investigation of the dilation angle and softening behavior effect of the confined concrete on self-centering segmental rocking base columns

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Abstract

In seismic regions, the construction of bridges and structures with better seismic performance and re-centering capability that can reduce residual displacement and damage, are necessary. As an alternative, prestressed columns were developed in recent years which can limit the permanent deformation and structural damage effectively. After severe damage and residual displacement of bridge piers and building's columns, extensive research was carried out on prestressed columns. In self-centering structures, the precast beam and column are connected to each other by prestressed tendons, and unlike the common moment resisting frame, the columns have rocking motion. In this paper, the finite element analysis method has been done using Abaqus software. The numerical and the experimental results are compared and the accuracy of the modeling is assured. The proposed model for validation is the segmental bridge pier, and the effect of different values of the dilation angle and the concrete softening on the hysteretic behavior of the columns confined with steel jacket and transverse reinforcements are investigated. The results show that the softening behavior of concrete has an important effect in the nonlinear response of RC structures and as the slope of stiffening decreases its resistance increases. Also results show that the greater the dilation angle, the more force needed to deform the concrete in the desired dilatation.

Keywords: prestressed column, self-centering rocking column, finite element analysis, cyclic loading, Abaqus software, dilation angle.