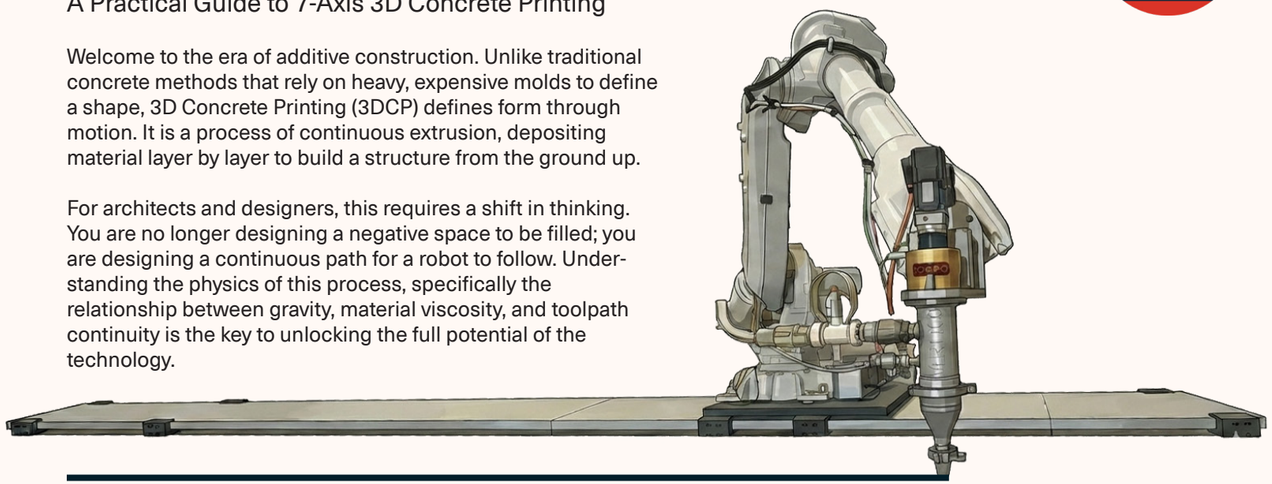
# PRINTERA

## Designing for 3D Concrete Printing (3DCP)

A Practical Guide to 7-Axis 3D Concrete Printing

Welcome to the era of additive construction. Unlike traditional concrete methods that rely on heavy, expensive molds to define a shape, 3D Concrete Printing (3DCP) defines form through motion. It is a process of continuous extrusion, depositing material layer by layer to build a structure from the ground up.

For architects and designers, this requires a shift in thinking. You are no longer designing a negative space to be filled; you are designing a continuous path for a robot to follow. Understanding the physics of this process, specifically the relationship between gravity, material viscosity, and toolpath continuity is the key to unlocking the full potential of the technology.

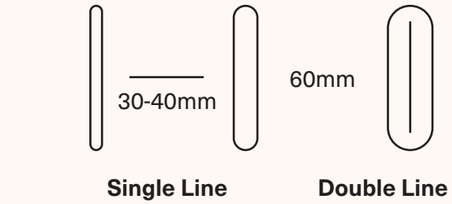


## The Bead

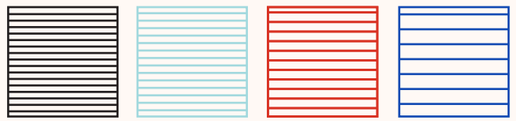
Extruded Concrete from Nozzle

The dimensions of this bead determines both the structural wall thickness and the vertical resolution of the piece. The beads width can be adjusted and either single line or double line extrusion. Equally important is the layer height, which dictates the visual quality of the print. We offer standard layer heights of 6mm, 8mm, 10mm, 12mm, and 15mm, as well as a specialized 20mm option for unique, bold texture applications.

For complex designs that require disconnected geometry, our design team can implement specific toolpath strategies to manage start/stop sequences without compromising the structural integrity of the piece.




**Single Line** **Double Line**



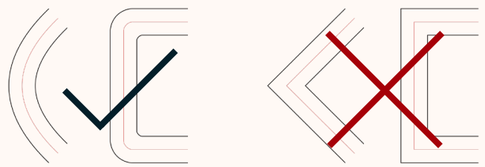

**Layer Height**

## Design for Printing

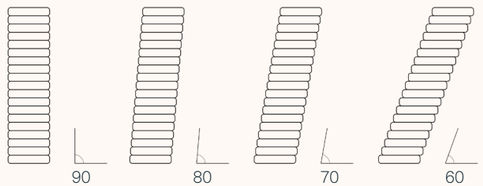
Parameters to Understand Printability

Because each layer relies on the one below it for support, there are physical limits to how far the material can “lean out” into open space before it collapses. Our standard self-supporting “Safe Zone” ranges from vertical walls (90°) down to a 60° angle. However, if your vision requires dramatic cantilevers or horizontal bridging that exceed this limit, the design is still achievable. In these cases, we utilize temporary supports such as loose sand or CNC-cut foam.

While our robotic arm moves with sub-millimeter precision, the concrete itself is a viscous fluid, not a solid block. Even if the robot is programmed to execute a sharp 90-degree turn, the extruded bead will naturally pull inward as it turns, resulting in a slightly rounded edge.



**Corner Results**




**Overhang**

## Robotic Constraints

Limitations but not Impossible

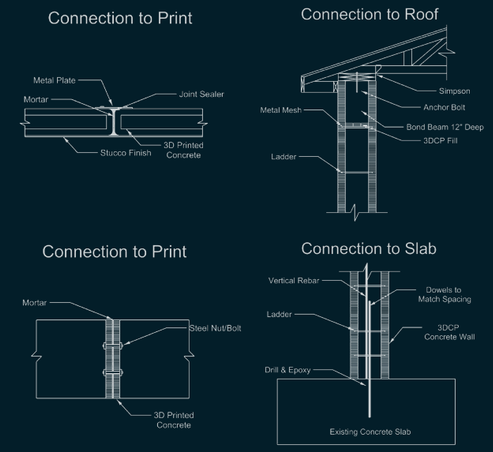
Our robotic system operates within a substantial build volume of 7’ Wide x 30’ Long x 10’ High, but these dimensions are not the only factors determining the maximum size of a single component. While we can technically print continuous elements up to 30 feet long, practical logistics often dictate a smaller module size. Concrete parts of that length are susceptible to stress during shipping, and anything exceeding 10 feet in height triggers expensive “oversize load” transportation permits. Therefore, for projects exceeding our build envelope or standard freight limits, we employ a strategic segmentation method; digitally slicing large scale designs into manageable, transport friendly sections that are printed individually and seamlessly assembled on site to achieve the final massive scale.

**68 Parts to make 1 Architectural Feature**

## Connection Details

Treat 3DCP as Concrete

Fundamentally, 3DCP should be engineered and detailed just like traditional precast concrete or masonry. Think of the printed element as pre-printed formwork. For wall to slab connections, the process mirrors standard construction: rebar dowels are set in the foundation, and the hollow 3D printed wall is slipped over them. Once positioned, the internal cell is filled with poured concrete, creating a solid structural bond that secures the wall to the slab. For connecting segmented parts or attaching roof systems, we offer versatile methodologies depending on the load requirements. This includes designing geometric interlocking sections with shared grout cells, utilizing standard mechanical hardware like steel plates and bolts, applying structural epoxy for seamless bonds, or placing cast in place anchors directly into the print to support overhead beams.




## File Perparation

Preferred File Types

We accept project files at every stage of development, from initial concept to final fabrication, and our workflow is designed to integrate seamlessly with yours regardless of the software you use. For clients in the early concept phase who wish to utilize our design services, we can begin with simple hand sketches, dimensional drawings, or reference photos to kick off the consultation.

If your design is fixed but not yet modeled in 3D, we prefer 2D CAD files, which allow us to accurately build print paths. For those with ready made 3D geometry, .OBJ is our preferred export format for immediate assessment, though we natively support files from Rhino, SketchUp, Revit, and Blender. Furthermore, we also support BIM workflows for complex architectural projects. You can provide us with your initial Revit massing or structural model, and after our team optimizes the geometry for printability, we will export the final “As Printed” file back to you. This allows you to update your central BIM model with the exact production geometry, ensuring perfect coordination with MEP and structural systems before a single layer is printed.