



Seismic Monitoring Mounting and Alignment

Lawrence Livermore National Labs w/ California Mechatronic Center

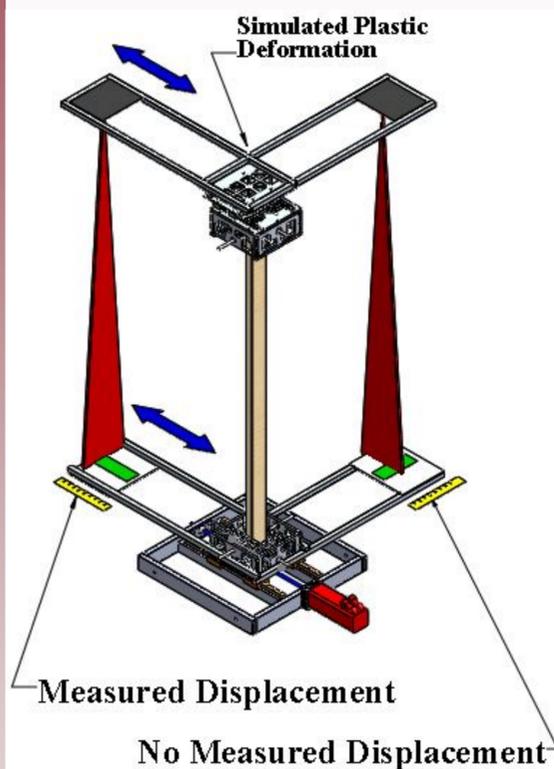
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PROJECT OVERVIEW

The purpose of this project was to build a demonstration test structure that can be used for LLNL's inter-story displacement measurement device. Buildings that suffer structural damage from earthquakes will use these sensors for safety.

The objectives of the project included:

- The test structure must shake at similar frequencies and amplitudes as a building during an earthquake.
- Mimic plastic deformation to demonstrate the displacement measuring device.
- Must be able to break down into transportable pieces which can fit through 8 ft. tall doorways.
- Provide a mounting solution for the displacement measuring device.

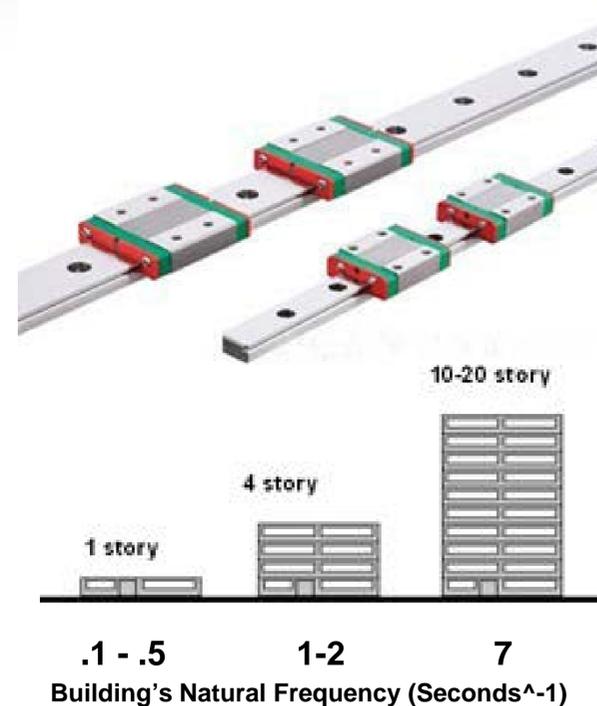
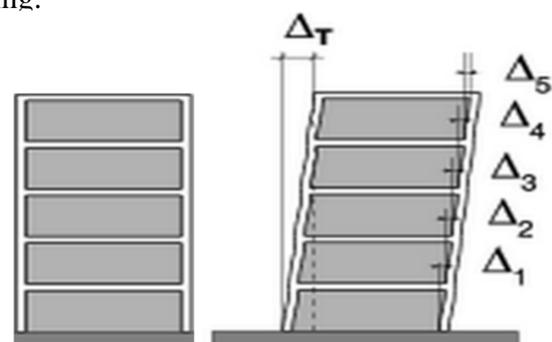


HOW IT WORKS

Earthquakes are simulated by rotating the base to orient the earthquake direction and moving at specific frequencies and displacements. The Top Assembly turns these earthquake motions into plastic deformation. By measuring motion in X and Y this allows the electronics to capture the plastic deformation simulated by the hardware.

Inter-Story Drift

Many buildings on fault line suffer from structural damage caused by earthquakes. Of all the structural damage, inter-story drift can be the most devastating. Inter-Story Drift occurs when a one floor of a building moves more than the floor beneath it resulting, in plastic deformation of the building.



Preloaded Bearings

Preloaded bearings supporting the laser assemblies. When sufficient earthquake energy would cause full size building destruction, the lasers will shift in their location simulating this plastic deformation.

Variable Frequency Columns

Specific buildings can be simulated depending on the columns shape, size, and material.

Columns with high stiffness and low periods simulate shorter buildings. Columns with lower stiffness and high periods simulate taller buildings.

PROJECT OUTLOOK

The test structure allows for the simulation of realistic earthquake motions in buildings. It repeatably displays the plastic deformation that happens as a result of earthquake damage without the cost of a full size simulation. This platform helps demonstrate the measuring capability of the sensors.

