

# 3D PRINTING BUILDING-A REVIEW

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### ABSTRACT—

The main objective of this paper is to give an overview on existing construction buildings. The 3D printed concrete buildings are one of the popular applications of 3D printing in construction. This paper introduces that the printing technology that makes use of 3D printers to deposit the concrete material one over another layer to form a complete building structure. These 3D printing buildings construction consumes less time and effort than the ordinary construction buildings and hence make the house or building affordable.

manufacturing include quick free-forming without moulds, complete digitization, and high flexibility.

### II. WORKING OF 3D PRINTER:

The working of 3D printing can be understood by assuming a 3D printer, for example, FDM 3D printer, which uses as the printing material. Using a set of machine language codes, the concrete 3D printer is managed. This machine commands direct the print head until the 3D model is constructed.

**KEYWORDS:** 3D printers, 3D buildings, 3D concrete

### I. INTRODUCTION

Most of the 3D printers that are available in the market can directly print on the spot and hence these are mobile 3D printers. These type 3D printers normally have a crane and robotic arm arrangement. Some of concrete printers works offsite.

These are manufactured offsite and bought on-site and assembled. The 3D printers for building construction can either be a super-size desktop printer which is a gantry type or can be printer with a rotating mechanical arm.



Fig-2: construction of building



Fig-1: 3D PRINTING MACHINE

3D printing technology is based on a digital model, and using automatic computer control technology. 3D solids are printed layer by layer with materials to achieve rapid prototyping. The term "additive manufacturing" is another name for this technology. Technical aspects of additive



Fig-3: Offices of the future in Dubai

The concrete 3D printers operate using X, Y & Z-axis. If the 3D printer is mounted on rails, then the length of the rails

to move the printer back and forth forms the x-axis. The y-axis is made up of the separation between the opposing rails. The height of the pillars that carry the nozzle the equipment forms the z-axis. Every building construction starts with foundation. Foundations are constructed and made the surface flat so that the 3D printer can place the rails properly and start working the foundation. Once the surface for monitoring the 3D printer ready, the next step is to install the printer. The following steps are necessary to set up and operate a 3D printer:

1. Install the printer's rails. The rails were made specifically for the 3D printer.
2. Attach the printer to the rail.
3. All three axes have been examined, and the pillars have been set up.
4. Place the robotic arm and nozzle on the horizontal metal beam.
5. Once the installation is complete, the designed concrete mix is brought to the site and connected to the printer's nozzle.
6. In a well-coordinated manner, the printing process simultaneously implements the electrical installations and the wall reinforcement.
7. In order to prevent the concrete nozzle from being clogged, the concrete used for printing must have appropriate flowability.
8. Therefore, the mixture needs to be prepared so that it hardens rapidly but still effectively bonds with the newly printed layers.

**III. METHODS FOR 3D PRINTING BUILDING AND COMPARISON:**

Method	FDA	SLA	SLS	EBM	LOM 3.
<b>Working principle</b>	Extrusion Stacking Technique	Solidification of photopolymer material with UV light	Sintering of powder with CO2 laser	Electron Beam Melting	Laser Cutting and Gluing of Sheets
<b>Material used</b>	ABS, polyamide, polycarbonate, polyethylene, polypropylene, and investment casting wax.	ABS, polyamide, polycarbonate, polyethylene, polypropylene, and investment casting wax.	Polyamide, carbon fiber and aluminum added polyamide, polycarbonate, stainless steel, cobalt chrome, nickel chrome, titanium, ceramic.	Cobalt chrome and titanium alloys, ceramics.	Paper, plastic foam, metal and ceramic powder impregnated materials.
<b>Resolution</b>	Medium	Good	Weak	Weak	Medium
<b>Strength</b>	Good	Medium	Good	Good	Medium
<b>Roughness</b>	Medium	Good	Weak	Good	Medium

**IV. ADVANTAGES OF 3D PRINTING BUILDINGS:**

1. Because 3D printers are so quick, they can build continually. Some building companies can print a full house in just 24 hours.
2. Since the printing medium is the only input, the entire manufacturing process is cost-effective. As a result, labor costs are decreased.

3. An economical house may be built anywhere thanks to 3D printers, which is a better and quicker solution for the world's impoverished.
4. The structures made using 3D printers are incredibly strong and can survive tornadoes. This means that by using a 3D process, strong foundations can be created.
5. Life of incredible structures can be provided using a 3D concrete printing method.

**V. CONCLUSION:**

It is anticipated that 3D printing would be used in the construction sector and offer both financial and environmental benefits. This method is dependent on the printing accuracy, the printing medium, the cost, and the time. The usage of 3-D printing is also influenced by factors like its suitability for large-scale construction, the advancement of building information modeling, the diversity of manufacturing, and life cycle costs. It is suggested that this technique will be used at the highest level once these conditions have been successfully overcome.

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