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# PROBABILISTIC ANALYSIS FOR ESTIMATION OF THE INITIATIONTIME OF CORROSION

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**Abstract**: In this paper, a probabilistic study on durability concrete was carried out. In such a design,initiation time of corrosion must be expressed as a mathematical model using Fick's second law andthe statistical distributions properties of theirs parameters was included in this model. The scatterboth in the environmental exposure conditions and structural properties was considered as randomfields in the mathematical model with a probabilistic design. The main objective of this study ispredicted initiation time of corrosion of concrete structures in chloride containing environments. Thisprobabilistic study is developed using Monte Carlo simulation to determine the contribution of eachinput parameters and the statistical parameters of the random variables on the probability distributionfunctions of the initiation time of corrosion. Also, a comparison study was carried out to analyze theimpact of the probability distribution on the response (the initiation time of corrosion).Keywords: Durability, chloride effect, corrosion, spatial variability, Monte-Carlo simulation.1. IntroductionThe major cause of degradation of reinforced concrete bridge structures is chloride-inducedcorrosion of the reinforcing steel. This problem can impair to important serviceability and safetyreductions as well as increasing repair and maintenance costs [1, 2, 3].The initiation time of corrosion (tini) is a key factor in the service life prediction of a concreteelement, because the risk of steel corrosion is highly dependent on the quality of design andconstruction of the concrete cover. Which concrete represents the physical barrier againstany external aggressive agents. Increasing the density and impermeability of the concretecover by reducing the water-cement materials ratio and producing properly placed,compacted, and cured concrete, reduces the apparent chloride diffusion and consequentlydelays the initiation of corrosion.The analysis approach based on the probabilistic method

is the most reliable way to solveuncertainty problems. The latter has attracted a lot of interest from researchers recently [1, 2, 4, 5,6, 7, 8, 9]. As reliability concepts are better understood and more software developed, reliability-based applications move from simple, hypothetical examples using fictitious data to morecomplex, practical, and realistic engineering problems [10].The present work aims to predict initiation time of corrosion (tini) of concrete structures in chlorideenvironments using a spatial variability approach. This approach takes into account the spatialvariability of the different parameters of the structure such as, the surface concentration of chloride(Cs), the concentration threshold (Cth), the diffusion coefficient (Dc) and the coating (ct)appearing in simple Model.The Monte Carlo Simulation (MCS) methodology is used to compute the ProbabilityDistribution Function (PDF) and the failure probability of the system response of the initiationtime of corrosion. To illustrate the prediction of the service life of a reinforced concrete structure,an example of a concrete bridge element deteriorating due to chloride-initiated corrosion isanalyzed [11].