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无背索斜拉桥主梁空间内力分析方法 ——以长沙市环线浏阳河洪山大桥无背索斜拉桥为例

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摘要: 采用空间剪力柔性梁格法离散桥面结构, 建立了大悬臂钢脊骨箱梁主梁-混凝土桥面组合截面徐变内力重分布计算的初应变法, 编制了模拟无背索斜塔异形斜拉桥施工过程和使用阶段的空间内力及稳定分析程序. 以此为基础, 分析计算了长沙市环线浏阳河洪山大桥无背索斜拉桥主梁内力分布规律、徐变内力重分布对结构内力分配的影响、结构的整体稳定性安全系数等. 采用3种计算模式进行分析, 结果表明: 梁根部全截面轴力基本一致, 但轴力的分配差别较大, 若不考虑徐变影响, 钢箱梁承担的轴力为全截面轴力的0.47~0.50倍; 考虑徐变内力重分布, 钢箱梁承担的轴力为全截面轴力的0.78倍, 而对应的主梁钢箱梁稳定安全系数分别为4.18及3.1, 可见, 钢箱梁轴力是该桥钢箱梁设计的控制因素.

关键词: 无背索斜拉桥; 徐变; 内力; 重分布; 稳定安全系数

The spacial analysis of internal force on cable-stayed bridge without back stay over Liuyang river in Changsha

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Abstract: The initial strain method of calculating redistribution of internal force by creep in concrete steel combined section is established and the program of internal force and space stability analysis of cable-stayed bridge without back stay is developed based on the flexible shear grillage. The principle of internal force distribution, and the influence of creep on internal force distribution between steel girder and concrete deck and the safety factors of cable-stayed bridge without back stay in Liuyang river are presented. Three methods are conducted. The analysis results show that the internal force of whole section is the same but the distribution between steel girder and concrete deck is very different. If influence of concrete creep is ignored, the internal force of steel girder is 0.47~0.50 times as great as that of the whole combined section and the safety factor of steel girder is 4.18. On the other hand, if influence of concrete creep is considered, the internal force of steel girder is 0.78 times as great as that of the whole combined section and the safety factor of steel girder is 3.1.

Key words: cable-stayed bridge without back stay; creep; redistribution of internal force; safety factor of stability

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