



HERITAGE NEW ZEALAND
POUHERE TAONGA

Sustainable Management of Historic Heritage Guidance Series

Repairing Historic Brickwork after an Earthquake

Repairing Historic Brickwork after an Earthquake

Brickwork damage can occur during earthquake events and may continue during aftershocks. Bricks have little inherent strength on their own but require a system of mortar, reinforcing and ties to hold them together.

In countries with minor seismic activity, masonry can be constructed, brick upon brick, and remain stable for centuries. In New Zealand, however, the sideways and vertical thrusts of earthquakes strain the brickwork. If strong enough, the earthquake forces eventually cause damage.

Unreinforced brickwork is particularly prone to collapse but partly reinforced or partly strengthened brickwork can also suffer failure. Cracks might appear, bricks or whole walls of bricks fall away, brick walls might lean or move out of alignment, or mortar between the bricks might be lost.

If brickwork was compromised before the earthquake, the cracking or loss of bricks may be exacerbated and if the earthquake events are strong or long enough, partial or total collapse can occur. Brick chimneys are particularly susceptible to earthquake damage and are covered in a separate information sheet.

First, Make Your Place Safe

In the first days after an earthquake you will hopefully have had initial assistance in deciding what degree of damage has been caused. For severe damage, you may have been advised to evacuate and tape off or barricade the building or undertake urgent work to hold the bricks together. It may have been necessary to contain or remove loose bricks to prevent them falling on people, or waterproof your building where brick loss makes it open to weather.

For information about conservation principles that inform works such as repairing historic brickwork, see the NZ ICOMOS Charter 2010: www.icomos.org.nz

See also Heritage New Zealand's Sustainable Management of Historic Heritage Guidance Series Information Sheet No. 1 <http://www.heritage.org.nz/resources/sustainable-management-guides>

Repairing Heritage Buildings

Heritage buildings have historical, architectural, cultural or other values that make them important. The loss of brick material may have been devastating and subsequent restoration may be necessary for the understanding of the building. For instance, a house that is important for its architectural values should have aspects of architectural design repaired. Otherwise the sense of the building is changed – even diminished. Most importantly, apparent damage is not a reason to unnecessarily alter or demolish the heritage building until all avenues and options are considered.

Every part of a Heritage Building is Important...

But some parts may be more important than others. As a heritage owner you may be well aware of the significance of your building and its fabric, or you may be contemplating removing brickwork because it looks too hard to repair.

Heritage New Zealand can work through with you any dilemmas of damage and options for appropriate repair. Heritage New Zealand's experience in many issues of heritage repair nationwide means it is well placed to offer advice for seemingly unsolvable problems. You can be sure that when Heritage New Zealand confirms your direction it will be based on sound best practice heritage principles.

You Are Not Alone

As a heritage building owner confronted by extraordinary circumstances you have the goodwill of New Zealand's heritage community. Please contact Heritage New Zealand anytime during working hours to discuss options about repairing your heritage building.

It may be the first time you need to engage a structural earthquake engineer, architect or heritage professional with conservation knowledge. They will have had experience with other brick buildings around the country. Names of heritage professionals experienced in repair of heritage buildings can be obtained from your local Heritage New Zealand office.

You will need to check with your insurer and EQC before proceeding to employ consultants or carrying out the work.

Determine the structural cause of the failure

A structural engineer is needed to determine the cause of the material failure and formulate a repair and strengthening concept. An engineer will be able to look at the building in terms of the strength of its component parts and will observe the building – perhaps over a period of time – looking at the types of failure and where they occurred.

Designing Repairs

The design and repair of damaged buildings will involve a comprehensive look at the strength of the building. There is no point in putting back a brick walls and chimneys if they are not adequately strengthened. Repairing to be able to

Resource consent is required under the RMA from your local authority to demolish or alter any heritage building listed on a district plan schedule..

Always check with your local authority before carrying out any repair work to heritage buildings.

The demolition or partial demolition of any pre-1900 historic building requires an archaeological authority from Heritage New Zealand.

<http://www.heritage.org.nz/protecting-heritage/archaeology/archaeological-authorities>

withstand another earthquake is the aim. An engineer will not only look at the areas that were damaged this time, but will look to ensure it will survive as a whole in the future. A conservation architect, heritage consultant or contractor skilled in heritage work can help design the repairs so that they don't impact adversely on the special features that your place has. Some of the repairs that will be considered are:

- New mortar & reinstating individual bricks.
- Re-building walls.
- Re-seating lintels.
- Structural tying of gable ends, towers.
- Strengthening of wall-to-wall connections.
- Strengthening of wall-to-roof connections.
- Tying floors and masonry walls together
- Strengthening of the two or more layers of brickwork and tying together.
- Methods of strengthening brick walls and their foundations.
- Tying floors and ceilings into walls.
- Reinstating chimneys with increased strength.

In undertaking repairs to damaged buildings, the local authority will also often require a building consent to meet earthquake strengthening and other NZ Building Code requirements. These requirements ensure that buildings are 'built-back-better' to be more resilient for the future. A resource consent may also be required if the heritage building is listed in a Council plan. For further information contact your local Heritage New Zealand office.

Pre-existing Conditions

Repair work can be complicated by pre-existing conditions and earthquake damage may have been exacerbated by these conditions. These may have been part of an ongoing maintenance programme for your building or they may have been there undetected for some time. These matters may include:

- Crumbling or decayed mortar.
- Crumbling or decayed bricks.
- Rising damp.
- Water penetration from above.
- Settling of the brickwork or movement.
- Efflorescence (that white stuff!).
- Damaged or inadequate lintels or other structural members.
- Existing but inadequate structural strengthening.

Now is the time to also look at these issues as well. Your engineer and conservation architect/expert can advise you on how to proceed.

Further information about repairing historic brickwork is available from Heritage New Zealand::
Ian Bowman, *Historic Brick Structures*, Conservation Bulletin No.2, NZHPT, 1992

Further information and advice can be obtained by contacting Heritage New Zealand.

Contact details for regional offices are available from the Heritage New Zealand website:

<http://www.heritage.org.nz/contact-us>

Repairing Mortar

Taking professional heritage advice about repair of mortar joints is recommended. Inappropriate materials or methods can cause problems very quickly.

The choice of mortar composition is vital. The commonly-used high-cement mortar is harder, more impervious and allows little movement. It is also likely to crack, allowing in moisture which then becomes trapped because the mortar will not allow evaporation. As a general rule the mortar mix should be weaker than the bricks themselves to prevent the bricks breaking in any future event.

Mortar has a colour, composition and textural appearance both in the mix and the pointing methods used. For a heritage building, the match is important and skilled tradespeople with experience on heritage buildings need to be used. Advice from a conservation architect/heritage expert on the mortar 'recipe' and application is recommended. **Contact your local Heritage New Zealand office for information on heritage professionals and brick layers experienced with heritage buildings.**

Is the damage too serious?

By their nature heritage buildings are worth keeping because of their heritage values. If an entire building is seriously compromised, it may need to be partially rebuilt or in rare circumstances demolished. This is a difficult decision for any building owner and requires guidance to explore all options at an early stage. A heritage building, or part of it, may hopefully be restored and may be deemed inappropriate for demolition.

This is not a decision to be taken quickly but after discussion and advice from engineering consultants, insurers, the Earthquake Commission, the local Council, and Heritage New Zealand. There are usually several options for the future of the building, and there are normally engineering solutions that can assist in the most economical retention and strengthening and repair of heritage buildings without undue loss of heritage value.

Consent requirements

A building and/or resource consent may be required for any repair and strengthening work and this needs to be clarified with your local authority.

Is there funding to support owners of heritage buildings?

Building owners should explore all potential funding options. Access to funding sources, however, is often dependent on the nature of ownership of the building or its heritage status. Further information is available in a separate Information Sheet or the Heritage New Zealand website: <http://www.heritage.org.nz/protecting-heritage/funding-for-heritage-protection>

This information sheet provides a summary of key information as provided in the Heritage New Zealand draft guide, *Earthquake Strengthening: Improving the Structural Performance of Heritage Buildings*

The revised guide will be published in 2016. If you would like a copy of the draft guide, please email SnrHerPolAdvisor@heritage.org.nz

Heritage New Zealand welcomes any feedback and comments on this information sheet.

Comments can be provided to information@heritage.org.nz.

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