Standard Operating Procedure for 3D printing using:

University of Glasgow
James Watt School of Engineering

Bambu P1S

Bambu Studio

CAD graphics

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What you need to bring:

- A laptop with Bambu Studio slicing software installed: https://bambulab.com/en/download/studio
- Your CAD model exported as an STL, 3MF, or OBJ file.

What you need know:

- The 3D Printer Farm consists of communal access machines for James Watt School of Engineering student work.
- You must understand how to set up and operate the 3D printers safely and effectively before use.
- You must adhere to the Standard Operating Procedure that follows, and the read the 3D Printer Farm Policy.
- If you are interested in using the the Bambu P1S machines or Ultimaker S5 / S7 machines for exotic engineering materials, speak to the Technician present, or contact cadgraphics@glasgow.ac.uk
- If you are interested in using the Ultimaker machines, see the Ultimaker Standard Operating Procedure.

www.gla.ac.uk/schools/engineering/informationforstaff/technicalservices/aboutechnicalservices/ourteam/cadandgraphicsservices/3dprinterinformation

Bambu Studio: Prepare setup

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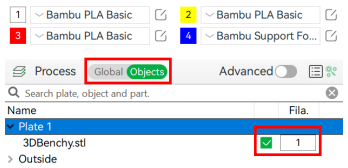
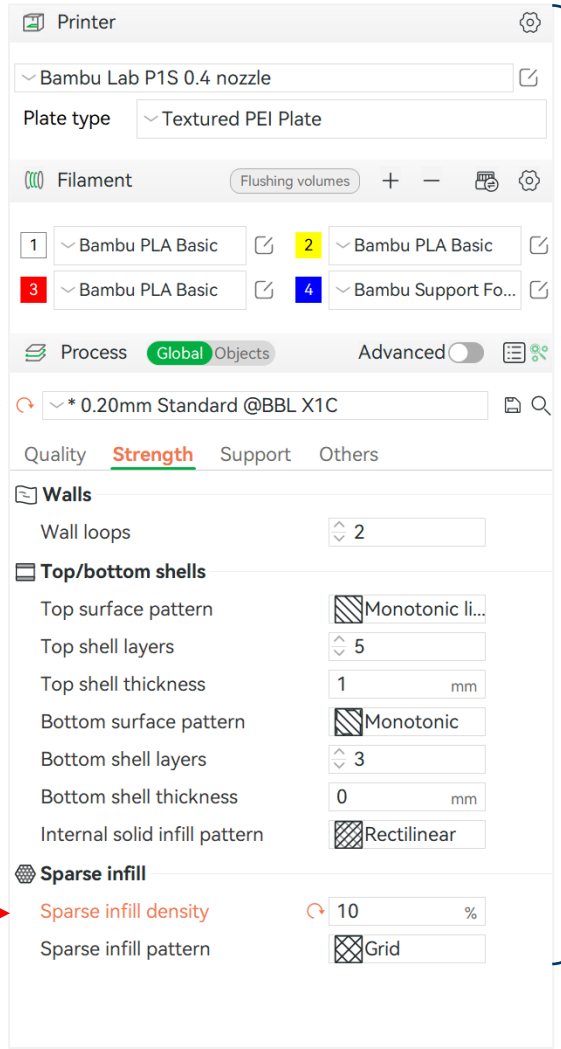
How you should set up the software for the 3D Printer Farm

- Set printer to Bambu P1S with 0.4mm nozzle
- Add/remove filaments using the +/- buttons
- How the material stations are usually configured (colours are arbitrary):
  - Bay 1-3 – PLA Basic
  - Bay 4 – Support for PLA
- Set layer height here
  - 0.2mm standard should be used in majority of cases
  - Don't change layer height in the quality tab
- By clicking "Objects" you can identify and change the bay used if necessary.



- Infill density in most cases should be set to 10%



1. Select prepare to start a new project

2. Import model

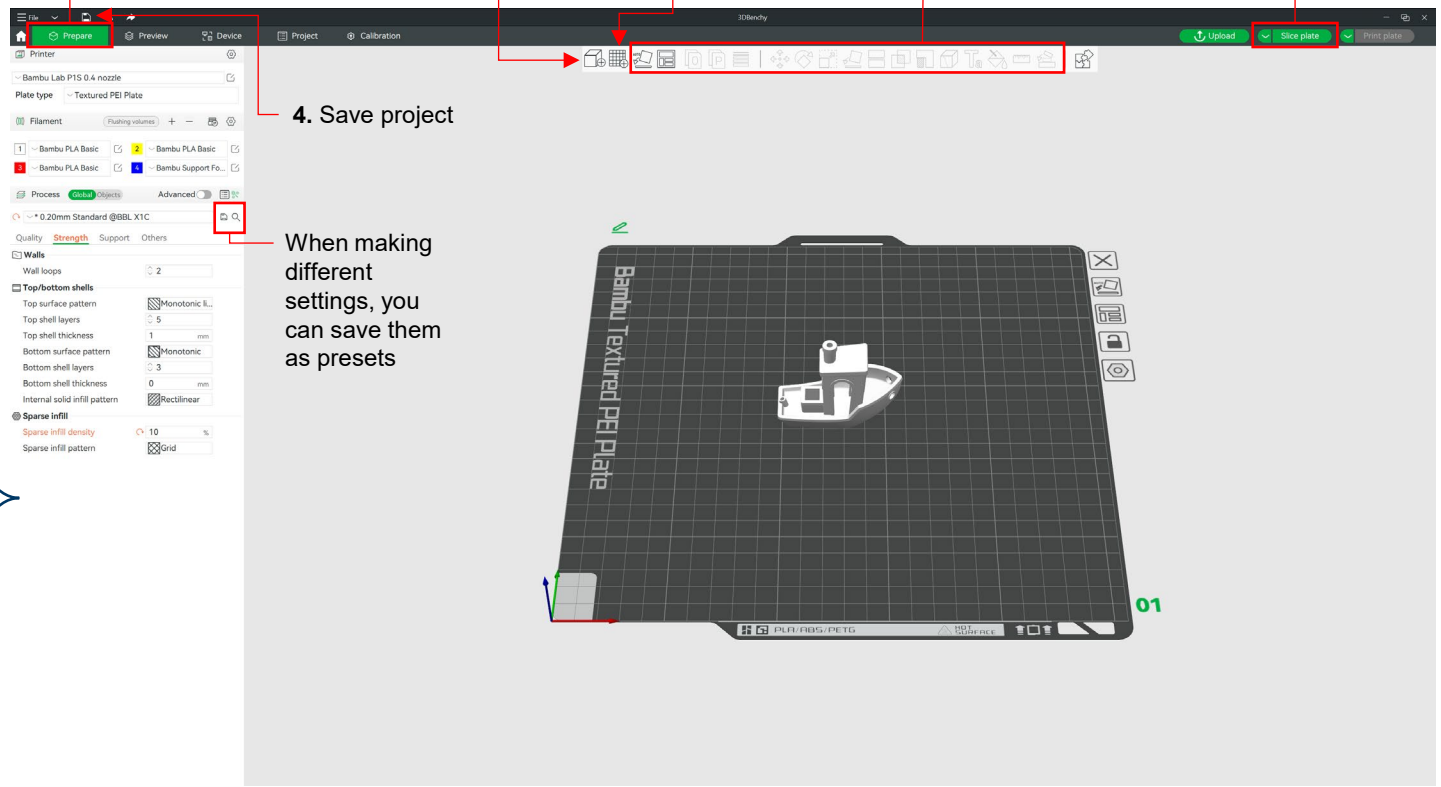
Add build plate

3. Model manipulation tools

5. Select "Slice plate" to preview the generated file

4. Save project

When making different settings, you can save them as presets



- For in-depth instruction, see the Bambu Studio playlist: https://www.youtube.com/playlist?list=PLFUVS59deIm2mawl3Zjk1XI9yp7H7955J
- **Multi-colour model printing is not permitted on these printers** without prior discussion with the CAD-Graphics team.

Bambu Studio: Support settings

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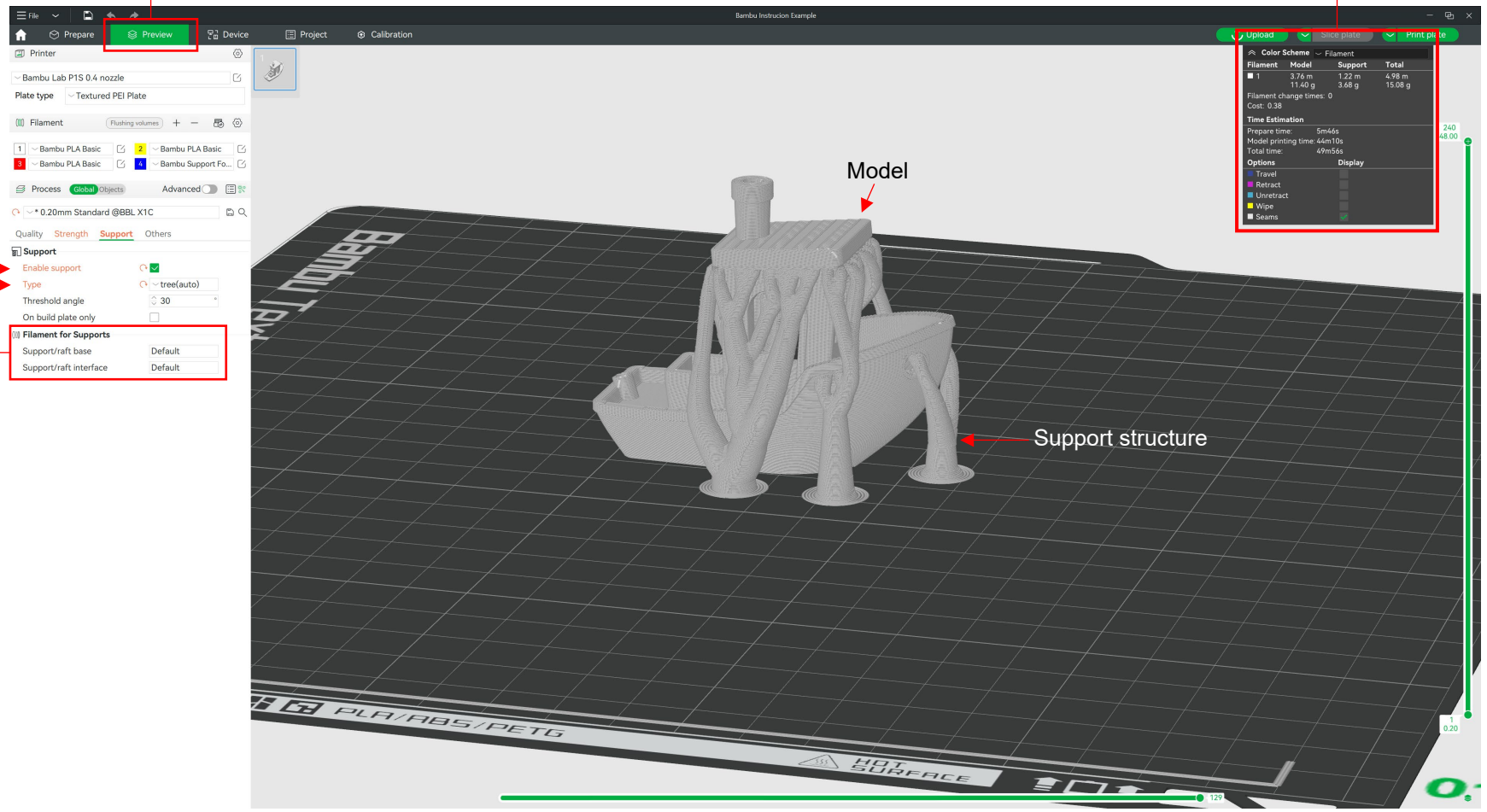
How you should set up the software if using the same material for the model and supports.

- If support material is necessary, select enable support.
- Choose tree or normal. Tree is often more efficient, especially for complex geometries.
- By default, Bambu Studio will set the support material to be the same material as the model.
- Design and orientate your model to minimise the amount of support structure needed.



Bambu Studio: Support settings

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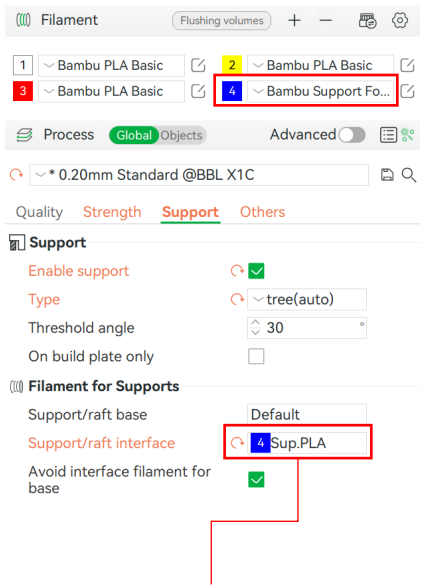
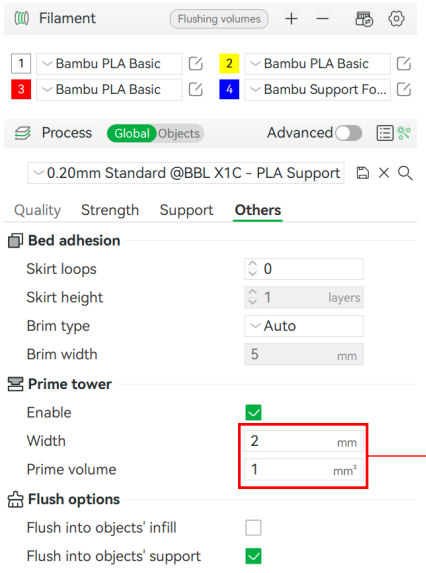
How you should set up the software if using separate build and support materials.

It is important to follow this instruction to avoid excessive material wastage and large time loss.

- The Bambu P1S printers can host material which allows for easier removal of support structures called “Bambu Support for PLA”. To use this, set as follows:



- In the Support tab, set **“Support/raft interface”** material to the Support for PLA bay. Select “Yes” to the pop-up message.

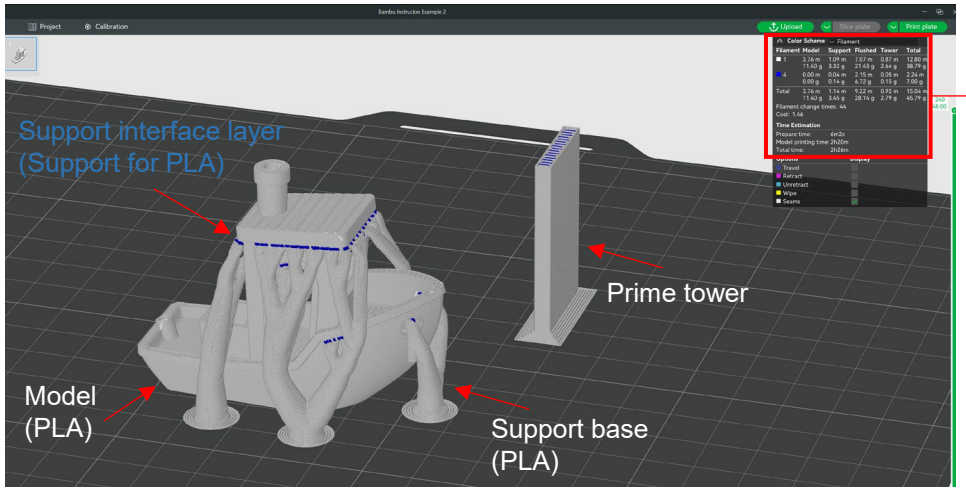


- In the Others tab, set Prime tower width and volume to the figures shown.

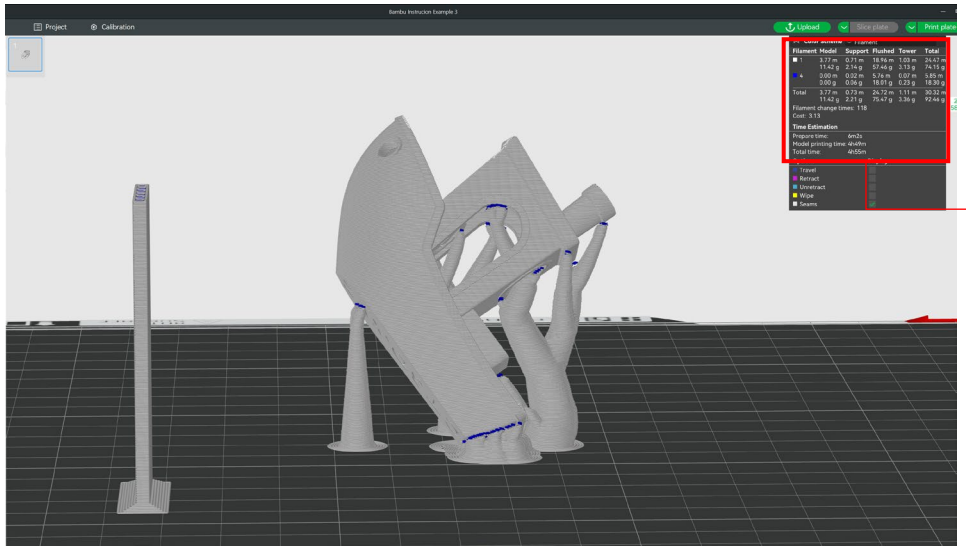
Geometry and orientation

- Every time there is a material change on a P1S 3D printer, it stops, changes the filament spools, and performs a purging and priming operation.
- Orientate the model to minimise material changes across a layer and design your model to minimise the amount of support structure needed.

1



2



Note: Two filaments being used, and time estimation and material used. More changes = more time & material waste

Material changes:
Image 1- 44
Image 2- 118

Bambu Studio: Preview

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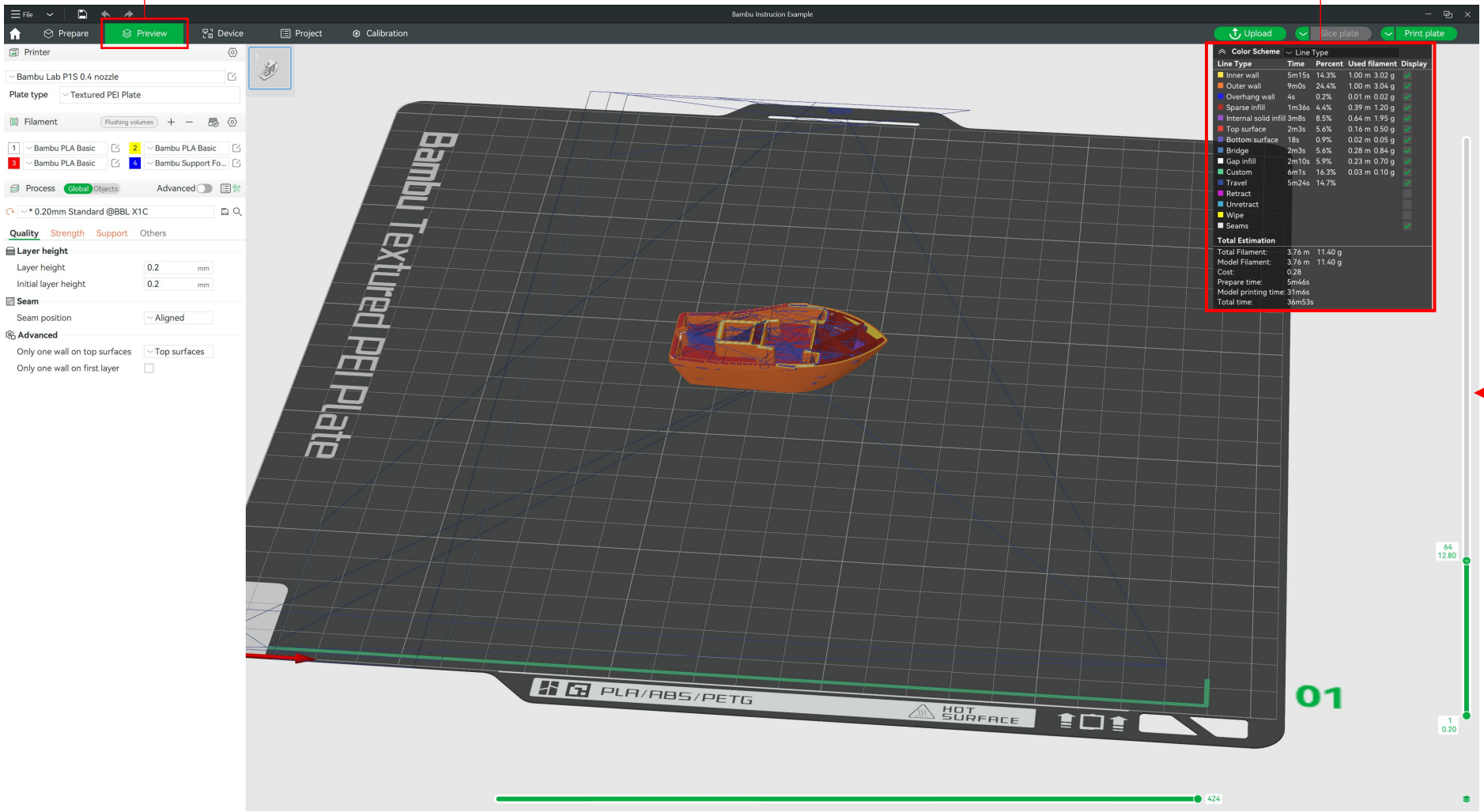
When selecting “Line Type” from the Colour Scheme drop-down, it is possible to see the time and material usage for different print operations of the build. It is important to pay attention to Support and Prime tower numbers if using separate materials.

In preview mode after slicing



Drag this bar up and down to see a layer-by-layer sliced view of the build.

When you are satisfied with the project’s settings, model orientations and times, move on to the next steps.

Step 1

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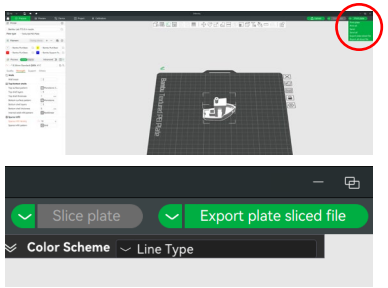
A

A – The printer's MicroSD cards are cold swappable, meaning the machine must be switched off when the card is removed and inserted, to avoid file corruption. The switch to turn the printer off is on the back of the machine, right side when facing. Press the buttons on the LCD screen if you are unsure if the printer is on/off.

B

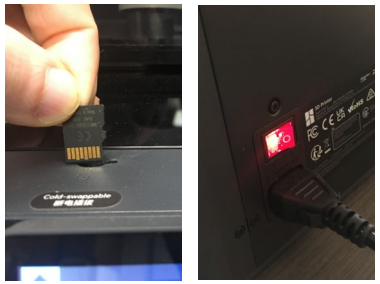
B – Remove the MicroSD card from the front of the machine with a gentle press to eject it. Carefully put the card into one of the card readers drop-down insert the card reader's USB into your laptop.

C



C – Once your model has been sliced and the project file saved, the G-code can be exported to the MicroSD. Select "Export Plate Sliced File" from the drop-down menu on the top right side of the screen then confirm. From here the G-code can be saved. Give your file a recognisable name. Safely eject the MicroSD.

D



D – Insert the MicroSD back into the switched off machine. Following this, the machine can be switched on.

Step 2

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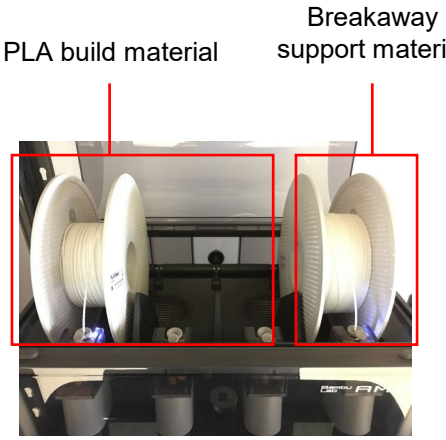
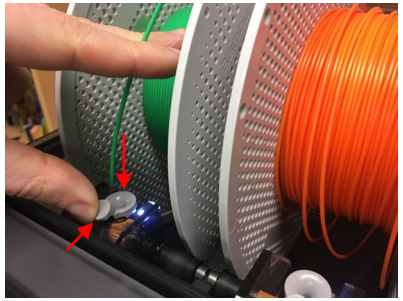
A



A – The filament spool bays should be laid out in the configuration shown. Check whether the spools are empty or near empty. There are markers on the side of the spools indicating the number of grams of material remaining. If there doesn't appear to be enough material for your model, use another printer.

Check that the material and bays at a minimum match what you assigned to the model in Bambu Studio.

B



B – If it is necessary to switch spools between bays, gently push the tab of the feeder towards the spools, then feed the material in carefully until the machine pulls the material automatically.

C

C – Ensure the material station is closed properly and sealed.

Do not use a different material type or brand of material without first discussing this with technical staff. For assistance, training, or troubleshooting → Speak to the Technician present, or contact cadgraphics@glasgow.ac.uk

Step 3

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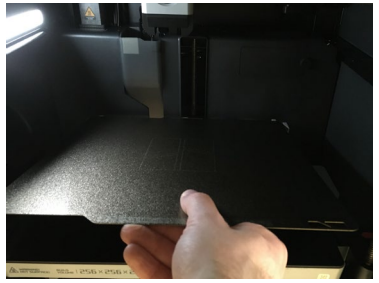
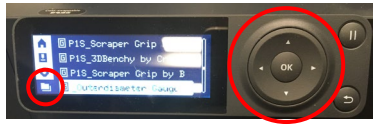
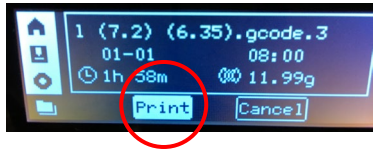
A



A – Ensure the magnetic build plate is keyed onto the platen and lying flat. Check that the build plate is clear of debris. If not, remove the plate and scrape debris away with the plastic scrapers provided. When done, carefully guide the build plate back on to the platen.

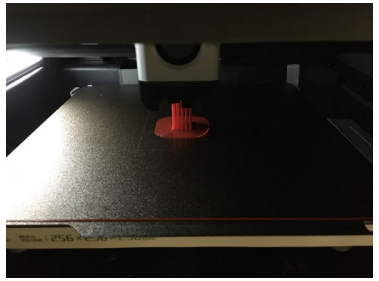
B





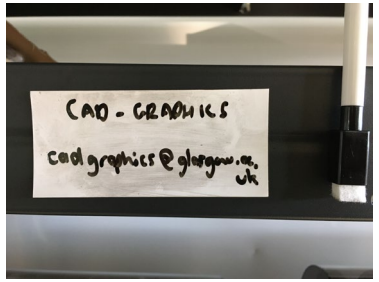
B – Use the down arrow button on the interface to move to the folder menu. Use the arrow buttons to find your file, and then press the “OK” button to select the file, and then to select “Print”.

C



C – Wait at the machine until the start up procedure has completed and the first layer of material has successfully printed. This will take a few minutes. **Caution: the bed and nozzles heat up and become hot to touch during printing. Do not place your hands inside the printer while the printer head is in motion across the gantry.** Options to pause/abort the print will become available and used if problems are noticed.

D



D – Leave a note with your name and student email address using the labels and pens provided, so you can be contacted if necessary.

Notice any on-screen warnings that arise during the printer’s start up procedure. Do not attempt to perform any mechanical maintenance. Move to another printer and report issues to the Technician present.

Checklist: Before you start

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- Printing a large box or plate? → Consider redesigning for laser cutting and submit your DXF file to
- Does your file take >24 hours to print? → It is not suitable for these printers. Adjust infill and layer height settings to reduce time, or submit your STL/3MF file to be printed on our industrial machines
- Do your settings match the printer, material and nozzle specified in the settings?
- Have you checked that the spool in the material station has enough filament for your print? If you have chosen to use the support material, is there a support material spool in Bay 4?
- Do not use more than two printers at one time if your models take more than 2 hours to print.
- Ensure the magnetic build plate is laid flat and even on the platen.
- Wait for the first layer of filament to print before leaving. Put your details on the labels provided.

Service Request System

www.gla.ac.uk/schools/engineering/informationforstaff/technicalservices

Step 4

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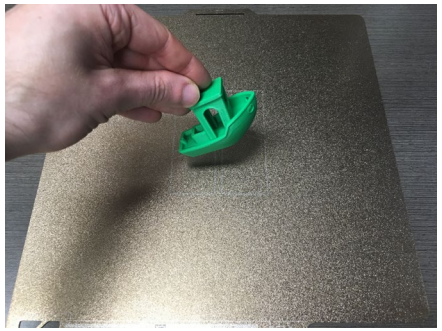
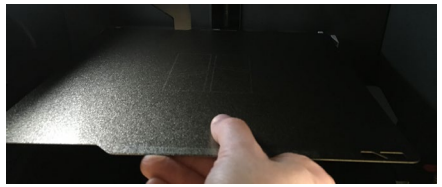
A



B



C

A – When the print is complete, carefully remove the build plate from the printer. Separate the model from the plate by bending the plate, or carefully use a plastic scraper to assist.

Put any waste or support material into the bin. Do not excessively finish or file your model in the lab – take it away and do this elsewhere.

B – Use the plastic scrapers to remove any remaining material from the build plate. Carefully guide the build plate back on to the platen, ensuring it is keyed in and lay flat.

C – Follow the onscreen instructions until the printer is returned to its “ready to print” screen. Turn off the printer using the switch at the back. Erase your name and details from the label.

The printer and surrounding area should be left in the same condition as you would like to find it.

Checklist: When you are finished

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- Leave the machine and work area in the condition you would like to find it.
- Take the magnetic build plate out of the machine when removing your components. Do not remove printed objects from the plate when it is in the machine. This disrupts the printer's calibration.
- Remove all material from the build plate, and use the **plastic scrapers** provided if necessary. Do not leave build plates covered in material.
- Place the build plate back in the machine, flat and even on the platen.
- Put any tools used back in the boxes. Put any remaining waste material in the bin using the dustpan and brushes provided.
- Do not store private materials at the 3D Printer Farm. Unattended materials may be deemed fair use. Remove private spools from the facility after use.

Useful Information

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Service Request System

www.gla.ac.uk/schools/engineering/informationforstaff/technicalservices

3D Printer Farm Standard Operating Procedures and Policy

www.gla.ac.uk/schools/engineering/informationforstaff/technicalservices/abouttechnicalservices/ourteam/cadandgraphicsservices/3dprinterinformation/

For enquiries, training, or troubleshooting

1. Speak to the Technician present

2. Contact:
cadgraphics@glasgow.ac.uk

- Ultimaker troubleshooting: https://support.makerbot.com/s/topic/0TO5b000000Q4uRGAS/3d-printers
- Bambu troubleshooting: https://wiki.bambulab.com/en/home
- Print quality guide: https://www.simplify3d.com/resources/print-quality-troubleshooting/
- Bambu material table: https://bambulab.com/en/filament-guide
- Filamentive material table: https://www.filamentive.com/3d-printer-filament-materials-guide/
- Ultimaker material table: https://core-electronics.com.au/guides/ultimaker-printing-material-comparison/
- Ultimaker marketplace – material profiles: https://marketplace.ultimaker.com/app/cura/materials