# Seismic fragility of gypsum partition walls

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## ABSTRACT

In recent decades, the seismic response of building nonstructural components has received increased attention because of their relatively high investment cost for new construction and associated repair cost following earthquakes. Based on estimates from past earthquakes, nonstructural components and systems can account for more than half of the building's economic losses. In this research, the experimental seismic responses and fragility of the gypsum partition walls with cold-formed steel frame which are defined as nonstructural components was carried out. A series of 12 tests of full-scale partition walls with various gypsum board types and connection details consisting of 11 gypsum partition walls and 1 block brick wall were conducted under the quasi-static lateral cyclic loading. To estimate loss estimation, fragility curves which are the relation between the interstory drift and the damage states of the gypsum partition walls were developed. Three damage states based on the repairing methods which is DS1 requiring repair of the gypsum wallboard, DS2 requiring the replacement of the wallboards, and DS3 requiring the replacement of the partition were defined in accordance with Federal Emergency Management Agency (FEMA) P-58BD-3.9.2 damage states and were further adjusted based on the current damages of the tested gypsum partition walls. Based on the experimental results, the gypsum partition walls show the average peak load approximately half of that of the brick wall, but the gypsum partition walls perform more flexible with the average drift at the peak load nearly twice of that of the brick wall. In addition, the deformability against damages of the tested gypsum partition walls performs better than the gypsum walls presented in FEMA with the drift shifting of 0.1% for DS1, 0.3% for DS2, and 0.5% for DS3, respectively.

**Keywords**: Seismic Fragility, Gypsum Partition Walls, Nonstructural Components, Quasi-Static Cyclic Test

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