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EFFECTS OF HETEROGENEITIES IN DYNAMICAL RESPONSE OF REINFORCED CONCRETE STRUCTURES

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ABSTRACT

An important domain of application in Civil Engineering practice is reserved for structures subjected to extreme dynamical events like earthquakes, storms, etc. where it is necessary to understand the real structural response, in order to prevent any inconvenient or collapse. This structural response depends on the kind of materials that constitutes each specific structural element. Reinforced concrete is a man-made typical composite material used extensively in construction, integrating three major components: concrete, steel reinforcement and bonding. These three items are considered a unique and homogeneous material, and the majority of structures are designed based on this assumption. Nevertheless, concrete is not a homogeneous material: in fact, it is composed of cement, aggregates, water, and others. Because of this, cracking appears almost immediately in the concrete body, and its presence can modify the expected structural response.

In a damaged concrete structure, cracking pattern distribution is conditioned by the heterogeneities of the material [1], and its effects can be incremented by the kind of solicitation applied to the structure. In that case, dynamical loads could have a major influence in cracking distribution.

The purpose of this work is to analyze numerically the dynamical response of standard traction tie, subjected to an axial dynamical load applied at the rebar, taking account of the random effect produced by concrete heterogeneities. For this, we modeled the specimen in a Finite Element code (FEAP, see [4]), which takes into account the nonlinear damage behavior of the concrete, elasto-plastic behavior of steel, and nonlinear behavior of bonding. In the case of bonding, a zero-thickness interface element is adopted. To model heterogeneities, we introduced a random variable which affects the concrete elastic strain limit for each finite element. /See [2,3] for details.

The results of our numerical simulations as well as their analysis will be presented at the conference.

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