

Development of 3D Concrete Printing Technology: A Case Study

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The development of 3D Concrete Printing (3DCP) has been pursued by Maeda Corporation since 2017. In order to aim for social implementation of 3DCP, the focus has been on four stages: ① material development, ② printer development, ③ test printing, and ④ joint development with co-creation partners through open innovation. A gantry-type 3D printer for indoor use has been designed and built, as shown in Fig. 1. The development of 3DCP materials has been carried out using this 3D printer, enabling the printing of objects with complex shapes (Fig. 2). Based on the knowledge gained from this gantry printer, a robot-arm-type 3D printer suitable for actual construction was developed, as shown in Fig. 3. A structure with a height of 1.8 m was printed to confirm its feasibility. This printed structure is currently being used as a smoking area (Fig. 4).

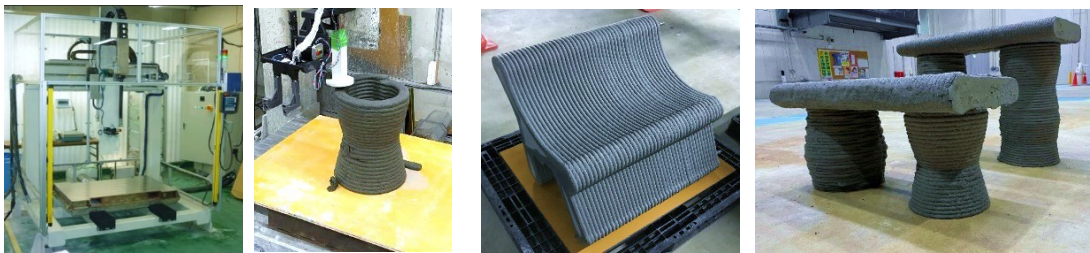


Fig.1 Indoor gantry-type 3D printer and printing

Fig.2 Objects fabricated using a gantry-type 3D printer



Fig.3 Robot arm-type 3D printer and printing



Fig.4 Smoking area fabricated by 3DCP in use at Maeda Corporation research facility

In a joint development with Polyuse Inc. the first outdoor construction demonstration in Japan was conducted using a gantry-type 3D printer that can be assembled on-site, for the renewal of an aged catch basin (June 2021). A printing environment was set up next to the existing catch basin and a circular cross-section catch basin was printed. After the shape and performance (strength and water tightness) of the printed object were confirmed, it was hoisted from the printing location and installed. More than two years have passed, and it is still in use without any problems (Fig. 5).



Fig.5 Installation of water catchment basin printed by 3DCP