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Civil Engineering, IT, 2009
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Civil Engineering, IT, 2008
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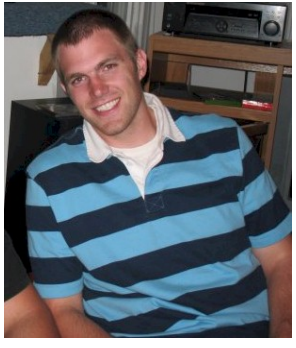
Earthquake Simulations on Unbonded Post-Tensioned Precast Concrete Box Structures



Cast-in-place concrete walls are typically reinforced with steel bars that are bonded to the concrete, and they are also fixed to the foundation. In the event of an earthquake, significant cracking will form along the shear plane of the wall and along the bonded reinforcement. As a minimum, epoxy adhesives need to be injected into the cracks and voids to fix the seismic damage, and this is usually an expensive operation. Unbonded post-tensioned concrete walls are able to displace from the foundation in a controlled and predictable manner during a seismic event and there is no stress transfer to the concrete along the length of the unbonded tendons, so there is no need for expensive epoxy repairs. However, a research gap currently exists regarding the seismic performance of unbonded post-tensioned precast concrete walls due to a lack of experimental research using simulated seismic motions. To meet this need, a medium scale (1:4) box structure (comprising four wall panels, a roof diaphragm and a concrete foundation) was designed using contemporary design techniques and tested on an earthquake simulator (i.e., shake table). The results from this study can be used to provide insight into on the dynamic performance of precast concrete wall structures under biaxial seismic motion.

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