
3. Then click on the export option and it will open a new window. In that window, change the Save as type to SteroLith (*.STL). Name your file as lastname_firstname_1 with your first and last name and choose the location you want it saved. Then click save.

4. Once you hit save a new window will appear, make sure it is set ti Binary and the box next to "selected only" is checked and click okay.

5. Check your model in ZEdit in the RP Lab to make sure it is printable or to change the color of the model.
Using Z Edit Pro

Opening and Checking a File:
ZEdit is a program that is used for the 3D printers. It is only available on the computers in the RP Lab. If you want to check your model to see if it will print or if you want to do some hollowing or change the colors of the model, you will have to use ZEdit. (You can shell models in other programs such as Rhinoceros).

Opening Models
1. Once you open ZEdit, go to File>Open… and then choose your STL file that you wish to work with.
2. The first window to pop up will give you the size of the model. Make sure you know what it is supposed to be and the units. Verify those dimensions as well as the units. Then click OK.

3. A new window will appear. You will select and click on Fix Model.
Using Z Edit Pro

4. If the model works you will get the window below that says it can be saved and printed, there will be two more windows that pop up. Say No to the first and click okay on the second (If you would like to change colors or hollow the model, proceed to the next section of this tutorial). If you get a window that looks like the second one under this step your model needs to be repaired (Continue on to step 5 to see how you can do this in the program).

5. If you received a message like the second screen shot from step 4, then there are gaps, holes, inverted or missing faces in your model. First click OK on that pop up.
6. It will then ask you if you would like to run an Auto Repar. Click Yes.

7. It will then ask you about changing the color to the repair color mode. Click No. Then if you get the message of the model can be printed you are all set. If you get the message as seen below, the Auto Repair was unable to fix the model.
Using Z Edit Pro

8. It will display the problem areas with a red outline on the model. You will also see along the left side there is a list and the errored part has a red rectangle next to it. You have a few options now. You can return to your original model and make sure everything is a closed polysurface or closed mesh or you can use the repair tool along the right side of the ZEdit program and you can either fill gaps or fix the incorrect faces.

9. As long as there are errors in the model it cannot and will not be printed.

Hollow and Drain Models:

1. To hollow a solid model out you first need the menu on the right side of the screen to be set the Print Preparation tab.
2. And then you will need to click on the hollow button on that tab.
Using Z Edit Pro

3. Once you click on the hollow tool a new window will pop up. Hit okay if it is asking if you want to hollow the model. It should then bring up a window as can be seen below. In this window you will set your minimum wall thickness. It is suggested that you go no lower than 1/8”. If you do go any thinner than that you will be warmer that it will most likely break and that it will not be reprinted if it does break. This goes for any part of a 3D print. Please do not have any parts of the model thinner that 1/8” otherwise it will break while being taken out of the printer.

4. Once you choose you wall thickness click OK and the model will be hollowed. After you do this you must add drain holes so that the excess powder can be taken out after excavation.

5. The first step is to rotate the models so that you can see the face in which you would like to put the holes. Once you are in the dialog box for the holes you cannot rotate, so rotate before you start the process.

6. Now click on the drain hole button, right next to the hollow button that you used earlier. It will open a new window.
Using Z Edit Pro

7. In that window you can chose if you want a round or a square hole. That is to your preference. There are also 2 parameters. Diameter, which is for the whole and Wall thickness. The whole must be a minimum diameter of 1/4", you can go larger if you want. The wall thickness relates to the thickness you set earlier. Always go a little larger than the thickness you used for this value. If you did 0.125, then use 0.175 or 0.2 for this dimension.

8. You will then have to click on the spots that you would like to put in the model. Make sure you put in 2 holes minimum. Red boxes will appear where you chose to put the holes. And once you have chosen the hole locations you will be able to click OK in the pop up window.

9. Another window may pop up, click OK. Unless the green rectangle on the left panel has turned red, your model is ready to print or change colors.
Using Z Edit Pro

Coloring Models:

Adding Color to Models
1. The first step is to change the color that you want your model to be. On the right side of the screen, you need to be under the "Paint & Texture" Tab. The click on the top box under the color area to change the color.

2. That will open a color menu to change the color. Select the color you want and click okay.
**Using Z Edit Pro**

3. To color a model you have to go to the top menu and go over to Color & Texture>Paint. You can then paint the entire model a single color or by individual surfaces. When you select surface you will get a small cross, click on the surfaces you want to change with that cross. When you are done selecting surfaces, right click to end the command.

**Single Triangles**

**Surfaces**
Using Z Edit Pro

Shells/Model