

学术论文

L形钢管混凝土框架结构抗震性能试验研究

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摘要:

为了探讨L形钢管混凝土柱-钢梁框架的抗震性能,进行了4个1/2.5缩尺比例两层单跨L形钢管混凝土柱-钢梁空间框架的拟静力试验研究,主要考察了柱轴压比(n=0.4, 0.6)、加载方向(β=0°, 45°)对试件抗震性能的影响,对结构的破坏形态、破坏机制、滞回曲线、结构塑性铰出现的位置及次序、位移延性和耗能能力等性能进行了研究.试验结果表明:结构的破坏形态基本相同,梁端先屈曲,形成塑性铰,然后柱脚核心混凝土开裂压碎,钢管屈曲,形成塑性铰,节点核心区没有出现破坏现象,满足“强柱弱梁、强节点”的抗震设计要求;结构的滞回曲线呈饱满的梭形,强度和刚度退化不明显,变形能力和耗能能力较强;结构的延性较好,正向和反向的位移延性系数均大于4.0;轴压比对结构的抗震性能影响较大,随着轴压比的增大,框架的位移延性和耗能能力降低.

关键词: L形钢管混凝土框架 拟静力试验 抗震性能

Experimental research on seismic behavior of concrete-filled L-section steel tubular frames

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Abstract:

In order to study the seismic behavior of concrete-filled L-section steel tubular column-steel beam frames, four 1/2.5 reduced-scale, two-story space frame specimens with single span were tested under constant vertical load and lateral cyclic loads. Axial compression ratio of columns (n=0.4, 0.6), lateral loading direction (β=0°, 45°) are both considered as experimental parameters. Failure modes, failure mechanism, hysteretic curves, the region and appearance sequence of plastic hinges, displacement ductility and energy dissipation capacity of the structure specimens were studied. The test results showed that failure modes of the structure specimens were basically the same: the beam end firstly yielded, plastic hinges appeared afterwards, then core concrete of column foot cracked and crushed, and buckling happened to steel pipe. There was no failure on joint core area, which met the seismic design requirements of 'strong columns weak beams, stronger joints'; the hysteretic curves of the frames exhibited plump spindle shape, the degradation of strength and stiffness was not obvious, the deformability and energy dissipation capacity of the frames were good; the displacement ductility of the structure was also well, both the forward and reverse displacement ductility coefficients were above 4.0; axial compression ratio had great influence on seismic performance of the structures, the displacement ductility and energy dissipation capacity of the frames reduced with the increase of axial compression ratio.

Keywords: concrete-filled L-section steel tubular column pseudo-static test seismic behavior

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