# A damage-propagation model for chloride-induced corrosion of reinforced concrete beams

Abul K. Azad, Shamsad Ahmad, and Syed A. Azher

Proceedings of 8th International Conference on Concrete in Hot and Aggressive Environments, Bahrain, 27-29 November 2006

**Abstract:**

Corrosion of reinforcement in concrete is a major problem for concrete durability in an aggressive, salt-laden, hot and humid environment. Corrosion of reinforcement progressively reduces the flexural capacity of beams due to continuous loss of metal and degradation of bond between steel and concrete. In this paper, a damage-propagation model in terms of the reduced residual flexural strength has been proposed to predict the useful service life of a reinforced beam exposed to a salt-laden corrosive environment. In the first phase of the life cycle which is corrosion free, the damage is nil and the time-to-corrosion in ideal conditions can be predicted using Fick's law of diffusion. In the damage-propagation phase, the residual flexural strength is calculated by a two-step analytical procedure. In the first step, the moment capacity is calculated using the reduced metal area. In the next step, this moment capacity is multiplied by a correction factor to account for the loss of bond and other factors. The useful service life ends when the residual flexural strength of a beam reaches the minimum value that can be permitted with reduced factor of safety.