

世博会工程专辑

世博会英国国家馆主展馆结构设计要点及试验研究

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摘要:

新颖的建筑理念给世博会英国国家馆的结构设计带来许多研究课题, 尤其是主展馆钢桁架-重型木结构以及亚克力刺杆的设计。钢桁架-重型木结构的研究与设计尚无经验可循, 通过合理的结构设计理念及计算假定, 运用两种思路对其进行比对设计, 确保结构的整体力学性能、构件的强度和稳定以及结构位移等多项指标满足相关规范的要求。首先利用刚度等效的原则将钢-木混合结构等代壳单元, 用ROBOT软件对结构进行有限元建模分析, 得出木结构壳单元的应力, 对木结构构件进行设计; 然后将钢楼板、木墙和木结构屋顶等代交叉的工字形梁单元, 用SAP2000软件进行校核。最后通过的亚克力刺杆进行风洞、疲劳以及徐变的试验研究, 确定刺杆的风荷载效应, 并确保其在1.5年服役期内疲劳、徐变效应下不产生破坏。

关键词: 钢桁架 重型木结构 亚克力杆 风洞试验 疲劳试验 徐变试验 结构设计

Structural design points and experiment research on British Pavilion of the World Expo 2010

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Abstract:

Innovative architectural concept leads to a large number of research topics for the structural design of the Expo British Pavilion, especially for the design of steel truss-heavy timber structure and acrylic spike. The research and design of steel truss-heavy timber structure is no experience to follow, therefore, through the rational structural design concepts and calculation assumptions, the comparative design was processed using two different methods. First, the stiffness equivalence principle was induced to divide the steel-wood composite structure to shell elements. The shell element stress of timber structure and design of timber components were obtained by Robot software. Second, the steel floor, timber wall and timber roof were replaced by crossed I-beam elements which were analyzed and checked using SAP2000 software. These methods ensure that the mechanical properties of overall structure, the strength and stability of structural assemblies as well as a number of design indexes such as displacement to meet the requirements of the relevant codes. The wind tunnel, fatigue and creep tests and research for acrylic spike were carried out to determine the wind load effect of spike and ensure that the spikes are not damaged under fatigue and creep effects during 1.5 years service period.

Keywords: steel truss heavy timber structure acrylic spike wind tunnel test fatigue test creep test structural design

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