

02 November 2017

Gareth Webber c/o- Karl Gaskell  
[karl@kensway.co.nz](mailto:karl@kensway.co.nz)

Dear Gareth,



Job No: 17-536

**RE: STRUCTURAL ASSESSMENT – 46 CHARLES STREET, WALTHAM, CHRISTCHURCH 8011.**

We confirm that a structural assessment was carried out by Cephas Rock Limited on 26 October 2017 at the above property. Our assessment included a visual inspection of the exterior and interior of the building to determine the extent of any structural damage caused by the earthquakes from September 2010 up to the inspection date.

**BUILDING DESCRIPTION**

The building is a single storey timber-framed dwelling, situated on a flat site to the southwest of Charles Street in Waltham. The dwelling is believed to have been originally built in approximately 1950 and it has been relocated on above address in 1999. It has a suspended timber floor founded upon timber piles with concrete block perimeter foundation walls. The dwelling exterior is clad with using Summer hill stone veneer, and the roof is clad with heavy weight concrete tiles. The attached garage has concrete masonry block wall and its floor has slab on grade foundation with perimeter foundation walls.

The site is classified as “Green Zone, Technical Category 3, blue” area as given by the Canterbury Earthquake Recovery Authority (CERA). This means that moderate to significant land damage from liquefaction is possible in future significant earthquakes.

EQC liquefaction and lateral spreading observations show “no observation” in the area after September 2010 and “no lateral spreading but minor to moderate quantities of ejected material” in the area after February 2011 earthquake event. No site specific geotechnical investigation was undertaken as part of this assessment.

Council documents were received from the client and sighted as part of this assessment.

**REPAIRS / OBSERVATIONS**

***Exterior of dwelling***

Moderate mortar step cracks to the Summer hill stone veneer at southeast corner of the dwelling were observed. Except this, minor mortar step cracks to the Summer hill stone veneer were identified at a few locations around the dwelling. A single moderate separation in between concrete blocks of perimeter foundation wall was observed at southeast side of the building.

### *Interior*

No apparent damages to the dwelling wall lining and ceiling were identified during our inspection. However, minor vertical sheet separations at corner of openings were observed at attached garage wall linings.

### *Floor*

A floor level survey using Zip-Level Pro-2000 instrument of a typical accuracy of  $\pm 3\text{mm}$  was carried out during the inspection and is presented in the Floor Level Plan attached in this report. It should be noted that the purpose of the floor level survey is to provide assistance in determining possible structural damage of the building and therefore should be treated as indicative only. Where a high-level dependence and an accurate and credible presentation of the survey information are required, a registered professional surveyor should be engaged to carry out the survey.

The overall floor level variations were measured to be approximately 70mm for dwelling timber floor and 86mm for garage concrete floor. The both floors level variations exceed 50mm tolerance for floor variation indicated in the MBIE Guidelines. The dwelling floor slopes are generally sloping from east to west of the dwelling with a few locations noticeably exceeding the local slope variation 1:200 (0.5%) MBIE tolerance. The garage concrete floor slopes are generally sloping from east to west of the garage with exceeding the local slope variation 1:200 (0.5%) MBIE tolerance. Hence, the dwelling timber floor and garage concrete floor fall within the “foundation re-level indicated” category.

### *Subfloor Space*

Access to subfloor was limited at the time of inspection. The subfloors had a standard timber floor on timber piles with perimeter concrete block wall. There were steel strap connections identified at the pile-to-bearer interface. The timber internal piles appear to have performed well and have retained its structural integrity. No piles were observed to be leaning, and appeared to provide adequate support for the floor above.

### *Roof Space*

A visual assessment of the roof was carried out from the exterior of the building. The roof appears to have no structural damages, including deflection of the ridge, valley and hip lines. Roof cavity was accessed through an access panel and visibility was limited through this. No apparent damages were observed to timber members and connections.

## **CONCLUSIONS**

It was observed that the building sustained moderate structural damage. We consider that the current state of the buildings is able to provide sufficient structural integrity for immediate use. However, we recommend the following structural repairs to the dwelling for continued occupancy and tenancy:

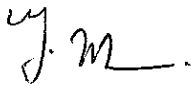
- Timber floor re-levelling by jacking and packing internal piles as practicably level as possible. Adequate fixing of pile/packing to bearer connections and packing between foundation and superstructure elements following jacking and packing repairs should be installed as per MBIE guidelines. Our recommended target tolerances are within 25mm overall floor level variation with local floor slopes not exceeding 1:200. Replacement of

piles to be recommended if requiring more than 100mm packing to re-level or pile loose on footings or pile more than 15mm out-of-plumb.

- (Post re-level) Inspection of roof structure to be carried out by suitable qualified builder. Satisfactory evidences of roof structural integrity (Photos) to be provided to structural engineer for their review.
- As Summerhill stones veneer was moderately damaged, it is recommended to take them down and re-clad with appropriate fixing to timber walls where required.
- Rake out mortar along the minor crack lines of dwelling Summer hill stones veneer, and repointing with appropriate fixing to timber walls where required. Locally remove broken bricks and replace with new bricks.
- Rake out mortar along the moderate crack or missing mortar of perimeter foundation block wall, and repointing with appropriate fixing to timber walls where required. Locally remove broken bricks and replace with new bricks.
- Floor levelling compound may be used for garage concrete floor to re-level within MBIE tolerance with following of repair strategies recommended in our sketch attached (Refer to SK2) to the garage concrete floor. **NOTE:** Prior to proceeding repair works to garage concrete floor, inspection for neighbouring attached garage is recommended to confirm the both garage repair methodologies.
- (Post re-level) Where diagonal cracks from corners of openings are less than 50mm long and cracks or separations are typically along sheet joints, re-stop to wall (Fibafuse) and ceiling plasterboard.
- (Post re-level) Where diagonal cracks from corners of openings are exceeding 50mm length and panel fractured, replacement of wall and ceiling plasterboard with equivalent bracing elements (GIB Braceline) is recommended. Installation of new fasteners to be in a bracing pattern around the plasterboard sheet perimeter in accordance with manufacturer's guidelines.

Please refer to the MBIE guidelines and manufacturer's specifications for detailed repair methodologies. The suitability for occupancy must be re-assessed by a structural engineer after any future moderate earthquakes.

Inspection and Report by,



**Gulendrarajah Nerooshan**  
Structural Engineer  
*BEng (Hons) MEngNZ*

Checked and verified by,



**Joshua Wong**  
Structural Engineer / Director  
*BEng (Hons) CMEngNZ IntPE (NZ)*

**Disclaimer:**

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The above report does not constitute our confirmation that the building is “safe”, “earthquake resistant” or similar. We have not checked the level of actual structural compliance with the current Building Code, nor assessed the level of actual past seismic activity at the particular site on which the building is situated. We have carried out visual non-destructive inspection of readily accessible areas and have used our professional judgement to assess the extent of structural earthquake damage (if any) sustained from 4 September 2010 to date. We are unable to predict the severity of any future seismic activity on your site, and how the building and site may perform in such an event, or series of events. If engaged to do so, we can carry out further structural investigation (which may include invasive methods) and desktop analysis work to ascertain level of structural compliance of the building in its current state, and identify structural vulnerabilities (if any) that may compromise the building’s structural performance in the future.

The scope of any foundation re-levelling is to return the building foundations to as close to as reasonably practicable to its structural pre-earthquake condition (i.e. NZBC Section 112 repair). This clause states that the repair strategy does not have to improve the overall performance of the structure; rather it cannot be made any worse than it was prior to the earthquake sequence. The re-levelling of the foundations will not lead to any “betterment” of the existing foundation structure. Similar performance is likely to be observed, should we experience a further significant seismic event.

**Reference**

- Canterbury Earthquake Recovery Authority. My Property web page for land zone and technical category. <http://cera.govt.nz/my-property> (data retrieved dated 02 November 2017).
- Canterbury Geotechnical Database. Earthquake Commission (EQC) Liquefaction interpreted from aerial photography. (data supplied by Tonkin and Taylor for Canterbury Earthquake Recovery Authority)
- Google Map <https://maps.google.co.nz/>
- Ministry of Business, Innovation and Employment (MBIE). (2012). Repairing and rebuilding of houses affected by the Canterbury earthquakes – Technical Guidance (Part A). <http://www.dbh.govt.nz/guidance-on-repairs-after-earthquake> Wellington, New Zealand.
- QV.co.nz. (2017). Property Details for 46 Charles Street, Waltham, Christchurch 8011 <https://www.qv.co.nz/property/2-19-woodgrove-avenue-north-new-brighton-christchurch-8083/1257532>

## Appendix



Photo 1. 46 Charles Street, Waltham, Christchurch (Google Maps).



Photo 2. Northwest elevation.



### Ground Surface Observations

- No observed ground cracking or ejected liquefied material
- Minor ground cracking but no observed ejected liquefied material
- No lateral spreading but minor to moderate quantities of ejected material
- No lateral spreading but large quantities of ejected material
- Moderate to major lateral spreading; ejected material often observed
- Severe lateral spreading; ejected material often observed
- No observations (uncoloured)

Photo 3. EQC liquefaction and lateral spreading observations show “no observation” in the area after September 2010 and “no lateral spreading but minor to moderate quantities of ejected material” in the area after February 2011 earthquake event.





Photo 4. Moderate mortar step cracks to the Summer hill stone veneer at south east corner of the dwelling



Photo 5. Moderate separation in between the concrete blocks of perimeter foundation wall.

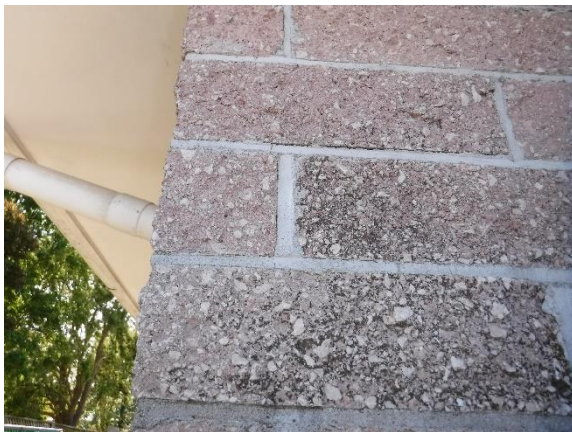


Photo 6. Minor mortar step cracks around the dwelling.

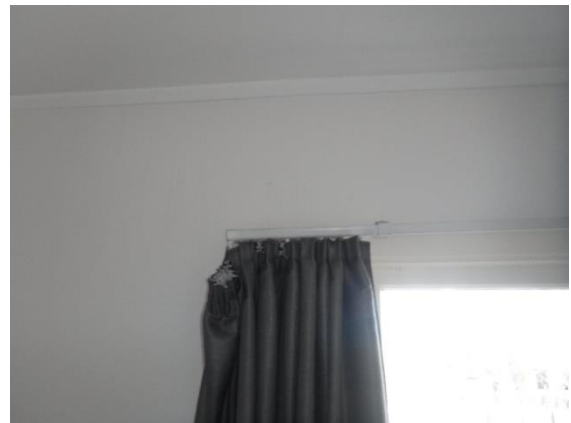


Photo 7. Dwelling wall lining



Photo 8. Dwelling wall lining and ceiling



Photo 9. Minor vertical sheet separation at corner of opening to garage wall lining.



Photo 10. Garage concrete block wall from interior view.



Photo 11. Sub floor space (View 1)



Photo 12. Sub floor space (View 2)



Photo 13. Sub floor space (View 3)



Photo 14. Roof space (View1)



Photo 15. Roof space (View2)



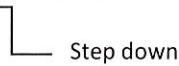


Note :

1) Measurements location are approximate and indicative only

2) Instrument used for measurement has a rated accuracy of +/- 3.0mm (ZIP level Pro 2000). Other sources of variation to the measurements can include construction tolerances, carpet, wear, and atmospheric temperature changes.

3) All measurements have been adjusted to the floor covering type at the datum. Adjustments made to raw measurements are indicated in sketch as follow :



Notes :

1) levels indicated are in millimeters.

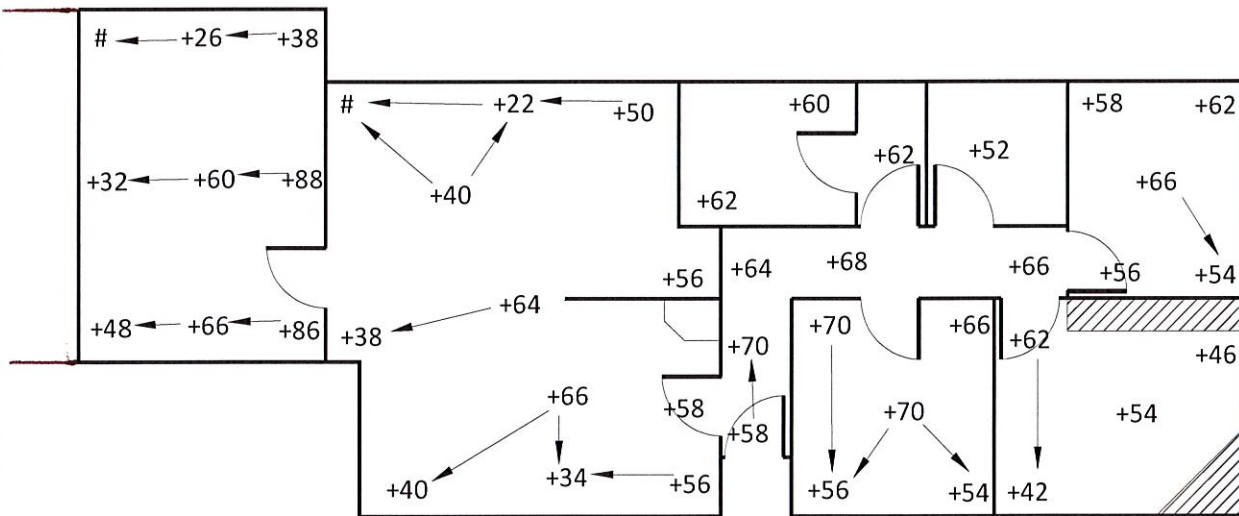
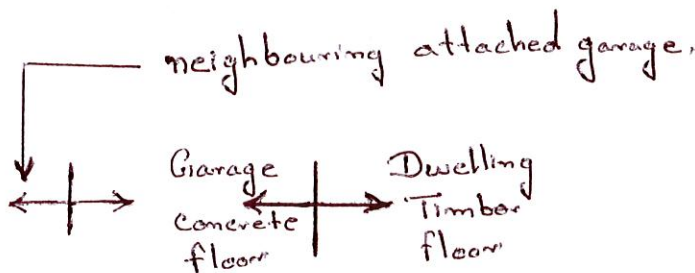
2) Reference point zero millimeter denoted as "#".

3) Floor plan layout is indicative only and not to scale.

4) Floor levels relative differences between highest and lowest point are as follows:

- 1) for dwelling's floor : 70 mm
- 2) for garage : 86 mm

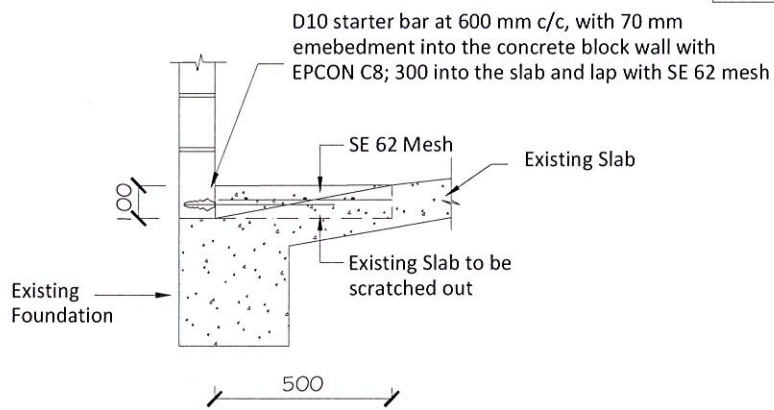
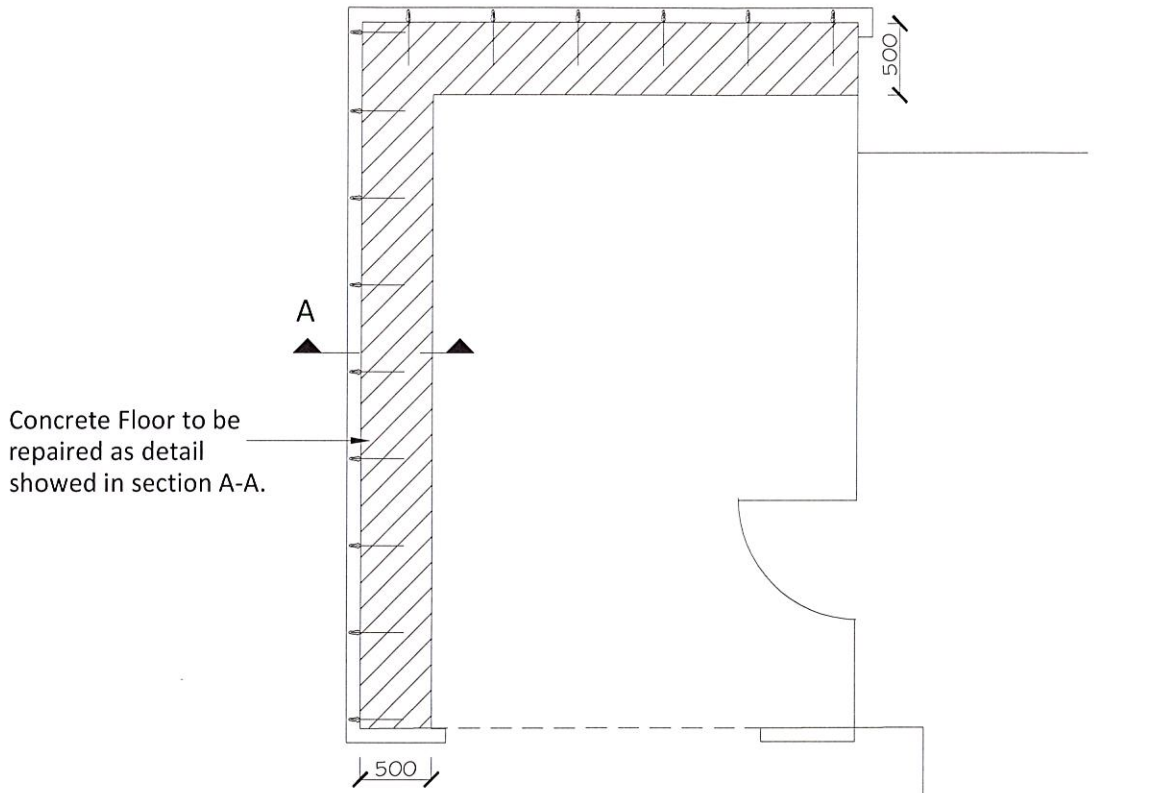
5) The Floor slope exceeded 1/200 tolerance denoted as "↘" (indicative only).



DWELLING: FLOOR LEVEL PLAN

LEVEL SURVEY PLAN  
(NTS)





LEVEL SURVEY PLAN  
(NTS)

03 November 2017

Job ref: 17-536

Gareth Webber c/o- Karl Gaskell  
[karl@kensway.co.nz](mailto:karl@kensway.co.nz)

Dear Gareth,

**RE: STRUCTURAL ASSESSMENT – 46 CHARLES STREET, WALTHAM,  
CHRISTCHURCH 8011.**

### **CONSTRUCTION MONITORING**

For the structural assessment carried out, we recommend a construction monitoring level “CM2”. This is an audit of a sample of work, rather than a detailed inspection of every component. On this project, we propose the following inspections:

#### **Proposed inspections for structural repairs at above property:**

1. Inspection for neighbouring attached garage.
2. Pre-pour inspection to garage concrete floor and subfloor inspection after re-level the timber floor
3. Repair items (repair to brick veneer, repairs to concrete floor and foundation wall, repairs to wall lining and ceiling, and level survey post re-level)

The number of inspections for the above will depend on the contractor’s method of construction, concrete pour sequencing, etc. and shall be agreed with the contractor as the works progress.

A producer statement (PS4 Construction Review) could be issued once the above inspections have been completed.

We ask that the contractor notify us at least 24 hours in advance of all major items of work before they are concealed.

For any construction queries or inspection notifications, please contact our office.

Yours faithfully



**Joshua Wong**

**BEng (HONS) CMEngNZ IntPE (NZ)**



Building Code Clause(s).....**MBIE Guidelines**.....

# PRODUCER STATEMENT – PS1 – DESIGN

(Guidance notes on the use of this form are printed on page 2)

ISSUED BY: **CEPHAS ROCK LIMITED**.....  
(Design Firm)

TO: **GARETH WEBBER C/O- KARL GASKELL**.....  
(Owner/Developer)

TO BE SUPPLIED TO: **CHRISTCHURCH CITY COUNCIL**.....  
(Building Consent Authority)

IN RESPECT OF: **REPAIR SCOPING TO EXISTING DWELLING– RE-LEVELLING BY JACKING AND PACKING TO INTERNAL PILES, GARAGE CONCRETE SLAB REPAIR AND RELEVEL, PERIMETER FOUNDATION BLOCK WALL REPAIR, AND SUMMER HILL STONE VENEER REPAIR.**  
(Description of Building Work)

AT: **46 CHARLES STREET, WALTHAM, CHRISTCHURCH 8011**.....  
(Address)  
..... **LOT DP SO** .....

We have been engaged by the owner/developer referred to above to provide .....  
... **structural repair scoping, construction monitoring** ..... services in respect of the requirements of  
Clause(s) **MBIE Guidelines**.....of the Building Code for  
All  or Part only  (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:

- Compliance Documents issued by the Ministry of Business, Innovation & Employment.. **B1/VM1, B1/AS1, B1/VM4**...or  
(verification method / acceptable solution)
- Alternative solution as per the attached schedule.....

The proposed building work covered by this producer statement is described on the drawings titled .....

... **CEPHAS ROCK LIMITED STRUCTURAL ASSESSMENT REPORT (Ref No. 17-536, dated 02/11/2017)**.....and numbered .....

together with the specification, and other documents set out in the schedule attached to this statement.

On behalf of the Design Firm, and subject to:

- (i) Site verification of the following design assumptions
- (ii) All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that a) the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code and that b), the persons who have undertaken the design have the necessary competency to do so. I also recommend the following level of construction monitoring/observation:

CM1  CM2  CM3  CM4  CM5 (Engineering Categories) or  as per agreement with owner/developer (Architectural)

I, **JOSHUA WONG**..... am:  
(Name of Design Professional)

CPEng ... **1007291**..... #  
 Reg Arch ..... #

I am a Member of:  IPENZ  NZIA and hold the following qualifications: **BEng (HONS) CPEng IntPE CMEngNZ**  
The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than \$200,000\*.  
The Design Firm is a member of ACENZ: ]

SIGNED BY **JOSHUA WONG**..... ON BEHALF OF **CEPHAS ROCK LIMITED**.....  
(Design Firm)

Date **24.1.18**..... (signature).....

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*Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of \$200,000\*.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

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