Probabilistic Corrosion Service Life Model of Concrete Bridge Exposed to Chloride Deicer Salts

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Abstract text:
A model to determine the time till first repair and subsequent rehabilitation of concrete bridge decks exposed to chloride deicer salts that recognizes and incorporates the statistical nature of factors affecting the corrosion process, consists of the following serial phases: diffusion to the depth of the steel that would precipitate first maintenance actions; corrosion of the steel at the first maintenance depth until cracking and spalling occurs; continuous spalling until a damage level is reached which is defined as the end of functional service life for the deck of concrete bridge. The model expands on an existing deterministic model using statistical computing techniques, including resampling techniques such as the parametric and simple bootstrap. Emphasis was placed on the diffusion portion of the diffusion-cracking model, but advances can be readily included for the time for corrosion deterioration after corrosion initiation. The diffusion phase is described by Fick's law and the boundary conditions define the solution form. The time till cracking model depends upon some factors as concrete strength properties, cover depth and corrosion rate. Corrosion rate has a significant influence on the time to cracking which typically occurs in three to seven years after initiation. Service life model that predict the time to first repair and rehabilitation of concrete bridge decks provide a useful tool for comparing the effectiveness measures and provide bridge engineers with a useful planning tool. A service life model for the corrosion of concrete bridge deck in chloride laden environments is proposed. The aim of this paper is to enhance the awareness among the engineering community to use the model to determine the time till first repair and subsequent rehabilitation of concrete bridge decks exposed to chloride deicer salts in Romania.

Key Words:
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