

Visualization Tools Developed at the NEES@UCSB Facilities

Three Educational Videos

<http://nees.org/resources/4874/>

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PURDUE UNIVERSITY
Discovery Park

Introduction

- Two soil-foundation-structure-interaction (SFSI) structures installed side-by-side at the NEES@UCSB Garner Valley field site are fully instrumented to record response to ambient earthquakes. The larger frame is identified as the SFSI and the smaller one is affectionately called “MiniMe.”
- The test structures are instrumented with accelerometers, rotational velocity sensors, strain gauges, pressure cells, and uplift displacement sensors. These field studies of structural frames with and without diagonal bracing demonstrate the importance of bracing and the primary effect of horizontal accelerations during earthquakes.



NEES@UCSB Garner Valley Site

Braced & Unbraced
Soil-Foundation-
Structure-Interaction
(SFSI) Frames

Uniaxial shaker mounted
on the underside of the
top slab



Application

- Structural performance concepts that are covered in theory in engineering classes can be seen in these animations.
 - For example, in the unbraced SFSI frame, the roof of the structure resonates in response to the base excitation.
 - In the braced MiniMe structure, it is possible to see the greater deflection in the “soft” direction, which is the longer side of the rectangular structure.
 - Features of earthquakes are also visible in these animations, such as the initial vertical motion from the P-wave followed shortly by the larger horizontal motions of the S-wave.



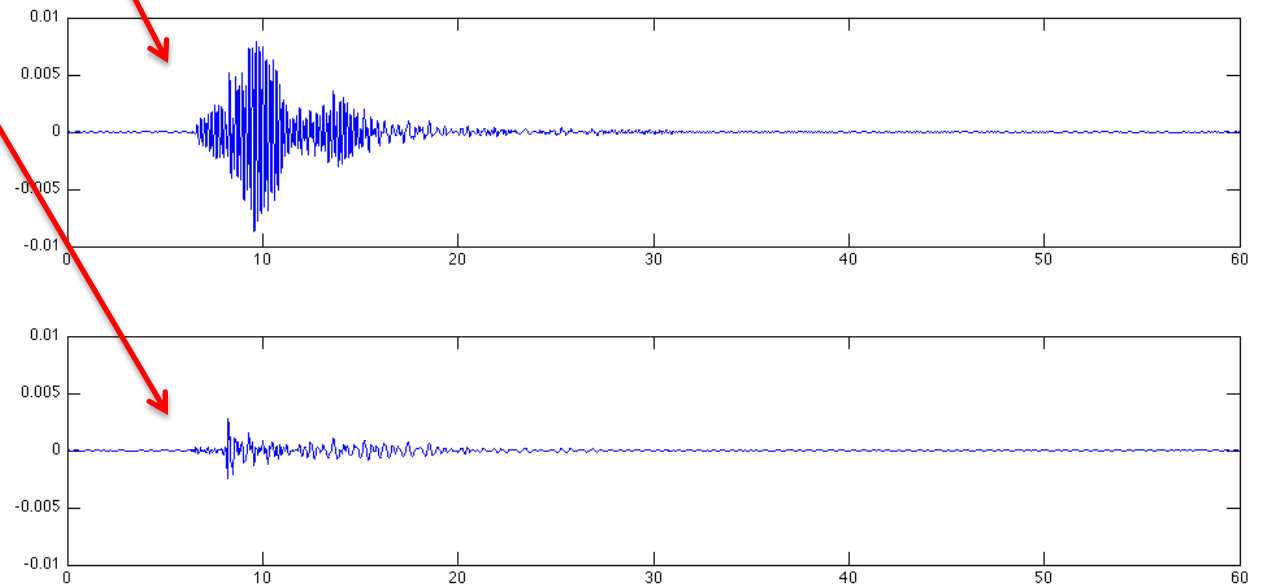
Significance

- The SFSI experiments are very significant because they record **in situ** response of structures to earthquakes.
- While experimental shake table and laboratory testing research is advancing understanding of the response of structures and components to fixed base excitation, the “truth” of structural response is found in these in situ recordings.



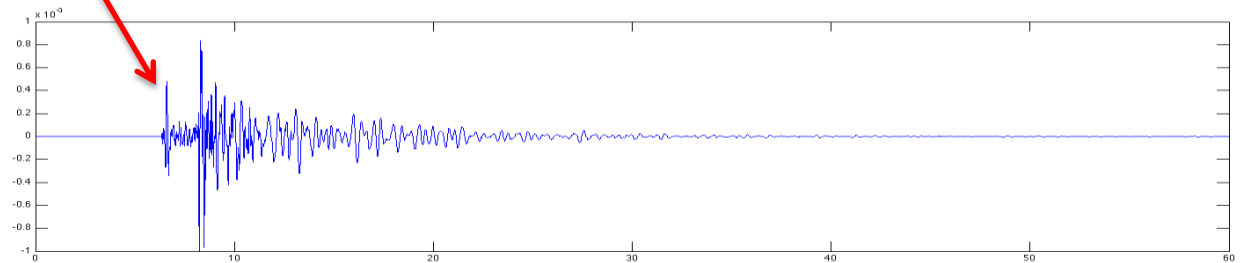
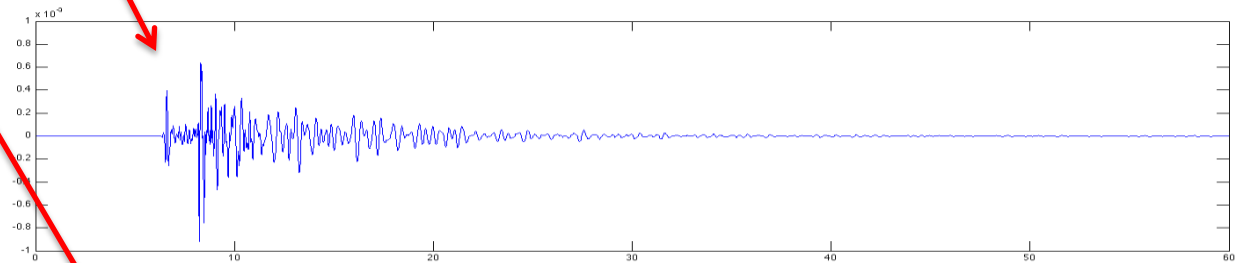
3 June 2011 M3.1 Event

Unbraced Frame, Resonance of the Top Slab



3 June 2011 M3.1 Event

Braced Frame, No Resonance of the Top Slab



ANIMATION #1 3 June 2011 M3.1 Event

Displacements in cm x75,000, Time x0.5



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ANIMATION #2 14 June 2011 M3.6 Event

Displacements in cm x75,000, Time x0.5



ANIMATION #3



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Excitation of Uniaxial Shaker

Displacements in cm x75,000, Time x0.5

