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

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ABSTRACT

In this paper, the nonlinear behaviour of reinforced concrete shear wall with consideration of bond-slip effect between the bars and surrounding concrete is investigated. 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. In the modeling, shear wall is divided into two type of joint element and RC element. In RC element, the effect of shear deformation is considered and based on Timoshenko beam theory the effect of shear has been considered during the calculation. a numerical model based on the fiber method is used for nonlinear analysis of reinforced concrete shear wall. The effect of bond-slip has been considered in the formulation of a RC element by replacing the perfect bond assumption from the fiber analysis method. The effects of embedded length and pull-out force on the seismic behaviour of a reinforced concrete shear wall were investigated. The precision of the analytical results were compared with the experimental results achieved from two specimens under cyclic loading. The comparison showed that the proposed method can model the nonlinear behaviour of reinforced concrete shear walls with very good precision. A good agreement between experimental and analytical results is obtained for both cases of strength and stiffness during the analysis.

INTRODUCTION

Many analytical models have been devised for nonlinear analysis of reinforced concrete shear wall. The analytical model can be separated into two groups: macroscopic models and microscopic models based on finite element models. The macroscopic models is based on representing the overall behavior of the RC shear wall, such as the wall deformations, strength, and energy dissipation capacity. Various macroscopic models have been proposed to predict the nonlinear response of RC structural walls (Jalali and Dashti. 2010). In this way, several concentrated and distributed plasticity constitutive models and also modeling through the combination of sub-elements have been proposed. The most promising model for the nonlinear analysis of reinforced concrete elements is, presently, fiber section model. The fiber model, basically, adopts the perfect bond assumption. This assumption causes a considerable difference between experimental and analytical responses of the reinforced concrete shear wall in many cases. In this model, the member is divided longitudinally into several segment, and each segment is composed of parallel layers. Some layers would represent the concrete material and other layers would represent the steel material. Behavior of concrete and