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学术论文

混凝土早龄期性能与裂缝控制

金贤玉，田野，金南国

浙江大学 建筑工程学院, 浙江杭州 310058

摘要：

从混凝土微观结构出发，研究普通混凝土、高性能混凝土成型过程的时变温度场；对裂缝持续增长的早龄期混凝土物理、力学特性进行深入、系统的研究；综合考虑混凝土材料、结构特征,研究混凝土结构早期裂缝的成因机理、分析方法与控制措施；提出裂缝开展的预测和控制方法，建立裂缝扩展过程的损伤模型；在理论分析与试验研究的基础上，总结了混凝土早龄期的水化、温度、收缩、徐变、力学性能和断裂性能随时间的发展规律；综合分析各种因素对混凝土早期开裂的影响，推导了混凝土结构内部应力的增量计算方法。对室内试验与实际工程的研究表明：对混凝土早期开裂的分析应该是对混凝土温度、收缩、徐变、力学性能、结构特征等因素的综合动态分析，提出的混凝土早龄期开裂分析模型与试验结果吻合良好，采用理论模型结合数值模拟的方法可以有效提高分析过程的效率与准确性。 图18参22

关键词： 混凝土 早龄期性能 裂缝控制

Early age properties and cracking control of concrete

JIN Xianyu，TIAN Ye, JIN Nanguo

College of Civil Engineering and Architecture, Zhejiang University, Hangzhou 310058, China

Abstract:

Based on the microstructure of concrete, the time dependent temperature behavior of normal and high-performance concrete during construction was investigated, along with the in-depth research on the continuously changing physical and mechanical properties of concrete at early age. Considering material and microstructure characteristics of concrete, the mechanism, analytical method and control of early age cracking of concrete structures were studied. A method to predict and control concrete cracking was proposed. The damage modeling of the crack propagation was established. Based on the theoretical and experiment research, the development of cement hydration, temperature, shrinkage, creep, mechanical and fracture properties of concrete at early age were systematically evaluated. With considering the influence of shrinkage, temperature, creep, ultimate tensile strain and elastic modulus on early age cracking of concrete, an incremental method was established to calculate the stress development in concrete structures. The analytical results agree well with both the laboratory test results and the observations from actual construction projects. The research results show that the analysis of early age cracking of concrete should be based on a dynamic and systematic investigation on the temperature, shrinkage, creep, mechanical properties and structure characteristics of concrete. The proposed early age cracking analysis model of concrete fits well with the experiment results. The application of theoretical model and numerical simulation can improve the efficiency and accuracy of analysis.22Refs.In Chinese.

Keywords: concrete early age concrete properties cracking control

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