

Assessment of modeling uncertainties in the FE analysis of deteriorated concrete structures

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ABSTRACT

The present paper is focused on the uncertainty of the structural response of corroded beams predicted by a non-linear finite element model. A probability-based approach is generally used for the assessment of deteriorated structures in order to account for the uncertainties related to the actual condition and its evolution in time. Although several models concerning the initiation and propagation phases of corrosion have been formulated, a probabilistic characterization of the uncertainty related to the structural modeling is still lacking.

The structural effects of reinforcement corrosion include loss of reinforcement area, reduction of strength and ductility of the corroded bars, loss of bond between reinforcement and concrete, cracking and spalling of the concrete cover. Concrete and reinforcement are modeled by two-node beam and truss elements, respectively. Bond between concrete and reinforcement as well as the structural effects of corrosion are taken into account in the finite element model. A set of beams subject to different corrosion conditions is considered in this investigation. The modeling uncertainty is obtained from comparisons of physical tests and model results.

Keywords: non-linear FEM, reinforcement corrosion, modeling uncertainties.