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1) Evaluation of Tensile Behaviour of 3D Printed Concrete Assemblies with Reinforcement.

Evaluation of Tensile Behaviour of 3D Printed Concrete Assemblies with Reinforcement

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Abstract. Inclusion of reinforcement to improve the tensile capacity of 3D printed concrete specimens has been gaining significance in recent times. Different types and procedures for introducing steel reinforcement in printing are currently under development. The present study involves understanding the influence of two different types of reinforcement on the tensile behaviour of 3D printed concrete. The different reinforcements considered were steel mesh and a 3 mm bar. The reinforcement was placed between printed layers in a beam-type assembly. The influence of the reinforcement in providing tensile stresses across a crack propagating across printed interfaces is evaluated from a fracture beam test. The crack bridging provided by the reinforcement is evaluated from the measured surface crack profiles obtained from fracture test. Mesh reinforcement showed a better bond behaviour when compared to the 3 mm bars. The factors which contribute to the tensile performance of reinforcement across a tensile crack are identified.

Keywords: 3DCP · Reinforcement · Tensile stress · Crack · Bond

2) Influence of Cold Joint on Fracture Behaviour of 3D Printed Concrete

Influence of Cold Joint on Fracture Behaviour of 3D Printed Concrete

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Abstract. Extrusion-based layer deposition is the most popular form of 3D Concrete Printing (3DCP). The inter-layer bonding is an important parameter in the case of extrusion-based layer deposition in 3DCP, which affects the homogeneity of the element and thus its mechanical behaviour. The bond between the layers depends upon several factors including the fluidity of the mixture and the print time gap between layers. Weak interfaces develop in the form of cold joints between two adjacent layers of concrete when they are placed with a time gap. The study involves the understanding of influence of time gap between the vertical layers on the fracture behaviour of the printed beams. Crack propagation in the layered beam is evaluated using digital image correlation. The influence of wait time on the crack planes across the printed interfaces are studied. The reduction in the bond between layers with waiting time is related to fracture behaviour of the printed beam.

Keywords: Fracture behaviour · Cold joints · Bond strength · 3D Concrete Printing