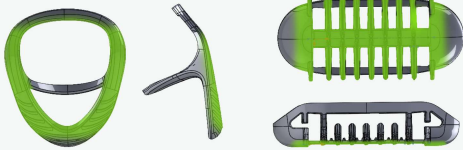


Additive  
Manufacturing  
**Redesign**  
**Guidance**  
**Cards**

# Smoothness

An example guide on how to define areas requiring smoothness and how to satisfy this requirement when designing for 3D printing.

## Identifying the area



Surfaces that come into **contact with skin** must be smooth to avoid irritating the skin.



Surfaces that require low friction to ensure **efficient flow** and prevent unwanted resistance.

## Ask: Can the area(s) be smoothed by sanding?

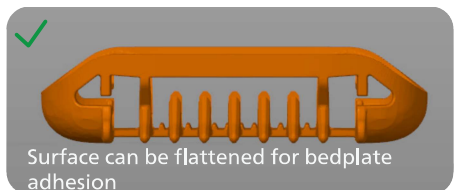
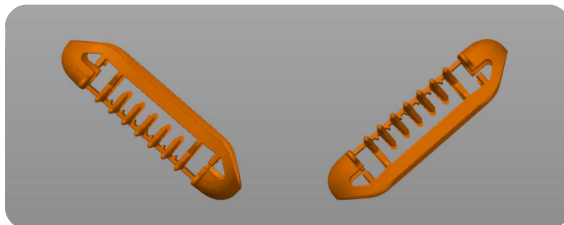
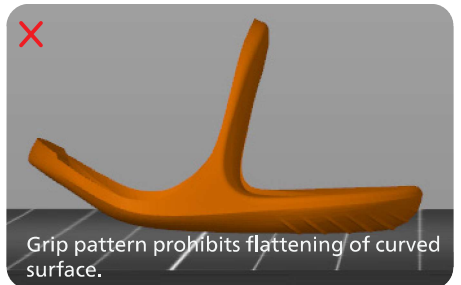
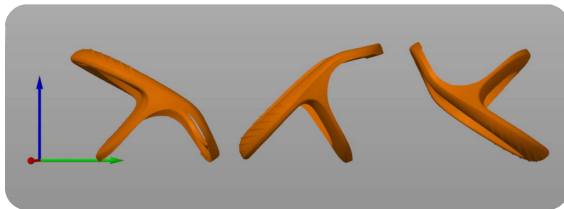
Watch out for textures that must be preserved, and consider sandblasting for internal surfaces that cannot be reached manually.

## Ask: Can the area(s) be printed at a 45° angle?

Watch out for textures that must be preserved, and consider sandblasting for internal surfaces that cannot be reached manually.

## Ask: Can the area(s) be printed flat on the buildplate?

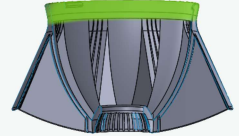
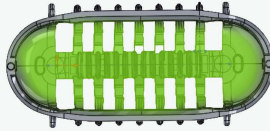
Watch for curved geometries that won't make full contact, and evaluate if flattening the area is possible while maintaining sufficient adhesion.



# Dimensional accuracy

An example guide on how to define areas that require dimensional accuracy and how to satisfy this requirement when designing for 3D printing.

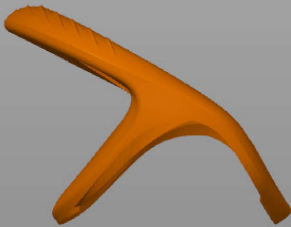
## Identifying the area



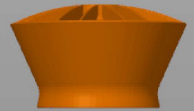
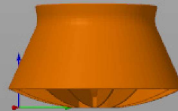
Identify all areas that **interface** with the device or assembly they attach to, look for features such as **click-fits**, or **alignment profiles** that must match precisely.

## Ask: Can the area(s) be printed parallel to the build plate?

Consider whether all identified features lie in the same plane.



Geometry prevents both sides from being printed parallel to the build plate simultaneously.

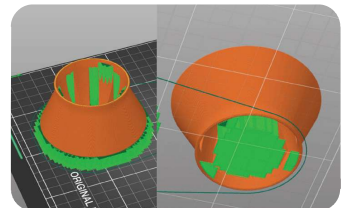
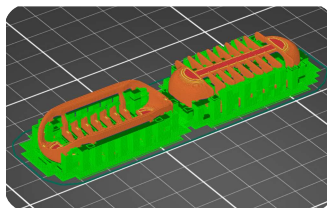
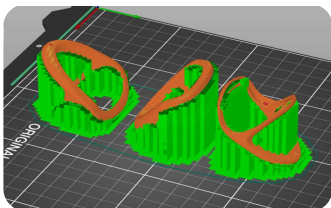


All features are in the same plane.



## Ask: Can the area(s) be printed with supports?

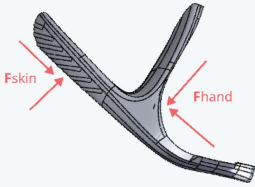
Explore how support structures could stabilize the identified features during printing.



# Strength

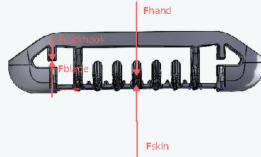
An example guide on how to define areas that require strength and how to satisfy this requirement when designing for 3D printing.

Free body diagram (FBD) of the part in use



**$F_{hand}$ :** User-applied force pressing the device against the skin and driving its movement.

**$F_{skin}$ :** Reactive force of the skin, including resistance to pressure and friction due to motion.



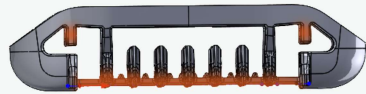
**$F_{hand}$ :** User-applied force pressing the device onto the skin

**$F_{skin}$ :** Skin reaction force

**$F_{blade}$ :** Force of the blade acting on the click hook

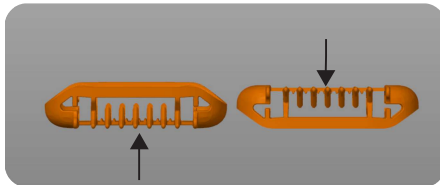
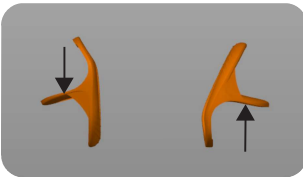
**$F_{clickhook}$ :** Reactive force resisting blade motion

Find the area that withstands the highest force

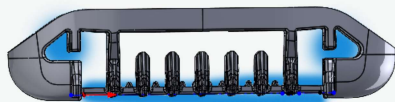
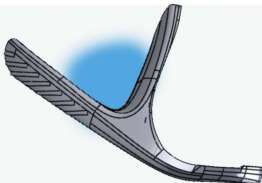


Look for **thin** or **unsupported** features where forces are **applied** or **transferred**.

Orient the highest load in the x-y plane



Free body diagram (FBD) of the part in use



Look for **non-functional empty regions** where material can be added, **thin features that can be thickened**, and **unsupported walls that could have additional structural support**. Assess whether the reinforcements reduce the identified loads.

# Finding the modifiable areas

## Step 1: Analyze Empty Spaces

Ask: Why does this empty space exist?

Is it functional?  
(e.g., light passage,  
airflow, hair  
clearance)

Is it aesthetic? (e.g.,  
design language,  
user experience)

Were these voids  
left for injection  
moulding material  
savings?

## Step 2: Mark Areas Where Material Cannot Be Added

Examples:

Adding material  
would block a  
functional path  
(light, hair, airflow).

Adding material  
would interfere  
with assembly or  
movement.

Adding material  
would violate  
safety constraints.

## Step 3: Mark All Areas Where Material Can Be Added

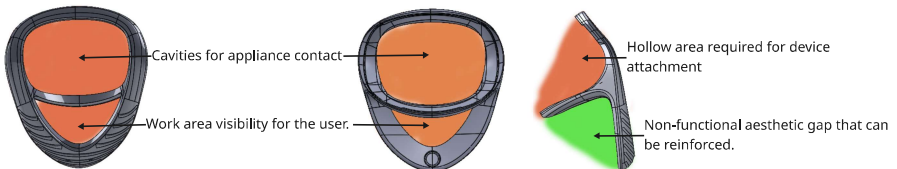
Examples:

Hollow sections  
created for  
injection moulding.

Non-functional  
aesthetic gaps or  
cavities.

Thin walls or ribs  
that could be  
thickened without  
affecting function.

### Examples



Inner ribs and fins designed for heat dissipation and effective airflow cannot be filled.



Non-functional aesthetic gap that can be reinforced.

Space between teeth for hair clearance.

Hollow area required for device attachment.

