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学术论文

宝安体育场车辐式屋盖结构施工误差敏感性试验及误差限值控制方法研究

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摘要：

采用定尺定长设计与张拉技术进行施工时，确定拉索以及其他刚性构件的施工误差限值对工程建设和验收非常重要，但目前缺乏相应的统一标准。为此进行了宝安体育场屋盖结构施工误差敏感性试验，模拟了车辐式结构径向索、环索、飞柱的长度以及环梁位形的施工误差。研究结果表明：径向索、飞柱长度以及环梁径向位形误差对本榀索桁架预应力的影响约为相邻索桁架的2~3倍，对距离3榀以上的索桁架影响较小，将这3类构件定义为局部敏感性构件；环索误差对各处径向索预应力的影响较接近，定义环索为全局敏感性构件。在此基础上结合一次二阶矩可靠度指标，提出车辐式结构施工误差限值的控制方法。该方法首先将预应力变化量表达为施工误差值随机变量的线性函数，依据构件的敏感性分类确定线性函数的项数；然后由预应力变化量得到临界状态方程和一次二阶矩可靠度指标；最后由可靠度指标需要满足的范围得出每个施工误差值应满足的统计学限值。该方法得到的施工误差限值可以用于指导宝安体育场车辐式屋盖结构的施工和验收。

关键词： 车辐式结构 预应力 施工 静力试验 误差控制

Experiment on sensitivity to construction tolerance and research ontolerance control criteria in spoke structural roof of Bao’an Stadium

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Abstract:

The tolerance control criteria for cable length and compression ring configuration are significant for construction and acceptance when the design and tensioning are based on fixed size and length. However, so far no such standard has been established. The experiment on sensitivity to construction tolerance in spoke structure of Bao’an Stadium was done in order to solve this problem. The tolerances in the lengths of radial cables, inner tension ring cables and flying columns and compression ring configuration were simulated. According to the experimental results, the influence of the tolerances on the lengths of radial cables, inner tension ring cables and flying columns and compression ring configuration on cable truss where the tolerances are located are two to three times of those on adjacent cable truss. These three kinds of members are called the locally sensitive members. Tolerance on the length of inner rings have approximately the same effect on all cable trusses. The inner ring is called the globally sensitive member. Base on this classification and first-order-second-moment reliability index, a construction tolerance control method in spoke structures is proposed. In this method, firstly the change of prestressing is expressed as a linear function of the construction tolerances which are stochastic variables. The number of terms in the linear function is decided by the sensitivity classification of the member. Then critical state equation and first-order-second-moment reliability indices are achieved through the change of the prestressing. At last the stochastic criteria that construction tolerances have to satisfy are calculated by limiting the value of reliability indices. Tolerance criteria by this method have been used in construction and acceptance of spoke structural roof of Bao’an Stadium.

Keywords: spoke structure prestressing construction static test tolerance control

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