

Repairing Damaged Heritage Buildings

Guidelines for building owners

HERITAGE GUIDELINE 2 – Repairs to the heritage building

These guidelines were developed after the Canterbury Earthquake, 4 September 2010. They are intended as guidelines for owners of heritage and character buildings, to assist with repair and maintenance of these buildings, and are applicable following any earthquake or building damage.

Resource consents:

The resource consent processes apply for work to damaged heritage buildings. In all instances property owners of listed heritage buildings need to contact the Council prior to undertaking any work. Where emergency works have been permitted to take place by Council, retrospective consent approval will be required.

Building consents:

Any building work normally requires a building consent. This includes work to alter or demolish a building. Exceptions include minor works. [Click here](#) to find out whether you need a building consent. Further information can also be found on the Department of Building and Housing website www.dbh.govt.nz.



Repairs to the heritage building

Once a heritage building has been stabilised, a programme of permanent works should be instigated. This should be done with a structural engineer and an architect with experience in working on historic buildings.

Wherever possible, repair of historic building fabric should use traditional methods and materials. Repairs should generally not be “aged” in an attempt to make them appear older, they will blend in over time.

Once the repair work has been completed, the building should continue to be properly maintained to ensure its survival.

1 Roofs

Damaged roofs can include damage to parapets, gable ends or chimneys. Tile or slate roofs can be particularly prone to this. In some cases, the timber structure of the roof can be damaged when masonry items collapse onto it.

When planning for repairs the advice of a roofer experienced in working on heritage buildings should be obtained.

Where possible, repairs should be made using original materials. Pre-used tiles can sometimes be obtained from demolition yards. They should match the originals. Pre-used slates can also be obtained, however, they need to match the original slates.

If pre-used tiles and slates cannot be found, it may be possible to use new tiles or slates. Existing tiles or slates may be used on areas of the roof that are more visible, with new tiles or slates used on areas such as valleys or the rear sides of roofs where they are less visible.

The quality of new slates should be checked. Welsh slates are the best quality, but expensive. Chinese slates are poor quality and should generally not be used. Spanish slates can be obtained at reasonable cost and should be satisfactory.

Some older buildings have lead flashings against chimneys and gable ends. Lead is also used to flash ridges and hips of roofs. These flashings can be dislodged when parapets and roofs are damaged. They should be refixed or replaced as recommended by an experienced lead worker.

Although it is likely that native timber was originally used for the structure of roofs, damaged parts could be replaced with exotic species. The advice of a structural engineer or architect will need to be obtained where extensive repair work is required or where large roof structures have been damaged.

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2 Stone work

Many heritage buildings are constructed from un-reinforced stone masonry. Damaged stonework can include cracked or collapsed sections of walls. Damaged areas of stone walling may need to be rebuilt.

Firstly, any loose stone should be removed by a stonemason, and recorded to show where it has come from and stored safely.

Recommendations for rebuilding stonework are as follows:

- **Reconstruction methodology** Agree on reconstruction work with a structural engineer and a stonemason. One option may be to rebuild the stonework in a traditional manner but with additional structural elements to reduce the possibility of future collapse – see [HERITAGE GUIDELINE 4 – Strengthening of buildings](#).
- **Rebuild the stonework to resemble the original** New work should match the original. In particular, the original pattern should be replicated. For example, the stonework may be laid in continuous regular layers (known as courses) or may have a random pattern.
- **Original mortar** New mortar should match the original in terms of texture, colour and mix (e.g. lime mortar for soft stone such as limestone or sandstone) – a stonemason will be able to assist with this. Pointing should use the same techniques as the original work and the ratio of mortar to stonework should also be the same to ensure that new finished stonework matches the original.

In some instances, new stone may be required to replace existing stone. It may be difficult to match due to original quarries no longer operating. In these instances, different stone may have to be used. This should be as close a match to the original as possible in terms of colour and texture and should be compatible with the existing stone. For example, sandstone should not be placed directly below limestone as carbonates from the limestone can damage the sandstone. The advice of an experienced stonemason should be sought when replacement stone is to be used.

Reconstruction of stonework should be undertaken by experienced stonemasons who are able to demonstrate competency in work of the required nature.



3 Brickwork

Many heritage buildings are constructed from un-reinforced brick masonry. Some walls are constructed of two brick skins either unconnected or with minimal ties. In some cases, the outer skin can collapse leaving the inner skin relatively intact.

Fallen bricks should be carefully recovered and stacked in a secure, dry location to enable them to be reused.

Brickwork can be readily repaired or reconstructed by an experienced bricklayer, who should be able to demonstrate competency in work of the required nature. Walls and other elements that are being reconstructed may need to be structurally strengthened – see [HERITAGE GUIDELINE 4 – Strengthening of buildings](#).



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Pre-used bricks These may need to be obtained where bricks have been damaged or have been thrown away. Finding these can be difficult. Pre-used bricks have often been damaged when the building they came from was demolished and they may also have residual paint or cement mortar on them. The use of pre-used bricks does not always result in a satisfactory repair and if such bricks are to be used they need to be carefully selected.

Matching brick types Care needs to be taken to ensure the type of brick matches the original. The difference between hand made and machine made bricks needs to be recognised when pre-used bricks are being sourced. Replacement bricks should also match in terms of size and colour.

Recommendations for rebuilding brickwork are as follows:

- **Bonds** Brick bond describes the various styles of laying bricks to create different patterns. Historically, brickwork was constructed using various bonds, including English bond where courses of horizontally laid bricks (known as stretchers) were interspersed with courses of bricks laid at right angles to the wall (known as headers). Remaining original brickwork should be carefully studied to determine which bond was originally used and this should be replicated in any repair work.
- **Original mortar** New mortar should match the original in terms of texture, colour and mix – e.g. older bricks are relatively soft so the mortar should be lime-based and also reasonably soft. Mortar that is too hard will cause damage to bricks as moisture in the brickwork will try to escape through the softest material. If the moisture contains dissolved salts, these can crystallise and cause the bricks to disintegrate. Hard cement-based mortars can also crack, allowing moisture into the wall.
- **Pointing** Once the bricks have been laid, the joints will need to be finished in a process known as pointing. Mortar used for pointing should match the original as discussed above. The technique used for pointing should also match the original with regards to things such as the width of the joints and the style of the pointing.

4 External plasterwork

Damage to external plasterwork can result in areas of plasterwork being lost or having significant cracks. Cracks in plasterwork often indicate cracks in the wall behind and this needs to be addressed before the plasterwork can be repaired. See [HERITAGE GUIDELINE 4 – Strengthening of buildings](#). Repairs to plasterwork should be carried out by experienced craftspeople who are able to demonstrate their competency in working with heritage materials. It is important to ensure new plaster matches the original.

- Traditional plaster renders used on heritage buildings generally



contained lime. Cement was used sparingly, although later heritage buildings tended to use more cement based plasters.

- Plaster with too much cement becomes hard and its surface can develop fine cracks which allows water into the wall behind. Lime prevents the plaster from becoming too brittle and makes it more flexible.

Painted plasterwork If the plasterwork is painted, satisfactory repairs are more simple as the repair can simply be painted. Unpainted plasterwork has usually weathered and is more difficult to repair satisfactorily without the repair being obvious. The aim should be to provide a repair that is not readily visible from a distance but may be discerned on close inspection.

Recommendations for repairing external plasterwork are as follows:

- **Carefully examine the existing plasterwork** Determine what aggregate may have been used. Sand for new work should be carefully chosen as sand traditionally used for plasterwork was generally finer than that more commonly used today.
- **Plaster mouldings** These should be accurately replicated. A pattern cut from sheet zinc fixed to a timber frame should be used to run new sections of mouldings.
- **Cracks should be repaired carefully** New plaster should not extend over adjacent sound plaster surfaces. It is preferable if the repair is recessed very slightly. In the past, crack repairs have often been done by injecting the crack with epoxy resin. Epoxy resin should be used sparingly in historic building repairs as it is much stronger than the walls around it and injecting a crack with epoxy resin may result in cracks opening elsewhere in the façade. In general, a standard repair mortar should be sufficient.

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5 Internal plasterwork

Internal masonry walls were often rendered with plaster prepared by mixing lime and sand. This would be overlaid with a finish coat comprising a fine coat of gypsum plaster sometimes known as “hardwall” plaster.

Traditional methods Areas of plasterwork that were damaged in the earthquake should be repaired by experienced craftspeople using traditional methods.

- Damaged plaster mouldings that were formed “in-situ” should be accurately replicated. A pattern cut from sheet zinc fixed to a timber frame should be used to run new sections of mouldings. The mouldings should also be finished with gypsum plaster.
- Preformed mouldings made from gypsum plaster were also used. New sections of mouldings should be able to be formed using old sections as a pattern.
- Ceilings in older buildings were often formed using lath and plaster. This is achieved by applying a sand and lime plaster reinforced with horse hair over timber laths or battens fixed to ceiling joists with a gap between. The plaster is applied with sufficient pressure to push some of it between the laths to form a series of keys. Once the plaster is dry, the keys make the plaster adhere to the laths.

From specialist tradespeople to simple repairs In some cases ceiling keys can crack causing the plaster to come loose. Some ceilings can be re-fixed using plaster wads; this work would need to be undertaken by a specialist tradesperson.



If the plaster is generally sound but has cracked, it can often simply be repaired with crack repair products, for example, a gypsum-based proprietary filler. The cracks should be carefully cut out to form a key and the crack thoroughly cleaned to remove any debris. If the laths have separated from the ceiling joists they may be able to be refixed with brass screws.

With more extensively damaged ceilings, areas of plasterwork may need to be replaced. New plaster can be applied using traditional methods. Where this is not possible, preformed fibrous plaster sheets could provide a satisfactory result.

Paper-faced plasterboard such as Gibraltar Board or Elephant Board should generally not be used as a substitute for lath and plaster as the joints are often visible.

6 Other materials

• Timberwork

Timberwork in various locations can get damaged where walls have moved or masonry has fallen. This may include joinery and trim such as architraves and skirtings. Repairs to timberwork should reuse as much of the original fabric as possible with new sections being spliced in as appropriate. The profile of new timberwork should match the original.



The species of the timber used for repairs should match the original if the timber is stained or varnished. Efforts should be made to ensure the finish matches the original and the advice of a conservator may be needed. If the timber is painted, an exotic species may be used.

• Cob or sod buildings

Canterbury has a number of buildings constructed of sod or cob. Where the sod or cob construction is an important heritage feature, the buildings should be repaired using similar materials.

See [HERITAGE GUIDELINE 4 – Strengthening of buildings](#).

For more information or advice contact:
heritage@ccc.govt.nz or call 941 8999.

Go to the complete series Damaged buildings -
Guidelines for heritage building owners :
www.ccc.govt.nz/heritagepublications

Heritage Guideline 1 – Safe and secure

Heritage Guideline 2 – Repairs to the heritage building

Heritage Guideline 3 – Reconstruction of elements

Heritage Guideline 4 – Strengthening of buildings

Heritage Guideline 5 – Professional advice and tradespeople

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