Department of
Building and Housing
Te Tari Kaupapa Whare

Information sheet

Interim guidance for repairing and rebuilding foundations in TC3

27 April 2012

The Department of Building and Housing has published technical guidance for foundation repairs and reconstruction for residential properties in green zone Foundation Technical Category 3 (TC3).

The guidance provides information and criteria that will help engineers, building control officials and insurance assessors determine if foundations can be repaired or need to be replaced. It provides options for the repair and replacement of damaged foundations.

The guidance focuses on foundation design solutions for one- and two-storey timber-framed dwellings, which are the dominant form of construction in the TC3 area.

The guidance provides a range of foundation options. Each of the options needs to be carefully selected for each individual property. For example, in some areas, such as parts of North New Brighton and Wainoni where there is potential for significant lateral movement of the ground, deep pile options may not be suitable.

The guidance is an appendix to the Department's November 2011 *Revised guidance on repairing and rebuilding houses affected by the Canterbury earthquake sequence*.

Repairs to existing foundations

The guidance provides information and criteria for establishing where damaged foundations can be repaired and where replacement foundations are required.

For properties where repairs to existing foundations can be undertaken, the guidance provides information about repair options. In some cases, heavy roofing material may need to be replaced with lighter-weight roofing materials in order to provide greater resilience in future earthquakes. Where there has been damage to heavy wall claddings, the cladding may need to be removed and replaced with a lighter-weight material.

Replacement or new foundations

The guidance outlines three foundation types for homes in TC3 that require new or replacement foundations – there is no-one-size-fits-all solution. These are: deep piles, site ground improvements, and surface structures with shallow foundations.

Each of the foundation types have different capabilities to accommodate various levels of vertical settlement and lateral spreading, and place different constraints on the type of dwelling that the foundation can support.

1. Deep pile foundations

Provided there is a suitable bearing layer that will not liquefy and there is no risk of lateral movement at depth, deep pile foundations can accommodate the weight of heavier or more irregular buildings.

Deep pile foundations involve drilling or driving piles (timber, concrete or steel) into the ground to a suitable bearing layer.

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2. Site ground improvements

Site ground improvements will place limits on some two-storey dwellings with heavy walls and irregular floor plans. For example, this option may not be suitable for a two-storey, brick veneer and tile-roofed house.

Site ground improvement options aim to strengthen the land, using a variety of methods, to provide an improved building platform. This typically involves treating the land beneath the building footprint by either densifiying the land by compaction or stabilising the land with the addition of cement.

Most ground improvement options will require the demolition or temporary removal of the existing dwelling to enable ground strengthening work to occur. Once the land is strengthened, standard TC2 (concrete slab or timber) foundations can be used.

3. Surface structures with shallow foundations

Shallow foundation options may be suitable for properties where there is only minor to moderate potential for vertical settlement and lateral spreading. One form of surface structure involves placing shallow or short piles into the ground in accordance with NZS 3604 and wrapping the perimeter foundation with plywood sheeting to provide bracing against earthquake movement.

For properties where there has been major lateral spreading some surface structure types may be appropriate but additional engineering design will be required.

Surface structures with shallow foundations are suitable only for lightweight homes that have standard design features, for example timber piled homes with lightweight cladding such as weatherboards board and iron roofs. This solution is not appropriate for homes with concrete slab floors or irregular floor plans.

Chartered Professional Geotechnical Engineers (CPEng) will be able to determine what foundation type is appropriate for each property based on information obtained from geotechnical assessments. Ultimately, decisions about foundation repairs or reconstruction will need to be made by homeowners and their insurers based on professional advice.

Minimising future earthquake damage

Houses repaired in accordance with the Department's guidance should perform significantly better in future earthquakes but there will always be a risk of future earthquake damage. This is due to the nature of the Canterbury sub-soil conditions and risk of future liquefaction and lateral spreading in TC3 areas.

Generally, the guidance advocates the use of lighter-weight construction materials for homes in TC3 areas. In most cases homes with light-weight cladding and roofing materials performed reasonably well in the Canterbury earthquake sequence.

The future performance of homes constructed with lighter-weight roofing and cladding materials will be significantly improved. By reducing the weight of your home you will reduce the load placed on the foundations that may cause damage. The cost of repairing any damage from future seismic events for lighter-weight houses with suspended timber floors is likely to be significantly reduced.

Meeting the requirements of the Building Code

The Department's technical guidance for rebuilding and repairing foundations in TC3 aims to provide guidance and solutions that result in compliance with the Building Act 2004 and the Building Code.

Next steps

TC3 homeowners with foundation damage should continue to work with EQC and/or their insurer to progress their repairs.