



BCN/2022/4378

Exemption from building consent

29/06/2022

Packer, Gray

Notwithstanding any drawings or specifications
accepted herein, all building work must comply
with the New Zealand Building Code.

BUILDER DETAILS

Mainmark Ground Engineering (Nz) Limited will be carrying out the releveling works.

Theo Hnat from Mainmark has a significant amount of experience in house releveling and earthquake repairs. And has been involved with many jobs through the council consent process.

Mainmark Ground Engineering (Nz) Limited - Registration Number 5311501.

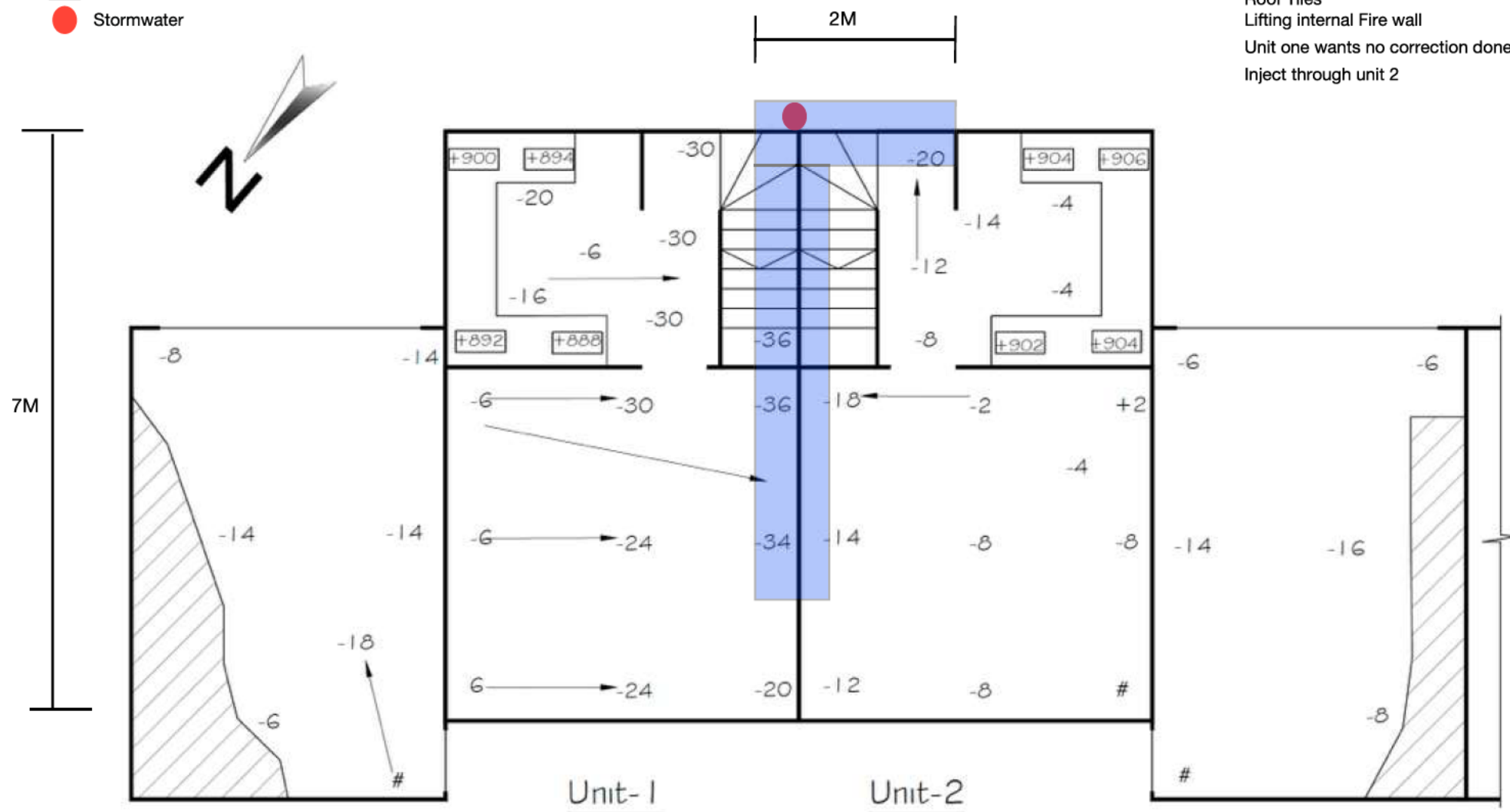
Mainmark (Theo Hnat) will be providing a PS3 for the completed work.

Legend

- Footing Injection Zone
- Slab injection Zone
- Stormwater

Notes

RL Taken from Contractor
 Two story connected units
 Slab on ground
 Weatherboard
 Roof Tiles
 Lifting internal Fire wall
 Unit one wants no correction done
 Inject through unit 2



Scope of Works
22JT015

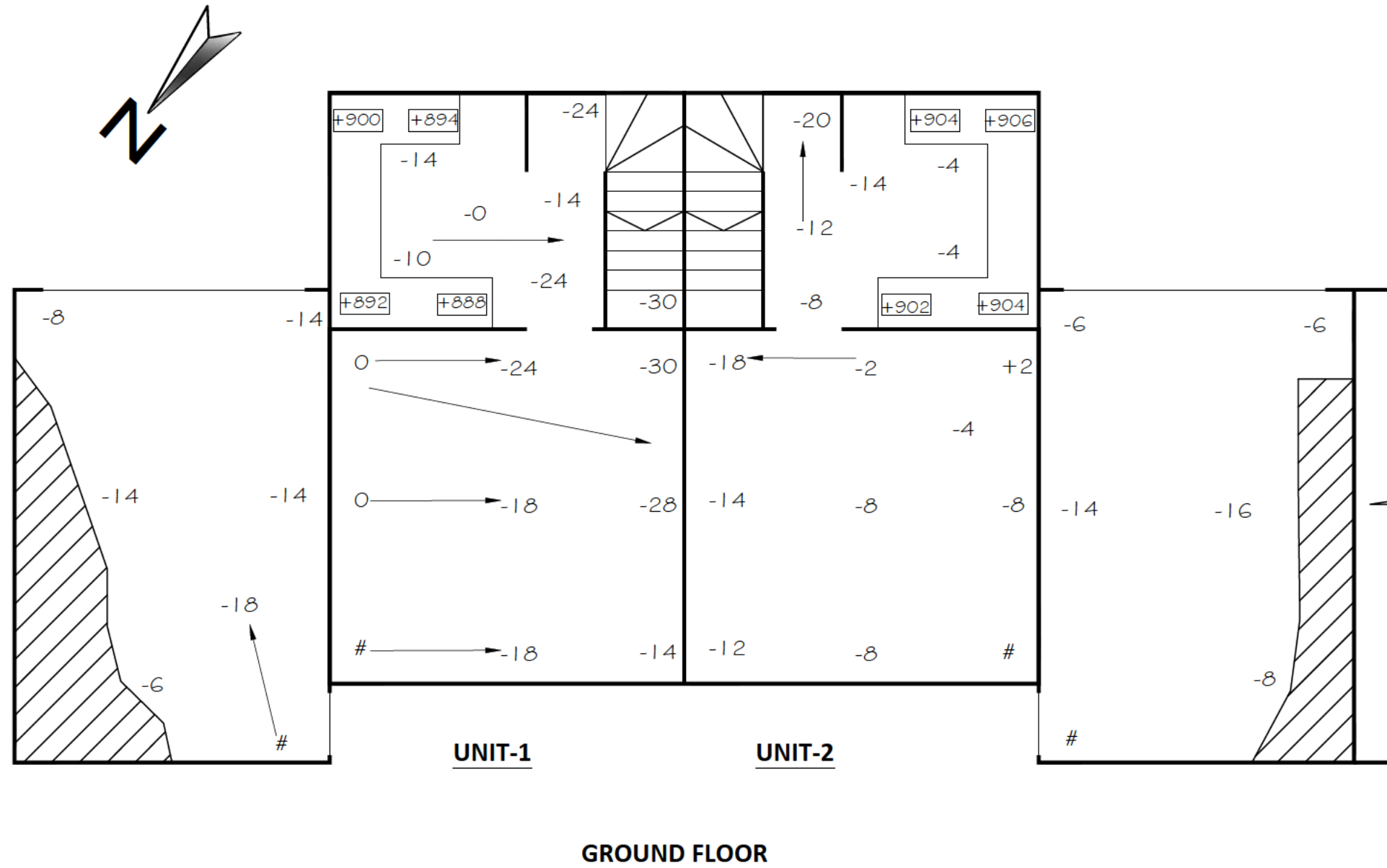
Date of S.I.
21/02/2022

Project Address
1-2/85 Trafalgar Street, Saint Albans

Site Inspection carried out by
 Josh Townsend -
 townsend@mainmark.com

Level measurements are in millimeters accurate to
 +/-2mm (hardware tolerances)
 This drawing is approximate and for illustration and
 scoping purposes only

mainmark



FLOOR LEVEL SURVEY PLAN BY OTHERS (NTS)

NOTE :

- 1) FLOOR LEVEL BY OTHERS
- 2) DATUM DENOTED AS "#".
- 3) THE FLOOR SLOPE EXCEEDED 1/200 TOLERANCE DENOTED AS " " (INDICATIVE ONLY).
- 4) FLOOR LEVEL DIFFERENCES BETWEEN THE HIGHEST AND LOWEST POINTS ARE:
 - GROUND FLOOR UNIT 1: 30 MM (-30, 00)
 - GROUND FLOOR UNIT 2: 20 MM (-20, 00)
 - GARAGE FLOOR UNIT 1: 18 MM (-18, 00)
 - GARAGE FLOOR UNIT 2: 16 MM (-16, 00)

RE-LEVELLING AND REPAIR PLAN (NTS)

PROJECT : STRUCTURAL REPAIR ASSESSMENT

ADDRESS : 85 TRAFALGAR STREET SAINT ALBANS, CHRISTCHURCH

JOB NO : 22.091

DRAWN BY : AEN


DATE : 21/06/2022

CHECKED BY : SA

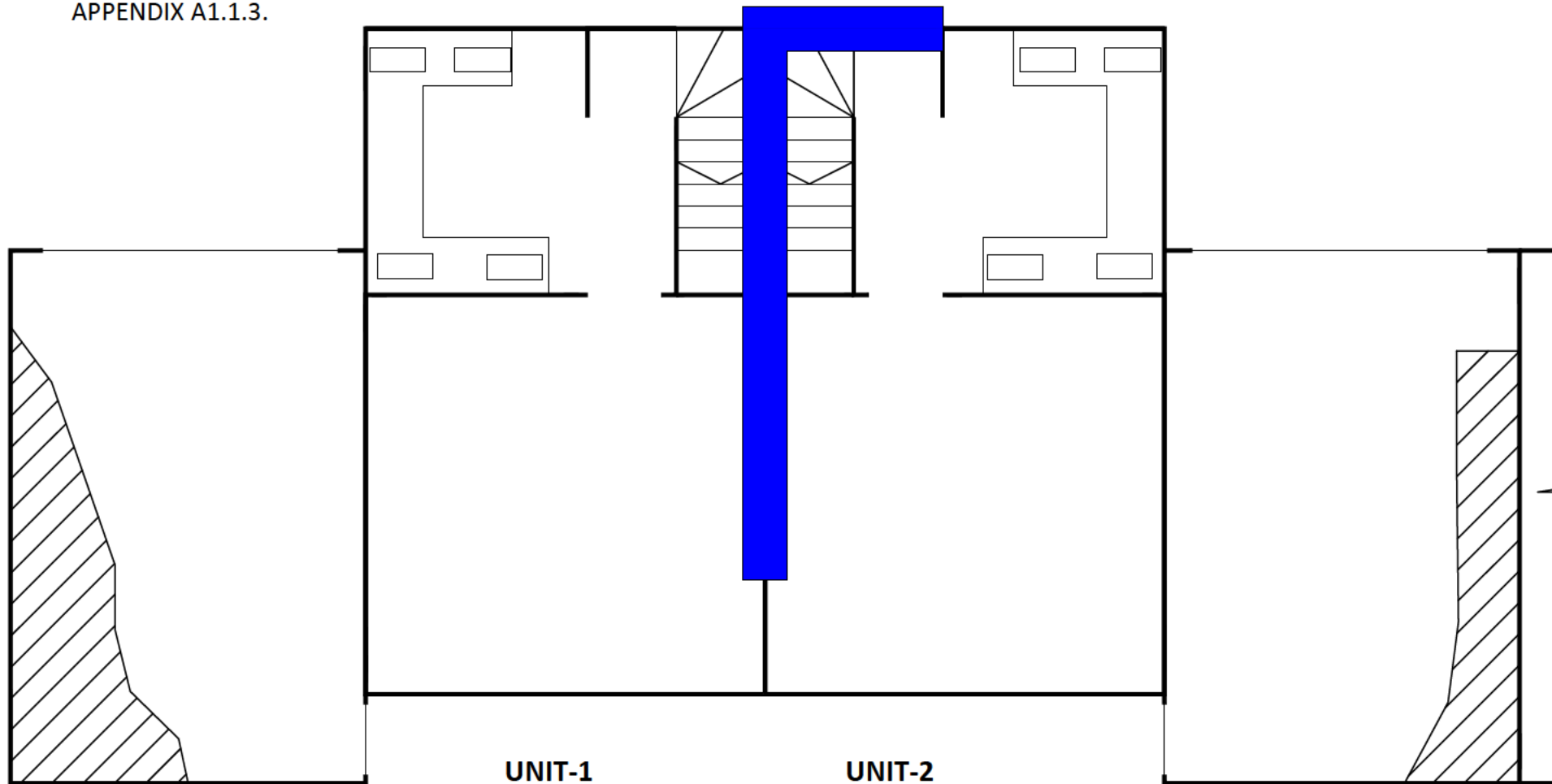
PAGE :

SK2

LEGEND:

 FOOTING INJECTION ZONE

CONCRETE FLOOR AND FIRE WALLS CAN BE RELEVELLED BY ENGINEERED DESIGN AS PER OPTION 3 OF THE MBIE GUIDANCE: PART A, APPENDIX A1.1.3.



UNIT-1

UNIT-2

GROUND FLOOR

GENERAL NOTES

1. CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON SITE.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH STRUCTURAL ASSESSMENT REPORT; ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

INSPECTION SCHEDULE

FINAL FLOOR LEVEL SURVEY, AND ANY OTHER STRUCTURAL REPAIR ITEMS.

MINIMUM 24 HOURS NOTICE IS REQUIRED FOR ALL INSPECTIONS.

NOTE: THE AREAS AND AMOUNTS ARE INDICATIVE ONLY. BUILDER TO ENSURE THE BUILDING IS RE-LEVELLED TO WITHIN TARGET TOLERANCES.

21 June 2022

Job No: 22.091

Andrew and Ann-Maree Coombs
[REDACTED]

Dear Andrew,

REVIEW OF EXISTING STRUCTURAL ENGINEERS' REPORT – UNITS 1 & 2 / 85 TRAFALGAR STREET, SAINT ALBANS, CHRISTCHURCH.

The purpose of this letter is to provide a professional opinion on the existing structural assessment report of the above address.

Following relevant documents have been reviewed as part of this process,

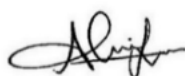
- 1) Structural Assessment Report by Cephas Rock Limited for 85 Trafalgar Street, Saint Albans, Christchurch (Job No: 21-174, dated 01 June 2021).

Based on the review of the above document, and MBIE guideline, we are of the opinion from a structural perspective that the proposed structural repair methodology in the above documents can be considered adequate at this stage.

Limestone engineers consider that releveling the concrete floor and firewalls by engineered design per option 3 of the MBIE guidance: part a, appendix a1.1.3 will be more practical and economical.

It should be noted that the above opinion was not intended to be a full scope of repairs and therefore should not be treated as such.

Yours faithfully



Abin Nicholas

*B.Tech (Civil), GD Prjct Mgt
Structural Engineer*

PRODUCER STATEMENT – PS1 – DESIGN

ISSUED BY: Limestone Engineers Ltd.
(Design Firm)

TO: Andrew and Ann-Maree Coombs
(Owner/Developer)

TO BE SUPPLIED TO: Christchurch City Council
(Building Consent Authority)

IN RESPECT OF: Structural Earthquake Repairs to the dwelling
(Description of Building Work)

AT: Unit 1 & 2, 85 Trafalgar Street, Saint Albans
(Address)

Town/City: Christchurch **LOT** **DP** 37537 **SO**
(Address)

We have been engaged by the owner/developer referred to above to provide:

Structural repair scoping, construction monitoring

(Extent of Engagement)

services in respect of the requirements of Clause(s) MBIE Guidance 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&VM4&AS1, MBIE 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:

Structural re-levelling design for 85 Trafalgar street(22.091) and numbered S1-S2 (22.091, dated 21/06/22)
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)

I, Sananthanan Amirthalingam am: ☒ CPEng # 1023988
(Name of Design Professional)

I am a member of: ☒ Engineering New Zealand and hold the following qualifications: BSc(Civil), MSc, CMEngNZ, CPEng(NZ)

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 ACE New Zealand: ☐

SIGNED BY Sananthanan Amirthalingam (Signature)
(Name of Design Professional)

ON BEHALF OF Limestone Engineers Ltd. Date 21/06/2022
(Design Firm)

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.
THIS FORM AND ITS CONDITIONS ARE COPYRIGHT TO ACE NEW ZEALAND AND ENGINEERING NEW ZEALAND

GUIDANCE ON USE OF PRODUCER STATEMENTS

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects, Institution of Professional Engineers New Zealand (now Engineering New Zealand), ACE New Zealand in consultation with the Building Officials Institute of New Zealand. The original suit of producer statements has been revised at the date of this form as a result of enactment of the Building Act (2004) by these organisations to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with reasonable grounds for the issue of a Building Consent or a Code Compliance Certificate, without having to duplicate design or construction checking undertaken by others.

PS1 Design Intended for use by a suitably qualified independent design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 Design Review Intended for use by a suitably qualified independent design professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 Construction Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011²

PS4 Construction Review Intended for use by a suitably qualified independent design professional who undertakes construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Design Professional

This statement is made by a Design Firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its designers.

A competent design professional will have a professional qualification and proven current competence through registration on a national competence based register as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand (formerly IPENZ) provides additional assurance of the designer's standing within the profession. If the design firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent design professional".

*Professional Indemnity Insurance

As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard, small projects. If the parties deem this inappropriate for large projects the minimum may be up to \$500,000.

Professional Services during Construction Phase

There are several levels of service which a Design Firm may provide during the construction phase of a project (CM1-CM5 for Engineers³). The Building Consent Authority is encouraged to require that the service to be provided by the Design Firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design firm's engagement.

Attached Particulars

Attached particulars referred to in this producer statement refer to supplementary information appended to the producer statement.

Refer Also:

¹ Conditions of Contract for Building & Civil Engineering Construction
NZS 3910: 2013

² NZIA Standard Conditions of Contract SCC 2011

Guideline on the Briefing & Engagement for Consulting Engineering Services
(ACE New Zealand/Engineering New Zealand 2004)

⁴ PN Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org



01 June 2021

Job No: 21-174

Earthquake Commission
Attn: Jonathan Graham
JGraham3@eqc.govt.nz

Dear Jonathan,

RE: STRUCTURAL ASSESSMENT – UNITS 1 & 2 / 85 TRAFALGAR STREET, SAINT ALBANS, CHRISTCHURCH.

We confirm that a structural damage assessment and geotechnical investigation was carried out by Cephas Rock Limited;

- 18/03/2021 - Structural damage assessment for Unit 2.
- 24/03/2021 - Structural damage assessment for Unit 1.
- 16/04/2021 - Deep Geotechnical investigation for Unit 1.
- 21/04/2021 - Deep and shallow Geotechnical investigation.

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.

This multi-unit property contains four units: 1/85, 2/85, 3/85 and 4/85 Trafalgar Street, and the units all have separate attached garages. 1/85 and 2/85 units are structurally connected and share an intertenancy wall, while the attached slab-on-grade garages are physically connected, they are not considered to be structurally connected to the main building. It is therefore expected that the units 1/85 and 2/85 will be prone to behave as one structure when subjected to earthquake-induced lateral forces. It is recommended by the MBIE guidance that the whole structure (Unit 1 and 2) to be inspected. Cephas Rock has completed the inspection to both units.

BUILDING DESCRIPTION

The site contains 2 two-storey multi-unit buildings consisting of 4 adjacent flats and attached garages, situated on a flat site to the southwest of Trafalgar Street, in Saint Albans. The buildings are believed to have been built circa 1970 and have a concrete slab-on-grade foundations (Type C foundation as per the MBIE Guidance). The majority of the superstructure of the building is timber-framed, and the inter-tenancy wall (firewall) between units 1 and 2, and units 3 and 4 is constructed using concrete masonry blocks. The building is clad with a combination of light-weight timber weatherboards and heavy-weight concrete masonry blocks. The roof of the building is clad with heavy-weight concrete tiles.

The site is classified as “Green Zone, Technical Category 3, blue” area as given by the Ministry of Business, Innovation and Employment (MBIE). Specific Geotechnical investigation by Cephas Rock Ltd revealed that the site characteristics are consistent with “Technical Category 3”. MBIE stated 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 the September 2010 earthquakes and “no lateral spreading but minor to moderate quantities of ejected material” after February 2011 earthquake events.

Further to the site visit, we have received the following documentation and were referred where relevant.

- Cephas Rock Ltd (2021) Geotechnical Investigation Report 85 Trafalgar Street, Saint Albans, Christchurch (dated May 2021, Ref:21-190).
- Earthquake Commission (EQC) scope of works – Full Assessment Report at 2/85 Trafalgar Street, Saint Albans, Christchurch on 30/11/2011, (CLM/2011/126312).
- Earthquake Commission (EQC) Statement of Claim Checklist / Repair Strategy. (CLM/2010/086160, dated 14/2/2011).
- Builders report by Canterbury Property Reports (dated 27 July 2020).

OBSERVED DAMAGE - DWELLING

Exterior

Evidence of ground movement was observed through cracking in the concrete driveway and undulations in the footpaths around the building.

It was noted that the repair works to the exterior of the dwelling had been partially completed prior to our site inspection. Due to the previous repair works, there was no significant structural damage observed to the external cladding.

Moderate horizontal cracking damage was observed to the concrete perimeter foundation wall besides the firewall at the front of unit 1. Minor horizontal cracking damage was observed to the concrete perimeter foundation wall at the rear of unit 1. The pattern of the cracking damage to the exterior were considered to be a typical result of the ground movement and/or settlement from the Canterbury Earthquake Sequence (CES). Therefore, Cephas Rock considers that the damage to the exterior of the building is attributed to the seismic events.

Interior

Unit-1

Minor damage to the internal wall and ceiling linings of the unit-1 was observed during our site inspection, including:

- Minor vertical cracking damage to the wall linings along the sheet joints. The majority of these cracks were around the window and door opening corners.
- Minor cracking damage to the ceiling linings.
- Minor wall-to-wall and wall-to-ceiling juncture movement.
- Minor step cracking to the block wall.
- Door misalignments.

Cephas Rock considers that the earthquake-related damage to the internal linings is consistent with level 1 damage category as per Table 7.1 of the MBIE Guidance.

Signs of moderate water ingress were identified to unit 2. However, according to the owner, the water ingress issues are not directly related to the earthquake related movements.

Unit-2

We were informed that repairs to the unit-2 had been carried out prior to our inspection. No major cracking damage was observed to the plasterboard wall and ceiling linings throughout the unit-2 at the time of our inspection. However, minor bowing to the plasterboards identified at one location on the first floor.

Due to the completion of previous cosmetic repairs to the internal linings, the correlating damage to the wall and ceiling linings around the dwelling couldn't be inspected during our assessment. However, descriptions of wall lining cracks in the EQC scope of works indicates that the building has experienced earthquake-induced building movements.

Limited verticality measurements of the internal walls were taken and showed that the walls appeared to be in sound condition. Also, the verticality measurements (up to 6mm/m) to the inter-tenancy firewall showed that the firewall remained relatively plumb. Additionally, there was only minor cracking damage observed to the concrete masonry blocks. As such, Cephas Rock is of the opinion that the structural integrity of the firewall has unlikely been compromised but the firewall was likely settled along with the concrete floor as a result of the Canterbury Earthquake Sequence (CES). The repair to this area shall be carried out as per our "Conclusions and Remediations" section of this report.

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 findings of the floor levels measured within each flat were summarised in Table 1 as follows:

Table 1. Summary of floor level survey for each unit.

Unit Number	Maximum Floor Level Variation (mm)		Floor Slope > 0.5%
	Ground Floor	First Floor	
1	30	40	Yes
2	20	28	Yes
Overall	36	N/A	Yes

The ground floor level variations are within the 50mm suggested threshold for "no foundation re-level considered necessary" set out in Table 2.3 of the MBIE Guidance. However, there was a few floor slope exceeding the MBIE tolerance for local floor slopes of 1:200 (0.5%) identified in the ground floor. As such, the building falls into the category of "foundation re-level indicated" as per the MBIE Guidance. Due to the presence of the floor coverings, any possible damage to the concrete slab of the main dwelling could not be investigated during our site inspection.

Table 2. Summary of floor level survey for each garage.

Garage Unit Number	Maximum Floor Level Variation (mm)	Floor Slope > 0.5%
1	30	Yes
2	20	No


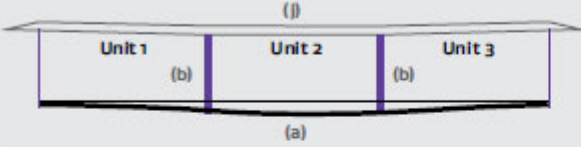
The attached garage concrete ground floor level variations are within the 50mm suggested threshold of “no foundation re-level considered necessary” set out in Table 2.3 of the MBIE Guidance. A minor local slope exceeding the MBIE tolerance for variation 1:200 (0.5%).

Table 2. Indicator criteria for floor / foundation re-level, repair, or rebuild in MUBs (Table 18.2 of the MBIE Guidance, 2012).

Column 1	Column 2	Column 3	Column 4	Column 5
Floor type	NO foundation relevel considered necessary [Note l]	Foundation relevel and/or repair indicated [Note j]	Foundation rebuild indicated for individual unit (partial rebuild)	Foundation rebuild indicated for whole building
Type C Timber-framed dwelling on concrete floor	<p>The slope between any two points >2m apart is <0.5% (1 in 200) <i>within a single unit</i> [Note a and g]</p> <p>and</p> <p>The variation in the level over the floor plan is <50mm <i>in a single unit</i></p> <p>and</p> <p><i>The slope along the whole building is <0.5% (1 in 200) [Note d]</i></p> <p>and</p> <p>There is no distress in floor coverings</p> <p>and</p> <p>Services are functioning</p> <p>and</p> <p><i>Firewalls do not require repairs, refer to Table 18.3</i></p>	<p><i>The slope along the whole building is >0.5% (1 in 200) [Note d]</i></p> <p>or</p> <p>The variation in floor level is >50mm and <150mm <i>within a single unit</i></p> <p>or</p> <p><i>1 or more firewalls require replacement – partial foundation replacement of individual unit</i></p>	<p>The variation in floor level is >150mm <i>within a single unit</i></p> <p>or</p> <p>There is irreparable damage to buried services <i>within a unit's footprint</i></p> <p>or</p> <p><i>The floor has stretched >20mm within a single unit [Note e]</i></p> <p>or</p> <p><i>>50% of the concrete slab within any single unit requires replacement [Note m]</i></p>	<p><i>This will relate to the degree of total damage and the number of unit foundations requiring replacement exceeding economic repairs [Note f and n]</i></p>

The floor levels measured across the entire building footprint (floor levels across the 2 units based on one datum) showed a maximum floor level variation of 36mm (-36, 0). The general trend of the floor level variations on the ground floor was sloping towards the middle of the building, indicating the foundation damage mechanism may be combination of case 5 and 6 ("Firewall settlement" and "Dishing (sagging)"), as per Table 18.4 of the MBIE Guidance, which is shown below, and the foundation re-level is also recommended in this table.

Table 3. Typical MUB foundation damage mechanisms (Table 18.4 of the MBIE Guidance, 2012).

Damage Mechanism	Analysis	Potential Solution
<p>5. Firewall settlement</p>  <p>Typical indicators:</p> <ul style="list-style-type: none"> (b) Distress in walls and ceiling (c) Cracking in ring beam (Type B) or concrete slab (Type C) (h) Localised settlement in floor 	<p>Check firewall verticality.</p>	<p>Relevel floor adjacent to firewall or for a small area breakout and replace (Type C).</p> <p>Relevel firewall, replace if more practical. It may be possible to leave the firewall in place and extend height to marry back in with the roof structure.</p> <p>Repair superstructure.</p>
<p>6. Dishing (sagging)</p>  <p>Typical indicators:</p> <ul style="list-style-type: none"> (a) Evidence of foundation settlement relative to land or nett settlement (uniform settlement of a portion of the building) of the land that is more difficult to observe (b) Distress in walls and ceiling (j) Deformation of roofline 	<p>Unit 2 may not appear to exceed slope or differential settlement criteria; however it has a degree of uniform settlement relative to the original foundation level. [Note 1]</p>	<p>Relevel foundations of all units, as required, if outside the Table 18.2 criteria. If unit 2 has settled greater than 100mm or 150mm (Type A/B or C respectively) then unit 2 foundation may need to be replaced.</p>

Roof Space

A limited visual assessment of the roof from the ground level identified no evidence of earthquake-related damage where readily visible. Most of the roof appears to have no structural damage, including deflection of the ridge, valley and hip lines.

DISCUSSION

It is understood that the building was constructed circa 1770's. Considering the type of construction, concrete foundation, steel reinforcement in the slab, and the age of the building, notable settlement from historical damage/ pre-existing conditions would not be expected.

Additional measurements were also taken during our inspection of the benchtop, ceiling, and window levels, door head slopes, and wall verticalities. The measurements showed that the majority of the slopes were consistent with the floor settlement trend. In addition to this, the first-floor levels also somewhat correlate with the general ground floor settlement trend. Apart from the floor levels and additional measurements, we identified some shaking damage around the building (prior to the repairs), resulting in damage to the internal linings, door misalignments etc.

More importantly, specific Geotechnical investigation revealed that majority of the differential floor and firewall settlement is attributed to earthquake related actions. Therefore, considering all these factors, Cephas Rock concludes that damage to this part of the dwelling is attributed to the CES, and the damage repair shall be carried out as per our "Conclusions and Remediations" section of this report.

CONCLUSIONS AND REMEDIATIONS

It was observed that the building sustained minor to moderate structural damage, predominantly to the concrete perimeter foundation wall and floor levels due to earthquake-induced building movements. We recommend the following structural repairs to the dwelling for continued long term occupancy and tenancy:

Foundation Repairs

- **Option 1:** Where the concrete perimeter foundation and firewalls have settled (dropped), the concrete perimeter foundation and firewalls can be re-levelled by mechanical lifting using portable jacks as per Option 1 of the MBIE Guidance: Part A, Appendix A1.1.3. The foundation re-levelling shall be designed, approved and monitored by a qualified structural engineer. The soil conditions need to be confirmed by a geotechnical engineer prior to any construction.
 - The internal concrete slab may be replaced as per specific engineering detail.
 - It is expected that the floor slopes of the timber floors on the first can be remediated by mechanically re-levelling the foundation on the ground floor. Some further local re-levelling works may be required to individually remediate the floor slopes of the timber floors.
- **Option-2:** Concrete floor and firewalls can be re-levelled by engineered resin as per option 3 of the MBIE Guidance: Part A, Appendix A1.1.3.

Other Repairs

- The floor coverings shall be removed, and the condition of the ground floor slab shall be inspected by a structural engineer for repair methodology confirmation prior to proceeding with any repair works.
- The cracking damage may be repaired by epoxy repairs (Sikadur 52 or equivalent approved) to concrete perimeter foundation and slab cracks (<5mm wide) or cementitious grout repairs (Ramset PoziLite HB/ PoziCote FR or equivalent approved) to concrete cracks (5~10mm wide). Surface preparation and application to interface shall be in accordance with manufacturer's instructions.

- Re-stopping to wall (Fibafuse) and ceiling plasterboard where diagonal cracks from the corners of openings are less than 50mm long and cracks or separation are typically vertical along sheet joints. Installation of new fasteners is required around the plasterboard sheet perimeter where fasteners have pulled through or plaster bulges around fastener heads.
- 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 shall be in a bracing pattern around the plasterboard sheet perimeter in accordance with manufacturer's guidelines.
- Once the foundations have been re-levelled and repaired, the non-structural elements, such as doors, windows, driveway, external amenities etc., should be assessed and remediated by a suitably qualified person as required.
- Once the foundations have been re-build, all non-structural elements, such as doors, windows etc., should be assessed and remediated by a Licensed Building Practitioner as required.

It should be noted that this assessment was not intended to be a full scope of repairs and therefore should not be treated as such. The photos exhibited in the appendix do not necessarily constitute the entirety of the damage found upon inspection. As this is a qualitative report that provides general repair methods, the appendix merely exhibits an example of the types of damage found. It is up to the contractor to thoroughly inspect for all damage that requires repair.

The suitability for occupancy must be re-assessed by a structural engineer after any future significant earthquakes. It should be noted that this assessment was not intended to be a full scope of repairs and therefore should not be treated as such.

Inspection and Report by,



Abin E.N
Structural Engineer
B.Tech (Civil), GD Prjct Mgt

Checked and verified by,



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

Disclaimer:

1. This report has been prepared on behalf of and for the exclusive use of Earthquake Commission and is subject to and issued in accordance with the provisions of the contract between Cephas Rock Limited and Earthquake Commission. Cephas Rock accepts no liability or responsibility, whatsoever, for or in respect of any use or reliance upon this report by any third party.
2. This report is the copyright of Cephas Rock Limited. Except for the use of Earthquake Commission and subject to the conditions in the agreement, no part of this publication may be copied without the express permission in writing from Cephas Rock Limited.
3. 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. No assessment relating to weathertightness has been made, and it should be performed by a weathertightness specialist if required.
4. 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-landzone> (data retrieved dated 01 June 2021).
- Canterbury Geotechnical Database. Earthquake Commission (EQC) Liquefaction interpreted from aerial photography. (data supplied by Tonkin and Taylor for Canterbury Earthquake Recovery Authority)
- Cephas Rock Ltd (2021) Geotechnical Investigation Report 85 Trafalgar Street, Saint Albans, Christchurch, dated 29 January 2021, Ref:21-190.
- Earthquake Commission. (2011). Claim Assessment – scope of works – Assessment of Property at 85 Trafalgar Street, Saint Albans, Christchurch on 30/11/2011, (CLM/2011/126312)
- 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.
- Propertyvalue.co.nz. (2021). Property Details for 85 Trafalgar Street, Saint Albans, Christchurch. <https://www.propertyvalue.co.nz/canterbury/christchurch-city/st-albans-8014/1-85-trafalgar-street-st-albans-christchurch-8014-6078399>

Appendix



Photo 1. 85 Trafalgar Street, Saint Albans, Christchurch.



Photo 2. Elevation view of the flats from the southeast corner of the property.



Photo 3. EQC liquefaction and lateral spreading observations obtained from Canterbury Geotechnical Database show “No observations (uncoloured)” following the September 2010 and “No lateral spreading but minor to moderate quantities of ejected material” following the February 2011 earthquake events.



Photo 4. Cracking damage to the concrete perimeter foundation.



Photo 5. Undulation to the concrete pavers.



Photo 6. Cracking damage to the concrete driveway.

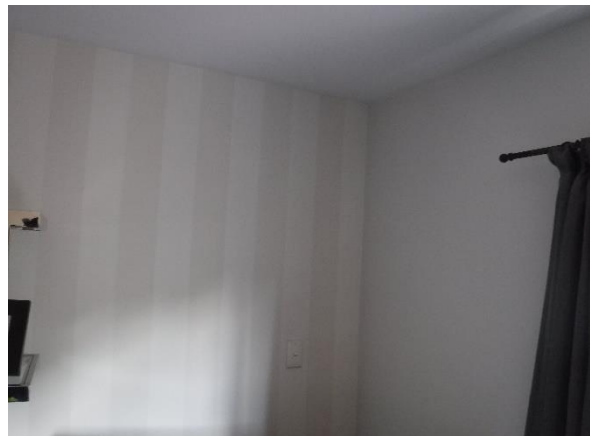


Photo 7. Internal view 1 (Unit -2).

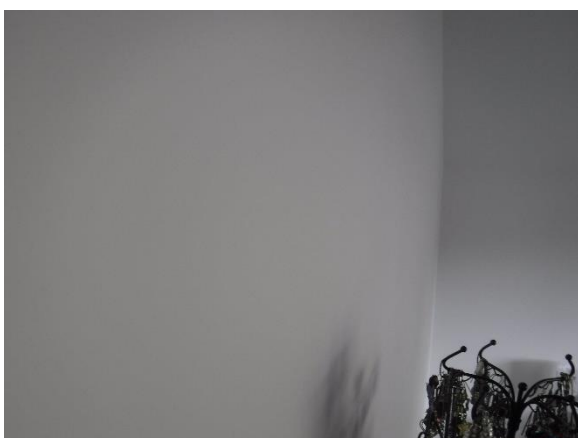


Photo 8. Internal view 2 – Minor bowing to the plasterboard linings (Unit -2).



Photo 9. Cracking damage to the internal wall linings (Unit -1).



Photo 10. Water ingress identified to the unit 2.



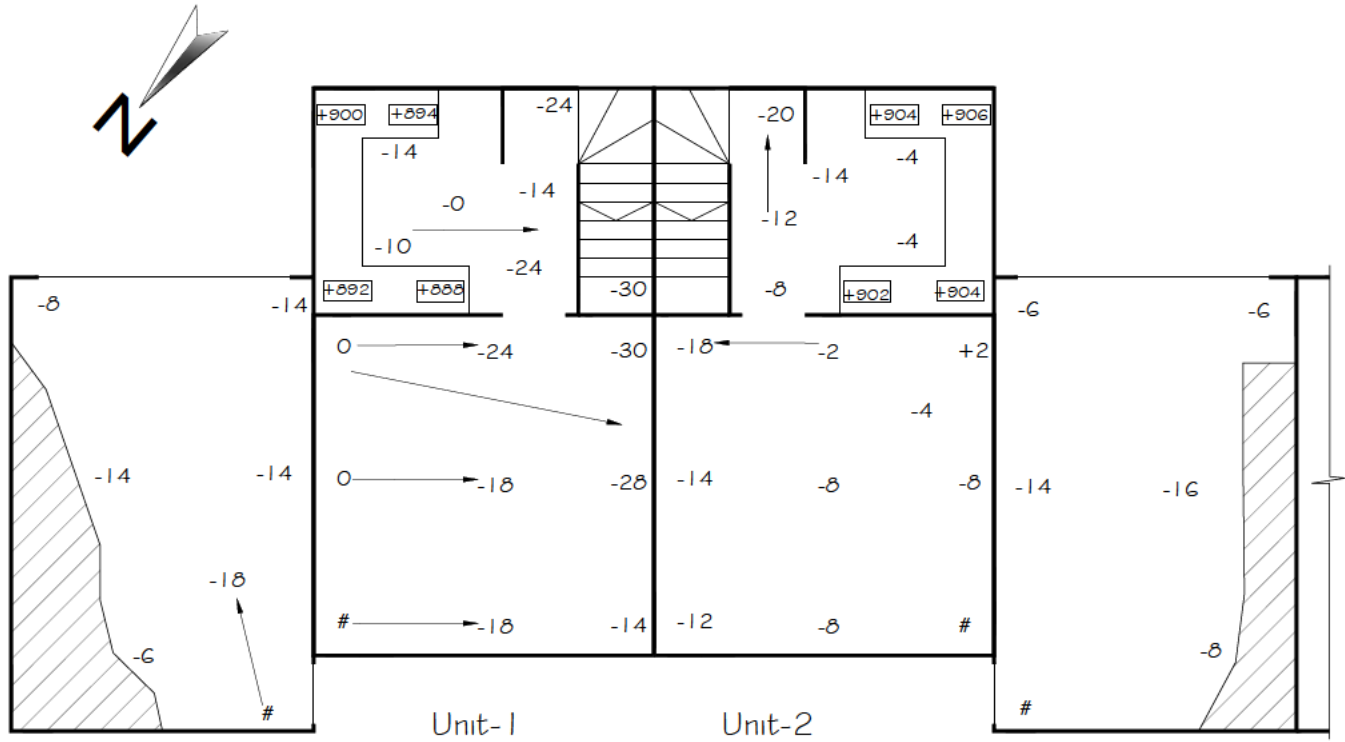
Photo 11. Minor step cracking to the block wall.



Photo 12. Door misalignment view -1 (Unit -1).



Photo 13. Door misalignment view 2 (Unit -2).



GROUND FLOOR

**FLOOR LEVEL SURVEY PLAN (NTS)
(SEPARATE DATUM)**

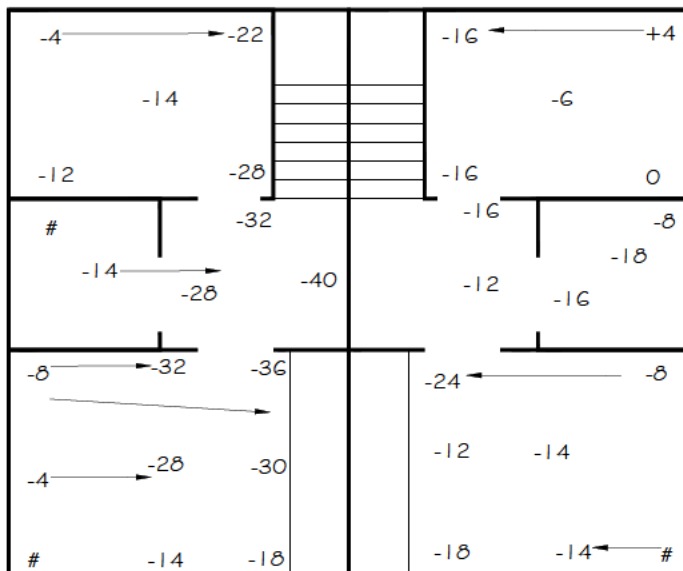
Note :

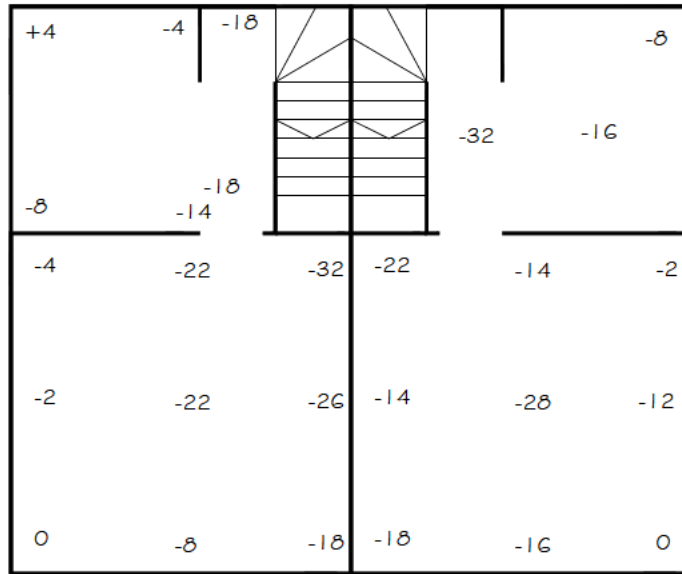
- 1) Measurements location are approximate and indicative only and not to scale.
- 2) Levels indicated are in millimeters.
- 3) Instrument used for measurement has a rated accuracy of +/- 3.0mm (ZIP level Pro 2000). Other sources of variation to the measurements can include construction tolerances, carpet, wear, and atmospheric temperature changes.
- 4) All measurements have been adjusted to the floor covering type at the datum.
- 5) Reference point zero millimeter denoted as "#".
- 6) Benchtop levels indicated as "+xxx".
- 7) The Floor slope exceeded 1/200 tolerance denoted as "—" (indicative only).
- 8) The relative floor level differences between the highest and lowest points are as follows:
Ground Floor Unit 1 : 30mm (-30, 00)
Ground Floor Unit 2 : 20mm (-20, 00)
First Floor Unit 1 : 40mm (-40, 00)
First Floor Unit 2 : 28mm (-24, +04)

Ground Floor overall : 36mm (-36, 00)

Garage Floor Unit 1 : 18mm (-18, 00)

Garage Floor Unit 2 : 16mm (-16, 00)

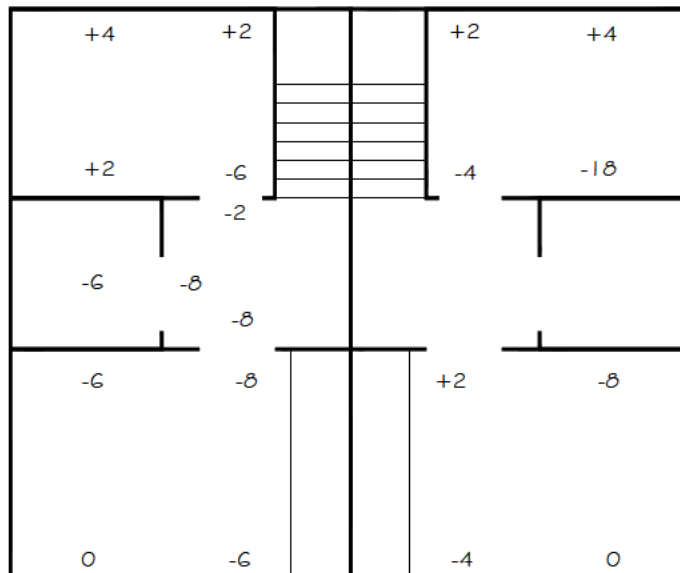




Unit-1

Unit-2

GROUND FLOOR



Unit-1

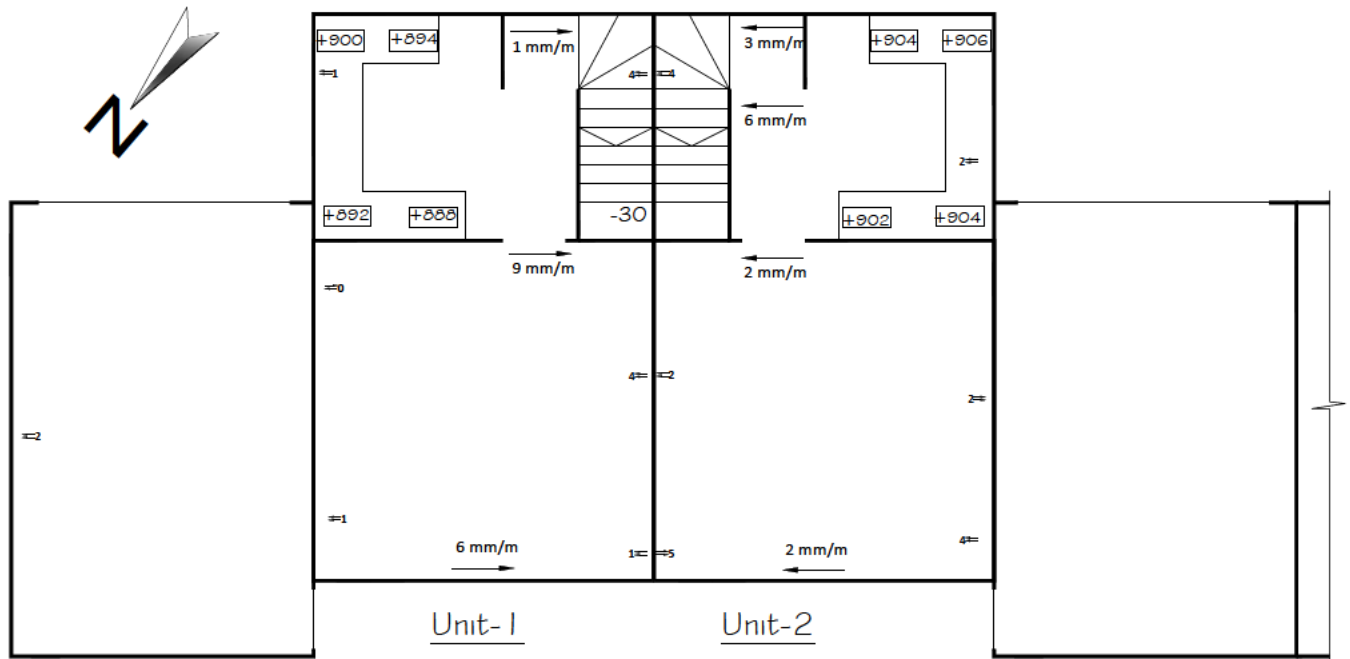
Unit-2

FIRST FLOOR

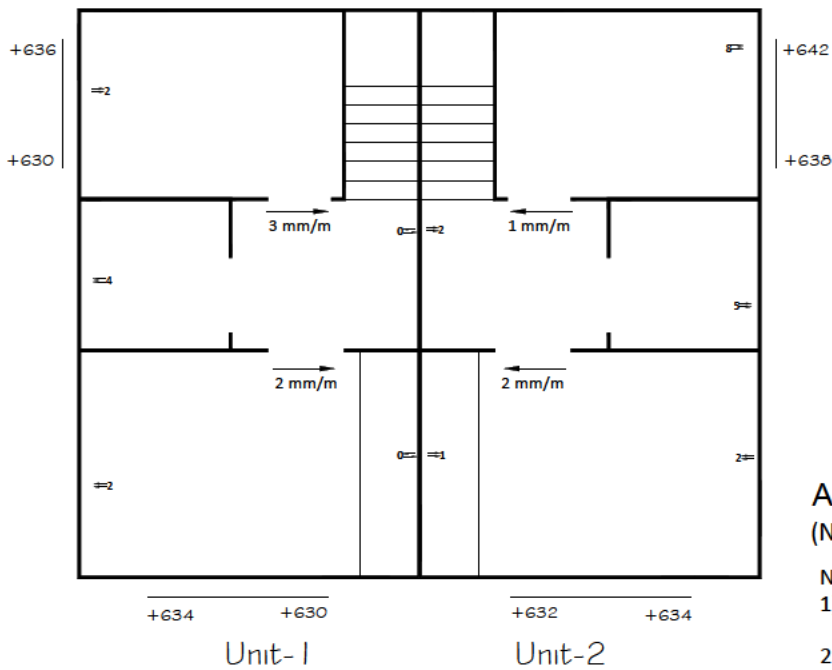
CEILING LEVEL SURVEY PLAN (NTS)

Note :

- 1) Measurements location are approximate and indicative only and not to scale.
- 2) Levels indicated are in millimeters.
- 3) 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.



GROUND FLOOR



FIRST FLOOR

AMENITY LEVEL SURVEY PLAN (NTS)

Note :

- 1) Measurements location are approximate and indicative only and not to scale.
- 2) Levels indicated are in millimeters.
- 3) 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.
- 4) Wall horizontal verticality displacements (mm/m) denoted as " $\uparrow\uparrow$ " (indicative only)
- 5) Doorhead slopes indicated as " $\rightarrow xx\%$ ".
- 6) Windowsill levels (mm) from floor reference point (zero mm) denoted as " $xx \quad xx$ " (indicative only).
- 7) Benchtop levels indicated as " $+xxx$ ".



LEGEND



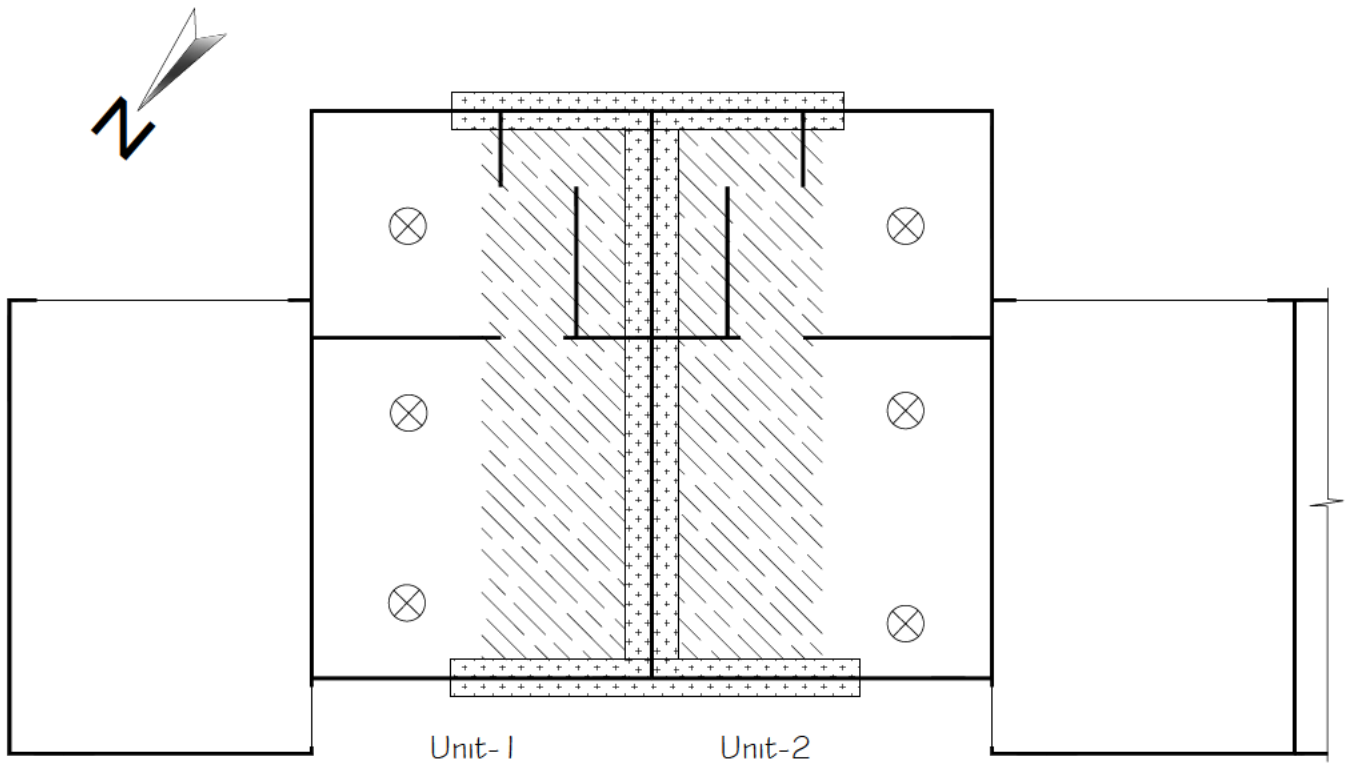
Approximate area for mechanical lifting.



Partial cut out and replacement of concrete slab as per engineering details.



Internal lifting Point (If required)



GROUND FLOOR

**APPROXIMATE REMEDIATION PLAN
(FOR OPTION 1)**

Note :

- 1) Location are approximate and indicative only and not to scale.
- 2) Not for construction