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Design Guidelines

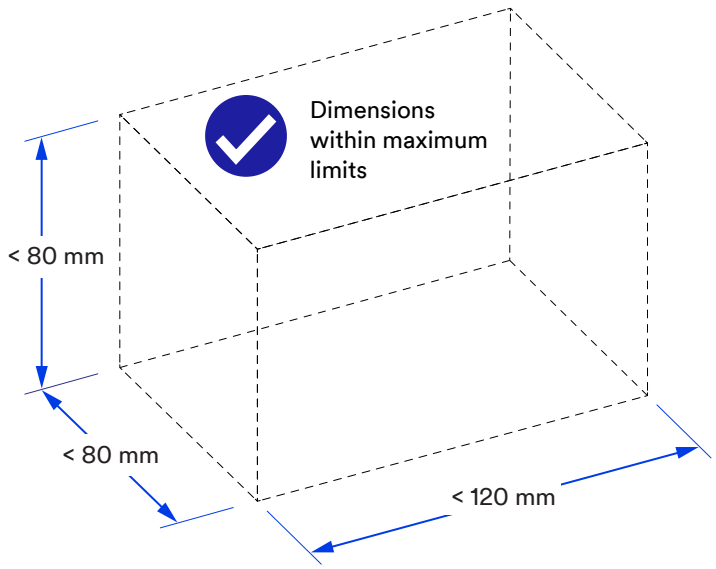
3D Printing with PTFE

Note: The purpose of this guide is to provide basic information to help user in evaluating their design of 3D printed PTFE parts. The information provided is general or summary in nature and is offered to assist the user and their design engineers. The information is not intended to replace the user's careful consideration of the unique circumstances and conditions involved in its design and use of 3M 3D printed products. The user is responsible for determining whether this information is suitable and appropriate for the user's particular use and intended application.

The user is solely responsible for evaluating third party intellectual property rights and for ensuring that user's use and intended application of 3M product does not violate any third party intellectual property rights. Any technical information, recommendations, and other statements contained in this document are general in nature and the accuracy or completeness of such information is not guaranteed. Such information should not be used for specification purposes. Such information is intended for persons with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information.

Part Dimensions

Maximum: **120 mm x 80 mm x 80 mm**



Part designs that exceed the specified dimensions will require redesign or segmentation to fit within the build volume. For larger parts that cannot be easily modified or for assistance, please contact us for additional support.

Large parts that do fit within the build volume may still require additional modifications (e.g. hollowing, use of internal latticework, support structures) to ensure a successful build.

Printed PTFE tolerances typically comply with ISO 2768-1 c.

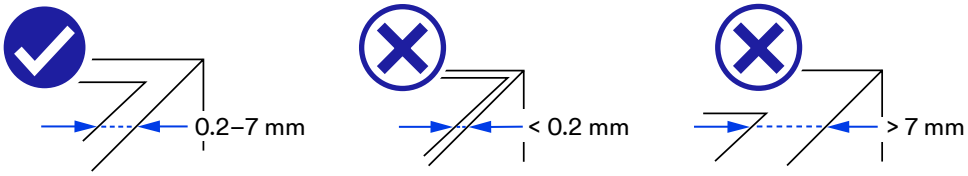
Nominal size range	Tolerance
0.5–3 mm	+/- 0.2 mm
> 3–6 mm	+/- 0.3 mm
> 6–30 mm	+/- 0.5 mm
> 30–120 mm	+/- 0.8 mm

Please note that dimensional accuracy for 3D printed parts is geometry dependent so actual results may vary. When possible, please indicate the most dimensionally critical features of the part.

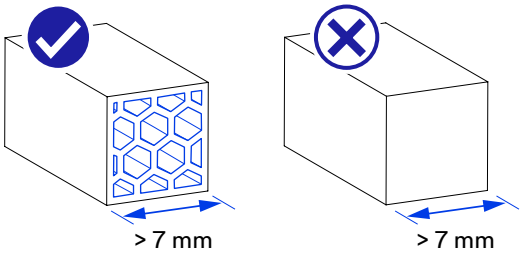
Please specify all relevant tolerance requirements clearly when submitting part designs and ensure units (e.g. mm, inch) are referenced in CAD files.

Wall Thickness

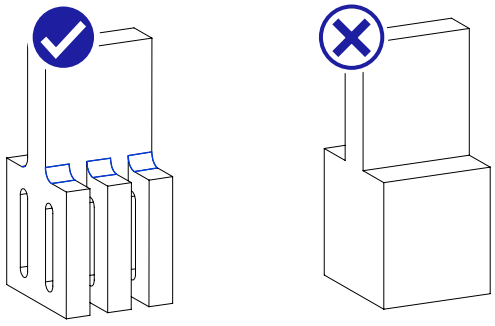
Minimum: **0.2 mm**
Maximum: **7 mm**



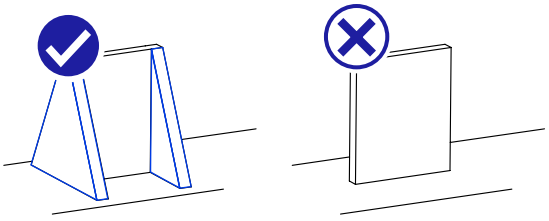
To achieve the best possible part quality, wall thicknesses between 0.2 and 7 mm, preferably 2–4 mm, are recommended. Minimum wall thicknesses are generally dependent on overall part size and should be increased for larger or heavier parts.



Hollowing thick walls or features and reinforcing with internal latticework is suggested.



Abrupt changes in wall thickness may lead to stresses or distortion. Coring thick sections and adding fillets can alleviate related issues.

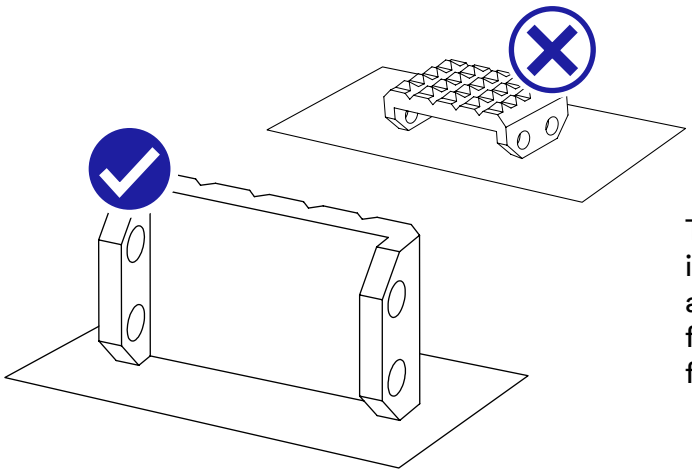


Designed-in reinforcements for thin, free-standing walls are suggested. Unsupported walls may require thickening or temporary support structures.

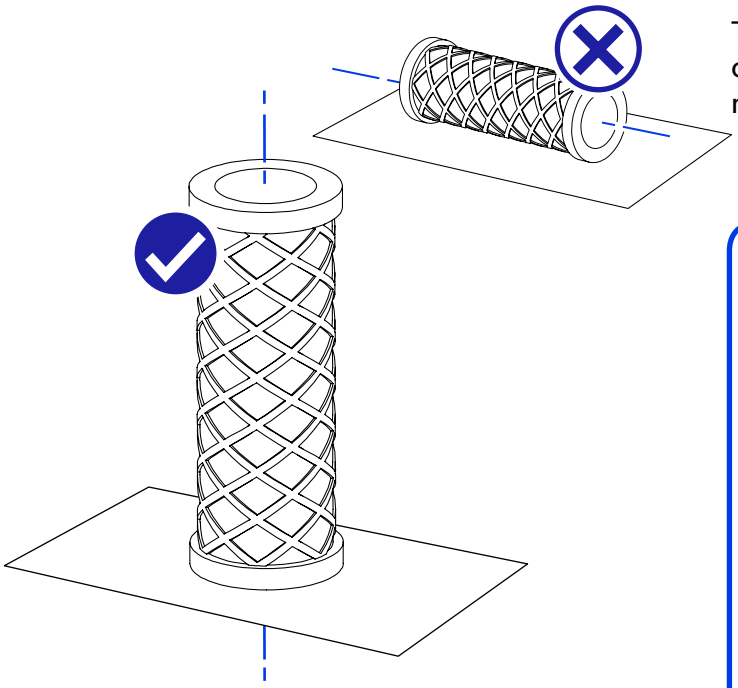
Print Orientation

Print orientation is an important design criterion because it often determines which features are not self-supporting and which surface(s) will face the build platform. These areas may require supports. For features that require supports, the finished surface quality at contact points tends to be poorer than areas that were not supported. In addition, orientation will determine the location and pattern of layer steps.

The optimal print orientation will be chosen by 3M experts based on the following criteria.



The total down-facing area is reduced. Flat, structured, and application-critical features are faced away from the build platform.

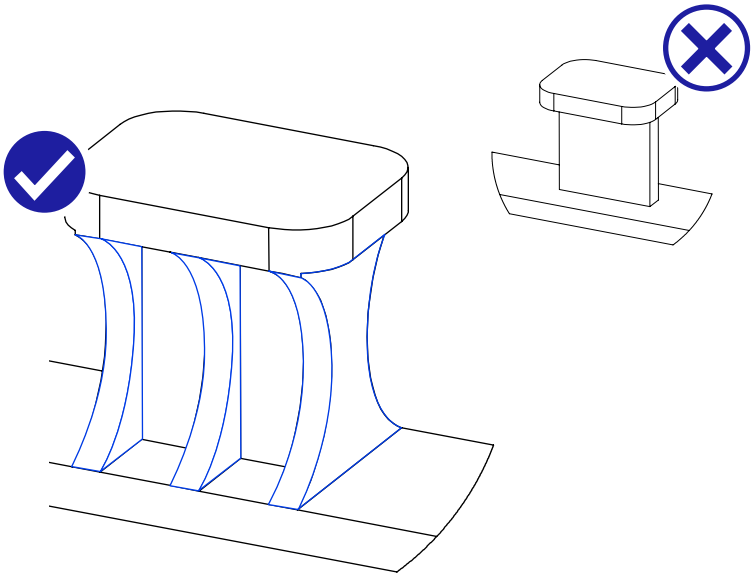


The dominant bounding curvature axis is oriented normal to the build platform.

Please indicate surfaces/ features where surface quality is of highest priority. Our 3M experts will consider your requirements for printing orientation. The required number of supports can often be minimized or components can be oriented to become self-supporting.

Supports

Support structures link the part to the build platform to increase stability throughout the printing process. Unsupported features like overhangs and bridges could cause defects or print failures.



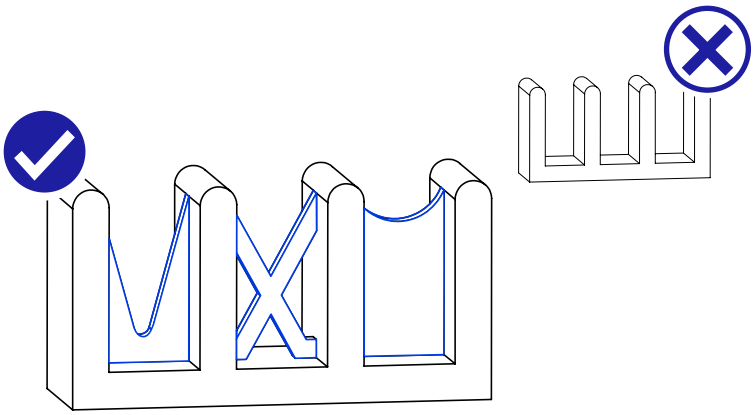
Ideally, parts should be designed to be as self-supporting as possible. Self-supporting parts are often not possible, therefore support structures are added to design models prior to printing. 3M experts will design, add and remove these temporary structures.

Removal of support structures is an important consideration for additive manufacturing. Finished surface quality will be affected where support structures are required. Please indicate surfaces where supports should be avoided.

Aspect Ratio

Maximum: **4:1**

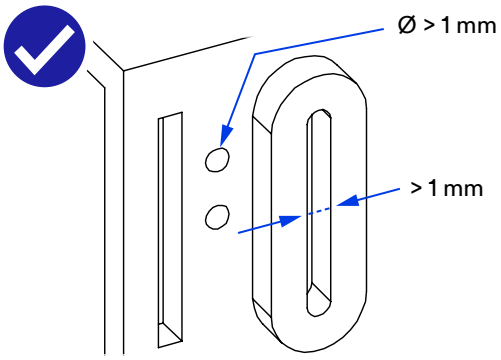
The aspect ratio describes the relationship between dimensions (width, length, or height) of a feature. Features that exceed an aspect ratio of 4:1 may deform in the absence of supports.



Bridging and supporting features can ensure print quality for higher aspect ratio designs.

Holes and Cavities

Minimum: **1 mm**



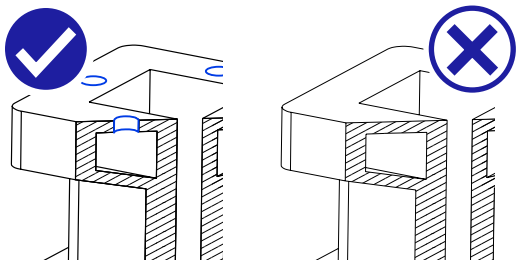
Holes/cavities with a minimum width of 1 mm are recommended as smaller dimensions may result in undersized features. For holes where final dimensions or circularity are critical, 3M experts will drill/bore to the final parameters during post-processing.

For a given hole width, shallower holes and through-holes have better outcomes.

Escape/Drainage Holes

Minimum: **3 mm**

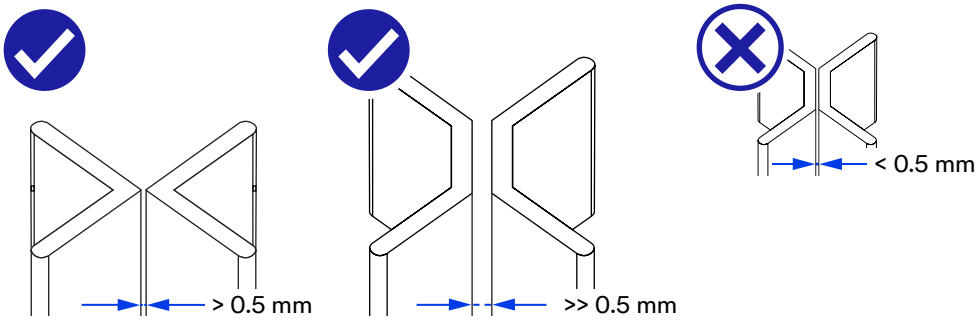
Escape holes must be added to hollow features to prevent resin from becoming trapped inside closed cavities. A minimum diameter of 3 mm is suggested.



The optimal position of the drainage holes depends on part orientation. You may include holes in your design if you want them to be in a specific location.

Spacing

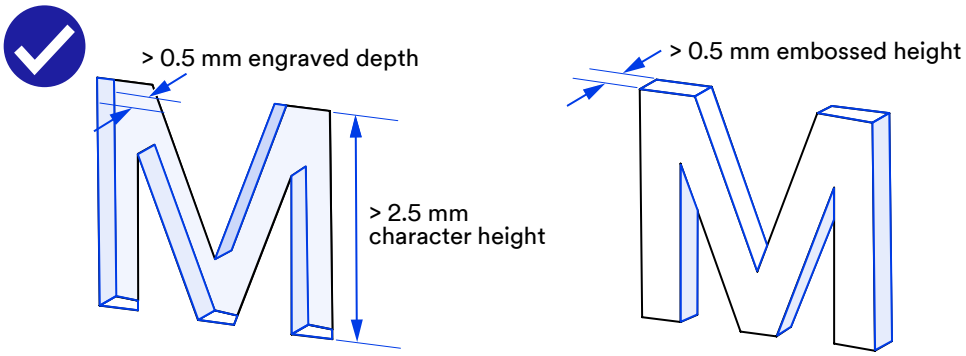
Minimum: **0.5 mm**



Spacing (gaps) between separated positive features should be greater than 0.5 mm. In the case of gaps that cover a wide area, greater spacing may be required.

Surface Features

Typical embossed height: **> 0.5 mm**
Typical engraved depth: **> 0.5 mm**
Typical character height: **> 2.5 mm**



Surface features are features that are slightly raised or lowered from the surface and may include labels and text. Characters with a minimum height/depth of 0.5 mm and character height of 2.5 mm (or larger) will ensure that labels are clearly visible.

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