

ABSTRACT

The planning and design of reinforced concrete structures aims at providing a safe, serviceable, durable and economical structure. Such a structure should be able to effectively and efficiently sustain loads as well as maintain the required level of functionality throughout its period of service. A successful design optimises for two key properties viz. the strength and the durability of reinforced concrete. Design for strength is premised upon the analysis of mechanical loads and their effects. Design for durability focuses on the physical and chemical influences from the environment which cause a decrease in the quality and consequently the performance of structures. A structure may have satisfactory strength properties and yet fail prematurely under the degrading influence of an adverse environment. This underscores the necessity of durability design. This paper reviews existing literature on the durability design of reinforced concrete. Reliability theory, as applicable to engineering design, and specifically to durability design, is discussed. The primary environmental causes implicated in the structural degradation of reinforced concrete are reviewed. Various models which have been proposed for use in predicting the evolution of these causes, as well as reinforced concrete's corresponding response to them over time, are also discussed. Finally, this paper provides an overview of the durability index tests developed in South Africa. These tests are useful for quantifying certain parameters used as inputs in durability design, as well as for quality control purposes during construction.