

学术论文

古代殿堂式木结构建筑模型振动台试验研究

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摘要: 对按照《营造法式》制作的古代殿堂式木结构建筑心间缩尺模型进行了模拟振动台试验研究。选用E1 Centro波、Taft波、兰州波作为输入地震动。测量了台面、柱脚、柱头、木梁的位移和加速度响应。对模型的破坏形态、自振周期、阻尼比、动力响应、滞回耗能进行了分析。试验结果表明:自振周期T的变化范围为0.48~0.67s,阻尼比ξ的变化范围为0.029~0.046,模型的自振周期和阻尼比随着地震加速度的增强而增大;模型的动力放大系数β<1,且随着地震加速度的增强而减小;铺作层、柱础层都是通过摩擦滑移来耗能,柱架榫卯节点的耗能能力最强,在模型的耗能、减震中起着主要作用。

关键词: 古建筑 木结构 振动台试验 抗震性能

A study on Chinese ancient timber structures by shaking table test

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Abstract: An intermediate bay model of an ancient palace was made according to Fabrication Methods of the Song dynasty,on which the shaking table test was carried out.El Centro,Taft and Lanzhou waves were chosen as input seismic excitations.The displacement and acceleration responses of the shaking table,column ends,column upper and beam under different levels of earthquake excitation were measured.The failure mode,natural period,damping ratio,dynamic responses,and hysteretic energy dissipation performance were analyzed.Test results indicate that the range of natural period T is 0.48~0.67s and the damping ratio ξ is 0.029~0.046.The first period and damping ratio of the model increase along with the increasing seismic excitations.The dynamic magnification factor β is less than 1 and decreases as the input seismic excitations increase.The dougong layer and column base dissipate seismic energy by means of frictional slippage.The mortise-tenon joint of the frame has the largest energy dissipation capacity,playing an important role in shock absorption.

Keywords: timber structure shaking table test seismic behavior

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