Mesomechanic Modelling of Steel-Concrete Bond Mechanisms in Pull-Out Test at different Strain Rates

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ABSTRACT

Attention is focussed in the pull-out test at different strain rates. Response behaviour is highly dependent on the applied loading rate. Computational modelling uses zero-thickness interface elements to simulate steel-concrete bond. Steel-concrete bond mechanism is explored at constitutive point of view by proper calibration using a hyperbolic constitutive model specifically designed for analysis of concrete/mortar joints at different strain rates. Rate/time effects are introduced by considering a viscoelastoplastic extension of the original constitutive law based on Perzyna's Theory of Viscoplasticity. The inviscid cohesion and friction parameters of the constitutive model are calibrated to allow interfaces between concrete and steel to follow the observed experimental behaviour. After model calibration, the classical RILEM configuration for the Pull-Out test is evaluated at different loading rates for model validation. Results are used for evaluation of a structural response considering a cantilever reinforced concrete beam at meso-level of observation subjected to different loading rates. Obtained results indicate that the proposed model, after proper calibration, is able to numerically simulate the structural behaviour of reinforced concrete structures at mesomechanic level of observation.

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