3D Printing Guidelines

✓ As a 3D printed object is printed in layers, the lower finished layer becomes a deposited support for the next one.

- For impended areas of an object avoid the exposed angle to be more than 45°. As a rule of thumb regions that remain unsupported will end to have rougher finish than the rest of the model.

≤ 45°

Exposed angle should be less than 45°

✓ As a common practice try to design your model as lightweight as possible adding supports <u>only</u> where needed (depending on the 3D printing technology used).

✓ Adding more supports than required (over-engineering) will result more weight and cost (especially in metallic 3D printed models) as well as printing time. Supports should be added only where necessary.

✓ The design of a model needs to be suitable with the specific 3D printing methods that is going to be used while a part made with traditional manufacturing methods (inj. moulding, blow moulding etc) will have to follow different design guidelines.
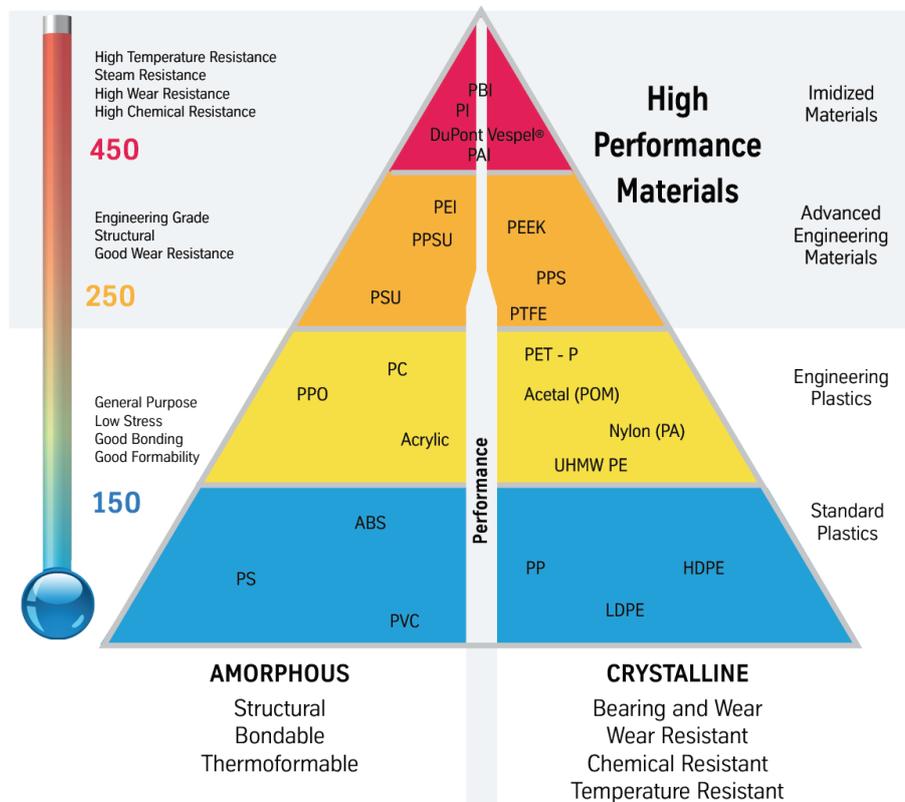

Could this model have less supports?

✓ Pay attention to the orientation of the part that is going to be 3D printed. If your model has the centre of gravity above the Z-height medium then it is recommended to be 3D printed upside down.

✓ Model's wall thinness is an important factor. As a general guideline, a designed model should have more than 0.8mm wall thickness to be successfully printed. Thinner walls might end to thickness inconsistencies to your 3D printed model or might be completely unprintable.

✓ Always make yourself aware of the material properties your model is going to be 3D printed of. There are materials with different core properties such as strength, stiffness and durability

**Be aware of material properties prior 3D printing your model**

✓ Ensure that your 3D model has not large flat areas as there is a risk of distortion during 3D printing. Due to the constant heat concentration (melting, sintering) on the same flat area while 3D printing, the part locally might show surface anomalies and also angular distortion (face might seem to be flat but it in reality it won't be as it will be overheated against a pivot area). This risk is higher when the model is particularly thin. A way to mitigate this risk is to

- Avoid large flat areas
- Add tangent fillets on the edges (round corners)

✔ Choose the best material based on the intended application of your 3D printed part.

High Temperature Resistance
Steam Resistance
High Wear Resistance
High Chemical Resistance

450

Engineering Grade
Structural
Good Wear Resistance

250

General Purpose
Low Stress
Good Bonding
Good Formability

150

PBI
PI
DuPont Vespel®
PAI

PEI
PPSU
PSU

PC
PPO
Acrylic

ABS
PS
PVC

PEEK
PPS
PTFE

PET - P
Acetal (POM)
Nylon (PA)
UHMW PE

PP
HDPE
LDPE

High Performance Materials

Imidized Materials

Advanced Engineering Materials

Engineering Plastics

Standard Plastics

Performance

AMORPHOUS
Structural
Bondable
Thermoformable

CRYSTALLINE
Bearing and Wear
Wear Resistant
Chemical Resistant
Temperature Resistant

High performance materials pyramid

✔ Stress concentration during 3D printing. A residual local stress might appear in your 3D printed part as a surface distortion. That might happen due to poor model support, high flat areas, wrong machine calibration (high speed, wrong temperature). Up to a point, a good practice to reduce that risk is to increase the strength of your model and apply fillet zones in the areas that are likely to be distorted.
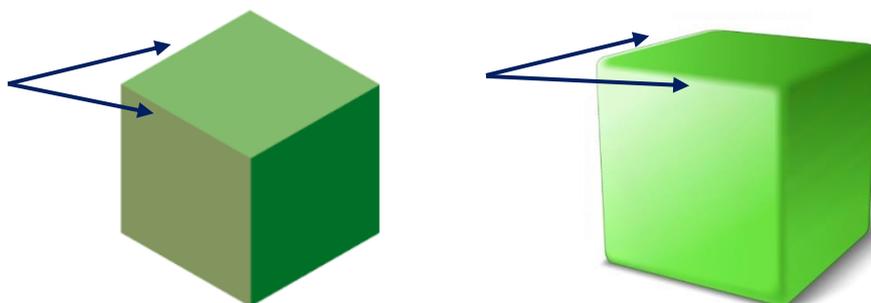
Rule of thumb to round the edges of your model