Xometry

# Design Guide: Preparing a File for 3D Printing

VERSION 2.0

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# Technical Considerations

## Preferred File Settings

STEP is our preferred CAD file format. Working with this parametric format allows our team to be more inventive creating support structures. However, we will work with just about any CAD format, including native SolidWorks, AutoCAD and PTC Creo (Pro/ENGINEER.)

STL is the standard file type for our 3D Printing software. A mesh resolution of 0.01-0.03mm and a ≤0.016mm chord length produce an optimal STL file. To change your mesh resolution, while saving your file to STL, click on options and choose the resolution to coarse or fine. Customize the .stl output with manual changes to deviation & angle to fine tune the resolution for your part.

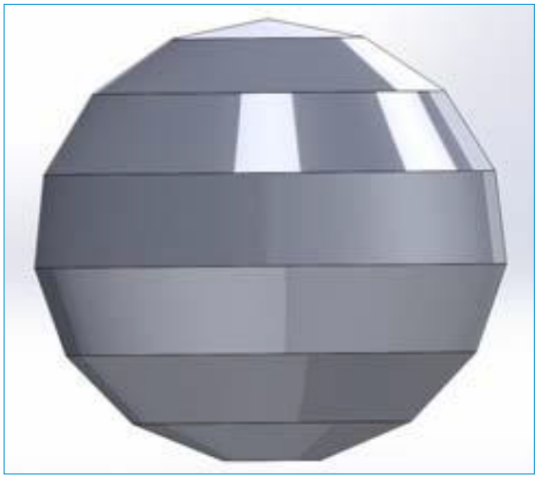
**NOTE:**

Keep in mind that higher resolution creates larger files, and recommended settings are given for a good mix of quality and file size.

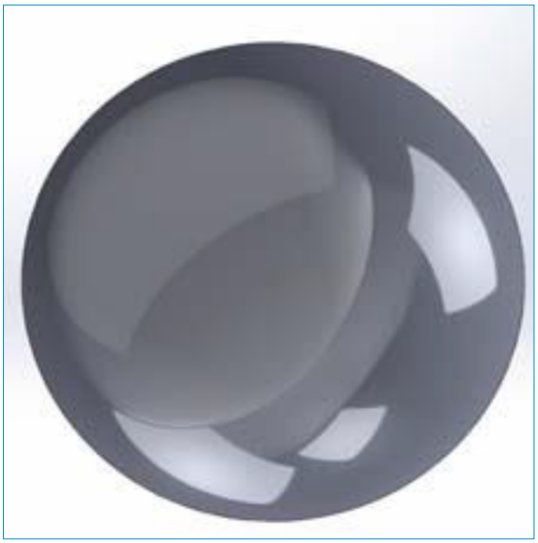
# STL File Resolution

A mesh resolution of 0.01 to 0.03 mm generally produces a good-quality STL file. Reducing mesh resolution below this range does not necessarily mean that model accuracy is improved. As a rule of thumb, designs that have many contours or curved surfaces need a higher resolution than flat, geometric surfaces.

To change mesh resolution while saving your file to STL, click on options to set the resolution to be coarse or fine. The STL file can also be customized with manual changes to the deviation and angle. Keep in mind that higher resolutions create larger files.



*Low resolution*

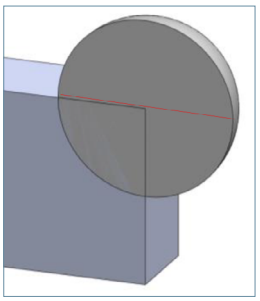


*High resolution*

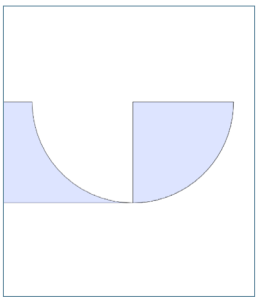
# Design Tips

## Overlapping Geometry

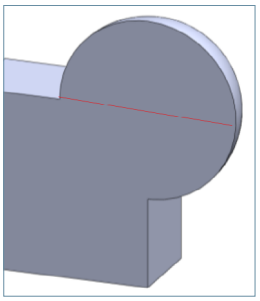
Overlapping geometry will sometimes cause problems, being misinterpreted by printer software when being converted into 2D layers. To ensure proper interpretation, multiple bodies are always unified, merged or booleaned together.



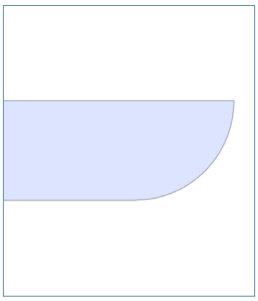
*Example of overlapping geometry*



*Cross section of model at left demonstrates possibility of data loss*



*Unified/merged geometry*



*Cross section of model at left demonstrates intact data*

## Minimum Thickness

It is recommended that the features of a design have a minimum thickness of 0.6 mm [.024 in].

**NOTE:**

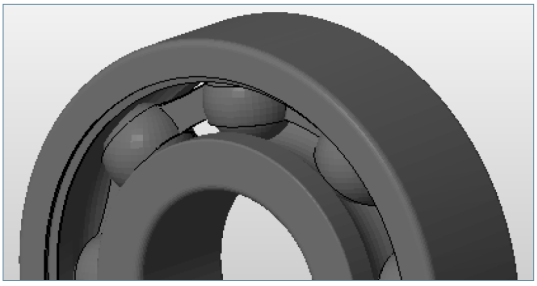
Xometry recommends >1 mm [.039 in] for load-bearing features.

*Example of a model design with thin features*

# Clearance Between Moving Parts

A great feature of SLS and PolyJet 3D printing is the ability to print all-in-one assemblies that feature moving parts.

For assemblies including moving parts, e.g. fine detail separation, Xometry recommends a clearance of >0.5 mm [.02 in].



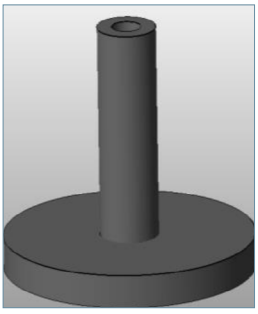
*Example model design of an all-in-one assembly with moving parts*

# Confined Hollows

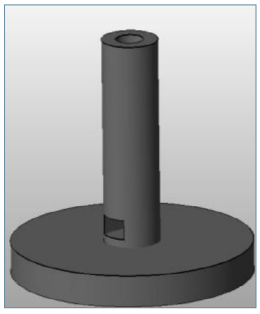
If a model design contains confined hollows, there is no way to remove the support material. Xometry recommends designing a model so that support material can be removed. This is especially important when printing moving parts and parts made from clear material.

Limiting cavities that are confined to one opening will reduce cleaning time for support material, thus lowering the price of the build.

Additionally, cavities having a depth of over 50.8 mm [2 in] with only one access point are not recommended.



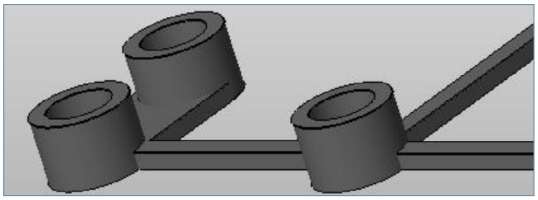
*Original model*



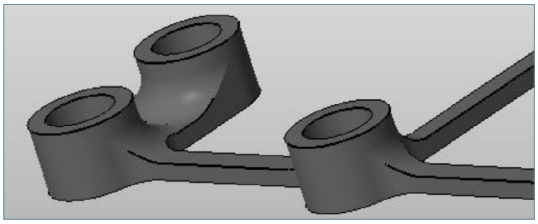
*Model with holes added for removing support material*

# Fillets

Adding fillets (rounded edges) to a design will strengthen unsupported surfaces and make parts more robust by distributing stress over a broader area. While Xometry's PolyJet, SLS, and DMLS printers are capable of printing 90° corners, fillets are recommended to add strength to any part. "Lollipop head" features, where a large mass connects to a much smaller mass, are especially prone to breaking, making them ideal candidates for fillets as well.



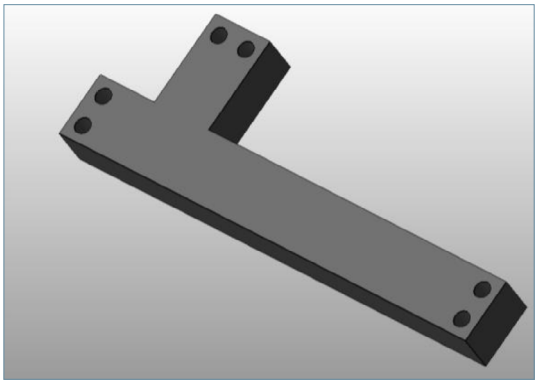
*Original model*



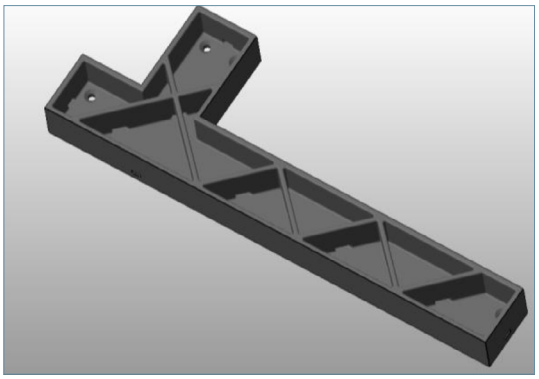
*Model with fillets added*

# Lightweighting

Creating pockets in designs will reduce print material and making it more cost-effective to build. When creating a pocket, be sure to create an exit hole for un-sintered (SLS and DMLS) or support (PolyJet) material removal.



*Original model*

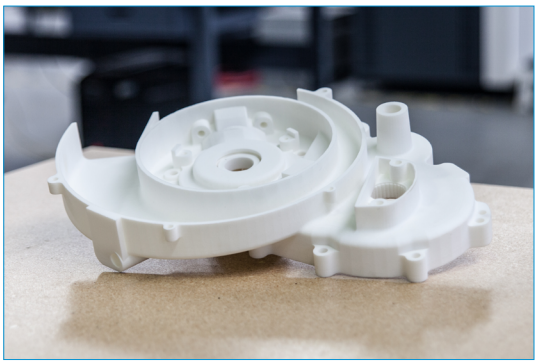


*Model with lightweighting*

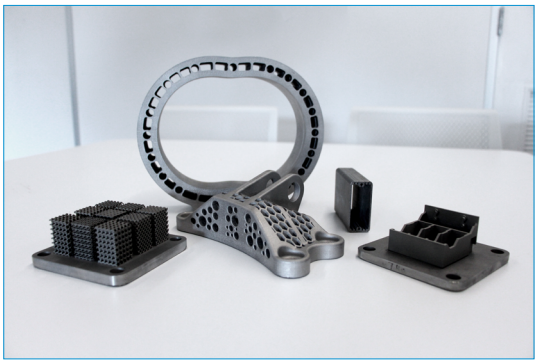
# Build Volume

The maximum build volume of a part depends on the 3D printing technology used:

- SLS: 13″ x 13″ x 20″ (13″ max dimension preferred)
- FDM: 24″ x 36″ x 36″
- PolyJet 3D: 19″ x 15″ x 7″
- DMLS (Aluminum): 6″ x 6″ x 6″
- DMLS (Stainless Steel): 9″ x 6″ x 6″



*Part built with SLS*



*DMLS parts of various sizes*

*FDM parts in progress*

# Resources at Xometry

## Online Instant Quoting

**Web**: Upload your CAD file at get.xometry.com/quote

**CAD**: Download the free Xometry Add-In for SOLIDWORKS: xometry.com/solidworks

**Accepted File Types**: .stl, .step, .stp, .x_t, .x_b, .sldpart, .ipt, .prt, .sat, .catpart (max file size: 300MB)

**Capabilities**: CNC Machining, Sheet Metal Fabrication, 3D Printing, Urethane Casting, Injection Molding

## Live Engineering Support

**Hours**: M-F 8:00 AM - 9:00 PM EST

**Email**: support@xometry.com

**Phone**: (240) 252-1138

**Online**: xometry.com/support offers live chat, FAQs, and other helpful articles.

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