# Seismic Behavior and Analysis of Planar Concrete Walls

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Structural walls are one of the most commonly used lateral-load resisting systems, and many previous studies have addressed the seismic performance, analysis and design of these systems. However, few previous tests have focused on the performance of structural wall systems and few have simulated the reinforcement patterns, complex geometries and loading distributions found in modern structures. As such, limited data have been available for validation of the models used in performance-based seismic design of these systems.

To overcome the deficiencies in previous tests, large-scale reinforced concrete walls are being tested using the advanced equipment, control algorithms and instrumentation available at the NEES MUST-SIM facility at the University of Illinois. Test specimens include planar, coupled, and C-shaped walls. To maximize the scale, for each test only the lower three stories of a ten-story building are simulated in the laboratory. To simulate the demand originating from the upper stories of the ten-story structure, specialized load-and-boundary-condition boxes (LBCBs) are used to apply the appropriate combination of shear, moment and axial load. Testing of the first series of specimens, four planar walls, was completed in 2008. Testing of a coupled wall will be completed in September 2010 with testing of the C-shaped walls following.

Specimen behavior was monitored using an optical Metris coordinate measurement system (formerly Krypton) as well as traditional displacement transducers and concrete and steel strain gages. The dense displacement field data provided by the Metris system have been used to determine strain fields histories as well as the contribution to total deformation of flexural, shear, anchorage and other response mechanisms. These data provide insight into the impact of splices, shear demand and reinforcement distribution on the seismic response of walls. These data will be presented and compared with data from earlier tests and numerical models; behavior will be compared with current practice expectations.