



# EARTHQUAKE ENGINEERING RESEARCH INSTITUTE

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1. USGS Award Number G13PX01084
2. Title of the Award Special Issue of Earthquake Spectra on the Canterbury Earthquakes of 2010-2011
3. Award Dates (MM/YY) From 07/23/2013 to 06/14/2014
4. Institution and Address Earthquake Engineering Research Institute  
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5. Publications 2010-2011 Canterbury Earthquake Sequence Special Issue

Early morning on 4 September 2010, Christchurch residents were awakened by a strong Mw 7.1 earthquake known as the Darfield earthquake. With an epicenter 45 km west of Christchurch, on a previously unknown fault in the Canterbury Plains, the earthquake resulted in damage associated with surface faulting in agricultural lands and widespread liquefaction in residential areas of Christchurch. Damage to structures in the city was generally limited to unreinforced masonry buildings. There were no fatalities. The Darfield earthquake was followed by approximately 60 earthquakes over Mw 5 and hundreds exceeding Mw 4; collectively, these are known as the Canterbury Earthquake Sequence.

The most significant event of the Canterbury Earthquake Sequence struck at 12:51 p.m. on 22 February 2011; a Mw 6.2 earthquake with an epicenter of only 6 km from the Christchurch Central Business District (CBD). In contrast to the 4 September event, the 22 February earthquake hit when people filled the offices and cafes of the CBD, leading to 185 fatalities. Liquefaction was widespread in the CBD and the eastern suburbs, resulting in foundation movement for housing and office buildings alike. Two reinforced concrete buildings and one parking garage collapsed, and hundreds of unreinforced masonry buildings experienced partial or total collapse, including many heritage structures. Many other buildings in the CBD experienced severe damage, some requiring demolition, necessitating carefully controlled access. A portion of the CBD has remained cordoned off from public access for 2.5 years following the February 2011 earthquake. During this period, the earthquake sequence continued, including an Mw 6.0 event on 13 June 2011 and two events (Mw 5.8 and 5.9) on 23 December 2011.

The special issue of Spectra focuses on early research projects using data from the earthquakes, the impacts of the earthquakes on engineering practice, and new emerging lessons for policy and regulation and complements special issues previously released by the *Seismological Research Letters* (SSA 2011) and the *NZSEE Bulletin* (NZSEE 2011). The special issue is organized in topical sections as follows: Seismology and Geotechnical Impacts; Lifeline Performance; Building Performance; Resilience and Recovery. Unique multidisciplinary aspects of many of the papers lead to crossover between several of these topical sections. These findings were published in EERI's Earthquake Spectra Journal, Volume 30, Number 1. This publication is available for purchase at <https://www.eeri.org/products-page/reconnaissance-issues/es-30s1-the-2010-2011-canterbury-earthquake-sequence-special-issue/>

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