

学术论文

大跨楼盖结构减振设计与分析

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摘要:

针对大型火车站房的大跨楼盖的振动舒适度问题, 围绕基于人体舒适度的大跨楼盖减振设计理论和方法, 首先介绍了新研制的可调节刚度调谐质量阻尼器 (tuned mass dampers, 简称TMD); 随后, 系统研究了各种可能引起动力效应的人体活动, 建立了起立、步行等人致动力荷载的模拟方法, 进而给出基于有限元模型的大跨楼盖人致振动分析方法; 在分析大跨楼盖多重调谐质量阻尼器 (multiple tuned mass dampers, 简称MTMD) 减振机理的基础上, 借鉴已有的MTMD研究成果, 提出了考虑人体舒适度的大跨楼盖MTMD减振设计方法; 据此对数个大型结构开展了MTMD减振设计、分析与现场实测研究。理论和实测结果表明, 利用本文方法设计的MTMD系统可以有效地控制大跨楼盖的竖向振动。本文的可工作为类似的大跨楼盖的振动舒适度的分析和控制系统的设计提供参考和借鉴。 图18表10参13

关键词: 大跨楼盖 振动控制 调谐质量阻尼器 人行荷载 人体舒适度

Design and analysis on vibration control of long-span floor structures

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Abstract:

In this paper, the anti-vibration design theories and methods of long-span floors based on human comfort are studied. Firstly, a novel Tuned Mass Damper (TMD) with controllable stiffness is developed. Secondly, by systematically studying various human activities, the methods of modeling the human-induced loads are established, and an analysis method of long-span floors based on finite element model is proposed. Thirdly, based on the study of the damping mechanism of Multiple Tuned Mass Dampers (MTMD) in long-span floors and existing relevant studies, a design method for long-span floor with MTMD considering human comfort is established. Lastly, the design, analysis and field survey on several large-scale structures are carried out. The analytical and field survey results show that the MTMD system designed by the proposed method can control the vertical vibration of long-span floors effectively. The study described in this paper can provide an important reference for the analysis of vibration serviceability of similar long-span floors and determination of control system for these structures. 13Refs. In Chinese.

Keywords: long-span floor vibration control tuned mass dampers human-induced loads human comfort

收稿日期 修回日期 网络版发布日期

DOI:

基金项目:

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