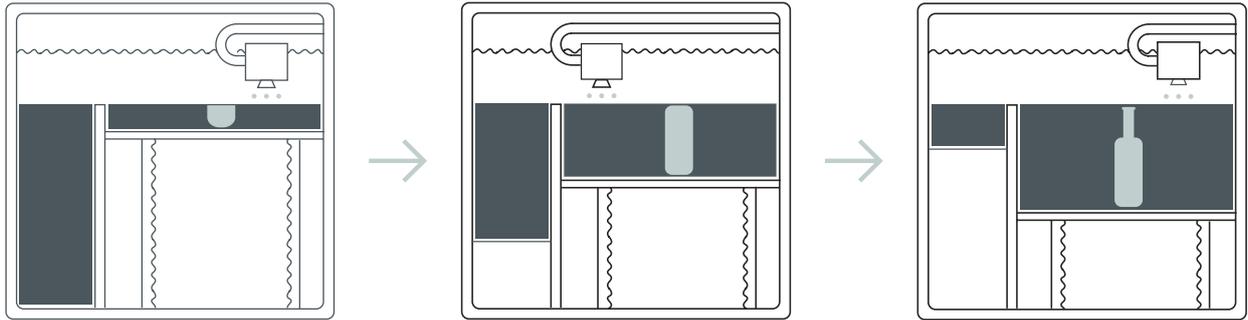


# 3D-Printing Guidelines

## How Binder Jetting works



**1**

Binder Jetting is an additive manufacturing process in which a liquid binding agent is selectively deposited to join powder particles.

**2**

Layers of material are then bonded to form an object.

**3**

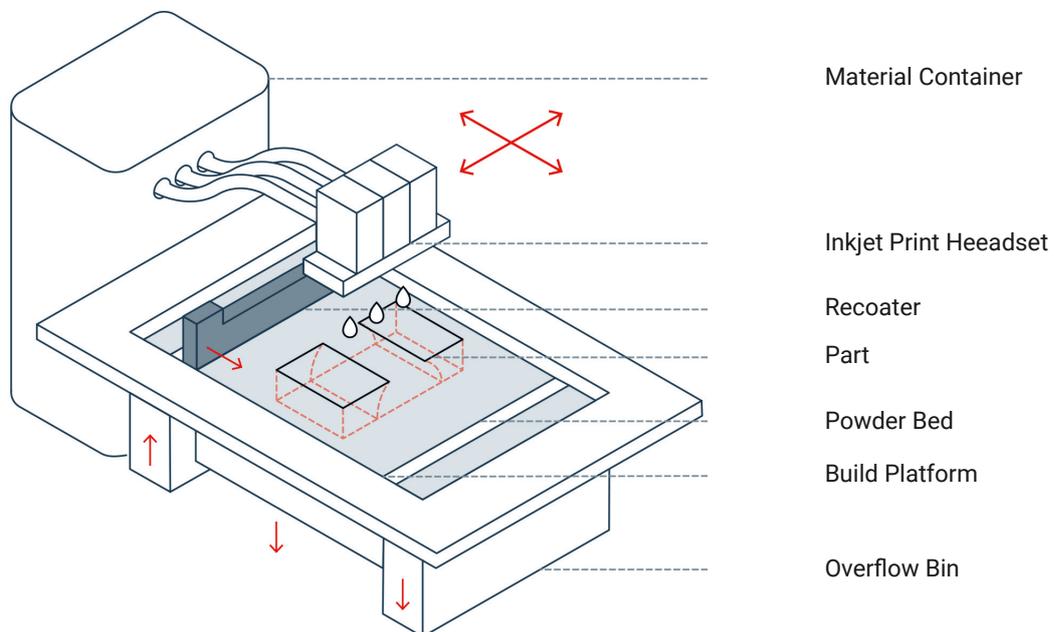
The printhead strategically drops binder into the powder.

**4**

The job box lowers and another layer of powder is then spread and binder is added.

**5**

Over time, the part develops through the layering of powder and binder.



## Green State

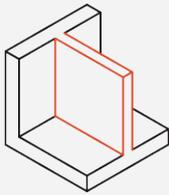
Out of the printer, Binder Jetting parts are in a fragile green state. At this point, the parts are very delicate as they are essentially comprised of sand or powder particles glued together.

If the part is too fragile to be handled in the green state, secondary post-processes cannot be applied to it. Post-processing involves removing the unbound powder from the surface of the part with brushes and pressurized air and then strengthening the part through an infiltration.

It is important for the designer to adhere to the guidelines presented to ensure that the parts are strong enough to survive handling during post-processing.

## Print Features

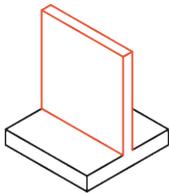
This recommended measurements can slightly change depending on the type of sand used in the printing process and size of the piece. Sandhelden will always check the final 3D file and its printability.



### ***wall thickness $\geq 5$ mm***

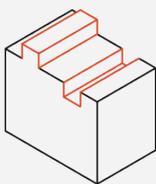
The recommended minimum wall thickness is 5 mm.

This ensures that the part can be removed from the powder and handled in the green state without being damaged.



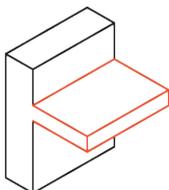
### ***Unsupported walls $\geq 7$ mm***

Unsupported walls (including fins or ribs) are at a greater risk of being damaged during handling and should not be thinner than 7 mm



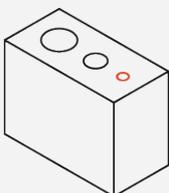
### ***Embossed & engraved details $\pm 1$ mm***

To ensure details are visible, embossed and engraved details should be at least 1 mm below or above the surface.



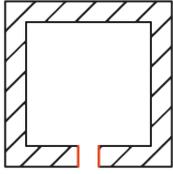
### ***Unsupported edges $\leq 50$ mm***

Although the powder surrounding parts offers support during the build stages, unsupported edges are at a high risk of breaking during handling in the green state. Unsupported edges should be no longer than 50 mm when wall thickness is 7 mm.



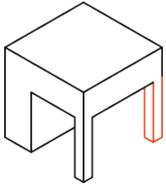
### ***holes $\varnothing 3$ mm***

For a hole to be successfully printed the minimum diameter should be no smaller than 3 mm.



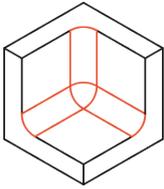
### **escape holes $\varnothing$ 30 mm**

Binder Jetting is able to produce parts with hollow sections. To remove unbound powder after printing, escape holes must be included to the design. Escape holes must be a minimum of 30 mm diameter and the use of at least 2 escape holes is recommended.



### **minimum features $\geq$ 10 mm**

The main concern with Binder Jetting minimum feature size is the potential for damage. Although the process is able to produce parts with very fine details, it is the handling of the very brittle parts in the green state that is the issue. Because of this a minimum feature size of 10 mm is recommended.



### **minimum features $\geq$ 3 mm**

All fillets should be a minimum of 3 mm radius and used in all edges of the design where possible. This ensures that they will not be damaged in the green state. These fillets are particularly important for internal cavities to aid in powder removal and accurate construction.

Source: 3D Hubs

## **important 3D file information**



### **required format: STL**

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An STL file is 3D printable if each edge is connected to exactly two faces (manifold).

Faulty or poorly exported STL files can lead to unexpected results: missing faces, poor resolution or other geometric inaccuracies.



### **fix your file**

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To make the most of this technology and use our online 3D printing service, you have to be aware of all the mistakes that could make your 3D file non-printable.

Non-manifold edges, naked edges or not minding surface orientation are some of most common errors.

<https://www.3dhubs.com/knowledge-base/fixing-most-common-stl-file-errors/#errors>