

Reliability-Based Fatigue Evaluation Considering Various Initial Conditions of Defects

Lee-Sak AN

Ph. D. student
Seoul National University
Seoul, Republic of Korea
peacefulan@snu.ac.kr

Mr. Lee-Sak An received a master degree at Seoul National University in 2018 and continued to pursue Ph.D. at the same university. His current research topic is reliability-base fatigue evaluation and corrosion-to-fatigue crack transition phenomenon.



Yeun Chul PARK

Assistant Research Professor
Seoul National University
Seoul, Republic of Korea
ryan1886@gmail.com

Dr. Yeun Chul Park received doctoral degree at Lehigh University in 2015. Currently, he is working on establishing evaluating methodology for deteriorated steel bridges and corroded post-tensioning tendons.



Ho-Kyung KIM

POSCO Chair Professor
Seoul National University
Seoul, Republic of Korea
hokyungk@snu.ac.kr

Dr. Ho-Kyung Kim received his doctoral degree at Seoul National University in 1993. He currently serves as the Chair, NG of Korea, IABSE.

Contact: ryan1886@gmail.com

1 Abstract

This study presents the reliability-based fatigue evaluation procedure for deteriorated steel members of a bridge with estimation in initial conditions of defects. For this purpose, deterioration scenarios and limit states are defined when fatigue crack or pitting corrosion are found. Since the initial conditions of the defects, such as the initial crack depth or the time for corrosion nucleation have large uncertainties, the initial conditions are estimated using the inspection results. A numerical example is presented to confirm the applicability of proposed method for typical steel structural members. The initial crack depth and the time for corrosion nucleation estimated by the proposed methods are similar to those proposed in previous studies, depending on the size of the defect. It is also possible to estimate more reasonable initial conditions of defects compared to the fixed distribution parameters or deterministic values which have been presented in previous studies. Therefore, it is expected that the proposed evaluation procedure could facilitate precise fatigue reliability analysis.

Keywords: fatigue evaluation, reliability index, deterioration, fatigue crack, corrosion, initial state