

## Parameters Affecting the Elasto-Plastic Behavior of Outrigger Braced Walls to Earthquakes

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**Abstract :** Outrigger-braced wall systems are commonly used to provide high rise buildings with the required lateral stiffness for wind and earthquake resistance. The existence of outriggers adds to the stiffness and strength of walls as reported by several studies. The effects of different parameters on the elasto-plastic dynamic behavior of outrigger-braced wall systems to earthquakes are investigated in this study. Parameters investigated include outrigger stiffness, concrete strength, and reinforcement arrangement as the main design parameters in wall design. In addition to being significant to the wall behavior, such parameters may lead to the change of failure mode and the delay of crack propagation and consequently failure as the wall is excited by earthquakes. Bi-linear stress-strain relation for concrete with limited tensile strength and truss members with bi-linear stress-strain relation for reinforcement were used in the finite element analysis of the problem. The famous earthquake record, El-Centro, 1940 is used in the study. Emphasis was given to the lateral drift, normal stresses and crack pattern as behavior controlling determinants. Results indicated significant effect of the studied parameters such that stiffer outrigger, higher grade concrete and concentrating the reinforcement at wall edges enhance the behavior of the system. Concrete stresses and cracking behavior are significantly enhanced while lesser drift improvements are observed.

**Keywords :** outrigger, shear wall, earthquake, nonlinear

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