



工程力学

ENGINEERING MECHANICS

ISSN 1000-4750

CN 11-2595/O3

CODEN GOLIEB

EI 收录期刊

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» 2011, Vol. 28 » Issue (7): 157-164 DOI:

土木工程学科

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弦支穹顶结构的模型设计与试验研究

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MODEL DESIGNING AND EXPERIMENTAL RESEARCH OF SUSPEN-DOME STRUCTURE

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摘要 弦支穹顶结构由上部单层网壳和下部索杆系统组成。为进一步了解弦支穹顶结构的力学性能与施工张拉过程,以一跨度为122m的实际工程,制作了8:122的缩尺模型。在模型的制作过程中,首先利用相似原理进行了各参数相似比的确定,然后进行了上部网壳、下部索杆和连接节点的设计与制作,同时针对试验内容与模型特点进行了应力与位移测点的布置。最后对该模型进行了全跨与半跨加载试验,试验过程中各节点分5级共施加了大小为80kg的集中荷载。分析结果表明:结构的试验值与理论值吻合较好;测量值相对较小、抗扰能力较弱的测点误差较大;加载与卸载过程中结构的内力与位移基本呈线性关系。该文的研究成果可为类似工程的设计与制作提供参考。

关键词: 弦支穹顶 缩尺模型 相似比 预应力 索杆

Abstract: A suspen-dome includes a single-layer dome and a bottom tensegrity system. To further understand the structural mechanical properties and construction process, a 8 : 122 reduced scale suspen-dome model according to the actual structure with 122m span was made. During making the model, a similar ratio of each parameter was firstly determined in according to the similar principle, Then, the upper single-layer dome, the bottom tensegrity system and nodes were designed and made, at the same time the stress and displacement measuring points were arranged according to experimental contents and model characteristics. Last, a full span load and a half span load were loaded on model, a 80kg load was loaded on each model node by 5 times during experiment. Results shows that the theoretic and experimental data are basely available. Error is larger in measuring point whose measured value is relatively small and whose anti-interference ability is weak . Internal forces and displacements are basicly linear during a loading and unloading process. What the paper studied can be referenced for other structural design.

Key words: suspen-dome scale model similar ratio prestress cable-strut

收稿日期: 1900-01-01;

PACS:

引用本文:

郭佳民,董石麟,袁行飞. 弦支穹顶结构的模型设计与试验研究[J]. , 2011, 28(7): 157-164.

GUO Jia-min,DONG Shi-lin,YUAN Xing-fei. MODEL DESIGNING AND EXPERIMENTAL RESEARCH OF SUSPEN-DOME STRUCTURE[J]. Engineering Mechanics, 2011, 28(7): 157-164.

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