

学术论文

圆钢管约束钢筋混凝土短柱抗震性能试验研究

周绪红<sup>1</sup>, 刘界鹏<sup>1,2</sup>, 张素梅<sup>3</sup>

1.兰州大学 土木工程与力学学院, 甘肃兰州 730000; 2.哈尔滨工业大学 建筑设计研究院, 黑龙江哈尔滨 150090; 3.哈尔滨工业大学 土木工程学院, 黑龙江哈尔滨 150090

摘要:

进行了3个剪跨比为1.5的圆钢管约束钢筋混凝土短柱和1个钢筋混凝土对比试件的拟静力试验研究, 试验中的主要参数为轴压比(0.35, 0.45和0.55)。试验结果表明: 钢筋混凝土短柱的破坏模式为剪切破坏, 延性和变形能力很差; 圆钢管约束钢筋混凝土短柱的破坏模式为弯曲破坏, 延性和变形能力优越。外包钢管对核心混凝土的约束作用限制了核心混凝土的受剪开裂, 改变了钢筋混凝土短柱的破坏模式, 显著提高了钢筋混凝土短柱的受剪承载力、延性、变形能力和耗能性能。随轴压比的提高, 圆钢管约束钢筋混凝土短柱的水平承载力提高, 延性系数降低, 但轴压比对圆钢管约束钢筋混凝土短柱的极限变形能力无明显影响。对钢管的弹塑性应力分析结果表明: 水平荷载施加过程中, 钢管并未受剪屈服。根据试验结果建立了圆钢管约束钢筋混凝土短柱的荷载-位移恢复力模型, 提出了设计建议, 可为工程实践提供参考。 图10表2参12

关键词: 圆钢管约束钢筋混凝土 短柱 拟静力试验 轴压比 破坏模式 抗震性能

Seismic behavior of circular tubed reinforced concrete short columns

ZHOU Xuhong<sup>1</sup>, LIU Jiepeng<sup>1,2</sup>, ZHANG Sumei<sup>3</sup>

1. School of Civil Engineering and Mechanics, Lanzhou University, Lanzhou 730000, China; 2. Architectural Design and Research Institute, Harbin Institute of Technology, Harbin 150090, China; 3. School of Civil Engineering, Harbin Institute of Technology, Harbin 150090, China

Abstract:

The seismic behavior of circular tubed RC (CTRC) short columns was studied by testing three CTRC columns and one common RC column under combined axial constant compression and lateral cyclic load. The mian test parameter was the axial load ratio (0.35, 0.45 and 0.55). The test results indicate that the failure mode of RC short column is shear failure, and the ductility and deformation ability of RC short column are very low. The failure mode of CTRC short column is flexural failure, and the ductility and deformation ability of CTRC short column are excellent. The confining effect of the tube to the core concrete in a CTRC short column prevent the concrete from cracking under shear force. Therefore the failure mode of the RC short column tubed by a circular steel tube is transformed from shear failure to flexural failure, and the shear strength, ductility, deformation ability and energy dissipation ability are greatly improved. The lateral load strength of the CTRC short columns increase as the axial load ratio increase. The ductility index of the CTRC short columns decrease as the axial load ratio increase. The ultimate deformation ability of the CTRC short columns is barely affected by the increase in axial load. Elasto-plastic analysis on the steel tube during the loading procedure was carried out on the steel tube, and the analysis results indicate that the steel tube do not yield during the lateral load being applied procedure. Simplified lateral load-lateral response model of CTRC short columns as well as design advices were proposed in this paper.

Keywords: circular tubed reinforced concrete short column quasi-static test axial load ratio failure mode seismic behavior

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通讯作者: 周绪红(1956—), 男, 湖南南县人, 工学博士, 教授

作者简介:

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