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Service life prediction model for chlorine induced reinforced concrete structure

Satish N Desai and Deepak Kamde

Sardar Vallabhbhai National Institute of Technology, Surat, Gujarat

Durability is one of the major challenges in front of researchers and industrialist especially for the case of structures which are directly exposed to the marine environment under chloride attack. The present work proposes some modified relations between the factors which directly or indirectly effect the corrosion of reinforcement. Prediction of time to corrosion is the key element in evaluation the service life of RCC structures. In present work we have critically reviewed number of empirical, analytical models to predict time to corrosion and propagation. Service life has been modified in to three stages 1) Initiation 2) Propagation time and 3) Time to strength reduction. Fick's law has been used for predicting time to corrosion based on apparent diffusion coefficient which has been considered as time variant function. By adopting available data from the published journals we have obtained the relation between different variables which have been further used in the model proposed by vu et al 2005 to modify the propagation time; which has been considered as the time at which crack propagation reaches to its limiting value. And it was observed that even after the end of propagation time structure can behave structurally stable in few cases therefore 'time to strength reduction' has been introduced as the additive of former two. During this structure is expected to undergo further corrosion which may result to reduction in strength of concrete which leads to end of service life. Rate of corrosion has been introduced as time variant function; which depends on corrosion current density. And corrosion current density has been found depending on many variables there for multiple regression analysis has been used to obtain relationship. Service life prediction models have been proposed for two different cases 1) General corrosion model 2) Pitting corrosion model under five different exposure conditions. Concrete covers, bar diameter, water to cement ratio and exposure conditions are major factors which affect the service life. MATLAB code was developed for modelling of service life based on proposed model. Monte-Carlo simulation technique has been used to obtain set of data for all possible cases to understand the behaviour of service life of reinforced concrete structures with respect to variables involved in it. Concrete covers, bar diameter and w/c ratios have been found to be important variables which affect service life. Fly ash and silica fume also plays an important role in Initiation and propagation time; which increase the service life.

Biography

Dr Satish N Desai completed his PhD at SVNIT. (This institute is a central government institution of INDIA, and also considered as institute of national importance). He is the Professor of Applied Mechanics Department since 40 years. He has published more than 05 papers in International journals and more than 10 papers in national conference.

snd_02@yahoo.co.in

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