

** APPENDIX

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Dated: 17 feb 2020
kshan



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Dated: 17 Feb 2020
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O'BRIEN GEOTECH_{CO LTD}

Geotechnical Assessment for Proposed New House

16 Oakland Place, Ngongotaha, Rotorua

For Mark Lam

Project No 583

May 2017

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1 Introduction

O'Brien Geotech Ltd has been engaged by Mark Lam to undertake a geotechnical assessment for a proposed new house at 16 Oakland Place, Ngongotaha. This report outlines the investigations undertaken, the analysis carried out and provides recommendations on the foundation aspects of the proposed development.

2 Site Description

The site is located in Stage 2 of the Oakland Subdivision in Ngongotaha, approximately 1.5km from the lake. The site location is shown on Figure A below. It is legally described as Lot 70 DP 389915 and has an area of 1143m².



Figure A: Site Location

Photograph from RLDC GIS System

The site is located on relatively flat ground and has an elevation of approximately RL286m (Moturiki Datum). The site layout is shown on Figure B below.

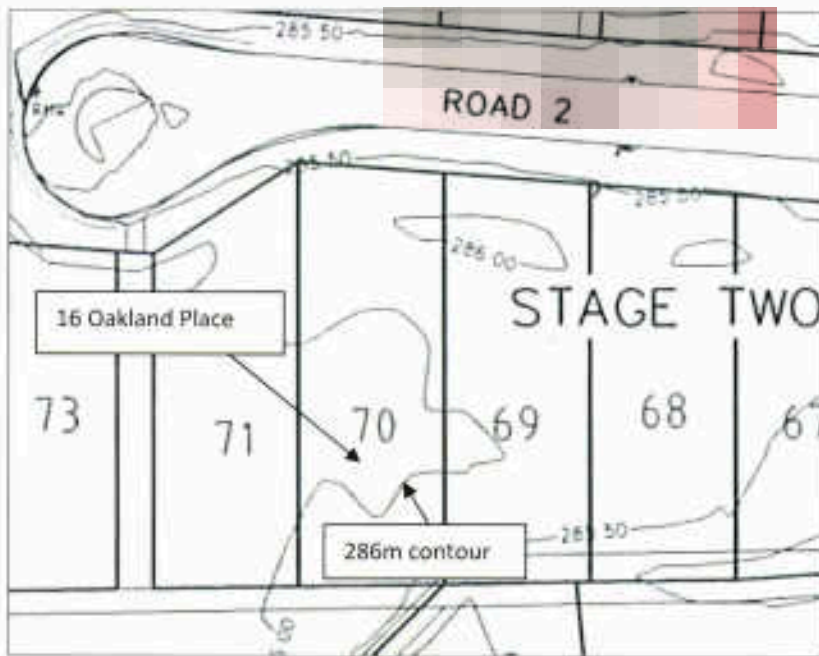


Figure B: Site Layout

Plan from T&T Assessment Report

3 Proposed Development

It is proposed to construct a single storey house with brick cladding and a lightweight roof. The proposed building location is shown on Figure 1 in Appendix A.

4 Site History & Previous Reports

The Oakland Subdivision has been intensively investigated and assessed, since compressible soils were discovered by investigations undertaken in 2008. A Geotechnical Assessment Report¹ which relates to the Stage 2 and 3 of the subdivision was issued in 2009.

The Geotechnical Assessment Report outlines the results of an intensive program of ground investigation, laboratory testing, site monitoring and assessment and provides general recommendations for construction on the subdivision.

The conclusions and recommendations concerning Lot 70 contained in this report are summarised below:

- The lot is underlain by approximately 6m of soft compressible silt
- Between 0.5m and 1m of cut was undertaken during the subdivision works. Refer to Fig C below.
- The assessment report included Lot 70 in Zone C – areas of cut overlying significant a thickness of soft silt.
- Stiffened rafts were recommended for Zone C lots.
- Settlement monitoring on Lot 68 (approximately 35m away) between July 2008 and January 2009 indicated minimal movement.
- 1m to 1.5m deep subsoil drains have been installed to lower the ground water level.

¹ Geotechnical Assessment Report, Volume 1 & 2; Ref 851126 produced by Tonkin & Taylor in March 2009.

- The ground water was recorded at 2.5m depth in December 08 and January 09.
- Rotorua Lakes Council have confirmed that a minimum Finished Floor Level of RL286.25m (Moturiki Datum) (or 250mm above surrounding ground, whichever is higher) is required to ensure sufficient freeboard above the 1% AEP (Annual Exceedance Probability) flooding level. This value includes a 50mm future settlement allowance.
- An enhanced damp proof membrane and a capillary break with perforated pipe connected to the stormwater disposal system is required.
- A maximum of 150mm of filling for patios or decks is allowed.
- No stockpiles of materials over 1m high and/or covering an area greater than 4m² are to be placed on or adjacent to the proposed building footprint or existing underground services.



Fig C: Cut/Fill Plan

From Geotechnical Assessment Report

5 Ground Conditions

5.1 Published Geology

The published geology for the area² indicates that the site is underlain by Tauranga Group Alluvium.

5.2 Investigations Carried Out

Five handaugers and Scala Penetrometer Tests were undertaken as part of this assessment. In addition, two CPTs undertaken as part of previous investigations were referred to. The site investigation locations are shown on Figure 1 in Appendix A. The site investigation data is included in Appendix B.

5.3 Ground Conditions

The ground conditions encountered are summarised in Table 2 below:

Stratum	Description	Depth to Top of Stratum m	Stratum Thickness m	Typical qc mPa
1	Topsoil	-	0.1 to 0.35	N/A
2	Very stiff to hard SILT	0.2 to 0.35	0.4 to 0.6	6
3	Loose to medium dense sand, pumiceous	0.5 to 0.9	2 to 3	1 to 5
4	Very soft to soft SILT with sand layers	3 to 4	7 to 8	0.25
5	Medium dense to dense SAND	11	9+	4 to 14

The water table was measured at 2.1m depth in CPT 2-71 and was not encountered in the 2m depth of the recent investigation.

² Geology of the Rotorua Area by Leonard et al GNS 2010

6 Geotechnical Assessment

6.1 Discussion of Results of Investigation

The investigations confirm the presence of soft compressible silt and potentially liquefiable soils. The presence of a relatively competent crust has also been confirmed. Because of the amount of cutting which has previously taken place, significant settlement is not expected to occur.

The liquefaction issue is assessed below.

6.2 Liquefaction Assessment

6.2.1 Liquefaction Assessment Parameters

Recent alluvial soils are known to be potentially vulnerable to liquefaction. Liquefaction is the term used to describe the severe strength loss which can occur when saturated loose to medium dense granular soils and low plasticity silts are subject to seismic shaking. Liquefaction can also result in post seismic settlement, slope failure and in lateral movement toward free edges such as rivers or streams known as lateral spreading (not relevant for this site).

At this site, the water table has been measured at approximately 2m depth (CPT 2-71 undertaken in June 2008). An assessment of the effect of seismic shaking on this site has been undertaken using the computer program Cliq and the method of Idriss & Boulanger³ (I&B). The effects of clay-like behaviour under seismic shaking have also been assessed.

The proposed building is Importance Level (IL) 2 as defined by NZS 1170.0 2004 'New Zealand Standard for Structural Design Action'. The code requires that structures must avoid collapse as a result of an Ultimate Limit State Level (ULS) of shaking (500 year return period for IL 2 structures – i.e. 10% risk of occurrence within 50 years). It must be readily repairable after a Serviceability Limit State (SLS) level of shaking (25 year return period for IL2 structures – i.e. 87% risk of occurrence within 50 years).

The site has been assessed as being Class D 'Deep Soil Site' in accordance with NZS 1170.5 2004. From the New Zealand Bridge Manual⁴ a PGA of 0.3g and an earthquake magnitude of 6 has been adopted for ULS shaking. For SLS shaking a PGA of 0.075g has been used.

6.2.2 Results of Liquefaction Assessment

The liquefaction plots are included in Appendix C. The results indicate that liquefaction in the sands below the water table is expected under ULS shaking. A ground surface settlement of between 33 and 200mm is predicted. The predicted settlement from liquefaction within the top 10 m only reduces to between 10 and 40mm. A Liquefaction Severity Index (LSN) of 7 and 26 is indicated. No liquefaction is predicted under a SLS level of shaking.

It should be appreciated that the settlement prediction methods are approximate. The predicted settlement should therefore be considered to be an indicator of relative severity rather than an accurate prediction of the settlement which will occur.

³ Idriss I.M. & Boulanger R.W (2008) 'Soil Liquefaction During Earthquakes' monograph series No.MNO-12 Earthquake Engineering Research Institute.

⁴ The New Zealand Transport Bridge Manual SP/M/022, Third Edition, Amendment 1, Sept 2014

The Liquefaction Severity Number (LSN) has been developed following the Canterbury earthquakes as a way of predicting the level of settlement related land and building damage which will occur from liquefaction. The LSN highlights the degree of liquefaction occurring close to the surface, which has been found to be a major contributor to land damage in Canterbury. A LSN value of 0 to 20 indicates little or no expression of liquefaction, minor sand boils, and minor damage to homes. A value between 20 and 40 indicates moderate expression of liquefaction, undulations and cracking of ground surface (there are occasional instances of severe damage). A value in excess of 40 indicates widespread damage, extensive expression of liquefaction, severe settlement of buildings and damage to services. The calculated LSN values for ULS shaking are 7 and 26, indicating a low to moderate level of damage can be expected.

6.3 Proposed Foundation Details

The Geotechnical Assessment Report proposes that a specifically designed cellular raft is required for a conventional brick construction. An enhanced damp proof membrane and a capillary break with a perforated pipe connected to the stormwater system is also proposed. An indicative foundation detail, which was provided in the Assessment Report, is included in Appendix A.

To address the level of liquefaction predicted, an enhanced 'Ribraft' type foundation is proposed. The details shall comply with Option 4 of the TC2 solutions, as outlined in the guidelines for the Canterbury rebuild⁵. An extract from the guidelines is included in Appendix A. In addition, the foundations and the superstructure shall be designed to withstand differential settlement of approximately 25mm in 6m.

The proposed foundation details shall be developed by a structural engineer, taking account of the potential differential settlements. The structural engineer shall determine if dowel piles are required. The damp proofing and capillary break details shall be added to the architect's drawings. Sufficient movement joints shall be incorporated into the building fabric to accommodate the level of differential settlement outlined above.

If required, light weight pumice fill (to be approved by the geotechnical engineer) shall be used.

7 Conclusions and Recommendations

The investigation and assessment undertaken has confirmed that the site is suitable for the proposed development.

It is recommended that an enhanced 'Ribraft' type foundation shall be used, as indicated in the Geotechnical Completion Report. An 'Option 4' type foundation from the Canterbury Guidelines shall be used. The raft foundation and the building as a whole shall be designed to accommodate the level of differential settlement outlined in Section 6.4 above. The foundation details shall be developed by a structural engineer. Lightweight fill shall be used.

A Finished Floor Level of RL286.25m m (or 250mm above surround ground, whichever is higher) is required. The damp proofing and capillary break details outlined in the Assessment Report shall be adopted, as well as all other recommendations outlined in Section 4.

⁵ Revised guidelines on repairing and rebuilding houses affected by the Canterbury earthquakes sequence – MBIE (December 2012)

The cleared formation shall be examined by a geotechnical engineer, or a technician acting under the direction of a geotechnical engineer. Any firm to soft cohesive soils or very loose granular soils encountered shall be removed and replaced by compacted granular fill.

8 Applicability

This report has been prepared for the benefit of Mark Lam with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

The proposed liquefaction mitigation measures are intended to meet the code requirements, i.e. to prevent the collapse of the structures under ULS level shaking. It should be appreciated that extensive damage could occur, which may result in the subsequent demolition of the building.

Recommendations and opinions in this report are based on data obtained from a limited number of investigation locations. The nature and continuity of the ground away from these locations is inferred but it must be appreciated that actual conditions may vary from the assumed model.

O'Brien Geotech Ltd can accept no responsibility for the accuracy of geotechnical data obtained from independent contractors such as Geotechnics Ltd and Perry Geotech Ltd.

During excavation and construction, the site should be examined by an engineer or engineering geologist competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. It is important that we be contacted if there is any variation in subsoil conditions from those described in the report.

For O'Brien Geotech Ltd,

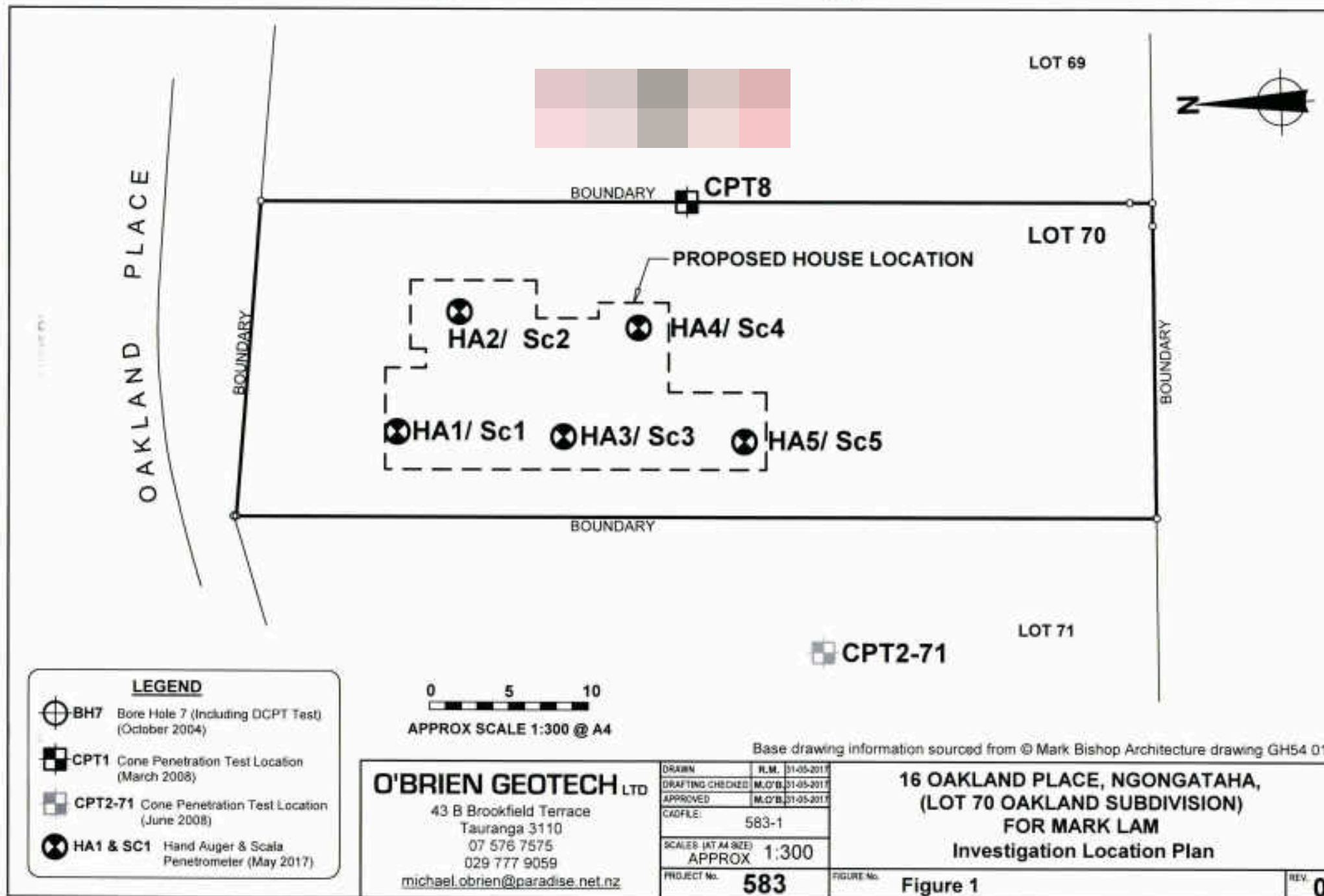


Michael O'Brien
MSC DIC MIPENZ (Geotechnical) CPEng, IntPE(NZ)
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michael.obrien@paradise.net.nz

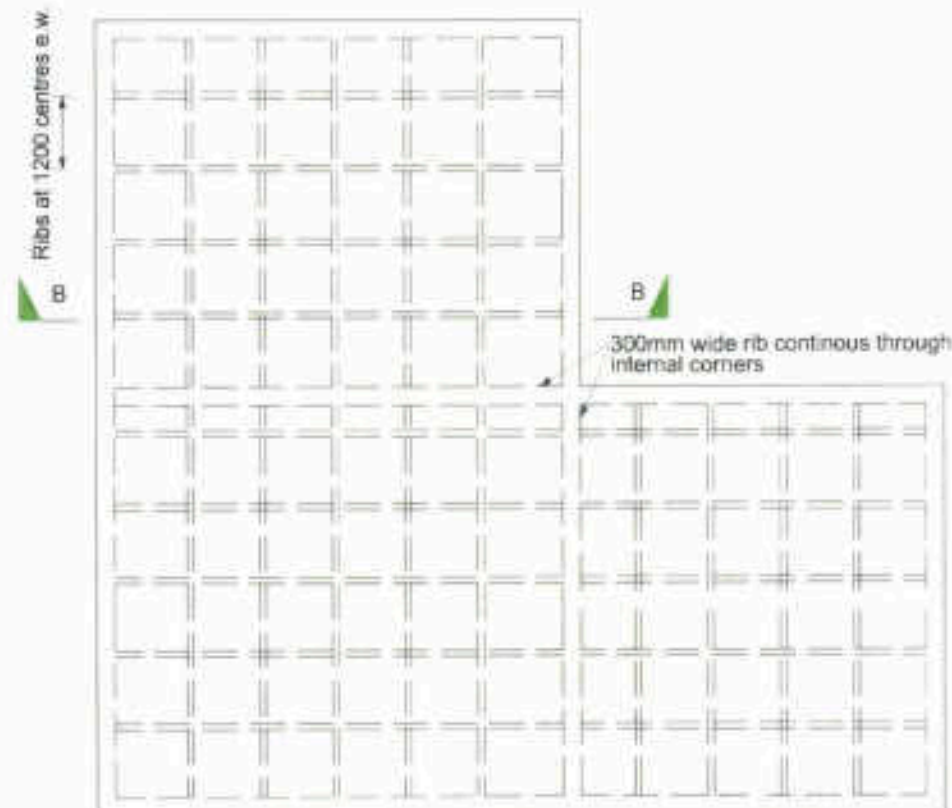
Appendix A

Figures + Proposed Details



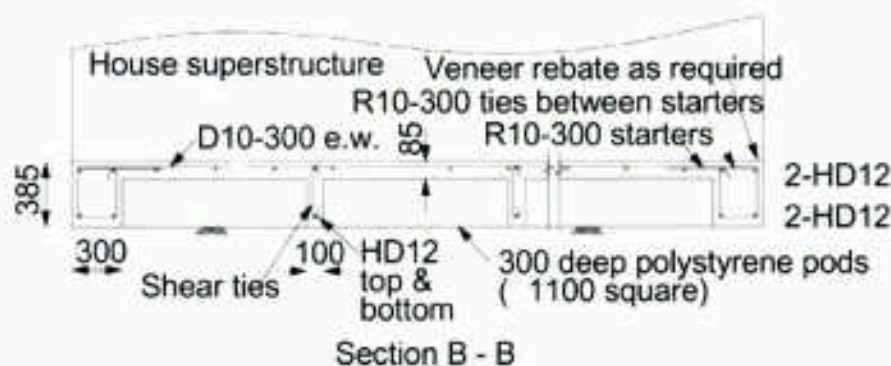
Option 4 – Construct a waffle slab over the existing soil

Figure 5.10: Enhanced foundation slab – Option 4 plan

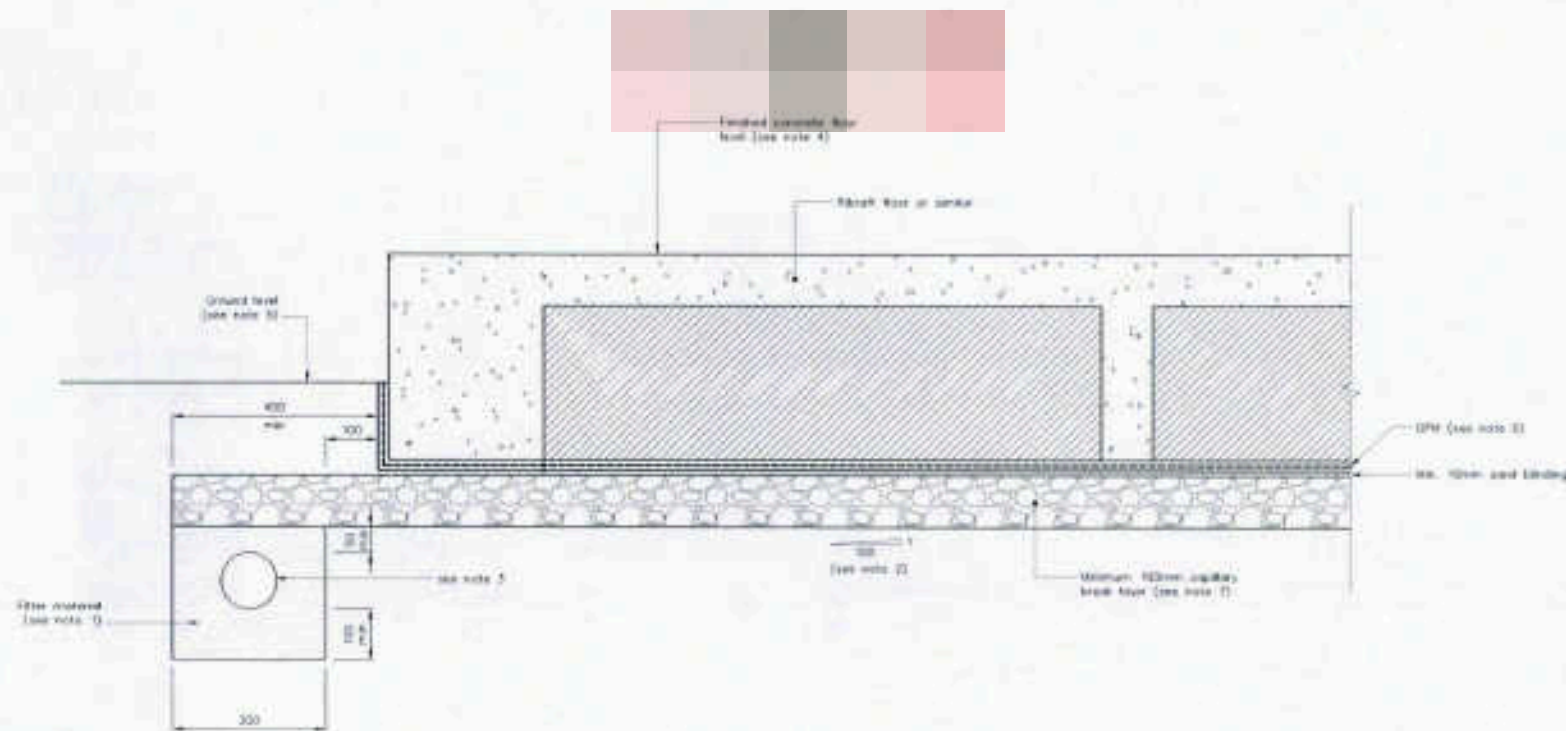


Note: Reinforcing details are not sufficient for two-storey heavy-weight cladding (brick veneer) with either a heavy or light roof.

Figure 5.11: Enhanced foundation slab – Option 4 cross-section



The ground immediately beneath the polystyrene and ribs must have a minimum geotechnical ultimate bearing strength of 200 kPa, or the system should be subject to specific engineering design (refer to section 3.4.1). Shear ties in accordance with NZS 3101 are required in the ribs.



TYPICAL DETAIL INDICATIVE FOUNDATION DESIGN

1. From site material grading as indicated in Table 1.
2. Base of Copylift/brake beam to have a minimum fall of 1:100 towards drain from centre of foundation.
3. Copylift/brake beam to extend beyond perimeter of building with a positive connection to structural system.
4. Vertical supports from level shall be a minimum of 500mm above adjacent ground level or the minimum height given in Clause 7.5.2.1 of NZS3604:1999 (whichever is greater).
5. Independent upon whether the ground is protected by permanent paving or not, all the tips of struts will be coving. Care allowance to be made for anticipated post-construction settlement to meet compliance with minimum dimensions required by NZS3604, in the long term.
6. A minimum fall of 1:25 to be provided for ground surface adjoining foundation for minimum 6m from the building to permanent system. A minimum 1:50 fall to 500mm above grade shown in accordance with Clause 7.5.2.2 of NZS3604:1999. Allowance to be made for possible future settlement close to building.
7. IFM to generally comply with Clause 7.5.4 of NZS3604:1999. Two layers of 2.0mm polythene to be used, one for each layer to be staggered, laps to be taped.
8. Copylift/brake system shall be well grouted and compacted beneath with not more than 50 kg/m³ during the 2.0mm seal and 100kg/m³ during the 10mm seal.
9. Foundation and struts are indicative only and not be subject to specific engineering design.

Test Date January (mm)	Percentage passing (%)
28.5	100
15.2	85-100
9.5	80-90
4.75	85-100
2.5	50-70
0.85	20-50
0.4	10-40
0.25	3-25
0.15	0-10
0.075	0

SCALE : 1:100

[illegible]

PIONEER PROPERTY TRUST
WESTERN ROAD, NGONGOTAHA
STAGE THREE GEOTECHNICAL COMPLETION REPORT
Indicative Foundation Design

Figure 10

Appendix B

Site Investigation Data





Our Ref: 1003135.0.0.0/REP1

Customer Ref: 583

24 May 2017

O'Brien Geotech Ltd
43b Brookfield Rd
Otumoetai
Tauranga

Attention: Michael O'Brien

Dear Michael,

16 Oakland Place, Ngongotaha - Site Investigation Site Report

Introduction

Geotechnics was engaged to complete Hand Auger (HA) and Scala Penetrometer (SC) testing at the above mentioned location.

Date of Procedure

10 May 2017

Determining the Test Location

A location plan illustrating proposed investigation locations was provided to Geotechnics by Michael O'Brien of O'Brien Geotech Ltd. Investigation locations were positioned on site using a measuring tape and dimensions from the plan provided.

Location Plan

The attached plan provides indicative locations only and is not to scale.

Customer's Instructions

We were instructed to:

- Complete Hand Auger investigations at the locations and depths indicated on the provided plan.
- Carry out Shear Vane testing at 300mm centres in cohesive soil.
- Carry out Scala Penetrometer testing adjacent to hand auger boreholes.

Specifications

None Issued.

Methods

NZS 4402:1988 Test 6.5.2 - Determination of the penetration resistance of a soil (Hand method using a dynamic cone penetrometer) - Scala

NZGS 8:2001 - Test method for determining the vane shear strength of a cohesive soil using a hand held shear vane.

Material Description

Material descriptions are provided in the attached results.

Results

Results are attached.

Photos can be downloaded from the following link:

<https://transfer.tonkinandtaylorgroup.com/message/16NZt7hcNDkuJIEpFFxoI8>.

This link will expire on 21 August 2017.

Test Remarks

Material Logging

Material logging and descriptions in the field are in general accordance with the New Zealand Geotechnical Society Inc in 'Guideline for the Field Classification of Soil and Rock for Engineering Purposes' (December 2005), excluding geological information and are based on the observational behaviour of the material.

The logs represent our best assessment of the sub-surface conditions, but due to the subjective nature of material logging, we take no responsibility for any inaccuracies or misinterpretations.

Scala

Our standard test procedure is to over-drill Scala penetrometer tests every 1m. As requested by you, we have not over-drilled these tests. This variation to the standard test method may increase friction with depth due to skin friction and the protrusion of the rod connectors. The results >1m deep may therefore not be accurate and are provided for your own interpretation and inference.

Shear Vane

Shear Vane tests are potentially unsuitable for material described in the borehole logs as 'non-plastic', 'sandy SILT' or 'silty SAND'. Tests in these materials may not be compliant with the stated test method. Results are provided for your own interpretation and inference.

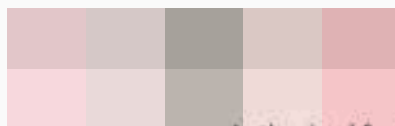
General Remarks

We provide the results and logs for your interpretation and inference.

Please reproduce this report in full when transmitting to others or including in internal reports.

If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of the letterhead page.

GEOTECHNICS LTD



Report prepared by:

Spoffit Reid
Geotechnician

Authorised for Geotechnics by:

Paul Burton
I have reviewed this
document
2017-05-24 16:07:57 +12:00

Paul Burton
Project Director

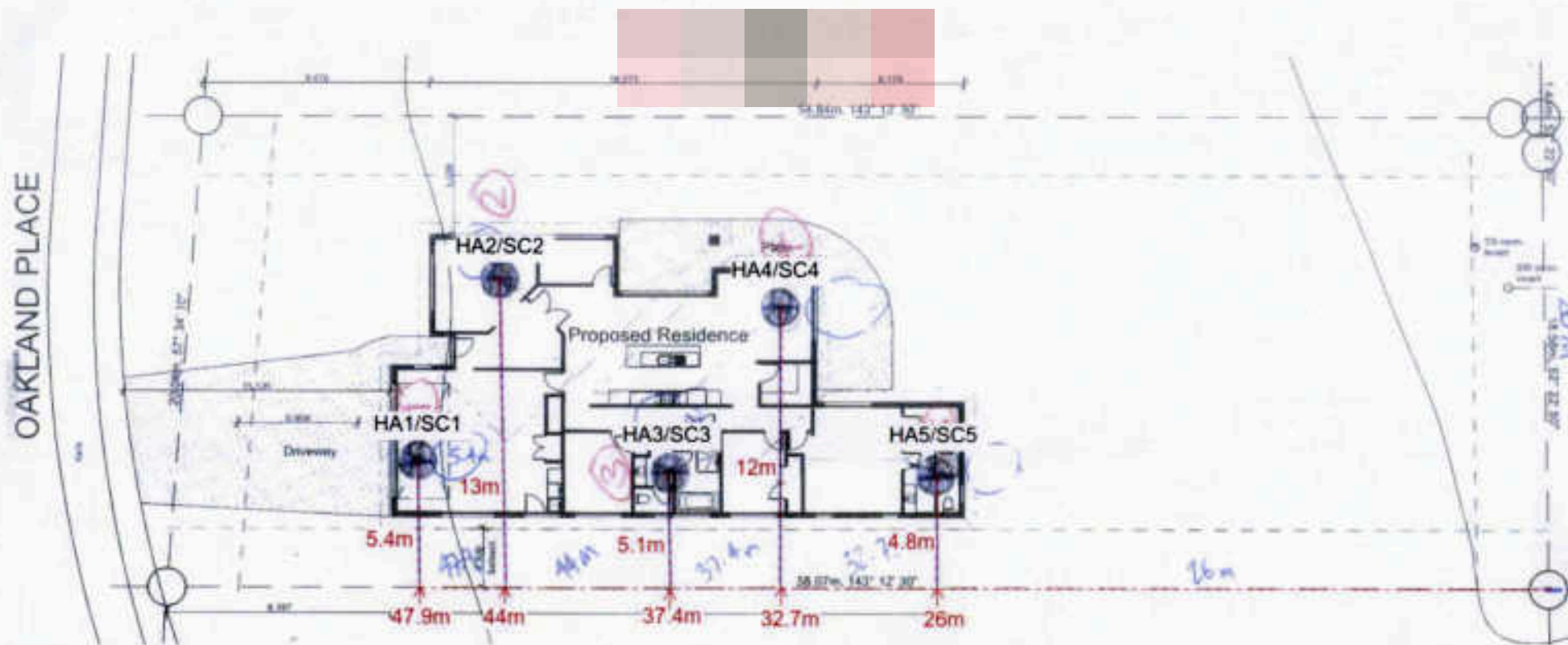
Report checked by:

David Boston
Project Manager

This report consists of 14 pages.

24-May-17

t:\geotechnicsgroup\projects\1003135\workingmaterial\20170524 sre 16 oakland pl final report.docx



LOCATION PLAN

15C Amber Crescent
Judea
Tauranga 3110

16 Oakland Place, Ngongotaha - Site Investigation

Locations are indicative only

Site	16 Oakland Place	Our Ref	1003135.0.0.0/REP1	Drawn	SREI	Date	24 May 2017
Location	Ngongotaha	Your Ref	583	Checked	DFB	Date	24 May 2017
Project	1003135.0.0.0/REP1	Lab Ref	N/A	Scale	Not to Scale		





BOREHOLE LOG

BOREHOLE No.:
HA01

SHEET: 1 OF 1

DRILLED BY: TASH

LOGGED BY: TASH

CHECKED: DFB

START DATE: 10/05/2017

FINISH DATE: 10/05/2017

CONTRACTOR: Geotechnics

PROJECT: 16 Oakland Place, Ngongotaha St
JOB No.: 1003135
LOCATION: Ngongotaha

CO-ORDINATES:

R.L. GROUND:

R.L. COLLAR

DATUM:

SURVEY: Map or aerial photograph

DIRECTION

ANGLE FROM HORIZ: -90°

LITHOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering	Rock Strength	Sampling Method (Core Recovery %)	Testing	RL (m)	Depth (m)	Geotech Log	ROCK DEFECTS					Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
									Defined Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations						
	SOIL Classification: colour, consistency, density, moisture, plasticity ROCK Weathering: colour, fabric, name, strength, cementation	SI 2.5	25-30 MPa															
	SILT, with trace sand, trace gravel; blackish dark brown. Stiff, dry to moist, non-plastic; sand, fine to coarse, pumiceous; gravel, fine, subrounded, pumiceous. SILT, with minor sand, trace gravel, orange brown. Hard, dry to moist, non-plastic; sand, fine to coarse, pumiceous; gravel, fine, subangular to subrounded. Sandy SILT, light brownish grey, Hard, moist, non-plastic; sand, fine to medium. Fine to coarse SAND, with some silt, trace gravel; light brownish grey, minor grey mottling. Medium dense, moist, poorly graded; gravel, fine, pumiceous. 0.90m - light grey, trace light greyish brown mottling 1.10m - some orange brown mottling. Fine to coarse SAND, with minor silt; light brownish grey with some grey mottling. Medium dense, moist to wet, poorly graded.				● uTM													
	End of borehole at 2.0mbgl. No groundwater encountered.																	

COMMENTS:

Notes: Depth (m)

Scale 1:10

Rev. 4

SHEET 1 OF 1

DRILLED BY: TASH

LOGGED BY TASR

CHECKED DFB

START DATE: 10/05/2017

FINISH DATE: 10/05/2017

CONTRACTOR Geotechnics

PROJECT: 16 Oakland Place, Ngongotaha St

JOB No. 1003135

LOCATION Ngongotaha

CO-ORDINATES

DIRECTION

ANGLE FROM HORIZ -80°

R.L. GROUND.

R. L. COLLAR

DATUM

SURVEY: Map or aerial photograph

[illegible]

COMMENTS

Style Depth

Scale 1-11.

Plan A



BOREHOLE LOG

BOREHOLE No.:
HA03

SHEET: 1 OF 1

DRILLED BY: TASR

LOGGED BY: TASR

CHECKED: DFB

START DATE: 10/05/2017

FINISH DATE: 10/05/2017

CONTRACTOR: Geotechnics

PROJECT: 16 Oakland Place, Ngongotaha SI
JOB No.: 1003135
LOCATION: Ngongotaha

CO-ORDINATES:

DIRECTION:

ANGLE FROM HORIZ: -90°

R.L. GROUND:

R.L. COLLAR:

DATUM:

SURVEY: Map or aerial photograph

GEOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	R.L. (m)	Depth (m)	ROCK DEFECTS					Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
									Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations					
	GOL Classification: colour, consistency / density, moisture, plasticity ROCK Weathering: colour, texture, strength, characteristics																	
	SILT, with trace sand; trace rootlets; blackish dark brown. Stiff, dry to moist, non-plastic; sand, fine to coarse, pumiceous.																	
	SILT, with minor sand, trace gravel; orange brown, trace white speckling. Hard, moist, non-plastic; sand, fine to coarse, pumiceous; gravel, fine, subrounded, pumiceous.					• <0.075 mm												
	Sandy SILT, light brownish grey. Hard, moist, non-plastic; sand, fine to medium.					• <0.075 mm												
	Silty, fine to coarse SAND, light brownish grey. Medium dense, moist, poorly graded.																	
	Sandy SILT, light brownish grey. Hard, moist, non-plastic; sand, fine to medium.																	
	Fine to coarse SAND, with minor silt, trace gravel; light greyish brown, with some grey mottling. Medium dense, moist, poorly graded; gravel, fine, subrounded, pumiceous.																	
	1.20m - gravel absent																	
	1.75m - wet																	
	End of borehole at 2.0mbgl. No groundwater encountered.																	

COMMENTS:

Scale Depth
2m

Scale 1:10

Rev: A



GEOTECHNICS

BOREHOLE LOG

BOREHOLE No.:

HA04

SHEET: 1 OF 1

DRILLED BY: TASR

LOGGED BY: TASR

CHECKED: DFB

START DATE: 10/05/2017

FINISH DATE: 10/05/2017

CONTRACTOR: Geotechnics

PROJECT: 16 Oakland Place, Ngongotaha SI

JOB No: 1003135

LOCATION: Ngongotaha

CO-ORDINATES:

DIRECTION:

ANGLE FROM HORIZ: -90°

R.L. GROUND:

R.L. COLLAR

DATUM

SURVEY: Map or aerial photograph

GEOLOGICAL UNIT	DESCRIPTION OF CORE	ROCK DEFECTS									
		Rock Weathering	Rock Strength	Sampling Method:	Core Recovery (%)	Testing	RL (m)	Depth (m)	Gravel Log	Defect Log	Fracture Spacing (mm)
	SDG: Description: colour, consistency, density, moisture, plasticity ROCK: Weathering: colour, fabric, texture, strength, orientation										
	SILT, with trace sand, trace gravel; blackish dark brown. Stiff, moist, non-plastic; sand, fine to coarse, pumiceous; gravel, fine, subangular to subrounded, pumiceous.										
	SILT, with minor sand, minor gravel; orange brown, trace white speckling. Hard, moist, non-plastic; sand, fine to coarse, pumiceous; gravel, fine, subrounded, pumiceous.										
	Sandy SILT, light brownish grey. Hard, moist, non-plastic; sand, fine to medium.										
	Silty, fine to coarse SAND, with trace gravel; light greyish brown. Dense, moist, poorly graded; gravel, fine, subrounded, pumiceous.										
	Sandy SILT, light brown. Hard, moist, non-plastic; sand, fine to medium.										
	Fine to coarse, SAND, with minor silt; light brownish grey with some grey mottling. Dense, moist, poorly graded.										
	1.30m - medium dense										
	1.70m - wet										
	End of borehole at 2.0mbgl										
	No groundwater encountered										

COMMENTS

Note Depth
2m

Scale 1:10

General Log - 23/05/2017 - 10:26:58 a.m. - (Printed with Core-205 by Geotech)

Sec. A



BOREHOLE LOG

BOREHOLE No.:
HA05

SHEET: 1 OF 1

DRILLED BY: TASR

LOGGED BY: TASR

CHECKED: DFB

START DATE: 10/05/2017

FINISH DATE: 10/05/2017

CONTRACTOR: Geotechnics

PROJECT: 16 Oakland Place, Ngongotaha St
JOB No.: 1003135
LOCATION: Ngongotaha

CO-ORDINATES:

R.L. GROUND:

R.L. COLLAR:

DATUM:

SURVEY: Map or aerial photograph

DIRECTION:

ANGLE FROM HORIZ.: -90°

GEOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	R.L. (m)	Depth (m)	Graphic Log	ROCK DEFECTS				Fluid Loss (%)	Water Level	Casing	Installations	Core Box No
										Defined Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations					
	SOL Classification: colour, consistency / density, moisture, plasticity RTCC: Weathering colour, fabric, core strength, orientation	100%	01-2+13															
	SILT, with trace sand; blackish dark brown. Stiff, dry to moist, non-plastic; sand, fine to coarse, pumiceous.																	
	SILT, with minor sand, trace gravel, orange brown, trace white speckling. Hard, moist, non-plastic; sand, fine to coarse, pumiceous; gravel, fine, subrounded, pumiceous.					• UTP												
	Sandy SILT; light brownish grey. Hard, moist, non-plastic; sand, fine to medium.					• >20% silt												
	Silty, fine to coarse SAND, with trace gravel, light brownish grey. Dense, moist, poorly graded; gravel, fine, subrounded, pumiceous.																	
	Fine to coarse, SAND, with minor silt, trace gravel; light brown with some grey mottling. Medium dense, moist, poorly graded; gravel, fine, subrounded, pumiceous.																	
	1.50m: light brownish grey, trace light brown mottling																	
	Fine to coarse SAND, with minor silt, minor gravel; greyish orange brown. Medium dense, wet, well graded; gravel, fine, subangular to subrounded, pumiceous.																	
	End of borehole at 2.0mbgl. No groundwater encountered.																	

COMMENTS:

Scale Depth
3m

Scale 1:10

Rev: 0



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FILE:	1003135.0.0.0/1

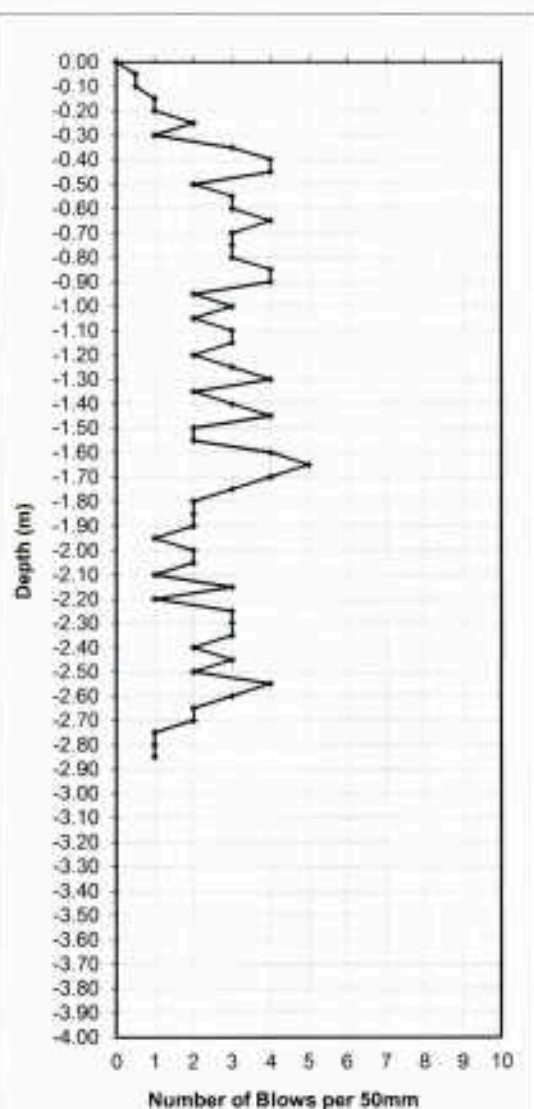
Sheet 1 of 1

Dynamic Cone Penetrometer (Scala) -NZS 4402:1986 Test 6.5.2

Site:	16 Oakland Place	Job Name:	16 Oakland Pl, Ngongotaha St	Job no:	583
Test pit/BH no:	SC1 / HA1	Location:	Ngongotaha	Depth:	2.85m
Material:	See HA01 borehole log	Penetrometer ID:	TGO851		
Test / Sample Series:	16OaklandPl/180517/SC1-5	New Test Site / Re-Test of Site - Lab Ref:			

Vertical distance driven (mm)	Depth (mm)	No. of Blows	Vertical distance driven (mm)	Depth (mm)	No. of Blows
50	50	0.5	2050	2050	2
100	100	0.5	2100	2100	1
150	150	1	2150	2150	3
200	200	1	2200	2200	1
250	250	2	2250	2250	3
300	300	1	2300	2300	3
350	350	3	2350	2350	3
400	400	4	2400	2400	2
450	450	4	2450	2450	3
500	500	2	2500	2500	2
550	550	3	2550	2550	4
600	600	3	2600	2600	3
650	650	4	2650	2650	2
700	700	3	2700	2700	2
750	750	3	2750	2750	1
800	800	3	2800	2800	1
850	850	4	2850	2850	1
900	900	4	2900	2900	
950	950	2	2950	2950	
1000	1000	3	3000	3000	
1050	1050	2	3050	3050	
1100	1100	3	3100	3100	
1150	1150	3	3150	3150	
1200	1200	2	3200	3200	
1250	1250	3	3250	3250	
1300	1300	4	3300	3300	
1350	1350	2	3350	3350	
1400	1400	3	3400	3400	
1450	1450	4	3450	3450	
1500	1500	2	3500	3500	
1550	1550	2	3550	3550	
1600	1600	4	3600	3600	
1650	1650	5	3650	3650	
1700	1700	4	3700	3700	
1750	1750	3	3750	3750	
1800	1800	2	3800	3800	
1850	1850	2	3850	3850	
1900	1900	2	3900	3900	
1950	1950	1	3950	3950	
2000	2000	2	4000	4000	

Depth from ground surface to commencement of penetration: (m)



Tested:	TASR	Date:	10/05/2017
Calculated:	SREI	Date:	18/05/2017
Checked:		Date:	23/05/2017



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LAB. REF.:	063/17
FILE:	1003135.0.0.0/1

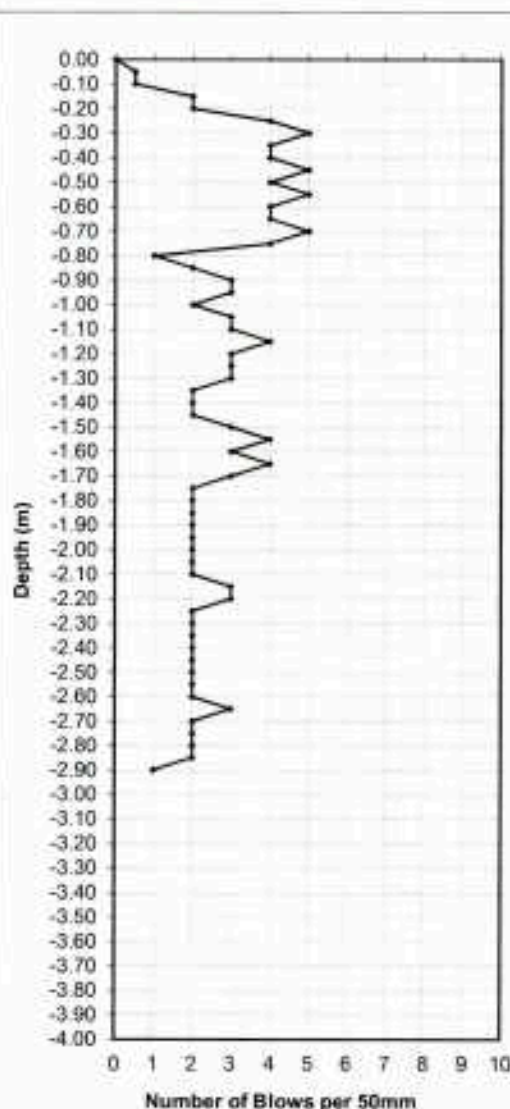
Sheet 1 of 1

Dynamic Cone Penetrometer (Scala) -NZS 4402:1986 Test 6.5.2

Site:	16 Oakland Place	Job Name:	16 Oakland Pl, Ngongotaha Sl	Job no:	583
Test pit/BH no:	SC2 / HA2	Location:	Ngongotaha	Depth:	2.90m
Material:	See HA02 borehole log	Penetrometer ID:	TGO851		
Test / Sample Series:	16OaklandPl/180517/SC1-5	New Test Site / Re-Test of Site - Lab Ref:			

Vertical distance driven (mm)	Depth (mm)	No. of Blows	Vertical distance driven (mm)	Depth (mm)	No. of Blows
50	50	0.5	2050	2050	2
100	100	0.5	2100	2100	2
150	150	2	2150	2150	3
200	200	2	2200	2200	3
250	250	4	2250	2250	2
300	300	5	2300	2300	2
350	350	4	2350	2350	2
400	400	4	2400	2400	2
450	450	5	2450	2450	2
500	500	4	2500	2500	2
550	550	5	2550	2550	2
600	600	4	2600	2600	2
650	650	4	2650	2650	3
700	700	5	2700	2700	2
750	750	4	2750	2750	2
800	800	1	2800	2800	2
850	850	2	2850	2850	2
900	900	3	2900	2900	1
950	950	3	2950	2950	
1000	1000	2	3000	3000	
1050	1050	3	3050	3050	
1100	1100	3	3100	3100	
1150	1150	4	3150	3150	
1200	1200	3	3200	3200	
1250	1250	3	3250	3250	
1300	1300	3	3300	3300	
1350	1350	2	3350	3350	
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1500	1500	3	3500	3500	
1550	1550	4	3550	3550	
1600	1600	3	3600	3600	
1650	1650	4	3650	3650	
1700	1700	3	3700	3700	
1750	1750	2	3750	3750	
1800	1800	2	3800	3800	
1850	1850	2	3850	3850	
1900	1900	2	3900	3900	
1950	1950	2	3950	3950	
2000	2000	2	4000	4000	

Depth from ground surface to commencement of penetration: (m)



Tested:	TASR	Date:	10/05/2017
Calculated:	SREI	Date:	18/05/2017
Checked:		Date:	23/05/2017



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FILE:
1003135.0.0.0/1

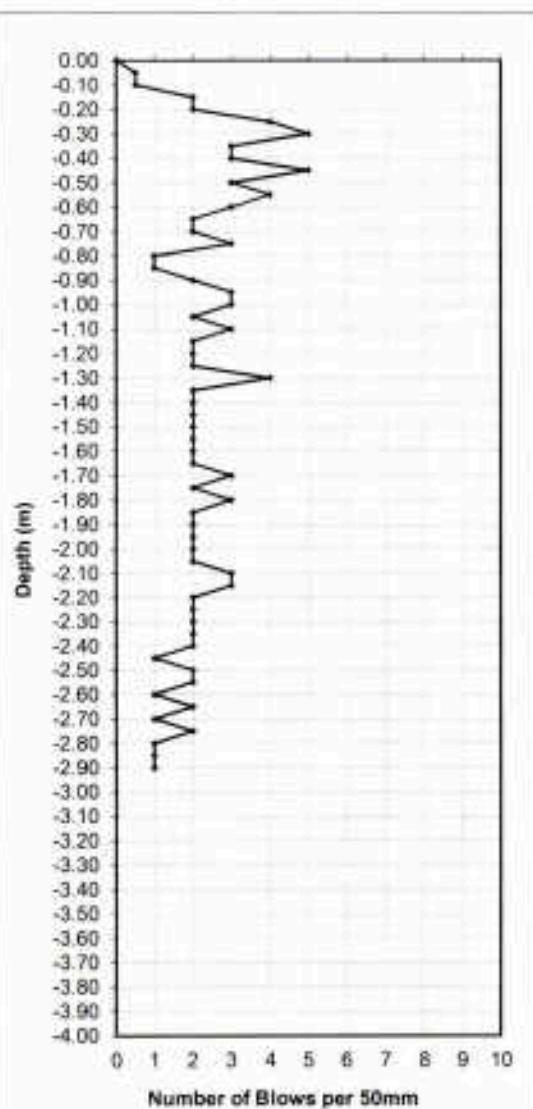
Sheet 1 of 1

Dynamic Cone Penetrometer (Scala) -NZS 4402:1986 Test 6.5.2

Site: 16 Oakland Place Job Name: 16 Oakland Pl, Ngongotaha Sl Job no: 563
Test pit/BH no: SC3 / HA3 Location: Ngongotaha Depth: 2.90m
Material: See HA03 borehole log Penetrometer ID: TGOB51
Test / Sample Series: 16OaklandPl/180517/SC1-5 New Test Site / Re Test of Site - Lab Ref:

Vertical distance driven (mm)	Depth (mm)	No. of Blows	Vertical distance driven (mm)	Depth (mm)	No. of Blows
50	50	0.5	2050	2050	2
100	100	0.5	2100	2100	3
150	150	2	2150	2150	3
200	200	2	2200	2200	2
250	250	4	2250	2250	2
300	300	5	2300	2300	2
350	350	3	2350	2350	2
400	400	3	2400	2400	2
450	450	5	2450	2450	1
500	500	3	2500	2500	2
550	550	4	2550	2550	2
600	600	3	2600	2600	1
650	650	2	2650	2650	2
700	700	2	2700	2700	1
750	750	3	2750	2750	2
800	800	1	2800	2800	1
850	850	1	2850	2850	1
900	900	2	2900	2900	1
950	950	3	2950	2950	
1000	1000	3	3000	3000	
1050	1050	2	3050	3050	
1100	1100	3	3100	3100	
1150	1150	2	3150	3150	
1200	1200	2	3200	3200	
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1300	1300	4	3300	3300	
1350	1350	2	3350	3350	
1400	1400	2	3400	3400	
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1600	1600	2	3600	3600	
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1700	1700	3	3700	3700	
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1800	1800	3	3800	3800	
1850	1850	2	3850	3850	
1900	1900	2	3900	3900	
1950	1950	2	3950	3950	
2000	2000	2	4000	4000	

Depth from ground surface to commencement of penetration: (m)



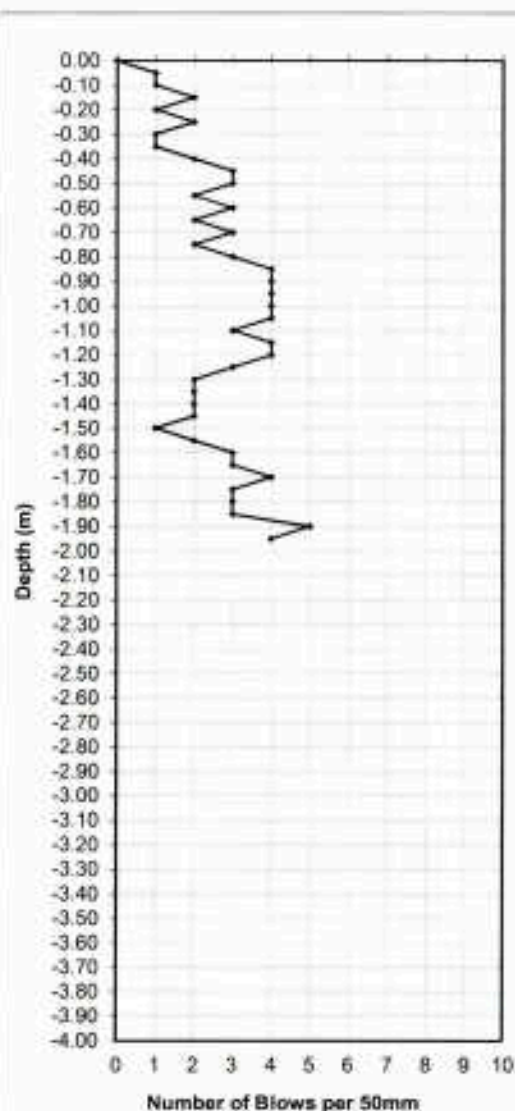
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Checked:		Date:	23/05/2017

Dynamic Cone Penetrometer (Scala) -NZS 4402:1986 Test 6.5.2

Site:	16 Oakland Place	Job Name:	16 Oakland Pl. Ngongotaha SI	Job no:	583
Test pit/BH no:	SC4 / HA4	Location:	Ngongotaha	Depth:	1.95m
Material:	See HA04 borehole log	Penetrometer ID:	TGO851		
Test / Sample Series:	16OaklandPl/180517/SC1-5	New Test Site / Re-Test of Site - Lab Ref.			

Vertical distance driven (mm)	Depth (mm)	No. of Blows	Vertical distance driven (mm)	Depth (mm)	No. of Blows
50	50	1	2050	2050	
100	100	1	2100	2100	
150	150	2	2150	2150	
200	200	1	2200	2200	
250	250	2	2250	2250	
300	300	1	2300	2300	
350	350	1	2350	2350	
400	400	2	2400	2400	
450	450	3	2450	2450	
500	500	3	2500	2500	
550	550	2	2550	2550	
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650	650	2	2650	2650	
700	700	3	2700	2700	
750	750	2	2750	2750	
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1500	1500	1	3500	3500	
1550	1550	2	3550	3550	
1600	1600	3	3600	3600	
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1700	1700	4	3700	3700	
1750	1750	3	3750	3750	
1800	1800	3	3800	3800	
1850	1850	3	3850	3850	
1900	1900	5	3900	3900	
1950	1950	4	3950	3950	
2000	2000		4000	4000	

Depth from ground surface to commencement of penetration: (m)



Tested:	TASR	Date:	10/05/2017
Calculated:	SREI	Date:	18/05/2017
Checked:		Date:	23/05/2017



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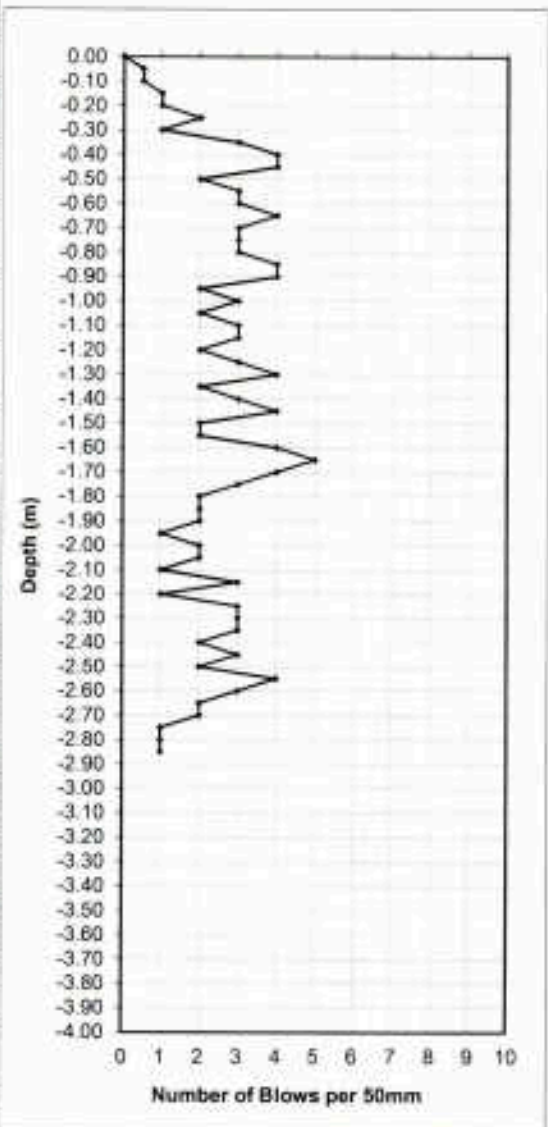
Sheet 1 of 1

Dynamic Cone Penetrometer (Scala) -NZS 4402:1986 Test 6.5.2

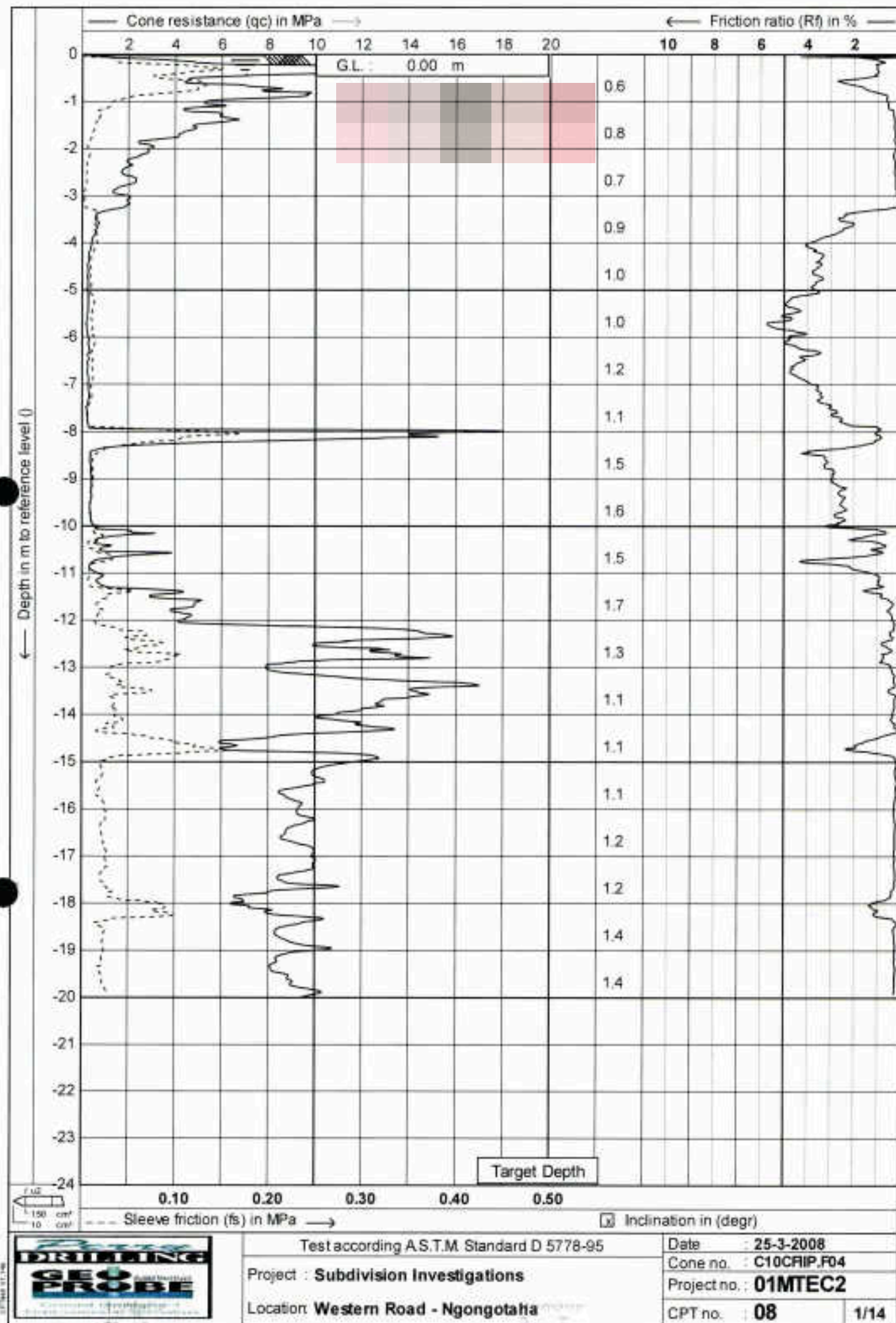
Site:	16 Oakland Place	Job Name:	16 Oakland Pl, Ngongotaha St	Job no:	583
Test pit/BH no:	SC5 / HA5	Location:	Ngongotaha	Depth:	2.85m
Material:	See HA05 borehole log	Penetrometer ID:	TGO851		
Test / Sample Series:	16OaklandPl/180517/SC1-5	New Test Site / Re Test of Site - Lab Ref.			

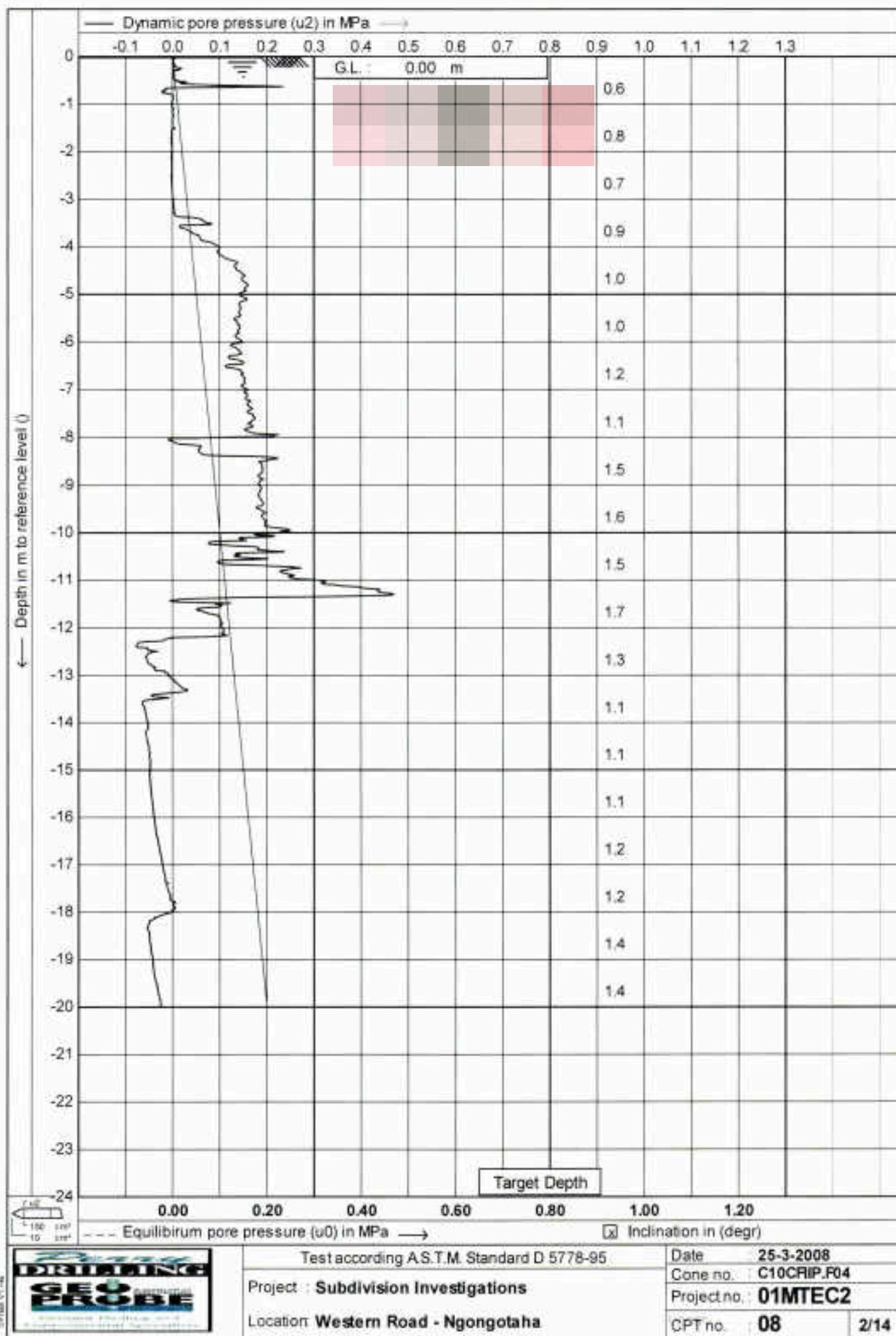
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50	50	0.5	2050	2050	2
100	100	0.5	2100	2100	1
150	150	1	2150	2150	3
200	200	1	2200	2200	1
250	250	2	2250	2250	3
300	300	1	2300	2300	3
350	350	3	2350	2350	3
400	400	4	2400	2400	2
450	450	4	2450	2450	3
500	500	2	2500	2500	2
550	550	3	2550	2550	4
600	600	3	2600	2600	3
650	650	4	2650	2650	2
700	700	3	2700	2700	2
750	750	3	2750	2750	1
800	800	3	2800	2800	1
850	850	4	2850	2850	1
900	900	4	2900	2900	
950	950	2	2950	2950	
1000	1000	3	3000	3000	
1050	1050	2	3050	3050	
1100	1100	3	3100	3100	
1150	1150	3	3150	3150	
1200	1200	2	3200	3200	
1250	1250	3	3250	3250	
1300	1300	4	3300	3300	
1350	1350	2	3350	3350	
1400	1400	3	3400	3400	
1450	1450	4	3450	3450	
1500	1500	2	3500	3500	
1550	1550	2	3550	3550	
1600	1600	4	3600	3600	
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1700	1700	4	3700	3700	
1750	1750	3	3750	3750	
1800	1800	2	3800	3800	
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1950	1950	1	3950	3950	
2000	2000	2	4000	4000	

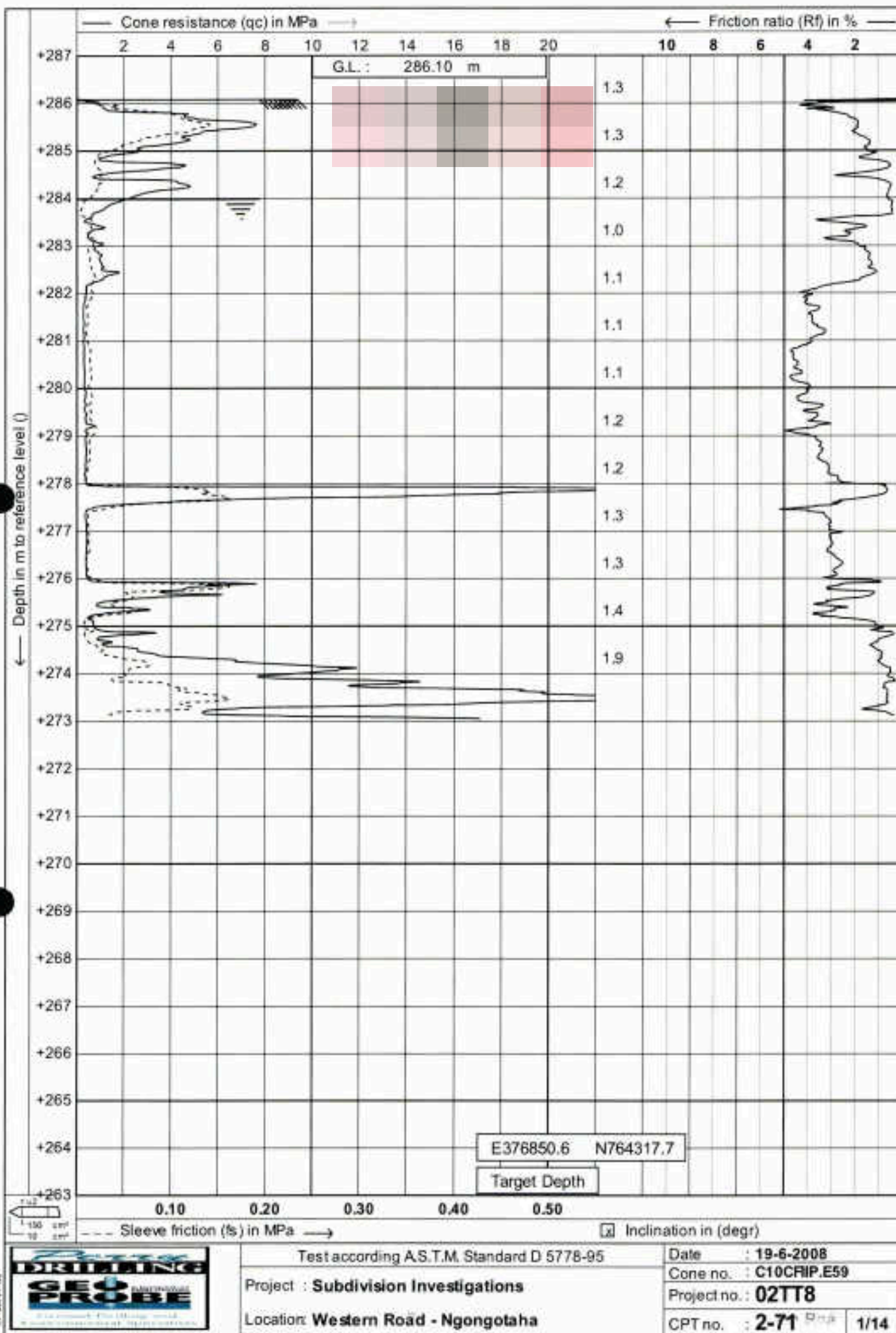
Depth from ground surface to commencement of penetration: (m)



Tested:	TASR	Date:	10/05/2017
Calculated:	SREI	Date:	18/05/2017
Checked:		Date:	23/05/2017





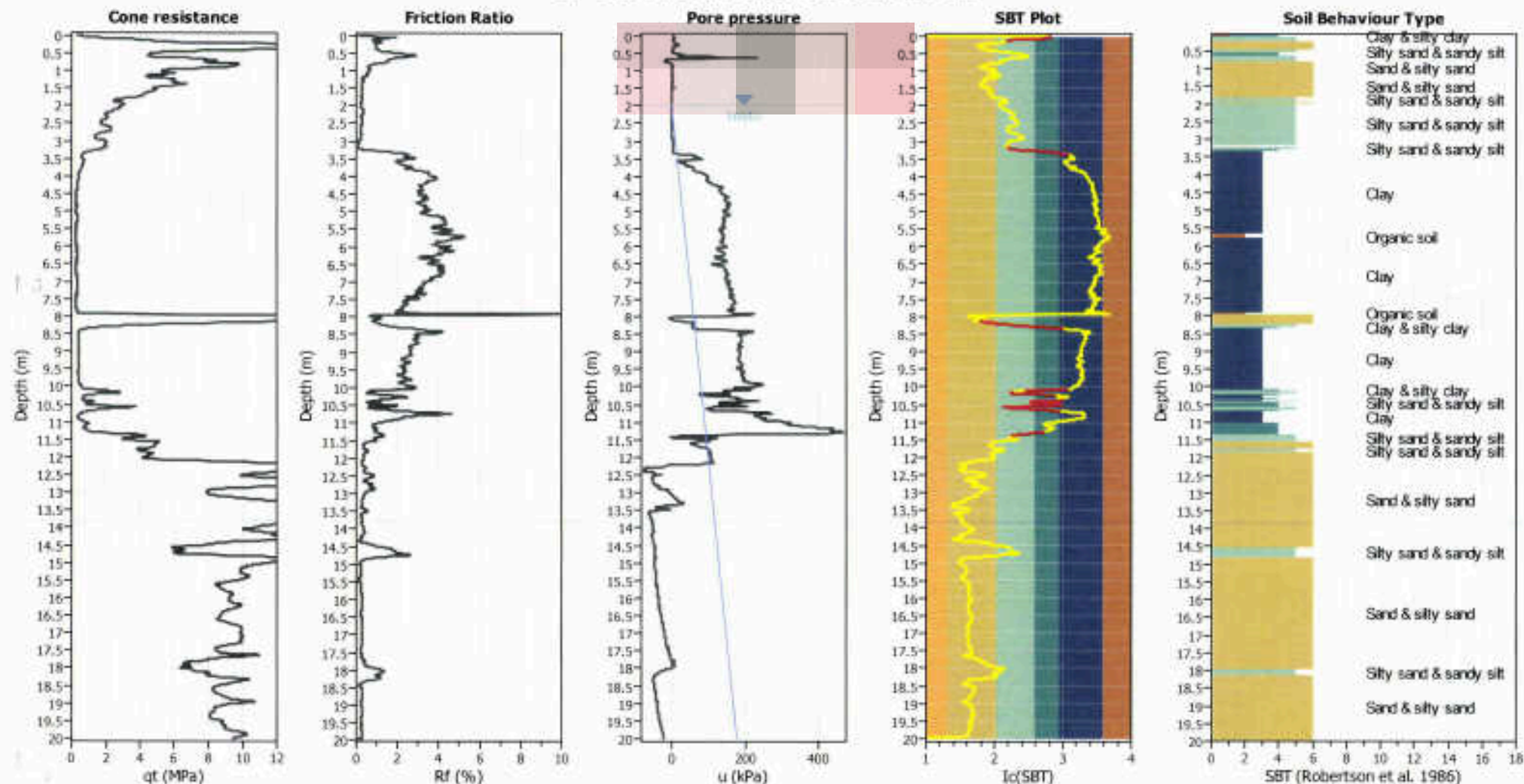




Appendix C

Liquefaction Assessment

CPT basic interpretation plots



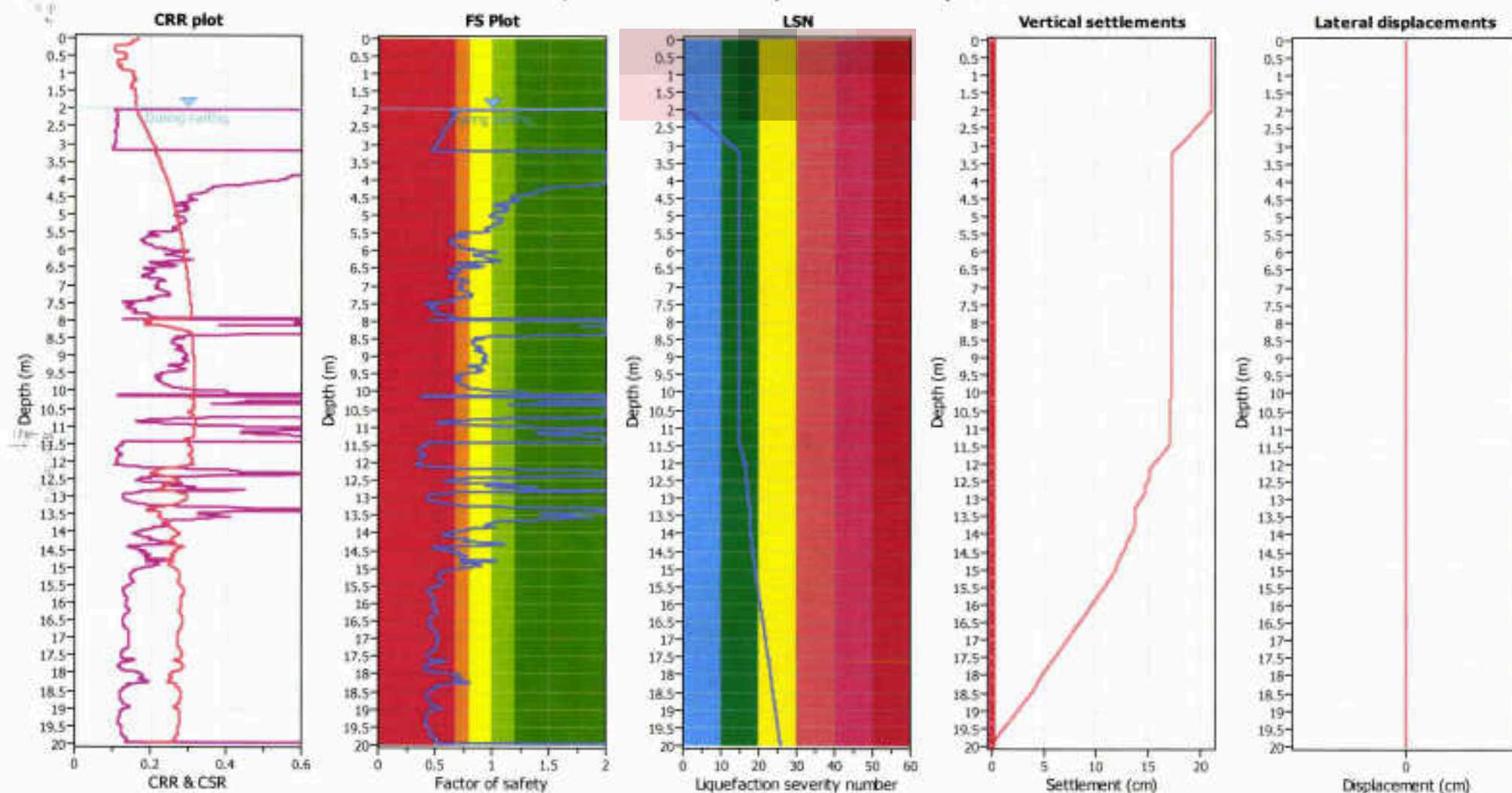
Input parameters and analysis data

Analysis method:	B&J (2014)	Depth to GWT (earthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&J (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_v applied:	Yes
Earthquake magnitude M_w :	6.00	Unit weight calculation:	14.00 kN/m ³	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.30	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method: B&I (2014)
 Fines correction method: B&I (2014)
 Points to test: Based on I_c value
 Earthquake magnitude M_w : 6.00
 Peak ground acceleration: 0.30
 Depth to water table (insitu): 2.00 m

Depth to GWT (earthq.): 2.00 m
 Average results interval: 3
 I_c cut-off value: 2.60
 Unit weight calculation: 14.00 kN/m³
 Use fill: No
 Fill height: N/A

Fill weight: N/A
 Transition detect. applied: Yes
 K_0 applied: Yes
 Clay like behavior applied: Sand & Clay
 Limit depth applied: No
 Limit depth: N/A

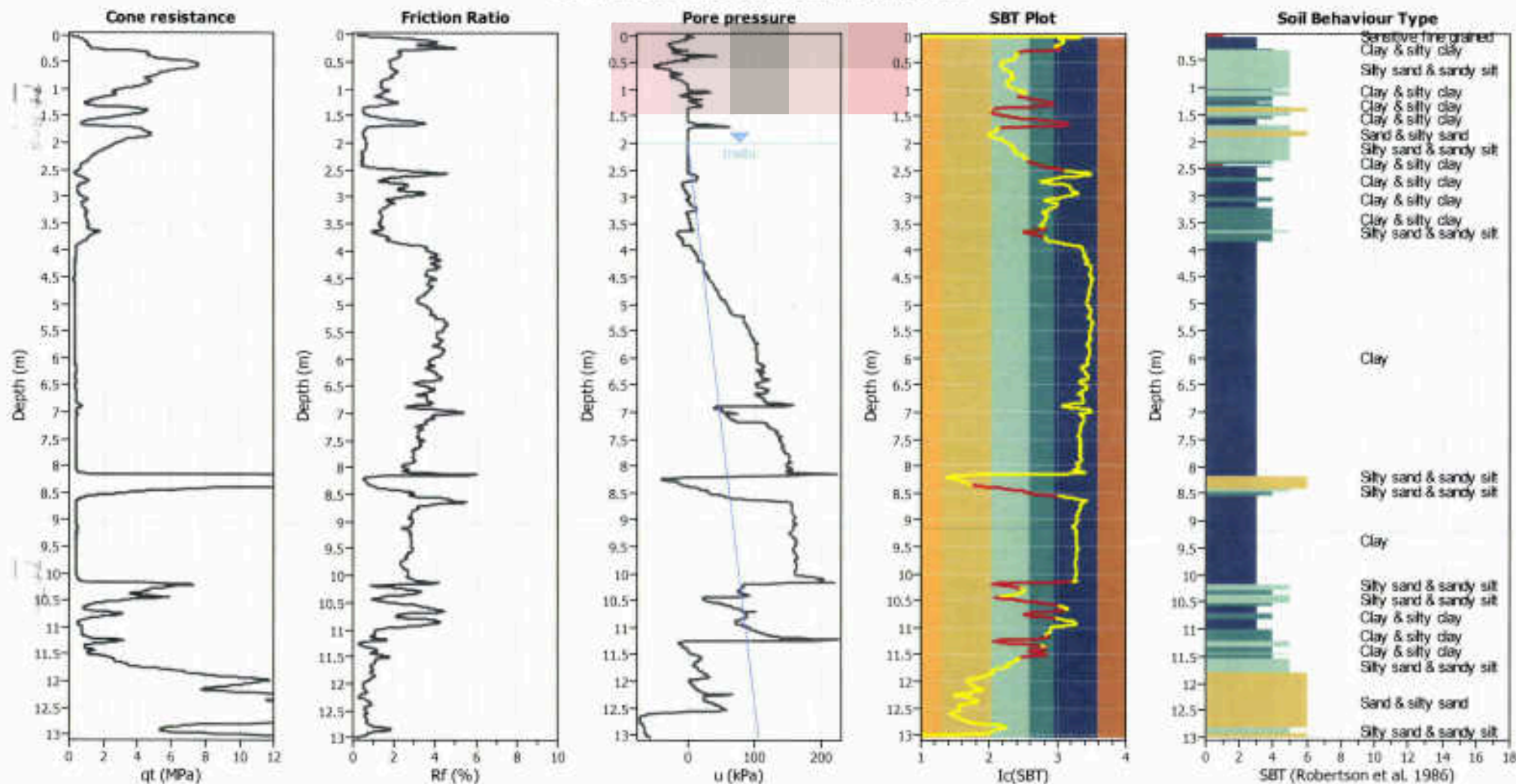
F.S. color scheme

Almost certain it will liquefy
 Very likely to liquefy
 Liquefaction and no liq. are equally likely
 Unlike to liquefy
 Almost certain it will not liquefy

LSN color scheme

Severe damage
 Major expression of liquefaction
 Moderate to severe exp. of liquefaction
 Moderate expression of liquefaction
 Minor expression of liquefaction
 Little to no expression of liquefaction

CPT basic interpretation plots



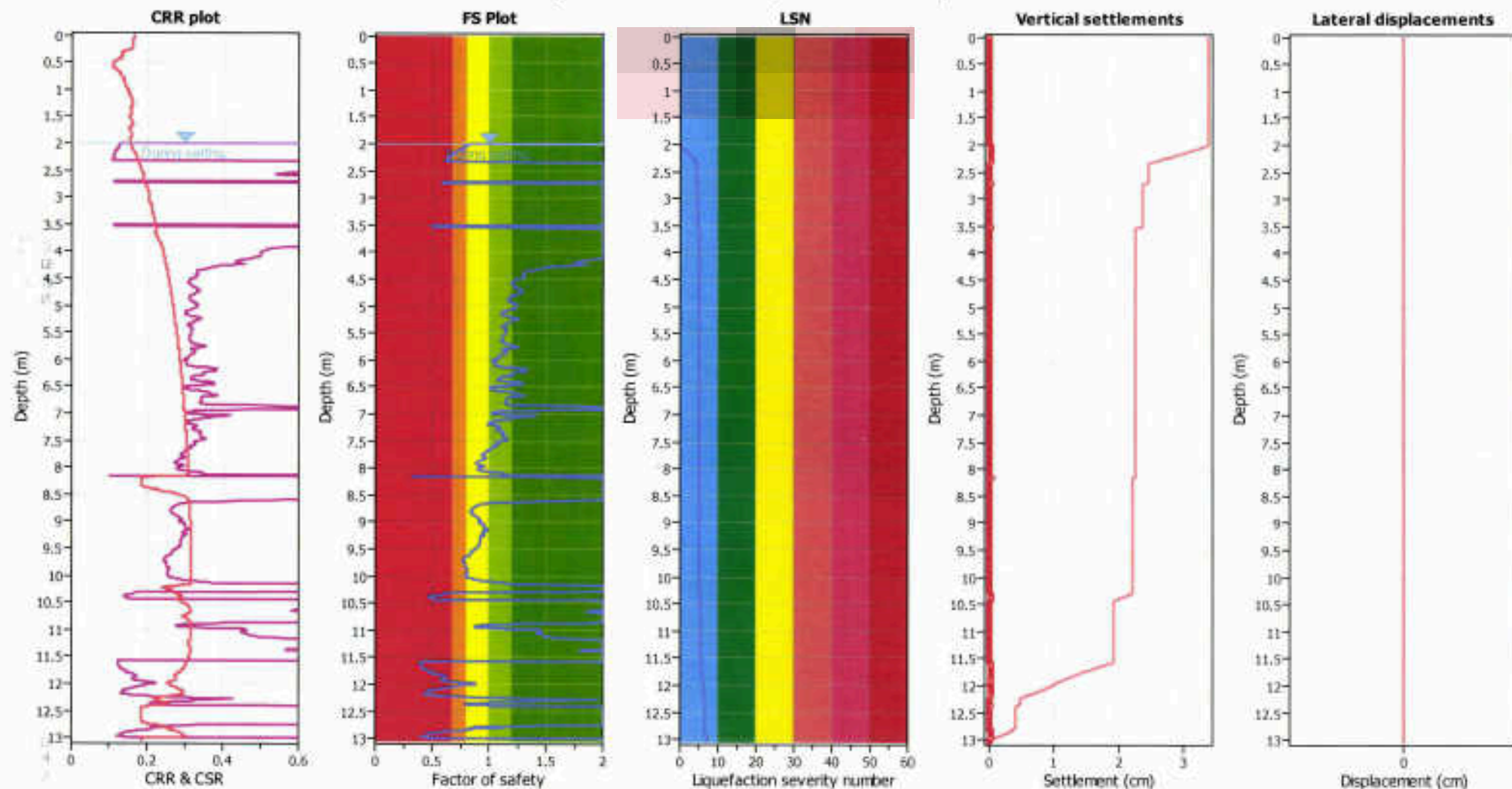
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GW (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect, applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{α} applied:	Yes
Earthquake magnitude M_w :	6.00	Unit weight calculation:	14.00 kN/m ³	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.30	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silt	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method: B&I (2014)
 Fines correction method: B&I (2014)
 Points to test: Based on I_c value
 Earthquake magnitude M_w : 6.00
 Peak ground acceleration: 0.30
 Depth to water table (inst): 2.00 m

Depth to GWT (earthq.): 2.00 m
 Average results interval: 3
 I_c cut-off value: 2.60
 Unit weight calculation: 14.00 kN/m³
 Use fill: No
 Fill height: N/A

Fill weight: N/A
 Transition detect. applied: Yes
 K_{α} applied: Yes
 Clay like behavior applied: Sand & Clay
 Limit depth applied: No
 Limit depth: N/A

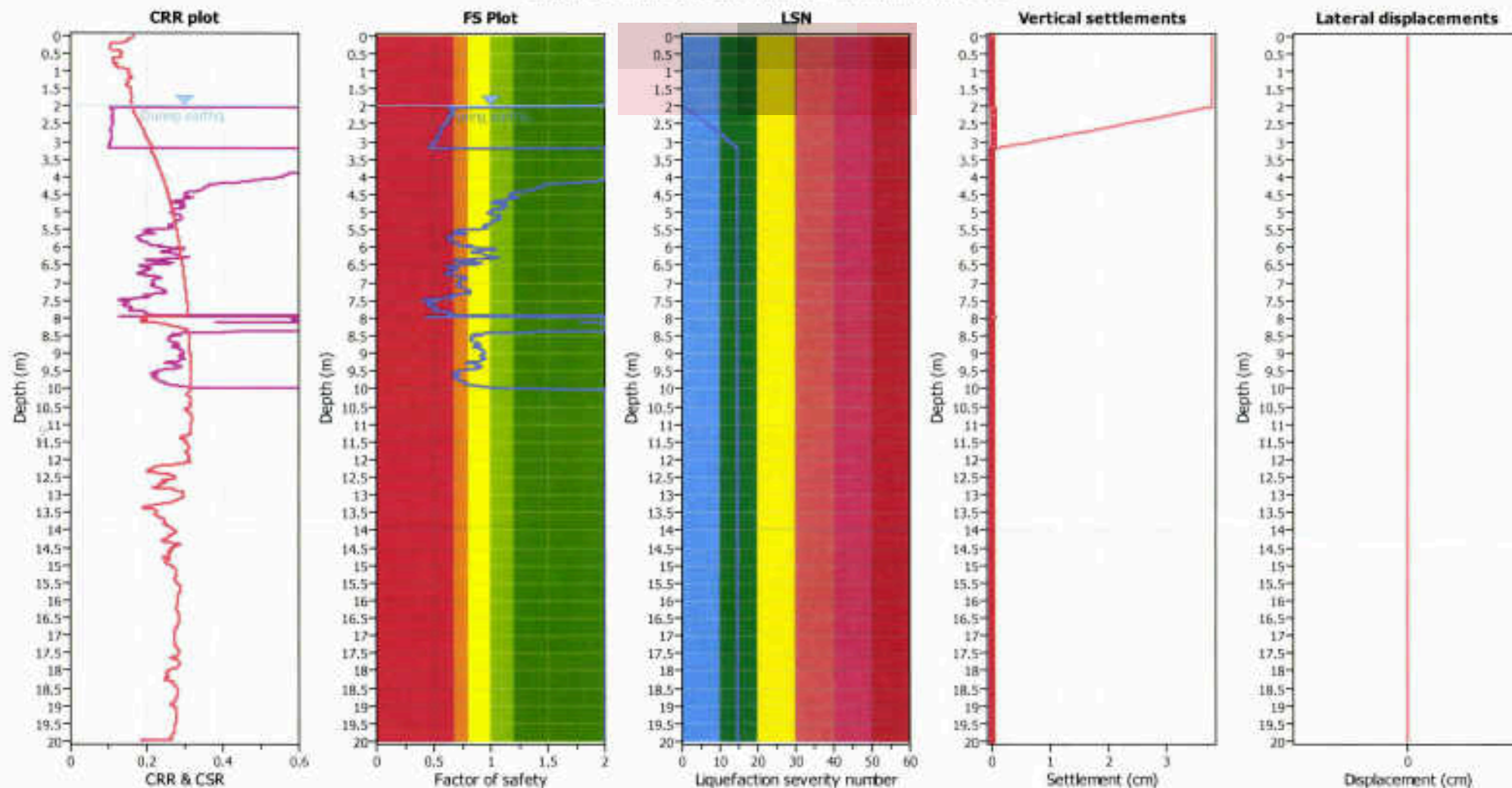
F.S. color scheme

Red: Almost certain it will liquefy
 Orange: Very likely to liquefy
 Yellow: Liquefaction and no liq. are equally likely
 Green: Unlike to liquefy
 Blue: Almost certain it will not liquefy

LSN color scheme

Red: Severe damage
 Orange: Major expression of liquefaction
 Yellow: Moderate to severe exp. of liquefaction
 Green: Moderate expression of liquefaction
 Blue: Minor expression of liquefaction
 Light Blue: Little to no expression of liquefaction

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method: B&I (2014)
 Fines correction method: B&I (2014)
 Points to test: Based on I_c value
 Earthquake magnitude M_w : 6.00
 Peak ground acceleration: 0.30
 Depth to water table (insitu): 2.00 m

Depth to GWT (earthq.): 2.00 m
 Average results interval: 3
 I_c cut-off value: 2.60
 Unit weight calculation: 14.00 kN/m³
 Use fill: No
 Fill height: N/A

Fill weight: N/A
 Transition detect. applied: Yes
 K_s applied: Yes
 Clay like behavior applied: Sand & Clay
 Limit depth applied: Yes
 Limit depth: 10.00 m

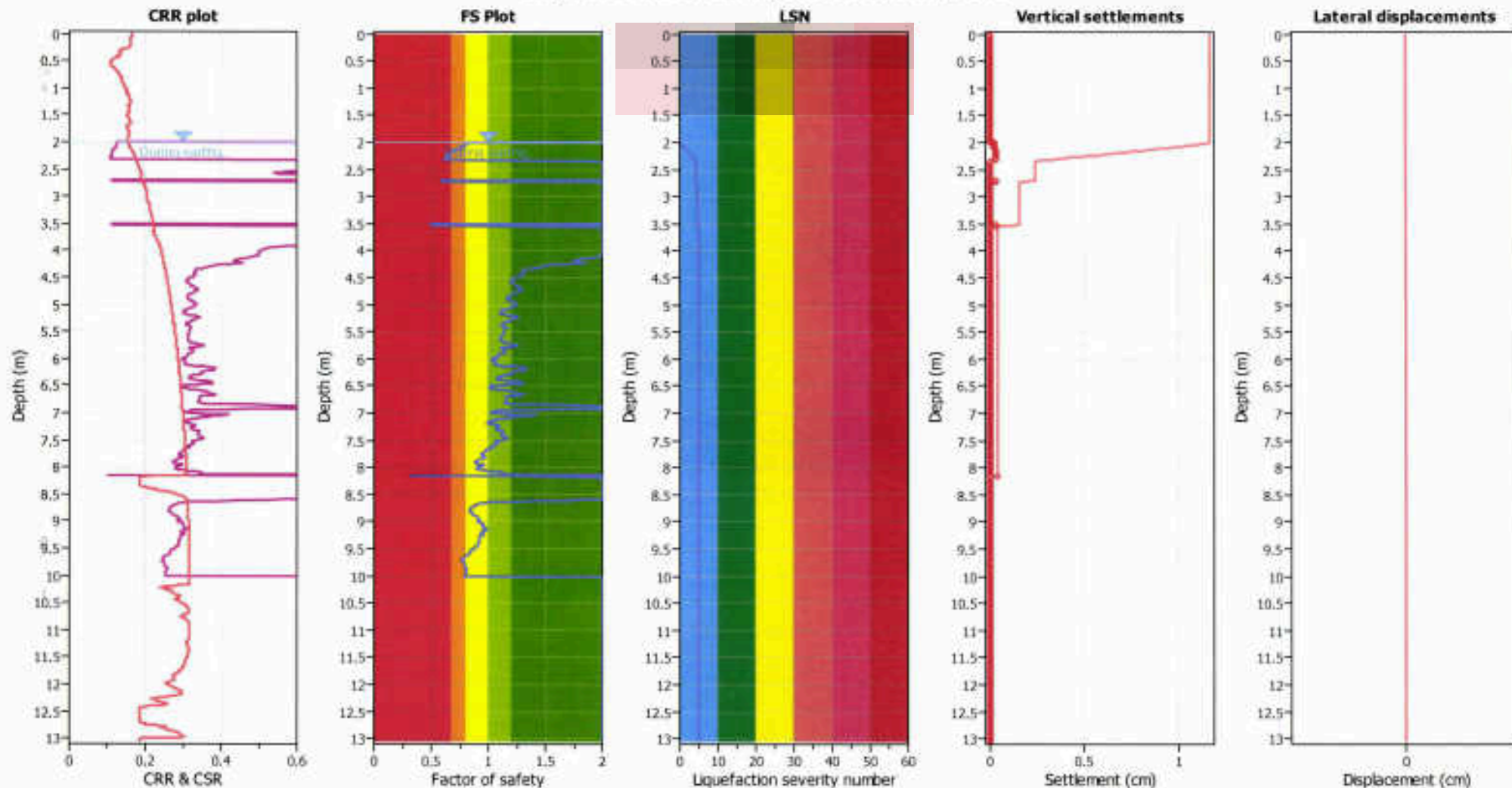
F.S. color scheme

Red: Almost certain it will liquefy
 Orange: Very likely to liquefy
 Yellow: Liquefaction and no liq. are equally likely
 Green: Unlike to liquefy
 Blue: Almost certain it will not liquefy

LSN color scheme

Red: Severe damage
 Orange: Major expression of liquefaction
 Yellow: Moderate to severe exp. of liquefaction
 Green: Moderate expression of liquefaction
 Blue: Minor expression of liquefaction
 White: Little to no expression of liquefaction

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (earthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_u applied:	Yes
Earthquake magnitude M_w :	6.00	Unit weight calculation:	14.00 kN/m ³	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.30	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

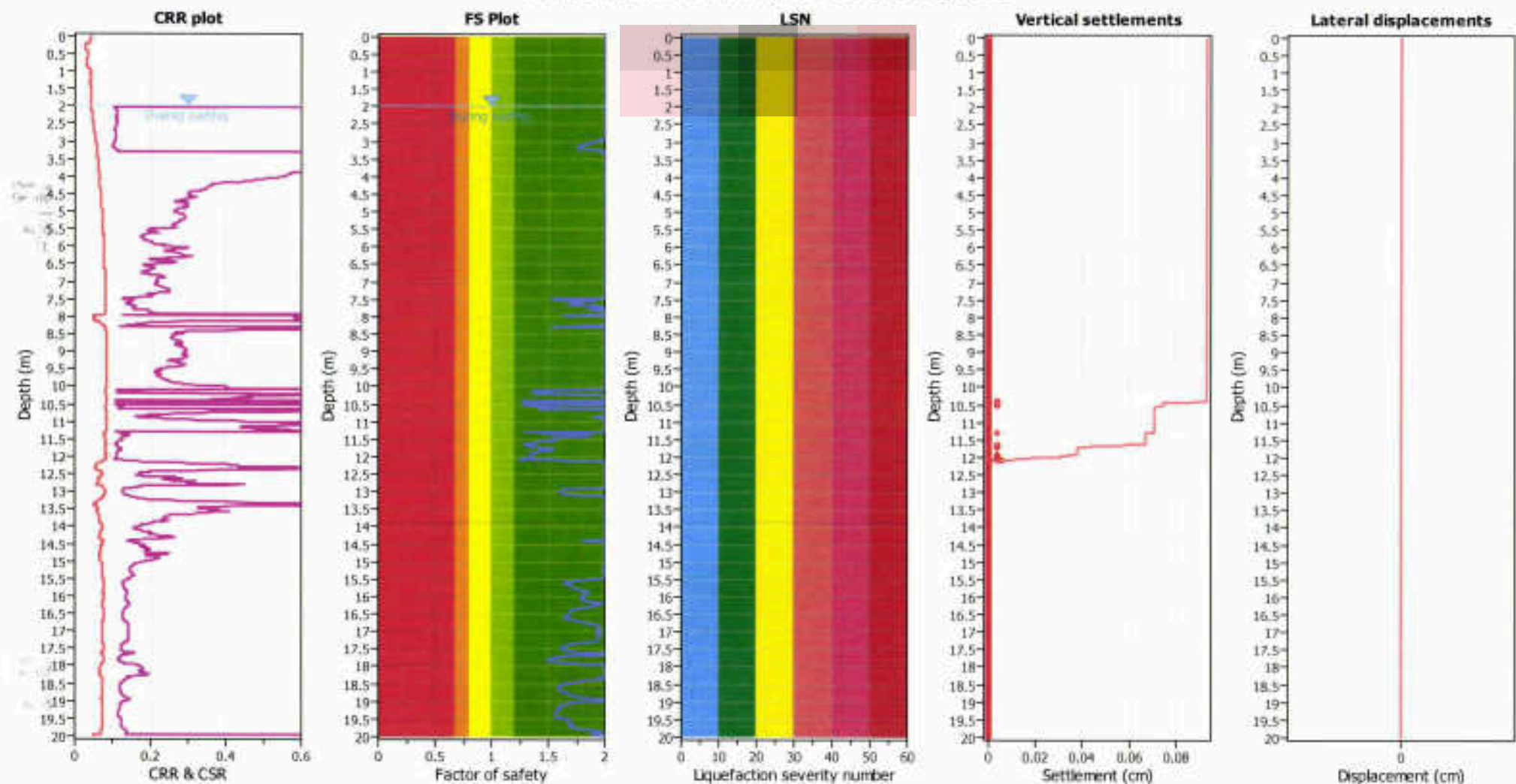
F.S. color scheme

Red	Almost certain it will liquefy
Orange	Very likely to liquefy
Yellow	Liquefaction and no liq. are equally likely
Green	Unlike to liquefy
Dark Green	Almost certain it will not liquefy

LSN color scheme

Red	Severe damage
Orange	Major expression of liquefaction
Yellow	Moderate to severe exp. of liquefaction
Green	Moderate expression of liquefaction
Dark Green	Minor expression of liquefaction
Blue	Little to no expression of liquefaction

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method: B&J (2014)
 Fines correction method: B&J (2014)
 Points to test: Based on I_c value
 Earthquake magnitude M_w : 6.00
 Peak ground acceleration: 0.08
 Depth to water table (m): 2.00 m

Depth to GWT (orth.): 2.00 m
 Average results interval: 3
 I_c cut-off value: 2.60
 Unit weight calculation: 14.00 kN/m³
 Use fill: No
 Fill height: N/A

Fill weight: N/A
 Transition detect, applied: No
 K_0 applied: Yes
 Clay like behavior applied: Sand & Clay
 Limit depth applied: No
 Limit depth: N/A

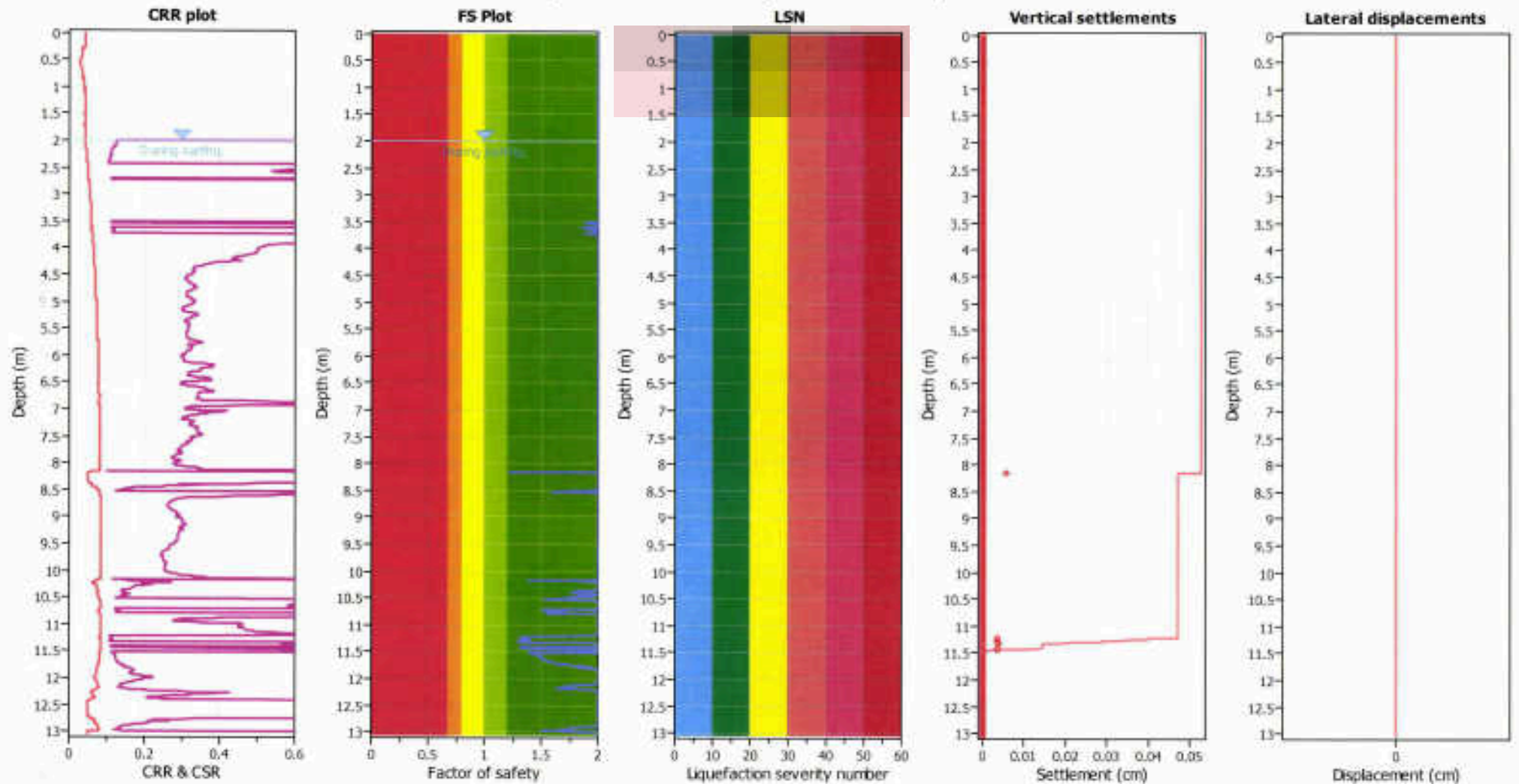
F.S. color scheme

Almost certain it will liquefy
 Very likely to liquefy
 Liquefaction and no liq. are equally likely
 Unlike to liquefy
 Almost certain it will not liquefy

LSN color scheme

Severe damage
 Major expression of liquefaction
 Moderate to severe exp. of liquefaction
 Moderate expression of liquefaction
 Minor expression of liquefaction
 Little to no expression of liquefaction

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (earth.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect, applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.00	Unit weight calculation:	14.00 kN/m ³	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	No
Depth to water table (instu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

Red	Almost certain it will liquefy
Orange	Very likely to liquefy
Yellow	Liquefaction and no liq. are equally likely
Green	Unlike to liquefy
Blue	Almost certain it will not liquefy

LSN color scheme

Red	Severe damage
Orange	Major expression of liquefaction
Yellow	Moderate to severe exp. of liquefaction
Green	Moderate expression of liquefaction
Blue	Minor expression of liquefaction
Light Blue	Little to no expression of liquefaction

O'BRIEN GEOTECH LLD

43 B Brookfield Terrace

Tauranga 3110

07 576 7575

029 777 9059

michael@obriengeotech.co.nz

Mark Bishop Architecture
Attn: Aaron Thomsen

1 June 2018
Project No 583

Re: 16 Oakland Place, Ngongotaha – Geotechnical Review of Drawings

Dear Aaron,

I have examined the following Wilton Joubert drawings; 76541 – S0, S1, S2, S0, D1, & Tonkin & Taylor Fig 10, which you have sent me.

I can confirm that the drawings appear comply with the intention of my geotechnical report for the above site. Please note, I have not undertaken a detailed review of the drawings.

The required Finished Floor Level (RL286.25m or 250mm above surround ground whichever is higher) does not appear to be indicated on the drawings which I have seen. I assume that this is indicated on the architectural drawings.

Please contact me if you have any queries.

Yours sincerely,



Michael O'Brien
CPEng MSc. DIC. CMEngNz IntPE
Geotechnical Engineer

NZS 4218:2009 CALCULATION METHOD TOOL

PROJECT SUMMARY

Project name

New Gourlay Home

Address

16 Oaklands Place, Ngongotaha Rotorua

Designer

Address

PO Box 908, Rotorua

Phone

07 929 9807

Date

Reference number

GH84

Climate zone

2: Rest of North Island not in zones 1 or 3

Wall construction type

1: Any wall type

If mixed wall types

0 Percentage of wall area solid timber construction

0 Percentage of wall area high thermal mass construction

100 Percentage of wall area "Any wall type"

If solid timber wall

1: External 75 mm thick solid timber and timber framed internal walls

Summary of calculation method heat loss

Element	Area (m ²)	Proposed building heat loss (W/°C)	Reference building heat loss (W/°C)
Roofs/ceilings	179.2	58.4	61.8
Walls	164.6	51.1	86.6
Floors			
Vertical glazing	39.2	150.8	235.1
Skylights	0.0	0.0	-
Doors	0.0	0.0	-
Total		381.1	521.4 W/°C

Glazing percentage: 19%

Glazing <40%: Yes

Minimum R-values OK: Yes

Issues to check:

PASS/FAIL

PASS

NZS 4218:2009 CALCULATION METHOD TOOL

I New Altered Alpha

Roofs/ceilings: Skylights are not included here. Enter them in the skylights table below.

Roof/ceiling	Description	Area (m ²)	Construction R-value	Heat loss
1	Roofing Metal Tile(R3.2)	179.2	3.07	58.4
2				
3				
4				

Total area 179.2 m²

1: Any wall type

Total roofs/ceilings heat loss 58.4 W/°C

Skylights: Skylights are at an angle of 60° or less to the horizontal. If the skylight R-value is not known, use a value of 0.15.

Skylight	Description	Area (m ²)	Construction R-value	Heat loss
1				
2				
	From Skylight Schedule	0		0.0

Total area 0 m²

Total skylight heat loss 0.0 W/°C

Walls: Doors are not included here. Enter them in the door table.

Wall element	Description	Perimeter	Stud He	Area (m ²)	Construction R-value	Heat loss
Cladding type 1	Brick Veneer (R2.2)	57	2.42	137.94	1.92	71.8
Cladding type 2	Garage wall (R2.2)	11	2.42	26.62	1.98	13.4
Cladding type 3						
Cladding type 4						
Cladding type 5						
Cladding type 6						

Total area 164.56 m²

Total wall heat loss 85.3 W/°C

Floors: Only include the ground or exterior floors. Intermediate floors not exposed to the exterior are excluded.

Floor element	Description	Area (m ²)	Construction R-value	Heat loss
1	Raft Floor	179.2	2.07	86.6
2				
3				
4				

Total area 179.2 m²

Floor heat loss 86.6 W/°C

Vertical glazing: Vertical glazing only (steeper than 60°), including glazing in doors. Skylights are on the Skylight table.

If the glazing R-value is not known, use a value of 0.15

Glazing element	Description	Area (m ²)	Construction R-value	Heat loss
1	Refer to element schedules			
2				
	From Glazing Schedule	39.218		150.8

Total area 39.218 m²

Total vertical glazing heat loss 150.8 W/°C

Doors: Only the non-glazed area of doors is included. The glazed area of doors must be entered in the Glazing table.

The heat loss of doors is automatically set to 0 if the total door area is ≤ 6m² or 6% of the total wall area.

If the R-value of a door is not entered a default value of R 0.18 is automatically used.

Door element	Description	Area (m ²)	Construction R-value	Heat loss
1				0.0
2				0.0
	From Door Schedule	0		0.0

Total area 0

Total door heat loss 0.0 W/°C

NZS 4218:2009 CALCULATION METHOD TOOL

1 New Altered Alpha

125 Oaklands Place, Ngongotaha Rotorua

If the glazing R-value is not known, use a value of 0.15. Skylights are on the Skylight table.

ID	Description		cladding Height (mm)	Width (mm)	Construction R-value	Area (m²)	Heat loss	
1		w01	1	2050	1360	0.26	2.788	10.7
2		w02	1	1000	2000	0.26	2	7.7
3		w03	1	1000	600	0.26	0.6	2.3
4		w04	1	1000	600	0.26	0.6	2.3
5		w05	1	1200	2000	0.26	2.4	9.2
6		w06	1	2000	3200	0.26	6.4	24.6
7		w07	1	1500	2700	0.26	4.05	15.6
8		w08	1	1000	700	0.26	0.7	2.7
9		w09	1	2000	2400	0.26	4.8	18.5
10		w10	1	1000	700	0.26	0.7	2.7
11		w11	1	1000	700	0.26	0.7	2.7
12		w12	1	1200	2000	0.26	2.4	9.2
13		w13	1	1200	2000	0.26	2.4	9.2
14		w14	1	1200	2000	0.26	2.4	9.2
15		w15	1	1000	800	0.26	0.8	3.1
16		w16	1	1000	1600	0.26	1.6	6.2
17	(Garage)	w17	1	2000	1400	0.26	2.8	10.8
18	(Garage)	w18	1	600	1800	0.26	1.08	4.2
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32	Cladding type one total						39.218	
33	Cladding type two total						0	
34	Cladding type three total						0	
35	Cladding type four total						0	
36	Cladding type five total						0	
37	Cladding type six total						0	

Total area 39.2 m²

Total vertical glazing heat loss 150.8

Door Schedule

Doors: Only the non-glazed area of doors is included. The glazed area of doors must be entered in the Glazing.

heat loss of doors is automatically set to 0 if the total door area is ≤ 6m² or 6% of the total wall area.

If the R-value of a door is not entered a default value of R 0.18 is automatically used.

ID	Description	Quantit	Width (mm)	Height (mm)	Construction R-value	Area (m ²)	Heat loss
1							
2							
3							
4							
5							
6							

Total area 0.0 m²

Total door heat loss 0.0

Skylight Schedule

Skylights: Skylights are at an angle ≤ 60° to the horizontal.

ID	Description	Quantit	Width (mm)	Height (mm)	Construction R-value	Area (m ²)	Heat loss
1	Lounge						
2	Ensuite						
3							
4							
5							
6							

Total area 0.0 m²

Total skylight heat loss 0.0

Roof: Timber framed roof, direct fixed or battened flat ceiling ▼

	external surface 0.03	
Roofing	Metal tiles with building paper	▼
	R-value: 0.01	
Insulation []		
Timber Frame & Cavity		
90mm rafters or joists @ 900mm, battens (covered with insulation) ▼		
Frame Area: 5%	Cavity Area: 95%	
Roof space (still air) 0.11	Roof space (still air) 0.11	
Trusses and dwangs	Insulation 3.2	
R-value: 0.75		
Ceiling Lining: Gypsum plasterboard 13mm ▼		
R-value: 0.06		
internal surface 0.09		
Recessed downlights		
Ceiling area (m²):	Number of downlights:	Clearance from lamp holder side [m]: []
Resulting R-value: 3.09 m²K/W		

1. Any wall type

R Value Downlight Adjustment

R value Insulated roof	3.09
Overall area of ceiling	179.2 m²
Number of Downlights	23 downlights
Downlight Clearance	0.1 m
Un-insulated ceiling area	0.722566 m²
Insulated ceiling area	178.4774 m²

Overall R-Value or Roof R 3.079

Calculation:

Area of un-insulated ceiling = $3.14159(\pi) \times r^2 \times \text{number of downlights}$

Area of insulated ceiling = overall area - uninsulated area

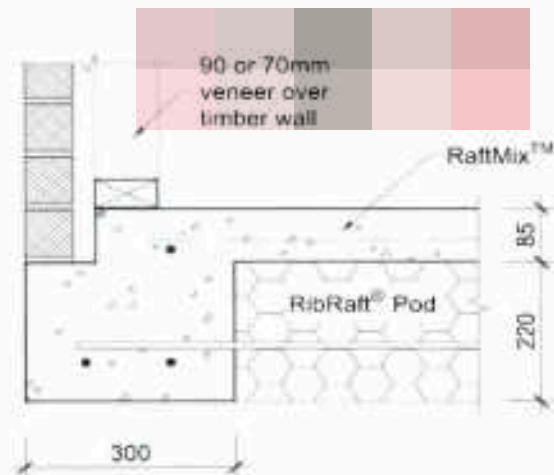
(Assuming an R-value of R0.25 for un-insulated ceilings)

Average R-value = $\frac{[R0.25 \times \text{area of un-insulated ceiling}] + [3.09 \times \text{area of insulated ceiling}]}{\text{divided by overall ceiling area}}$

Wall: Timber frame with vented cavity

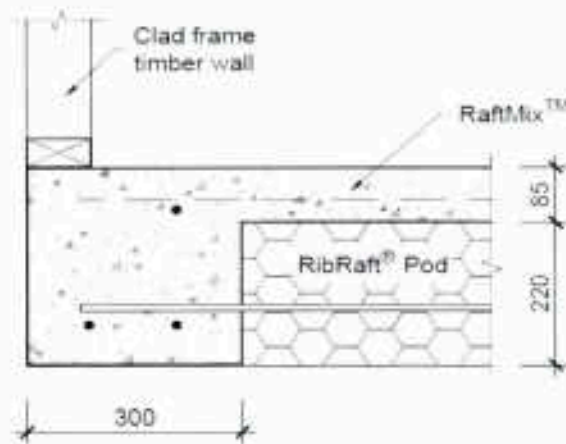
external surface 0.03	
Cladding: 70mm brick	R-value: 0.05
Air Barrier: Building paper	R-value: 0.01
Timber Frame & Cavity: 90mm studs @ 400mm, dwangs @ 800mm	
Frame Area: 17.9%	Cavity Area: 82.1%
15-90mm vented cavity (all R-values on ext. side of cavity will be halved). R: 0.08	15-90mm vented cavity (all R-values on ext. side of cavity will be halved). R: 0.08
Timber Frame R-value: 0.75	Insulation 2.2
	still Airgap: none
	R-value: 0
Wall Lining: Gypsum plasterboard 10mm	
R-value: 0.04	
internal surface 0.09	

Resulting R-value: 1.92 m²K/W



	Floor Area To Perimeter Ratio m^2/m									
	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.50	4.00
R-value $m^2 \cdot ^\circ C/W$	1.54	1.67	1.80	1.93	2.05	2.17	2.28	2.40	2.62	2.84

Figure 9 RibRaft R-Values for 70-90mm thick veneer, cavity, and 90mm walls.



	Floor Area To Perimeter Ratio m^2/m										
	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.50	4.00
R-value $m^2 \cdot ^\circ C/W$	1.39	1.51	1.63	1.74	1.85	1.96	2.07	2.18	2.28	2.48	2.68

Figure 8 RibRaft R-Values for 90mm thick walls on the floor edge.



DESIGN CERTIFICATE

Technical basis for structural design methodology contained in designIT for houses - New Zealand.

designIT for houses, New Zealand has been developed by experienced timber engineers to assist designers in selecting appropriate sizes of structural laminated veneer lumber products manufactured by Carter Holt Harvey (including hySPAN, hy90, hyONE and hyJOIST) and other generic stress grades of timber, to be used as structural elements for the construction of buildings that fall within the scope of NZS 3604.

The design methodology used for the software complies with the loading and general design requirements contained within AS/NZS 1170 and with timber structural design in accordance with NZS 3603:1993 including Amendment 4 (Verification method B1/VM1, 6.1).

designIT relies on the accurate input of span and loading information by the user. Where accurate inputs are submitted the product and/or stress grade and the size given will comply with the structural requirements of the New Zealand Building Code (NZBC), provided the installation is in accordance with the installation requirements provided by designIT and/or in product literature and/or NZS 3604, or specific engineering design, as appropriate.

Futurebuild LVL and Laserframe components, when used and treated to the required treatment levels prescribed in NZS 3602 and NZS 3604, as modified by Acceptable Solution B2/AS1, will comply with the requirements of the NZBC (Acceptable Solution B2/AS1, 3.2).

References:

NZS 3603:1993 Timber Structures Standard.

NZS 3604:2011 Timber-framed buildings.

AS 1720.1:2010 Timber structures. Part 1: Design methods.

AS 1720.3:2016 Timber structures. Part 3: Design criteria for timber-framed residential buildings

AS/NZS 1170:2002 Structural design actions, Parts 0 and 1.

AS/NZS 1170:2011 Structural design actions, Part 2: Wind actions.

AS/NZS 1170:2003 Structural design actions, Part 3: Snow and ice actions.

This Design Certificate, and any associated warranty/certification, is void where there has been substitution of alternate products not detailed within the Member Specification.

Version date: 3 May 2017

For further information or advice contact:

Carter Holt Harvey Woodproducts New Zealand,
173 Captain Springs Road, Onehunga, Auckland
Telephone: 0800 808 131
Facsimile: 0800 808 132
Email: designit@chhwoodproducts.co.nz
Web: <http://www.chhwoodproducts.co.nz>

Specifier details:

Specifier:	AT
Business name:	Bishop Architecture
Address:	PO Box 908 Rotorua
Email:	jobs@markbishop.co.nz

Project & site details:

Project:	New Goorlay Home
Reference:	GH84
At (address):	16 Oakland Rotorua
For (owner/s):	Mark Lam
Design wind zone	High
Snow loading	Design snow zone: N0

MEMBER DESIGN DETAILS

Member 1

1) Member code and description	L1 - Lintels - In single or upper storey load bearing walls
--------------------------------	---

- 2) Date prepared 19 April 2018
- 3) Serviceability criteria AS 1720.1: 2010 and AS 1720.3: 2016
- 4) Design inputs
- | | |
|------------------------|---|
| Span | 4.8 m |
| Roof load width 'RLW' | 0.9 m |
| Roof type and mass | Light roof and ceiling - 40 kg/m ² |
| Nominal wall thickness | 90 mm |
- 5) Member specification
- | | |
|----------------------------|---|
| Size, stress grade/product | Use 2/290 x 45 SG8 Laserframe |
| Material type | Dry softwood, machine stress graded and verified (NZS 3622) |
| Assumed design density | < 480 kg/m ³ |

6) Serviceability

Load case	Limit ² on average deflection ²	Estimated average deflection ²	Rigidity ratio ⁴
Long term load - G + $\Psi_L Q^*$	10.0 mm	6.4 mm (long term)	1.6
Live load - $\Psi_L Q$	15.0 mm	1.5 mm	10.2
Wind load - W_s	24.0 mm	4.4 mm	5.4

*Critical serviceability load case

See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

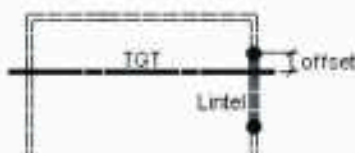
Load case	k_1 ¹	Limit States Design Reaction ^{2,3}
		End kN ⁴
1.35G	0.60	-1.7
1.2G + 1.5Q	0.80	-2.3
1.2G + W_u + $\Psi_u Q$	1.00	-3.2
0.9G + W_u	1.00	1.6

8) Installation requirements

- Provide at least 30 mm bearing at end supports

Member 2

- 1) Member code and description w09 - Lintels - Supporting girder truss / truncated girder truss



- 2) Date prepared 19 April 2018
- 3) Serviceability criteria AS 1720.1: 2010 and AS 1720.3: 2016
- 4) Design inputs
- | | |
|-----------|---|
| Roof type | Light roof and ceiling - 40 kg/m ² |
|-----------|---|

Roof pitch	25.0 °
Truss spacing	900 mm
Eaves overhang	600 mm
TGT span	9170 mm
TGT setback	2762 mm
TGT offset	890 mm
Lintel span	2400 mm
Nominal wall thickness	90 mm

5) Member specification

Size, stress grade/product	Use 200 x 90 hy90
Material type	Structural Laminated Veneer Lumber to AS/NZS 4357

6) Serviceability

Load case	Limit ¹ on average deflection ²	Estimated average deflection ²	Rigidity ratio ⁴
Long term load - $G + \Psi_L Q^*$	8.0 mm	5.2 mm (long term)	1.5
Live load - $\Psi_L Q$	9.6 mm	1.6 mm	6.1
Wind load - W_s	12.0 mm	4.7 mm	2.5

*Critical serviceability load case

See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

Load case	k_1 ¹	Limit States Design Reaction ^{2,3} End kN ⁴
1.35G	0.60	-4.1
1.2G + 1.5Q	0.80	-6.4
1.2G + W_u + $\Psi_c Q$	1.00	-9.0
0.9G + W_u	1.00	5.8

8) Installation requirements

- Provide at least 30 mm bearing at end supports

Notes for interpretation of serviceability data

- 'average deflection' is an engineering concept based upon a notional estimated load, notional member rigidity and, in some cases, an approximate model of material response to environmental conditions. These parameters are, 'standardised' in AS 1170 and AS 1720. Deflections calculated using this methodology cannot therefore be usefully compared with deflections calculated using other methods, eg GLTAA design methodology.
- Deflection is the flexural response to load 'out-of-level' measurements of installations are not necessarily deflections and can incorporate 'initial out-of-straightness', whether intended or not. Furthermore, loads can be higher/lower than the notional estimate and in any comparison with measured levels, material variability needs to also be considered. AS 1720 gives the following basis for estimation of upper bound deflections for various materials.

No 1 Framing – visually graded to NZS 3631	Average + 100%
SG grades – mechanically graded to AS/NZS 1748	Average + 43%
GL grades for glulam to AS 1328	Average + 33%
LVL to AS/NZS 4357 (includes hySPAN and hyJOIST)	Average + 18%

As can be seen, comparison of the 'average deflection' for different materials, even if calculated on the same basis, does not give the whole picture!

- The limits referred are those specified in AS 1720.3 for the stated load case.
- 'Rigidity ratio' expresses the rigidity of the specified beam relative to the rigidity of a notional beam just meeting the serviceability requirements of AS 1720.3

Notes for interpretation of reaction data

1. Duration of load factor 'k₁' for strength as per NZ 3603:1993
2. Negative (-) reactions relate to the 'gravity' or 'downwards' force on the support
3. Positive reactions relate to the 'upwards' forces or 'tie-down' requirement on the support
4. End reaction includes allowance for overhang/cantilever where one has been designed



MiTek New Zealand Limited

Correspondence from : **AUCKLAND**
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PO Box 58-014, Botany 2163
Phone: 09 274 7109
Fax: 09 274 7100

CHRISTCHURCH
14 Pilkington Way, Wigram 8042
PO Box 8387, Riccarton 8440
Phone: 03 348 8591
Fax: 03 348 0314

www.mitek.nz.co.nz

MiTek 20/20 Engineering 4.7.184.0

Printed: 09:36:43 18 Apr 2018

PRODUCER STATEMENT for MiTek 20/20[®] TRUSS DESIGN - Version 4.7

ISSUED BY: **MiTek New Zealand Limited**

TO: **CARTERS**

IN RESPECT OF: **MiTek[®] Truss Designs**

This producer statement covers the MiTek 20/20[®] truss design and the structural performance of the GANG-NAIL[®] connector plate for the job reference **267122C1** and may be used by a Building Consent Authority to assist in determining compliance with the New Zealand Building Code.

The MiTek 20/20[®] truss design program has been developed by MiTek New Zealand Limited for the design of MiTek[®] timber roof, floor and attic trusses in New Zealand. The truss designs computed by MiTek 20/20[®] are prepared using sound and widely accepted engineering principles, and in accordance with compliance documents of the New Zealand Building Code and Verification Method B1/VM1; and internationally accepted standard ANSI/TPI 1 - 2002 as an alternative solution, to satisfy the requirements of Clauses B1 and B2 of the New Zealand Building Code.

On behalf of MiTek New Zealand Limited, and subject to:

- i) All proprietary products meeting their performance specification requirements
- ii) The provision of adequate roof bracing and overall building stability
- iii) Correct selection and placement of GANG-NAIL connector plates
- iv) Correct input of Truss Design Data as shown in the Fabricator Design Statement for this job
- v) The design being undertaken by the accredited fabricator under the terms of the software licence
- vi) Timber is graded to the requirements of NZS 3603:1993
- vii) Minimum timber treatment for these MiTek[®] trusses shall be in accordance with B2/AS1 Table 1A and the relevant sections of NZS 3602:2003.

I believe on reasonable grounds that the trusses, if constructed in accordance with the MiTek 20/20[®] truss design and shop drawings, will comply with the relevant provisions of the New Zealand Building Code.

MiTek New Zealand Limited holds a current policy of Professional Indemnity Insurance no less than \$500,000.

On behalf of MiTek New Zealand Limited,

Date: Wednesday, 18 April 2018

In Ling Ng, BE (Hons), CPEng, IntPE, MIPENZ (ID: 146585)
TECHNICAL SERVICES MANAGER, MiTek New Zealand Limited

Job: 257122C1

Client: GOURLAY HOMES LIMITED
Phone:Site: MARK LAM
16 OAKLAND PLACE
NGONGHATARA
ROTORUADescription:
Building Consent No.:
RCH 257122C1 (1/1)Phone:
Printed: 25/02/2020 14:49:20**MITEK FABRICATOR DESIGN STATEMENT**

This statement is issued by Mitek accredited fabricator **CARTERS**, being licensed to use the Mitek 20/20[®] software, to the client listed above and may be used by the Building Consent Authority to assist in determining compliance with the New Zealand Building Code.

Mitek 20/20[®] TRUSS DESIGN DATA

The Mitek 20/20[®] computer design for this job is based on the following design parameters entered into the program. The Fabricator shall ensure that these job details are current and relevant to the project for the design of the Mitek[®] trusses.

Job Details		Importance Level:	2	Design Working Life:	50 years
Roof Truss					
Timber Group:	MSG& DCP H1.2	Pitch:	25.000 deg	Nominal Overhang:	600 mm
Roof		Ceiling		Wind	
Material:	Metal Tiles	Material:	Gib 13mm/Timber Battens	Area:	High (44.0 m/s)
Dead Load:	0.210 kPa	Dead Load:	0.200 kPa	Pressure Coeff:	Cpe = varies: Cpl = -0.30, 0.20
Restraints:	400 mm centres	Restraints:	600 mm centres		
Live Load:	Q _{ur} = 0.250 kPa	Live Load:	Q _c = 1.400 kN		
	Q _c = 1.100 kN				

The minimum timber treatment for these Mitek[®] trusses shall be in accordance with B2/AS1 Table 1A and the relevant sections of NZS 3602:2003. The timber for these Mitek[®] trusses shall be graded to the requirements of NZS 3603:1993. Proprietary fixings and timber connectors shall be selected in accordance with NZS3604:2011 Section 4 - Durability.

Mitek[®] Truss List

Legend: * = detail only, ? = input only, Txx = tailed design, G = non certified, Unmarked trusses = designed successfully, LB = lateral bracing required, GB = gable brace required

Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)	Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)	Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)
GT1	1	10260	25.000	900	J3B	1	3307	25.000	900	V1	1	1045	25.000	900
GT2	1	10260	25.000	900	J4	1	2407	25.000	900	V2	1	995	25.000	900
GT3	1	6150	25.000	900	J4A	1	2407	25.000	900	V3	1	2544	25.000	900
GT4	1	3754	25.000	900	J5	1	1507	25.000	900	V4	1	1644	25.000	900
GT4A	1	3754	25.000	900	J5A	1	1507	25.000	900	V5	1	759	25.000	900
GT5	1	4780	25.000	900	J6	1	3167	25.000	900	V6	1	1659	25.000	900
GT7	1	4099	25.000	900	J6A	1	3167	25.000	900	V7	1	2559	25.000	900
J3	1	3307	25.000	900	J7	1	2267	25.000	900	V8	1	1154	25.000	900
T1	3	7808	25.000	900	J7A	1	2267	25.000	900	V9	1	866	25.000	900
T2	1	10260	25.000	900	J8	1	1367	25.000	900	*HB1	2	7278	18.249	900
T3	3	10260	25.000	900	J8A	1	1367	25.000	900	*HB2	1	1232	18.249	900
T3A	1	10260	25.000	900	J9	1	3315	25.000	900	*HB3	1	8049	18.249	900
T3B	1	10260	25.000	900	J9A	1	3315	25.000	900	*HB4	1	5306	18.249	900
TG1	1	9170	25.000	900	J10	1	2367	25.000	900	*HB5	1	768	18.248	900
TG2	1	5678	25.000	900	J10A	1	2367	25.000	900	*HB6	1	4913	18.249	900
TG3	1	7328	25.000	900	J10B	1	2367	25.000	900	*HB7	1	3099	18.249	900
ET1	1	6154	25.000	900	J10C	1	2367	25.000	900	*HB8	3	4174	18.249	900
GT6	1	2735	25.000	900	J11	3	1467	25.000	900	*HB9	1	478	18.249	900
J1	2	2762	25.000	900	J11A	3	1467	25.000	900	*R1	2	1553	25.000	900
J1A	2	2762	25.000	900	J12	1	2367	25.000	900	*R2	14	891	25.000	900
J1B	1	2762	25.000	900	R2A	1	891	25.000	900	*R3	1	1198	25.000	900
J1C	1	2762	25.000	900	R6	1	748	25.000	900	*R4	1	1068	25.000	900
J1D	1	2762	25.000	900	T4	3	6150	25.000	900	*R5	1	1058	25.000	900
J2	2	1862	25.000	900	T5	2	7328	25.000	900	*R5A	1	1058	25.000	900
J2A	2	1862	25.000	900	T6	1	2735	25.000	900	*R7	1	7350	25.000	900
J3A	1	3307	25.000	900	TR1	1	7808	25.000	900	*R8	3	1158	25.000	900

Total quantity : 112

The computer design input has been carried out by:

Mitek 20/20 Software Operator: David Shaw

Mitek Candidate Number and Qualifications:

Accredited Fabricator:



Wednesday, 18 April 2018

Job: 267122C1

Client: GOURLAY HOMES LIMITED
Phone:

Sale: MARK LAM
18 OAKLAND PLACE
NGONGHATARA
ROTORUA

Description:
Building Consent No.:
267122C1 Engineering 4/7/2020

Phone:
Address: 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

TRUSS BEARINGS EXCEEDING 10KN REPORT -

Ultimate Limit State Loads

MiTek Truss List

Legend: ? = input only, ~~Ex~~ = failed design, ~~GT~~ = non certified, Unmarked trusses = designed successfully

Critical Trusses	Qty	Span (mm)	Joint	Bearing Reactions (kN)
				Down Uplift
TG1	1	9170	O	8.904 11.033

Note:
1) Select appropriate Slab Thickening Detail from the MiTek 'Internal Load Bearing On Concrete Floor Slabs' brochure.



DESIGN CERTIFICATE

Technical basis for structural design methodology contained in designIT for houses - New Zealand.

designIT for houses - New Zealand has been developed by experienced timber engineers to assist designers in selecting appropriate sizes of structural laminated veneer lumber products manufactured by Carter Holt Harvey (including hySPAN, hy80, hyONE and hyJOIST) and other generic stress grades of timber, to be used as structural elements for the construction of buildings that fall within the scope of NZS 3604.

The design methodology used for the software complies with the loading and general design requirements contained within AS/NZS 1170 and with timber structural design in accordance with NZS 3603:1993 including Amendment 4 (Verification method B1/VM1, 6.1).

designIT relies on the accurate input of span and loading information by the user. Where accurate inputs are submitted the product and/or stress grade and the size given will comply with the structural requirements of the New Zealand Building Code (NZBC), provided the installation is in accordance with the installation requirements provided by designIT and/or in product literature and/or NZS 3604, or specific engineering design, as appropriate.

Futurebuild LVL and Laserframe components, when used and treated to the required treatment levels prescribed in NZS 3602 and NZS 3604, as modified by Acceptable Solution B2/AS1, will comply with the requirements of the NZBC (Acceptable Solution B2/AS1, 3.2).

References:

NZS 3603:1993 Timber Structures Standard.

NZS 3604:2011 Timber-framed buildings.

AS 1720.1:2010 Timber structures. Part 1: Design methods.

AS 1720.3:2016 Timber structures. Part 3: Design criteria for timber-framed residential buildings.

AS/NZS 1170:2002 Structural design actions. Parts 0 and 1.

AS/NZS 1170:2011 Structural design actions. Part 2: Wind actions.

AS/NZS 1170:2003 Structural design actions. Part 3: Snow and ice actions.

This Design Certificate, and any associated warranty/certification, is void where there has been substitution of alternate products not detailed within the Member Specification.

Version date: 3 May 2017

For further information or advice contact:

Carter Holt Harvey Woodproducts New Zealand,
173 Captain Springs Road, Onehunga, Auckland
Telephone: 0800 808 131
Facsimile: 0800 808 132
Email: designit@chhwoodproducts.co.nz
Web: <http://www.chhwoodproducts.co.nz>

Specifier details:

Specifier:	David Shaw
Business name:	Carters Building Supply LTD
Email:	david.shaw@carters.co.nz

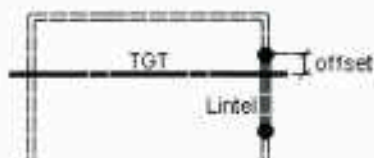
Project & site details:

Project:	MARK LAM
Reference:	267122C1
At (address):	16 OAKLAND PLACE NGONGATAHA
For (owner/s):	GOURLAY HOMES
Design wind zone	High
Snow loading	Design snow zone: N0

MEMBER DESIGN DETAILS

Member 1

1) Member code and description	L1 - Lintels - Supporting girder truss / truncated girder truss
---------------------------------------	---



- 2) Date prepared 18 April 2018
- 3) Serviceability criteria AS 1720.1: 2010 and AS 1720.3: 2010

4) Design inputs

Roof type	Light roof and ceiling - 40 kg/m ²
Roof pitch	25.0 °
Truss spacing	900 mm
Eaves overhang	600 mm
TGT span	4780 mm
TGT setback	2387 mm
TGT offset	1667 mm
Lintel span	2000 mm
Nominal wall thickness	90 mm

5) Member specification

Size, stress grade/product	Use 150 x 90 hy90
Material type	Structural Laminated Veneer Lumber to AS/NZS 4357

6) Serviceability

Load case	Limit ¹ on average deflection ²	Estimated average deflection ²	Rigidity ratio ⁴
Long term load - $G + \Psi_L Q$	6.7 mm	2.3 mm (long term)	2.8
Live load - $\Psi_L Q$	8.0 mm	0.7 mm	11.6
Wind load - W_s	10.0 mm	2.1 mm	4.8

¹Critical serviceability load case

²See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

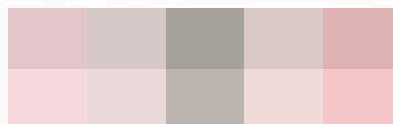
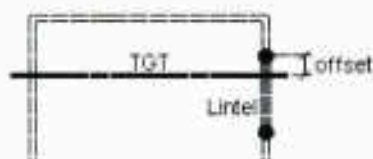
Load case	k_t ¹	Limit States Design Reaction ^{2,3}
		End kN ⁴
1.35G	0.60	-2.6
1.2G + 1.5Q	0.80	-4.0
1.2G + W_u + $\Psi_c Q$	1.00	-5.6
0.9G + W_u	1.00	3.6

8) Installation requirements

- Provide at least 30 mm bearing at end supports

Member 2

- 1) Member code and description L2 - Lintels - Supporting girder truss / truncated girder truss



2) Date prepared

18 April 2018

3) Serviceability criteria

AS 1720.1: 2010 and AS 1720.3: 2016

4) Design inputs

Roof type	Light roof and ceiling - 40 kg/m ²
Roof pitch	25.0 °
Truss spacing	900 mm
Eaves overhang	600 mm
TGT span	9170 mm
TGT setback	2762 mm
TGT offset	1872 mm
Lintel span	2000 mm
Nominal wall thickness	90 mm

5) Member specification

Size, stress grade/product	Use 150 x 90 hy90
Material type	Structural Laminated Veneer Lumber to AS/NZS 4357

6) Serviceability

Load case	Limit ¹ on average deflection ²	Estimated average deflection ²	Rigidity ratio ⁴
Long term load - $G + \Psi_L Q^*$	8.7 mm	2.4 mm (long term)	2.8
Live load - $\Psi_S Q$	8.0 mm	0.7 mm	11.3
Wind load - W_s	10.0 mm	2.1 mm	4.7

*Critical serviceability load case

See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

Load case	kN ¹	Limit States Design Reaction ^{2,3}
		End kN ⁴
1.35G	0.80	-5.4
1.2G + 1.5Q	0.80	-6.5
1.2G + W_u + $\Psi_c Q$	1.00	-12.0
0.9G + W_u	1.00	7.8

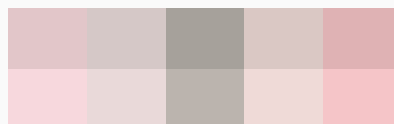
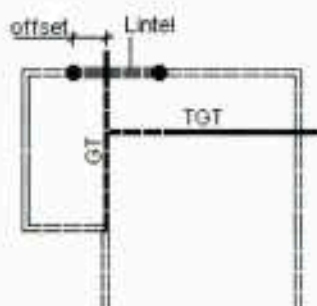
8) Installation requirements

- Provide at least 30 mm bearing at end supports

Member 3

1) Member code and description

L3 - Lintels - Supporting girder truss / truncated girder truss



- 2) Date prepared 18 April 2018
- 3) Serviceability criteria AS 1720.1: 2010 and AS 1720.3: 2016

4) Design inputs

Roof type	Light roof and ceiling - 40 kg/m ²
Roof pitch	25.0 °
Truss spacing	900 mm
Eaves overhang	600 mm
TGT span	6380 mm
TGT setback	3167 mm
GT span	6150 mm
GT offset	600 mm
Lintel span	1860 mm
Nominal wall thickness	90 mm

5) Member specification

Size, stress grade/product	Use 200 x 90 hy80
Material type	Structural Laminated Veneer Lumber to AS/NZS 4357

6) Serviceability

Load case	Limit ¹ on average deflection ²	Estimated average deflection ²	Rigidity ratio ⁴
Long term load - $G + \Psi_L Q^*$	6.0 mm	1.7 mm (long term)	3.4
Live load - $\Psi_L Q$	7.2 mm	0.5 mm	13.6
Wind load - W_s	9.0 mm	1.6 mm	5.6

*Critical serviceability load case

See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

Load case	k_1^1	Limit States Design Reaction ^{2,3}
		End kN ⁴
1.35G	0.80	-4.0
1.2G + 1.5Q	0.80	-6.2
1.2G + W_u + $\Psi_L Q$	1.00	-8.8
0.9G + W_u	1.00	5.7

8) Installation requirements

- Provide at least 30 mm bearing at end supports

Notes for interpretation of serviceability data

1. 'average deflection' is an engineering concept based upon a notional estimated load, notional member rigidity and, in some cases, an approximate model of material response to environmental conditions. These parameters are 'standardised' in AS 1170 and AS 1720. Deflections calculated using this methodology cannot therefore be usefully compared with deflections calculated using other methods, eg GLTAA design methodology.
2. Deflection is the flexural response to load 'out-of-level' measurements of installations are not necessarily deflections and can incorporate 'initial out-of-straightness', whether intended or not. Furthermore, loads can be higher/lower than the notional estimate and in any comparison with measured levels, material variability needs to also be considered. AS 1720 gives the following basis for estimation of upper bound deflections for various materials.

No 1 Framing – visually graded to NZS 3631	Average + 100%
SG grades – mechanically graded to AS/NZS 1748	Average + 43%
GL grades for glulam to AS 1328	Average + 33%
LVL to AS/NZS 4357 (includes hySPAN and hyJOIST)	Average + 18%

As can be seen, comparison of the 'average deflection' for different materials, even if calculated on the same basis, does not give the whole picture!

3. The limits referred are those specified in AS 1720.3 for the stated load case.
4. 'Rigidity ratio' expresses the rigidity of the specified beam relative to the rigidity of a notional beam just meeting the serviceability requirements of AS 1720.3

Notes for interpretation of reaction data

1. Duration of load factor 'k₁' for strength as per NZ 3603:1993
2. Negative (-) reactions relate to the 'gravity' or 'downwards' force on the support.
3. Positive reactions relate to the 'upwards' forces or 'tie-down' requirement on the support
4. End reaction includes allowance for overhang/cantilever where one has been designed

BUILDABLE CONSENT LAYOUT

CARTERS

**Your
Building Partner**

CARTERS
Carters Manufacturing Cambridge
(07) 3431049

JOB No 267122C1

Client: GOURLAY HOMES LIMITED
Job: MARK LAM
Site: 16 OAKLAND PLACE
NGONGHATAHA
ROTORUA

Pitch: 25.5deg
Roof Type: Metal Tiles
Overhang: 600mm
Wind Area: High
Roof Snow: 0.000kPa

Trusses and rafters at 900 mm
max centres unless stated otherwise.
This layout is to be read in conjunction
with the Architectural plans.

DRAWN David Shaw 18 Apr 2018



Ultimate Limit
State Loads

Notification of point loaded lintels
or point loads on internal walls
where the downward load is
higher than 8kN (85mm raft type slab)
or 10kN (100mm standard slab), or
the upward load is greater than 10kN.

Any roof loads as stated on this
layout over 16kN up or down are
outside the scope of NZS3604, and
the architect / draughtsperson is
responsible for the design to transfer
the loads to the ground.

The lintels have been sized using
one of the following:

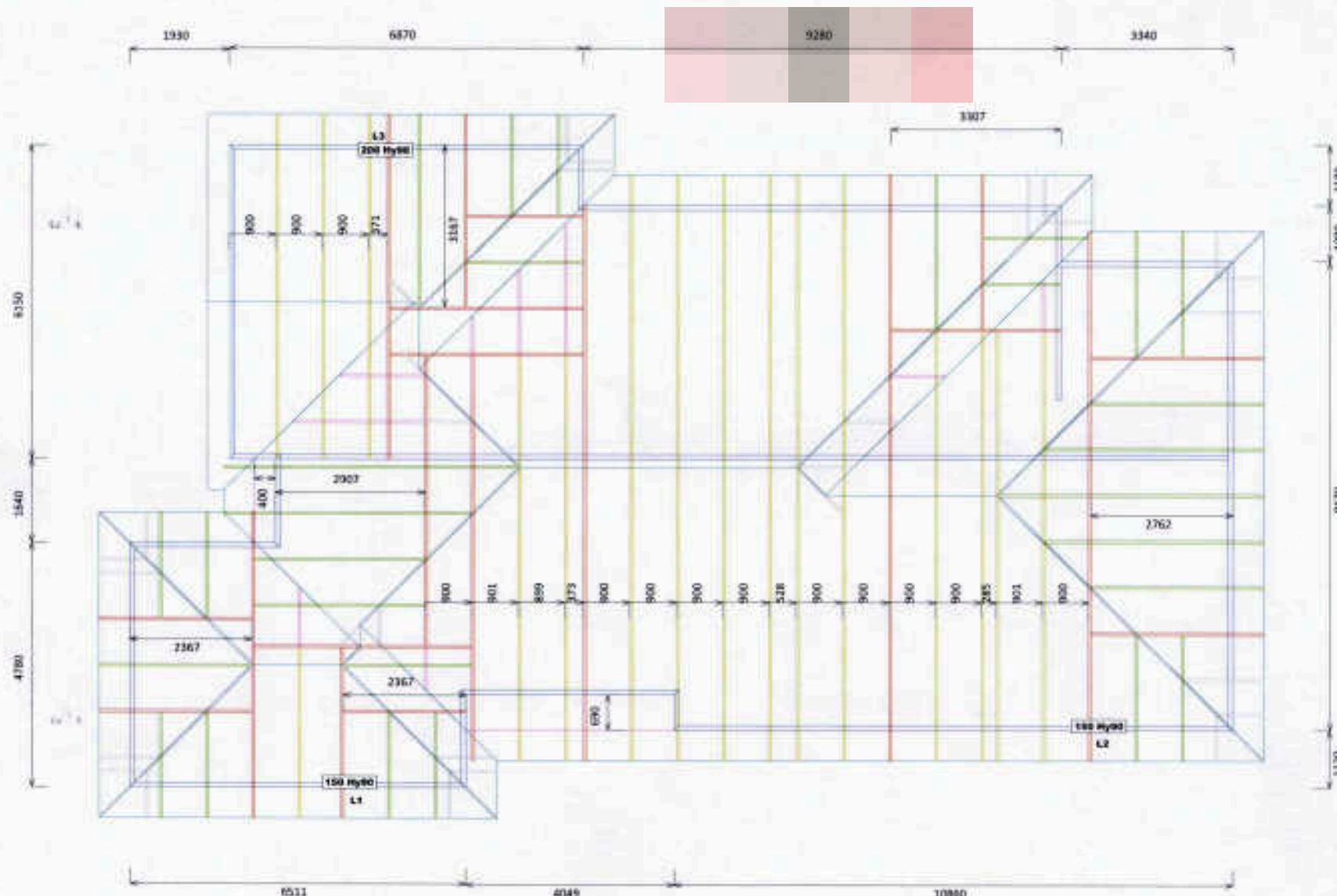
hy90, hyONE and hySPAN lintels
have been sized using the designIT
for houses - New Zealand series 6
software.

GANGLAM and FLITCH BEAMS
have been sized using the MITek
Beam Program V1.10 June 2011.

Any treated LVL product is H1.2, which
satisfies the minimum treatment
requirement of NZS3602.

Unless otherwise stated the timber grade
for all lintels is SG8. Lintels not shown
are to be selected as per NZS3604: 2011.

FTMA
NEW ZEALAND



All internal walls shown hatched on this layout are considered to be loadbearing
Lintel fixing specification remains the responsibility of the architect / draughtsperson



**WILTON
JOUBERT**

Consulting Engineers

NORTHLAND

P.O. Box 8130

Kerangaroa

Whangarei 0143

T: +64 9 945 4188

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WAIKATO

P.O. Box 11381

Ellerslie

Auckland 1547

T: +64 9 517 0196

SOUTHERN LAKES

P.O. Box 169

Wanaka 9343

T: +64 3 443 6709

CANTERBURY

T: +64 21 824 063

Structural Design Calculations for:

Lot 70 : DP 389915

16 Oakland Place

Ngongotaha

Bay of Plenty

Job #: 76541

May 2018

Date : 17/05/2018
 Designer : AAF
 Checker : NL
 Job Number : 76541

Earthquake Raftfloor Design



**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : EDGE BEAM

Loadings

Upper Wall must be Timber



Tributary Roof and Floor Lengths

WALLS

Lower	Timber			
			(North/South Taupo)	
		=	38	kg/m ²
		=	0.37	kPa
	Height	=		m
	Load/m	=		kN/m

Upper	Timber			
			(North/South Taupo)	
		=	38	kg/m ²
		=	0.37	kPa
	Height	=		m
	Load/m	=		kN/m

Other (Specify Wall Weight)

Weight	=	170	kg/m ²
	=	1.67	kPa
Height	=	2.40	m
Load	=	4	kN/m

SUSPENDED MID-FLOOR

Tributary Length L/2

Unit/Floor	=	Timber	
Topping	=	N/A	
	=	0.38	kPa
Live Loading	=	1.50	kPa
Super Imposed Dead	=		kPa
Tributary Span	=		m
Dead Load/m	=		kN/m
Live Load/m	=		kN/m

ROOF

Tributary Length = S

Light	=	0.46	kPa
Live Loading	=	0.25	kPa
Tributary Span	=	3.58	m
Dead Load/m	=	1.64	kN/m
Live Load/m	=	0.89	kN/m

Loadings Summary

Walls	4.00	kN/m	Dead
Mid Floors		kN/m	Dead
		kN/m	Live
Slab*	4.15	kN/m	Dead+SDL
	0.90	kN/m	Live
Roof	1.64	kN/m	Dead
	0.89	kN/m	Live*
Extra Dead		kN/m	Dead
Extra Live		kN/m	Live

* Includes Edge Beam Weight. SDL = 0.5 kPa LL = 1.5 kPa

^ Roof LL not added if midfloor exists else LL = 0.25 kPa

Date : 17/05/2018
 Designer : AAF
 Checker : NL
 Job Number : 76541

Earthquake Raftfloor Design



**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : EDGE BEAM

Working Loads

	Dead	9.80	kN/m
	Live	1.79	kN/m
Ultimate Loads (1.2G + 1.5Q)	Dead	11.76	kN/m
	Live	2.69	kN/m
Total Ultimate Load on Edge	w =	14.45	kN/m

Edge Beam Details

Wall Construction Type:

Brick Veneer min beam width 300mm

Beam Width = 400 mm
 Pod Depth = 220 mm
 Top slab Depth = 85 mm
 Self Weight = 2.93 kN/m
 Construction Type = Standard Raft

OK!

Standard Raft Construction

Dependable bearing capacity: 100 kPa

Bearing Check = OK

Working Pressure = 26 kPa

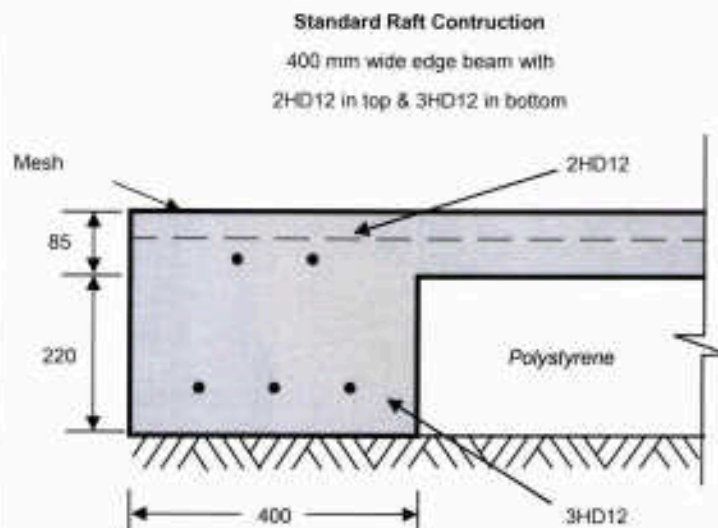
Steel Requirements - As Per Std Org's

Top Steel: 2HD12

Blm Steel: 3HD12

Prescribed Edge Beam Design

Location (ie: which wall):
 EDGE BEAM



Date : 17/05/2018
 Designer : AAF
 Checker : NIL
 Job Number : 76541

Earthquake Rafterfloor Design

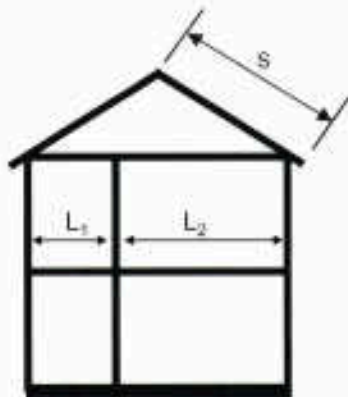


**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : INTERNAL THICKENING

Loadings



Tributary Roof and Floor Lengths

WALLS

Lower:	HOTBloc	Solid
Light	=	(North/South Taupo) 400 kg/m ³
	=	3.92 kPa
Height	=	m
Load/m	=	kN/m

Upper:	HOTBloc	Solid
Light	=	(North/South Taupo) 400 kg/m ³
	=	3.92 kPa
Height	=	m
Load/m	=	kN/m

Other (Specify Wall Weight)		
Weight	=	30 kg/m ³
	=	0.29 kPa
Height	=	2.40 m
Load	=	0.71 kN/m

SUSPENDED MID-FLOOR

Tributary Length = $(L_1 + L_2)/2$

Unit/Floor	=	Timber
Topping	=	N/A
	=	0.38 kPa
Live Loading	=	1.50 kPa
Super Imposed Dead	=	kPa
Tributary Span	=	m
Dead Load/m	=	kN/m
Live Load/m	=	kN/m

ROOF

Tributary Length = S (Check if Rafter or Truss)

Light	=	0.46 kPa
Live Loading	=	0.25 kPa
Tributary Span	=	5.56 m
Dead Load/m	=	2.56 kN/m
Live Load/m	=	1.39 kN/m

Loadings Summary

Walls	0.71	kN/m	Dead
Mid Floors		kN/m	Dead
		kN/m	Live
Slab*	4.56	kN/m	Dead+SDL
	1.80	kN/m	Live
Roof	2.56	kN/m	Dead
	1.39	kN/m	Live*
Extra Dead		kN/m	Dead
Extra Live		kN/m	Live

* Includes Internal Rib Weight, SDL = 0.5 kPa LL = 1.5 kPa

* Roof LL not added if midfloor exists else LL = 0.25 kPa

Date : 17/05/2018
 Designer : AAF
 Checker : NL
 Job Number : 76541

Earthquake Raftfloor Design



**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : INTERNAL THICKENING

Working Loads

	Dead	7.82	kN/m
	Live	3.19	kN/m
Ultimate Loads (1.2G + 1.5Q)	Dead	9.39	kN/m
	Live	4.78	kN/m
Total Ultimate Load on Internal	w =	14.17	kN/m

Internal Rib Details

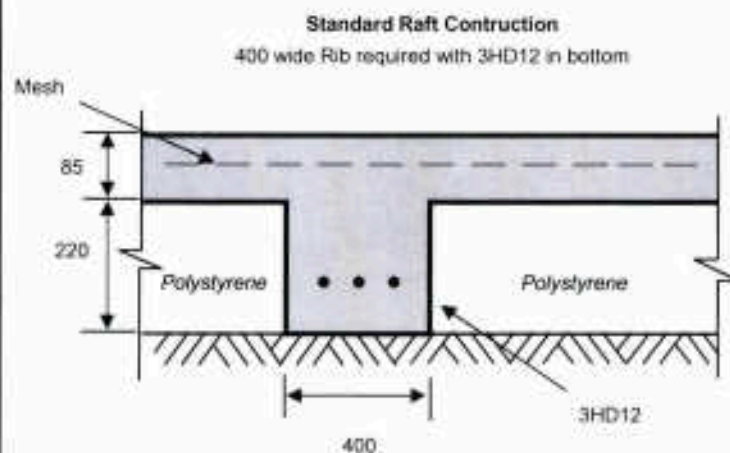
Rib Width =	400	mm	OK!
Pod Depth =	220	mm	
Top slab Depth =	85	mm	
Self Weight =	2.11	kN/m	
Construction Type: Standard Raft			

Standard Raft Construction

Dependable bearing capacity:	100	kPa
Bearing Check =	OK!	
Working Pressure =	23	kPa
Steel Requirements - As Per Std Drg's		
Btm Steel:	3HD12	

Prescribed Internal Rib Design

Location (ie: which wall):
 INTERNAL THICKENING



Date : 17/05/2018
 Designer : AAF
 Checker : NL
 Job Number : 76541

Earthquake Raftfloor Design



**WILTON
JOUBERT**

Consulting Engineers

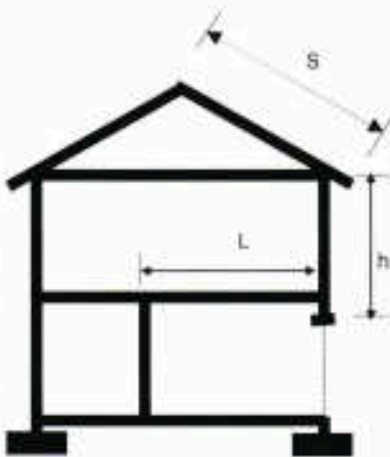
Site Address : Lot 70, 16 Oakland Place
 Description : SUSPENDED INTERNAL THICKENING

Geometry and Lintel Info

L = 4 m
 b = 400 mm
 h = 305 mm
 d = 249 mm

Reinforced Concrete

Loadings



Tributary Roof and Floor Lengths

MASONRY WALL ABOVE

HOTBLOC

800 crs

Light

(North/South Taupo)

= 220 kg/m²
 = 2.16 kPa
 Height (h) = m
 Load/m = kN/m

OTHER WALL ABOVE (Specify Wall Weight)

Weight = 30 kg/m²
 = 0.29 kPa
 Height (h) = 2.40 m
 Load = 0.71 kN/m

FLOORS Tributary Length L/2

Unit/Floor = Timber

Topping = N/A

= 0.38 kPa
 Live Loading = 1.50 kPa
 Super Imposed Dead = kPa

Tributary Span = m
 Dead Load/m = kN/m
 Live Load/m = kN/m

ROOF Tributary Length = S

Light = 0.46 kPa
 Live Loading = 0.25 kPa

Tributary Span = 5.56 m
 Dead Load/m = 2.56 kN/m
 Live Load/m = 1.39 kN/m

Self Weight: = 2.93 kN/m

Loadings Summary

Slab loadings

Component	Value	Unit	Type
Walls	0.71	kN/m	Dead
Floors		kN/m	Dead
		kN/m	Live
Roof	2.56	kN/m	Dead
	1.39	kN/m	Live
Self Weight:	2.93	kN/m	Dead
Extra Dead	2.75	kN/m	Dead
Extra Live	1.65	kN/m	Live

Date : 17/05/2018
 Designer : AAF
 Checker : NL
 Job Number : 76541

Earthquake Raftfloor Design



**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : SUSPENDED INTERNAL THICKENING

Working Loads

	Dead	8.94	kN/m
	Live	3.04	kN/m
Serviceability Loads (G + 0.4Q)	Dead	8.94	kN/m
	Live	1.22	kN/m
Total Ultimate Load Intol	w =	10.2	kN/m

Design Parameters

ϕ =	0.85	
E_s or E_{st} =	20	GPa
E_c =	200	GPa
f_{cy} or f_{st} =	20.0	MPa
f_{cs} or f_{st} =	20.0	MPa

Design Bending Moment Ultimate Moment Capacity

Beam Type: Simply Supported

wlf/ 8

$$M^* = 20.31 \text{ kNm}$$

$$\phi A_s f_y (d - a/2) = \phi M_u \text{ kNm}$$

(Grade/size/No. of bars in TENSION)

3 HD12

$A_s =$	339	mm ²
$f_y =$	500	MPa
$d =$	249	mm
$\phi =$	0.85	

$$a = \frac{A_s f_y}{0.85 b f_{cs}} \quad \text{where } f_{cs} \text{ is either } f_{cs} \text{ or } f_{st}$$

$b =$	400	mm
$f_{cs} \text{ or } f_{st} =$	20.0	MPa

$$\begin{aligned} a &= 25 \text{ mm} \\ c &= a/0.85 = 29 \text{ mm} \end{aligned}$$

$$\phi M_u = 34.1 \text{ kNm} \quad \text{OK}$$

Yield Check

$$\begin{aligned} \epsilon_s &= f_y/E_s = 0.0025 \quad (\text{Yield Strain}) \\ \epsilon_c(d-c)/c &= 0.0187 \quad (\text{Act. Strain @ } M_u) \\ (\epsilon_c \text{ assumed as } 0.0025) \end{aligned}$$

$$\epsilon_c(d-c)/c - \epsilon_s = 0.0162 \quad \text{OK}$$

Deflection Check

$$I = bd^3/12 = 514608300 \text{ mm}^4$$

$$\delta = \frac{5 w l^4}{384 E I} = 3.29 \text{ mm}$$

$$\delta/L = 0.00082 \text{ L}$$

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 Checker : NL
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Earthquake Raft/floor Design



**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : SUSPENDED INTERNAL THICKENING

Shear Check

Shear strength without stirrups based on research report by P. Adebar & M.P. Collins "Shear strength of members without transverse reinforcement", Canadian Journal of Civil Engineering, v.23, n.1, 1996, pg.30-41.

Note: minimum 4 bar longitudinal reinforcement required if width of beam > 100

$$f = 0.75 \text{ (Reinforced Concrete)}$$

$$V_{max} = 20.3 \text{ kN}$$

$$V^* = 17.8 \text{ kN}$$

$$v_u = 0.24 \text{ MPa}$$

$$b' = -1285.3$$

$$c = 164.49 \text{ mm}$$

$$\epsilon_s = 0.0015$$

$$s_u = 199 \text{ mm}$$

$$\beta = 0.165$$

$$f V_u = 44.16 \text{ kN}$$

OK

$$f V_u > \text{ kN}$$

$$d_b = 6 \text{ mm}$$

$$\text{No. Legs} = 2$$

$$A_v = 56.5 \text{ mm}^2$$

$$\text{Spacing, } s = \text{ mm}$$

$$w/2$$

$$V_{max}(V/2-d)/(V/2)$$

$$\{V^*/f_y\}/(bd)$$

$$M^* = T(d-c/3)$$

$$T = e_s E_s A_s \text{ \& solve for } c \text{ strain at } M^*$$

$$\text{distance b/w steel centres}$$

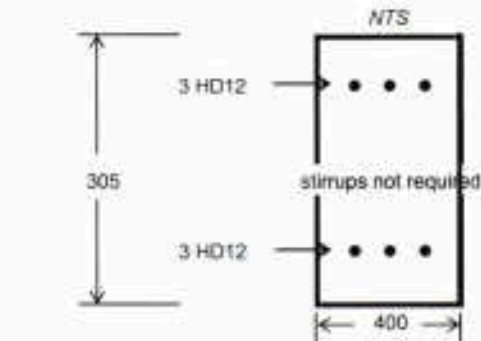
$$n/a \text{ at } M^*$$

$$= V_u/\sqrt{f'_c}/b_s s_u$$

Prescribed Lintel Design

Location on plan: (i.e. Bedroom window etc.)

SUSPENDED INTERNAL THICKENING



Reinforced Conc. Lintel

Stirrup requirements:

not required

(d/2)

Stirrup Layout:



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Earthquake Raftfloor Design

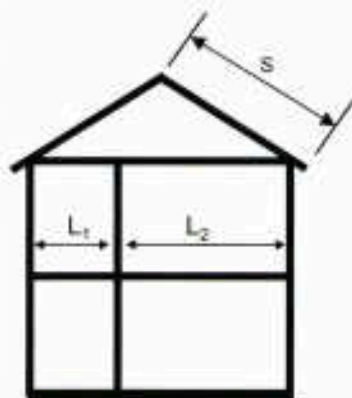


**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : STANDARD RIB

Loadings



Tributary Roof and Floor Lengths

WALLS

Lower

HOTBloc

Solid

(North/South Taupo)

Light = 400 kg/m²
 = 3.92 kPa
 Height = m
 Load/m = kN/m

Upper

HOTBloc

Solid

(North/South Taupo)

Light = 400 kg/m²
 = 3.92 kPa
 Height = m
 Load/m = kN/m

Other (Specify Wall Weight)

Weight = 30 kg/m²
 = 0.29 kPa
 Height = 2.40 m
 Load = 1 kN/m

SUSPENDED MID-FLOOR

Tributary Length = $(L_1 + L_2)/2$

Unit/Floor = Timber

Topping = N/A

= 0.38 kPa
 Live Loading = 1.50 kPa
 Super Imposed Dead = kPa

Tributary Span = m
 Dead Load/m = kN/m
 Live Load/m = kN/m

ROOF

Tributary Length = S (Check if Rafter or Truss)

Light = 0.46 kPa
 Live Loading = 0.25 kPa

Tributary Span = m
 Dead Load/m = kN/m
 Live Load/m = kN/m

Loadings Summary

Walls	0.71	kN/m	Dead
Mid Floors		kN/m	Dead
		kN/m	Live
Slab*	2.98	kN/m	Dead+SDL
	1.80	kN/m	Live
Roof		kN/m	Dead
		kN/m	Live*
Extra Dead		kN/m	Dead
Extra Live		kN/m	Live

* Includes Internal Rib Weight, SDL = 0.5 kPa LL = 1.5 kPa

* Roof LL not added if midfloor exists else LL = 0.25 kPa

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Earthquake Raftfloor Design



**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : STANDARD RIB

Working Loads

	Dead	3.68	kN/m
	Live	1.80	kN/m
Ultimate Loads (1.2G + 1.5Q)	Dead	4.42	kN/m
	Live	2.70	kN/m
Total Ultimate Load on Internal	w =	7.12	kN/m

Internal Rib Details

Rib Width =	100	mm	
Pod Depth =	220	mm	OK!
Top slab Depth =	85	mm	
Self Weight =	0.53	kN/m	
Construction Type	Standard Raft		

Standard Raft Construction

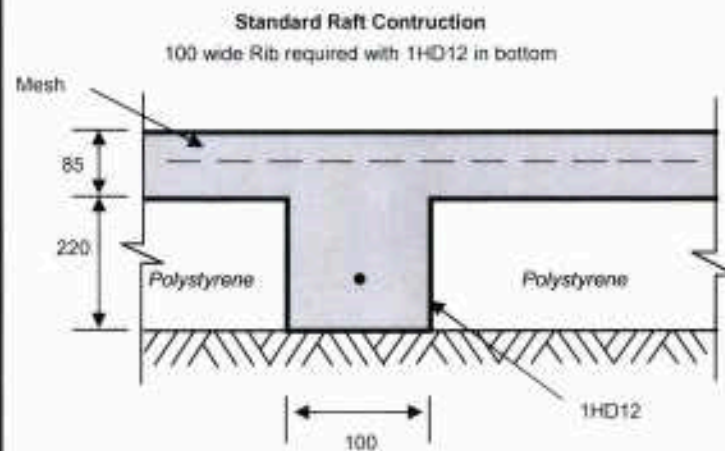
Dependable bearing capacity:	100	kPa
Bearing Check =	OK!	
Working Pressure =	44	kPa

Steel Requirements - As Per Std Drg's

Btm Steel: 1HD12

Prescribed Internal Rib Design

Location (ie: which wall):
 STANDARD RIB



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Designer : AAF
Checker : NL
Job Number : 76541

Earthquake Raftfloor Design



**WILTON
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Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
Description : Summary

Brief:

Design a raftfloor to satisfy the criteria set-out by DBH document 'Guidance on house repairs and reconstruction following the Canterbury Earthquake'

House Type:

Walls:

Lower:	Timber				=	38 kg/m ²
Height:	0 m			Load/m:	=	0.00 kN/m
Upper:	Timber				=	38 kg/m ²
Height:	m			Load/m:	=	0.00 kN/m
Other:				Weight:	=	170 kg/m ²
Height:	2.4 m			Load/m:	=	4.00 kN/m

Floor:

Unit/Floor:	Timber	Topping:	N/A	=	0.38 kPa
Tributary span:	m	Load/m:		=	0 kN/m

Roof:

Roof type:	Light				=	0.46 kPa
Tributary span:	5.56 m			Load/m:	=	2.5553 kN/m

Design Summary:

Mesh: 500E, 6.1 mm diameter @ 200 spacing on 40mm mesh chairs
concrete f_c = 20 MPa
Pods: 1100mm square, 220mm deep
Rib 1: 100mm wide rib, with 1 HD12 at top
Rib 2: 100mm wide rib, with 1 HD12 at top
HD10 to bottom of ribs
Generally: 400mm wide edgebeam with 2/ HD12 bars to top and 3/ HD12 bars to bottom
Additional:

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 Designer : AAF
 Checker : NL
 Job Number : 76541

Earthquake Raftfloor Design



**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : Edge Cantilever

A: Edge Cantilever



Section Parameters along Edge

Rib 1		Rib 2	
Rib 1 width:	100	Rib 2 width:	100
pod depth:	220	topping depth:	85
pod width:	1100		

Rib 1: Section Properties

$A =$	124000 mm ²	}	$\Rightarrow$	$I_x =$	571008938.2 mm ⁴
moment area =	8625000 mm ³			$I_{xx} =$	402333105 mm ⁴
centroid =	69.55645161 mm				

Rib 2: Section Properties

$A =$	124000 mm ²	}	$\Rightarrow$	$I_y =$	571008938.2 mm ⁴
moment area =	8625000 mm ³			$I_{yy} =$	402333105 mm ⁴
centroid =	69.55645161 mm				

Load combination to consider:

G, Eu, ΨcQ ($\Psi c=0.3$)

Loads:

load at edge, G:	5.76 kN/m	slab live load:	1.5 kPa
edge beam:	2.93 kN/m	load at edge, 0.3Q:	0 kN/m
Rib 1, G:	3.46 kN/m	Rib 1, 0.3Q:	0.54 kN/m
Rib 2, G:	3.46 kN/m	Rib 2, 0.3Q:	0.54 kN/m

Design Forces at critical sections:

$M^*_{total} =$	49.51 kNm	$M^*_{Rib1} =$	24.75 kNm
		$M^*_{Rib2} =$	24.75 kNm
$V^*_{total} =$	31.74 kN	$V^*_{Rib1} =$	15.87 kN
		$V^*_{Rib2} =$	15.87 kN

From P-frame analysis:

Max. deflection $\Delta_s =$ 3.9 mm OK

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 Designer : AAF
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 Job Number : 76541

Earthquake Raft/floor Design



**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : Edge Cantilever

Section Design - Rib 1

Bending:

mesh:	6.1 mm	200 spacing	500 MPa	87.67 kN
top reinforcement:	1 of	12 diameter	500 MPa	56.55 kN
mesh chair:	40 mm	top reinforcement, tied under mesh		
therefore d=	257.1 mm			
try f_c =	20 MPa	T =	144.22 kN	
a =	84.84 mm	c =	99.81 mm	OK, less than 0.75cb
$\phi M_{Rib,1}$ =	26.32 kNm	$M^*_{Rib,1}$ =	24.75 kNm	OK

Shear:

p_n =	0.01121876	v_c =	0.803 MPa	
$\phi V_{Rib,1}$ =	15.48 kN	$V^*_{Rib,1}$ =	15.87 kN	not OK try adding steel fibres

If shear exceeded, try adding 10kg/m3 steel fibres (to section below topping concrete only):

$V_{st} = 0.7 k_f k_1 l_{ef} b_w d$	$k_f = 1.84302506$	$\rightarrow$	1.5
	$k_1 = 1.88197381$		
$l_{ef} =$	0.12 MPa	$f_{stk,s} =$	1.0 MPa
$\phi V_{Rib,1,ef} =$	4.57 kN		
$\phi V_{Rib,1,total} =$	20.05 kN	$V^*_{Rib,1} =$	15.87 kN
			OK

Section Design - Rib 2

Bending:

mesh:	6.1 mm	200 spacing	500 MPa	87.67 kN
top reinforcement:	1 of	12 diameter	500 MPa	56.55 kN
mesh chair:	40 mm	top reinforcement, tied under mesh		
therefore d=	257.1 mm			
try f_c =	20 MPa	T =	144.22 kN	
a =	84.84 mm	c =	99.81 mm	OK, less than 0.75cb
$\phi M_{Rib,2}$ =	26.32 kNm	$M^*_{Rib,2}$ =	24.75 kNm	OK

Shear:

p_n =	0.01121876	v_c =	0.803 MPa	
$\phi V_{Rib,2}$ =	15.48 kN	$V^*_{Rib,2}$ =	15.87 kN	not OK try adding steel fibres

If shear exceeded, try adding 10kg/m3 steel fibres (to section below topping concrete only):

$V_{st} = 0.7 k_f k_1 l_{ef} b_w d$	$k_f = 1.84302506$	$\rightarrow$	1.5
	$k_1 = 1.88197381$		
$l_{ef} =$	0.12 MPa	$f_{stk,s} =$	1.0 MPa
$\phi V_{Rib,2,ef} =$	4.57 kN		
$\phi V_{Rib,2,total} =$	20.05 kN	$V^*_{Rib,2} =$	15.87 kN
			OK

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Earthquake Raftfloor Design



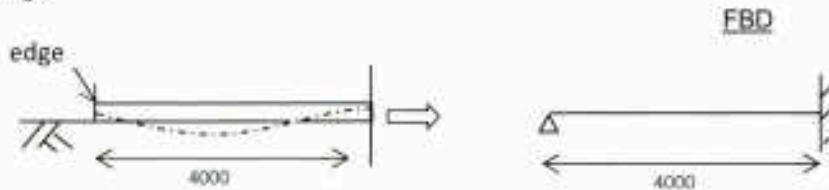
**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : Floor

A: Loss of support (4.0m) under slab

Scenario 1 - near edge:



Scenario 2 - within slab:



Comment: Scenario 1 would yield higher forces & deflections compared to scenario 2.

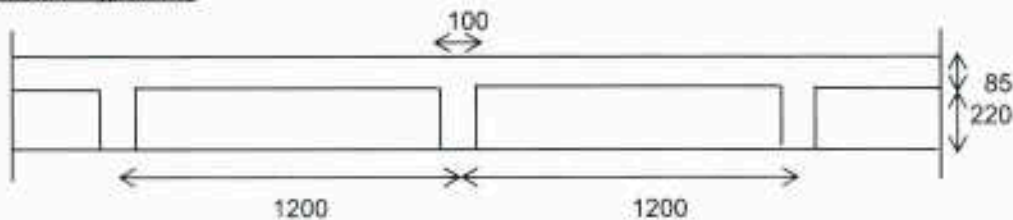
Loadings:

Self weight of raftslab: 3.460 kN/m, per rib
 Domestic live load: 1.8 kN/m, per rib

Load combination to consider:

G, Eu, $\psi_e Q$ ($\psi_e = 0.3$)

Section Parameters: Typical Rib



T-section per each rib:

A =	124000 mm ²	}	⇒	I _g =	571008938.2 mm ⁴
moment area =	8625000 mm ³				
centroid =	69.55645161 mm				
f _r =	2.68 MPa				
M _{cr+} =	6.51 kNm				
M _{cr-} =	22.03 kNm				

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Earthquake Raftfloor Design



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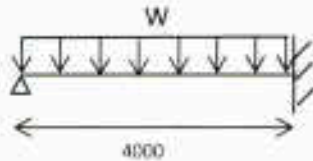
Site Address : Lot 70, 16 Oakland Place
 Description : Floor

Analysis:

Under loads given previous, UDL (w):

$$G = 3.46 \text{ kN/m}$$

$$\psi_c Q = 0.54 \text{ kN/m} \quad (\psi_c = 0.3)$$



From P-frame analysis:

$$M^{*+} = 4.52 \text{ kNm} < M_{cr+} = 6.51 \text{ kNm}$$

$$M^{*-} = 7.94 \text{ kNm} < M_{cr-} = 22.03 \text{ kNm} \quad \left. \vphantom{\begin{matrix} M^{*+} \\ M^{*-} \end{matrix}} \right\} l_e = l_g$$

$$\text{Max. deflection } \Delta = 0.48 \text{ mm} \quad \text{OK!}$$

Check strength:

Positive strength - 10 mm diameter 500 MPa

$$T = 39.27 \text{ kN} \quad d = 250.00 \text{ mm}$$

$$a = 3.25 \text{ mm}$$

$$\Rightarrow eM^{*+} = 8.29 \text{ kNm} > M^{*+} \quad \text{OK!}$$

Negative strength - only mesh considered

$$T = 87.67 \text{ kN} \quad d = 263.05 \text{ mm}$$

$$a = 51.57 \text{ mm}$$

$$\Rightarrow eM^{*-} = 17.68 \text{ kNm} > M^{*-} \quad \text{OK!}$$

Shear:

$$V_{max} = 10.0 \text{ kN} \quad (\text{from P-frame analysis})$$

$$V^* = 8.5 \text{ kN} \quad (\text{from P-frame analysis, 263.05mm from support})$$

$$p_w = 0.00667 \quad v_k = 0.811 \text{ Mpa}$$

$$\Rightarrow eV_c = 11.88 \text{ kN} > V^* \quad \text{OK!}$$

$$v_c = 0.602 \text{ Mpa}$$

If shear exceeded, try adding 10kg/m3 steel fibres (to section below topping concrete only):

$$V_{Rd1} = 0.7 k_f k_1 l_{fy} b_w d \quad k_1 = 1.823987835 \rightarrow 1.5$$

$$l_{fy} = 0.12 \text{ MPa} \quad f_{yk,s} = 1.0 \text{ MPa}$$

$$\phi V_{Rd1,CM} = 4.65 \text{ kN}$$

$$\phi V_{Rd1,tot} = 16.53 \text{ kN} \quad V_{Rd1}^* = 8.53 \text{ kN} \quad \text{OK}$$

Date : 17/05/2018
 Designer : AAF
 Checker : NL
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Earthquake Raftfloor Design



**WILTON
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Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : Edge Beam

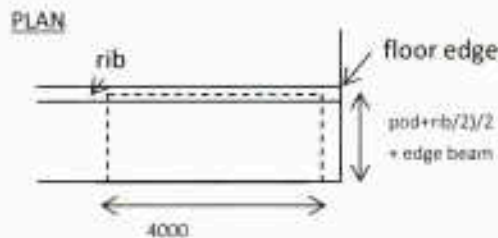
B: Loss of support (4.0m) under edge beam

As per case A, worst case is scenario 1 where happens near the edge.

Loadings:

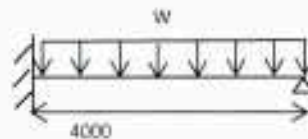
wall load:	3.20 kN/m	
roof load:	2.56 kN/m	
floor load:	0 kN/m	(G only)
Self weight of raftslab:	3.46 kPa	
live load:	1.5 kPa	

Consider failure of support as illustrated:



Hence, edge beam to support 1000mm of floor at worst point.

Edge beam: 400 mm wide



Floor weight

G=	1.90 kN/m
Q=	1.20 kN/m

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 Designer: AAF
 Checker: NL
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Earthquake Raftfloor Design

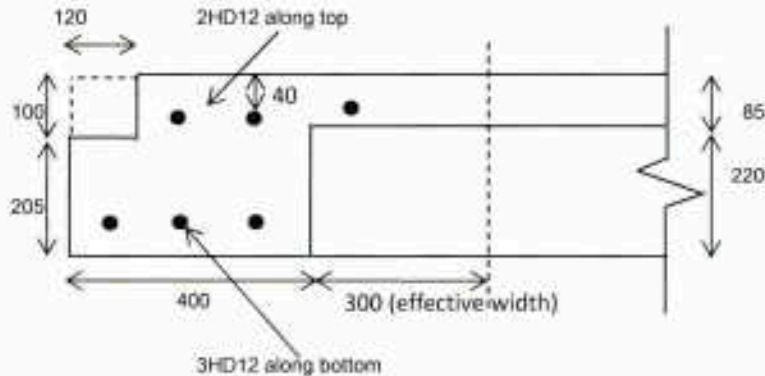


**WILTON
JOUBERT**

Consulting Engineers

Site Address: Lot 70, 16 Oakland Place
 Description: Edge Beam

Section properties:



$A = 135500 \text{ mm}^2$
 moment area = 19088750 mm^3
 centroid = 140.8763838 mm
 $I_r = 2.68 \text{ Mpa}$
 $M_{cr+} = 18.23 \text{ kNm}$
 $M_{cr-} = 21.24 \text{ kNm}$
 $I_g = 1115275096 \text{ mm}^4$

Analysis:

From P-frame analysis:

$M^+ = 12.3 \text{ kNm}$ < $M_{cr+} = 18.23 \text{ kNm}$
 $M^- = 21.8 \text{ kNm}$ > $M_{cr-} = 21.24 \text{ kNm}$ } *calc I_g

Max. deflection $\Delta = 0.67 \text{ mm}$ OK! $I_g = 1072176126 \text{ mm}^4$

Check strength:

Negative strength

$T = 113.10 \text{ kN}$
 $a = 22.33 \text{ mm}$
 $\Rightarrow \phi M_n = 31.44 \text{ kNm}$ > M^- OK!
 $T_{mesh} = 38.72 \text{ kN}$
 $d = 254.82 \text{ mm}$

Positive strength

$T = 169.65 \text{ kN}$
 $a = 24.95 \text{ mm}$
 $\Rightarrow \phi M_n = 34.11 \text{ kNm}$ > M^+ OK!
 $d = 249 \text{ mm}$

Shear

$V_{max} = 27.4 \text{ kN}$ (from P-frame analysis)
 $V^* = 23.8 \text{ kN}$ (from P-frame analysis, 254mm from support)

$\rho_w = 0.00296$
 $\Rightarrow \phi V_c = 33.60 \text{ kN}$ > V^* OK!
 $v_{cr} = 0.446 \text{ Mpa}$
 $v_c = 0.440 \text{ Mpa}$

If shear exceeded, try adding 10kg/m3 steel fibres (to section below topping concrete only):

$V_{f1} = 0.7 k_1 k_2 I_{ef} b_w d$
 $k_1 = 1.10841055 \rightarrow 1.10841055$
 $k_2 = 1.885930447$

$I_{ef} = 0.12 \text{ MPa}$
 $\phi V_{f1,1.5d} = 13.42 \text{ kN}$
 $\phi V_{f1,1.5d} = 47.03 \text{ kN}$
 $f_{RCA} = 1.0 \text{ MPa}$
 $V^*_{RST} = 23.80 \text{ kN}$ OK

Date : 17/05/2018
 Designer : AAF
 Checker : NL
 Job Number : 76541

Earthquake Raftfloor Design

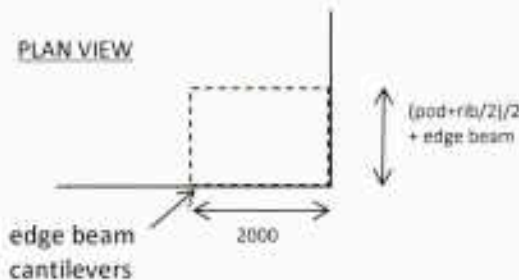


**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : Edge Beam

C: Loss of support (2.0m) at extreme of floor (outer corners)



Loadings:

wall load:	3.20 kN/m	
roof load:	2.56 kN/m	
floor load:	0 kN/m	(G only)
Self weight of raftslab:	3.46 kPa	
live load:	1.5 kPa	

Model:



G1=	1.903 kN/m
Q1=	1.2 kNm

Section property as per previous

Analysis:

From P-frame analysis:

M ⁺ =	22.0 kNm	> 1	M _{cr} =	21.24 kNm	*calc le
Max. deflection δ =	0.95 mm	OK!	le =	1004024096 mm ⁴	

Check strength:

Negative strength:

T =	113.10 kN	T mesh =	38.72 kN
a =	22.33 mm	d =	254.82 mm
⇒ eM _n =	31.44 kNm	>	M ⁺ OK!

Shear:

V_{max}	21.9 kN	(from P-frame analysis)	
V^+	19.7 kN	(from P-frame analysis, 254mm from support)	
p_h	0.00298	v_h	0.446 Mpa
		v_s	0.440 Mpa
 eV_c	33.60 kN	>	V^+ OK!

If shear exceeded, try adding 10kg/m³ steel fibres (to section below topping concrete only):

V _{sl} =	0.7 k ₁ k ₂ l _{ef} b _w d	k ₁ =	1.10841055	→	1.10841055
		k ₂ =	1.885930447		
l _{ef} =	0.12 MPa	f _{yk,4} =	1.0 MPa		
φ V _{RB,1.50} =	13.42 kN	V _{RB,1} =	19.70 kN	OK!	
φ V _{RB,1.000} =	47.03 kN				

Date : 17/05/2018
 Designer : AAF
 Checker : NL
 Job Number : 76541

Earthquake Raftfloor Design



**WILTON
JOUBERT**

Consulting Engineers

Site Address : Lot 70, 16 Oakland Place
 Description : SLIDING RESITANCE

Calculation of Shear Pile Requirements

Use AS1170 design philosophy of preventing damaging movement up to an SLS event, and thereafter accepting increasing levels of damage as the event increases.

Assumed Class C soil.

City/Town: Rotorua

$C(t) = Ch(t) Z R N(T, D)$

$Ch(t)$ 2.36

Z 0.24

R_s (25 yr RP) 0.25

R_u 500yr 1

$N(T, D)$ 1 SLS

$C(t)$ SLS 0.14

$C(t)$ ULS 0.57

Assume $T1 = 0.4$

$k_u = 1 + (u-1)T1/0.7$

$k_u = 1$

$C_d(T1) = C(t) Sp/k_u$

For base sliding $Sp = 1.0$

SLS $C_d(T1) = 0.14$

Note for Class D soil SLS $C_d(t1) = 0.18$

ULS $C_d(T1) = 0.50$

ULS $C_d(t1) = 0.63$

Testing by Dr McManus University of Canterbury (Geotechnical Society Symposium, 2003) found the friction co-efficient of slab on polythene on sand had peak friction co-efficients of 0.42 for an unloaded slab and 0.53 for a loaded slab. Residual friction coefficient were 0.38 and 0.49 respectively.

These values are some what lower than that published by other sources, normally 0.7 peak and 0.5 residual.

Even using the lower values there will be no relative movement between the slab and the ground at SLS level event on either Class C or D. At ULS level event there may be relative movement between the slab and the ground, this may break services to the house, but will also serve to reduce the forces transferred to the structure of the house. This is acceptable within the intent of NZS 1170.5 2004.

However as the foundation is founded on 2 layers of DPM, the above assumptions are no longer accurate as it does not reference the friction co-efficient of slab on polythene on polythene, therefore shear keys will be required to support the house in shear.

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108 Lunn Ave
Auckland,

16 Oakland Place

GRAPHICAL RESULTS - Ld Comb 1 G & 0.3Q->Deflec
Engineer: AAF

0.0000

Wilton Joubert Ltd.

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Auckland,

16 Oakland Place

Filename: D:\K:\SW11\DATA\BENTON\PROJECTS\2019\KAW FLEET\BENTON\2019\COMBINED\LOT 16 - 16 OAKLAND PLACE\CA000014

GRAPHICAL RESULTS - Ld Comb 1 G & 0.3Q->Moment

Engineer: AAF



Wilton Joubert Ltd.

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Auckland,

16 Oakland Place

GRAPHICAL RESULTS - Ld Comb 1 G & 0.3Q->Moment
Engineer: Wilton Joubert Ltd.



Wilton Joubert Ltd.

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Auckland,

16 Oakland Place

Filename: \\WFL00011\DATA\BENDER\BENKAW16-16-20-16-WILTON.JOB File: \\WFL00011\DATA\BENDER\BENKAW16-16-20-16-WILTON.JOB

GRAPHICAL RESULTS - Ld Comb 1 G & 0.3Q->Moment

Engineer: AAF



108 Lunn Ave
Auckland.

16 Oakland Place

GRAPHICAL RESULTS - Ld Comb 1 G & 0.3Q > Shear For
Engineer: AAF



Wilton Joubert Ltd.

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16 Oakland Place

GRAPHICAL RESULTS - Ld Comb 1 G & 0.3Q->Shear For

Engineer: Wilton Joubert Ltd.



Wilton Joubert Ltd.

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Filename: \\SR-00011\DATA\BENCHM\WB FILE\2019_KB FILES\7960 - 16\2019\001\541-1\001.TL 16 OAKLAND PLACE\CALCULATIONS

GRAPHICAL RESULTS - Ld Comb 1 G & 0.3Q->Shear For
Engineer: AAF



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GRAPHICAL RESULTS - Ld Comb 1 G & 0.3Q->Deflections
Engineer: AAF



P-FRAME

Standard Version 9.02

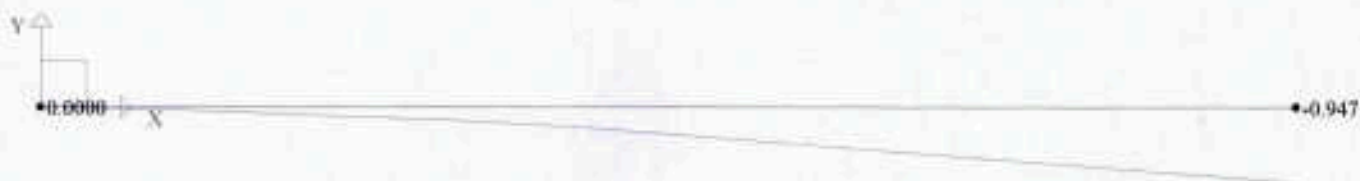
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GRAPHICAL RESULTS - Ld Comb 1 G & 0.3Q -> Deflections
Engineer: AAF



P-FRAME

Standard Version 9.02

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SLIDING RESISTANCE

<Job No.> 76541
<Job Title> Lot 70, 16 Oakland Place
<Description> Sliding Resistance

Date: 17/5/2018
Designer: AAF
Checker: NL

Horizontal Loadings

$$V = C \cdot Wt \quad C = C_n(T_1) \cdot Z \cdot R \cdot N(T, D) \cdot S_n / k_a$$

Limit state:

assumed subsoil category (b)

Subsoil Class: D
 $\mu = 1.25$
 $C_n(T_1) = 3$
 $Z = 0.24$
 $R = 0.25$
 $N(T, D) = 1$
 $S_n = 1$
assume $T_1 = 0.4$
then $k_a = 1.14$
 $C_d = 0.158$ then $C = 0.158$
or greater than = 0.008

Testing by Dr McManus University of Canterbury (Geotechnical Society Symposium, 2003) found the friction co-efficient of slab on polythene on sand had peak friction co-efficients of 0.42 for an unloaded slab and 0.53 for a loaded slab. Residual friction coefficient were 0.38 and 0.49 respectively.

Sliding resistance is given by:

$$R = 0 \quad Wt$$

not OK. $R < V$, provide shear keys

Building Weight

(only required if $R < V$)

Building weight = 409 kN
(from Wall Loadings Sheet)
Total floor slab area = 228.9 m²
slab perimeter = 82 m
edge beam width = 400 mm
topping thickness = 85 mm
pod depth = 220 mm
internal rib width = 100 mm
pod dimension 1 = 1100 mm
pod dimension 2 = 1100 mm
total volume = 69.8 m³
pod volume = 36.4 m³
net concrete volume = 33.4 m³
weight of slab = 819 kN
live load over slab, $q_b = 1.5$ kPa
 $q_s = 0.6$ kPa
 $Q_d = 137$ kN
total weight, $Wt = 1366$ kN
 $C = 0.16$
 $V = 215.2$ kN
resistance provided, $R = 0.0$ kN
to be prov. by shear keys = 215.2 kN
resistance from each shear key, $F = 12.5$ kN - see following page
number of shear keys required = 17



**WILTON
JOUBERT**

Consulting Engineers

SLIDING RESISTANCE

<Job No.>: 76541
<Job Title>: Lot 70, 16 Oakland Place
<Description>: Sliding Resistance

Date: 17/5/2018
Designer: AAF
Checker: NL

Horizontal Loadings

$$V = C \cdot Wt \quad C = C_M(T_1) \cdot Z \cdot R \cdot N(T,D) \cdot S_p / k_b$$

Limit state:

assumed subsoil category (b)

$C_M(T_1) = 3$
 $Z = 0.24$
 $R = 1$
 $N(T,D) = 1$
 $S_p = 0.925$
 assume $T_1 = 0.4$
 then $k_b = 1.14$
 $C_d = 0.583$
 or greater than = 0.032

Subsoil Class: D

$\mu = 1.25$

then $C = 0.583$

Testing by Dr McManus University of Canterbury (Geotechnical Society Symposium, 2003) found the friction co-efficient of slab on polythene on sand had peak friction co-efficients of 0.42 for an unloaded slab and 0.53 for a loaded slab. Residual friction coefficient were 0.38 and 0.49 respectively.

Polythene sheet should rip at design seismic loads as it is 0.2mm thin, and the sand will be acting as 'sandpaper'.
Sliding resistance is given by:

$$R = 0.38 \quad Wt$$

not OK. $R < V$, provide shear keys

Building Weight

(only required if $R < V$)

Building weight = 409 kN
(from Wall Loadings Sheet)

Total floor slab area = 228.9 m²
slab perimeter = 82 m

edge beam width = 400 mm
topping thickness = 85 mm
pod depth = 220 mm
internal rib width = 100 mm

pod dimension 1 = 1100 mm
pod dimension 2 = 1100 mm

total volume = 69.8 m³
pod volume = 36.4 m³
net concrete volume = 33.4 m³
weight of slab = 819 kN

live load over slab, $q_b = 1.5$ kPa
 $q_u = 0.6$ kPa
 $Q_u = 137$ kN

total weight, $Wt = 1366$ kN
 $C = 0.58$
 $V = 796.1$ kN

resistance provided, $R = 519.1$ kN
to be prov. by shear keys = 277.0 kN

resistance from each shear key, $F = 12.5$ kN - see following page

number of shear keys required = 22



**WILTON
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Consulting Engineers

SHEAR PILE RESISTANCE

<Job No.>: 76541
<Job Title>: Lot 70, 16 Oakland Place
<Description>: Shear Pile Resistance

Date: 17/5/2018
Designer: AAF
Checker: NL

Pile strength

Pile diameter = 300 mm
equivalent square = 212 mm
reinforcement diameter = 12 mm (or 2/HD12)
reinforcement yield = 500 MPa

$T = 56.5$ kN
 $a = 17.9$ mm
 $M_u = 5.5$ kNm
say at $0.7 \cdot M_u$, $M^* = 3.84$ kNm

assuming $f_c' = 17.5$ MPa

shear in concrete, $v_u = 0.40$ MPa
 $V_c = 17.91$ kN
 $0.7 \cdot V_c = 12.54$ kN

undrained soil strength, $c_u = 50$ kPa
safety factor, $SF = 1.43$
 $S_u = c_u / SF = 35.0$ kPa

Brom's method for analysis

resolve horizontally, $H_u = 9 S_u d f$
 $f = H_u / 9 S_u d$

taking moments about lower hinge, and solving for H_u :

$$H_u = S_u d^2 \{ 13.5 [\sqrt{1 + 16 M^* / 81.1 S_u d^3}] - 1 \}$$

$H_u = 12.5$ kN
 $f = 0.13$ m
<- this value to calculate depth of pile based on 'short pile' analysis

'Short Pile' analysis

equivalent height, $e = 0.31$ m
therefore $e' = e + 1.5d = 0.76$ m
 $\beta = H_u / 9 S_u d = 0.13$ m

Taking moments about point O and simplifying gives:

$$L' = \beta [1 + \sqrt{2 (1 + (2 e' / \beta)) }]$$

$$= 0.79 \text{ m}$$

Pile depth, $L = 1.10$ m

Resistance provided by 300mm concrete shear key 1.1m into the ground:

$F = 12.5$ kN



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WALL LOADINGS

<Job No.> 76541
<Job Title> Lot 70, 16 Oakland Place
<Description> Loadings

Date: 17/5/2018
Designer: AAF
Checker: NL

Upper Floor

WALLS

Upper Floor Wall Height = m

Type 1

HOTBLOC 2.36 Light
Solid = 400 kg/m²
= 3.92 kPa
Length = m
Load = kN

Type 2

20 Series Light
Solid = 400 kg/m²
= 3.92 kPa
Length = m
Load = kN

Type 3

Timber
= 30 kg/m²
= 0.29 kPa
Length = m
Load = kN

Other (Specify Wall Weight)

Weight = kg/m²
= kPa
Length = m
Load = kN

FLOOR

Tributary Midfloor Area = m²

Timber Floor Type
N/A Topping depth

Dead Load = 0.38 kPa
Live Loading = kPa
Super Imposed Dead = kPa
Dead Load = kN
Live Load/m = kN

ROOF

Tributary Roof Area = m²

Light = 0.46 kPa
Live Loading = kPa
Dead Load = kN
Live Load = kN

Other Loads

Details

Dead Load = kN
Live Load = kN



**WILTON
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WALL LOADINGS

76541

Job Number

76541

Title:

Lot 70, 16 Oakland Place

Ground Floor

WALLS

Ground Floor Wall Height = 2.4 m

Type 1

20 Series

Light

800 c/s

Length

Load

= 220 kg/m²
= 2.16 kPa
= m
= kN

Type 2

20 Series

Light

800 c/s

Length

Load

= 220 kg/m²
= 2.16 kPa
= m
= kN

Type 3

Timber

Length

Load

= 30 kg/m²
= 0.29 kPa
= 82.0 m
= 58 kN

Other (Specify Wall Weight)

Weight

Length

Load

= 170 kg/m²
= 1.67 kPa
= 72 m
= 289 kN

ROOF

Tributary Roof Area = 262 m²

Light

Live Loading

Dead Load

Live Load

= 0.46 kPa
= 120.52 kN
= kN

Loadings Summary

Upper:

Roof

Walls

Floor

Other

Total =

kN
kN
kN
kN
kN

Ground:

Roof

Walls

Total =

121 kN
289 kN
409 kN

assuming 80%

Total Seismic Weight:

409 kN

GENERAL

1. Do not scale from drawings. These drawings are to be read in conjunction with the architectural drawings and all other related documents. Refer to architectural drawings for dimensions, details & notes.
2. Contact the architect/engineer if any discrepancies are found.
3. Under no circumstances shall polystyrene spacers be used. Use recommended spacers as per details provided.
4. DPM shall be in accordance with NZS3604 (polyethylene sheet, min. 0.25mm). All penetrations through the DPM must be sealed.
5. A layer of sand/sinking or glasser fines (GAP?) shall be placed, screeded and compacted over the building platform. The maximum thickness of this layer shall be no more than 50mm.
6. All service trenches shall be properly backfilled and compacted.
7. Where underfloor heating is installed, floor topping shall be minimum 110mm.
8. Concrete polishing/grinding has not been allowed for in this design. Please advise Wilton Joubert Ltd if it is intended for the floor to be polished/grinded.
9. Polystyrene pods shall be: 1100 x 1100 x 220mm.

CONCRETE

1. All concrete work and materials shall conform to NZS3109 and applicable building consent authority regulations.
2. No cuts shall be made to the floor other than those shown on the drawings.
3. Unless otherwise noted, concrete shall be:
20MPa concrete with Fy_{0.2} 475N/mm² for min. for 25MPa concrete with Fy_{0.2} 500N/mm² (see also clause 4.1.1)

REINFORCEMENT

1. Unless otherwise specified, all reinforcement shall be Ductility Class E, in accordance with NZS 4671.
2. All joint splicing shall comply with NZS 3109. Re-lapping of reinforcement is not permitted. 'Spot' welding of reinforcement is not permitted.
3. All mesh reinforcement shall be Ductility Class E as per NZS 4671.
4. Unless otherwise specified by proprietary product specifications, mesh shall be topped a minimum of 250mm or by a grid plus 50mm, whichever is greater.
5. Unless otherwise specified on plans, minimum covers are:
exposed to path: 75mm
exposed to edge: 50mm
protected by damp proofing: 50mm
6. Unless otherwise specified, reinforcement laps are:

Reinforcement Grade	Nomination	min. lap (whichever is greater)	concrete strength (MPa)
300	'D'	400 or min. 500mm	all blackfill, 20 and 25
500	'HD'	700	all blackfill
500	'HD'	560	20
500	'HD'	500	25

SITE CONDITIONS

1. Design based on soils report/assessment by: O'Brien Geotech Ltd
Ref: 583
Date: May 2017

Specifically: Design based on all unsuitable material removed and uniform soils across building platform with a desired Ultimate bearing capacity of: 200 kPa, subject to engineers confirmation.

Design based on TC2 requirements as detailed in MBE Guidance Document December 2012.

INSPECTIONS

1. Check the BUILDING-CONSENT CONDITIONS for any inspections that are required by the Building Consent Authority (BCA).
2. If BCA requires PS4 to be issued for inspections, a local engineer may be engaged to carry out such inspections and issue a PS4 accordingly.

NOTES



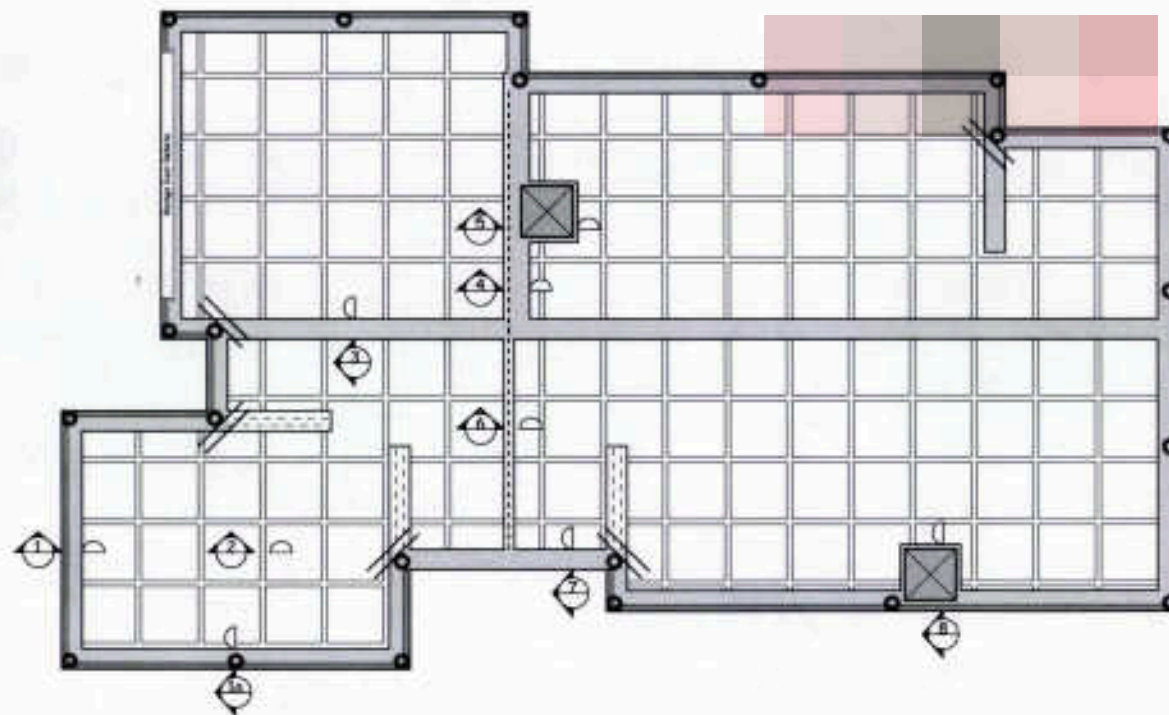
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Consulting Engineers

Northland: 09 945 4288
Auckland - Waikato: 09 527 0356
Canterbury: 03 824 0611
Southern Lakes: 03 443 8829
www.wiltonjoubert.co.nz

Proposed Residence:
 Lot 70 DP 589915
 16 Oaklands Place
 Napier, Bay of Plenty

General Notes

AAP	NH
NL	
Job # 76541	50



Ribraft Floor Plan

Scale 1:100

Legend:

- 1. Ribraft corner steel
200 x 2 x 1200mm
at 200mm
- 2. Ribraft
20mm deep, 20mm wide,
cut into edge beam
- 3. 400mm x 500mm
edge beam extension
cutting off side at corner
(12.0m maximum)
with 10mm 550mm
- 4. Ribraft (20mm deep,
20mm wide, cut into edge beam)
- 5. 500mm Shear Key (120 x 120mm,
1.1m below DGL)

Quantities of Spacing

(Quantities are approximate
and should be used as a guide only)

Item	Qty
1. Ribraft Corner Steel	250
2. Ribraft Edge Beam	115

NOTES:

Do not scale from Drawings.
Refer Architectural Drawings for
overall dimensions. To be read in
conjunction with all other related
documents.

Rev	Description	Date

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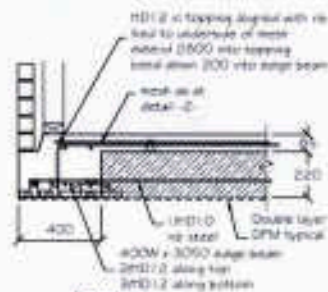
Proposed Residence
Lot 70 DP 589915
16 Oaklands Place
Napapitahi, Bay of Plenty

Ribraft Floor
Plan

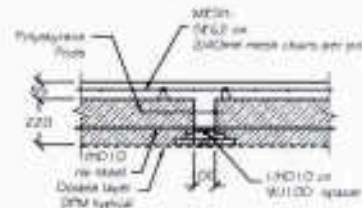
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Job # 76541

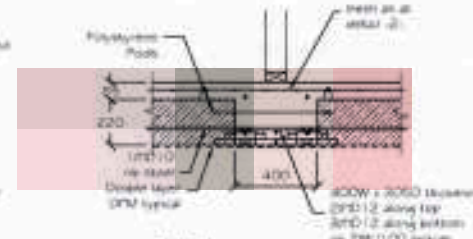
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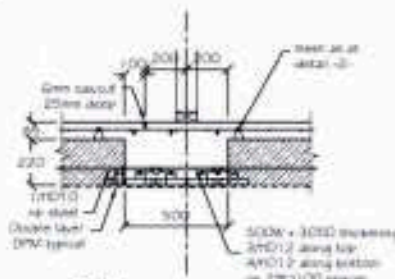
Detail
Raftfloor Edge Beam - 400
Scale 1:25



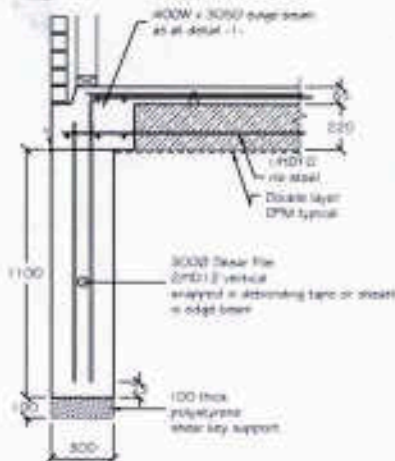
Detail
Raftfloor Internal Rib - 100
Scale 1:25



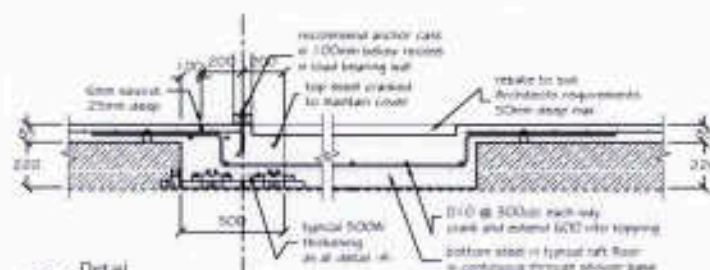
Detail
Raftfloor Internal Rib - 400
Scale 1:25



Detail
Raftfloor Internal Rib - 500
with Sawcut
Scale 1:25



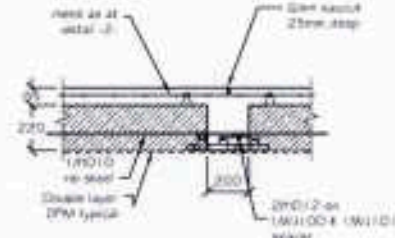
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Raftfloor Edge Beam - 400
Scale 1:25



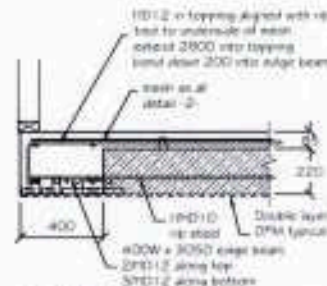
Detail
Raftfloor Solid Floor
Shower Setdown
Scale 1:25

NOTE:

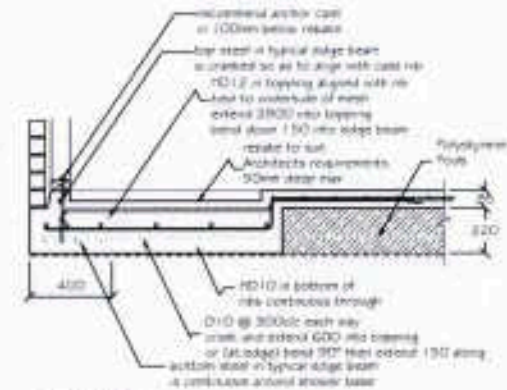
Allow for Ribs and/or
Thickenings as may be shown on plan



Detail
Raftfloor Internal Rib - 200
with Sawcut
Scale 1:25



Detail
Raftfloor Edge Beam - 400
Scale 1:25



Detail
Raftfloor Edge Beam - 400
Scale 1:25

Double DPM Layer: DPM to generally comply with Clauses 7.5.4 to 7.5.7 of NZS3604:2011.
Two layers of 0.25mm polythene to be used, one for each layer to be staggered. Laps to be typical.

NOTES:
Do not scale from drawings.
Refer Architectural Drawings for
overall dimensions. To be read in
conjunction with all other related
documents.

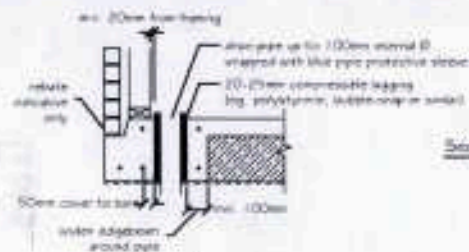
Drawn	Checked	Date

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Christchurch: 03 324 0623
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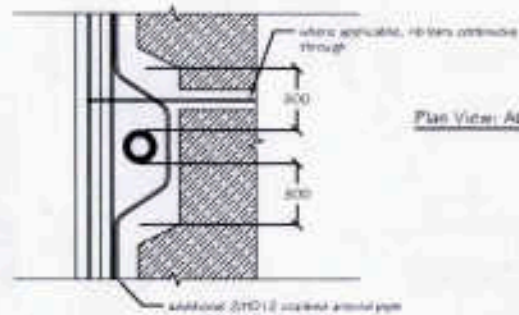
Proposed Residence
Lot 70 DP 389915
16 Oaklands Place
Ngaurupia, Bay of Plenty

RiRaft Floor
Details

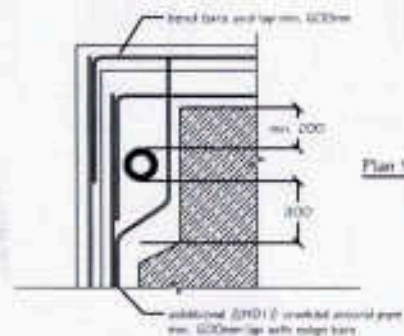
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Check: N	Rev: 1.1
Date: 1.1.20	Date: 1.1.20
Job # 76541	52



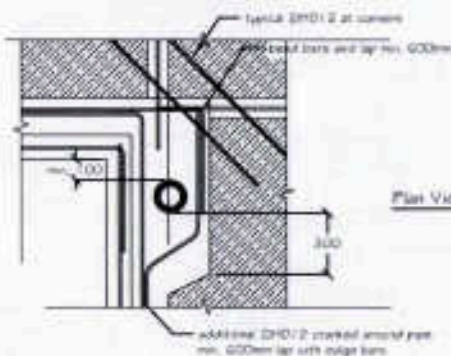
Section View At Edge



Plan View At Edge

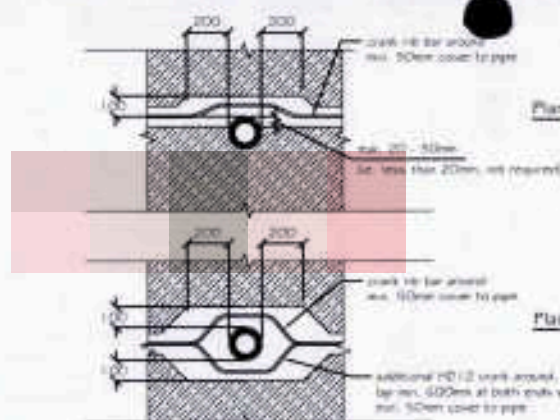


Plan View At Open Corner

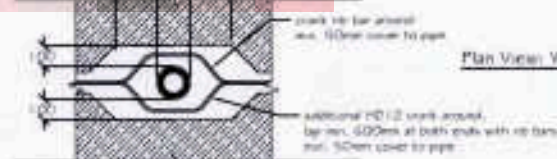


Plan View At Closed Corner

Typical Detail Around Pipes
Raftfloor Edge Beam

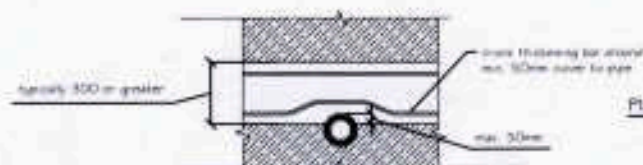


Plan View At Rib Edge

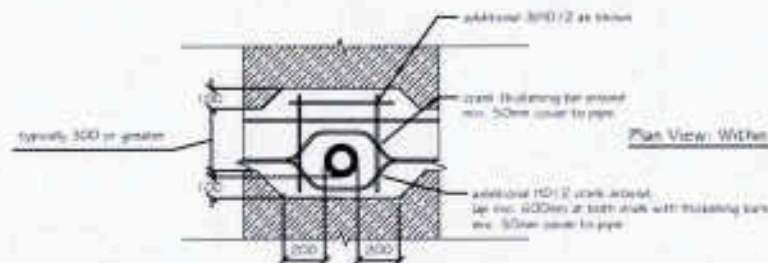


Plan View Within Rib

Typical Detail Around Pipes
Raftfloor Internal Ribs



Plan View At Thickening Edge



Plan View Within Thickening

Typical Detail Around Pipes
Raftfloor Internal Thickenings

NOTES:

These details are applicable where plumbing/services are conveyed underground. Services are to be taken through polystyrene pods as much as possible. If this is unavoidable, it may be taken through ribs/thickenings, provided the details (or similar in principle) on this sheet are used.

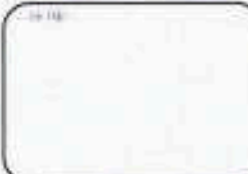
All service trench backfill shall be properly compacted.

Member sizes and reinforcing shown are indicative only, details shown on raftslab plan & details shall take precedence over the details shown here.

NOTES

WILTON JOUBERT
Consulting Engineers

Northland: 09 945 4188
Auckland/Whakatane: 09 927 9196
Canterbury: 021 924 000
Southern Lakes: 03 445 6208
www.wiltonjoubert.co.nz



Typical Pipe Details

D1



New Zealand
Institute of Architects
Incorporated



Building Code Clause(s).....

PRODUCER STATEMENT – PS1 – DESIGN

(Guidance on use of Producer Statements (formerly page 2) is available at www.engineeringnz.org)

ISSUED BY: Wilton Joubert Ltd.
(Design Firm)

TO: Mark Lam c/o Gourlay Homes
(Owner/Developer)

TO BE SUPPLIED TO: Mark Lam c/o Gourlay Homes Council
(Building Consent Authority)

IN RESPECT OF: TC2 Raft/floor design
(Description of Building Work)

AT: 16 Oakland Place, Ngongotaha, Bay of Plenty
(Address)

Town/City: Ngongotaha LOT 70 DP 389915 SO
(Address)

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

(Extent of Engagement)
services in respect of the requirements of Clause(s) B1 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
(verification method/acceptable solution)

☒ Alternative solution as per the attached schedule MBIE Guidance Document December 2012

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

Lot 70 DP 389915 16 Oakland Place Ngongotaha, Bay of Plenty and numbered S0-S2, D1, Figure 10
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 as per Geotechnical Report by O'Brien Geotech. Ref:583 Date: May 2017
- (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, David Lau am: ☒ CPEng 221906 # ☐ Reg Arch #
(Name of Design Professional)

I am a member of: ☒ Engineering New Zealand ☐ NZIA and hold the following qualifications: BE(Hon)LPD, CMEngNZ, CPEng, MPE

The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than \$200,000*.

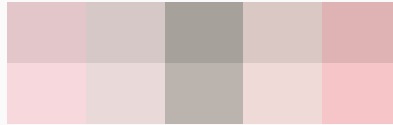
The Design Firm is a member of ACENZ: ☐

SIGNED BY: David Lau (Signature)
(Name of Design Professional)

ON BEHALF OF: Wilton Joubert Ltd. Date: 22/05/2018
(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 ACENZ, ENGINEERING NEW ZEALAND AND NZIA



To the BCA

Site address: 16 Oakland Place, Ngongotaha, Bay of Plenty

Dear Sir / Madam,

B2 Compliance

You have requested a Producer Statement for Design – PS1 for Clause B2 of the Building Code – Structural Durability. Based on advice by Engineering New Zealand, we are not able to provide this because there is no effective verification method for B2 contained within the Building Code.

However, we can confirm that for the structural elements shown in our documentation:

Timber

Timber treatment has been selected in accordance with Table 1A of B2/AS1. In general this is already covered by the submitted architectural drawings.

Concrete & Masonry

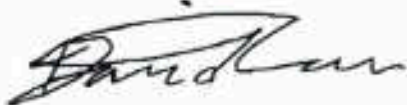
Concrete covers have been selected in accordance with NZS3101, Part 1, Section 3. Masonry as per NZS4230, Table 4.1.

Mild Steel

Generally, steel member/connections requirements as per NZS3604:2011 or proprietary coatings to comply with AS/NZS2312. Otherwise, steel protection has been specified in accordance with the 'Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings' AS/NZS 2312. We note that this is on a time to first maintenance basis.

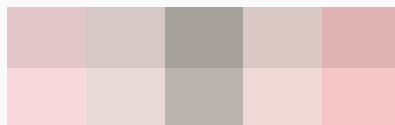
We trust this provides the information that you are seeking.

Yours faithfully



David Lau, Wilton Joubert Ltd.

Dated: 22/05/2018



PRODUCER STATEMENTS – Advisory Note

Producer Statements shall be submitted to territorial authorities or building consent authority in order for Code of Compliance Certificates to be issued. The requirement for consultants to issue the related Producer Statements may appear as a condition under the building consent documents or as a separate letter from the territorial authority or building certifier. **It is the owner's (or consent applicant) responsibility to check the building consent documentation and notify Wilton Joubert Ltd. in relation to the requirement for construction inspections required (and the subsequent PS4: Producer Statement for Construction Review) as stated on the consent documents. Please note, we cannot issue PS4 if we did not carry out the inspection.**

In order to secure our inspection services, it is strongly recommended that Wilton Joubert Ltd. be given at least 48 hours notice prior to time of inspection. Our inspections are limited to items that have been designed and detailed by us. We are also unable to inspect non-consented or unauthorised work. Building consented, stamped plans with consent numbers (or legible copy of the same) including amendments where applicable shall be made available on site during inspections.

In some cases due to the distance of the job from our offices, it may be more practical and cost effective to contact a local professional engineer to carry out the inspection, who may contact us with any questions that may arise. The engineer who carried out the inspection would subsequently be responsible for the issue of the producer statement for construction review.

The costs associated with site inspections and issuing of Producer Statements are separate from any previous work that we have been engaged for, such as engineering design of works. The costs for carrying out the inspections and related work are based on time spent travelling to site, time on site and other associated costs. Please contact us for an estimate of costs. Our assumptions are that the person(s) who arranged the inspection is responsible for payment of the fees, unless otherwise stated at time of engagement.

PO Box 8130
Remington
Whangarei 0145
T +64 9 945 41

AUCKLAND
WAIKATO
PO Box 11 381
Ellerslie
Auckland 1524
T +64 9 579 111
F +64 9 579 771

CANTERBURY
PO Box 6312
Upper Riccarton
Christchurch 84
T +64 3 341 13

SOUTHERN LAKE
PO Box 169
Waiwaka 9343
T +64 3 443 53

Memorandum from licensed building practitioner: Certificate of design work

Section 45 and section 30C, Building Act 2004

Please fill in the form as fully and correctly as possible.

If there is insufficient room on the form for requested details, please continue on another sheet and attach the additional sheet(s) to this form.

THE BUILDING

Street address: 16 Oakland Place

Suburb:

Town/City: Ngongotaha

Postcode:

THE OWNER(S)

Name(s):

Mailing address:

Suburb:

PO Box/Private Bag:

Town/City:

Postcode:

Phone number:

Email address:

BASIS FOR PROVIDING THIS MEMORANDUM

I am providing this memorandum in my role as the: Please tick the option that applies ☒

- ☐ **sole** designer of all of the RBW design outlined in this memorandum – I carried out all of the RBW design work myself – no other person will be providing any additional memoranda for the project.
- ☐ **lead** designer who carried out some of the RBW design myself but also supervised other designers – this memorandum covers their RBW design work as well as mine, and **no other** person will be providing any additional memoranda for the project.
- ☐ **lead** designer for all but specific elements of RBW – this memorandum only covers the RBW design work that I carried out or supervised and the **other** designers will provide their own memorandum relating to their specific RBW design.
- ☒ **specialist** designer who carried out specific elements of RBW design work as outlined in this memorandum – other designers will be providing a memorandum covering the remaining RBW design work.

IDENTIFICATION OF DESIGN WORK THAT IS RESTRICTED BUILDING WORK (RBW)

I, David Lau carried out / supervised the following design work that is restricted building work

PRIMARY STRUCTURE: B1

Design work that is RBW	Description of RBW	Carried out or supervised	Reference to plans and specifications
Tick ☒ if included. Cross ☐ if excluded	If appropriate, provide details of the RBW	Tick ☒ whether you carried out this design work or supervised someone else carrying out this design work	If appropriate, specify references
All RBW design work relating to B1 ☒		☐ Carried out ☐ Supervised	
Foundations and subfloor framing ☒	TC2 Raftfloor (B1)	☐ Carried out ☒ Supervised	S0-S2, D1, Figure 10

Design work that is RBW	Description of RBW	Carried out or supervised	Reference to plans and specifications
Tick ☒ if included. Cross ☒ if excluded	If appropriate, provide details of the RBW	Tick ☒ whether you carried out this design work or supervised someone else carrying out this design work	If appropriate, specify references
Walls ☒		☐ Carried out ☐ Supervised	
Roof ☒		☐ Carried out ☐ Supervised	
Columns and beams ☒		☐ Carried out ☐ Supervised	
Bracing ☒		☐ Carried out ☐ Supervised	
Other ☒		☐ Carried out ☐ Supervised	

Design work that is RBW	Description of RBW	Carried out or supervised	Reference to plans and specifications
Tick ☒ if included. Cross ☒ if excluded	If appropriate, provide details of the RBW	Tick ☒ whether you carried out this design work or supervised someone else carrying out this design work	If appropriate, specify references
EXTERNAL MOISTURE MANAGEMENT SYSTEMS E2			
All RBW design work relating to E2	☒	☐ Carried out ☐ Supervised	
Damp proofing	☒	☐ Carried out ☐ Supervised	
Roof cladding or roof cladding system	☒	☐ Carried out ☐ Supervised	
Ventilation system (for example, subfloor or cavity)	☒	☐ Carried out ☐ Supervised	
Wall cladding or wall cladding system	☒	☐ Carried out ☐ Supervised	
Waterproofing	☒	☐ Carried out ☐ Supervised	
Other	☒	☐ Carried out ☐ Supervised	

Design work that is RBW	Description of RBW	Carried out or supervised	Reference to plans and specifications
Tick ☒ if included. Cross ☒ if excluded	If appropriate, provide details of the RBW	Tick ☒ whether you carried out this design work or supervised someone else carrying out this design work	If appropriate, specify references
FIRE SAFETY SYSTEMS: C1 - C4			
Emergency warning systems Evacuation and fire service operation systems Suppression or control systems Other	☒	☐ Carried out ☐ Supervised	
Note: The design of fire safety systems is only restricted building work when it involves small-to-medium apartment buildings as defined by the Building (Definition of Restricted Building Work) Order 2011.			

WAIVERS AND MODIFICATIONS	
Waivers or modifications of the Building Code are required. ☐ Yes ☒ No	
If Yes, provide details of the waivers or modifications below:	
Clause	Waiver/modification required
List relevant clause numbers of building code	Specify nature of waiver or modification of building code required

ISSUED BY

Name and contact details of the licensed building practitioner who is licensed to carry out or supervise design work that is restricted building work.

Name: **David Lau**

LBP or Registration number: **221906**

The practitioner is a: ☐ Design LBP ☐ Registered architect ☒ Chartered professional engineer

Design Entity or Company (optional): **Wilton Joubert Ltd.**

Mailing address (if different from below): **PO Box 11381, Ellerslie, Auckland 1542**

Street address/Registered office: **108 Lunn Avenue**

Suburb: **Mt. Wellington**

Town/City: **Auckland**

PO Box/Private Bag:

Postcode:

Phone number: **09 527 0196**

Mobile:

After hours:

Fax:

Email address: **jobs@wjl.co.nz**

Website: **www.wiltonjoubert.co.nz**

DECLARATION

I, **David Lau**, LBP, state that I have applied the skill and care reasonably required of a competent design professional in carrying out or supervising the Restricted Building Work (RBW) described in this form, and that based on this, I also state that the RBW:

- Complies with the building code, or
- ~~Complies with the building code subject to any waiver or modification of the building code recorded on this form.~~

Signature:



Date: **22/05/2018**

Memorandum from licensed building practitioner: Certificate of design work

Section 45 and Section 30C, Building Act 2004

Please fill in the form as fully and correctly as possible.

If there is insufficient room on the form for requested details, please continue on another sheet and attach the additional sheet(s) to this form.

THE BUILDING

Street address: 16 Oaklands Place

Suburb: Ngongotaha

Town/City: Rotorua

Postcode: 3010

THE OWNER

Name(s): Mark Lam

Mailing address:

Suburb:

PO Box/Private Bag:

Town/City:

Postcode:

Phone number:

Email address:

BASIS FOR PROVIDING THIS MEMORANDUM

I am providing this memorandum in my role as the: Please tick the option that applies (✓)

☐	sole designer of all of the RBW design outlined in this memorandum – I carried out all of the RBW design myself – no other person will be providing any additional memoranda for the project
☐	lead designer who carried out some of the RBW design myself but also supervised other designers – this memorandum covers their RBW design work as well as mine, and no other person will be providing any additional memoranda for the project
☒	lead designer for all but specific elements of RBW – this memorandum only covers the RBW design work that I carried out or supervised and the other designers will provide their own memoranda relating to their specific RBW design
☐	specialist designer who carried out specific elements of RBW design work as outlined in this memorandum – other designers will be providing a memorandum covering the remaining RBW design work

IDENTIFICATION OF DESIGN WORK THAT IS RESTRICTED BUILDING WORK (RBW)

I Mark Bishop of Mark Bishop Architecture Limited carried out / supervised the following design work that is restricted building work

PRIMARY STRUCTURE: B1

Design work that is restricted building work	Description	Carried out/ supervised	Reference to plans and specifications
Tick (✓) if included Cross (X) if excluded	[If appropriate, provide details of the restricted building work]	[Specify whether you carried out this design work or supervised someone else carrying]	[If appropriate, specify references]

		out this design work]	
Primary structure			
All RBW Design work relating to B1	()	() Carried out () Supervised	
Foundations and subfloor framing	()	WJL SED () Carried out () Supervised	
Walls	(✓)	NZS3604 () Carried out (✓) Supervised	03,11,12
Roof	(✓)	NZS3604 MiTek SED () Carried out (✓) Supervised	08, 17
Columns and beams	()	() Carried out () Supervised	
Bracing	(✓)	EzyBrace () Carried out (✓) Supervised	07, 23
Other	()	() Carried out () Supervised	

EXTERNAL MOISTURE MANAGEMENT SYSTEMS: E2

All RBW design work relating to E2	(✓)	() Carried out (✓) Supervised	
Damp proofing	(✓)	DPC, DPM () Carried out (✓) Supervised	06, 11,12, 13
Roof cladding or roof cladding system	(✓)	Gerard Metal tile roofing () Carried out (✓) Supervised	04,05,17
Ventilation system (for example, subfloor or cavity)	()	Brick veneer cavity 20mm cavity () Carried out (✓) Supervised	13, 14, 15, 16
Wall cladding or wall cladding system	(✓)	70 Series brick veneer Timber weatherboard () Carried out (✓) Supervised	04, 05, 13, 14, 15, 16
Waterproofing	()	() Carried out () Supervised	
Other	()	() Carried out () Supervised	

FIRE SAFETY SYSTEMS: C1 – C6

Emergency warning systems, evacuation and fire service operation systems, suppression or control systems, or	(✓)	Smoke Alarms () Carried out (✓) Supervised	09
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other			
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Note: The design of fire safety systems is only restricted building work when it involves small-to-medium apartment buildings as defined by the Building (Definition of Restricted Building Work) Order 2011.

Note: continue on another page if necessary.

WAIVERS AND MODIFICATIONS

Waivers or modifications of the building code are required ☐ Yes ☒ No

If Yes, provide details of the waivers or modifications below:

Clause	Waiver/modification required
<i>[List relevant clause numbers of building code]</i>	<i>[Specify nature of waiver or modification of building code]</i>

Note: continue on another page if necessary.

ISSUED BY

Name: Mark Bishop	LBP or Registration number: 113995
The practitioner is a: ☒ Design LBP ☐ Registered architect ☐ Chartered professional engineer	
Design Entity or Company (optional): Mark Bishop Architecture Limited	
Mailing address (if different from below):	
Street address / Registered office: 1109 Pukuatua Street	
Suburb:	Town/City: Rotorua
PO Box/Private Bag: PO Box 908 ROTORUA	Postcode: 3010
Phone number: 07 9299807	Mobile: 021 244 0637
After Hours:	Fax:
Email address: mark@markbishop.co.nz	Website: www.markbishop.co.nz

DECLARATION

I Mark Bishop of Mark Bishop Architecture Ltd, LBP 113995,

state that I have applied the skill and care reasonably required of a competent design professional in carrying out or supervising the Restricted Building Work (RBW) described in this form, and that based on this, I also state that the RBW:

- Complies with the building code; or
- Complies with the building code subject to any waiver or modification of the building code recorded on this form.

Signature: 

Date: 30.05.18

Hydrathane

Water-based polyurethane waterproofing membrane

Packaging



Mixing



Application



Uses



Substrates

Concrete,
Building boards,
Brick, Block,
Render,
Cement sheet,
Flooring

Description

A one-part water-based polyurethane waterproofing membrane which is flexible, tough and fast curing (capable of drying in 6-12 hours @ 23°C @ 50% relative humidity). The cured membrane will remain tough, elastic and can bridge and seal hairline cracks.

Uses

A waterproofing membrane for internal wet areas e.g. bathrooms, showers, laundries, tiled or screeded roof tops, balconies and below ground applications e.g. retaining walls and planter boxes (subject to protection from damage and adequately drained) on concrete, render, screeds and approved wet area floor and wall building boards, i.e. compressed cement sheet, fibre cement sheeting and wet area plasterboard.

Features

- Waterproof and tile in the same day
- A tough elastic membrane
- UV stable
- Suitable for maintenance foot traffic
- Compatible with **Construction Chemicals** ceramic tile adhesives
- Does not stain tile grout or marble
- Fast drying - trafficable after 6-12 hours

Coverage (Approximate)

Floors – Apply two wet coats 0.8mm (800µm) to the floor and 100mm up the surrounding walls to obtain a 1mm (1000µm) dry film thickness. A 15 litre pail covers 10m².

Walls – Apply two wet coats 0.5mm (500µm) to obtain a 0.6mm (600µm) dry film thickness. A 15 litre pail covers 15m².

Performance Data

Conforms to AS/NZS 4858 Class 3 membrane

Tensile Strength (AS/NZS 4858) 2.20MPa

Elongation 468%

Modified CSIRO Moving Joint Test pass

Specification

The waterproofing membrane shall be a one-part water-based polyurethane compound with a tensile strength of 2.2MPa and 468% elongation such as **Hydrathane**, manufactured by **Construction Chemicals** and shall be applied in accordance with AS3740 and AS4654.2, local building codes, the manufacturer's instruction and good trade practice.

Surface Preparation

The surface to be waterproofed must be structurally sound and free from dirt, dust, grease, paint, wax, laitance and all other contaminants. Protrusions that can puncture the membrane must be ground flat. Holes and voids shall be filled with **Patch & Anchor**. Building boards must be installed in accordance with the manufacturer's instructions and local building codes. Cracks and junctions in building surfaces shall have a bond breaker tape or silicone applied evenly over the junction or crack prior to the membrane application (to accommodate extremes of movement). New concrete should be wood float finished and allowed to cure for 28 days. Steel float finished concrete, renders and screeds, must be mechanically abraded to remove laitance. Old concrete must be cleaned with a strong detergent/degreaser to remove contaminants then thoroughly washed and allowed to dry. All porous substrates, cement sheet and gypsum board must be primed with **Primebond** to prevent excessive moisture draw from the membrane. Metal surfaces, nail and screw heads, must be free of rust and primed with a rust inhibiting primer. All waterproofed floors, roofs and balconies shall be sloped to a drain outlet in conformity with AS3740 and external AS4654.2 and relevant local building codes. As a guide a 1:60 fall for wet areas and 1:100 fall for roofs and balconies.

Bond Breaker and Reomat

At the junction/joints in building surfaces i.e., floors/walls/walls, wastes etc., apply centrally over the junction, bond breaker tape or a 13mm bead of neutral cure silicone (allow to become touch dry). Apply a 150mm wide thick coat of waterproofing membrane centrally over areas where the bond breaker is applied.

Option 1: Reinforce the wet membrane with 140mm **Reomat** to guarantee its thickness and performance.

Option 2: Reinforcing is not required if the thickness is checked during application and the final dry film thickness is 1.5mm.

Membrane Application

Apply the membrane in accordance with AS3740 and AS4654.2 and local building codes and good trade practice. Prime concrete and building boards with **Primebond**. Apply two coats of **Hydrathane** with a brush or roller. Apply thickly allowing it to flow rather than brush to achieved required thickness. Apply the second coat at 90°

to the first (recoat time is approximately 2 hours @ 23°C @ 50% relative humidity) on floors and 100mm up surrounding walls apply two wet coats 0.8mm thick and on walls two wet coats 0.6mm thick. Apply the membrane down the front edge of balconies to the drip mould and down into drains and outlets and remove excess material. Apply a third coat if necessary to obtain the required thickness in critical areas i.e. over the bond breaking tape, cracks and building junctions.

Curing

1 day @ 23°C @ 50% relative humidity.
Colder temperatures will increase cure time.

Pond Test

If a ponding test is required, ensure the membrane is allowed to cure for a minimum of 1 day before pond testing.

Tiling

Apply tiling directly to the cured membrane with **Monoflex**, **Gripflex** or **Kemflex 2:1**. Tiling can commence after 4-6 hours @ 23°C @ 50% relative humidity, longer in cooler conditions.

Precautions

- **Hydrathane** is UV resistant and will withstand maintenance foot traffic. It is advisable to screed, tile or protect with **Deckgrip** when traffic is more regular
- Do not apply if temperature exceeds 35°C or less than 5°C
- At above 30°C temperatures the membrane exhibits thermoplastic characteristics
- Do not apply if rain is expected within 1 day
- Do not thin liquid
- Do not use in permanently immersed applications (swimming pools etc)
- Do not use on surfaces subject to rising damp or negative hydrostatic pressure
- Seal damp substrates with one coat of **Epecrete**
- Waterproofed areas must be sloped to a drain and water must not pond

Shelf Life

12 months in an unopened can, stored in a dry place at 22°C.



www.constructionchemicals.com.au

Adelaide (08) 8243 7888	Brisbane (07) 3271 2944
Darwin (08) 8947 1811	Melbourne (03) 9761 4711
Perth (08) 9356 9999	Sydney (02) 9756 3533
Auckland (09) 273 5444	Kuala Lumpur (603) 5122 2522

The information contained in this technical publication is based on our current knowledge and experience and is provided as a guide only. In view of the many factors that may affect application it is the user's sole responsibility to ensure suitability for a specific purpose.

March 17



BRANZ Appraised

Appraisal No. 957 [2017]

HYDRATHANE INTERIOR WATERPROOFING MEMBRANE

Appraisal No. 957 [2017]

BRANZ Appraisals:

Technical Assessments of products
for building and construction.



**Construction Chemicals NZ
Ltd**

16 Carpenter Road
East Tamaki
Auckland

Phone (09) 273 5444

Fax (09) 273 5442

Web:

www.constructionchemicals.com.au



BRANZ

BRANZ

1222 Moonshine Rd,
RD1, Porirua 5381
Private Bag 50 908
Porirua 5240,
New Zealand
Tel: 04 237 1170
branz.co.nz



Product

- 1.1 Hydrathane Interior Waterproofing Membrane is a liquid-applied waterproofing membrane for use under ceramic or stone tile finishes in internal wet areas.

Scope

- 2.1 Hydrathane Interior Waterproofing Membrane has been appraised for use as a waterproofing membrane for the internal wet areas of buildings within the following scope:
- on floor substrates of concrete, plywood, compressed fibre cement sheet and fibre cement sheet tile underlay, and on wall substrates of concrete, concrete masonry, wet area fibre cement sheet lining systems and wet area plasterboard lining systems; and,
 - when protected from physical damage by ceramic or stone tile finishes; and,
 - where floors are designed and constructed such that deflections do not exceed $1/360^{th}$ of the span.
- 2.2 The use of Hydrathane Interior Waterproofing Membrane on concrete slabs where hydrostatic or vapour pressure is present from below is outside the scope of this Appraisal.
- 2.3 Movement and control joints in the substrate must be carried through the membrane and tile finish. The design and construction of the substrate and movement and control joints is specific to each building, and is therefore the responsibility of the building designer and building contractor and is outside the scope of this Appraisal.
- 2.4 The ceramic or stone tile finishes are outside the scope of this Appraisal.
- 2.5 The membrane must be installed by trained installers, approved by Construction Chemicals NZ Ltd.

Building Regulations

New Zealand Building Code (NZBC)

- 3.1 In the opinion of BRANZ, Hydrathane Interior Waterproofing Membrane, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet the following provisions of the NZBC:
- Clause B2 DURABILITY:** Performance B2.3.1 [b] 15 years and B2.3.2. Hydrathane Interior Waterproofing Membrane meets these requirements. See Paragraph 9.1.
- Clause E3 INTERNAL MOISTURE:** Performance E3.3.6. Internal wet area floors and walls incorporating Hydrathane Interior Waterproofing Membrane meet this requirement. See Paragraphs 11.1-11.6.
- Clause F2 HAZARDOUS BUILDING MATERIALS:** Performance F2.3.1. Hydrathane Interior Waterproofing Membrane meets this requirement and will not present a health hazard to people.

Technical Specification

4.1 Materials supplied by Construction Chemicals NZ Ltd are as follows:

- **Hydrathane Interior Waterproofing Membrane** is a Class III, flexible, fast curing one part, waterbased polyurethane waterproofing membrane. It is supplied as a pink liquid in 4 and 15 litre containers.
- **Primebond** is a synthetic, acrylic based liquid, which is used for priming all internal porous surfaces. It is supplied in 1, 5 and 20 litre containers.
- **Primax** is a two pack, water resistant bonding primer for internal porous and low porosity substrates. It is supplied in a 5 lt/5 kg kit.
- **Bond Breaker Tape** is a fibre reinforced plastic tape installed to accommodate normal substrate differential movement. It is supplied in a roll 48 mm wide x 25 m long.
- **Reomat** is an alkali-resistant reinforcing fibre installed over the Bond Breaker Tape to increase strength and ensure correct membrane thickness. It is supplied in a roll 140 mm wide x 100 m long.

Handling and Storage

5.1 All materials must be stored inside, up off concrete floors, in dry conditions, out of direct sunlight and freezing conditions. The membrane products have a shelf life of 12 months from date of manufacture in the original unopened packaging. Once opened, the products must be used within 3 months.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the Hydrathane Interior Waterproofing Membrane. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

General

- 7.1 Hydrathane Interior Waterproofing Membrane is for use in buildings where an impervious waterproof membrane is required to floors and walls to prevent damage to building elements and adjoining areas.
- 7.2 The membrane must be protected from physical damage by the application of ceramic or stone tile finishes.
- 7.3 Movement and control joints may be required depending on the shape and size of the building or room, and the tile finish specified. Design guidelines can be found in the BRANZ Good Practice Guide: Tiling.
- 7.4 Timber framing systems must comply with NZS 3604, or where specific engineering design is used, the framing shall be of at least equivalent stiffness to the framing provisions of NZS 3604, or comply with the serviceability criteria of AS/NZS 1170. In all cases, framing must be provided so that the maximum span of the substrate as specified by the substrate manufacturer is met and all sheet edges are fully supported. Timber framing systems supporting the substrates must be constructed such that deflections do not exceed $1/360^{\text{th}}$ of the span. Where NZS 3604 is used, the allowable joist spans given in Table 7.1 shall be reduced by 20%.



Substrates

Plywood

- 8.1 Plywood must be a minimum of 17 mm thick complying with AS/NZS 2269, CD Grade Structural with the sanded C face upwards and treated to H3 [CCA treated]. LOSP treated plywood must not be used.
- 8.2 The plywood must be laid with the face grain at right angles to the floor joists. Joists must be at 400 mm centres maximum and the edges of the sheets must be supported with blocking or framing. The plywood must be fixed with 10 g x 50 mm stainless steel countersunk head screws at 150 mm centres along the sheet edges and 200 mm centres to all framing through the body of the sheets.

Fibre Cement Compressed Sheet/ Fibre Cement Sheet Tile Underlay

- 8.3 Fibre cement compressed sheet and tile underlay must be manufactured to comply with the requirements of AS/NZS 2908.2 and must be specified by the manufacturer as being suitable for use as a wet area membrane substrate. Installation must be carried out in accordance with the instructions of the manufacturer.

Concrete and Concrete Masonry

- 8.4 Concrete and concrete masonry substrates must be to a specific engineering design meeting the requirements of the NZBC, such as concrete construction to NZS 3101, concrete slab-on-ground to NZS 3604 or NZS 4229, and concrete masonry to NZS 4229 and NZS 4230.

Wet Area Wall Linings

- 8.5 Plasterboard wall linings must be manufactured to comply with AS/NZS 2588 and be suitable for use in internal wet areas.
- 8.6 Fibre cement sheet must be suitable for use in wet areas and comply with AS/NZS 2908.2.
- 8.7 Installation of plasterboard or fibre cement wall linings must be carried out in accordance with the instructions of the manufacturer.

Durability

Serviceable Life

- 9.1 Hydrathane Interior Waterproofing Membrane, when subjected to normal conditions of environment and use, is expected to have a serviceable life of at least 15 years and be compatible with ceramic or stone tile finishes with a design serviceable life of 15-25 years.

Maintenance

- 10.1 No maintenance of the membrane will be required provided significant substrate movement does not occur and the tile finish remains intact. Regular checks must be made of the tiled areas to ensure they are sound and will not allow moisture to penetrate. Any cracks or damage must be repaired immediately by repairing the tiles, grout and sealant.
- 10.2 In the event of damage to the membrane, the tiling must be removed and the membrane repaired by removing the damaged portion and applying a patch as for new work.
- 10.3 Drainage outlets must be maintained to operate effectively, and tile finishes must be kept clean.

Internal Moisture

- 11.1 Hydrathane Interior Waterproofing Membrane is impervious to water, and when appropriately designed and installed will prevent water from penetrating behind linings or entering concealed spaces.
- 11.2 Surfaces must be finished with ceramic or stone tiles. A means of compliance with NZBC Clause E3.3.3 and E3.3.4 is given in NZBC Acceptable Solution E3/AS1 Paragraph 3.1.1 (b), 3.1.2 (b) and 3.3.1 (b).
- 11.3 Falls in showers and shower areas must be a minimum of 1 in 50. In unenclosed showers, falls must extend a minimum of 1500 mm out from the shower rose. Floor wastes and drainage flanges must be provided and the floor must fall to the outlet.
- 11.4 Hydrathane Interior Waterproofing Membrane is suitable for use to contain accidental overflow to meet NZBC Clause E3.3.2. A means of compliance for overflow is given in NZBC Acceptable Solution E3/AS1, Section 2.
- 11.5 The waterproofing membrane must completely cover shower bases, and for unenclosed showers it must extend a minimum of 1500 mm out from the shower rose. Further design guidance on waterproofing wet areas, including waterproofing walls and junctions can be obtained from AS 3740, BRANZ Good Practice Guide: Tiling, and the flooring and wall lining manufacturers.
- 11.6 Where water resistant wall finishes such as prefinished sheet materials are used, they must overlap the membrane a minimum of 30 mm.

Installation Information

Installation Skill Level Requirement

- 12.1 Installation of the membrane must be completed by trained installers, approved by Construction Chemicals NZ Ltd.
- 12.2 Installation of substrates must be completed by, or under the supervision of, licensed Building Practitioners with the relevant Licence Class, in accordance with instructions given within the Construction Chemicals NZ Ltd Technical Literature and this Appraisal.

Preparation of Substrates

- 13.1 Substrates must be dry, clean and stable before installation commences. Surfaces must be even and free from nibs, sharp edges, dust, dirt or other materials such as oil, grease or concrete formwork release agents.
- 13.2 The relative humidity of concrete substrates must be 75% or less before membrane application. The concrete can be checked for dryness by using a hygrometer as set out in BRANZ Bulletin No. 585.
- 13.3 All voids, cracks, holes, joints and excessively rough areas must be filled to achieve an even and uniform surface. Junctions of substrate abutments, such as at wall/floor and wall/wall junctions must have reinforcements installed as set out in the Technical Literature.
- 13.4 Substrates must be primed with a primer as specified by Construction Chemicals NZ Ltd and allowed to dry fully before the membrane is installed.

Membrane Installation

- 14.1 Installation must not be undertaken where the substrate surface temperature is below 5°C or above 35°C.
- 14.2 Hydrathane Interior Waterproofing Membrane must be thoroughly stirred before application.
- 14.3 The membrane must be applied in a minimum of two coats at the rates set out in the Technical Literature. Subsequent coats must be applied in a different direction to the previous coat. The total finished thickness of the membrane must be 2.0 mm minimum.
- 14.4 Membrane application can be completed by roller [medium/long nap] or brush [long bristle].
- 14.5 The installation and use of any reinforcing must comply with the instructions in the Technical Literature.
- 14.6 Clean up may be undertaken with water.

Tiling

- 15.1 The membrane must be fully cured before tiling. The cured membrane must be protected at all times to prevent mechanical damage, so may require temporary covers until the finishing is completed.
- 15.2 Tiling must be undertaken in accordance with AS 3958.1 and the BRANZ Good Practice Guide: Tiling. The compatibility of the tile adhesive must be confirmed with the adhesive manufacturer or Construction Chemicals NZ Ltd.

Inspections

- 16.1 Critical areas of inspection are:
 - Construction of substrates, including crack control and installation of bond breakers and movement control joints.
 - Moisture content of the substrate prior to the application of the membrane.
 - Acceptance of the substrate by the membrane installer prior to application of the membrane.
 - Installation of the membrane to the supplier's instructions, particularly installation to the correct thickness and use of reinforcement.
 - Membrane curing and integrity prior to the installation of tiles including protection from mechanical damage during curing and prior to tile installation.

Health and Safety

- 17.1 Safe use and handling procedures for the membrane are provided in the Technical Literature. The materials must be used in conjunction with the relevant Material Safety Data Sheet.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

- 18.1 The following testing of Hydrathane Interior Waterproofing Membrane has been undertaken by the following organisations:
 - CSIRO, Australia – Testing to the requirements of AS/NZS 4858: 2004 including Appendix A the effect of heat ageing, bleach, detergent and water on tensile and elongation, Water Vapour Transmission to ASTM E96-92, Appendix B, resistance of waterproofing membranes to cyclic movement, and water absorption.
 - BRANZ – adhesion to various substrates and low temperature flexibility.
- 18.2 The above test methods and results have been reviewed by BRANZ and found to be satisfactory.

Other Investigations

- 19.1 An assessment was made of the durability of Hydrathane Interior Waterproofing Membrane by BRANZ technical experts.
- 19.2 Site inspections were carried out by BRANZ to examine the practicability of installation.
- 19.3 The Technical Literature has been examined by BRANZ and found to be satisfactory.

Quality

- 20.1 The manufacture of the membrane has been examined by BRANZ, and details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory.
- 20.2 The quality of supply to the market is the responsibility of Construction Chemicals NZ Ltd.
- 20.3 Designers are responsible for the building design, and building contractors are responsible for the quality of installation of the framing systems and substrate.
- 20.4 Quality on site is the responsibility of the trained installers, approved by Construction Chemicals NZ Ltd.
- 20.5 Building owners are responsible for the maintenance of the ceramic tiles in accordance with the instructions of Construction Chemicals NZ Ltd.

Sources of Information

- AS 3740 - 2010 Waterproofing of wet areas within residential buildings.
- AS 3958.1: 2007 Ceramic Tiles - Guide to the installation of ceramic tiles.
- AS/NZS 1170: 2002 Structural design actions
- AS/NZS 2908.2: 2000 Cellulose-cement products - flat sheet.
- AS/NZS 4858 - 2004 Wet area membranes.
- AS/NZS 2269: 2012 Plywood - Structural.
- Good Practice Guide: Tiling, BRANZ, April 2015.
- NZS 3101: 2006 Concrete Structures Standard.
- NZS 3602: 2003 Timber and wood-based products for use in buildings.
- NZS 3604: 2011 Timber framed buildings.
- NZS 4229: 2013 Concrete masonry buildings not requiring specific engineering design.
- NZS 4230: 2004 Code of practice for the design of masonry structures.
- Ministry of Business, Innovation and Employment Record of amendments - Acceptable Solutions, Verification Methods and handbooks.
- The Building Regulations 1992.

In the opinion of BRANZ, **Hydrathane Interior Waterproofing Membrane** is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to **Construction Chemicals NZ Ltd**, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
 - a) relates only to the product as described herein;
 - b) must be read, considered and used in full together with the Technical Literature;
 - c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
 - d) is copyright of BRANZ.
2. **Construction Chemicals NZ Ltd:**
 - a) continues to have the product reviewed by BRANZ;
 - b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
 - c) abides by the BRANZ Appraisals Services Terms and Conditions;
 - d) warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
 - a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
 - b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
 - c) any guarantee or warranty offered by **Construction Chemicals NZ Ltd**.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to **Construction Chemicals NZ Ltd** or any third party.

For BRANZ



Chelydra Percy

Chief Executive

Date of Issue:

10 July 2017

RECEIVED

20 JUL 2018

Thermakraft

COUNCIL
COPY

C/S/E

Jan 2015

THERMATHENE BLACK

250 MICRON
CONCRETE UNDERLAY

APPLICATION AND INSTALLATION

Product Description THERMATHENE BLACK 250 Micron Concrete Underlay is a tear resistant Polyethylene film.

Product Advantage THERMATHENE BLACK is used as a concrete underlay and a moisture vapour barrier in areas where protection is required. Thermathene Black is 250 micron, and coloured black for ultra violet resistance.

Installation THERMATHENE BLACK must be installed to E2/AS1 10.3.3. Damp Proof Membranes, and must be laid on a properly prepared base as required by NZS3604: 2011.7.5.4.

THERMATHENE BLACK may be used to cover ground areas under suspended timber floors to prevent the rise of dampness. Ensure that the site is clear of rubbish, sharp edges such as rocks or bricks. Slit and patch around jack studs or pipe work. All joints must be taped with Thermakraft 66mm White General Purpose Acrylic tape.

THERMATHENE BLACK must be inspected for tears and penetrations. Repair with Thermakraft 66mm White General Purpose Acrylic tape to ensure integrity of THERMATHENE BLACK as a moisture barrier.

Thermakraft recommends a lap of 150mm at all joints

Roll Dimensions 250micron x 4000mm x 25m = 100m² (gusseted rolls)
Other sizes and thickness available (check for availability)

BC

77977

THERMATHENE BLACK

250 MICRON
CONCRETE UNDERLAY

TECHNICAL SPECIFICATIONS

Durability

THERMATHENE BLACK 250 Micron Concrete Underlay to meet the performance requirements of NZBC Clauses B2, Durability B2.3.1[a] 50 years and B2.3.1(b) 15 years, E2 External Moisture,

THERMATHENE BLACK:

- Must be installed in accordance to the *APPLICATION and INSTALLATION GUIDELINES as outlined in E2/AS1 10.3.3. Damp Proof Membranes, and must be laid on a properly prepared base as required by NZS3604:2011.7.5.4
- Is not left exposed for more than 28 days,
- Installed by a licensed building practitioner,
- Free of tears and penetrations.

Physical Properties

THERMATHENE BLACK

- Exceeds the minimum impact resistant film test AS1326:1972(IR3)
- Complies with (A) AS2870:1995, 5.3.3 vapour barrier for concrete underlays
- Resistance to Water Vapour Transmission Not less than 90MN.s/g



I. THERMATHENE BLACK is used as a concrete underlay and a moisture vapour barrier.

The recommendations contained in Thermakraft's literature are based on good building practice, but are not an exhaustive statement of all relevant information and are subject to any conditions contained in the Warranty. All product dimensions and performance claims are subject to any variation caused by normal manufacturing process and tolerances. Furthermore, as the successful performance of the relevant system depends on numerous factors outside the control of Thermakraft (for example quality of workmanship and design), Thermakraft shall not be liable for the recommendations in that literature and the performance of the Product, including its suitability for any purpose or ability to satisfy the relevant provisions of the Building Code, regulations and standards.



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