

ABSTRACT

Smith, Jhon Paul, Ph.D., Purdue University, December 2004. Wall-Frame Structures with Vulnerable Foundations. Major Professors: Julio A. Ramirez and Mete A. Sözen.

Findings from previous studies have indicated that a reinforced concrete wall with a structural hinge at the base, used to reduce the strength requirement for the foundation, can be effective for limiting the drift demand for frames subjected to strong ground motions. The goal of this study was to investigate whether the development of a hinge at the foundation, rather than at the wall, would affect the behavior of the building negatively. A series of 17 tests of small-scale foundation models supported on sand was conducted in order to calibrate a numerical model proposed in this study and to formulate practical relations for the response of foundations in buildings subjected to ground motion. Two structures representative of medium and high-rise residential buildings in Turkey were analyzed to estimate their drift response with and without foundation yielding. Supporting soil for the structures was assumed similar to the sand used in the experimental program of this study. It was found that the supporting soil provided sufficient energy dissipation/deformation capacity and thus foundation yielding did not result in a significant increase in the calculated drift response.