Postprint: Nonlinear Behavior of Spiral Stiffened Square Concrete-Filled Steel Tubular Composite Columns with Large Diameter-to-Thickness Ratio under Eccentric Compression

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Abstract

The local buckling issue is particularly pronounced in concrete-filled steel tube members with large diameter-to-thickness ratios. Based on a novel confinement configuration employing spiral stiffening ribs, spiral-stiffened square concrete-filled steel tube composite columns are proposed. Eccentric compression test studies reveal that spiral ribs can provide effective confinement to square steel tubes with large diameter-to-thickness ratios, substantially mitigating local buckling and effectively enhancing both the load-bearing capacity and deformation capacity of members. Building upon the experimental results, parametric analysis of this innovative composite member was performed using ABAQUS finite element software, examining the influence patterns of steel tube thickness, width-to-thickness ratio of spiral ribs, rebar diameter, and eccentricity ratio. The results demonstrate that: increasing the eccentricity ratio leads to decreased load-bearing capacity but increased ductility in specimens; reducing the width-to-thickness ratio of the steel tube and increasing the rebar diameter both yield significant enhancements in load-bearing capacity and ductility; the width-to-thickness ratio of spiral ribs exerts minimal influence on specimen load-bearing capacity. Based on the numerical analysis findings, design recommendations are presented; additionally, the calculation method for eccentric compression bearing capacity of this composite column was investigated, and a practical calculation formula accounting for the influence of spiral ribs was proposed.

Full Text

Preamble

The provided preamble section contains only corrupted text artifacts, encoding errors, and binary fragments with no recoverable Chinese academic content. No translatable material is present.

Note: Figure translations are in progress. See original paper for figures.