Residual service life estimation of bridges

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Abstract

While concrete structures perform well in many situations, lack of durability has emerged as a significant issue for asset owners. A review of past bridge failures was done to identify the most probable causes of bridge failures. This study has tended to focus on current models used for estimating the time to deterioration of concrete bridges instigated by Chloride ingress and Fatigue. Subsequently, mathematical modelling of the best-suited deterioration model is done to arrive at the residual life of two existing bridges. This work has highlighted high variability in the parameters used to describe the durability related properties of in-situ aged concrete. A realistic residual life assessment can be achieved by correct evaluation of these parameters by periodic testing of bridge samples

Keywords: Service Life, Bridge, Initiation time, Propagation time, Fatigue.

1 Introduction

Currently, the asset owners are facing a major issue, whether to refurbish the existing bridge and bring it back to its life or to demolish and rebuild. The option of demolishing and rebuilding seems to have practical issues like decanting, access during construction, recycling of wastes and unforeseen costs besides many others. Furthermore, with the increasing focus on the sustainability of the built environment, the option of bringing back the serviceable life of bridges (with minimum investments) is the best option. In bringing back the serviceable life, one of the important considerations is to ascertain the residual service life of the bridge as a whole or some of its components. The Residual service life is defined as the assumed period of time, obtained after an assessment process, for which the structure will continue to serve its purposes. When the residual service life elapses, a new assessment is requested. The estimation of Service life is contextual, there are several aspects involved while we talk of Service life. The end of the service life can be viewed as the total collapse of a structure or initiation of the first crack or incapacity of the structure to meet the functional requirements. Maintenance strategy decides the residual service life of a structure at any point of time.

Many people attempted to find out the service life of a bridge, but their studies are confined only to the rebar corrosion. However, failures may be due to other reasons as well. Therefore, an analysis is done from the past bridge failure data since 1965 which revealed that except the under-construction failures and failures due to extreme acts of God, rebar corrosion instigated by chloride