Reliability Assessment of a Bridge Structure Subjected to Chloride Attack - DTU Orbit (20/10/2019)

Reliability Assessment of a Bridge Structure Subjected to Chloride Attack

Prediction of the service lifetime of concrete structures with respect to chloride ingress involves a number of parameters that are associated with large uncertainties. Hence, full-scale measurements are strongly in demand. This paper begins by summarizing statistical distributions based on measurements taken from the Gimsaystraumen Bridge in Norway. A large number of chloride profiles are available based on concrete coring samples, and for each of these profiles the diffusion coefficient and surface concentration (due to sea spray) are estimated. Extensive measurements of the concrete cover depth are also performed. The probability distributions are input into a prediction model for chloride concentration at the steel reinforcement. By also introducing the critical chloride concentration as a random variable, the probability of exceeding the critical threshold is determined as a function of time. To address chloride attack on the entire bridge, a system model with 90 components is introduced. Reliability updating based on observations at multiple sites along the bridge is also investigated. First-order reliability methods typically become inaccurate for large systems of this type, so an enhanced Monte Carlo simulation method is applied. It is shown that the corresponding computation time is significantly reduced compared to crude Monte Carlo methods.

General information
Publication status: Published
Organisations: Department of Civil Engineering, Design and Processes, Department of Management Engineering, Norwegian University of Science and Technology
Corresponding author: Leira, B. J.
Contributors: Leira, B. J., Thöns, S., Nielsen, M. H.
Pages: 318-324
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Structural Engineering International
Volume: 28
Issue number: 3
ISSN (Print): 1016-8664
Ratings:
BFI (2018): BFI-level 1
Scopus rating (2018): CiteScore 0.72 SJR 0.355 SNIP 0.602
Web of Science (2018): Impact factor 0.608
Web of Science (2018): Indexed yes
Original language: English
Keywords: Chloride ingress, Bridge test data, System reliability, Enhanced Monte Carlo Method
DOIs:
10.1080/10168664.2018.1458586
Source: FindIt
Source ID: 2434146234
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review