

Behavior of Composite Reinforced Concrete Circular Columns with Glass Fiber Reinforced Polymer I-Section

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Abstract : Pultruded materials made of fiber-reinforced polymer (FRP) come in a broad range of shapes, such as bars, I-sections, C-sections, and other structural sections. These FRP materials are starting to compete with steel as structural materials because of their great resistance, low self-weight, and cheap maintenance costs-especially in corrosive conditions. This study aimed to evaluate the effectiveness of Glass Fiber Reinforced Polymer (GFRP) of the hybrid columns built by combining (GFRP) profiles with concrete columns because of their low cost and high structural efficiency. To achieve the aims of this study, nine circular columns with a diameter of (150 mm) and a height of (1000mm) were cast using normal concrete with compression strength equal to (35 MPa). The research involved three different types of reinforcement: hybrid circular columns type (IG) with GFRP I-section and 1% of the reinforcement ratio of steel bars, hybrid circular columns type (IS) with steel I-section and 1% of the reinforcement ratio of steel bars, (where the cross-section area of I-section for GFRP and steel was the same), compared with reference column (R) without I-section. To investigate the ultimate capacity, axial and lateral deformation, strain in longitudinal and transverse reinforcement, and failure mode of the circular column under different loading conditions (concentric and eccentric) with eccentricities of 25 mm and 50 mm, respectively. In the second part, an analytical finite element model will be performed using ABAQUS software to validate the experimental results.

Keywords : composite, columns, reinforced concrete, GFRP, axial load

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