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Flexural behaviors of fiber-reinforced polymer fabric reinforced ultra-high-performance concrete panels

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1 **Flexural behaviors of fiber-reinforced polymer fabric reinforced ultra-high-performance**
2 **concrete panels**

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6 **Abstract**

7 The use of fiber-reinforced polymer (FRP) fabrics as reinforcement in concrete offers several advantages,
8 such as high tensile strength, corrosion resistance, and light weight. This paper presents experimental and
9 mechanical studies on the flexural behaviors of FRP fabric reinforced ultra-high-performance concrete
10 (UHPC) panels. Glass fiber reinforced polymer (GFRP) and carbon fiber reinforced polymer (CFRP)
11 fabrics were investigated. Mechanical properties of GFRP and CFRP fabrics, high-strength mortar, and
12 UHPC containing micro steel fibers were experimentally evaluated. The interfacial properties between the
13 FRP fabric and cementitious matrix were characterized using push-pull tests. The flexural performance of
14 panels with different reinforcement configurations was experimentally evaluated. The use of GFRP or
15 CFRP fabric enhanced the flexural properties of UHPC panels, but did not lead to any increase in the
16 flexural strength for the panels made with high-strength mortar. A mechanical analysis is performed to
17 understand and predict the flexural behavior of the FRP fabric reinforced UHPC panels. The proposed
18 fabric reinforced UHPC panel is demonstrated to be promising for the development of lightweight, high-
19 performance permanent formwork system. Such formwork can be potentially used in accelerated
20 construction of critical infrastructure with enhanced crack resistance and extended service life.

21 **Keywords:** Fiber reinforced polymer (FRP) fabrics; Flexural behavior; Interfacial bond; Mechanical
22 analysis; Microstructure; Ultra-high-performance concrete (UHPC)

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