

学术论文

三类钢板剪力墙结构试验研究

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摘要:

防屈曲钢板剪力墙已被试验证明是优秀的抗侧耗能构件, 但墙板嵌入受弯框架时, 二者之间的相互作用尚需进一步研究。为此进行了两层单跨钢框架内嵌防屈曲钢板剪力墙的试验研究, 作为比较同时进行了两层单跨钢框架内嵌非加劲钢板剪力墙与两层单跨钢框架内嵌组合钢板剪力墙结构的试验研究。在试验的基础上, 对试件进行有限元分析, 比较了三类钢板剪力墙之间的性能差异。研究表明, 防屈曲钢板剪力墙能够消除无加劲钢板剪力墙在水平荷载下产生的巨大屈曲噪声, 具有较大的初始刚度与承载力, 拥有良好的延性与滞回耗能性能, 而且由于其屈服先于屈曲发生, 对周边框架产生的附加弯矩很小; 组合钢板剪力墙的性能与防屈曲钢板剪力墙相似, 但由于后期外包的混凝土发生脱离, 内嵌钢板剪力墙会产生拉力带, 不仅对框架产生不利影响, 而且自身承载力、刚度与耗能能力均有不同程度的退化。图32表1参12

关键词: 钢板剪力墙 非加劲 防屈曲 组合 拟静力试验 拉力场 滞回耗能 抗侧性能

Experimental study on three types of steel plate shear walls under cyclic loading

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Abstract:

Buckling-restrained steel plate shear wall (BR-SPSW) has been proven to be an effective component for resisting lateral force and dissipating seismic energy. However, performances of moment-resisting frame structures with steel plate shear walls, especially the interactions between the walls and the frames remain to be investigated. An experimental study on a frame structure with BR-SPSW under cyclic loading was carried out, and as a contrast two more experiments on frame structures with non-stiffened and composite SPSW were conducted. A finite element analysis on the three SPSW specimens was made, and the differences between the three kinds of SPSWs were discussed. It is shown that frame structures with BR-SPSW have little buckling noise under lateral force, and possess better stiffness, larger ultimate loading capacity, better ductility and more stable hysteresis energy performance than frame structures with non-stiffened SPSW. With its yielding happens before buckling, the unfavorable effect on the adjacent columns induced by BR-SPSW is substantially lower than non-stiffened SPSW. Composite SPSWs have similar performances with BR-SPSWs, but after the covered concrete splits from the infill steel plate, tension field which brings additional moments to the frame columns appears in the steel plate, and ultimate load, stiffness and energy-dissipating ability of the wall all degenerate simultaneously. 12Refs. In Chinese.

Keywords: steel plate shear wall non-stiffened buckling-restrained composite pseudo-static test tension field hysteretic energy dissipating lateral force resisting

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