

## **SUMMARY OF COB DAMAGE EXPECTATIONS 2010 & 2011 NEW ZEALAND EARTHQUAKES**

On September 4th, 2010, Darfield, New Zealand (near Christchurch) experienced a 10 km deep, 7.1 magnitude earthquake. This was followed on February 22nd, 2011 by a 6.3 magnitude earthquake near Lyttelton (also near Christchurch). There were 32 earth houses and cottages, and 10 sheds or utility earth buildings in the affected areas. Subsequently 15 of these buildings were surveyed for damage. These buildings included a range of earth wall types. Built to modern earth construction were: sun dried adobe brick, stabilized rammed earth, stabilized Cinva pressed brick, and cement stabilized poured earth. There were also historic or replica cottages built of un-stabilized cob. Each of these technologies performed well when properly reinforced. The sod and cob constructions were unreinforced and some suffered major damage.

The damage was consistent with expectations and would have been prevented if the details used were consistent with the New Zealand earth building standards. Illustrated here are photos of two of the damaged cob houses and a drawing of how unreinforced cob buildings can be expected to fail in a severe earthquake.

This summary, photos and cob damage drawing are based on two articles about earthquake effects on earth building in New Zealand, by Hugh Morris and Richard Walker from New Zealand:

Modern and Historic earth buildings: Observations of the 4th September 2010 Darfield earthquake  
and

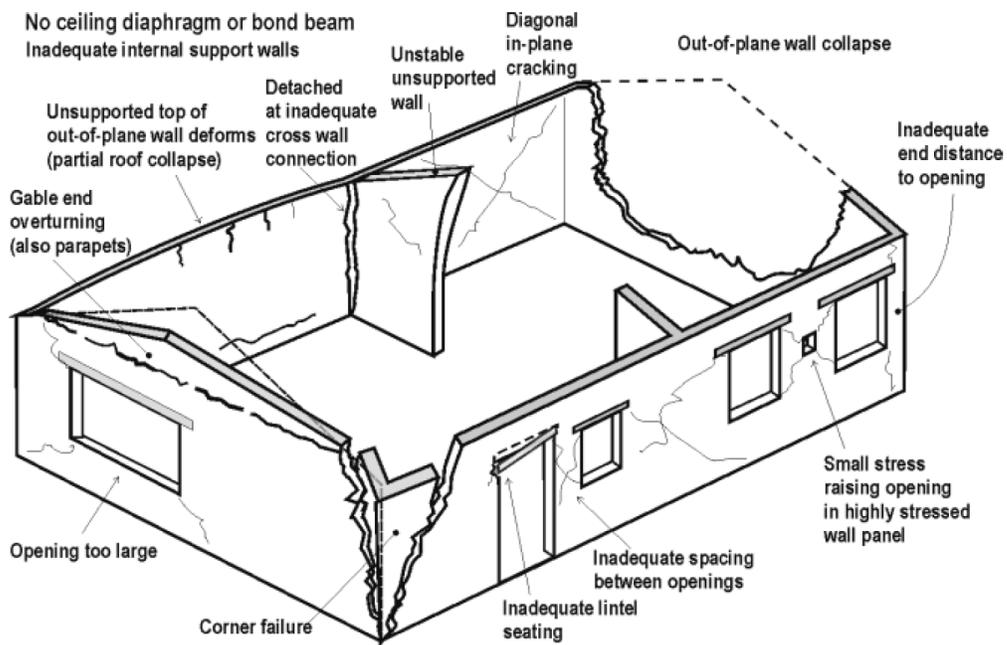
Observations of the performance of earth buildings following the February 2011 Christchurch earthquake

The entire articles can be found in the CRI website at

<https://www.cobcode.org/publications>



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*Figure 2: Typical earthquake damage in unreinforced houses. © Morris*