

[1]肖岩,赵禹斌,李凤武,等.钢筋混凝土大比例模型框架角柱突然失效模拟试验研究[J].自然灾害学报,2013,04:75-81.

XIAO Yan,ZHAO Yubin,LI Fengwu,et al.Experimental research on a large scale RC frame model subjected to sudden corner column removal[J].,2013,04:75-81.

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钢筋混凝土大比例模型框架角柱突然失效模

《自然灾害学报》 [ISSN:/CN:23-1324/X] 期数: 2013年04期 页码: 75-81 栏目: 出版日期: 2013-09-30

Title: Experimental research on a large scale RC frame model subjected to sudden corner column removal

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关键词: 连续倒塌; 倒塌试验; 钢筋混凝土框架; 构件拆除

Keywords: progressive collapse; collapse experiment; reinforced concrete frame; component removal

分类号: TU317.1;TU375.4

DOI: -

文献标识码: -

摘要: 结构在偶然荷载作用下的连续性倒塌是严重危害公共安全的问题。对经过抗震设计的3跨3层钢筋混凝土二分之一比例钢筋混凝土框架模型进行角柱突然卸载试验,研究结构的动力反应、失效机理及荷载传递路径的改变。框架系按美国和中国的抗震设计规范设计。在试验中用素混凝土块替代需拆除的柱,并以氢气炮冲击作用拆除角柱。框架角柱失效后,原框架柱所承受的作用力通过框架梁和楼板传递到四周的柱,在拆除第一根柱和 second 根柱后角柱位置的位移分别为6.3 mm和20.6 mm,整体结构未

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发生倒塌破坏。研究结果表明经过抗震设计的框架结构具有良好的抗倒塌性能。采用有限元分析软件Sap2000对试验模型进行了分析,其结果与试验吻合较好。

Abstract: The progressive collapse of structures under accidental actions is a serious threat to the public safety. This paper reports the dynamic response, failure mechanism and load-transmitting route change of a 3-bay and 3-story half-scale reinforced concrete frame model subjected to sudden corner column removal. The frame was designed according to the US and Chinese seismic design codes. In the experiment, the column to be removed was replaced by concrete blocks which were blasted out by a hydrogen gas-gun. After the failure of the column, the force that was withstood by the columns were transferred to the surrounding columns, and the displacements at the removed column nodes were 6.3mm and 20.6mm respectively following the removal of the first corner column and the column next to the corner. The structure did not collapse during the experiment, which showed good resistance to total collapse due to the proper seismic design. In addition, simulations of the experiment were conducted using software Sap2000, and the analysis results are in good agreement with the experimental results.

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