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NUMERICAL MODELING OF THE CORROSION EFFECTS ON REINFORCED CONCRETE BEAMS

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ABSTRACT

The evaluation of the structural response of existing reinforced concrete (RC) structures, subjected to aggressive environment, is still an evolving research topic. In particular, corrosion of steel reinforcement, which is acknowledged as one of the main causes of deterioration, may lead to a drastic reduction of the service life, a decrease of the ultimate load and a reduction of the global ductility. In this paper, a methodology able to evaluate the non-linear behaviour of RC elements at different level of deterioration, using an enhanced numerical damage model, is developed. The proposed comprehensive approach consider all the main local effects of corrosion, e.g. reduction of steel reinforcement cross section and mechanical properties, due to uniform and pitting corrosion; cracking and spalling of the concrete cover, by reducing the compressive strength and the ductility of the concrete; and bond degradation. The ability of the model to reproduce different types of failures is first verified with reference to the results of experimental tests carried out at sound RC beams. Then, some structural elements subjected to different levels of corrosion are analysed and the consequences of the local effects of corrosion on the structural response are discussed.

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