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Review article

Numerical modelling of the cyclic behaviour of RC elements built with plain reinforcing bars

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ABSTRACT

The bond–slip mechanism is one of the features that significantly controls the response as well as damage evolution of reinforced concrete structures when subjected to severe cyclic loadings, such as those induced by earthquakes. Its effect is particularly important in structures built with plain reinforcing bars. For a rigorous simulation of the response of existing RC structures, built mainly with plain bars, the bond–slip mechanism should be considered. However, the majority of the available concrete–steel bond numerical models were developed and calibrated for elements with deformed reinforcing bars. Moreover, the available experimental data on the cyclic behaviour of RC elements built with plain bars is still limited. In this framework, the objective of the present paper is to calibrate a numerical model based on results of a cyclic test performed on a two-span RC beam built with plain bars, which was collected from an existing structure. The numerical modelling was carried out with the nonlinear OpenSees software platform. Particular awareness was devoted to the bond–slip mechanism. The numerical results obtained with the calibrated nonlinear model are presented and compared with the experimental results. The consideration of the bond–slip effect in the numerical model was fundamental to achieve a good agreement between the numerical simulation and the test results.

Contents

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