

ATC-109

**Building Safety Evaluation after the February 22,
2011 Christchurch, New Zealand Earthquake:
Observations by the ATC Reconnaissance Team**

By the

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Preface

In June 2011 the Applied Technology Council (ATC) dispatched a small reconnaissance team to Christchurch, New Zealand to observe the building safety evaluation process following the magnitude-6.2 February 22, 2011 earthquake, one of several large earthquakes that significantly impacted Christchurch and the surrounding area on the South Island of New Zealand, beginning in September 2010. The ATC team spent one week in New Zealand, followed by additional research, including internet searches and the review of pertinent literature.

The outcomes of the building safety evaluation reconnaissance study were of particular interest to ATC because New Zealand conducted postearthquake safety evaluations using methodologies similar to those in the ATC-20 report, *Procedures for Postearthquake Safety Evaluation of Buildings* (ATC, 1989a), which has evolved into the defacto national standard in the United States. Moreover, the New Zealand earthquake series and related impacts occurred at a time when ATC was beginning to plan an update of the ATC-20 report and companion ATC-20-1 *Field Manual: Postearthquake Safety Evaluation of Buildings, Second Edition* (ATC, 2005)—an activity that could benefit from the reconnaissance efforts.

This ATC-109 report summarizes the reconnaissance team's observations, findings, and recommendations regarding postearthquake building safety evaluations. The report preparation process benefited from review comments received from New Zealand engineers and several U.S. and Canadian structural engineers who participated in the building safety evaluations in Christchurch immediately following the February 2011 event. Their observations and insights were very helpful in developing a picture of the immediate postearthquake situation and its subsequent evolution. The ATC team also relied on information provided in the earthquake investigation reports commissioned by the Canterbury Earthquakes Royal Commission, which was formed in response to the earthquake series and their devastating impacts on Christchurch.

The ATC reconnaissance team consisted of Bret Lizundia (lead), Ronald Gallagher, and Jim C. Barnes. Mr. Lizundia, a practicing structural engineer and a principal at Rutherford + Chekene in San Francisco, was the ATC Board President at the time of the trip. Mr. Gallagher, a structural engineer with R. P. Gallagher Associates in Oakland, California, led the development of the original ATC-20 report, *Procedures for Postearthquake Safety Evaluation of Buildings* (ATC, 1989a) and the companion ATC-20-1 *Field Manual: Postearthquake Safety Evaluation of Buildings* (ATC, 1989b). Mr. Barnes is a civil engineer with the California Governor's Office of Emergency Services (Cal OES) in Sacramento, California, where he is responsible for coordinating and overseeing the earthquake safety assessment program in California. All are experienced in the postearthquake safety evaluation procedures used in the United States and have observed safety evaluations following a number of damaging earthquakes.

ATC gratefully acknowledges the valuable assistance and generous help of the following organizations who assisted the ATC reconnaissance team and provided much useful information:

- Building Research Association of New Zealand (BRANZ);
- Canterbury Earthquake Recovery Authority (CERA);
- Christchurch City Council, Environmental Policy and Approval Unit (CCC EP&A);
- New Zealand Department of Building and Housing (DBH);
- Institution of Professional Engineers of New Zealand (IPENZ);
- New Zealand Ministry of Civil Defense & Emergency Management (MCDEM);
- New Zealand Society for Earthquake Engineering (NZSEE);
- Structural Engineers Association of California (SEAOC); and

- Structural Engineers Association of Washington (SEAW).

In addition, the valuable assistance and review comments of the following individuals are also gratefully acknowledged: Graeme Beattie (BRANZ), Russ Berkowitz (Forell/Elsesser Engineers), Mark Billingham (University of Canterbury), David Brunson (Kestrel Group and NZSEE), Paul Campbell (Opus), Tony Court (A.B. Court & Associates/SEAOC), Carl Devereux (Aurecon), Dmytro Dizhur (University of Auckland), Ken Elwood (University of Auckland), Helen Ferner (Beca), David Hopkins (DBH Consultant), John Hare (Holmes Group), Jason Ingham (University of Auckland), Janiele Maffei (California Earthquake Authority), Laurence Kornfield (City and County of San Francisco), Anne Mackenzie (Build Green), Steve McCarthy (CCC EP&A), Lisa Moon (University

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Christopher Rojahn
ATC Executive Director

Note on Images: Photographs in the report were taken by the reconnaissance team unless otherwise noted. Sources for other illustrations are indicated where shown.

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