3D Printing Guide

A Pickering Public Library Guide for using the Lulzbot Mini

1. **How do 3D printers work?**
   3D printers use an additive process to help turn a digital file into a physical three-dimensional object. The 3D printer in partnership with it's corresponding software will take a digital object and cut it into thousands of tiny slices. The 3D printer will then heat the filament and use it to lay down successive layers slice by slice from the bottom up until the object is complete.

2. **Getting to know the Lulzbot Mini**
   a. <u>About Lulzbot</u>

      The Lulzbot Mini is a 3D printer that's great for beginners and experienced users alike. The Lulzbot mini utilizes the Cura Software to load up digital .STL or .OBJ files that are then translated into slices and sent to the machine for printing.

      Specifications:

      Top Print Speed: 275mm/sec (10.8 in/sec) at 0.18 mm layer height.

      Layer Thickness: From 0.05mm to 0.50mm (0.002in - 0.020 in).

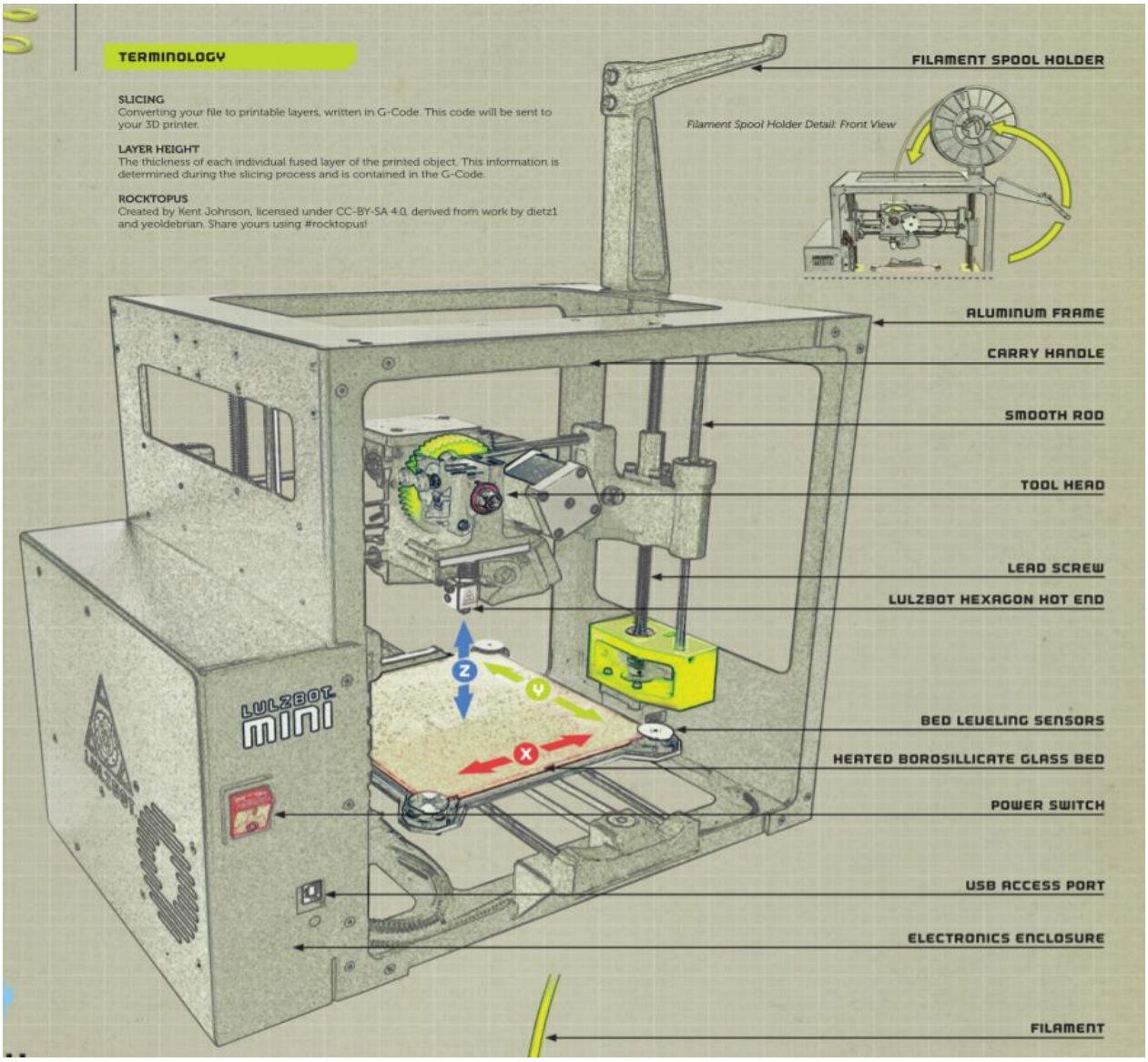
      Filament Materials: ABS, PLA.

      Compatible Software: Cura Lulzbot edition.

      Nozzle size: 0.5mm.

   b. <u>Parts of the Lulzbot</u>

      Diagram below:



3. **Using the Lulzbot safely**

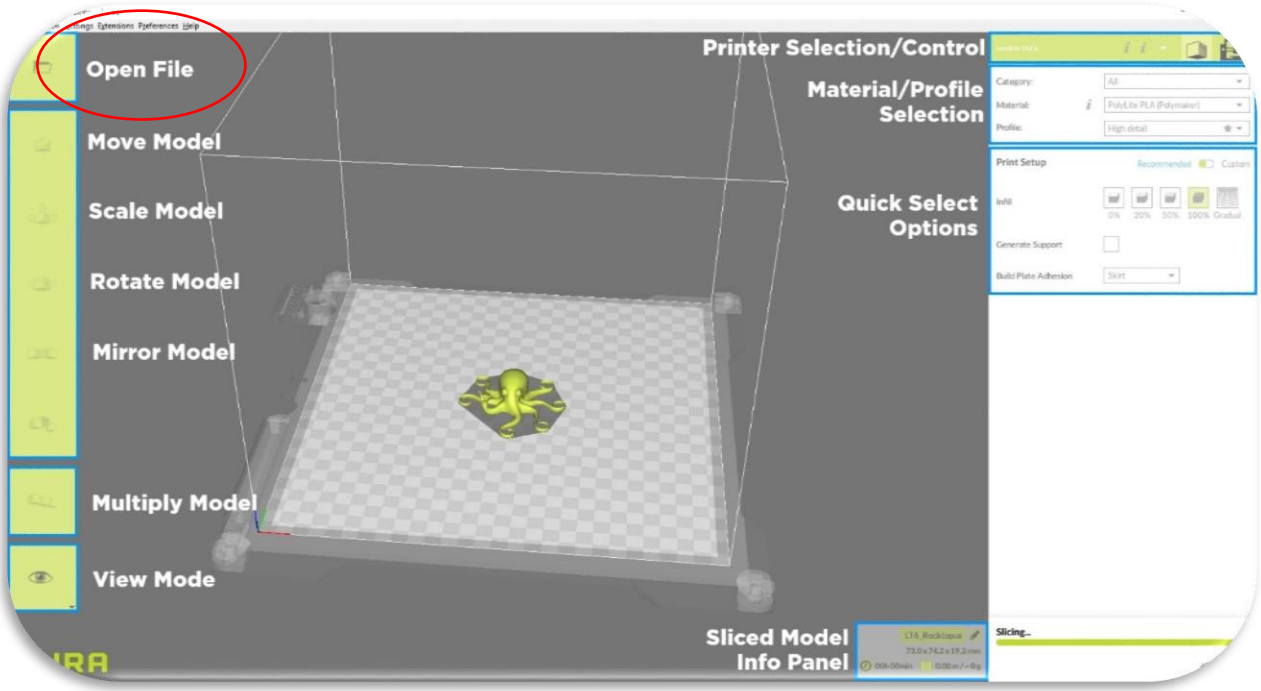
   Under no circumstances should the extruder/nozzle head be touched. The Lulzbot build plate or bed is designed to be heated before, during and after a print. The bed can get very hot and is not to be touched during the heating or printing process. When the print is complete and the bed is cooled the Lulzbot Mini will move the bed forward to indicate the print is now safe to remove. Safety gloves and a scraper are provided to remove print jobs.

   The ABS filament used is not food safe and should not be ingested, used as a food product or with food.

4. Cura

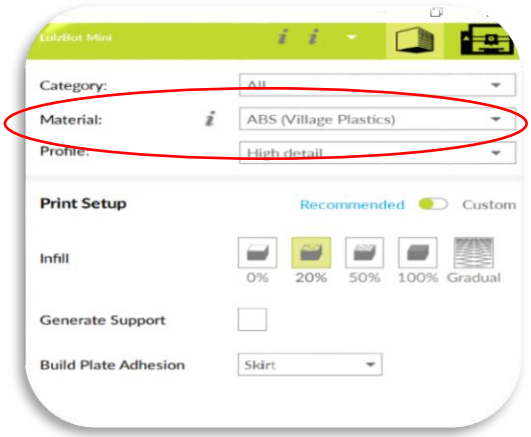
a. Navigating Cura (Lulzbot edition)

Load Model – with Cura open, use either use the **Open File** button or select File > Open File and navigate to the save location of the 3D file. and select open.



Once the file has been loaded, you will see a 3D rendering of your object on the build platform. Select the model to see the various options.

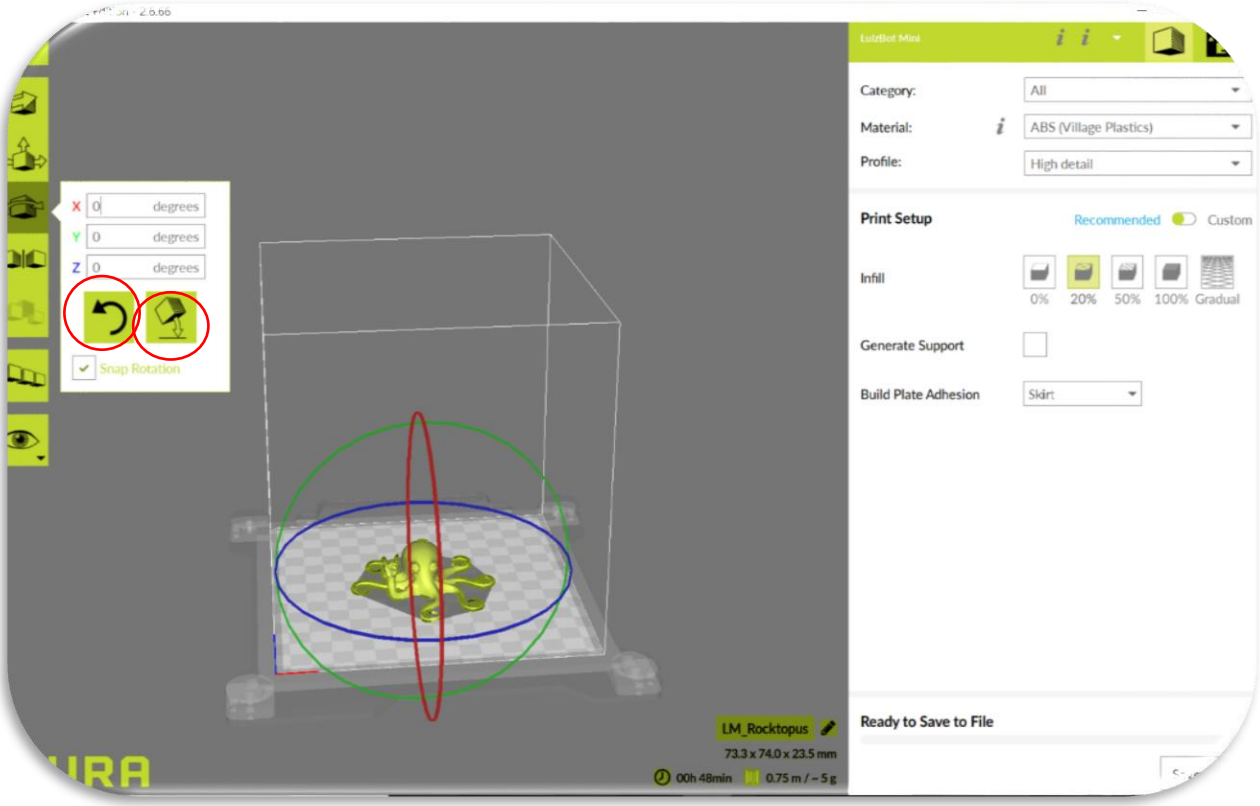
Choose Material – Make sure the **Material** selected is ABS (village plastics). These options are located on the upper right-hand side.



Model Orientation - Move your model to change where it is printed on the build plate. Do this by *left-clicking and holding* on the model and dragging it to the desired location. You can also r*ight-click and hold* in the build screen, to view your model from different angles.

Zoom – Use the scroll wheel on the mouse to zoom in and out.

Rotate - The Rotate button will give you the ability to orient your model in along all three axes. Once you click the rotate button, three circles will surround your model. The red circle will allow you to rotate around the X axis. The Blue circle will rotate around the Z axis. The Green circle will rotate around the Y axis. You may need to rotate the model so the flattest part is on the bed.

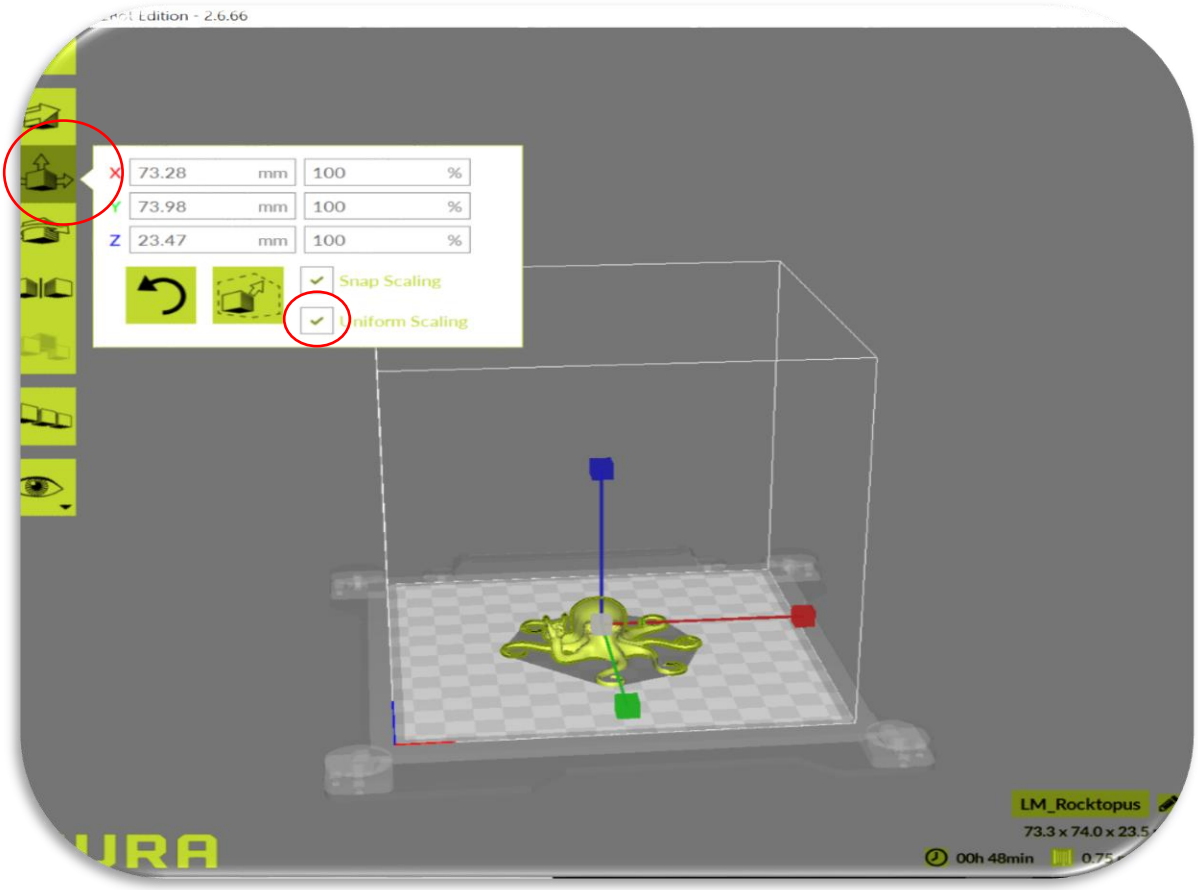


Lay Flat - The Lay Flat button will ensure that the flat portion of your print is securely attached to the bed. It is highly recommended to use this option after rotating your model in the Z direction, as it will help prevent adhesion issues during the print.

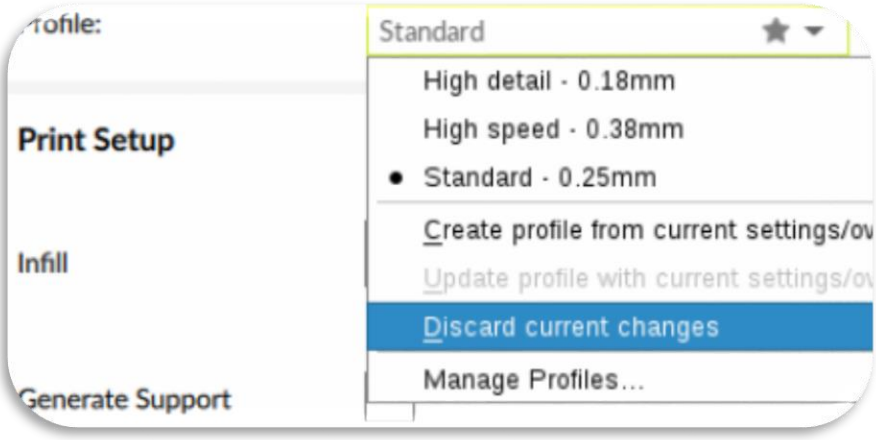
Reset - The Reset button will return your model to the original orientation as defined by the CAD program used to create the model.

Duplicate – Right click on object to duplicate it or delete it.

Resize - The Scale button displays the model's dimensions, along with the ability to scale along the X Y or Z axes. Anything below the number 100 will reduce the objects size, while anything above the number 100 will increase the objects size. As a default, it will be set to uniform scaling. This will cause the X Y and Z axes to be scaled by the same amount when you make a change to any of them. To disable this, select the **uniform scaling** box in the lower section of the scaling window.



Print Profile - The print quality settings can be found in the top right-hand corner of the window.



High Detail - Designed to give greater detail and finer objects. This will have a smaller layer height, which will make each layer thinner, so that curves seem more natural and walls seem less noticeable. This setting will also require more layers to be laid down, increasing overall print time.

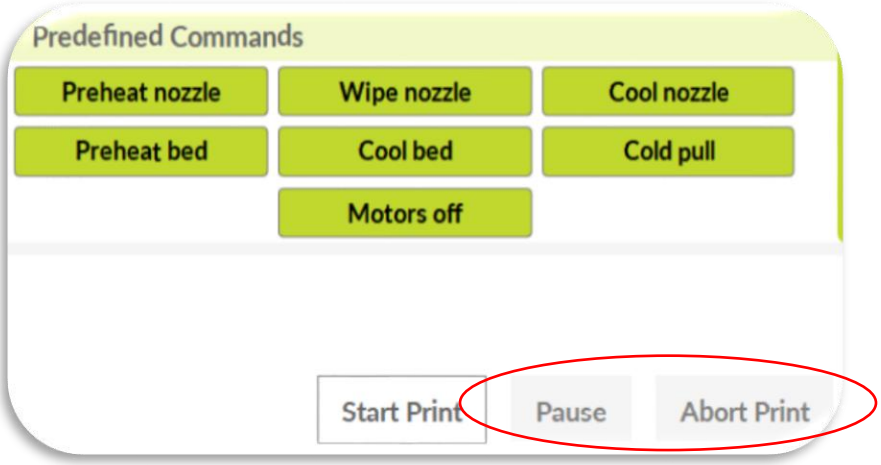
Standard Speed - Designed to give a medium resolution, by increasing the layer height and print speeds. This will make the organic curves slightly more step-like than the fine setting but will reduce printing time.

High Speed - Designed for faster printing, where overall model finish is not of concern. Most commonly used for quick iteration of designs found in rapid prototyping.

Supports - Some models will require support material to print properly. This will usually occur when an object has an angle in relation to the build plate between 0 to 45 degrees. It is highly recommended to orient your object so that it minimizes or eliminates the need for support. Support settings can be adjusted by using a **custom** profile.

Printing - Select the **Print Monitor** button (top right) to switch to the print window. Select **Connect** to establish a connection between the Lulzbot and the computer.

Cancel or pause a print – In the print window select **Abort Print** button to stop the print job entirely or select the **Pause** button if you wish to resume the print job a later time.



5. **How to change filament**

   Please refer to our filament changing video:
   https://www.youtube.com/watch?v=kVFqESArM0Y&feature=youtu.be

6. **When a Print is complete**
   When the Lulzbot is finished printing, the tool head and print bed will automatically move into the cooling position. The tool head will move to the top left and the print bed will move to the back. Once it has finished cooling the tool head will move to the top right and the print bed will move to front. After the print bed moves forward carefully remove your print with the provided scraper tool to get underneath the print and lift it up.

   Please use the safety glove on the hand opposite the scraper tool to prevent injury.

7. **Paying for a print**
   When the print is complete **before** removing the print job, please let staff know and they will come over and write you a receipt based on the weight of your prints. The cost of printing is $0.10/gram. An average print job is about 10-15 grams.

8. **Painting a print job**
   a. Before painting you may wish to clean up the print job of any supports, rafts or bumps with a long nose pliers. You can also use sandpaper to smooth some sides.
   b. For best results use a primer and acrylic paint that are plastic compatible. A primer will help fill in the pores and tiny holes that occur naturally during the 3D printing process.

9. **Note about intellectual property**

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