




Property Inspection

**41 Forest Drive
Parklands, Christchurch
STRUCTURAL REPORT**

July 2012

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Quality Assurance Statement and Revision History				
Revision	Date	Prepared By	Reviewed By	Status
1	14.07.2012	Tim Day Director – Structural Engineer BE(civil), MBA, MIPENZ, CPEng (1005159) 		

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Executive Summary

Viden Group Engineers have been engaged to conduct a structural inspection of 41 Forest Drive in Parklands, Christchurch. The purpose of the inspection and this report are to ascertain and document the extent of any structural damage caused through the recent seismic events in Canterbury, covering the period September 2010 to July 2012. A detailed visual inspection of the main structural elements of the house has been conducted, with a review of the structural condition and integrity as may be typical for a house of this age, material and construction. No review of the original design documentation, compliance with building code clauses B1/B2, or building consent has been undertaken as part of the inspection and this subsequent report. In addition, it should be noted that assessment of the baseline capacity of the structure is beyond the scope of this report. Further to this, Viden has not made any assessment of the structural stability or building safety in connection with future aftershocks or earthquakes – which have the potential to damage the building and to jeopardise the safety of those either inside or adjacent to the building. This report is necessarily limited by the restricted ability to carry out inspections due to coverings of many elements and no destructive testing has been undertaken. The report does not address defects that are not reasonably discoverable on visual inspection, including defects in inaccessible Places and latent defects.

Visual inspection of the property at 41 Forest Drive revealed structural damage to the concrete slab on grade ground floor. The slopes and settlement present in the floor levels suggests a repair of the foundation in accordance with the guidelines provided by the department of building and housing is appropriate. The damage to the floor does not present any danger, and the rest of the structure is in very good condition.

The original inspection and this subsequent report are carried out in accordance with the ACENZ Short Form Model Conditions for Engagement of Consulting Engineers, copies available at the following web address. (http://www.acenz.org.nz/UploadedDocs/Contracts/ACENZ_ShortFormAgrmt_July2011.docx)

1. Introduction

Viden Group conducted a structural inspection of the Forest Drive property for the current owners on the 14th July 2012.

The land was visually inspected and compared along with the Tonkin and Taylor detailed land reports and zoning maps for Christchurch. This has identified the house lying with the Green Zone Technical Category 3 which is described as being “generally suitable to be repaired and rebuilt on” but with “moderate to significant land damage possible from future significant earthquakes” (CERA and Department of Building and Housing Information Sheet October 2011 www.landcheck.org.nz/Content/PDFs/green-zone-factsheet.pdf). For houses in this technical category that have suffered foundation damage, site-specific geotechnical investigation and specific engineering design may be necessary for repair or rebuilding of those elements.).

2. Inspection

2.1 Structural Form

41 Forest Drive is characterised as a timber framed two story residential dwelling with masonry brick veneer cladding typical of modern house construction in New Zealand. It is assumed that this dwelling was designed and built in accordance with the governing codes of practice at the time of construction. No original engineering or building documentation has been reviewed as part of this report.

The gravity system consists of a profile metal roof supported on timber trusses, spanning between external and internal load-bearing walls. The ceiling is lined with plasterboard supported from timber joists spanning between external and internal load-bearing walls. The walls are timber framed, clad with masonry brick veneer on the outside, with plasterboard lining internally. The walls transmit loads vertically to the concrete slab on grade foundation. The suspended floor is constructed of timber framing.

Residential construction of this type is typically detailed to use the ceiling lining as a horizontal diaphragm, transferring lateral (earthquake & wind) loads to the vertical resisting elements (internal and external bracing walls) which transmit the loads into the foundation. The lateral load transfer capacity of any internal bracing walls is provided through 'panel' action of the plasterboard linings and their fixture to the timber framing studs behind, which ultimately act as vertical compression and tension chords attached to the concrete pile foundation.

The ceiling is lined with plasterboard supported from timber joists spanning between external and internal load-bearing walls. The walls are timber framed and internally clad with plasterboard. The external walls are brick veneer cladding.

Founded on a concrete strip footing below the walls, a house of this type typically relies on adequate bearing capacity of the soils or hardfill below to support the structure and imposed vertical loads. The bearing capacity of underlying soils is typically verified during the initial construction phase. The ability of the strip footing to transmit both lateral and vertical loads into the soil is typically a function of the area of the footing which spreads the loads into the underlying soil.

2.2 General

The house has a profile steel roof on timber framing with a separate garage. The house has internal plasterboard walls on timber framing and external brick walls. The floor is a reinforced concrete slab-on-grade, with strip footing under the load bearing walls.

2.3 Detailed Findings

At the time of inspection the property showed no evidence of land damage attributable to the effects of liquefaction. There is evidence of some liquefaction on adjoining properties as seen from aerial photographs taken shortly after the 22nd February 2011 earthquake.

There is no evidence of damage to other landscaping, fencing or the driveway.

The visible areas of the concrete foundation thickening around the outside of the dwelling were inspected, revealing no damage or cracking. The brick veneer is well secured to the timber framing and a light force applied to the veneer didn't reveal any sign of weakness or damage. Some minor patching and re-pointing has been carried out in some locations around the dwelling.

The lines of the roof, guttering, spouting and flashings were straight and there were no signs of damage or failure. The external joinery and doors appeared to be in good condition with only minor movement noted in the west facing lounge joinery.

The external surfaces and walls were checked with a 1200mm digital level which revealed a slight lean on some walls to the north. This lean is insignificant and is likely to be remedied when the foundation and damaged floor slab is repaired.

The internal floor levels were checked with a gas 'Zip' level. This survey revealed some movement and differential settlement in the concrete slab on grade and perimeter foundation. The levels revealed a drop from the high point in the west corner of the dining room to the east corner of the master bedroom. This settlement read 98mm overall which places it in the category likely to need repairs and re-leveling.

A small crack of approximately 0.8mm is evident in the concrete floor in the lounge. It is likely given the extent of settlement that more small cracks will be present once the floor linings are removed. These cracks should be repaired once the foundation and re-leveling work has been carried out.

A visual inspection of the linings revealed evidence of minor damage as would be typical of a house that has undergone settlement. This damage is most significant in the ensuite of the master bedroom where a horizontal crack extends from the corner of a window opening. Cracking in linings generally propagate from point of high stresses such as the corners of penetrations in wall linings and can easily be repaired. The repair methodology depends on the extent and width of the crack.

The internal walls were also checked for level revealing similar displacement to the external walls (very minor).

Level checks (with a digital level only) and lining inspections in the first floor rooms revealed no significant damage. The levels mirrored the ground floor, and there was very little damage to the linings. A sample of the doors and joinery were checked revealing no evidence of significant movement.

The timber roof framing was visually inspected from the access hatch. The framing is generally in good condition, with solid connections and straight framing.

3. Summary

The 41 Forest Drive property is in good condition with very little evidence of the damage caused by the foundation settlement. The slab has settled by up to 98mm overall and requires repair and re-leveling, it is understood that a claim exists to undertake this work.

Please don't hesitate to contact the undersigned to clarify anything contained in this report.

Yours Sincerely

Inspected By:



Timothy Day
Director – Structural Engineer
BE (civil), MBA, MIPENZ, CPEng (structures, management)

Appendix A – Site Location

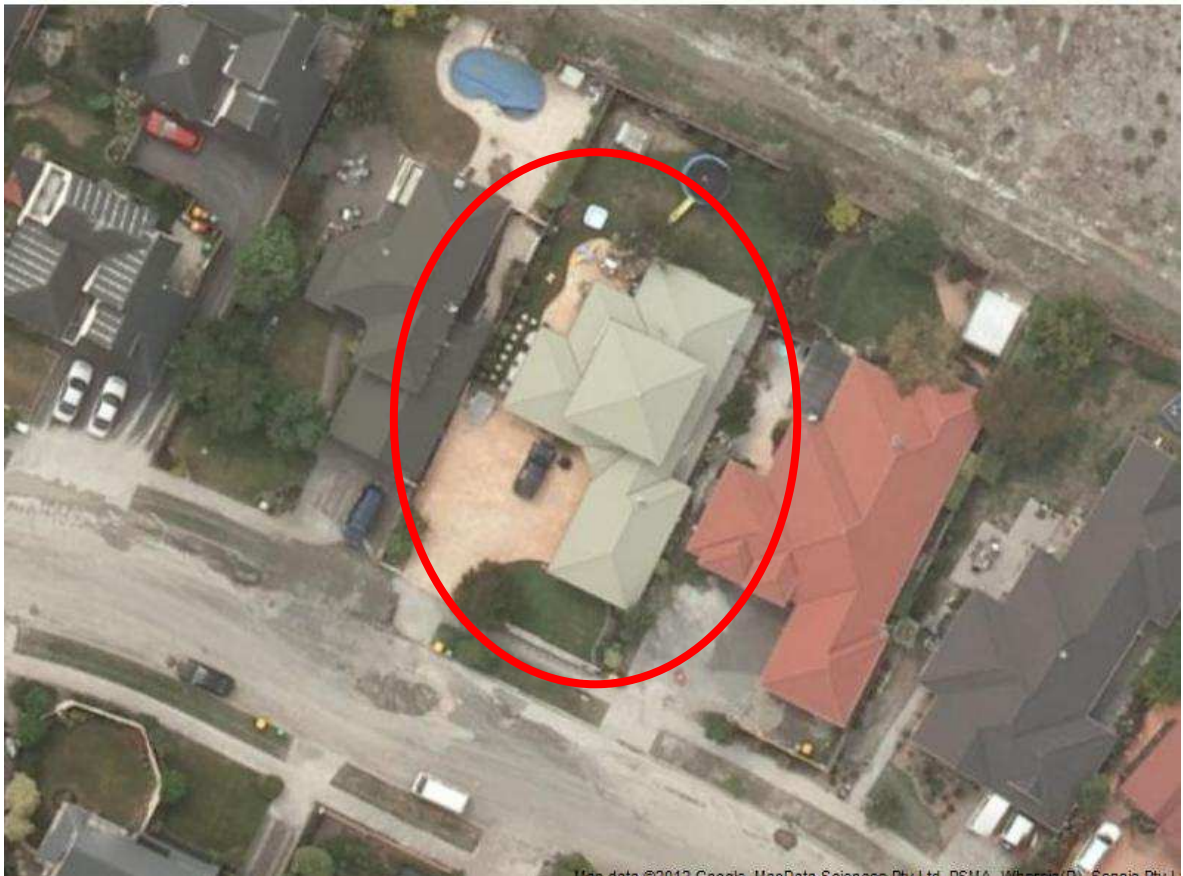


Figure 1 - Site location (aerial photo from 24th Feb 2011)

Appendix B – Site Sketch

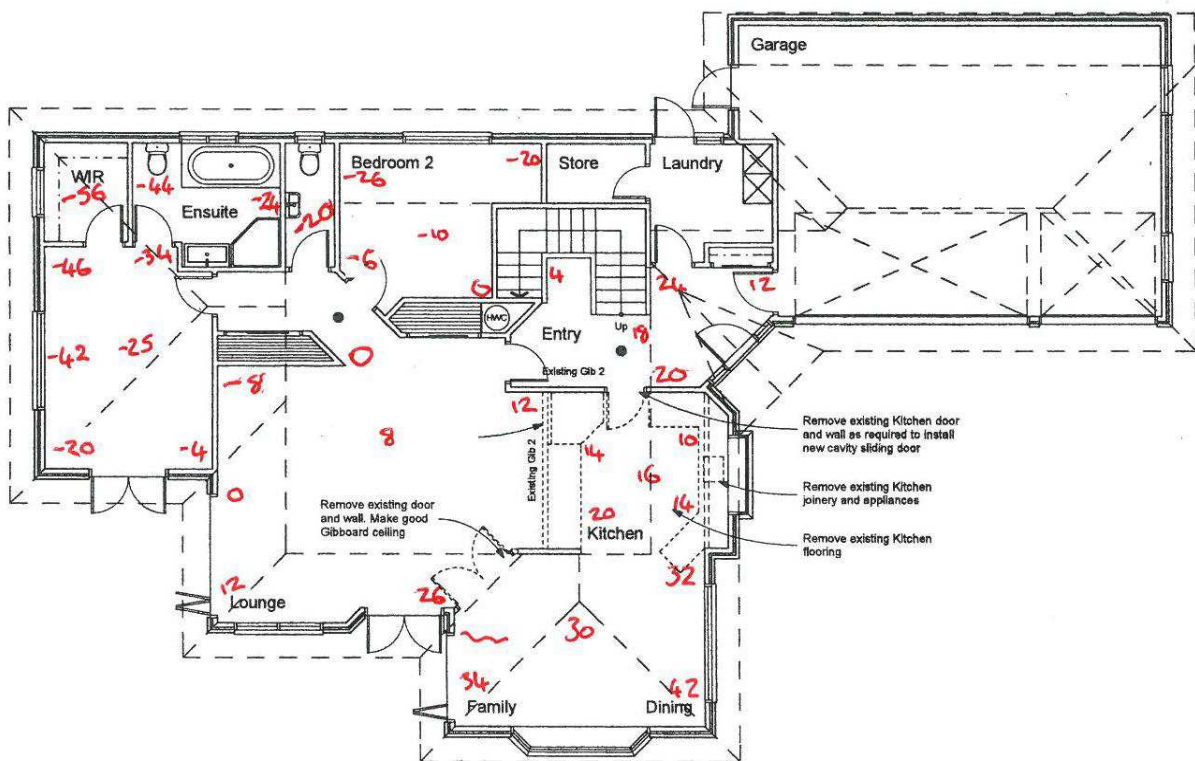


Figure 2 - Site location (aerial photo from 24th Feb 2011)

Appendix C – Site Photos



Figure 3 - External wall checks revealed minor lean to the northeast



Figure 4 - Minor crack in pavement on southeast side



Figure 5 – some evidence of movement in external lounge door



Figure 6 - Crack in lounge floor slab (up to 0.6mm)



Figure 7 - Horizontal crack in Gib lining in ensuite



Figure 8 - Slight twist in internal door frame - door still opens and shuts



Figure 9 - Level checks on both ground and upper floor were generally good, minor lean to the northeast

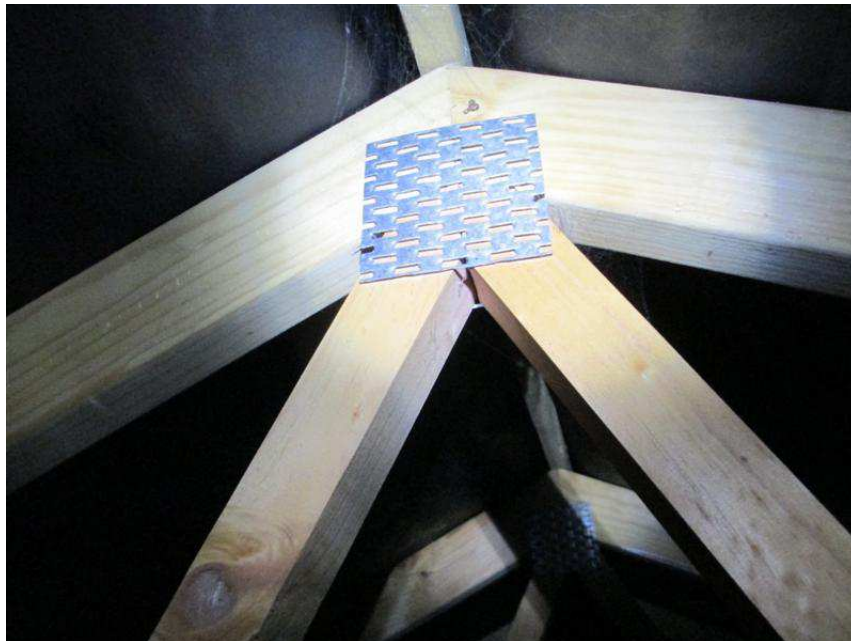


Figure 10 - Roof framing connections sound

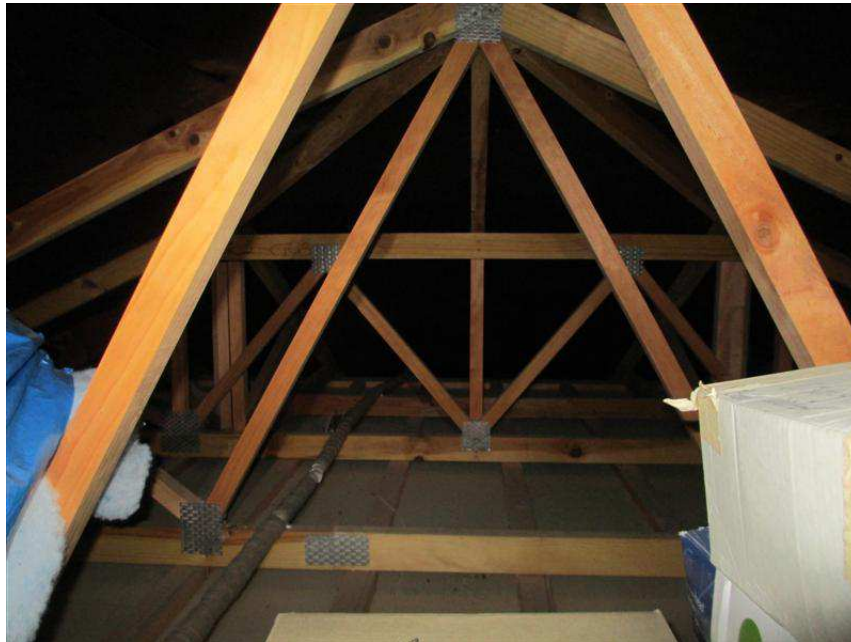


Figure 11 - Roof framing in good condition