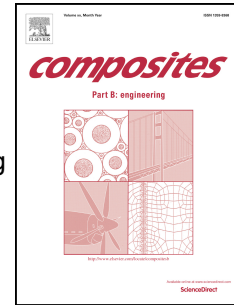


# Accepted Manuscript

Full-scale testing and numerical analysis of a precast fibre reinforced self-compacting concrete slab pre-stressed with basalt fibre reinforced polymer bars

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## COMPOSITES PART B: ENGINEERING

**FULL-SCALE TESTING AND NUMERICAL ANALYSIS OF A PRECAST  
FIBRE REINFORCED SELF-COMPACTING CONCRETE SLAB PRE-  
STRESSED WITH BASALT FIBRE REINFORCED POLYMER BARS**

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**Abstract**

Steel-free pre-stressed reinforced concrete may be used in aggressive environments to increase the durability of structural elements and to limit the carbon footprint by replacing steel with high-strength fibre composites. The design of a 10-m long steel-free precast fibre-reinforced concrete slab, pre-stressed with basalt-fibre reinforced polymer (BFRP) bars and shear-reinforced with glass-fibre reinforced polymer bars, is presented in this paper. Non-linear viscoelastic and elastic-plastic models have been employed for the prediction of the service and ultimate limit state flexural behaviour, respectively. Preliminary tests on the employed materials and a 3-point load test on the slab element are presented, together with indications on its manufacturing process. The proposed numerical analysis is validated against the experimental results.

**Keywords:** Steel-Free beams; Fibre Reinforced Self-Compacting Concrete (FRSCC); Basalt Fibre Reinforced Polymer (BFRP) Bars; Creep Losses; Visco-Elastic Analysis; Non-Linear Analysis.

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