Most of the damage in Canterbury associated with brick veneer construction was due to ground movement or damage, particularly affecting concrete bricks or older veneer construction, or because of poor installation.

Good performance of modern brick veneer in residential construction

The shaking effects of design level earthquakes have also been replicated in the BRANZ structures laboratory.

BRANZ simulated:
- design level earthquake displacements of a two storey, brick veneer, timber framed building
- shake tests and racking tests of single storey buildings.

These tests indicated that modern construction details performed well in design level earthquake simulations.

Even when building distortions were well beyond this level of earthquake, damage was far less than expected, with severe cracking occurring and only a few bricks falling away.

Mortar properties and construction practice

There have been concerns that mortar properties are not controlled adequately and therefore contribute to poor earthquake performance.

NZS 4210 masonry construction has a strength requirement for structural masonry but not for brick veneer. It states that mortars for veneers shall follow the strength requirements of masonry suppliers. However a minimum strength is required to facilitate good structural and durability performance of brick veneer. Research opinion indicates that this should be at least 6MPa and this can be achieved with mortar mixes of 4:1 sand to cement by volume.

In the Canterbury earthquakes brick veneer failures occurred due to lack of bond between the brick and the mortar because the mortar that had been applied was too dry. NZS 4210 states that the bond between brick and mortar is the most important single factor affecting brick veneer strength. Recent testing at BRANZ has confirmed this to be the case. Refer to Stuart Thurston’s article Brick veneer stands the test in BUILD magazine 127 (Dec 2011/Jan 2012).
BRANZ testing confirmed practices that improve bond strength. These include:

- wetting bricks before they are laid
- having enough water to get adequate mortar flow
- pressing and tapping the bricks to firmly embed them in the mortar
- not dislodging or disturbing the bricks once they are placed
- minimising the time between spreading mortar, placing the bricks and tooling the mortar joints
- adequately curing the freshly constructed veneer particularly in hot, dry weather.

The BRANZ testing found the most important factor to ensure good bond performance is that the mixed mortar contains sufficient water and has an adequate flow. This means it should have as much water as the bricklayer can easily handle without any free water forming in the mixing barrow and ties remain firmly attached to the timber framing.

Modern clay bricks are manufactured with vertical core holes to reduce weight. The dowelling effect of hardened mortar in these vertical core holes increases the strength of veneer walls. Also, because the practice of nailing ties to timber framing has been replaced with the modern screw fixing practice, bricks are no longer disturbed in the mortar by hammering. BRANZ testing has also shown that it is not necessary to wet bed brick veneer ties as the performance of brick veneer walls where ties have been dry bedded is acceptable.

Mortar mixes for external brick veneer are specified in NZS 4210 for sea spray areas and for other exposures. Those opting for a more consistent mortar mix may use proprietary bagged mortar where the mix proportions are more accurately controlled under factory conditions.
• with compliance with the Building Act, it is published under section 175 of the Building Act
• with a Weathertight Services claim, it is published under section 12 of the Weathertight Homes Resolution Services Act 2006.