15th World Conference of Earthquake Engineering

ABSTRACT SUBMISSION

Title: Earthquake Response and Structural Health Monitoring of Christchurch Women's Hospital Following the Canterbury and Christchurch Earthquakes

Abstract No. 1730

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Abstract The September 2010 Canterbury and February 2011 Christchurch earthquakes and associated aftershocks have shown that the isolator displacement in Christchurch Women's Hospital (Christchurch City's only base-isolated structure) was significantly less than expected. Occupant accounts of the events have also indicated that the accelerations within the hospital superstructure were larger than would usually be expected within a base-isolated structure and that residual low-level shaking lasts for a longer period of time following the strong-motion of an event than for non-isolated structures.

To investigate these observations, a multi-university collaboration between the University of California Los Angeles (NEES@UCLA), Duke University, and the University of Canterbury was formed to instrument the Christchurch Women's Hospital. Five tri-axial strong-motion accelerometers, three uni-axial strong-motion accelerometers and three string potentiometers were utilised to determine the overall building response to the many seismic events of the aftershock sequence. Instruments were installed across the isolation interface in the hospital basement, recording accelerations and relative displacements between the foundation and the base of the superstructure. Accelerometers were also installed in the roof-space to determine structural response and at each end of the structure to investigate any torsional response.

It was observed that significant liquefaction occurred below the main slab of the foundation, introducing essentially an extra layer of isolation, contributing to the observed longer duration of residual low-intensity vibrations. Rocking of the raft foundation on the underlying soil was also observed. Interaction between the isolated Women's Hospital building and an adjacent non-isolated hospital building was observed despite design detailing intended to prevent interaction and allow both structures to respond independently. This interaction contributed to the lower than expected isolation interface displacement. The abnormally large vertical accelerations for these events were determined to contribute to the high shaking intensity observed by occupants. Specific details of the instrumentation plans and the justification for these observations can be found within the manuscript.

Permission Yes

Approval Confirm

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