



We can't guarantee your files will be successfully fabricated as there are many factors which can affect it.

The guideline will help you understand laser cutting, 3D printing and CNC milling in greater detail to help you achieve a successful result.

*There is usually a queue for fabrication, so make sure you bring in your files early.

(3-4 days for 3d printing and CNC, 1-2 days for laser cutting.)

How do 3D printers work?

3D printing, or additive manufacturing, is a process of making three dimensional solid objects from a digital file.

The 3D printer cannot print directly from any digital model file. It needs a specific file format that contains toolpath created from the 3D digital model to specify the printer's movement, when to start and stop pumping molten plastic, and at what rate.

This guide will show you **how to prepare your digital model file for file export to 3D print.**

Location: DRH office, Level 4 Architecture Building, 421-423





Ultimaker3 Extended

Build Volume

Length: 18 cm

Width: 18cm

Height: 20 cm

Minimum thickness for printing: 3mm

*Thinner models could also be printed, the print may not turn out successful. Failed prints has to be paid in this case.



MakerBot Replicator Z18

Build Volume

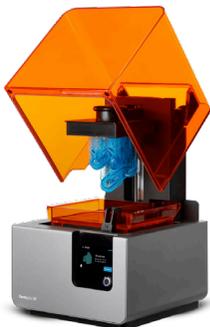
Length: 30 cm

Width: 30.5 cm

Height: 45.7 cm

Minimum thickness for printing: 3mm

*Thinner models could also be printed, the print may not turn out successful. Failed prints has to be paid in this case.



FormLabs SLA Form2

Build Volume

Length: 14.5 cm

Width: 14.5 cm

Height: 17.5cm



Materials we offer

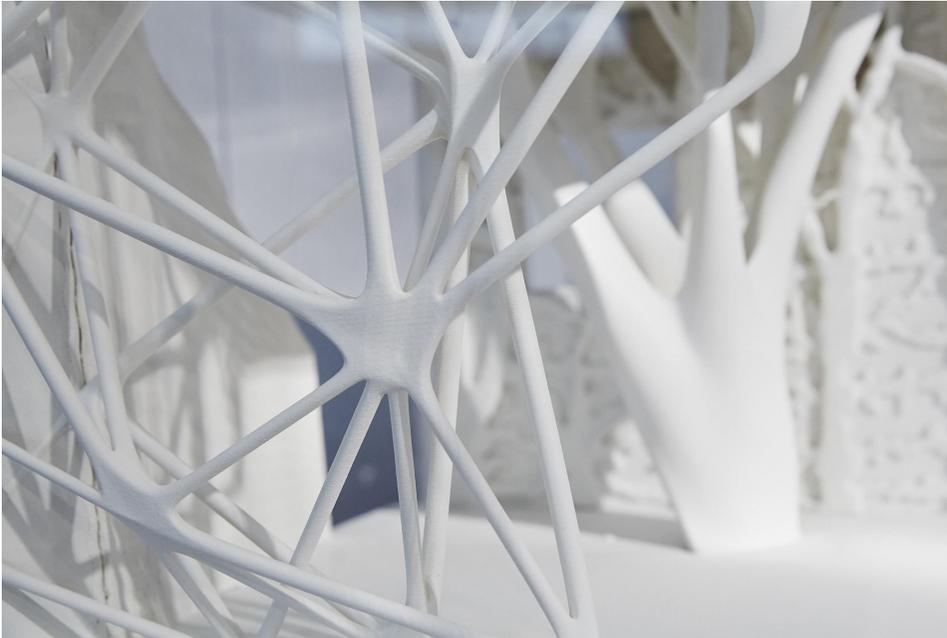
Standard White PLA

Coloured PLA: Black, Yellow, Orange, Green, Blue, Red, Transparent, Silver metallic

Breakaway

Resin: Clear, White, Black, Grey, Tough, Flexiable





Overview

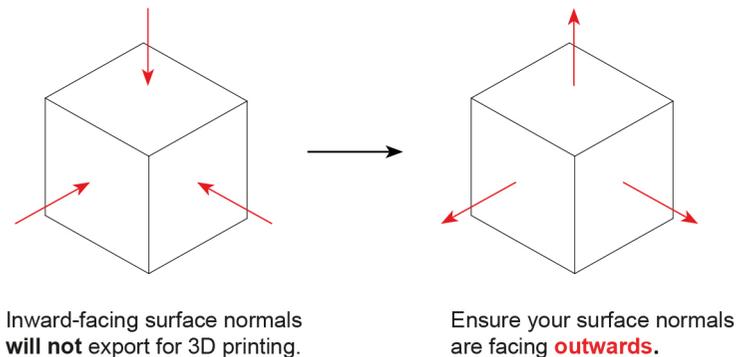
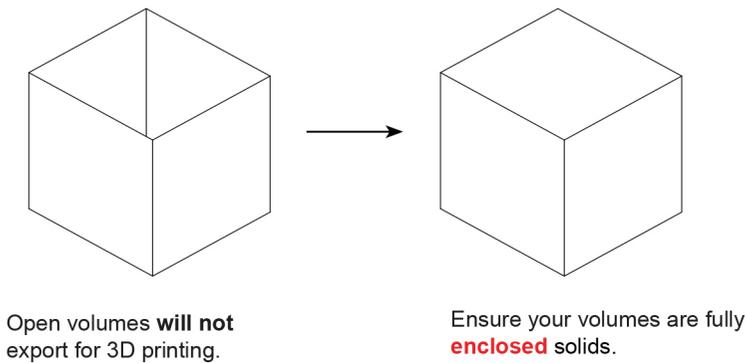
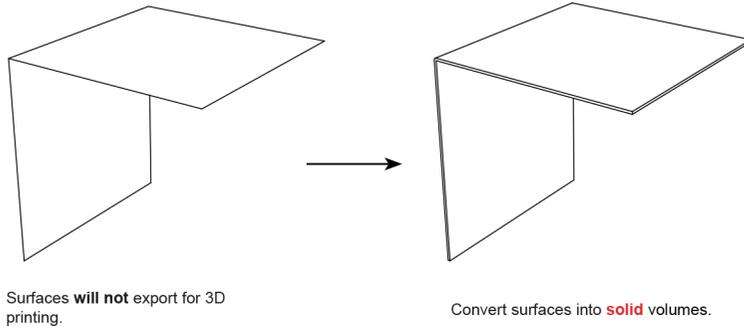
To 3D print, a program such as cura/preform is used to export the toolpath from the digital model.

How Does The Export Work?

- A. The digital 3D model is converted into 2D slices that are read by the machine.
- B. The 3D printer heats plastic filament and extrudes it through a nozzle onto a heated surface.
- C. The solid object is built layer by layer.

This method is called Fused Deposition Modelling (FDM) or Fused Filament Fabrication (FFF)

Files that 3D printers support: **STL files** (stereolithography)



Preparing your model for printing

1. Must be a SOLID Volume, it cannot be planar surfaces. It needs a thickness.

2. Save your model in .STL format. (this is a mesh format - NURB surfaces will be triangulated)

- Make sure your volume has no holes, the volume must be fully enclosed.

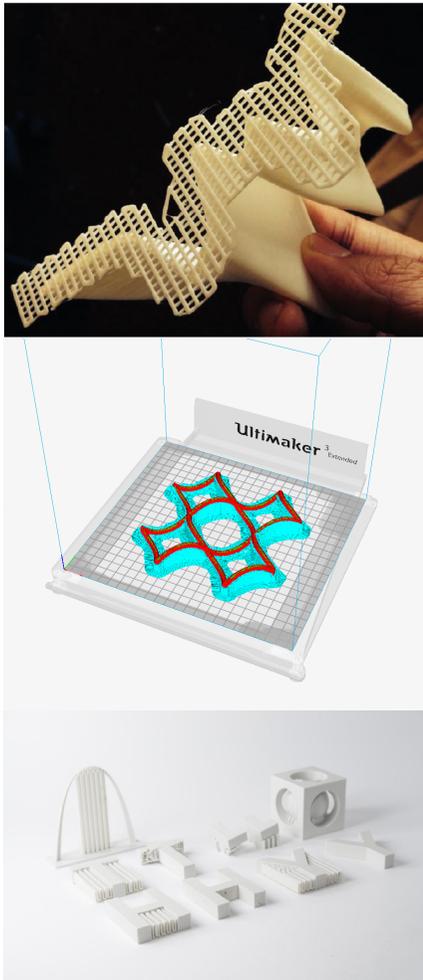
- Make sure surface normals are facing outwards and not inwards.

- Model dimensions must fit in the printing bed constraints (width, depth and height).

Overlaps

Printers are able to print overlapping geometry, however overlaps can cause errors and/or significantly increase time taken to export the toolpath.

It is recommended to produce a clean, non-overlapping model.
Model/File Preparation



3D Print General Information

A 3D Print will be printed with:

Rafts

A raft is a flat base that is printed.

It is temporary, helps stick the 3D print securely to the build plate.

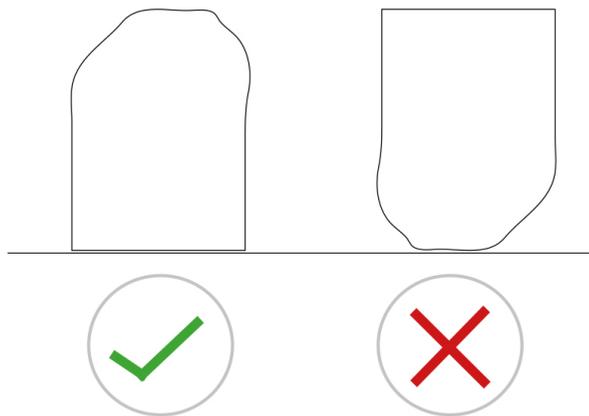
- Support structures might not adhere well to the build plate without a raft.

Supports

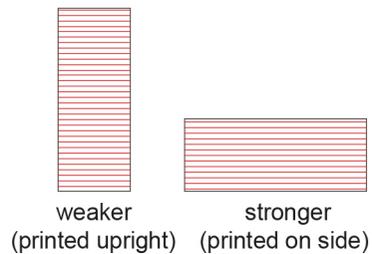
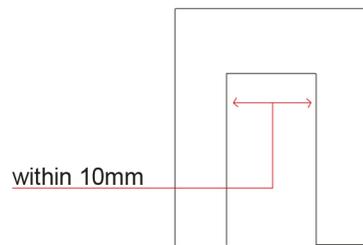
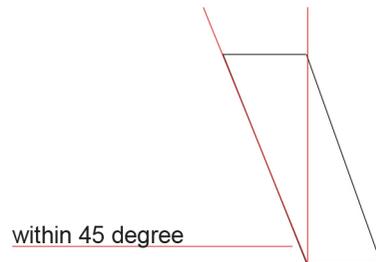
Supports allow printing of overhanging parts.

3D printers cannot print into thin air, supports provide a base for overhanging parts of a model.

- You can remove supports by tearing away with pliers or with your fingers.
- Supports can leave surface imperfections that require finishing of the object.
Eg. sanding down, or dissolving with acetone.
- Supports can also use up a significant amount of plastic.
- Supports can be reduced if your object has a flat side to rest on.
- Orient your object to minimize overhangs and bridges.



To get the print done **faster**,
Place the object so the bottom is as flat as
possible.



Extra Tips

Overhangs

As the printer prints your object, each layer of plastic rests on the one below.

When an object has straight sides, the new layer will be fully supported by the previous layer.

- To avoid printing supports, avoid creating overhangs that form an angle greater than 45 degrees from the vertical.
- Make sure at least half of each layer's outer perimeter is supported.

Bridges

A thread of extruded plastic that crosses from one supported area over an unsupported area is called a bridge. Because the thread is supported at both ends, the unsupported middle does not cause problems.

If the unsupported section is too long, it may sag in the middle.

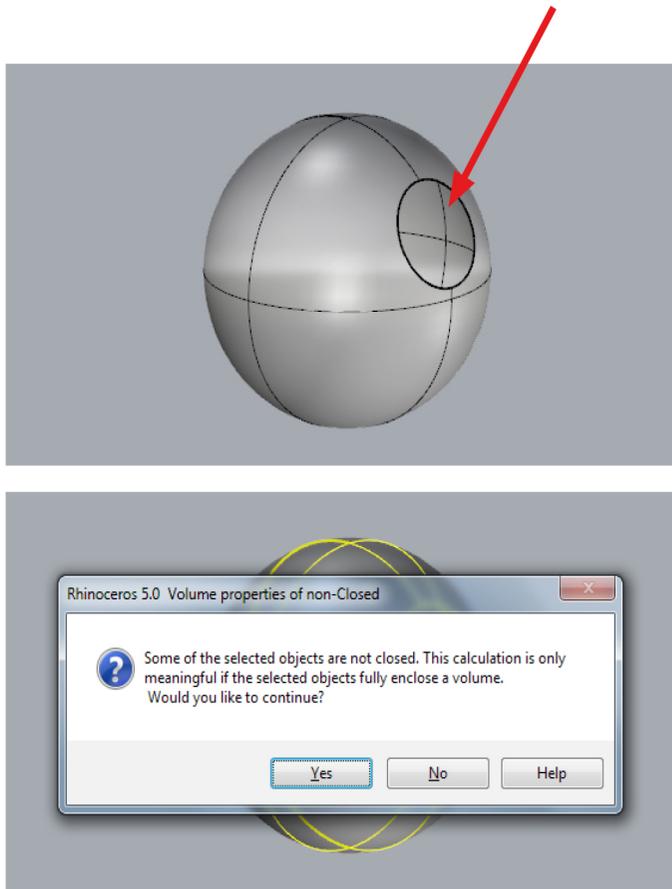
- 3D printers should handle bridges of 10mm well
- Sagging occurs on bridges of 20mm

Maximizing Object Strength

Another thing to consider is the 'grain' of the printed object.

Keep this in mind when designing functional objects:

- A thin cylinder printed upright will be composed of circles placed on top of one another. If bent in half, it has many natural breaking points and will snap easily.
- If it is printed on its side, the layers will run up along the cylinder. Every layer will have to bend in order for the cylinder to break.



How to check for enclosed volumes in Rhino

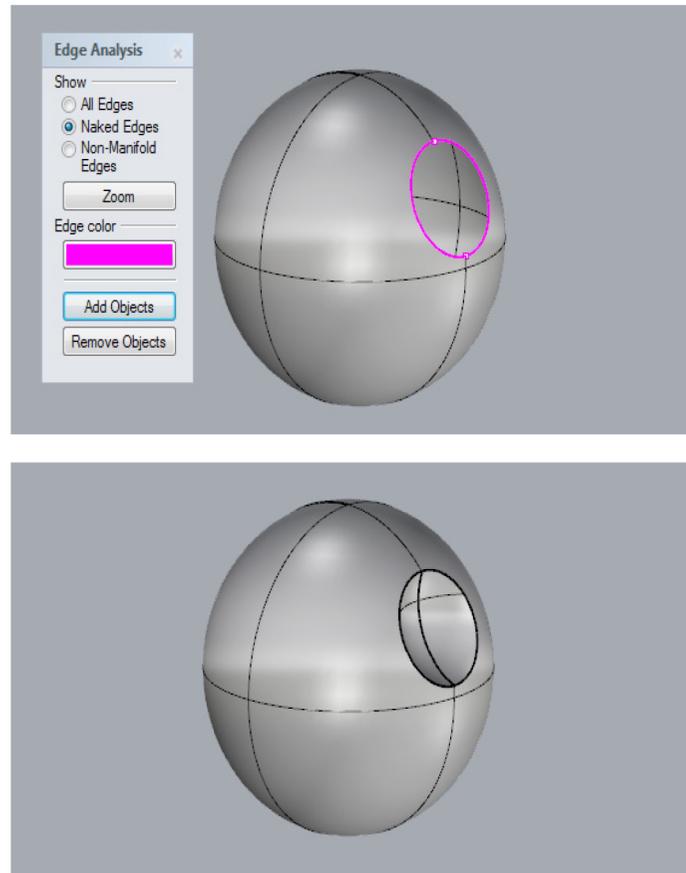
Example of a unenclosed volume.
Unenclosed volumes are unable to be exported for 3D printing.

To check if the object is enclosed

Select the object and go to:

[Analyze] > [Mass Properties] > [Volume]
(or type in the command bar: **Volume**)

IF a pop-up window appears, your model is not enclosed.



To easily select the unenclosed edges (naked edges)
Select the object:

[Analyze] > [Edge Tools] > [Show Edges]

Check show naked edges to show the unenclosed edge

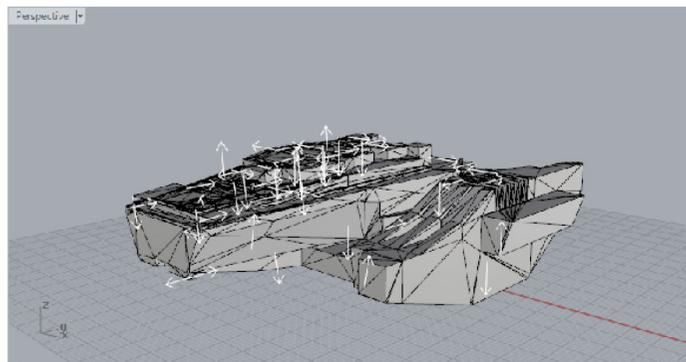
Close all naked edges before 3D printing.

Make sure to use the command join to ensure the object is one solid form.
You will then get an enclosed volume that is printable.

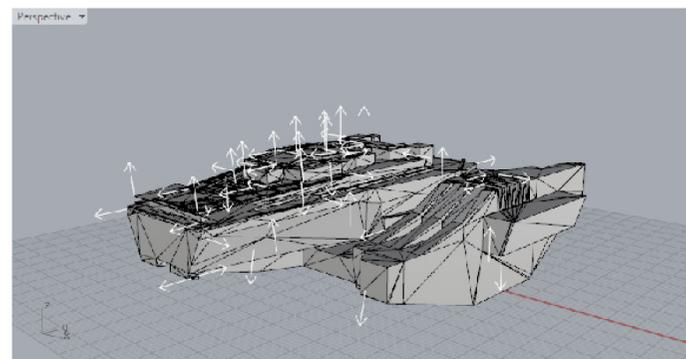


Check for normals in Rhino

Make sure the normals are facing the correct direction.
Use [Analyze directions](#)/Direction display, command “Dir”

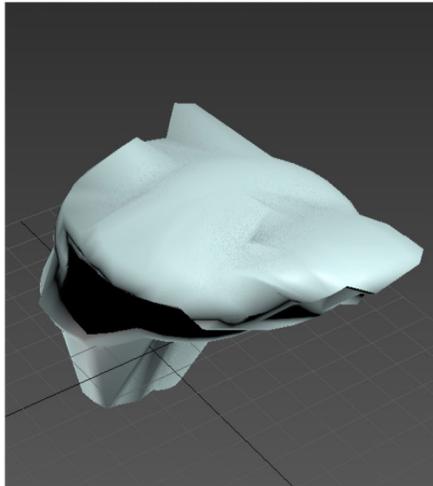


If any surfaces are facing inward it will **not be printable**.

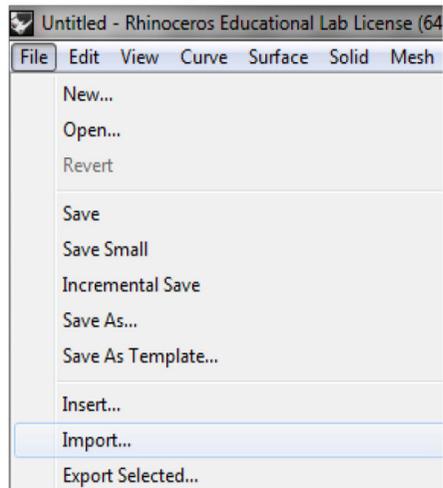


Use command “**Flip**” to change surfaces to facing **outwards**

Files created from other programs can be imported into Rhino for analysis.



Example model built in 3ds Max

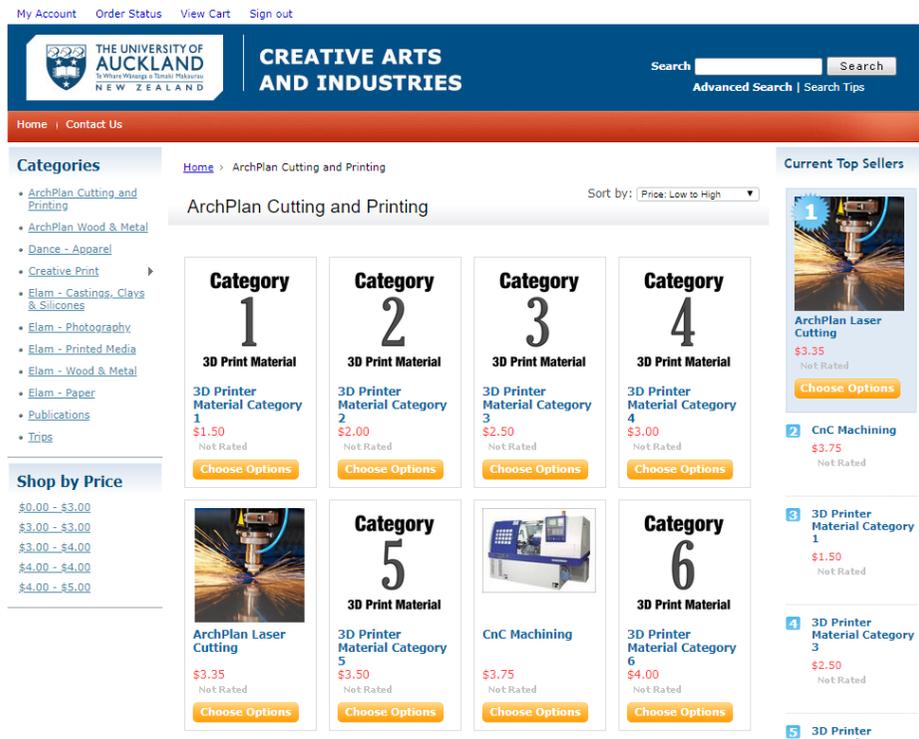


Import 3D model for analysis
[File] > [Import]

How to pay for a job through NICAI creative store

*Ask the staff for a estimated cost before the job processes

1. Go to <https://store.creative.auckland.ac.nz/>
2. Log on or create an account
3. Choose the ArchPlan Cutting and Printing category



Laser Cut Jobs: Select the number of minutes

3D printing: Select the category

Each unit represents 10 grams of material

Category 1 Includes 0.2 (Fast) printing of PLA and ABS materials

Category 2 Includes 0.15 (Good) printing of PLA and ABS materials

Category 3 Includes

0.1 (Fine) printing of PLA and ABS materials.

0.2 (Fast) printing of Nylon & Polycarbonate

Breakaway support. (All qualities)

If you are not sure, ask a DRH staff for help.

ArchPlan Laser Cutting



Price: \$10.05

SKU: 650030-1019I

- * **Time available:**
- 5 Min
 - 10 Min
 - 15 Min
 - 20 Mins
 - 25 Mins
 - 30 Mins
 - 35 Mins
 - 40 Mins
 - 45 Mins
 - 50 Mins
 - 55 Mins
 - 60 Mins

Quantity: [Add to cart](#)



4. Select “add to cart”, then select “proceed to checkout”.
5. Comfirm the billing address and shipping detail, tick “ Pick Up from Student Centre \$0.00 ”
6. Fill in payment details. You will recieve a confirmation email from NICAI for your puirchase

* All jobs has to be paid before collection, otherwise a receipt must be forwarded to **digitalresearchhub@gmail.com**

OK, 1 item was added to your cart. What next?



ArchPlan Laser Cutting (Time available:
15 Min)
\$10.05
Quantity added: 1

[Proceed to checkout](#)

Order Subtotal: \$11.55
Your cart contains 3 items

[Continue Shopping](#) or
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