CONTENTS

HARDWARE

a. Piston

b. Nozzle Holder

c. Nozzles

d. Acme screw

e. Lithium Grease

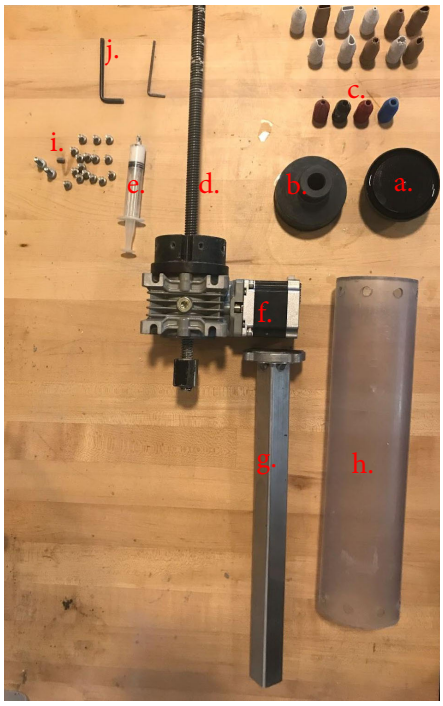
f. Motor

g. Acme screw cover

h. Polycarbonate tube

i. 16 screws

j. Hex key allen wrenches - various sizes (keep in toolbox)



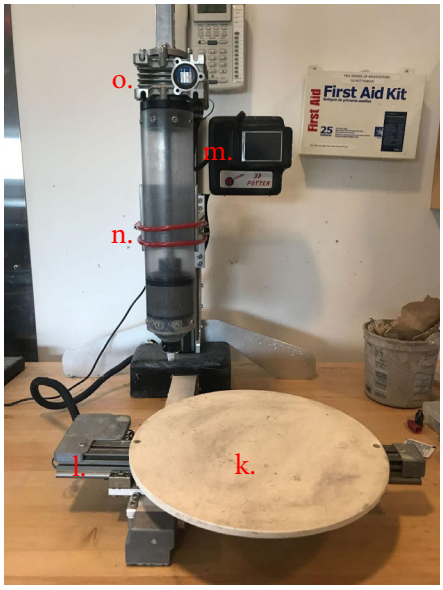
k.Rotary table

l. Rotary Table tracks

m.Printer interface

n. Clasp

o.Motor



CLAY PREPARATION

1.Clay can be found in the box under the table

2. Cut up enough clay for use

3. Wet and cover clay one day in advance

4. Manually mix clay, add extra water until the consistency is right; the consistency of the clay should be smooth throughout.

5. Cover clay for later use

Clay consistency

The recommended consistency of clay is a texture that resembles hardened toothpaste, with a slight gleen on the surface. When using narrower nozzles, the clay should be softer to reduce pressure on the extruder.

Clay location

Smooth clay sample

3.Add water

4.Mix thoroughly

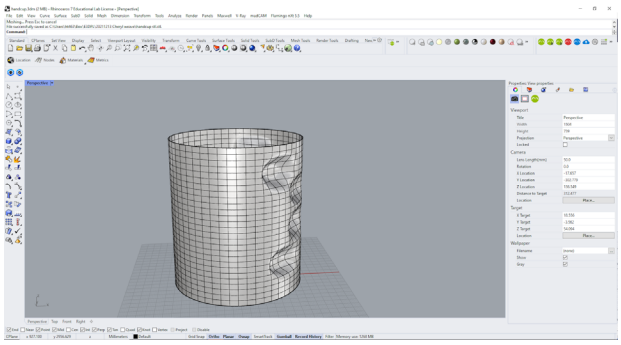
5. Cover for later use

MODELING IN RHINO

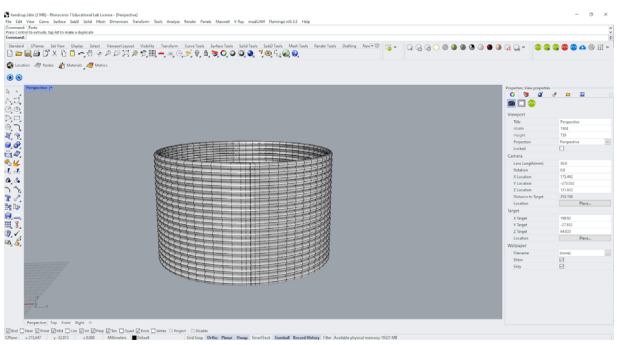
1.Set units as millimeters

2.Model polysurface without CAP

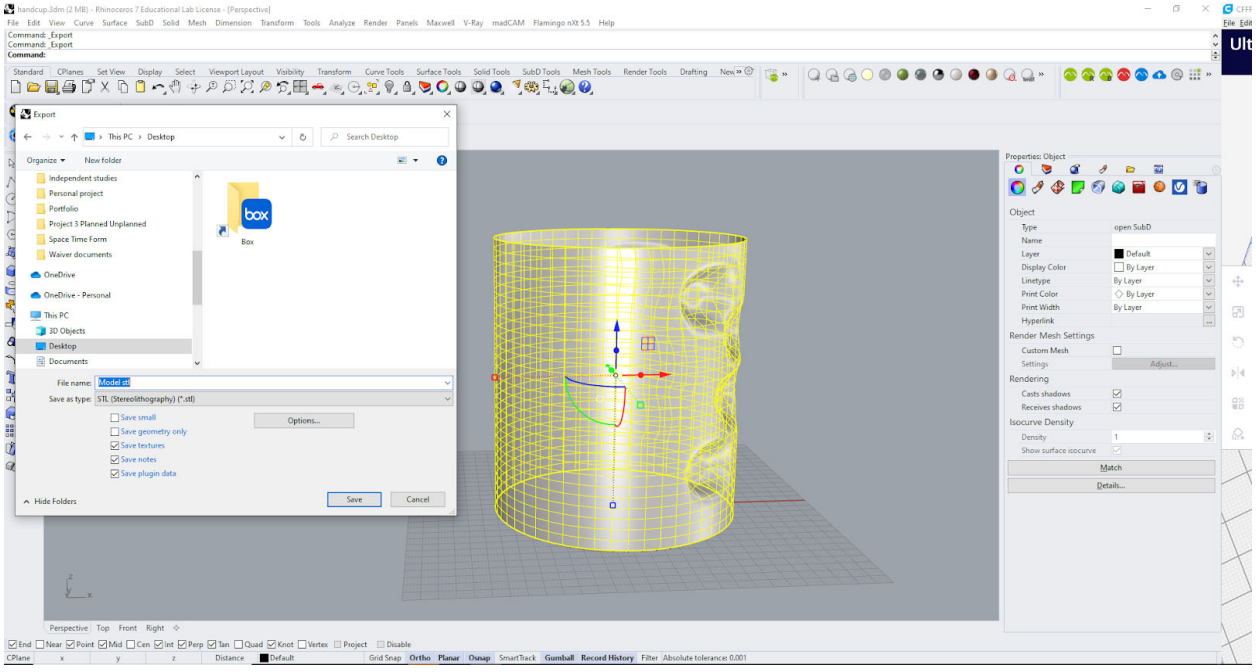
3. Select object and export as an STL file.
In some circumstances, piped polysurfaces slice better in cura



Polysurface without cap



Alternative modelling:piped polysurface



Exporting as STL

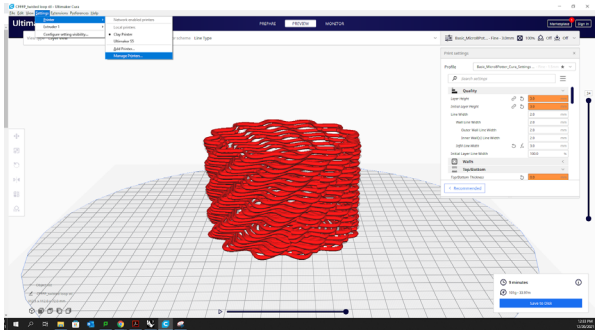
GENERATING GCODE IN CURA

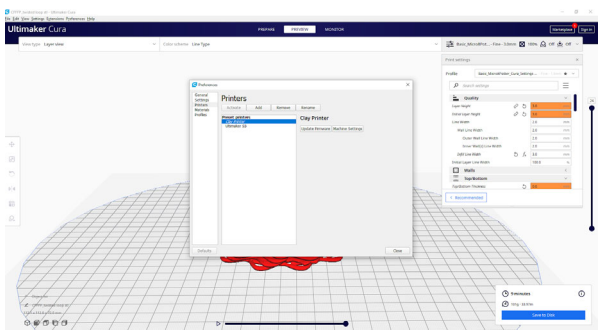
Download Cura at:
https://ultimaker.com/software/ultimaker-cura?utm_medium=cpc&utm_source=google&tm_campaign=2021_Alwayson_srengineer_traffic_do_US

Printer Settings

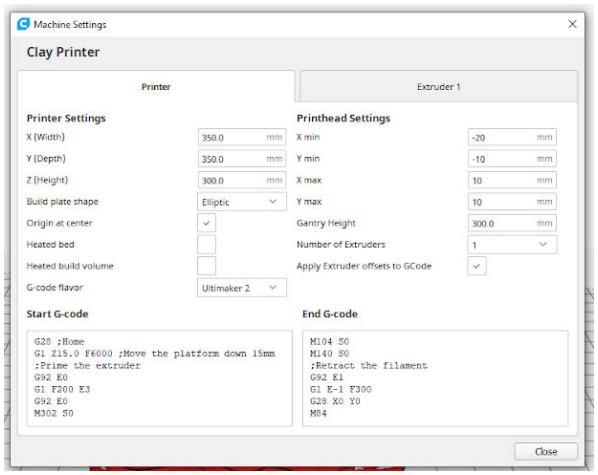
1. Settings>Manage Printers

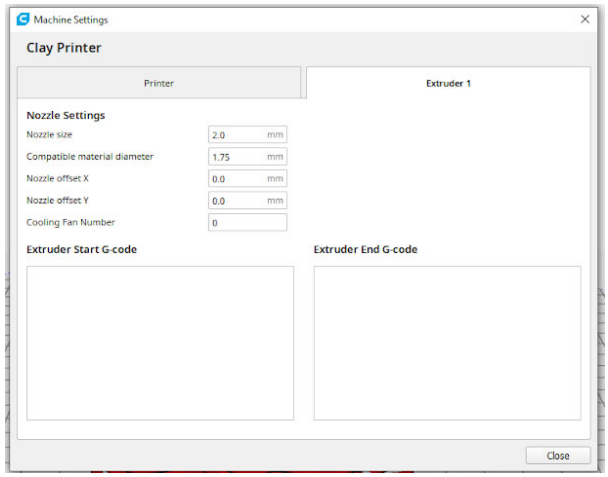
2. Select preset printer>Machine Settings





3.Set up printer profile as shown in the following, some settings such as nozzle settings can be adjusted to personal preference:



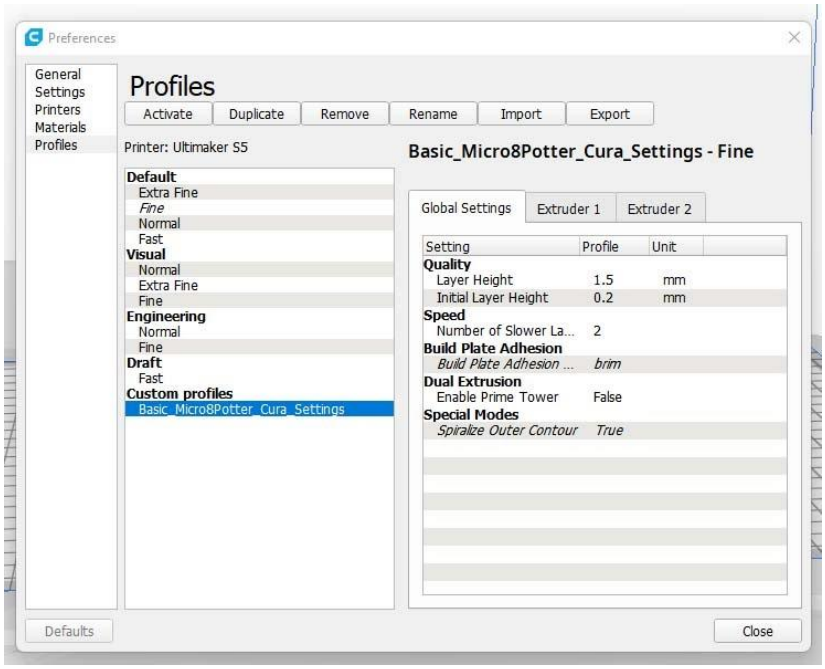


Cura Profile Settings

1.Download ‘Basic_Micro8Potter_Cura_Settings .curaprofile’

2.Print Settings> under the profile tab select Manage Profiles

3.Press Import and load ‘Basic_Micro8Potter_Cura_Settings .curaprofile’
Alternatively, you can create a custom profile similar to the settings shown:



Cura Slicing

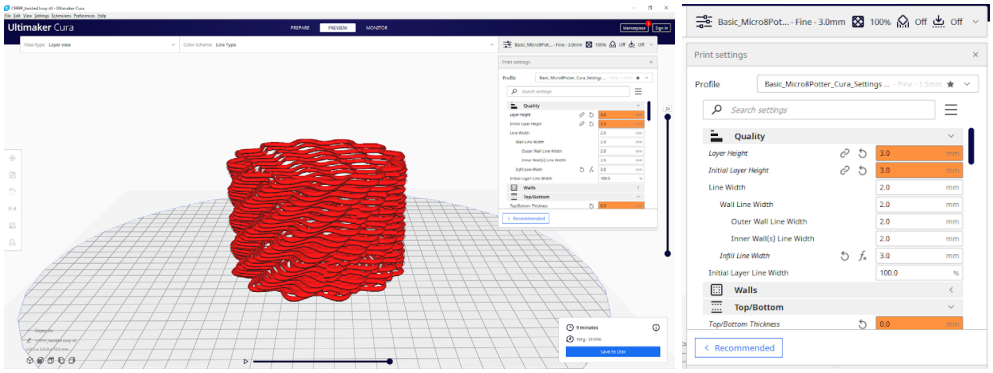
1. Drag STL into Cura

2.Adjust parameters under Print settings tab

3. Press Slice> Preview to preview slice results.

4. Adjust parameters until desired slice results are achieved

5. Cura automatically generates the GCode,to export the GCode press Save to Disk



6. Transfer GCode to an SD card with a SD card reader; avoid using cards with a capacity over 32GB.

<u>Slice height</u>

-The slice layer height is dependent on the wall width and personal preference. For stability the suggested slice height is one third of the wall width.

-The wall width is dependent on the nozzle size, the potterbot extrudes a little wider than the nozzle. Similarly, layer height will also extrude thicker than slice height

EMPTYING THE EXTRUDER TUBE

If the tube is almost empty at the end of your session, please follow the directions below to clean and empty.

1. Unscrew the nozzle holder from the tube with allen keys

2. Unscrew the top part of the tube from the motor and acme screw. Remove the motor and acme screw from the clear tube.

3. Unscrew the two screws holding the acme screw cover and remove the metal cover.

4. Use the cardboard pipe (located next to the printing table) to slowly push the extruder piston and nozzle holder out.

5.Separate the nozzle holder from the extruder piston, scrape and store remaining clay for reuse.

6. Unscrew the small screw holding the nozzle and gently push nozzle out from nozzle holder

1. Unscrew

4.Push piston out

5.Separate nozzle holder

6.Push nozzle out

CLEANING

1. Wipe nozzle holder, piston and tube down with a wet cloth then dry cloth to remove any stuck dried clay before washing. Clay chunks should not go down the drain as it’ll clog up the sink.

2. Wash the nozzle holder, piston, and tube with soapy water.

3. Wipe screws with a slight wet cloth to remove any clay wedged in threads.

4. Wipe all parts dry with dry cloth

5.Wipe down the desktop and printer surface with a damp cloth.

6.Clean table tracks with slightly damp cloth to remove clay and dust

LOADING BY HAND

1. Slot the piston into the extruder tube and hold it in place with the cardboard tube.

2.With the cardboard tube supporting the piston, layer clay into the extruder tube with a palette knife. Apply pressure to make sure the clay is compact without air bubbles.

3. Layer enough clay for the prints, make sure to leave room for the motor and the nozzle holder

4. Select preferred nozzle and slot it in the nozzle holder, hold it in with the small screw.

5.Fill the nozzle holder with clay using the palette knife, layer by layer.

6.Slot and push the filled nozzle holder into the extruder tube with the holes in the nozzle holder and tube aligned.

7.Clear clay from the holes of the extruder tube and the nozzle holder. Using the allen keys, secure the nozzle holder with screws.'

8. Apply lithium grease to the acme screw.

9. Slot acme screw into extruder tube and align the tip of the screw with the indentation of the piston.

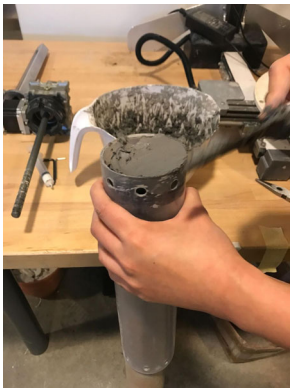
10. Wind/Unwind the acme screw until the two parts of the extruder tube and the motor fit together without gaps in between.

11. Align the upper holes of the extruder tube with the holes of the motor, using an allen key connect the screws to secure the two parts.

12.Put the metal cover over the acme screw and secure the cover with two long screws.

13.Put the tube upright and attach it to the printer using the clasp. For now leave a significant gap between the nozzle and the print table as the extruder tube will move further down during print. The height of the nozzle can be re-adjusted later by unlocking the clasp and sliding the tube up or down.

1.Support with tube



2.Load by layer

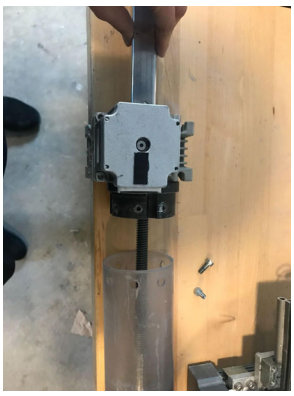
3.Screw in nozzle

4. Load nozzle holder

5.Slot in nozzle holder

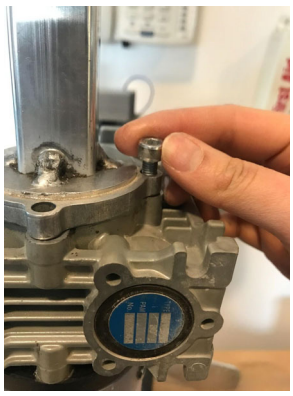
6.Clean nozzle holder

7. Secure nozzle holder



8.Wind/unwind acme screw

9.Secure motor



10.Screw on metal cover

11. Tighten clasp

12.Cover nozzle until use

CALIBRATION

1. Insert SD card.

2.Turn power on.

3.Go to Printing > select the print file and press Confirm

4. The extrusion tube will start moving down towards the table, once it starts its path on the first layer turn off the machine.

5.Unlock the clasp and adjust the height of the extruder tube to leave a gap half a nozzle wide between the nozzle and the printing surface.

6.The z-height should now be calibrated

-Alternatively, the z-height can be adjusted through changing the values in the Move menu. If done with care, the nozzle height can be adjusted during the print.

Printing surface

To do multiple prints in one day, you can put another surface on top of the extrusion table and tape it down to use as a printing surface.

Cardboard (Not suitable):The cardboard will dampen due to the moisture of the clay and as it dry out it will warp and crack the drying clay which dries at a much slower rate

Wood (Suitable): wood surfaces such as plywood have strong integrity between layers and will not likely warp. However wood sheets that are too thin might warp; on the other hand, wood too thick would be too heavy and prevent the movement of the printing table.

Polycarbonate sheet or foam core(Suitable): These surfaces are hydrophobic and would not warp upon contact with moisture. However, the waxy surface could cause trouble with adhesion, to make sure the base layer adheres, the print surface could be primed with a thin layer of clay.

Leave space between nozzle and table

PRINTING

1. Manually twist the metal cover of the acme screw until clay is extruded.

2.Secure the metal cover of the acme screw with two long screws.

3. Plug the black cord into the stepper motor.

4 Turn on machine by pressing the red button

5. On main menu go to Printing > select the print file and press Confirm

6. Nozzle should start moving towards the print table and print should begin.

7. Based on the first layer of extrusion, adjust the move rate and extrusion rate under the Speed menu.

8. If needed, press Pause to halt the print or Stop to cancel the print.

9. Leave the print to dry, you should be able to remove the print from the base in around 12 hours.

10. After all prints are done, cover and tape the nozzle with a plastic sheet to prevent the clay from drying out.

Stop printing when clay in tube is below this level

Nozzle selection

-Select nozzle size based on the scale of the print as it will determine the amount of detail that can be obtained. A corner can only be as sharp as the diameter of the nozzle.

-The nozzle also influences the layer height, with small nozzles capable of printing finer layer height.

-The nozzles also determine consistency of the clay that can be used, with larger nozzles able to print harder clay

Extrusion rates

-The extrusion rate is dependent on many factors such as the consistency of the clay, the nozzle aperture and the wall thickness.

-It is recommended to start with a lower extrusion rate for most prints to prevent:
a)Putting the nozzle and motor under high pressures, this will also cause ‘frilly’ prints with messy edges as too much clay is forced out of the nozzle. You might also hear grinding noises from the motor when the pressure is too high.
b)the nozzle from digging into the print during extrusion

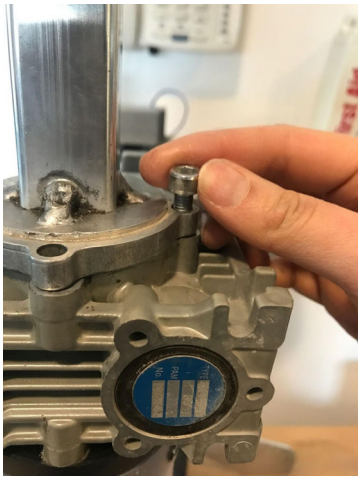
-When the extrusion rate is too low, there will be gaps in the line of prints

Move speed

-For prints with sharp turns, the extrusion might not adhere to the layer below if the move speed is too high

-Typically for prints with many turns, lower the move speed when the print starts using the speed menu. Alternatively, you could lower the move speed in cura under advanced settings.

1. Manual extrusion



2. Secure acme screw cover

3. Plug in cord

4. Turn on machine

5. Select print file

7. Adjust speeds

8. Menu to pause or stop

FIRING

1.Let clay dry for at least two weeks until bone dry.
2.Bring dried pieces to the workshop early in the day for firing. Workshop power shuts down at 5pm so leave enough time for firing and firing takes approximately 5 hours.

Firing schedule

Recommended firing Schedules and Ramp:

1. Ramp up to 200 °C over 2hrs then hold for 5 mins

2.Ramp up to 400 °C over 1hr then hold for 5 mins

3.Ramp up to 1000°C over1.5 hours

4. Leave overnight to cool

Consult with workshop staff before firing as the process needs to be supervised.

TROUBLESHOOT

Question 1. Nothing is extruding despite print being in progress
-This would likely happen when the extrusion tube has been freshly filled. In this case, unscrew the two long screws holding the metal acme screw cap then twist the acme screw clockwise until clay is manually extruded.

-This might also be caused by the machine not recognising the printing path. Some complex polysurfaces may not slice well or form clear print paths, it might help adjusting the slice settings or rebuilding the polysurfaces as layers of pipes.

Question 2. Machine is making too much noise
-The extrusion rate may be too high causing high pressures on the nozzle and motor.
-The acme screw may not be greased enough.

Question 3. Acme screw screwed on too tight after last print
-The lodged acme screw can be unscrewed with a pair of wrench spanners, these can be found at the wood workshop. Be careful not to grip too hard as this could damage the cap of the acme screw.

Lodged acme screw

Question 4. Messy/lumpy extrusions
-Frilly extrusions may be due to a high extrusion rate as too much clay is being extruded from an aperture that is too small.
-This may be due to an inconsistent clay mixture. To resolve this problem, leave the clay for a few days in the tube so that it homogenizes. If this does not resolve the problem, empty the tube and remix the clay mixture for refill.

Messy extrusion sample

Question 5..Layers not adhering at corners
-For prints with sharp turns, the extrusion may not adhere to the layer below due to high moving speeds. Resolve this problem by lowering the motion speed on the interface or lowering the speed in the advanced slice settings.

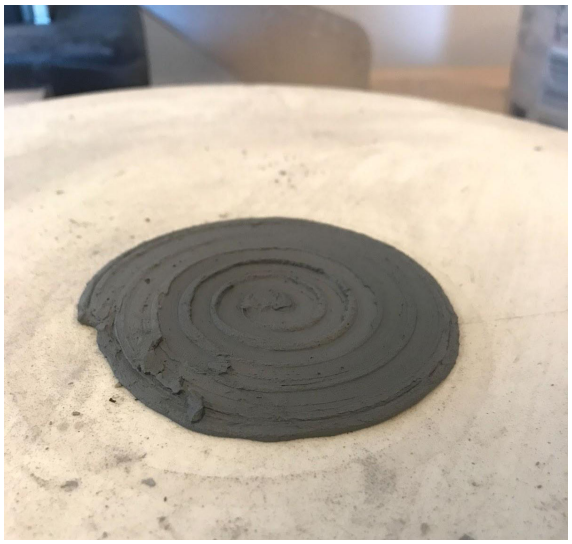
Corners not adhering

Question 6. Nozzle digging into printed layers
-The extrusion rate may be too high and too much clay is extruded compared to the set layer height.
-The nozzle may also be digging into the extruded layers if it is a double wall print not spaced apart enough. Double walls need to be more than one nozzle diameter apart.

Nozzle digging into print

Question 7. The base of an object doesn't seem to print properly
-It is advised to avoid printing bases and capped objects as the potterbot does not print bases well. The potterbot does the best printing walls and continuous paths.

-[Experimental] to print a base, try to create a spiralling tubular path instead of a flat poly surface base. In this case, it is recommended to separate the base and walls into two separate files; first print the base file then print the wall file on top of the base by manual alignment.



Question 8. The object is collapsing during print
-This may be due to steep inclinations in the object, with insufficient adhesion with the layer below. The weak interlayer bond will not be able to hold up the weight of the clay.
-Reducing the slice height may increase the interlayer bond
-Using harder clay may increase the stiffness of the print and its ability to withhold its own weight.

Collapsed print

Question 9. The machine is making long travel paths
-When slicing multiple objects in one print, the slicer might not be able to recognize them as discrete objects and print them all at once leading to non-regional printing paths. Instead, when printing multiple objects, it is recommended to separate them into multiple print files.

Question 10. Print bed jilts and the print goes off path
-This may be due to dust accumulating on the tracks of the print bed. Clean the tracks with a damp towel to make sure it is unobstructed.
-If an alternative printing surface is layered on top of the extrusion table, the alternative surface may be too heavy to be moved.

Question 11. The object cracked or broke after firing
-There might be air bubbles in the object, this may be due to the clay not being compact enough in the extrusion tube.
-The clay might not be dry enough for firing, the clay needs to be dried for around two weeks before firing.