Getting Started with 3D Printing:

The Hamilton Public Library is pleased to offer members the ability to submit projects to be created with our Library's 3D printers. The specific printer used to create your 3D print will be dependent on the branch to which you submit your file, and availability:

- The Ultimaker 2+ 3D Printer
- The Ultimaker 2+ Connect 3D Printer
- The Ultimaker 3 Extended 3D Printer
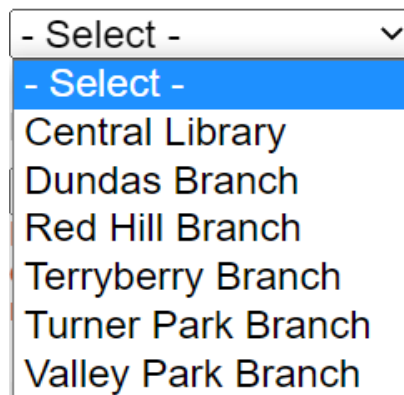- The Prusa i3 Mk3S 3D Printer

A 3D printer can create physical objects based on designs submitted as a digital file. These can be designs you've created yourself, or designs you've found online and have permission to use.

To submit a request to have a project printed on one of our 3D printers, Members can use the online Makerspace Takeout Request Form. Please submit only 1 file per request. Staff will upload your file for review, and then add it to the queue. When it is done, an HPL staff member will contact you to let you know it is ready for pick-up. Prior to placing your 3D print request, please read through our online 3D Printing Guidelines and our 3D Printing Frequently Asked Questions.

The Makerspace Takeout Request Form

1. When submitting your 3D file for consideration, the form will first ask for your preferred pick-up location. Choose the library that is closest to you. Please note that long print jobs can only be accommodated at Red Hill, Dundas, Central and Valley Park locations. 3D printing is available at all locations listed below:

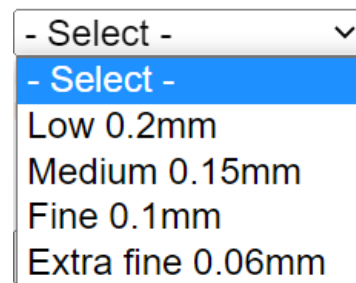2. Next, you will need to select your Print Profile. The Print Profile refers to the layering height of the extruded plastic and will affect the print speed and detail of the submitted file. A larger layer means the printer will not have to print as many layers to achieve the height of the print, resulting in a faster print. In general, increasing the layer height will slightly decrease the visual quality of the print and is better for medium-larger prints.

Print Profile *

- Select -

- Select -
Low 0.2mm
Medium 0.15mm
Fine 0.1mm
Extra fine 0.06mm

Please note that your print profile may need to be increased to achieve a print within the allowable time limit. Fine and Extra fine settings can substantially increase print time.

3. The Infill Percentage refers to the amount of plastic used on the inside of the print. Choosing a higher infill means there is more plastic supports on the inside, leading to a stronger object. You can request an infill percentage between 5-95%.
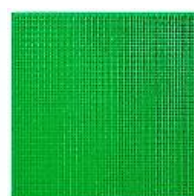
Infil Percentage *

20   %

Please enter a number between 5-95, inclusive.

A good standard percentage is 20%. With this infill percentage, you can achieve good strength with a lighter weight, and equates to efficiencies in both print time and cost.

0% Infill
-Time: 32m
-Material: 10.44g

40% Infill
-Time: 57m
-Material: 19.63g

10% Infill
-Time: 39m
-Material: 13.33g

100% Infill
-Time: 1h 26m
-Material: 30.54g

4. Supports: Whether you choose to generate supports for your 3D print will depend on the print and placement. 3D printing works by extruding layers on top of one another and is therefore limited by gravity, as the nozzle needs a base on which to layer the filament. If there are severe overhangs in your model, you will probably need supports. These supports are designed to be manually removed after the print job is complete. Sometimes reorienting the model on the bed minimizes this need.

Generate Support? *

○ Yes

○ No

Most prints will require supports.

5. Next, choose the Filament Colour and the Print Size. If the model needs to remain at the original size, please choose "Native STL size". Some models are quite large and can either; not fit on the 3D bed, or not be printed within the maximum allowable print time. In either case, if we can scale the model to accommodate either of these parameters, please choose "Scale to fit print time".

Filament Colour *

| - Select - ∨ |

Print Size *

| Scale to fit print time ∨ |
| Scale to fit print time |
| Native STL size |
| Other (please specify) |

6. Additional Information Field: Be as clear and detailed as you can. Ie: "I would like you to print 3 of these files as one print. Please orient the prints to minimize supports. If you need to decrease the infill to be able to print within the time limit, please do." The more information we have, the better!
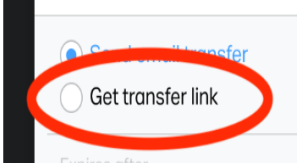
Additional information

Any information not captured above, or specifics about your print.

7. Submitting the File via We Transfer: The final step will be to upload your file via WeTransfer in order to get the transfer link to paste in the "WeTransfer URL" field. See How to Use WeTransfer to Upload Your Files for step-by-step instruction on the process. Please submit only 1 STL file per transfer submission.

3D Printing Frequently Asked Questions:

Materials & Cost:

PLA: The Hamilton Public Library uses PLA filament, or Polylactic Acid, in all of their 3D prints. PLA filament is derived from renewable resources, such as corn starch or tapioca roots and often considered a bio-plastic. One of the best things about PLA plastic is that it is industrially compostable. It is important to point out that although PLA is compostable, it is very robust when used in most applications. However, PLA can become soft when exposed to high heat.

PLA Filament Cost: $0.10/gram

- We are happy to estimate how much a 3D print will cost prior to proceeding with the print job. Upload your file using our Makerspace Takeout Request Form and ask us to estimate the print cost before printing using the "Additional Information" field.
- Please note that any 3D prints that are over $10 in cost will have to be pre-paid prior to beginning the print job. To add money to your HPL card via SmartPay, please follow this link.

3D Printing Important Information:

- Maximum of three-3D print Takeout Requests per week, with a maximum print time of 12 hours between all print jobs.
- 3D printing jobs are limited to a 4-hour print time at Terryberry and Turner Park branches.
- 3D print jobs are limited to a 10-hour print time at the Central, Dundas, Red Hill and Valley Park locations.
- Please submit *each* file as a separate Takeout Request.
- Maximum Build Volume of our 3D printers:
  - The Ultimaker 2+ 3D Printer: 8.7" H x 8.7" W x 8" D
  - The Ultimaker 2+ Connect 3D Printer: 8.7" H x 8.6" W x 8" D
  - The Ultimaker 3 Extended 3D Printer: 11.8" H x 8.4" W x 8.4" D
  - The Prusa i3 Mk3S 3D Printer: 9.8" H x 8.3" W x 8.3" D

File Type:

The best way to submit your 3D design is as an STL file. Stereolithography is a file format often used in computer-aided design (CAD) software. It is also known as "Standard Triangle Language" or Standard Tessellation Language. When we receive your STL file, we upload it to our 3D Printing Software, which allows us to set the supports, infill, speed, and layer height. The program then slices the design into layers and creates the G-code; the programming language used by the 3D printer.

Where can I find 3D designs, and how can I make my own?
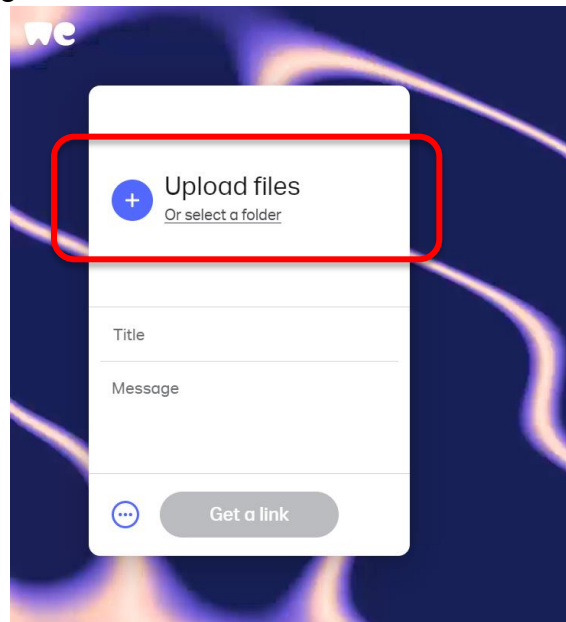
- Thingiverse, SketchUp, Free 3D, and more: A quick way to get started with 3D printing is to find an already-made STL file online. The internet is full of websites and resources for file-seekers.
- You can also create your own 3D files from a variety of CAD software platforms, such as: Tinkercad, Blender, Sketchup Free, Autocad, and more.
- The Hamilton Public Library leads regular "3D Design Intro" [programs](#) that include an introduction to Tinkercad. We also offer members the opportunity free online courses through our [LinkedIn Learning](#) portal, which you can find on our website under [HPL Online | Research and Reference](#). LinkedIn Learning offers many free online courses, including 3D printing, learning Tinkercad, and even how to "Become an AutoCAD Certified Professional."

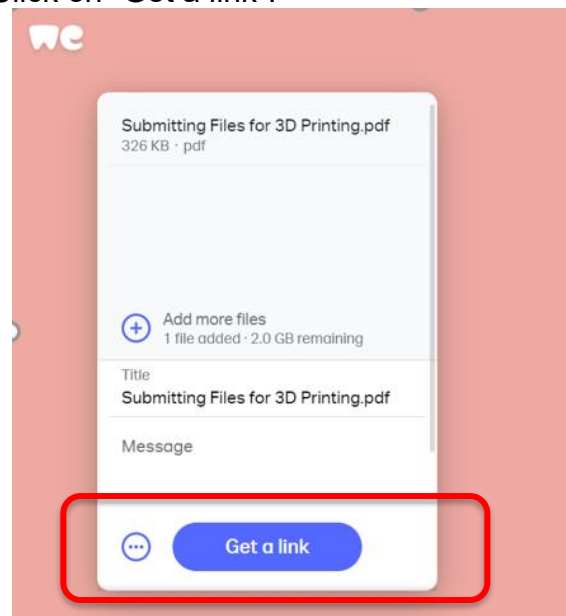**What is the expected turnaround time from submission to beginning the 3D print?**
We do our best to address all Makerspace Takeout submissions within 3-5 business days.
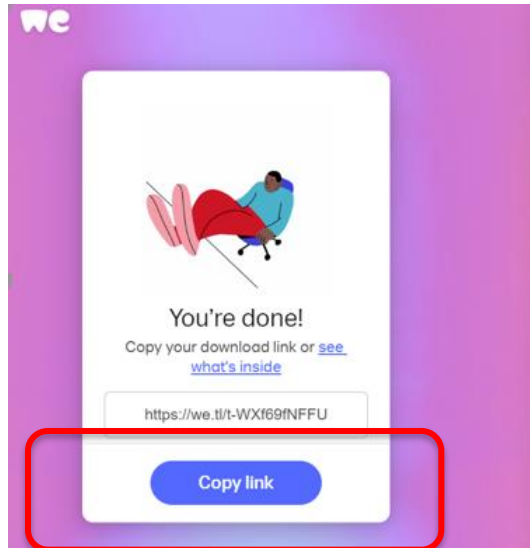
How to Use WeTransfer to Upload Your Files

1. Follow the link to WeTransfer.com
2. No need to sign up. Simply navigate to the left side of the screen, and click on: "Upload files":

3. Find the file for submission that you have saved on your computer and double-click on it to upload it to the WeTransfer link. Your file name should now appear in the "Title" line. Once it appears, the "Get a link" button will be blue. Click on "Get a link":
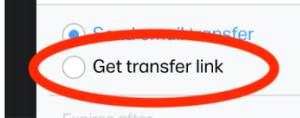
4. Your file will indicate it is transferring. Once complete, a file transfer link will appear within the window. Click on "Copy link":

5. Copy the link address into the Makerspace Takeout Request Form's "WeTransfer URL" field. Prove you're not a robot and submit your file. You have now submitted your file using the Hamilton Public Library's Makerspace Takeout Request Form!

Upload your file

1. Go to WeTransfer.com and click the icon on the bottom left

   Get transfer link

2. Click "Get transfer link"

3. Upload file and paste the URL below:

WeTransfer URL *

https://we.tl/t-WXf69fNFFU

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