The Mechanical Engineering Student Access

Machine Shop

U.C. BERKELEY

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Stratasys f170 Protocol

Fused Deposition Modeling (FDM) Overview:

FDM or 3D printing is a form of additive manufacturing technology where a three dimensional object is created by laying down successive layers of material. Additive manufacturing is defined by ASTM as the "process of joining materials to make objects from 3D model data, usually layer upon layer.

FDM begins with a software process, which processes an .stl file (stereolithography file format), mathematically slicing and orienting the model for the build process. If required, support structures are automatically generated. The Stratasys f170 machine dispenses two materials – one for the model and one for a disposable support structure.

Stratasys f170 – Machine Specifications:

- Build volume: 10” x 10” x 10” (254 mm x 254 mm x 254 mm)
- Model Material: ABS
- Support Material: Dissolve Support
- Available Layer Thicknesses: .125 mm (.005”), .178 mm (.007”), .25 mm (.01”), .33 mm (.013”)
- Accuracy: Parts are produced with an accuracy of +/- .2 mm (.008”)
- Programming: Prints are programmed via GrabCAD print

How to Submit a 3D Printing Job Request:

Please include the following items in your request:

- Accepted file formats: .stl or .sldprt
- .PDF drawing of part including dimensions and number of parts desired
- Infill style and fill density (*See Infill Style and Fill Density section below*)
- Layer thickness (*see Machine Specifications below – choose from 4 thickness options*)
- Please email your print requests to meshops-me@berkeley.edu
- Once we receive your request, we will respond back with a quote including the cost of materials and an approximate time needed to complete your job. Payment is required at the time of pick up. Acceptable forms of payment include credit/debit cards, checks made out to “UC Regents”, or an approved and signed IOC (interdepartmental charge) form.

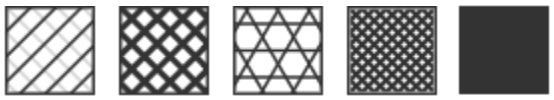
Current charges and other additional information on next page

Current Charges:

- $7.00 per cubic inch model
- $7.00 per cubic inch support

Infill Style and Fill Density:

There are 5 options to choose from when selecting an infill style. Within each of these you may have the option to specify the infill density:



- Sparse: Best used for further reducing the density when structural integrity is not a primary concern. *Infill Density Range: 17%-100%*
- Sparse - Double Dense: Best used to reduce overall density while maintaining structural integrity. *Infill Density Range: 33%-80%*
- Hexagram: Best balance between material usage and structural integrity. *Infill Density Range: 46%-60%*
- Sparse - High density: Best used for high structural integrity when solid infill may cause build issues. *Infill Density Range: None*
- Solid: Best used for maximum structural integrity. *Infill Density Range: None*

Materials Used:

Model: The acrylonitrile butadiene styrene (ABS) polymer is liquefied and deposited by an extrusion head, which follows a tool-path defined by the CAD file. The materials are deposited in layers as fine as .125 mm (.005") thick and parts are built from the bottom up – one layer at a time.

Support: Support material is used for making temporary supports while manufacturing is in progress. The soluble material is dissolved with a specialized mechanical agitation equipment utilizing a precisely heated sodium hydroxide solution.

Material specifications for the ABS material can be found here.

Additional Notes:

- While designing your parts, we have found that parts can have a minimum thickness of 1-1.5 mm (0.040-0.060"). Thinner features will not print successfully.
- Consider using fillets in the corners to add strength.
- Due to limited resolution, circular parts will not be perfectly round. If you plan on having mating pieces, there needs to be a minimum clearance of 0.178 mm (0.007").
- Expect external features to print larger than designed (Eg. Outer diameters).
- Expect internal features to print smaller than designed (Eg. Inner diameters).