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Investigation of the Leaning Column Effect on Estimating of the Responses of Self-Centering Base-Rocking Walls under Far and Near Field Ground Motions

In this research, the effect of P-Delta column (leaning column) on the response of gravitational frames with lateral-load resistance system of base-rocking wall has been investigated. The studied structures have 4-, 8-, 12-, 16-, and 20-stories. Nonlinear dynamic behavior is performed under 22 far-field seismic records and 28 near-field seismic records, half of which are pulse-like, via OpenSees software. The ground motions are scaled at both DBE and MCE levels and applied to the structure. The modeling is done in two dimensions. As a results, it has been shown that 1) the higher modes effect increases with increasing earthquake intensity, 2) the higher modes effect are more visible in the records of far-field and near-field-non pulse-like, 3) residual displacements in The both earthquake levels studied are insignificant and negligible, 4) P-Delta column has been more effective in structures under near-field-pulse-like records, 5) The maximum effect of P-Delta column in increasing the moment of wall under near-field-pulse-like earthquake that the value is 12%, and 6) In general, the effect of the P-Delta column on the base-rocking wall structures in especially the stepping-wall can be ignored.

Keywords: Self-centering system, Rocking wall, Residual displacement, Leaning column effect, Higher mode effect.

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