NONLINEAR SEISMIC ANALYSIS OF REINFORCED CONCRETE SHEAR WALL CONSIDERING BOND- SLIP EFFECT

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In this paper, a numerical model based on the fiber method is used for nonlinear analysis of reinforced concrete shear wall. The theory of numerical calculation is similar to fiber method but the perfect bond assumption between the bars and surrounding concrete has been removed. Separate degrees of freedom are used for the steel and concrete parts in nonlinear modeling of the reinforced concrete elements.

For the purpose of nonlinear analyzing of RC shear wall and investigation the bond-slip effect, two type of RC and joint elements are modelled as Figure 1. The bond-slip effect has been considered in the formulation of reinforced concrete elements and joint element. The effect of bond-slip has been considered in the formulation of a reinforced concrete element by replacing the perfect bond assumption from the fiber analysis method. Joint elements are formulated upon major behaviour including the pull-out of embedded longitudinal bars.

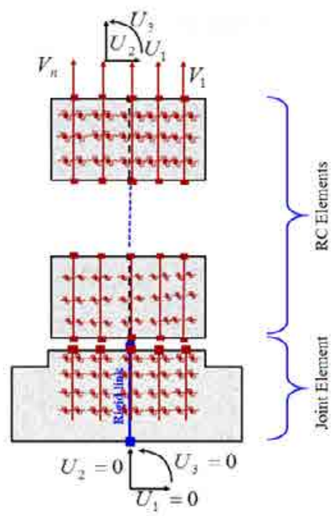

Figure 1. Numerical modeling of a RC Shear Wall

Bar and concrete stress-strain relations, the bond stress-slip relation and the shear stress-strain relation and, also, their cyclic behavior are adopted known specifications. Bond stress is referred to as the shear stress acting parallel to an embedded steel bar on the contact surface between the reinforcing bar and the concrete. Bond slip is defined as the relative displacement between the steel bar and the concrete. The adopted model to represent the bond slip effect between bars and concrete is proposed by Eligehausen et al. (1983), shown in Figure 2.

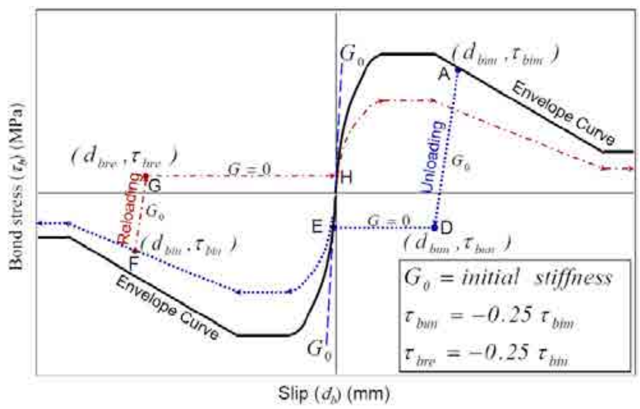

Figure 2. Cyclic bond stress- slip relation

The specimen is a wall under constant axial load with magnitude of 1420 kN. Lateral cyclic displacement was imposed at the free end. It was tested by Dazio et al. (2009). In numerical modeling, the wall is subdivided into enough number of shorter elements. Figure 3 shows the analytical and experimental load-displacement responses with good accordance for strength, stiffness, and their changes during cyclic loading.

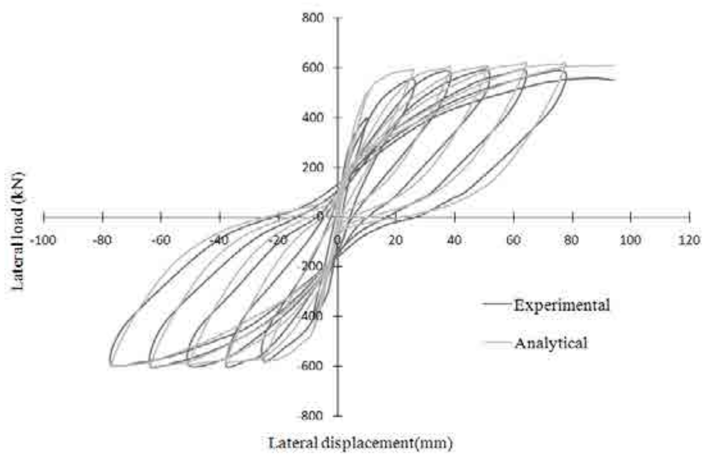

Figure 3. Experimental and analytical cyclic load- displacement responses for tested specimen

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