

EXPERIMENTAL BEHAVIOUR OF FRP-CONFINED LARGE-SCALE CURVILINEARIZED RECTANGULAR RC COLUMNS UNDER AXIAL COMPRESSION

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Existing research has shown that strengthening through fibre-reinforced polymer (FRP) confinement is highly effective for circular columns but much less so for square and rectangular columns due to the flat sides and sharp corners in the latter. Rounding the corners in the latter columns can enhance the effectiveness of confinement, but its benefit is limited. To overcome this problem, an alternative strengthening technique has recently been proposed by some researchers, in which the flat sides of a square/rectangular section are modified into slightly curved sides before FRP confinement (referred to as section curvilinearization). The resulting columns, referred to as curvilinearized square/rectangular columns, are much more effectively confined by an FRP jacket than the original square/rectangular columns with only corner rounding, and the associated column size increase is limited. While this section curvilinearization technique is highly attractive, there has been only very limited research on the behaviour of FRP-confined curvilinearized square/rectangular columns. In particular, all the existing experimental work has been limited to small-scale square columns (with section widths being around or below 150 mm) under axial compression.

Against the above background, a large experimental programme has been under way at The Hong Kong Polytechnic University to study the behaviour of large-scale curvilinearized RC columns under both concentric and eccentric compression. Both square and rectangular columns have been considered in the experimental programme. This paper presents a systematic experimental study on the behaviour of FRP-confined curvilinearized rectangular RC columns under axial compression to study the effects of the following parameters: rise-to-span ratio of the edge profile, sectional aspect ratio and corner radius. In addition to the presentation of experimental results, two existing stress-strain models for FRP-confined concrete in these columns are assessed to reveal their limitations.

KEYWORDS

FRP, strengthening, confinement, rectangular RC columns, section curvilinearization, stress-strain model.