

结构生命周期的可靠性管理

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摘要 结构的抗力性能、使用条件、环境作用等都是随时间变化的过程。结构的运行规律复杂且具有大量的不确定性和不确知性, 单纯依靠设计来保证结构的安全性是不够的, 而应该综合考虑设计、检测、维护等策略对结构生命周期的可靠性进行管理。首先分析了目前的可靠度设计方法的优点和局限性, 对可靠性管理的概念和必要性进行了阐述。继而引入时变可靠度和时点可靠度指标, 建立一套考虑安全控制和风险优化的结构生命周期可靠性管理框架, 并对其中的若干理论问题进行了讨论。该框架的特点在于, 由静态思路转向动态思路, 强调信息的更新和充分利用, 与现有设计理论和工程实践保持协调。

关键词 [结构工程](#); [可靠度](#); [生命周期管理](#); [信息更新](#)

分类号

LIFE-CYCLE RELIABILITY MANAGEMENT OF STRUCTURES

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Abstract

The performance of structures is a time-variant process with large amount of uncertainties as well as the load and environmental effects on them. The reliability of a specific structure should be managed considering not only a generic design but also the inspection and maintenance strategies during its life-cycle. In the paper, firstly the advantages and limitations of the time-variant reliability theory currently used in structural design are discussed. Then the concept of life-cycle reliability management is introduced. A framework considering risk optimization and safety constraint is proposed for life-cycle reliability management. Several important theoretic issues are discussed, including the definition and usage of time-dependent reliability and dynamic reliability index, the expression of life-cycle cost and the Bayesian decision analysis, etc.. The framework stresses the importance of information updating during the structural life-cycle, and keeps consistent with current design practice.

Key words [structural engineering](#); [reliability](#); [life-cycle management](#); [information updating](#)

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