

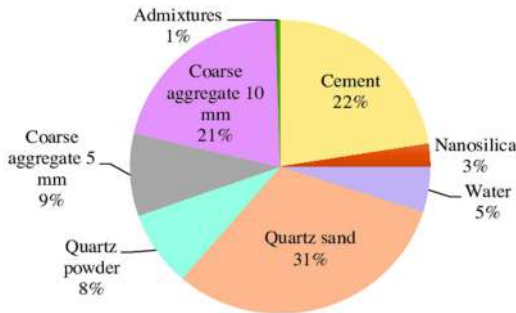
RENEWABLE ENERGY, BIOCLIMATIC CONSTRUCTIONS & SUSTAINABILITY CONFERENCE

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3D Printed Houses

Composition of Concrete:



What is 3D Printing?

3D printing is an additive manufacturing technology that creates three-dimensional objects from a digital file. It works by adding material layer after layer until the object is created.

Printing Process Requirements:

- Pumpability: Capability of a mix to be transported through a pipe.
- Extrudability: Capability of a mix to pass under pressure through contracting Nozzle
- Shape Retention: Capability of extruded layer to retain its cross-section equal to the cross-section of the Nozzle
- Printing Open Time
- Buildability




Materials Requirement:

- Compressive Strength
- Viscosity
- Tensile Strength
- Workability
- Thixotriopy

Optimization of Viscosity:

Types of Concrete Used in 3D printing:

Type of Concrete	Maximum Aggregate Particle Size
HFSC	2 mm
HPC	2 mm
CCM	1 mm
UHPC	-
GeoPolymer	2 mm

Polysaccharide VMA's	Definition
<p>Welan Gum</p> 	Exopolysachharide a rheology modifier used in construction like cement manufacturing. It is produced by the fermentation of sugar by bacteria.
<p>Xanthan Gum</p> 	Polysaccharide, produced from a single sugar using fermentation process.
<p>Starch Ether</p> 	Polysaccharide compound extracted from natural plants (seeds of corn, potato). Its basic properties are: dissolving in cold water, its viscosity varies between 300 and 800 CPS, moisture <10%. Mostly used in building mortar and increases its consistency.

For 1kg of Mortar admixture, we need:

Water required= $0.25 \times 0.0227 = 0.056\text{kg}$
Cement= 1 part= 0.227kg
Sand = $3.15 \times 1\text{part} = 3.15 \times 0.227 = 0.717\text{kg}$



Alternatives:

- ABS: Slightly Flexible Plastic, it can extrude cleanly at between 220°C and 240°C
- PLA: Lower melting point than ABS But it can be extruded at a higher temperature. It is more environment friendly than ABS
- Nylon: It has high corrosion resistivity, and it is stronger than the other plastics mentioned before