

学术论文

钢筋混凝土框架变梁中节点抗震性能试验研究

吴涛¹, 邢国华¹, 刘伯权¹, 白国良², 黄华¹

1. 长安大学 建筑工程学院, 陕西西安 710061; 2. 西安建筑科技大学 土木工程学院, 陕西西安 710055

摘要:

完成了10个1/3缩尺钢筋混凝土框架变梁中节点试件的低周反复荷载试验, 分析了变梁中节点的破坏形态、刚度退化和滞回耗能等力学性能, 研究了梁柱尺寸变化、轴压比、配箍率等参数对该类节点抗震性能的影响。研究表明: 变梁中节点初裂出现在小梁与上柱组成的小核心区, 最终破坏区域主要发生在大梁与下柱组成的大核心区; 变梁中节点通裂荷载与极限荷载比较接近, 变梁中节点大、小梁端滞回曲线差别显著, 大梁滞回曲线呈反S形, 小梁滞回曲线呈较为饱满的弓形, 小梁截面尺寸变化对试件的抗震性能影响显著; 变梁中节点的强度衰减、刚度退化明显, 耗能能力较差, 按常规节点设计构造的变梁中节点不能满足刚性节点的要求。

关键词: 框架结构 变梁中节点 拟静力试验 抗震性能 滞回曲线

Experimental research on seismic behavior of irregular interior joints in RC frame structure

WU Tao¹, XING Guohua¹, LIU Boquan¹, BAI Guoliang², HUANG Hua¹

1. School of Civil Engineering, Chang'an University, Xi'an 710061, China;

2. School of Civil Engineering, Xi'an University of Architecture & Technology, Xi'an 710055, China

Abstract:

According to the experimental investigation on ten 1/3-scale RC frame specimens with irregular interior joints under low cyclic reversed loading, the failure process and failure patterns were obtained. The failure characteristics, mechanical behaviors of the irregular interior joints such as the load displacement hysteretic loops, rigidity deterioration and energy dissipation were analyzed. The experimental study was conducted focusing on the effect of joint core dimensions, hoop percentage and axial compression ratio on seismic behavior of irregular interior joints. Test results indicate that the first crack appears in the minor core(determined by the low beam and the top column), and the final failure appears in the large core(determined by the high beam and the bottom column). The critical crack load is quite same value as the ultimate load of the irregular interior joints. The load displacement hysteretic loops of low beam and high beam are quite different each other, the hysteretic loops of all the high beams show a reversed S-shape exhibited sever pinching with little energy dissipation. On the contrary, those of the low beams show a hooked end shape with improved energy dissipation. The seismic behavior of the beam-column joint subassembly is significantly influenced by the dimensions of low beams, and this poor behavior of the beam-column joint subassembly is due to formation of the diagonal tension cracks within the joint core region, inadequate confinement to the concrete and the significant bond deterioration along the beam bars through the joints. The reinforcing details of the test specimen, which are designed under the guideline of current codes, can not preserve the structural integrity and satisfy the strong joint demand.

Keywords: frame structure irregular interior joint pseudo-static test seismic behavior hysteretic loop.

收稿日期 修回日期 网络版发布日期

DOI:

基金项目:

国家自然科学基金项目(50608004), 教育部高校博士点基金项目(20060710004), 陕西省自然科学基金项目(2010JM7002)。

通讯作者: 邢国华(1983—), 男, 内蒙古呼和浩特人, 工学博士, 讲师。

作者简介:

扩展功能

本文信息

Supporting info

PDF(OKB)

[HTML全文]

参考文献[PDF]

参考文献

服务与反馈

把本文推荐给朋友

加入我的书架

加入引用管理器

引用本文

Email Alert

文章反馈

浏览反馈信息

本文关键词相关文章

框架结构

变梁中节点

拟静力试验

抗震性能

滞回曲线

本文作者相关文章

PubMed

参考文献:

本刊中的类似文章

1. 王燕;高鹏;郁有升;王玉田;.钢框架梁端翼缘扩大型节点低周反复荷载试验研究[J]. 建筑结构学报, 2010,31(04): 94-101
2. 郭子雄;林煌;刘阳;.不同配箍形式型钢混凝土柱抗震性能试验研究[J]. 建筑结构学报, 2010,31(04): 110-115
3. 常鹏;姚谦峰;.密肋复合墙体受剪性能试验研究及弹塑性数值分析[J]. 建筑结构学报, 2010,31(04): 116-123
4. 陈星;张松;区彤;李松柏;傅剑波;李穗生;.广州亚运城历史展览馆结构设计[J]. 建筑结构学报, 2010,31(03): 114-122
5. 樊健生;陶慕轩;聂建国;李婷;赵楠;.钢管混凝土柱-钢桁梁组合节点抗震性能试验研究[J]. 建筑结构学报, 2010,31(02): 1-10
6. 张爱林;于劲;徐敏;刘显旺;刘会军;.低周反复荷载作用下十字形截面钢异形柱抗震性能试验研究[J]. 建筑结构学报, 2010,31(02): 11-19
7. 张爱林;于劲;徐敏;李健;刘会军;.低周反复荷载作用下T形截面钢异形柱抗震性能试验研究[J]. 建筑结构学报, 2010,31(02): 20-28
8. 石永久;熊俊;王元清;刘歌青;.多层钢框架偏心支撑的抗震性能试验研究[J]. 建筑结构学报, 2010,31(02): 29-34
9. 隋葵;赵鸿铁;薛建阳;张锡成;刘义;.古代殿堂式木结构建筑模型振动台试验研究[J]. 建筑结构学报, 2010,31(02): 35-40
10. 梁兴文;杨鹏辉;崔晓玲;邓明科;张兴虎;.带端柱高强混凝土剪力墙抗震性能试验研究[J]. 建筑结构学报, 2010,31(01): 23-32
11. 曹万林;张建伟;孙天兵;董宏英;.双向单排配筋高剪力墙抗震试验及计算分析[J]. 建筑结构学报, 2010,31(01): 16-22
12. 陈学伟;韩小雷;林生逸;吴培烽;何伟球;.中洲中心二期结构抗震性能分析[J]. 建筑结构学报, 2010,31(01): 101-109
13. 张富林;周健;项玉珍;张耀康;王冬;.上海陆家嘴金融贸易区X2地块南北塔楼结构与研究[J]. 建筑结构学报, 2009,30(S1): 14-20
14. 盛平;徐福江;柯长华;.海控国际广场续建超高层结构设计[J]. 建筑结构学报, 2009,30(S1): 41-45
15. 葛家琪;韩志宏;张国军;王明珠;张庆亮;.成都传媒中心大厦结构方案选型与抗震性能分析[J]. 建筑结构学报, 2009,30(S1): 77-86