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学术论文

带肋方钢管混凝土轴压短柱试验研究及有限元分析

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摘要：

以方钢管宽厚比和加劲肋高厚比为主要变化参数，进行了14个带肋方钢管混凝土轴压短柱试验研究；同时采用有限元软件ABAQUS对带肋方钢管混凝土轴压短柱的荷载-变形关系进行了计算，计算结果与试验结果吻合良好。同时从应力-应变关系、核心混凝土和钢管的纵向应力分布及其相互作用等方面对比分析了无肋、单肋和双肋方钢管混凝土轴压短柱的受力性能。分析结果表明：设置加劲肋不仅提高了核心混凝土的纵向应力，而且明显减小了钢管管壁的拉应力区范围，改善了管壁的稳定性；带肋试件的约束作用主要集中在钢管角部和加劲肋处，随着每边加劲肋数量的增加，角部约束力明显增大。 图13表1参11

关键词： 带肋方钢管混凝土 轴压 静力试验 有限元分析 受力性能

Experimental research and finite element analysis on mechanical performance of concrete-filled stiffened square steel tubular stub columns subjected to axial compression

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Abstract:

Fourteen specimens were tested under axial compression to investigate the behavior of concrete-filled stiffened square steel tubular stub columns. The stiffening effect was achieved by welding longitudinal stiffeners on the inside surfaces of the steel tubes. The main parameters varied in the test were width-thickness ratio of the steel tube and depth-thickness ratio of the stiffener. The load-deformation relationship curves of concrete-filled stiffened square steel tubular stub columns subjected to axial compression were analyzed using the finite element software ABAQUS. The analysis results were in good agreement with test results. On the basis of the experimentally verified reliability of the finite element model, mechanical behavior of the concrete-filled square steel tubular stub columns without reinforcing rib, with one reinforcing rib and with two reinforcing ribs were analyzed respectively and compared in terms of stress versus strain relationship curves, longitudinal stress distributions of steel tube and core concrete, and their interaction. The analysis results show that using stiffeners can result in the increas of maximum axial stress of core concrete and the tensile stress areas of steel tubes are decreased as a result of the welding stiffeners. The stability of steel tube is also improved. The confinement effect of concrete-filled stiffened square steel tubular stub columns is mainly developed at steel tube corners and the places where stiffeners were welded. And the confinement effect on steel tube corners can be enhanced with increased number of stiffeners.11Refs.In Chinese.

Keywords: concrete-filled stiffened square steel tubular columns axial compression static test finite element analysis mechanical performance

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