A Probabilistic Study on Time to Cover Cracking Due to Corrosion

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Abstract : Corrosion of steel in reinforced concrete structures is a major problem worldwide. The volume expansion of corrosion products causes concrete cover cracking, which could lead to delamination of concrete cover. The time to cover cracking plays a key role to the assessment of serviceability of reinforced concrete structures subjected to corrosion. Many analytical, numerical, and empirical models have been developed to predict the time to cracking initiation due to corrosion. In this study, a numerical model based on finite element modeling of corrosion-induced cracking process is used. In order to predict the service life based on time to cover initiation, the numerical approach is coupled with a probabilistic procedure. In this procedure, all the influential factors affecting time to cover cracking are modeled as random variables. The results show that the time to cover cracking is highly variables. It is also shown that rust product expansion ratio and the size of more porous concrete zone around the rebar are the most influential factors in predicting service life of corrosion-affected structures.