

学术论文

广州歌剧院空间异型大跨度钢结构设计

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摘要: 广州歌剧院建筑造型奇特,其屋盖与幕墙组成的外围护体系为空间不规则折面组合型体,结构采用了空间折板式三向斜交单层网格结构。本文对其结构体系、构型和网格划分原则、杆件截面选取及节点形式等设计情况进行介绍,列举结构在重力荷载、风荷载、地震作用及温度作用下的变形和内力情况,对结构整体稳定分析、节点分析和铸钢节点足尺试验等关键问题进行论述,并对结构的工作机理和受力特性进行总结。结果表明,该体系对奇异建筑型体的适用性强,侧向刚度和抗震性能良好,结构工作机理以刚架作用为主,整体稳定问题不突出,结构对初始缺陷不敏感。

关键词: 空间折板式三向斜交单层网格结构 铸钢节点 腹板屈曲后强度 整体稳定

Design of large-span spatial deformed steel structure of the Guangzhou Opera House

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Abstract: The architectural shape of the Guangzhou Opera House is unique and irregular with its building envelope formed by irregular spatial folded plates.This paper introduces a brand new type of structure,called spatial folded plate triangular lattice structure,which is applied in the design of the Guangzhou Opera House.Details of structural system,shape constituents,principle of structure layout,and joint design are presented.Deformation and member stress under gravity,wind load,earthquake and temperature action are discussed.Key problems such as overall stability,joint analysis and full-scale experimental research test of cast-steel joints are reported,and the working mechanism and characteristics of the structure system are summarized.The new structure system has great applicability to irregular-shaped buildings,offers great sideway rigidity and anti-earthquake performance,whereas possess little membrane rigidity.The main working mechanism is the frame action,overall stability problem is not critical to this kind of structure,and it is not sensitive to initial deformation.

Keywords: cast-steel joint post-buckling strength of web plate overall stability

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