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世博会工程专辑

考虑弯矩作用梭形钢格构柱稳定承载力非线性有限元分析

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摘要：

以2010年上海世博会世博轴工程中采用的梭形钢格构柱为研究对象，应用大挠度弹塑性有限元法研究考虑弯矩作用时梭形格构柱的稳定承载力。分析了初始几何缺陷作用方向、分布形式对梭形格构柱稳定承载力的影响，并与试验结果进行了比较。分析结果表明：梭形格构柱在轴力和弯矩共同作用下的一阶弹性屈曲模态表现为“S”形和“C”形两种形式；考虑弯矩作用后，初始缺陷作用方向对梭形格构柱的稳定承载力有较大影响；对一阶屈曲模态为“S”形的梭形格构柱，计算稳定承载力时只需考虑“S”形缺陷的影响，而对一阶模态为“C”形的梭形格构柱有必要综合考虑“C”形和“S”形缺陷的影响。与试验结果比较表明，建议方法计算梭形格构柱的稳定承载力安全、合理。 图12表1参11

关键词： 梭形钢格构柱 非线性有限元分析 初始缺陷 弯矩 稳定承载力

Nonlinear FEA of stability bearing capacity of shuttle-shaped steel lattice columns with bending mome

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Abstract:

Shuttle-shaped steel lattice columns were adopted in the Expo Axis project for 2010 Shanghai Expo. This paper investigated the stability load-carrying capacity of shuttle-shaped lattice columns considering the action of bending moment through geometrically and materially nonlinear FE method. The emphasis was on the effects of orientation and distribution pattern of initial geometric imperfections on the stability bearing capacity of shuttle-shaped columns. Comparison was made between numerical results and experimental results. It is shown that, the first elastic buckling mode of shuttle-shaped lattice columns subject to combined axial force and bending moment involves S-shaped mode and C-shaped mode. The imperfection orientation has obvious influence on stability bearing capacity for columns with bending moment. For columns with S-shaped buckling mode, only S-shaped imperfection should be considered in the calculation of stability capacity, while for columns with C-shaped buckling mode, and both C-shaped imperfection and S-shaped imperfection should be considered. Results from the comparison with experiments indicate that the method presented in this paper for the determination of stability bearing capacity of shuttle-shaped lattice column is safe and rational.11Refs.In Chinese.

Keywords: shuttle-shaped steel lattice column nonlinear FEA initial imperfection bending moment stability bearing capacity

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