



STDC143437 - Request For More Information

25 July 2023



Raewyn Pamela Stockman
27 County Drive
Hawera 4610

Dear Sir/Madam

Notification of Code Compliance Certificate (CCC) Decision
Re: Building Consent No. BC200394, Relocate New Dwelling

We have emailed/written to you/your agent or contractor on a previous occasion explaining the requirements for Council's Building Consent Authority to make a decision to issue a Code Compliance Certificate in respect of the above building consent.

As we have not received all the evidence required to conclude that the building work covered by this consent has been completed, we have decided **to refuse to issue a Code Compliance Certificate (CCC)** for the above building consent at this time.

Should you require a final inspection in the future, please contact our Customer Service team to request one.

Please note: Any further inspections or processing of any amendments to your consent may incur additional fees.

Should you wish to discuss this matter further, please contact me on 0800 111 323.

Yours sincerely

A handwritten signature in black ink, appearing to read "Heather Clarke".

Heather Clarke
Technical Support Officer

GoGet Inspection Outcome Report

Consent No: **200394**
 Applicant: **Central Housemovers**
 Site Address: **27 County Drive, Hawera 4610**
 Work Type: **Relocate New Dwelling**

Inspection Type: **Final-Relocate**
 Inspection Outcome: **Pass**
 Inspected By: **Wilson Collin**
 Inspection Date: **18 August 2023 11:49 a.m.**
 Duration: **60 minutes**

| Inspection Element | Status |
|--|--------|
| General | Pass |
| This is a final inspection of a new relocate dwelling with an app | |
| PS4 has been received for : Design and installation of foundations and piles for relocatable house from Martin Cockitt. CPEng 173183 - Current Civil engineer. | |
| Name of person on site Owner on site. | Pass |
| External moisture requirements and surface water runoff Dwelling is on piles. Garage has 150mm step up. | Pass |
| Down pipes connected and sealed where required. | |
| E2 details installed as per plans. Kiwispan E2 details accepted for IL1 outbuilding. | |
| Penetrations/fixtures weathertight, insulated | N/A |
| Sub-floor fixings, bracing and ventilation Base boards installed to NZS 3604. Access hatch installed. | Pass |
| Gully traps Sighted at drainage inspection. Photo on file. Covered by deck. Decking has been screwed down and can be removed if required. | Pass |
| Waste pipes sealed through gully dishes and suspended Sighted at time of drainage inspection. | Pass |
| Terminal vent size and location Sighted and installed above roof line. | Pass |
| Downpipes connected to spouting/house/soakhole | Pass |
| Decks/barriers 12mm gap maintained to E2/AS1. | Pass |
| Domestic smoke alarms Installed within 3m of bedrooms. Tested. | Pass |
| Woodfire as per specifications | N/A |
| Miscellaneous items Kiwispan connections installed. Slight variation made to plan. Top hat eaves Girt has been installed as Top hat purlin. Girt does not support wall cladding and ties portal frames together. | Pass |
| Any minor variations to the approved plans and documents? | N/A |
| Next likely inspection | N/A |
| Final outcome Approved for CCC. | Pass |



Taken at 10:55 AM on Friday 18/08/2023



Taken at 10:56 AM on Friday 18/08/2023



Taken at 10:56 AM on Friday 18/08/2023



Taken at 10:56 AM on Friday 18/08/2023



Taken at 10:56 AM on Friday 18/08/2023



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Taken at 10:58 AM on Friday 18/08/2023



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Taken at 10:59 AM on Friday 18/08/2023



Taken at 10:59 AM on Friday 18/08/2023



Taken at 11:01 AM on Friday 18/08/2023



Taken at 11:01 AM on Friday 18/08/2023



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Taken at 11:02 AM on Friday 18/08/2023



Taken at 11:02 AM on Friday 18/08/2023



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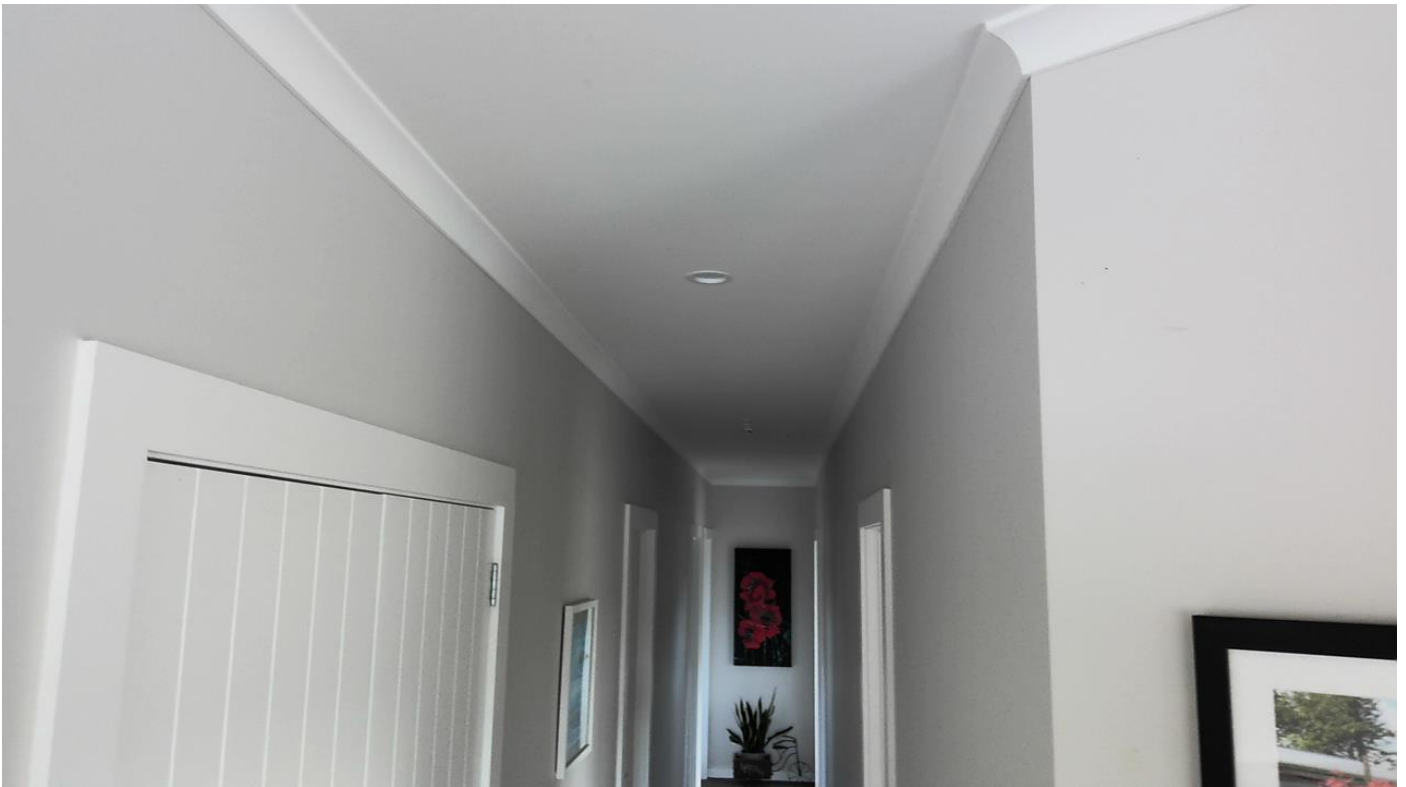
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Taken at 11:12 AM on Friday 18/08/2023



Taken at 11:12 AM on Friday 18/08/2023



Taken at 11:13 AM on Friday 18/08/2023

GoGet Inspection Outcome Report

Consent No: **200394**
Applicant: **Central Housemovers**
Site Address: **27 County Drive, Hawera 4610**
Work Type: **Relocate New Dwelling**

Inspection Type: **Footing/Foundation/Slab**
Inspection Outcome: **Pass**
Inspected By: **Ivan Blom**
Inspection Date: **14 April 2022 4:30 p.m.**
Duration: **30 minutes**

| Inspection Element | Status |
|---|--------|
| General | Pass |
| Siting confirmed | Pass |
| Garage is closer than 1500mm to boundary surveyor to confirm location > Juffermans Surveyors have since confirmed distance to boundary and provided a surveyors site boundary identification drawing. This has been accepted with town planning discretion as okay by STDC planning manager. Sitting updated to pass. | |
| Final outcome | Pass |
| > Review of garage Sitting completed in STDC office. It was discovered that fence is not on boundary and Surveyor location plan has been accepted by STDC planning with discretion. Inspection updated to Pass / Approved to place concrete | |



SITE NOTICE

Consent No: **BC20/0394**
Applicant: **Central Housemovers**
Site Address: **27 County Drive, Hawera 4610**
Work Type: **Relocate New Dwelling**
Building Category: **R1**

Inspection Type: **Footing/Foundation/Slab**
Inspection Outcome: **Pass**
Inspected By: **Ivan Blom**
Inspection Date: **14 April 2022**

Passed Items

General

Siting confirmed

Garage is closer than 1500mm to boundary surveyor to confirm location

> Juffermans Surveyors have since confirmed distance to boundary and provided a surveyors site boundary identification drawing. This has been accepted with town planning discretion as okay by STDC planning manager.
Sitting updated to pass.

Final outcome

> Review of garage Sitting completed in STDC office. It was discovered that fence is not on boundary and Surveyor location plan has been accepted by STDC planning with discretion.
Inspection updated to Pass / Approved to place concrete



SITE NOTICE

Consent No: **BC20/0394**
Applicant: **Central Housemovers**
Site Address: **27 County Drive, Hawera 4610**
Work Type: **Relocate New Dwelling**
Building Category: **R1**

Inspection Type: **Final-Relocate**
Inspection Outcome: **Pass**
Inspected By: **Wilson Collin**
Inspection Date: **18 August 2023**

Passed Items

General

This is a final inspection of a new relocate dwelling with an app

PS4 has been received for :
Design and installation of foundations and piles for relocatable house
from Martin Cockitt. CPEng 173183 - Current Civil engineer.

Owner on site.

Dwelling is on piles.
Garage has 150mm step up.

Down pipes connected and sealed where required.

E2 details installed as per plans.
Kiwispan E2 details accepted for IL1 outbuilding.

Base boards installed to NZS 3604.
Access hatch installed.

Sighted at drainage inspection. Photo on file.
Covered by deck. Decking has been screwed down and can be removed if required.

Sighted at time of drainage inspection.

Sighted and installed above roof line.

12mm gap maintained to E2/AS1.

Installed within 3m of bedrooms. Tested.

Kiwispan connections installed.
Slight variation made to plan. Top hat eaves Girt has been installed as Top hat purlin.
Girt does not support wall cladding and ties portal frames together.

Approved for CCC.

Final outcome

Documentation

Application form for CCC
Engineer's site report
Engineer's ground bearing report
Electrical certificate

Status

Accepted
Accepted
Accepted
Received

| | |
|------------------------------------|----------|
| Gas certificate | Received |
| As-built drainage plan | Received |
| PS4 - Pile driving and supervision | Received |



CERTIFICATE OF DESIGN WORK MEMORANDUM FROM LICENSED BUILDING PRACTITIONER



Section 300 and Section 45, Building Act 2004

The Building

Street address 27 County Drive

Suburb

Town/City HAWERA

Postcode

Building consent no.

The Owner

Name(s) Arthur Brown Construction

Email hawera@arthurbrown.co.nz

Phone 06-2785199

Address 108 Wilson Street - Hawera

Basis for providing this memorandum

I am providing this memorandum in my role as the specialist designer who carried out or supervised specific Primary structure elements of restricted work (RBW) design work as described in this memorandum. Other designers will provide memoranda covering the remaining RBW design work. Refer to the attached PSI.

Identification of restricted building work (RBW) design work

I, Andrew Fraser

carried out or supervised the following RBW design work:

Primary structure: B1

Design work that is RBW

Description (as required) and reference to plans and specifications

Carried out or supervised

Foundations and subfloor framing



Foundation ground improvements for raft floor as designed by others

Supervised

Retaining walls-



Beams-



Portal-



Bracing-



Other (primary)-



Note: SED = Elements subject to Specific Engineering Design outside of the scope of NZS 3604:2011, unless otherwise noted

Initial: _____

Date: 25 November 2020

Waivers and modifications

Are waivers or modifications of the Building Code required? No

If yes, please provide details of the waivers or modifications:

Building Code Clause Waiver/modification required

NA

NA

Issued by

Name Andrew Fraser

Design entity/company Red Jacket

Chartered status CPEng

Chartered no. 96197

Email info@redjacket.nz

Website

www.redjacket.nz

Phone (daytime) 06 759 0999

Phone (after hours)

Mobile 027 257 9970

Postal address PO Box 904, New Plymouth, 4340

Physical address 3 Davidson Street, New Plymouth

Declaration

I, Andrew Fraser, LBP state that I have applied the skills and care reasonably required of a competent professional in carrying out or supervising the RBW described in this memorandum and that based on this, I certify that the RBW described in this memorandum:

- Complies with the Building Code; or
- Complies with the Building Code subject to any waiver or modification or the Building Code described in this memorandum.

Signature: _____

Date: 25 November 2020





RESIDENTIAL BUILDING
27 COUNTY DRIVE
HAWERA

STRUCTURAL CALCULATIONS

File Ref. CAL-4104-01

| REV. | DATE | ISSUED FOR |
|------|------------|-----------------------------|
| A | 25/11/2020 | Issued for Building Consent |
| | | |
| | | |
| | | |

Scope of Work

Structural design for ground improvements to support the residential garage on ribraft floor foundation

Basis of Design

| | | |
|-------------------------------------|-------------|--|
| <input checked="" type="checkbox"/> | AS/NZS 1170 | Loading Standard |
| <input type="checkbox"/> | NZS 3404 | Steel Structures |
| <input type="checkbox"/> | NZS 3603 | Timber Structures |
| <input type="checkbox"/> | NZS 3101 | Concrete Structures |
| <input type="checkbox"/> | NZS 4320 | Reinforced Concrete Masonry Structures |
| <input checked="" type="checkbox"/> | NZS 3604 | Timber-Framed Buildings |
| <input checked="" type="checkbox"/> | B1/VM4 | |
| <input type="checkbox"/> | | |

References

- Arch Drawings by Mannor Build 27 October 2020
-



- RESIDENTIAL GARAGE IS TO BE LOCATED ON GROUND WHICH DOESN'T MEET NZS8604 'GOOD GROUND' REQUIREMENTS.

- IT IS PROPOSED TO INSTALL ROOM THICK WALLS WITH UNDER THE SLAB TO SUPPORT RIGID SLAB AND PREVENT BEARING PRESSURE ON SUBGRADE.

LOADS

GARAGE FLOOR
 $G = 2.5 \text{ kPa}$
 $G_{acc} = 0.5 \text{ kPa}$
 $Q = 2.5 \text{ kPa} \text{ \& } 18 \text{ kN}$

- 13 kN point load will govern.
 - ASSUME POINT LOAD WILL BE ON 2 x 1.0m OF RIBS $A_f = 2 \times 0.1 = 0.2 \text{ m}^2$.
 - LOAD COMBINATIONS.

$$WLS = 1.25 + 1.5Q = 1.2 \times 3 \text{ kPa} + 1.5 \times 13 \text{ kN} = 3.6 \text{ kPa} \text{ \& } 19.5 \text{ kN}$$

$$= 23.1 \text{ kN}$$

$$\therefore \frac{23.1}{0.2 \text{ m}^2} = q_{wls} = 116 \text{ kPa} \cdot ULS.$$

$$SLS = G + 0.4Q = 3.6 + 0.4 \times 13$$

$$= 8.8 \text{ kN}$$

$$q_{sls} = 44 \text{ kPa}$$

| | | | |
|------|------------|----------|------|
| Date | 25.11.20 | Job No. | 4104 |
| By | GS. | Page No. | |
| Ref. | Cal-4104-1 | | |

Job Title 27 COUNTRY DRIVE, HAWERA.



CURRENT SUBGRADE REMAINS CAPACITY.

FROM TST-4101-1 SCALP AVERAGE 75mm/80mm.

AFTER ALLOWABLE BEARING PRESSURE STOCKPILE.

$$q_{sub} = \frac{3 \times 45 \text{ kPa}}{2} = 68 \text{ kPa}.$$

TRY 300 THICK APRS AFT WITH 100 THK AIR $B = 0.1$

$$q_{sub} = 0.15$$

$$q_{sub} \text{ AT SUBGRADE} = 110 \times 0.15 = 17.4 \text{ kPa} < q_{sub}$$

$$\therefore \text{OK}.$$

$$q_{sub} \text{ AT SUBGRADE} = 44 \times 0.15 = 6.6 \text{ kPa}.$$

$$\therefore \text{OK}.$$

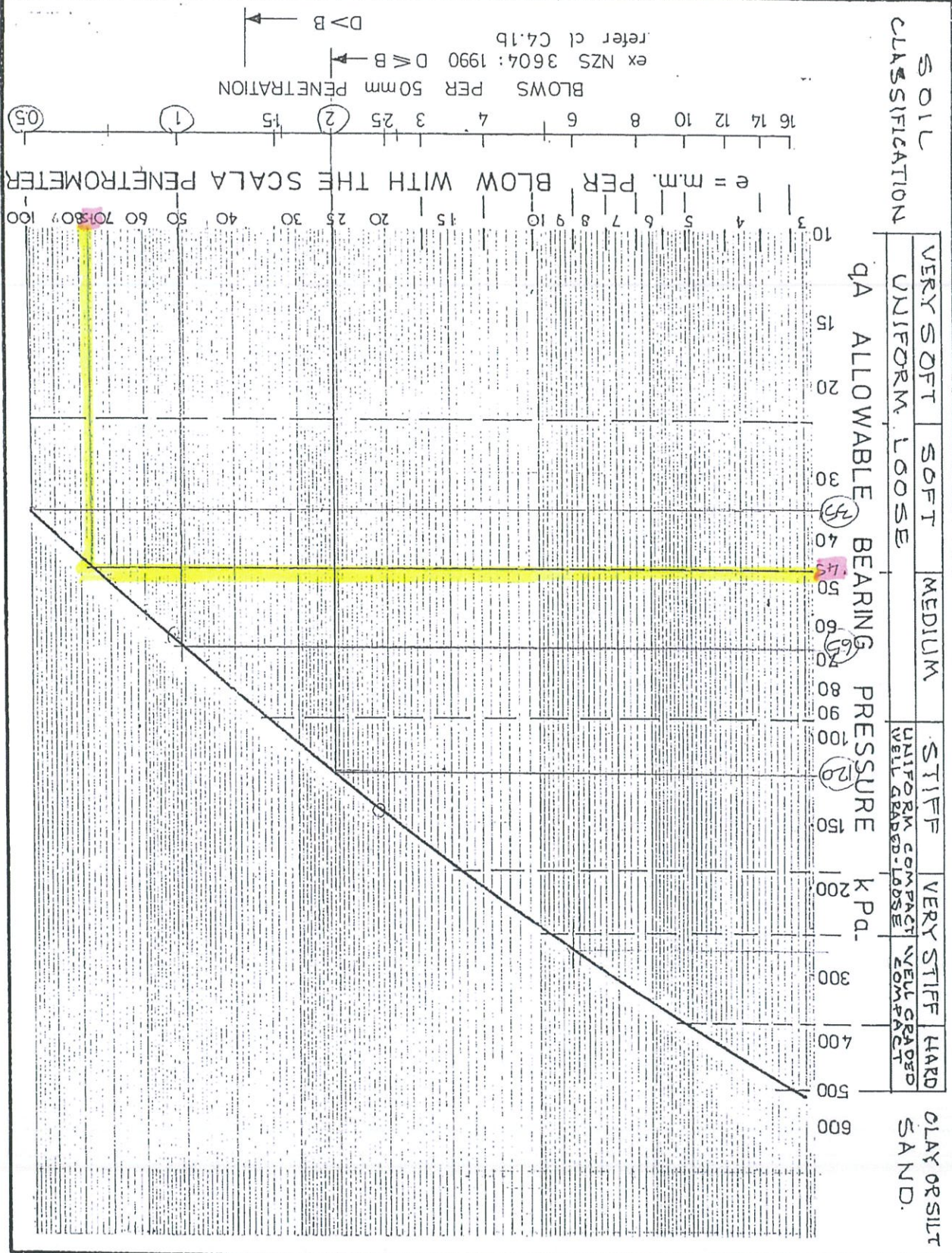
USE 300THK THREDFIL RFT.

- AFTER MARKED UP PLANS ATTACHED.

- SUITABLY QUALIFIED ENGINEER TO INSPECT COMPLETED SUBGRADE AND FINAL COMPACTED.

Determination of allowable bearing pressure under small structures

ref. N.Z. Engineering 15 June 1977
M.J. Stockwell



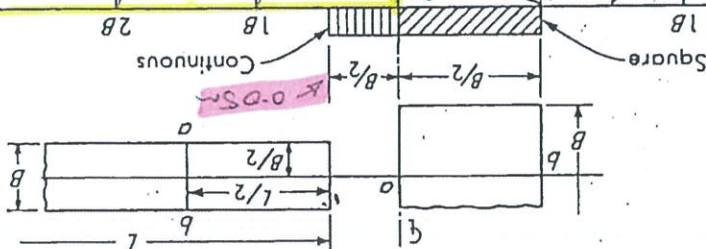


Fig 4
125mm/Blew
CBR 2/3.
~ 20 kPa
Type 100 kPa
OR 60 kPa / 0.1 m²
= 600 kPa
= 30
= 0.03
3B = 1.0 m
300mm COMPACTED
APP65 FILL

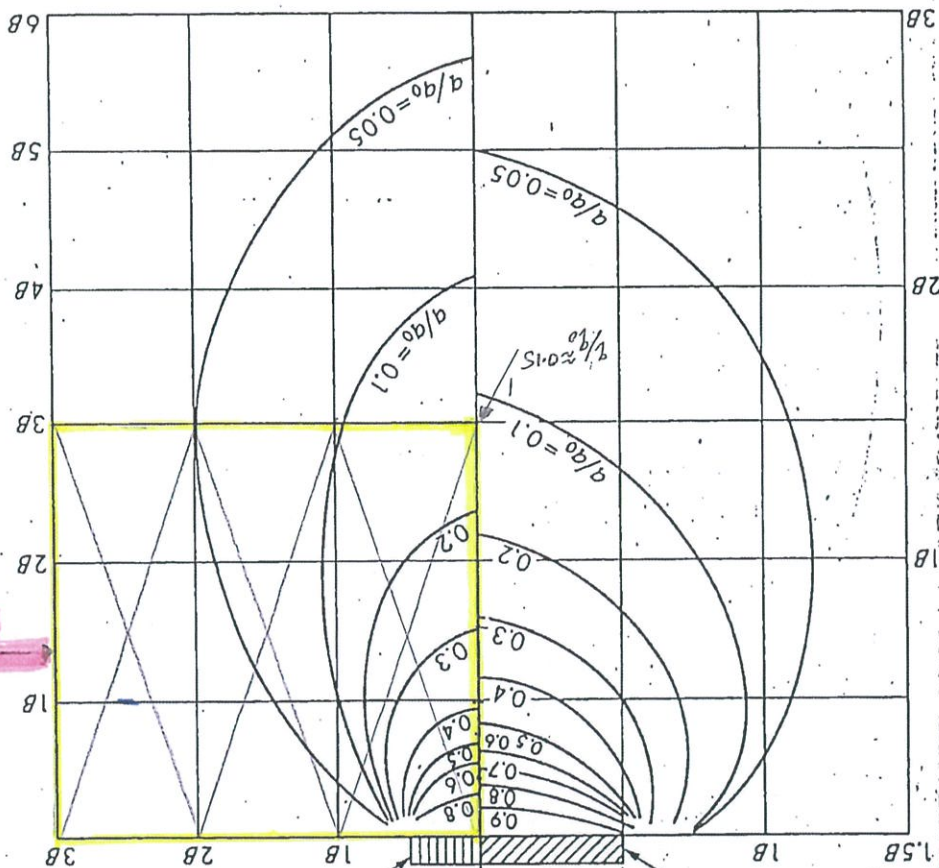


Figure 5-6. Pressure isobars based on the Westergaard equation for square and long continuous footings of dimension $B \times B$ or $B \times L$. Values for the continuous footings are at the point $L/2$ from the end. Chart constructed from Fig. 5-5 ($\mu = 0$). Applicable along line ab as shown.

AB scale shown on the chart, and thus the chart includes only 160 of the 200 units used to establish the influence value.
Figure 5-6 is a set of isobars prepared from Fig. 5-5 to obtain stresses at a point beneath continuous and square foundations. Figure 5-5 may be used for round contact areas.
A numerical procedure may be used to solve Eq. (5-8) on the computer in a similar manner to the Boussinesq equation.
In comparing the Boussinesq and Westergaard methods for vertical stresses, one finds that

1. At small r/z (close to footing) the Boussinesq equation gives larger stress intensity.
2. At r/z about 1.8 both values are approximately equal.
3. At r/z greater than 1.8 the Westergaard equation gives larger stresses.

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#Notes

client:
LOWE

project:
RELOCATE PERMIT

design by: Manor Build

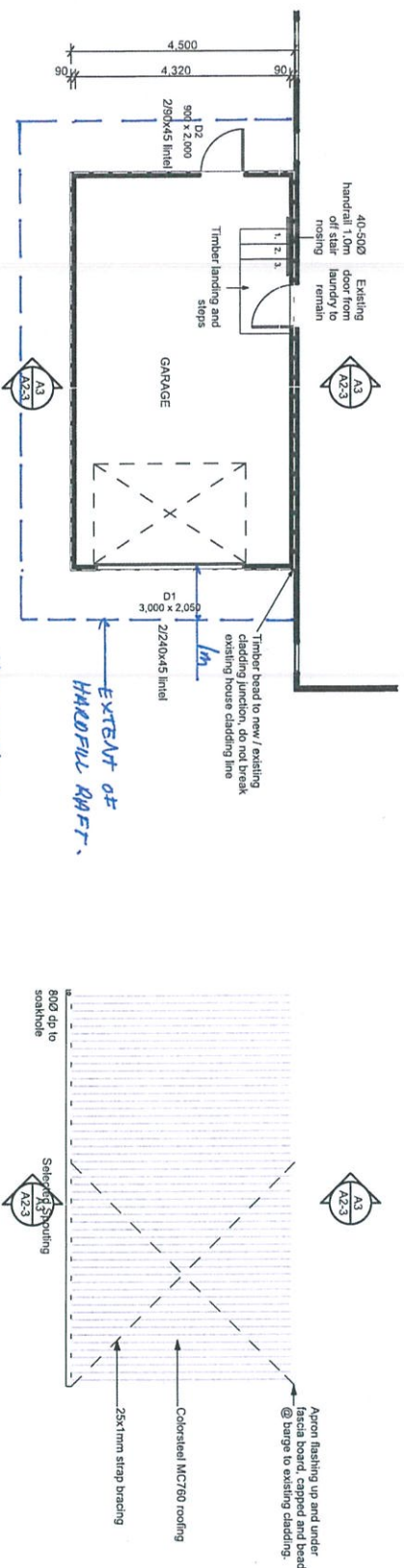
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date: 27/10/2020

PLANS

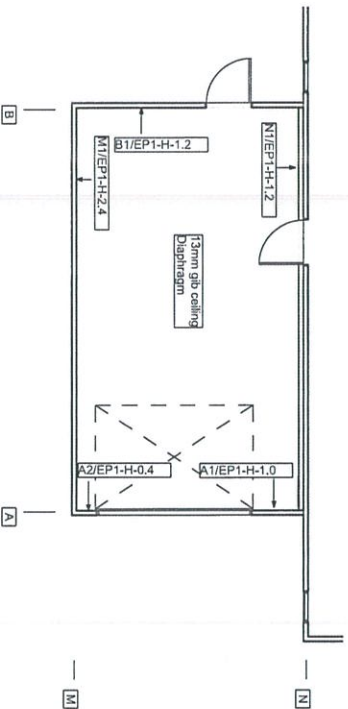
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sheet no: A2-2

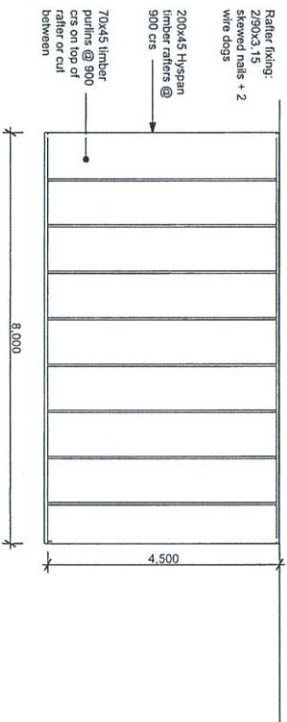


FLOOR PLAN
Scale 1:100

ROOF PLAN
Scale 1:100



BRACING PLAN
Scale 1:100



ROOF FRAMING PLAN
Scale 1:100



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#Notes

client:
LOWE

project:
RELOCATE PERMIT

design by: Manor Build

scale: As Noted

date: 27/10/2020

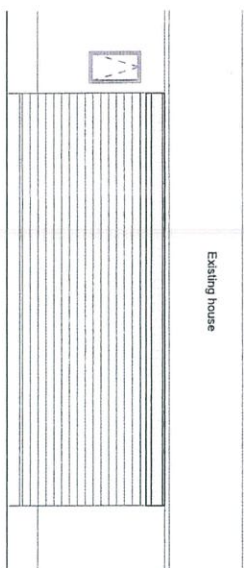
ELEVATIONS

job no:

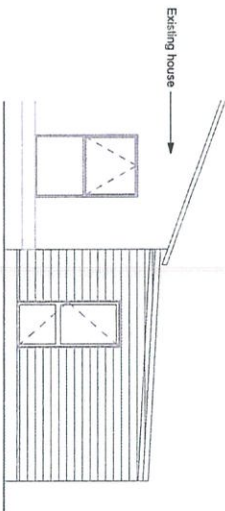
MG181

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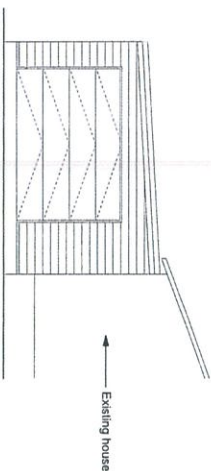
A2-3



ELEVATION E1
Scale 1:100

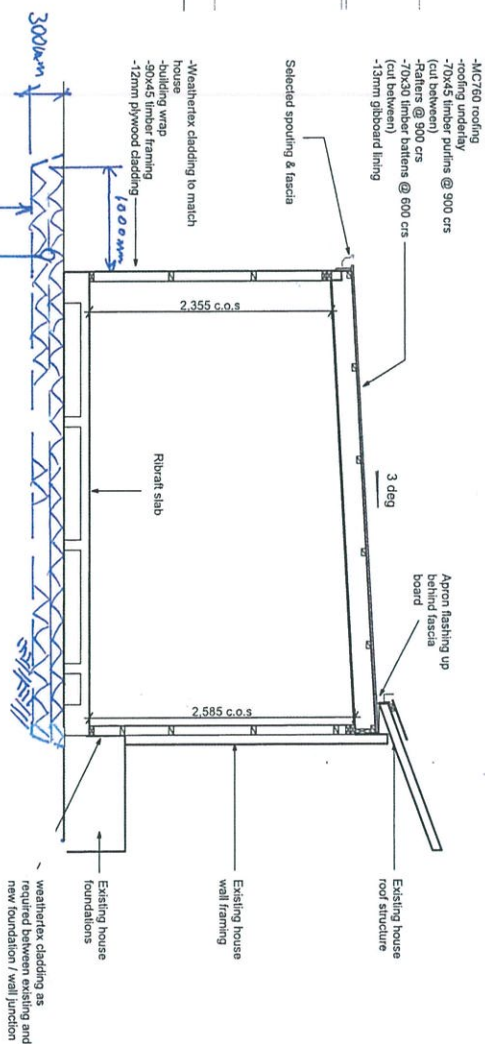


ELEVATION E2
Scale 1:100



ELEVATION E3
Scale 1:100

HOUSE NOT PART OF PERMIT



26.11.20

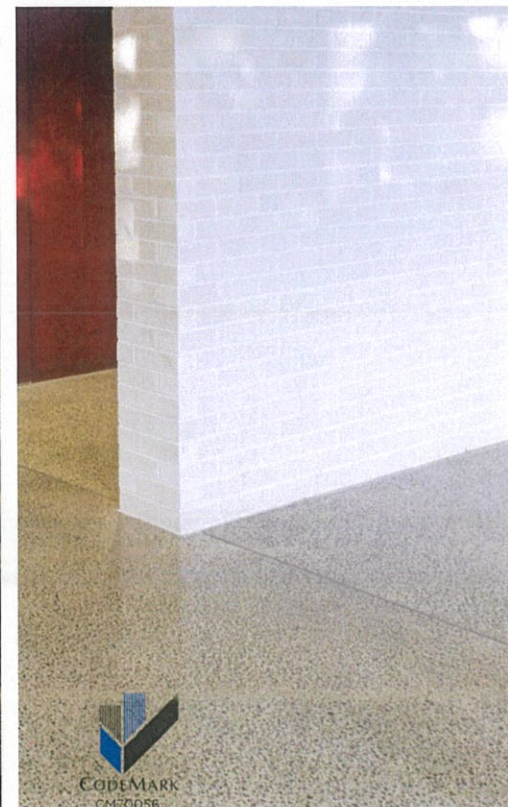
SKT-4104-1

gbl



+RibRaft®

TECHNICAL
MANUAL





This document contains design and installation information. A variation to any of the information given requires specific engineering design and is hence beyond the scope of this document.

The Firth RibRaft® Floor System can be constructed for all slab-on-ground concrete floors for domestic or residential buildings that fall within the scope of NZS 3604:2011 "Timber Framed Buildings" and Clause 3 "Scope" of Section 1 of this Manual. The design and installation details in this Manual shall be used to design and construct such a floor.

The Firth RibRaft® Floor System is covered by the MBIE Codemark®. This is conditional on the system being used as described in CertMark Australasia certification decision, which in turn requires design in accordance with Section 1 and installation in accordance with Section 2 of this Manual and on site verification in accordance with Section 3.

Note that a MBIE Codemark® means that if this Manual is rigidly followed the relevant Building Control Authority will automatically provide a building permit without the need for producer statements. To comply with the Manual does mean that Firth Certified Concrete® must be used.

**THIS
MANUAL
CONSISTS
OF 3
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SECTION: DESIGN INFORMATION

1

1.0 THIS SECTION OF THIS MANUAL CONTAINS DESIGN INFORMATION NOT REQUIRING SPECIFIC ENGINEERING INPUT FOR THE FIRTH RIBRAFT® FLOOR SYSTEM (THE SYSTEM). FULL INFORMATION ON THE INSTALLATION PROCEDURES IS DESCRIBED IN SECTION 2 OF THIS MANUAL (INSTALLATION INFORMATION). WHERE STANDARDS ARE REFERENCED IN THIS MANUAL, THESE SHALL INCLUDE THE LATEST AMENDMENTS.

2.0 TECHNICAL INFORMATION

2.1 Overview

The Firth RibRaft® Floor System is a reinforced concrete waffle raft floor slab-on-ground. Typically it consists of an 85mm thick slab supported by a grid of ribs normally 100mm wide at 1200mm x 1200mm centres. The overall depth is 305mm. Edge beams and ribs under load bearing walls are 300mm wide to provide for the extra load carried by these members. Where heating coils of less than 25mm diameter are embedded in the topping, the slab concrete thickness shall be 110mm meaning the overall thickness is 330mm. Where the top floor surface is honed to provide a decorative finish, a slab thickness of 100mm (before honing) should be specified.

2.2 Pods

Firth RibRaft® polystyrene pods 1100mm square and 220mm thick are placed directly on levelled ground and are arranged in such a way as to form a reinforced concrete floor slab with a grid of reinforced concrete ribs and edge beams when concrete is placed onto them. Pods may be cut to suit specific architecture layout and also to accommodate services. 300mm thick pods are available if needed for deeper edge beams and internal ribs.

2.3 Steel

Reinforcing steel in the slab shall consist of Welded Reinforcing Mesh complying with AS/NZS 4671:2001 with a minimum weight of 2.27kg/m², a lower characteristic stress of 500MPa, square configuration of orthogonal bars between 150 to 200mm centres, and ductility class L or E, hereafter referred to "mesh". The presence of Class E reinforcing bars in the ribs and beams provides adequate ductility of the system which allows the use of class L mesh. Typically the topping mesh reinforcement will be 665 mesh (class L) or SE62 ductile mesh, each being equally applicable. The reinforcing bars in the ribs and edge beams shall conform to AS/NZS 4671:2001 "Steel Reinforcing Materials". Specifically designed spacers are used to position the polystyrene pods and the rib and edge beam reinforcing steel bars in a secure manner until the concrete is placed. The reinforcing mesh is held in place by mesh chairs. Conventional timber or steel formwork is used to form the edge of the slab.

2.4 Concrete

One of the following Firth concrete products shall be used in the system:

- 1) Raftmix: a 20MPa 100mm slump mix available as a pump mix suitable for 100mm pump lines available in either a 13mm or more usually a 19mm nominal aggregate size, or as a structural (non-pump) mix.
- 2) Raftmix25: a 25MPa 100mm slump mix available as a pump mix suitable for 100mm pump lines available in either a 13mm or more usually a 19mm nominal aggregate size, or as a structural (non-pump) mix. This mix shall be specified for buildings constructed in the 'sea spray zone' (i.e. within 500m of the sea including harbours, within 100m of tidal estuaries or inlets, on offshore islands and elsewhere defined as exposure zone D in 4.2.3.3 of NZS3604).

3.0 SCOPE

This Clause sets out the limitations that apply to the use of the system to ensure that specific engineering input is not required. The concrete floor slab for buildings or ground conditions that do not meet this scope must be subjected to specific engineering design to comply with the requirements of the New Zealand Building Code.

3.1 Structure Limitations

Specific engineering input shall not be required only where the structure supported by the system complies with the following criteria:

- > The structure supported by the system is constructed in a location where the Seismic Hazard Factor Z (defined in NZ1170.5) is less than or equal to 0.45 (refer to Figure 6).
- > The system is laid level, or has a maximum step of 600mm detailed in accordance with this Manual.
- > The structure supported by the system has no basement, part basement or foundation walls.
- > The total height from the lowest ground level to the highest point of the roof shall not exceed 10m.
- > The structure supported by the system has a roof pitch limited to 60 degrees maximum from the horizontal.
- > The maximum height of a single or top storey is 4.8m and any other storey is 3m.
- > Only ground floor walls of the structure supported by the system are permitted to be "heavy external walls" (as defined in Clause 3.3).
- > The roof truss span shall be less than or equal to 12m when the roof and ceiling loads are supported entirely by the external walls. Where internal support of roof trusses is used the footings below point loads identified by the truss designer shall comply with this Manual.
- > Where internal load bearing walls are used to support the roof and floor, the loaded dimensions stated in tables 8.2 and 14.10 of NZ3604:2011 shall apply, and these load bearing walls shall be supported on a 300mm wide load bearing rib as detailed in this manual.
- > Floors may be of unlimited size provided that the maximum dimension between free joints shall not exceed 30m. Where free joints are required they should be detailed in accordance with this Manual.

3.2 Live Loading

The live loading cases of structures covered by these designs are:

- > 1.5kPa and 3.0kPa as per NZS3604 "Timber Framed Buildings".
- > 13kN concentrated load in garage over area of 0.3 x 0.3m (vehicle limited to 2500kg gross).

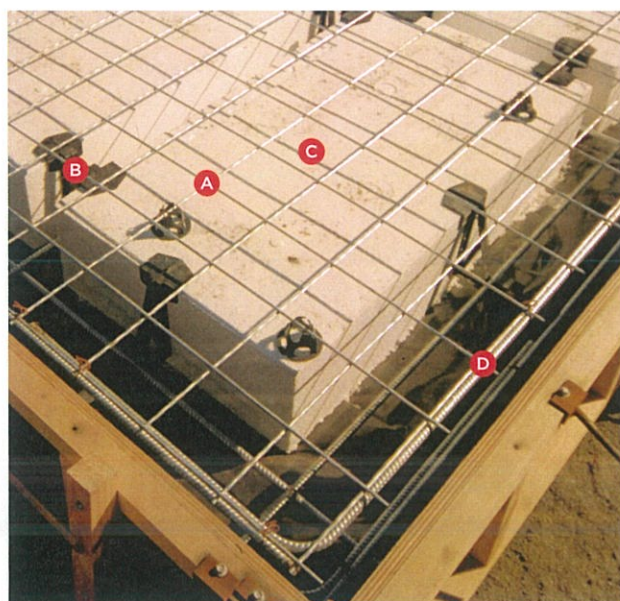
3.3 Snow Loading

Open ground snow loading as defined in NZS3604 of up to 2kPa.

3.4 Dead Loading for Use with This Manual

The dead load cases of structures covered by these designs are:

- > Light external walls with total mass not exceeding 60kg/m² - e.g. timber framing with weather boards and interior wall linings.
- > Heavy external walls with total mass greater than 60kg/m² but not exceeding 290kg/m² - e.g. timber framing with masonry veneer or partially filled 20 series masonry blocks.
- > Internal walls with total mass not exceeding 45kg/m² - e.g. timber framing and linings.
- > Light roofs with total mass not exceeding 45kg/m² - e.g. ceiling linings and metal roof, including framing.
- > Heavy roofs with total mass greater than 45kg/m² but not exceeding 85kg/m² - e.g. ceiling lining and concrete tiles or slates, including framing.
- > Mid-floors with total mass not exceeding 60kg/m² - e.g. timber framing and flooring, including ceiling linings.
- > Heavy internal walls and/or load bearing internal walls supported on a load bearing rib.



The RibRaft® System

- A** Steel mesh reinforcing
- B** Firth 100mm spacer
- C** Firth RibRaft® polystyrene pods
- D** Steel reinforcing

3.5 Foundation Requirement for Different Building Types

The designs given in this Manual are limited to where the system supports Building Types as described in Table 1. The classification of wall and roof weights are as detailed in Clause 3.4 of this Section. Single and two storey shall be as defined in NZS 3604:2011.

Table 1 Foundation Type Identifier

| NUMBER OF STORES | ROOF | GROUND FLOOR EXTERNAL WALLS | SECOND STOREY EXTERNAL WALLS | 1.5KPA LIVE LOAD & UP TO 1KPA SNOW LOAD | 3KPA LIVE LOAD & /OR 2KPA SNOW LOAD |
|------------------|-------|-----------------------------|------------------------------|---|-------------------------------------|
| SINGLE STOREY | Light | Light | | A | A |
| | Heavy | Light | | A | B |
| | Light | Heavy | | B | B |
| | Heavy | Heavy | | C | C |
| DOUBLE STOREY | Light | Light | Light | C | D |
| | Heavy | Light | Light | D | E |
| | Light | Heavy | Light | D | E |
| | Heavy | Heavy | Light | E | G |

3.6 Foundation Soils

The system may be used when the supporting ground meets the definitions of “good ground” given in Section 3 of NZS 3604:2011 (as modified by B1 of the Building Compliance Documents). In addition, the system shall not be used for damp sites i.e. where it can be reasonably expected that the ground water level could come within 600mm of the underside of the system. The acceptability of the ground shall be verified in accordance with Clause 3.1.3 of NZS 3604:2011.

Solutions for soils prone to liquefaction or expansive soils are available using the Firth RibRaft® technology, however these are outside the scope of this Manual and require specific engineering design.

Where the ultimate bearing capacity required of the supporting ground is verified by Scala Penetrometer testing in accordance with Clause 3.3 of NZS3604:2011 or for cohesive soils using a calibrated shear vane in accordance with the NZGS Guideline for Hand Held Shear Vane Test, the bearing capacity shall exceed the values in Table 2 for the proposed building type. For scala penetrometer testing, the bearing capacity shall be considered adequate when the number of blows per 300mm depth of penetration below the underside of the system at each test site exceeds the values given in Table 2 below.

For RibRaft® foundations compliance with Table 2 allows ultimate bearing capacities of less than 300kPa. However, with the exception of bearing capacity all other requirements in NZS3604:2011 for “good ground” shall be complied with.

Table 2 Scala Penetrometer Blows Required and Ultimate Bearing Capacity

| FOUNDATION TYPE | ULTIMATE BEARING CAPACITY (KPA) | MIN. BLOWS PER 300MM DEPTH FOR SCALA TESTING |
|-----------------|---------------------------------|--|
| A | 140 | 4 |
| B | 175 | 5 |
| C | 210 | 6 |
| D | 240 | 7 |
| E | 275 | 8 |
| G | Good ground | 9 |

3.7 Flow Diagrams

The flow diagrams on the following pages (adapted from NZS3604:2011) will help in determining whether the non-specific details for the system can be used for the purposes of the concrete floor slab construction. There are two checks in the process. The first is to determine whether the proposed building complies with the requirements set out in this Manual (Building Check), and the second is to determine whether the site complies with the requirements set out in this Manual (Site Check).

(Note: NZS3604:2011 provides for parts of buildings to be considered as individual buildings. These flow diagrams apply to those parts of the building where slab-on-ground is being considered and where the part of the building can be considered as an individual building under NZS3604:2011).

Figure 1 Building Check Flow Diagram

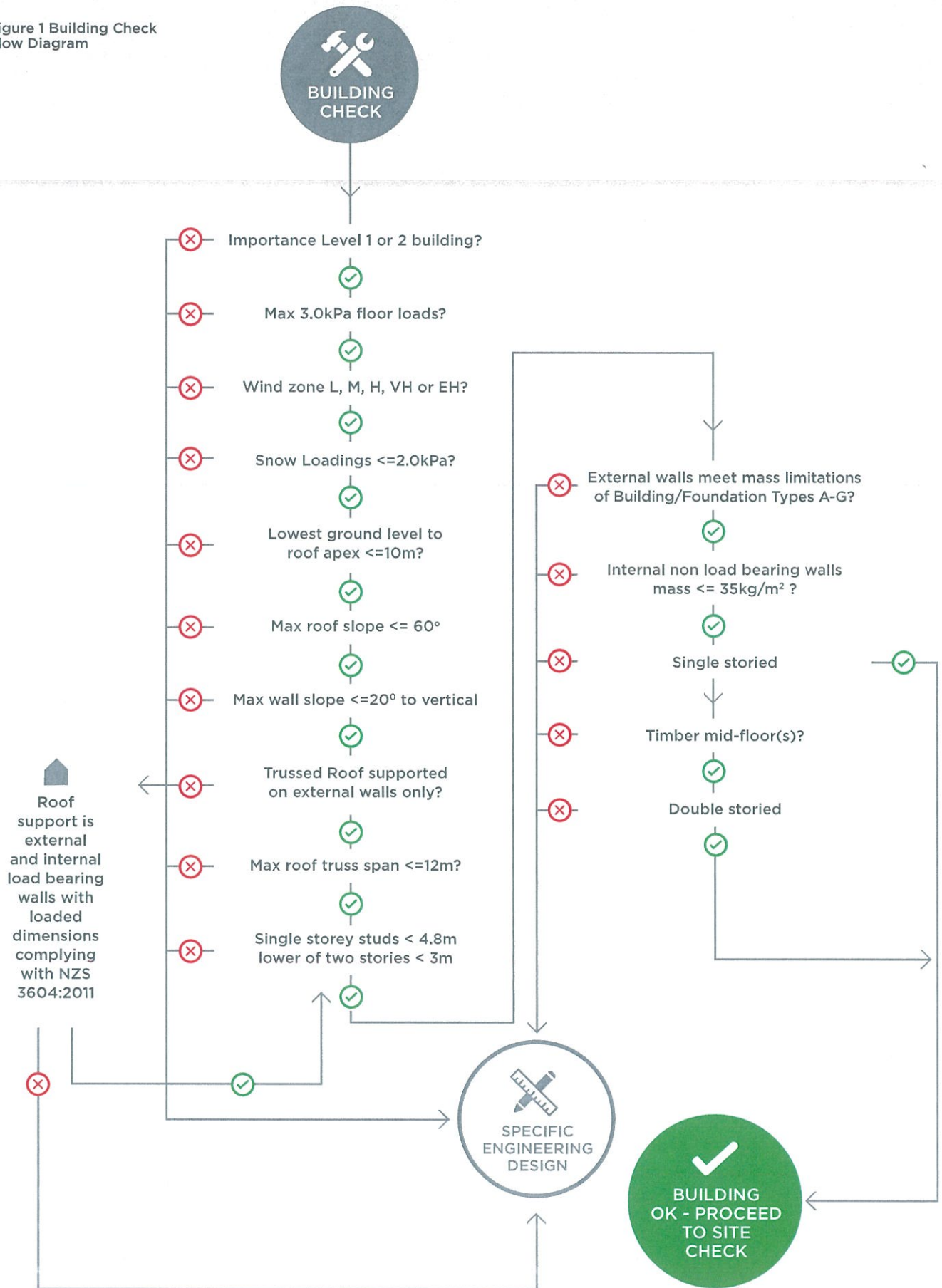
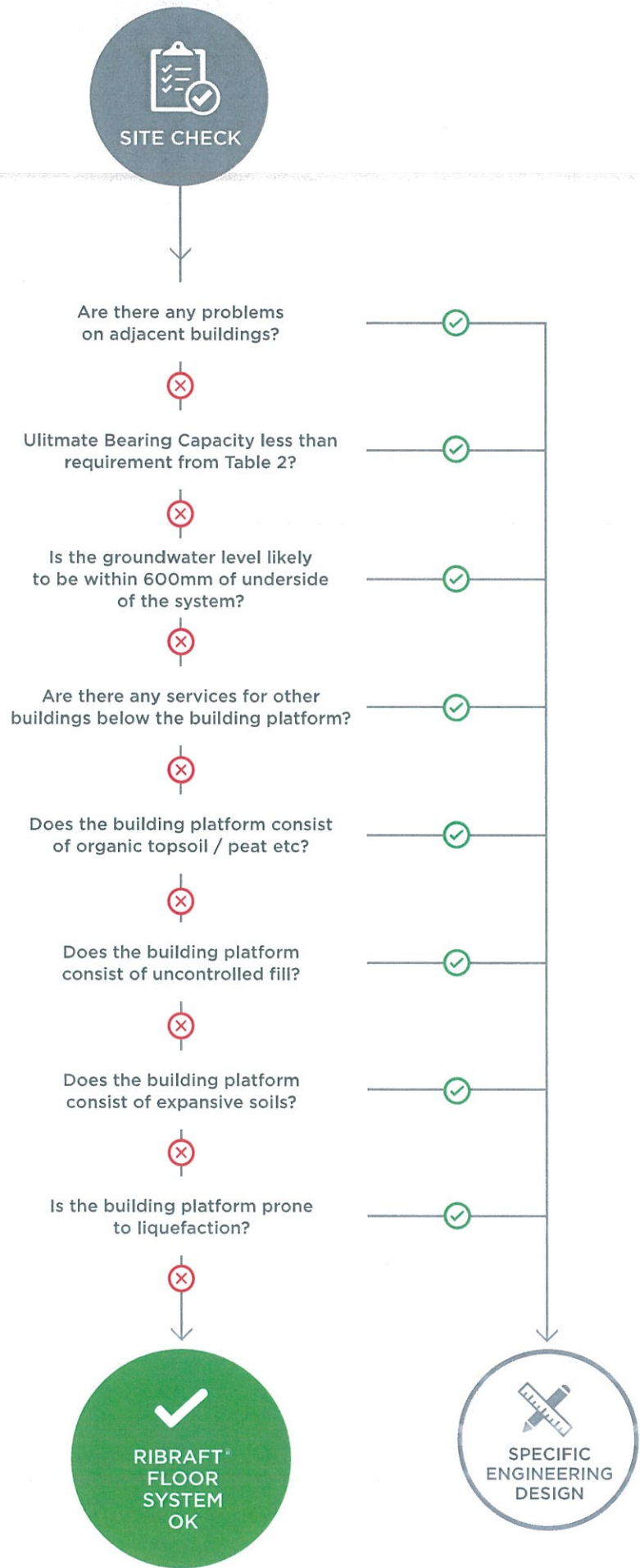


Figure 2 Building Check
Flow Diagram



4.0 CONSTRUCTION DETAILS

Standard construction details for the system are provided here for buildings that fall within the below scope.

4.1 Pod Layout

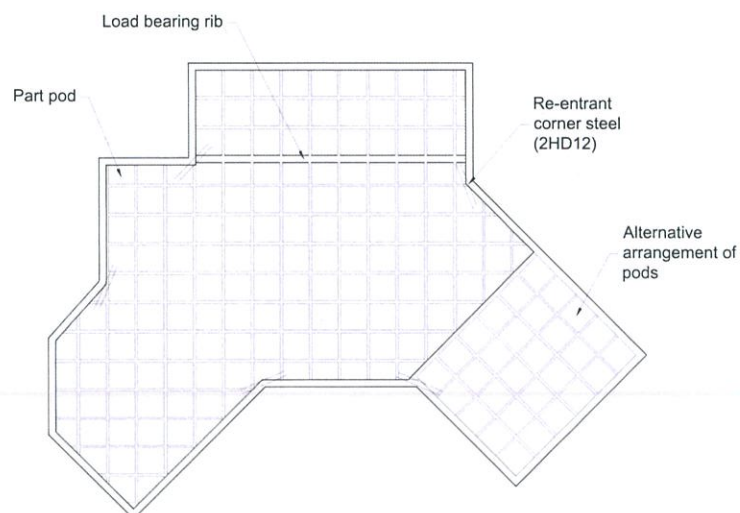
RibRaft® polystyrene pods supplied by Firth (1100 x 1100 x 220mm thick) shall be placed on levelled ground and arranged in a waffle pattern. The pods are used as void formers while the concrete is curing. These pods are an integral component of the system and shall not be substituted.

Pods shall be placed so as to provide the necessary spacing between the edge beams and ribs as described below. The first rib out from the edge beam shall have a maximum clear separation of 1100mm however in all other cases the centre to centre distance between the ribs, whether they are 100mm or 300mm wide, shall be 1200mm. In the case of 100mm ribs this centre to centre spacing is achieved by the 1100mm square pods however between 100mm and 300mm ribs, or between two 300mm ribs, the pods shall be cut down to suit. Pods may be cut down to size but shall not be added to, where this is necessary to suit the building layout, penetrations or orientation of beams and ribs.

Figure 3 shows a typical layout of the pods and ribs. Note the part pods around the edge, where the building shape dictates, and adjacent to the 300mm rib.

Firth suggests that when drawing the building plan, a generic RibRaft® grid (100mm wide ribs at 1200mm centres) is set out using the corner of the building as a starting point. The location of any load bearing ribs, or point loads greater than 10kN, are identified and pods cut to establish 300mm wide ribs or foundation pads as described in this Manual. The most cost effective solution being a simple grid layout which requires minimum cutting of the pods. Ribs can be used at less than 1200mm centres, however it is more cost effective to use the 1200mm centres wherever practicable.

Figure 3 Typical RibRaft® Plan



4.2 Edge Beam Width and Reinforcement

Edge beams around the perimeter of the floor slab shall be 300mm to provide bearing capacity for external load bearing walls, and contain 2-HD12 bars (Grade 500E) as bottom steel and 1-HD12 bar (Grade 500E) in the top. This top bar shall be tied to the underside of the reinforcement mesh. Refer Figure 5, below for construction details. The edge beam shall be rebated for brick veneers where necessary as shown in Figure 5(C).

4.3 Internal Ribs (non load bearing) Width and Reinforcement

Each standard internal rib shall be 100mm wide and shall contain 1-HD12 steel bar (Grade 500E) held in place at the bottom of the rib by a Firth spacer. Refer Figure 5E for construction details.

4.4 Internal Ribs (load bearing) Width and Reinforcement

For load bearing walls that support the roof and floors and heavy internal walls, the pods shall be cut to create a 300mm wide rib directly under the load bearing wall. Refer Figure 5(D) for construction details under load bearing walls. Where the load bearing ribs meet and terminate at an edge beam or internal rib the bottom reinforcement from the load bearing rib shall be bent into the adjacent rib and tied together. The reinforcement shall lap for at least 720mm.

4.5 Point Loads

Truss manufacturers often support the roof trusses internally on posts or studs within a wall, which are described on the truss manufacturer's drawings as falling into various ultimate limit state categories. Table 3 summaries when individual footings are required below the reactions, and the form these should take.

Table 3 Foundation Requirements for Individual Point Loads

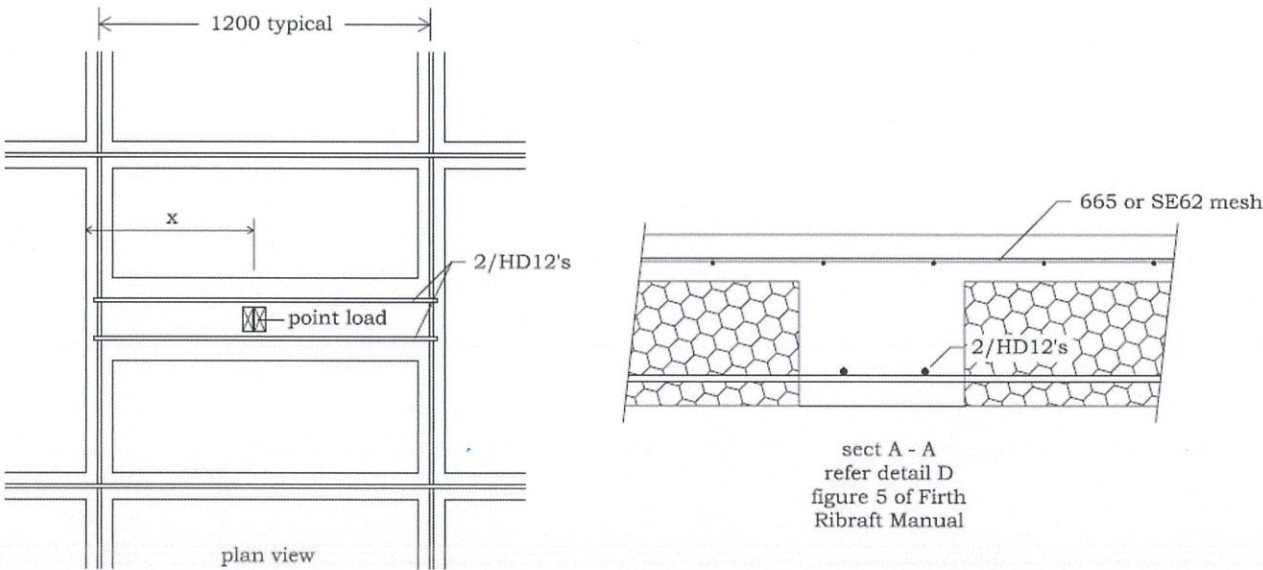
| FOUNDATION OPTIONS BELOW POINT LOAD: | | |
|--------------------------------------|----------------------------|--|
| ULTIMATE LIMIT POINT LOAD REACTION | PAD OPTION, GOOD GROUND | BEAM OPTION, BEARING CAPACITY GREATER THAN 140KPA ⁽³⁾ |
| Up to 10kN | No thickening required | No thickening required |
| Up to 20 kN | 375x375 pad ⁽¹⁾ | 300mm wide load under point load as detailed in Figure 5 |
| Up to 30kN | 450x450 pad ⁽²⁾ | 300mm wide load under point load as detailed in Figure 5 |

Notes
(1) Pad thickness to match depth of pods plus topping (bears on ground not polystyrene) and reinforced with 2 x D12 Bars both ways
(2) Pad thickness to match depth of pods plus topping (bears on ground not polystyrene) and reinforced with 3 x D12 Bars both ways
(3) Refer section 3.6 for confirmation of bearing capacity. With exception of bearing capacity all other requirements in NZS3604 for good ground shall be complied with.

Figure 4 Details for Beam Option Thickening Under Point Loads

| ULTIMATE LIMIT LOAD P FROM TRUSS DESIGNER | MINIMUM EDGE DISTANCE X IN MM |
|---|-------------------------------|
| 20kN | 200 * |
| 30 kN | 400 * |

* If minimum edge distances cannot be achieved extend thickening to next 100mm ribs



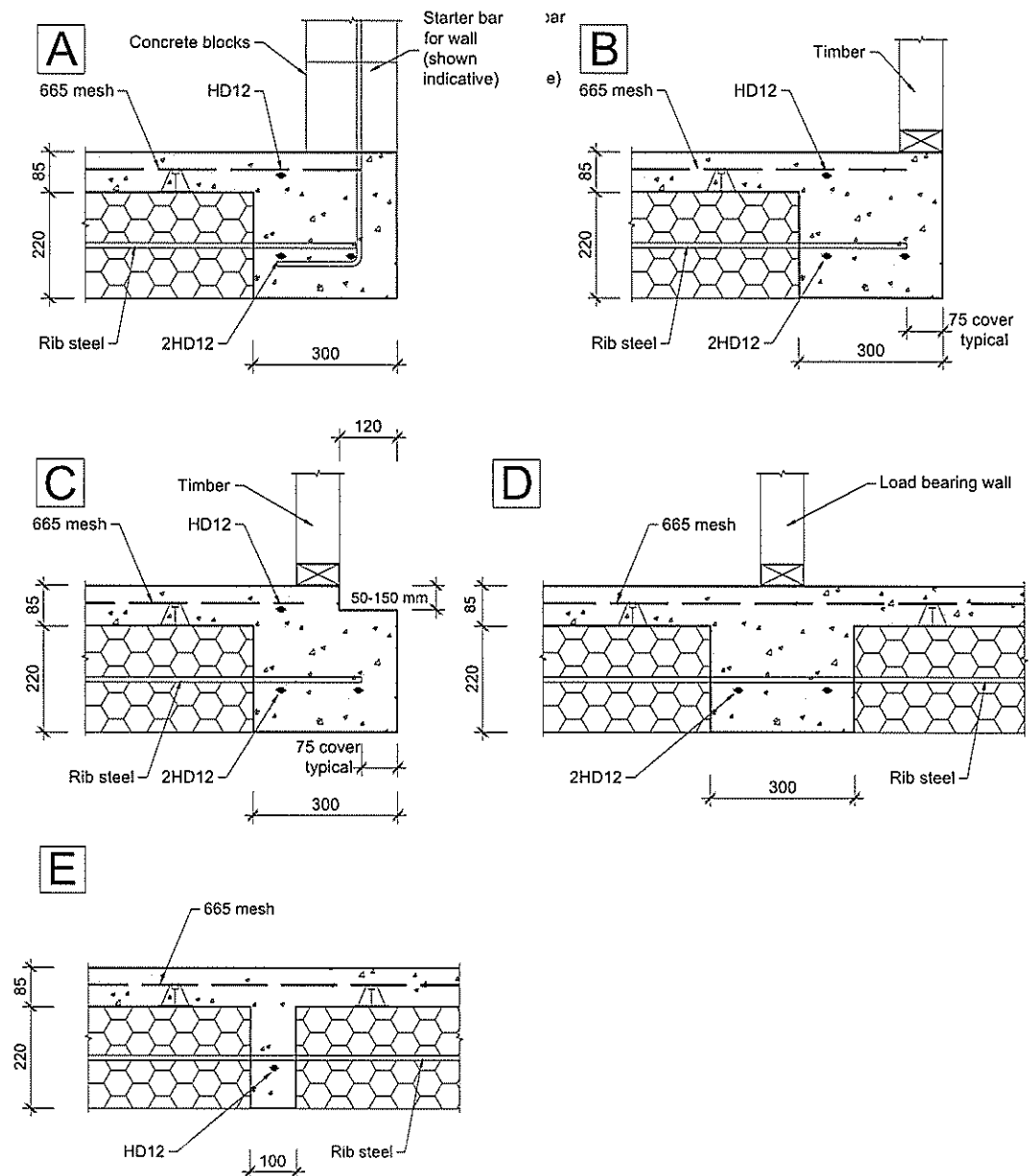
4.6 Mesh Reinforcement

The entire floor slab shall be reinforced with 665 mesh supported on 40mm mesh chairs sitting on the polystyrene pods.

4.7 Re-entrant Corners

In order to limit the width of cracking at the re-entrant, or internal corners, extra steel shall be placed on top of the mesh. These shall be 2-HD12 bars (Grade 500E), 1200mm long tied to the top of the mesh at 200mm centres, with 50mm cover from the internal corner - refer Figure 3.

Figure 5
Standard RibRaft®
Construction Details



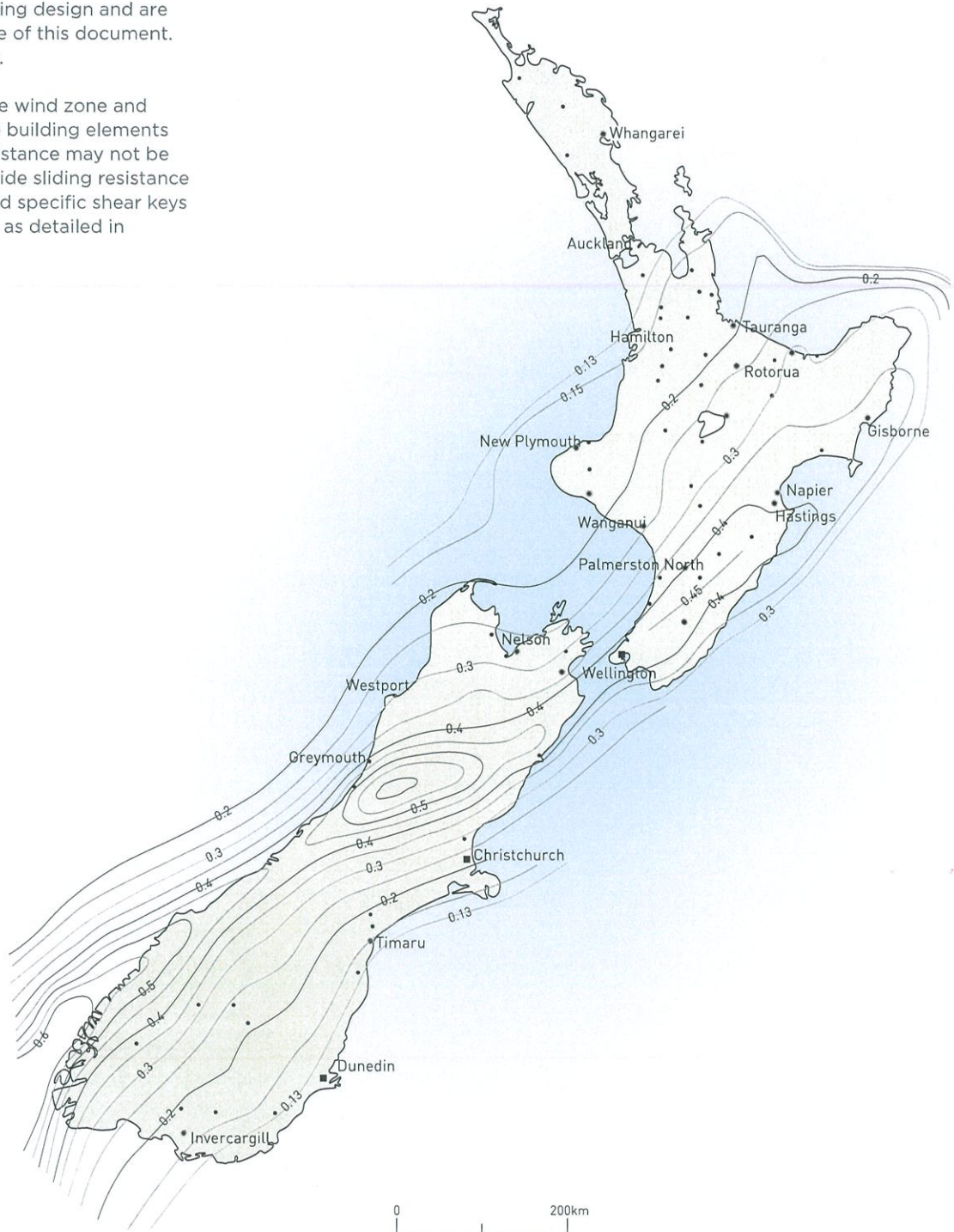
5.0 LATERAL RESISTANCE

5.1 Earthquake Resistance

Unlike conventional foundation systems, the Firth RibRaft® system is not embedded into the ground. Sliding resistance to horizontal seismic loads is provided by frictional contact with the soil. In locations where the Seismic Hazard Factor Z is greater than 0.45, shear keys maybe required to resist seismic loads. Such buildings require specific engineering design and are outside the scope of this document. Refer to Figure 6.

Depending on the wind zone and the weight of the building elements this frictional resistance may not be sufficient to provide sliding resistance to wind loads, and specific shear keys may be required, as detailed in Clause 5.2.

Figure 6
Seismic Hazard
Factor Z to
NZS 1170.5



5.2 Wind Resistance

The building's bracing demand from wind loading shall be assessed from Section 5 of NZS 3604:2011 for both directions (i.e. along and across the building). The bracing capacity of the system must exceed the greater of the bracing demands determined.

The bracing capacity of the system shall be determined as the sum of the bracing capacity provided by frictional resistance (i.e. friction between the system and the ground) and the bracing capacity provided by the shear keys (if any) necessary to meet the requirements of Clause 5.2.

The bracing capacity provided by frictional resistance shall be determined from Table 4 depending on the building type, roof weight, and floor live loading. The bracing capacity provided by the shear keys shall be the sum of the bracing capacity of the individual shear keys determined as follows. If the shear key is in clay, each shear key shall be considered to contribute 170 BU's. If the shear key is in sand, each shear key shall be considered to contribute 200 BU's. If the bracing capacity of the system, determined from the frictional resistance and the shear keys as described above, is less than the bracing demand further shear keys shall be added until the bracing demand is met.

| BUILDING TYPE | ROOF TYPE | GROUND FLOOR EXTERNAL WALLS | SECOND STOREY EXTERNAL WALLS | BU's PROVIDED PER 100M ² 1.5KPA | FOR LIVE LOADING OF: 3.0KPA |
|---------------|-----------|-----------------------------|------------------------------|--|-----------------------------|
| Single Storey | Light | Light | | 1630 | 1746 |
| Single Storey | Heavy | Light | | 1737 | 1857 |
| Single Storey | Light | Heavy | | 1802 | 1922 |
| Single Storey | Heavy | Heavy | | 1909 | 2029 |
| Double Storey | Light | Light | Light | 2163 | 2403 |
| Double Storey | Heavy | Light | Light | 2270 | 2510 |
| Double Storey | Light | Heavy | Light | 2335 | 2575 |
| Double Storey | Heavy | Heavy | Light | 2442 | 2682 |

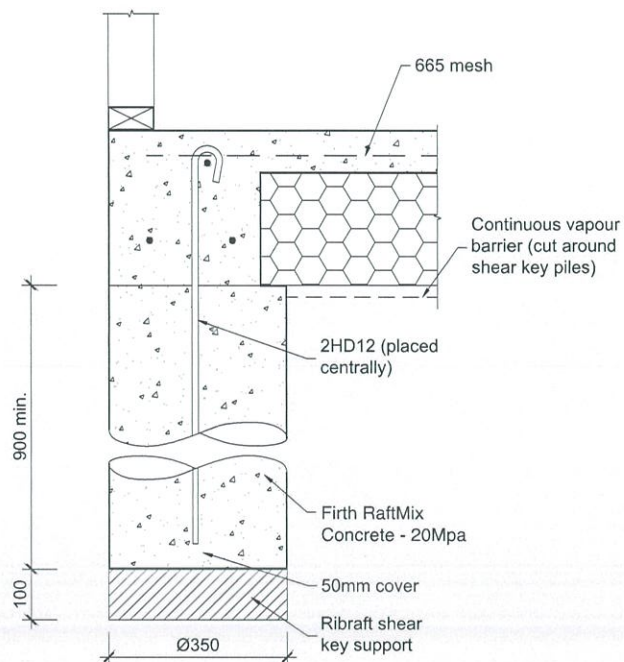
Table 4 Bracing Capacity Provided By Frictional Resistance Per 100m² Of Ground Floor Area

5.3 Shear Keys

Shear key piles required by Clause 5.2 must be uniformly distributed around the perimeter of the building, and be located at the edge beam/internal rib junction. Where a shear key is required, the minimum number of shear keys shall be two per floor plan. Where two shear keys are used they shall be placed at diagonally opposite ends of the floor plan.

Construction details of the shear keys shall be as shown on Figure 7. Shear keys shall be a minimum of 900mm long. The holes shall be over-drilled at least 100mm and a polystyrene RibRaft® Shear Key Support placed into the bottom of each hole. This will support only the plastic (wet) concrete and then allow movement of the shear key if settlement of the supporting ground occurs. The effective end bearing of the shear keys is therefore eliminated.

Figure 7 RibRaft® Shear Key



5.4 Design Example For Lateral Resistance Calculation

The following is a short example to demonstrate the process of determining whether shear piles are required.

Consider a 180m² single storey home with a light roof located in Palmerston North in a VH wind zone as defined by NZS3604. Assume the building height is 6m with 3m above the eaves. The length for across wind considerations is 15m and the width (along wind) is 12m.

First consider seismic actions. From Figure 6 the seismic hazard factor is 0.4. Since this is less than 0.45 shear keys will not be required for earthquake resistance.

Now consider wind loading. Table 5.5 of NZS3604 requires 95 bracing units per meter (BU/m) across the building and 90 BU/m along. As it's a very high wind zone these figures need to be increased by a factor of 1.3.

The BU demand for across building wind is therefore = $95 \times 1.3 \times 15 = 1853\text{BU}$
The BU demand along the building = $90 \times 1.3 \times 12 = 1404\text{BU}$

From Table 4 for a single storey light weight roof with 1.5kPa live load the capacity is 1630BU per 100m². Therefore for 180m² the capacity is 2934BU. As the capacity (2934) is greater than the demand (1853) no shear keys are required.

If the demand had exceeded the capacity then any shortfall can be provided by supplying shear keys in accordance with Section 5.3 with each shear key providing the BU specified in Section 5.2.

6.0 OTHER DESIGN DETAILS

6.1 R-Values

The insulation performance of a building element is measured by the "R-Value". The schedule method is the simplest method to achieve compliance with Clause H1 of the Building Code. Using this method the minimum R-Values required for floors are R1.3 for light timber frame construction, and typically R1.5 for masonry construction. R-values of R1.3 can be used for masonry construction if glazing with greater insulation is used (refer NZBC, Clause H1). If in-floor heating is used the minimum required R-Value is increased to R1.9, and the resistance to thermal movement into the room must be one tenth of that to the outside environment.

The fourth edition of H1 (amendment 3, January 2017) states that "Concrete slab-on-ground floors are deemed to achieve a construction R-value of 1.3, unless a higher R-value is justified by calculation or physical testing". RibRaft® is therefore a deemed to comply solution however in some instances designers may wish to determine the R-value as part of the design process. There are numerous methods for calculating R-values for slabs on ground, with many of the processes giving quite different R-values. NZBC clause H1 prescribed that an "Acceptable methods for determining the thermal resistance (R-values) of building elements are contained in NZS 4214."

The R-values provided in this Manual use the NZS4214 methodology.

If the R-value calculation is required to demonstrate compliance with the Building Code, then the NZS4214 methodology is probably the best alternative due to its reference in H1. However, more technically robust calculation methodologies exist and where the R-values are important, for example heated floors, use can be made of the BRANZ Home Insulation Guide. For these instances edge insulation is also recommended.

When slab edge insulation is specified, it is recommended that Firth HotEdge® is used as it has been designed to be compatible with Firth RibRaft®.

The R-Value of a concrete floor is dependent on the floor area to perimeter ratio, and the details of the floor perimeter. The R-Value for various solutions are illustrated below. The R-Values have been independently calculated using NZS4214:2006 "Methods of Determining the Total Thermal Resistance of Parts of Buildings," though modified for perimeter heat loss using recommendations from the Building Research Establishment.

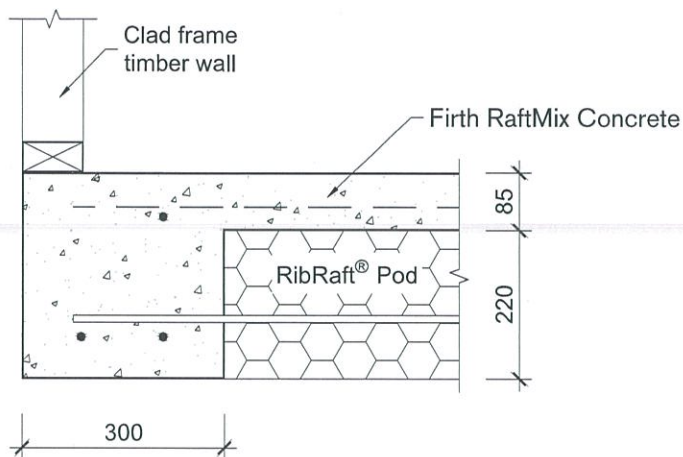


Figure 8
RibRaft® R Values
For 90mm Thick
Walls On The
Floor Edge

| | FLOOR AREA TO PERIMETER RATIO M ² /M | | | | | | | | | | |
|-----------------------------|---|------|------|------|------|------|------|------|------|------|------|
| | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.5 | 2.75 | 3.0 | 3.5 | 4.00 |
| R-Value m ² °C/W | 1.28 | 1.40 | 1.52 | 1.64 | 1.75 | 1.86 | 1.97 | 2.07 | 2.17 | 2.38 | 2.57 |

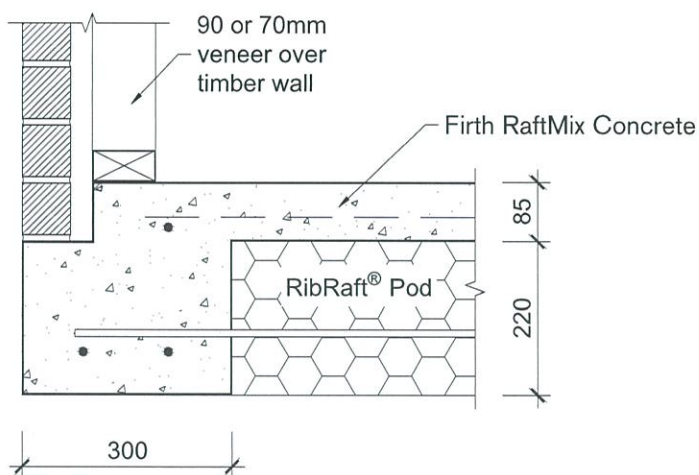


Figure 9
RibRaft® R Values
For 70-90mm
Thick Veneer,
Cavity, and
90mm Walls.

| | FLOOR AREA TO PERIMETER RATIO M²/M | | | | | | | | | |
|-----------------|------------------------------------|------|------|------|------|------|------|------|------|------|
| | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.5 | 2.75 | 3.0 | 3.5 | 4.00 |
| R-Value m² °C/W | 1.54 | 1.67 | 1.80 | 1.93 | 2.05 | 2.17 | 2.28 | 2.40 | 2.62 | 2.84 |

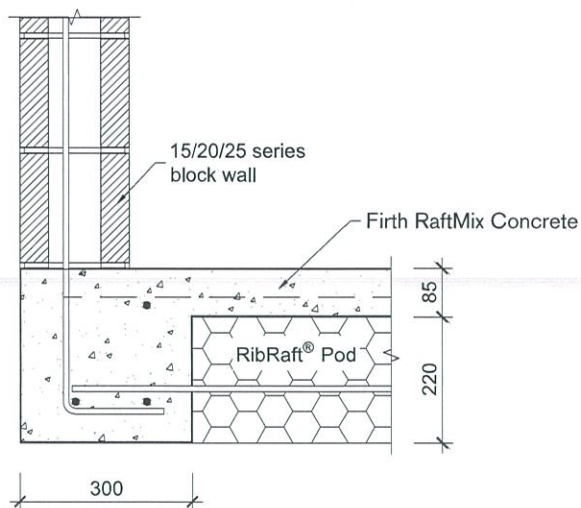


Figure 10
RibRaft® R Values
For Various
Thicknesses
Of Masonry Walls

| | BLOCK | FLOOR AREA TO PERIMETER RATIO M ² /M | | | | | | | | | |
|--------------------------------|--------------|---|------|------|------|------|------|------|------|------|------|
| | | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.5 | 2.75 | 3.0 | 3.5 | 4.00 |
| R-Value m ² °C/W | 15 SERIES | 1.48 | 1.60 | 1.73 | 1.85 | 1.96 | 2.08 | 2.19 | 2.30 | 2.51 | 2.72 |
| | 20 SERIES | 1.54 | 1.67 | 1.80 | 1.93 | 2.05 | 2.17 | 2.28 | 2.40 | 2.62 | 2.84 |
| | 25 SERIES | 1.59 | 1.73 | 1.86 | 1.99 | 2.12 | 2.24 | 2.37 | 2.49 | 2.72 | 2.95 |

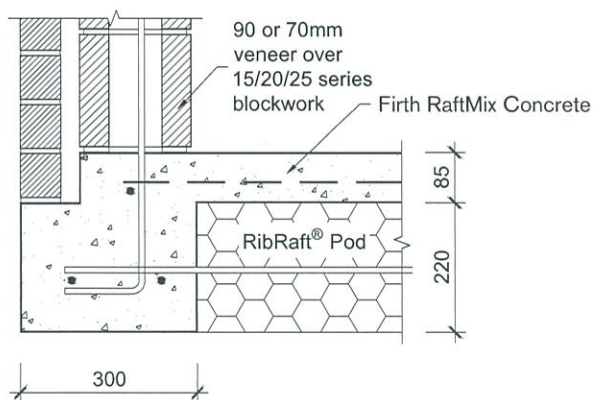


Figure 11
RibRaft® R-Values
For 70-90mm Thick
Veneer, Cavity, And
Various Thickness
Masonry Walls

| | BLOCK | FLOOR AREA TO PERIMETER RATIO M ² /M | | | | | | | | | |
|--------------------------------|--------------|---|------|------|------|------|------|------|------|------|------|
| | | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.0 | 2.75 | 3.0 | 3.5 | 4.00 |
| R-Value m ² °C/W | 15 SERIES | 1.59 | 1.73 | 1.86 | 1.99 | 2.12 | 2.24 | 2.37 | 2.49 | 2.72 | 2.95 |
| | 20 SERIES | 1.64 | 1.78 | 1.92 | 2.06 | 2.19 | 2.32 | 2.44 | 2.56 | 2.81 | 3.04 |
| | 25 SERIES | 1.69 | 1.83 | 1.98 | 2.11 | 2.25 | 2.38 | 2.51 | 2.64 | 2.88 | 3.12 |

6.3 Services Detailing

Two options exist for running services, both of which are appropriate, however some regional Building Control Authorities and Builders have clear preferences. The options being within slab, or under slab. Experience from the Christchurch earthquakes shows that the most seismically robust solution is for services to run within the plane of the pods (within slab).

6.3.1 Within Slab Running of Services

Pipes services can be run within the plane of the pods either exiting out of the side of the perimeter ring beam or going underground at the edge beam. Pipes shall be laid at a fall to comply with NZBC G13/AS1. For pipe up to 65mm diameter the minimum gradient is typically 1 in 40, while for 100mm pipes it's 1 in 60, however greater falls may be required dependent upon the required number of discharge units. Table 5 provides distances from the edge of the slab to pipe surface penetration to achieve minimum pipe gradients. A 300mm pod alternative is often used where the proposed positioning of the service means minimum required gradients cannot be achieved. Where gradients cannot be achieved with a 300mm pod, then service will require to be run under the slab.

Pipes shall be located to pass perpendicular to the ribs and beams and shall not be laid along the length of ribs or beams. Pods are cut as required to achieve the required fall and position. Pipes shall be laid to ensure 15mm concrete cover between pipe and reinforcement in the perimeter beam. All pipes in contact with concrete shall be lagged with an impermeable material of at least 6mm thickness.

Table 5 Maximum Distance From Exterior To Entrance Point Of Plumbing Pipes

| PIPE DIAMETER (ID)MM | GRADIENT | MAXIMUM DISTANCE TO EDGE WITH 220MM THICK POD | MAXIMUM DISTANCE TO EDGE WITH 300MM THICK POD |
|----------------------|----------|---|---|
| 40 | 1 in 40 | 3400 | 6600 |
| 50 | 1 in 40 | 3000 | 6200 |
| 65 | 1 in 40 | 2400 | 5600 |
| 100 | 1 in 60 | 1200 | 4400 |

6.3.2 Under Slab Running Of Services

For this option, services ducts shall be conveyed underground to their plan location then brought up through the polystyrene pod and the concrete floor slab, within the limitation imposed by Table 8. Services shall not be placed within any concrete except to cross that section of concrete i.e. services shall not run along ribs or edge beams. In accordance with AS/NZS3500.4:2015 pipes penetrating through concrete shall be:

- > Installed at right angles to the slab surface.
- > Lagged with an impermeable material for the full depth of the concrete penetration.
- > Lagging must be at least 6mm thick.

The maximum diameter of the services shall be as outlined in Table 6.

Any services crossing ribs or the edge beam horizontally shall be placed only within the middle third of the member. Except as noted in Figure 13, services crossing the ribs vertically shall also be constrained to the middle third of the width of the edge or internal load bearing rib. Except as noted in Figure 15 at no stage shall any of the reinforcement bars be relocated or cut to allow for the services (it is acceptable, however to cut the mesh). In some instances this will dictate the location of the ribs. The pods shall be cut to allow for this and if necessary, the spacing of the ribs shall be decreased locally. There shall be 600mm minimum clear spacing in each direction between penetrations through the system.

Table 6 Maximum Diameter Of Pipe Services

| ELEMENT | VERTICAL SERVICE | HORIZONTAL SERVICE |
|--------------------------------------|--|--------------------|
| 300mm wide edge beam | 50mm nominal bore pipe | 100mm NB pipe |
| 500mm localized wide edge beam (1) | 100mm NB pipe | 100mm NB pipe |
| 300mm wide internal load bearing rib | 50 NB pipe | 100mm NB pipe |
| 100mm wide internal rib | Nil | 100mm NB pipe |
| Slab | 100 NB pipe, or for large services 450mm square see also Note 3 | Nil |

Notes:

- (1) For situations where a 100mm diameter pipe is required to pass vertically through the edge beam, the edge beam shall be locally increased in width to a minimum of 500mm wide. This shall be achieved by keeping flush the outside face of the edge beam and removing 200mm from the pod. The width shall remain at 500mm for a distance of 600mm beyond the service pipe. Refer to figure 14 for details for pipes passing vertically through edge beam and internal rib.
- (2) Where a gas pipe line runs through the RibRaft® floor system, in addition to the requirements above, the pipeline shall enter the building through the outside face of the perimeter foundation beam and be located in the plane of the pods. The aim being to ensure that damage to the gas pipe will most likely occur outside the building envelope should movement occur between the ground and RibRaft® in a large earthquake.
- (3) Larger penetrations or voids up to 450mm square (e.g. for shower waste/traps) are permitted through the slab provided all the conditions of this paragraph are met. These openings shall be trimmed with 1 HD12 (Grade 500E) bar 1500mm long placed along each side of the opening, tied to the mesh. One set of parallel bars shall be placed on top of the mesh and the other set placed under the mesh. These openings shall not be placed over a rib or edge beam. If necessary, the rib spacing shall be reduced or the pod layout altered to ensure that the opening occurs solely in the slab above a polystyrene pod. Penetrations such as these shall not be installed in garages or other areas where large (>3kN) point loads could be present. Only one penetration greater than 110mm is permitted in the slab above any single pod or part pod. Where two large openings are required to be in close proximity, an internal rib shall separate them. For these large penetrations/voids in the slab, the services shall not be within 25mm of the edges of the void through which they pass, and the opening shall be sealed to prevent materials entering the subfloor cavities. (This type of opening is normally only required for a shower waste/trap and the installation of the shower will ensure that the void is sealed/covered).

A pictorial of some of the above requirements is illustrated in Figure 13 and 14.

Figure 13 Example of Detailing Requirements For Services

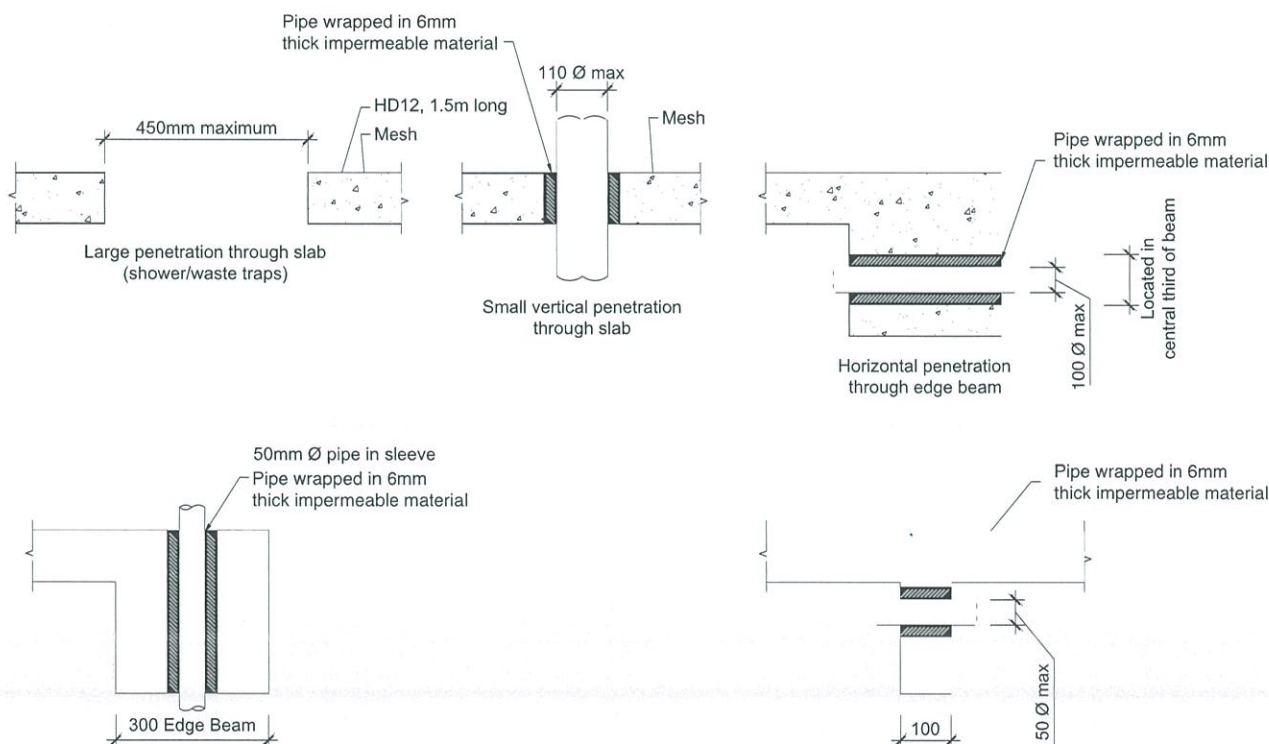
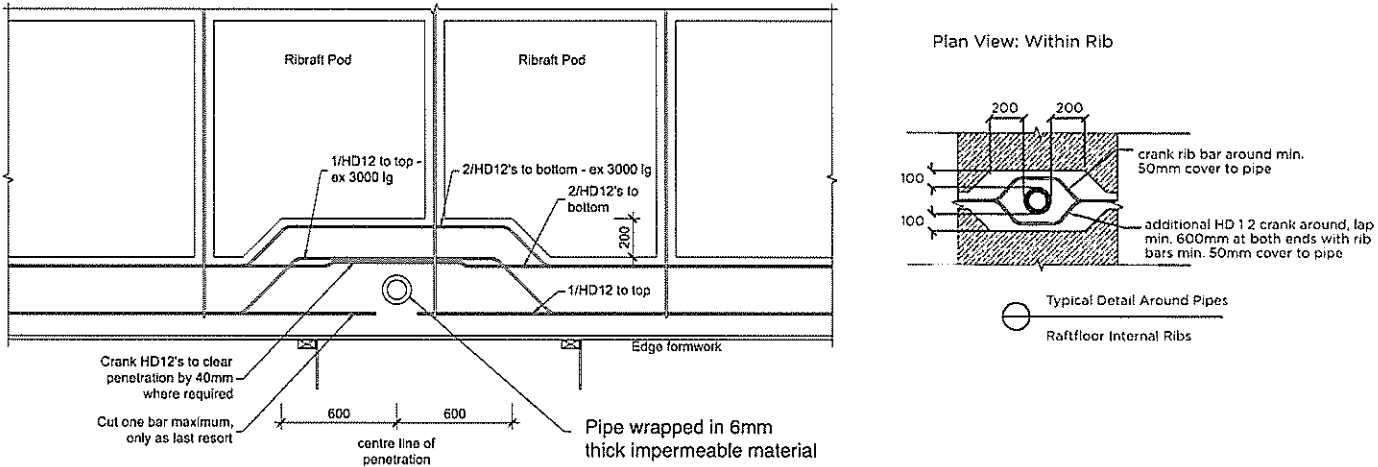


Figure 14
Localised Increase In Width At Edge Beam Where Vertical Service Up To 100mm Diameter Are Required



6.3.3 Recesses for Showers

Where showers are rebated up to 50mm into the RibRaft® concrete topping, the details specified shall be in accordance with Figure 15.

Figure 15 Details where recesses of up to 50mm are required for rebated showers

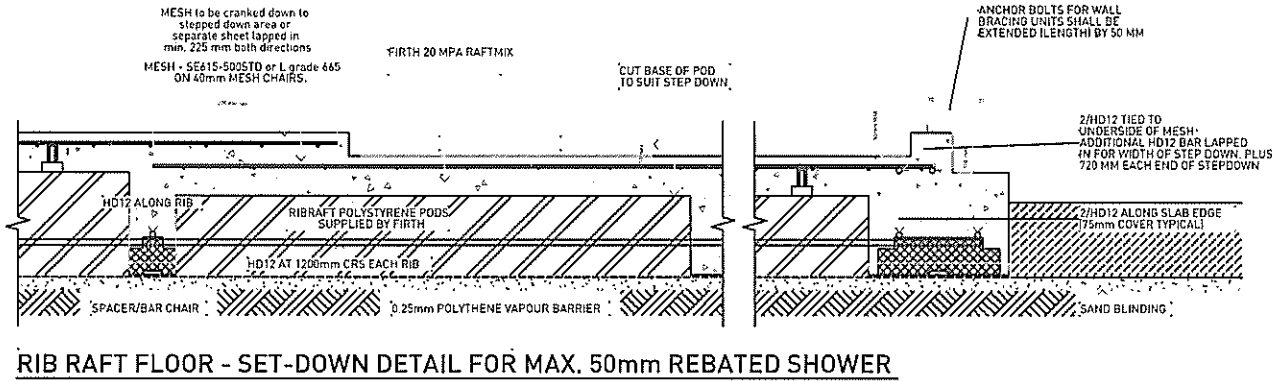
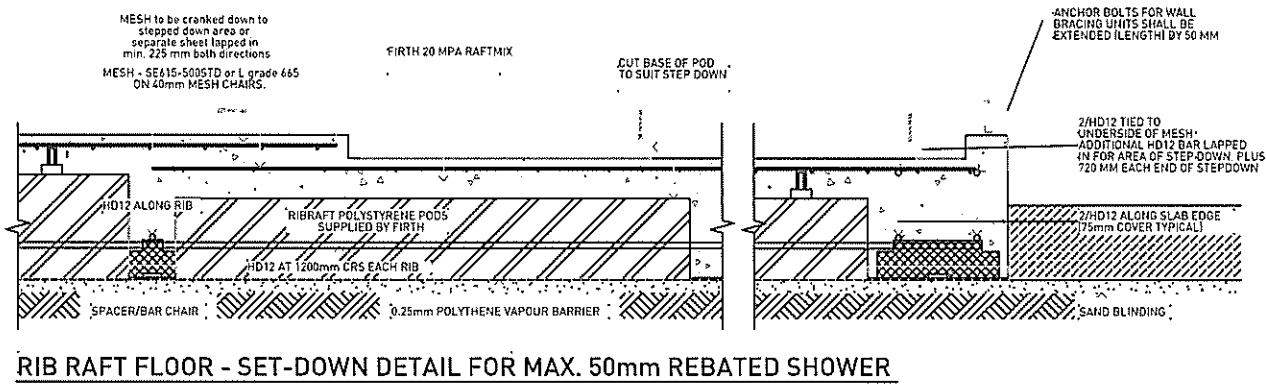
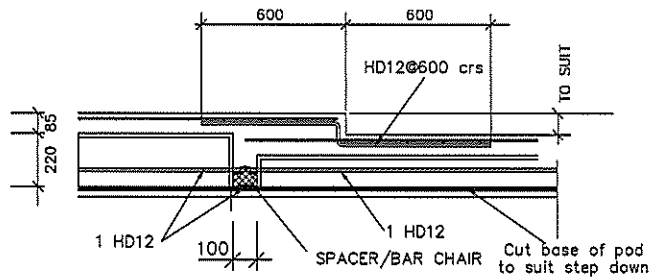
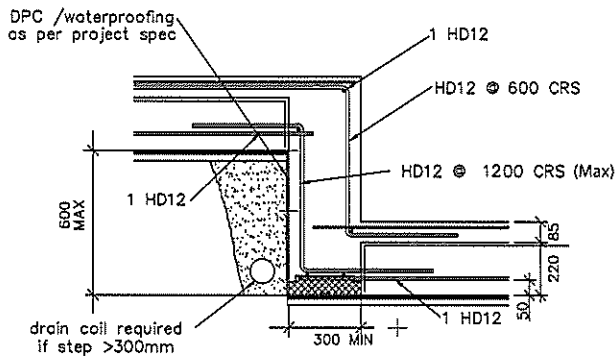


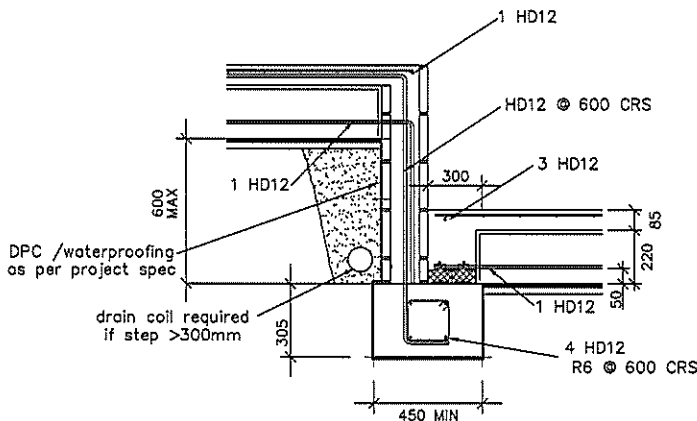
Figure 16 Details where step downs are required in the floor



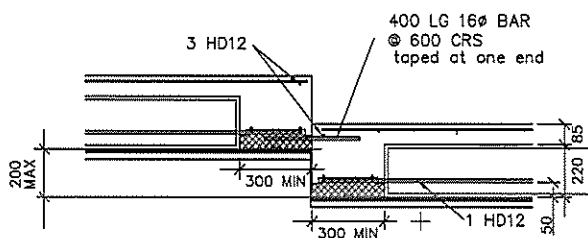
7
S2
SET-DOWN
DETAIL FOR STEP
UP TO 100mm
1:20



9
S2
SET-DOWN DETAIL
IN CONCRETE
FOR STEP LESS
THAN 600mm
1:20



8
S2
SET-DOWN DETAIL
IN MASONRY
FOR STEP LESS
THAN 600mm
1:20



10
S2
SET-DOWN
DETAIL FOR STEP
100 TO 200mm
FOR SEPARATELY
POURED SLABS
1:20

6.3.4 Step Down Of Up To 600mm In The RibRaft® Floor

Where the site topography requires a step down in the slab, steps of up to 600mm can be accommodated using one of the details provided in Figure 16. A step down in the RibRaft® floor system anchors the floor in that location with respect to volume changes associated with drying shrinkage. As required by 6.2.2, a free joint shall be provided if the distance from the step down to the slab edge exceeds 15m.

SECTION: INSTALLATION INFORMATION

2

1.0 THIS SECTION DETAILS THE INSTALLATION INFORMATION REQUIRED FOR THE FIRTH RIBRAFT® FLOOR SYSTEM (THE SYSTEM). FULL INFORMATION ON THE DESIGN PROCEDURES NOT REQUIRING SPECIFIC ENGINEERING INPUT, AND REQUIREMENTS FOR THE SITE ASSESSMENT ARE DESCRIBED IN SECTION 1 OF THIS MANUAL (DESIGN INFORMATION). WHERE STANDARDS ARE REFERENCED IN THIS MANUAL THESE SHALL INCLUDE THE LATEST AMENDMENTS.



2.0 SITE REQUIREMENTS

2.1 General

The site requirements of this Manual are concerned solely with the soil conditions under or immediately adjacent to the system. If a site does not comply with this Manual, the system shall be subject to specific engineering design.

This Section shall only apply for building sites such that:

- > The ground is as specified in Section 1 of this Manual;
- > Any system erected at the top of a slope (whether fill compacted in accordance with NZS4431, or natural ground) shall be located as shown in Figure 1 so that the finished ground is always outside the dashed line shown. (The vertical distance, V, shall be measured to 50mm below the underside of the slab).

Where the finished ground does not comply with Figure 1, the slope shall be retained by a specifically designed retaining wall.

2.2 Temporary Excavations

No excavation shall take place at a location or in a manner where the stability of the foundation material is likely to be compromised. The backfilled material shall match the compaction and strength of, and have similar properties to, the surrounding material. The sides of the excavation shall be propped as necessary.

Temporary excavations shall be open for no longer than 48 hours and shall take place only above the critical depth line as shown on Figure 2. Should temporary excavations be required below this line, specific engineering design is required.

2.3 Surface Water

Surface water from the site shall not flow across the slab platform. For example, on cut and fill sites the ground uphill from the system shall be graded to direct any surface run-off away from the system as shown in Figure 3.

Figure 1
Relationship
Of RibRaft®
To Sloping
Ground Surface

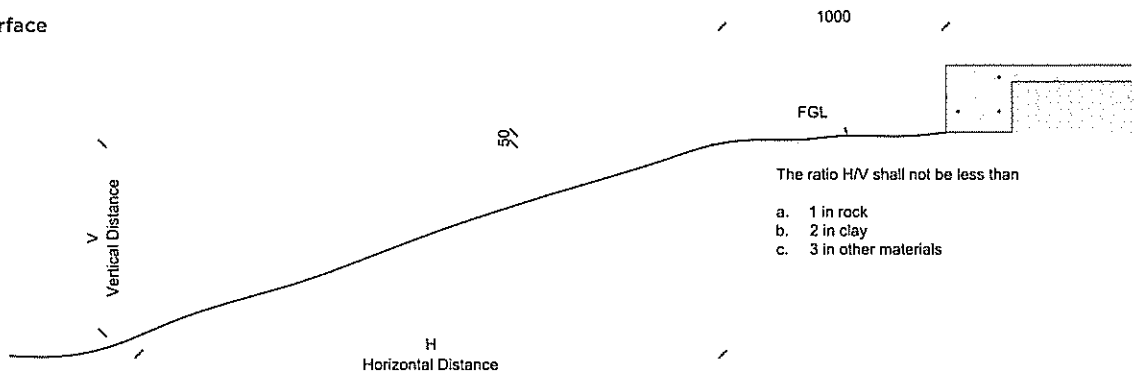


Figure 2
Temporary
Excavation
Limited

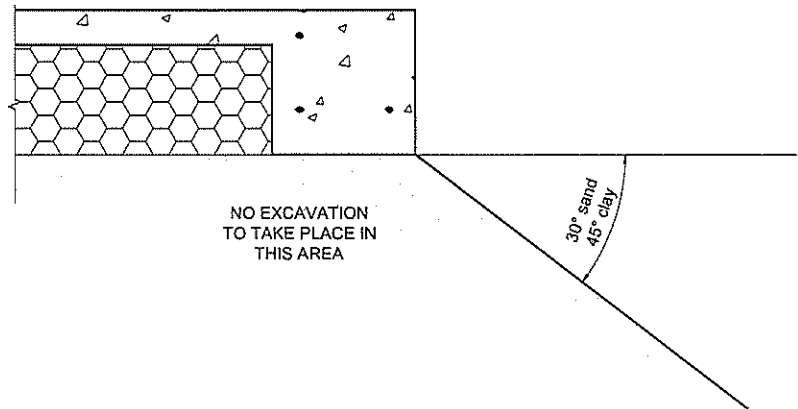
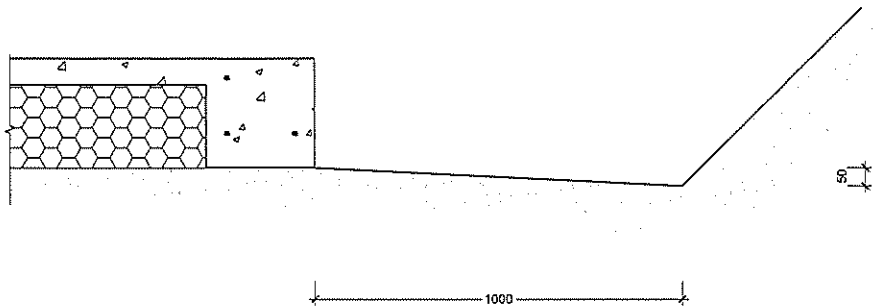


Figure 3
Site Grading



3.0 INSTALLATION PROCEDURE

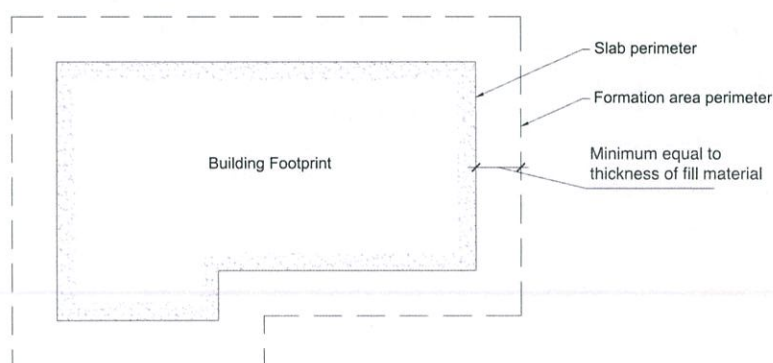
3.1 Site Preparation

All vegetation, topsoil and other organic or deleterious material shall be removed from the area to be covered by the building (formation area) prior to commencing construction of the system.

3.2 Earthworks

The formation area shall be cut or filled to a level approximately 330mm below finished floor level. Where fill is required to achieve this level, the fill shall be certified by a geotechnical engineer (outside the scope of this Manual) or shall be granular fill in accordance with Clause 7.5.3 of NZS 3604:2011 "Timber Framed Buildings". The formation area shall also extend a distance equal to the thickness of the fill material beyond the slab perimeter as shown in Figure 4. The installer shall confirm the acceptability of the ground over the entire building platform before proceeding with the construction. Refer to Clause 3.5 of Section 1 (Design Information) for requirements.

Figure 4 Plan of Formation Area



3.3 Shear Keys

Where shear keys are required, the holes shall be drilled following the site clearing and earthworks, in accordance with Clause 4 in this section, and prior to the construction of the system commencing.

3.4 Plumbing and Services

Plumbing and services required beneath the system should preferably be conveyed underground to their plan location then brought up through the system. The trenching, placing, and bedding of the pipes/ducts and the backfilling of the trenches shall conform to the requirements of the consent documentation. Services shall not run along ribs or edge beams. The maximum diameters of the services shall be as dictated in Clause 6.3 of Section 1.

Where required, the services can be installed by removing unnecessary polystyrene and placing pipes within the pod depth. All pipes shall be held firmly in place and have temporary end covers. Any services crossing ribs or the edge beam horizontally shall be placed only within the middle third of the member. Except as noted in Figure 14 (Section 1) services crossing the ribs vertically shall also be constrained to the middle third of the width of the edge or internal load bearing rib. Except as noted in Figure 13 (section 1) at no stage shall any of the reinforcement bars be relocated or cut to allow for the services (it is acceptable, however to cut the mesh). In some instances this will dictate the location of the ribs. The pods shall be cut to allow for this and if necessary, the spacing of the ribs shall be decreased locally. There shall be 600mm minimum clear spacing in each direction between penetrations through the system.

Where the services pass through the top of the pods, the opening shall be sealed to prevent materials entering the

subfloor cavities. (This can be achieved with Denso tape and a type of easily compressible foam.)

Larger penetrations or voids that are required, up to 450mm square (e.g. for shower waste/traps), shall be installed in accordance with all the conditions of this paragraph. These openings shall be trimmed with 1 HD12 bar (Grade 500E) 1500mm long placed along each side of the opening, tied to the mesh. One set of parallel bars shall be placed on top of the mesh and the other set placed under the mesh. These openings shall not be placed over a rib or edge beam. If necessary, the rib spacing shall be reduced or the pod layout altered to ensure that the opening occurs solely in the slab above a polystyrene pod. Penetrations such as these shall not be installed in garages or other areas where large (>3kN) point loads could be present. Only one penetration greater than 110mm is permitted in the slab above any single pod or part pod. Where two large openings are required to be in close proximity, an internal rib shall separate them. For these large penetrations/voids in the slab, the services shall not be within 25mm of the edges of the void through which they pass, and the opening shall be sealed to prevent materials entering the subfloor cavities. (This type of opening is normally only required for a shower waste/trap and the installation of the shower ensure that the void is sealed/covered).

Where a recess of up to 50mm is required in the topping to provide a rebate for a shower, the construction details shall be as shown in Figure 15 (Section 1).

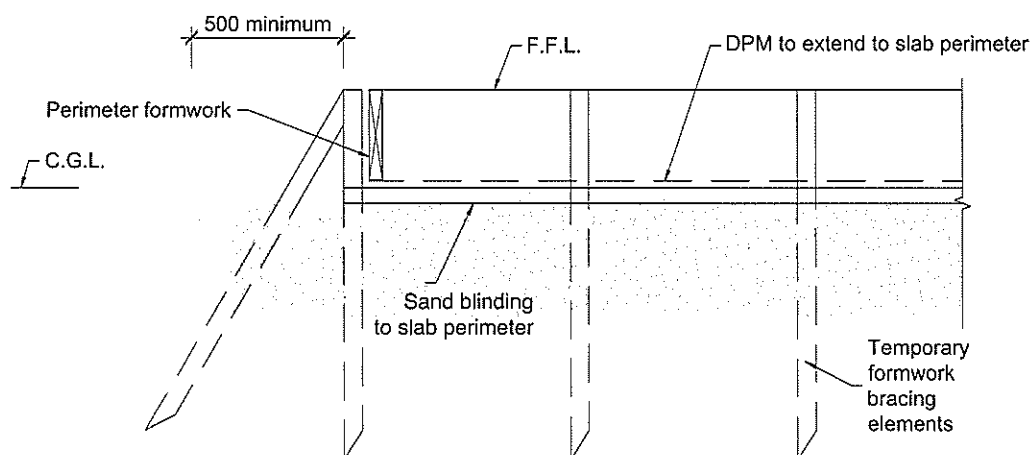
3.5 Sand Blinding

A layer of sand shall be placed, screeded and compacted over the building platform, extending to the outside edge of the perimeter foundation, refer Figure 5. The maximum thickness of this blinding layer shall be 50mm. The surface shall be level and a minimum of 305mm below finished floor level. A small plate compactor, vibrating roller or similar, should be used to compact the sand blinding layer. When the building platform is clay, it is essential that the blinding sand is compacted onto a clay surface that has not been softened by construction activities. If the clay has been softened (i.e. has a muddy surface layer due to construction activities), remove the softened material from under the RibRaft® ribs before placing the sand. If excavation lowers the clay surface to more than 50mm below the underside of the RibRaft®, fill shall be placed in accordance with Clause 7.5.3 of NZS 3604:2011 "Timber Framed Buildings". The sand is required to be level to ensure that pods remain stable throughout the installation of the system.

3.6 Damp Proof Membrane

The damp proof membrane (DPM) material shall be polyethylene sheet in accordance with NZS 3604:2011. The DPM shall be laid over the entire building platform directly on top of the sand blinding layer, extending to the outside of the edge beam – refer Figure 5 below. The joints shall be lapped not less than 150mm and sealed with pressure sensitive tape not less than 50mm wide. All penetrations of the DPM by plumbing and services or punctures during construction shall also be sealed with pressure sensitive tape. The DPM may extend beyond the edge of the slab i.e. underneath the formwork, or may be folded and stapled up the inside of the formwork. The minimum requirement is that the DPM extends to the outside of the edge beam. It is very important that the DPM is not bunched up at the formwork. The installer shall ensure a square and tidy finish at the underside and at all corners of the edge beam.

Figure 5 Sand blinding / DPM / Formwork Details



3.7 Edge Formwork

The edge formwork shall be constructed ensuring that the requirements of NZS 3109:1997 "Concrete Construction" are adhered to. The formwork shall be adequately supported and braced to prevent any buckling or warping. If the wall is to be constructed in masonry veneer, formwork for a masonry veneer rebate should be adequately fixed to the perimeter formwork.

Thorough cleaning of re-useable formwork and the use of release agents enhances the life and performance of formwork and maintains a quality surface finish.

3.8 Laying the Pods and Spacers

The Firth RibRaft® polystyrene pods shall be laid out over the DPM in a regular waffle pattern ensuring direct contact with the ground across the entire pod. The edge beam shall be formed using the Firth approved 300mm spacers (refer Figure 9). These shall be placed at a maximum of 1200mm centres along the perimeter of the slab and one per pod or part pod. Ribs supporting a load bearing wall shall be formed using a minimum of one Firth approved 300mm spacer along the edge of each pod or part pod.

Except where a 300mm wide rib is required, each pod or part pod shall always be separated by 100mm using a minimum of one Firth approved 100mm spacer along each edge of each pod or part pod. The ribs in both directions shall form a waffle pattern throughout the slab. It is essential that the ribs and edge beams are straight when the concrete is poured, i.e. the pods need to be lined up. Figure 6 shows a detailed layout of the pods and spacers.

Figure 6
Detailed layout
of Pods and
spacers (mesh
and top steel omit-
ted for clarity)

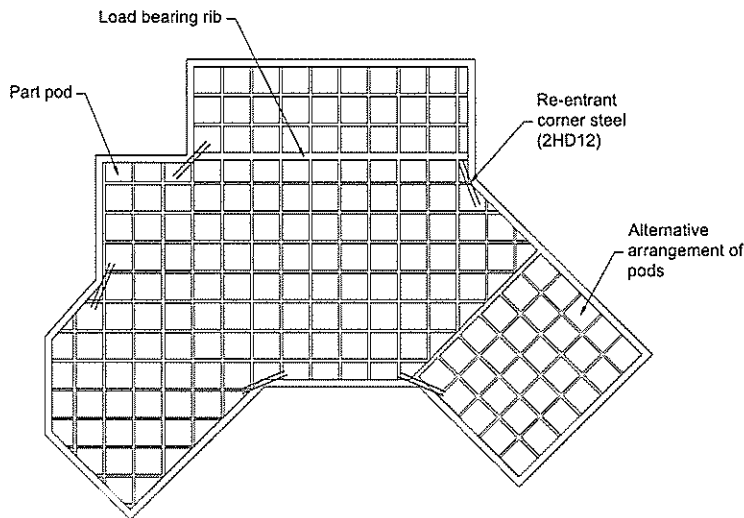
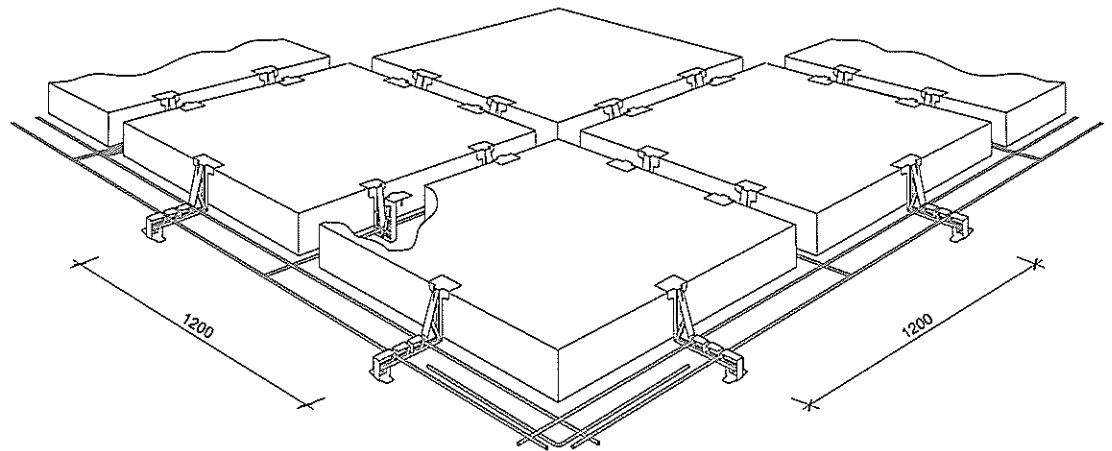


Figure 7 Typical Pod And Rib Layout

3.9 Reinforcing Steel

Reinforcing bars shall conform to NZS 4671:2001 "Steel Reinforcing Materials". All bars shall be of deformed type (Grade 500E). All bends shall be made cold without fracture and in accordance with the bend diameters given in NZS 3109 "Concrete Construction". Welded lap joints are not permitted.

Reinforcing steel in the slab shall consist of Welded Reinforcing Mesh complying with AS/NZS 4671:2001 with a minimum weight of 2.27kg/m, a lower characteristic stress of 500MPa, square configuration of orthogonal bars between 150 to 200mm centres, and ductility class L or E, hereafter referred to as "mesh". The presence of Class E reinforcing bars in the ribs and beams provides adequate ductility of the system which allow the use of class L mesh. Typically the topping mesh reinforcement will be 665 mesh (class L) or SE62 ductile mesh, each being equally applicable

Figure 10 shows the detailed layout of the spacers and the steel in the edge beam and the standard ribs.

3.9.1 Edge Beam Steel

Two edge beam reinforcing bars shall be placed in the bottom of the edge beam and supported in the correct position by the Firth spacers, as shown in Figure 10. One edge beam bar shall be tied below the mesh at the perimeter of the area covered by the polystyrene pods as shown in Figure 10.

All steel shall be lapped a minimum of 60 bar diameters (720mm for 12mm steel). Tying of the edge beam steel is only required at corners. Figure 8 shows the layout for the edge beam bottom steel bars at the corner. The inner bottom bars and the top bars shall cross each other and extend to 75mm from the outside face of the edge beam as shown. These bars shall be tied together where they cross. For solutions using veneer rebates the top bars shall terminate 50mm from the inside face of the rebate and be tied where they cross.

3.9.2 Rib Steel

Rib reinforcing steel shall be placed in the bottom of the internal ribs and supported in the correct position by the Firth or Wilton Joubert spacers (WJ). Figure 9 shows the detail of the Firth and WJ spacers, and Figure 10 shows a detailed section identifying how the steel is located in the spacers. The 300mm spacer shall be used for the 300mm wide internal ribs. These spacers ensure that cover to DPM below the base is greater than 45mm and cover to the exterior perimeter is 75mm.

All steel shall be lapped a minimum of 60 bar diameters (720mm for 12mm steel). At junctions with the edge beam, each rib steel bar shall sit on top of the edge beam bars, and extend to the outermost bar. The 75mm cover to the edge of the beam shall still be allowed for. One HD12 bar (Grade 500E) shall be placed in the bottom of each 300mm wide rib. For perimeter 300mm ribs a HD12 bar is also required in the top at the beam.

3.9.3 Mesh Reinforcing

Mesh reinforcing shall be placed over the pods and supported on 40mm mesh chairs spaced at a minimum of 1200mm centres, with at least two mesh chairs placed per pod and at least one per part pod. At laps the overlap of the outermost cross wires of the sheets shall be the spacing of the wires plus 50mm.

3.9.4 Re-entrant Corner Steel

Two HD12 bars (Grade 500E), 1200mm long tied to the top of the mesh at 200mm centres, with 50mm cover to the internal corner as detailed in Figure 7 (this steel is to help reduce the width of cracks that may develop at this location)

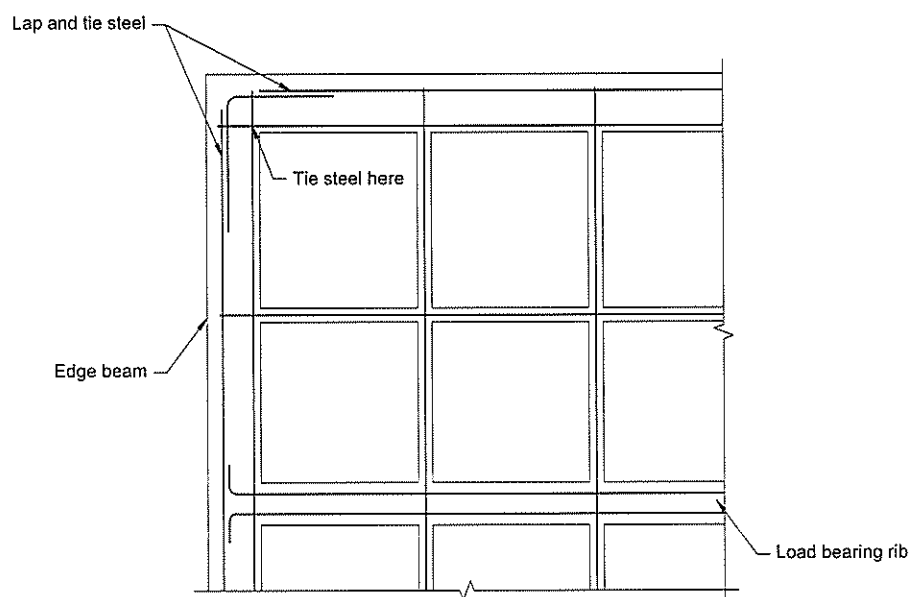


Figure 8 Corner steel layout

3.10 Concrete Installation

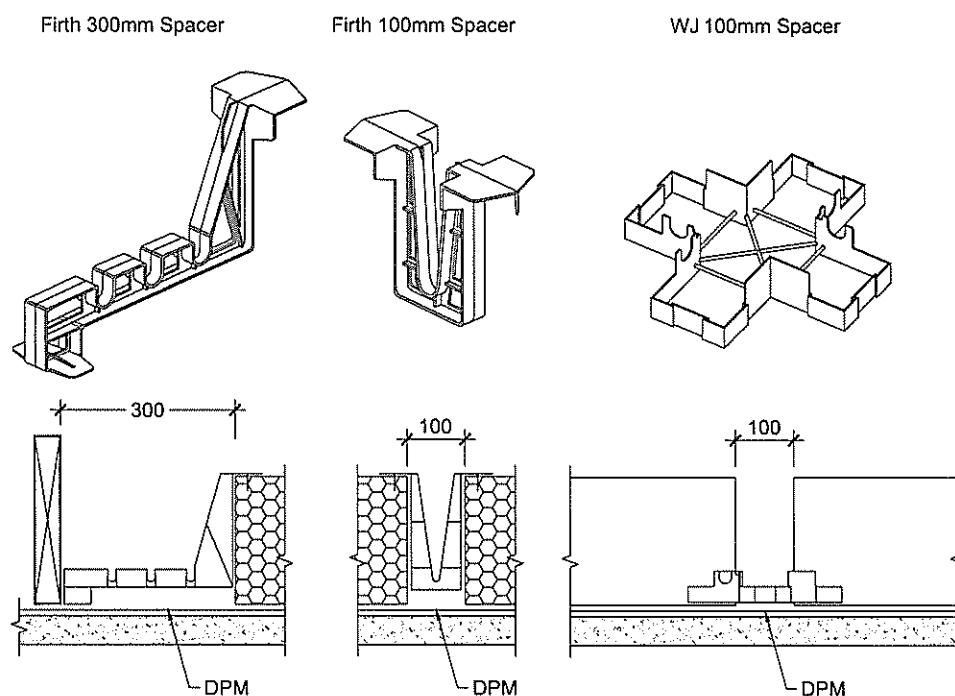
To comply with this manual, Firth Certified Concrete[®] must be used. Concrete placing, finishing and curing shall be in accordance with NZS 3109:1997, Clause 7.

3.10.1 Placing

Only Raftmix or Raftmix25 concrete supplied by Firth Industries, shall be used in the floor. These two different concrete mixes shall be used in the following instances:

- > Raftmix – a 20MPa 100mm slump mix available as a pump mix suitable for 100mm pump lines available in either a 13mm or more usually a 19mm nominal aggregate size, or as a structural (non-pump) mix
- > Raftmix25 – a 25MPa 100mm slump mix available as a pump mix suitable for 100mm pump lines available in either a 13mm or more usually a 19mm nominal aggregate size, or as a structural (non-pump) mix. This mix shall be specified for buildings constructed in the 'sea spray zone' (i.e. within 500m of the sea including harbors, within 100m of tidal estuaries or inlets, on offshore islands and elsewhere defined as exposure Zone D in 4.2.3.3 of NZS3604).

Figure 9
Spacer
Details



The concrete supplied by Firth shall be poured in such a way to ensure that the pods remain in position during placing (Firth recommends that small amounts of concrete be placed on top of the pods prior to the ribs being filled). The concrete shall be compacted with the use of an immersion vibrator around all steel and into all corners of the formwork.

3.10.2 Finishing

Screeding with the aid of a level shall commence immediately after compaction. Unless specifically installed as a screeding datum, the top of the formwork shall not be assumed as level and thus shall not be used for screeding purposes. Final finishing with a trowel shall take place after all the bleed water has evaporated. The edge of the slab and rebates shall be tooled to prevent chipping of the top of the slab.

Early age care of the slab shall be in accordance with good trade practice appropriate for the weather conditions – refer CCANZ website sections if further guidance is required:

www.ccanz.org.nz/page/Early-Age-Crack-Control.aspx

Early Age Crack Control

www.ccanz.org.nz/page/Hot-and-Cold-Weather-Concreting.aspx

Hot and Cold Weather Concreting

The surface shall be a blemish-free surface to class U3 finish (Refer NZS 3114:1987 "Specification for Concrete Finishes").

3.10.3 Curing

Proper curing of the concrete must take place immediately after finishing the concrete. One of the following methods of curing is recommended:

- > Ponding or continuous sprinkling of water.
 - > Placing a wet covering or plastic membrane over the slab.
 - > The use of liquid membrane curing compounds. However if these are used, they must be compatible with any subsequent applied surfacing.
-

3.11 Shrinkage Control Joints

Shrinkage control joints reduce the risk of unwanted cracks, and their placement needs to be carefully considered where uncontrolled cracking could be unacceptable. Two types are described here: saw cut joints (which are tied joints), and free joints.

3.11.1 Saw Cut Joints

Saw cuts are located at positions in which the concrete is likely to crack due to stresses induced by restrained shrinkage. The aim of providing them is for the concrete to crack at the bottom of the saw cut thus minimizing the potential for a visible crack wandering over the surface. The level of reinforcement provided in a RibRaft[®] mean that cracks have no structural implications being only an aesthetics issue. Factors to consider are the type of floor finish, the location of ribs and ground beams, underfloor heating and the effect of piles restraining shrinkage.

When warm sunny days are followed by cool nights, the change in temperature can cause cracking. Hence preference should be given to using early entry saws which are used immediately after finishing. Shrinkage control joints cut using diamond blades shall be cut as early as possible which is typically within 24 hours of hardening in summer, and 48 hours in winter. They shall be cut to a depth of 25mm. Shrinkage control joints do not guarantee to eliminate all visible or unwanted cracks.

Joints shall be positioned to coincide with major changes in floor plan. Where concrete is to be exposed, for example in a garage, or brittle covering placed over, the maximum intermediate bay sizes shall be limited to 5m. Bay dimensions formed by shrinkage control joints shall be limited to a maximum ratio of length:width of 1.5:1. Shrinkage control joints shall be placed over 100mm wide internal ribs wherever possible. Where a shrinkage control joint runs along the line of a 300mm wide load bearing rib, then the joint shall be located directly above one edge of that rib.

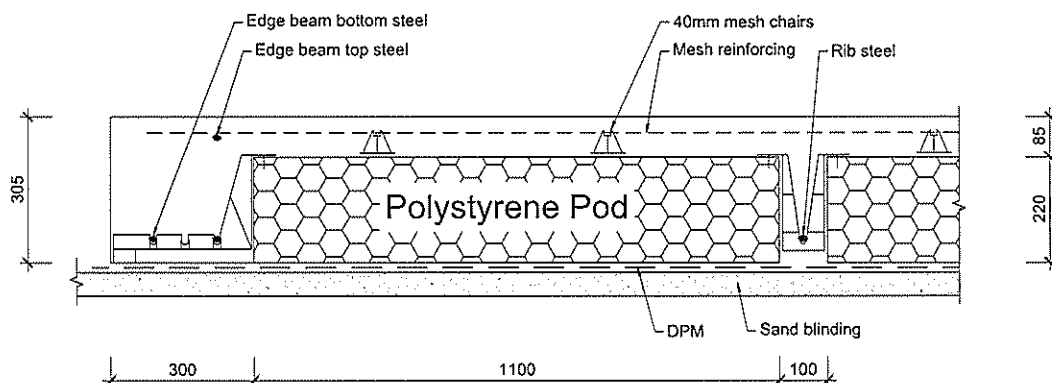
In order to limit the width of cracks at re-entrant, or internal corners, extra steel shall be placed on top of the mesh. These shall be 2-HD12 bars (grade 500E), 1200mm long tied to the top of the mesh at 200mm centres, with 50mm cover to the internal corner – refer Figure 7.

3.11.2 Free Joints

Where the length of the floor exceeds 30m a free joint shall be provided as detailed in Section 1, Figure 12. Movement, shrinkage and thermal, will occur over this joint so it shall be positioned to minimize the impact of this movement on floor coverings and wall elements.

Where the bottom of the RibRaft® is not flat (for example the floor incorporates a step down), free joints shall be provided if the distance from the step down to edge of slab exceeds 15m.

Figure 10 Detailed Section



3.12 Removal of Formwork

The formwork shall not be removed prior to 12 hours after the slab has been finished. No installation loads are to be placed on the system before adequate curing has taken place.

3.14 Landscaping/Paving

Landscaping and/or paving adjacent to the slab shall be kept as a minimum the specified distance below finished floor level as required by NZS 3604:2011. The landscaping shall allow for large trees to be kept sufficiently away from the edge of the slab. This is to prevent the tree roots from disturbing the soil moisture conditions under the slab. As a guide, trees should be as far away from the edge of the slab as they are tall when fully grown.

3.13 Masonry Veneer

Where the building is to be clad with masonry veneer, the rebate in the edge beam shall be waterproofed with a bituminous sealer due to the possibility of ponding of water. Firth recommends a Flintcote® or equivalent coating on both the vertical and horizontal faces of the rebate.

3.15 Ongoing Maintenance

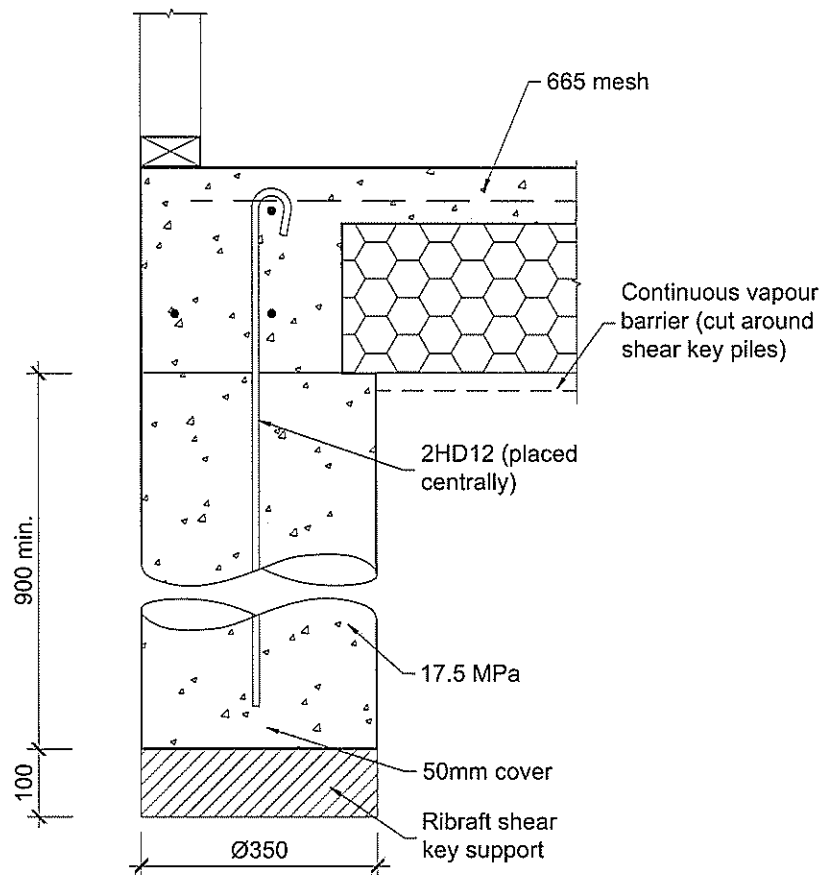
The building owner shall ensure that the ground surrounding the system be maintained so that the integrity of the system is not jeopardised. In other words, at no time shall the ground immediately adjacent to the system be allowed to settle away to expose the underside of the slab.

4.0 SHEAR KEYS

Shear keys, if required, shall be provided to conform to the requirements of Section 1 of this Manual. Holes for the shear keys shall be drilled at least 1000mm deep. Into the bottom of each hole a RibRaft[®] Shear Key Support shall be placed. Every precaution shall be taken to ensure that the shear key support is laid level and at the base of the hole. The minimum depth of concrete placed on the support shall be 900mm. Refer to Figure 11 for construction details.

The connection steel (2HD12 Grade 500E) shall be secured in place and held during pouring to ensure the bars are correctly located. The concrete for the shear keys can be placed separately to the rest of the floor and shall be finished level to the top of the sand blinding layer, or poured in one pour with the RibRaft[®] floor. If poured separately the top surface of the shear key shall be finished rough to ensure a good join to the Firth Raftmix concrete in the system and the DPM shall be neatly cut around the shear keys.

Figure 11 Shear Pile Construction Detail



1.0 DESIGN

Verification that the design complies with the structural limitation outlined in this Manual is the responsibility of the designer, and shall be confirmed by the Building Control Authority issuing the Building Consent. Solutions outside the limitations outlined in this Manual will require specific engineering design.

2.0 CONSTRUCTION

The RibRaft® foundation system has been designed to accommodate structures complying with the non specific design standards NZS3604 or NZS4229. With these types of structures the Building Control Authority specifies the inspections required and often conducts these. A similar construction verification process shall be applied to the RibRaft® system.

To assist inspection the following check list has been prepared for structures complying with the limitation:

PRE-POUR INSPECTION CHECK LIST

GOOD GROUND CONFIRMED AS PER NZS3604, CLAUSE 3.1.3. OR SCALA OR SHEAR VANES TESTS CONFIRM ADEQUATE BEARING CAPACITY.

VEGETATION, TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL REMOVED.

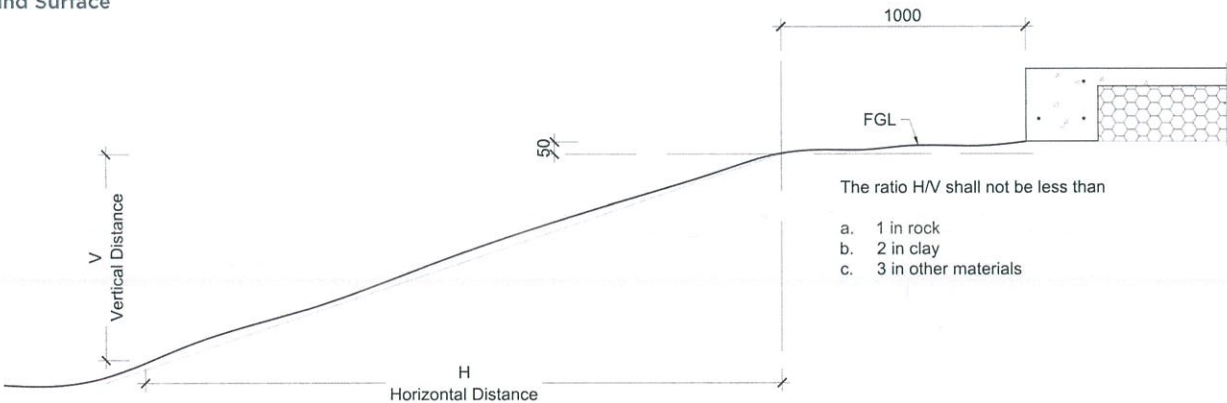
PROXIMITY TO SLOPE-GROUND SURFACE IS ALWAYS ABOVE DASH LINE SHOWN IN FIGURE 1.

SHEAR PILES (WHERE REQUIRED) IN PLACE AND REINFORCEMENT PROTRUDING.

FORMATION AREA EXTENDS AT LEAST THE DEPTH OF GRANULAR FILL BEYOND BUILDING FOOTPRINT.

STEPS IN THE FORMATION ARE DETAILED IN ACCORDANCE WITH THIS MANUAL.

Figure 1
Relationship of
RibRaft® To Sloping
Ground Surface



PRE-LAYOUT INSPECTION CHECK LIST: DAMP PROOF MEMBRANE IN PLACE

| | |
|----------------------|---|
| PERIMETER FOUNDATION | WIDTH 300MM ⁽¹⁾ REINFORCEMENT 2 X HD12 BOTTOM, 1 X HD12 TOP FIRTH SUPPLIED SPACER USED AT 1.2M MAXIMUM CENTRES |
| INTERNAL RIBS | WIDTH 100MM REINFORCEMENT 1 X HD12 FIRTH SUPPLIED SPACER, MAX SPACING OF ONE PER POD OR PART POD |
| LOAD BEARING RIBS | WIDTH 300MM REINFORCEMENT 2 X HD12 BOTTOM FIRTH SUPPLIED SPACER, MAX SPACING OF ONE PER POD OR PART POD |
| PODS | FIRTH SUPPLIED RIBRAFT* POD |
| MESH | 40MM CHAIRS, 1.2M MAX CENTRES, MIN TWO PER POD OR ONE PER PART POD MESH IN PLACE AND 665 OR SE62 MESH LAPS OVERLAP OF OUTERMOST CROSSWIRE = MESH SPACING + 50MM |
| REINFORCEMENT | 2 X HD12 BARS 1.2M LONG PROVIDED AT RE-ENTRANT CORNERS LAPS FOR 12MM REINFORCEMENT MINIMUM OF 720MM |
| CONCRETE | COVER TO PODS MINIMUM OF 85MM OR 110MM IF INFLOOR HEATING USED. FIRTH RAFTMIX ORDERED |
| SERVICE PENETRATIONS | NO REINFORCEMENT (WITH EXCEPTION OF MESH) CUT TO ALLOW PASSAGE OF SERVICE PIPES. REFER CLAUSE 6.3 OF SECTION 1 FOR EXCEPTIONS PIPES WRAPPED WITH MINIMUM 6MM THICKNESS OF IMPERMEABLE COMPRESSIBLE MATERIAL WHERE IN CONTACT WITH CONCRETE DIAMETER/SIZE OF PENETRATIONS AS PER TABLE 6, SECTION 1 OF THIS MANUAL |

(1) At locations of service penetrations the width of the perimeter foundation maybe locally increased. Refer Figure 14 Section 1 for details.



CONCRETE & MASONRY PRODUCTS: A SUSTAINABLE BUILDING OPTION & SOLUTION

- ✓ Environmentally compliant manufacturing plants
- ✓ Surplus water and some aggregates recycled
- ✓ Low transport impacts
- ✓ Leftover concrete returned from construction sites
- ✓ Passive solar heated thermal mass makes completed buildings more energy-efficient
- ✓ Most wash water returned from construction sites
- ✓ Highly durable, low maintenance buildings and no rot
- ✓ High degree of noise control
- ✓ Inherent fire resistance
- ✓ Overall longer effective building life
- ✓ Demolished concrete can be recycled as hard fill or aggregate

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0800 FIRTH 1 (347841)
FIRTH.CO.NZ



CODEMARK™

PRODUCT CERTIFICATE

Firth Ribraft® Floor System

This is to certify that

Complies with the New Zealand Building Code (NZBC):

If designed, used, installed and maintained in accordance with the scope of this certificate, the above mentioned product will meet or contribute to meeting the following provisions of the NZBC:

- Structure B1.3.1, B1.3.2, B1.3.3 (a, b, f, g, h, q, m), B1.3.4
- Durability B2.3.1(a), B2.3.2(a)
- External Moisture E2.3.3
- Hazardous Building Materials F2.3.1
- Energy Efficiency H1.3.1

Product description

The Firth Ribraft® Floor System comprises of polystyrene pods, steel reinforcing rods, plastic spacers and Firth Ribraft® concrete. The system consists of the following components:

- Ribraft® Polystyrene Pod 1100mm x 1100mm x 220mm. 300mm thick pods are also available for deeper edge beams and internal ribs.
- Firth Pod and Reinforcement spacer (300mm and 100mm)
- Firth Reinforcement Grade 500E
- Firth Ribraft® Concrete 20MPa or 25 MPa
- Mesh reinforcement
- Sand Blinding

Product purpose or use

The Firth Ribraft® Floor System is a method of concrete floor construction, suitable for all slab-on-ground concrete floors for domestic or residential buildings that fall within the scope of NZS 3604:2011 Timber framed buildings.

Certificate holder

Fletcher Concrete and Infrastructure Ltd.
T/A Firth Industries
810 Great South Road
Penrose Auckland NZ 1061
Ph: 0800 800 576
W: www.firth.co.nz

CodeMark Product Certification Body

Bureau Veritas Australia Pty Ltd
3/435 Williamstown Road,
Port Melbourne VIC, 3207
Ph: 1800 855 190
www.bureauveritas.com.au

Sam Guindi
Product Certification Manager
For and on behalf of
Bureau Veritas Australia Pty Ltd

19 March 2020
Date of issue

CM70056 Rev 2
Certificate Number



MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

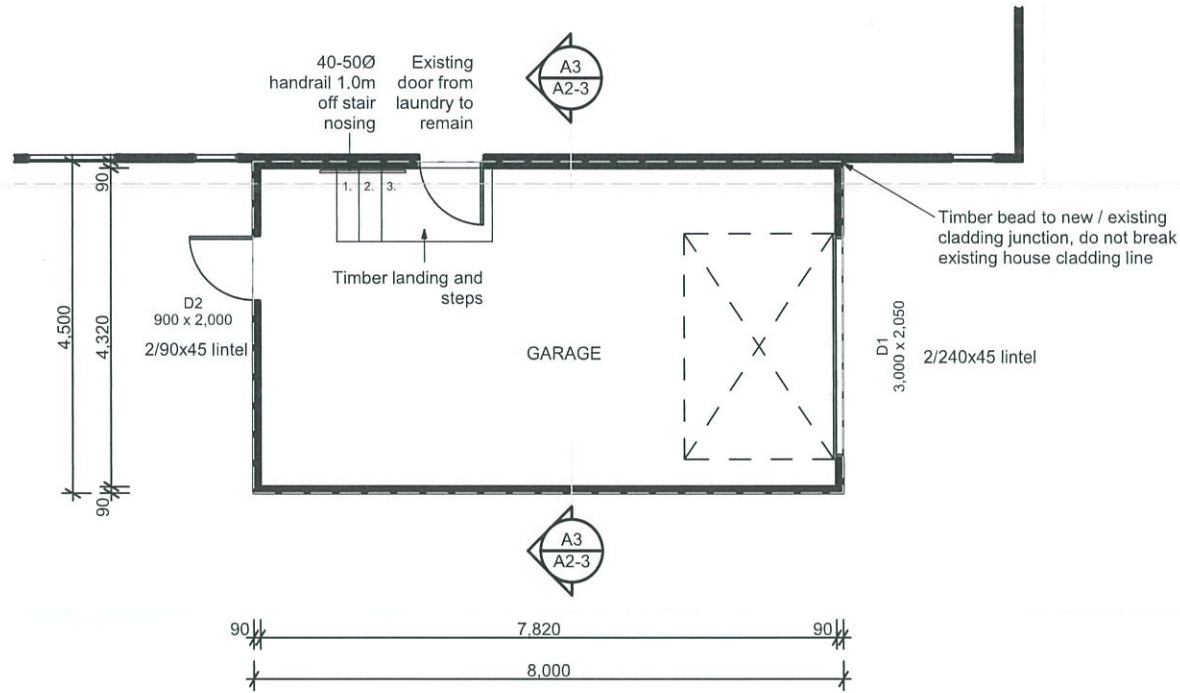


BUREAU
VERITAS

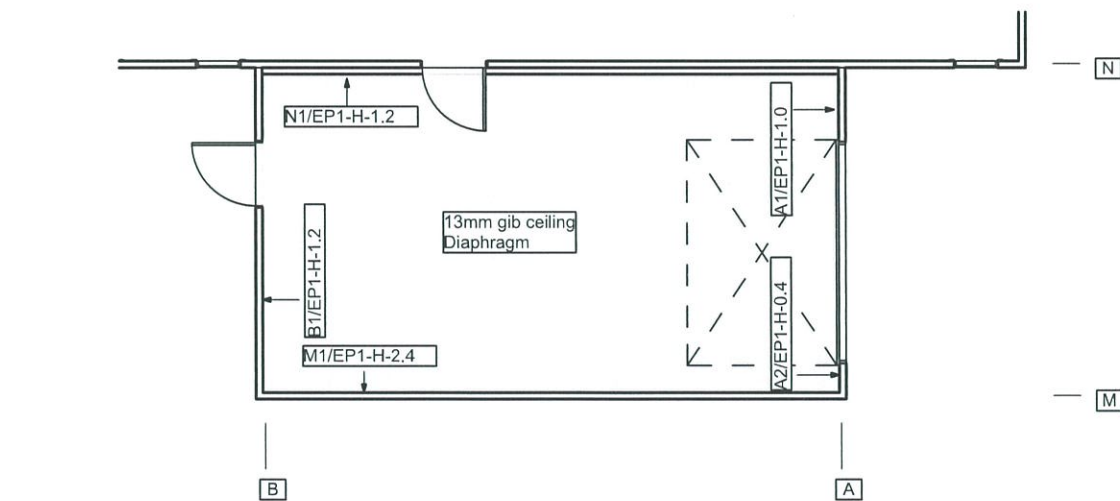


WWW.JAS-ANZ.ORG/REGISTER

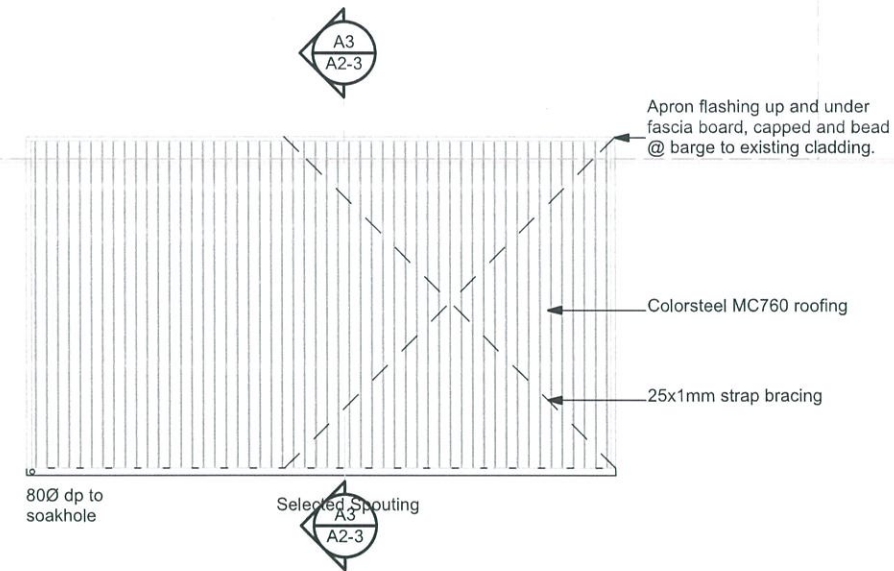
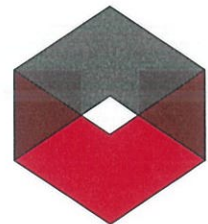
- This certificate is issued by an independent certification body accredited by JAS-ANZ, the product certification body appointed by the Chief Executive of the Ministry of Business, Innovation and Employment under the Building Act 2004. The Ministry does not in any way warrant, guarantee, or represent that the building method or product the subject of this certificate conforms with the New Zealand Building Code, nor accept any liability arising out of the use of the building method or product. The Ministry disclaims to the extent permitted by law, all liability (including negligence) for claims of losses, expenses, damages, and costs arising as a result of the use of the building method(s) or product(s) referred to in this certificate.
- The certificate holder must maintain compliance with the conditions set out in section 15 of the Building (Product Certification) Regulations 2008. This certificate may only be reproduced in its entirety. It is advised to check that this certificate is currently valid and not withdrawn or suspended by referring to the Register of Product Certificates on the Building Performance website <http://www.building.govt.nz>.



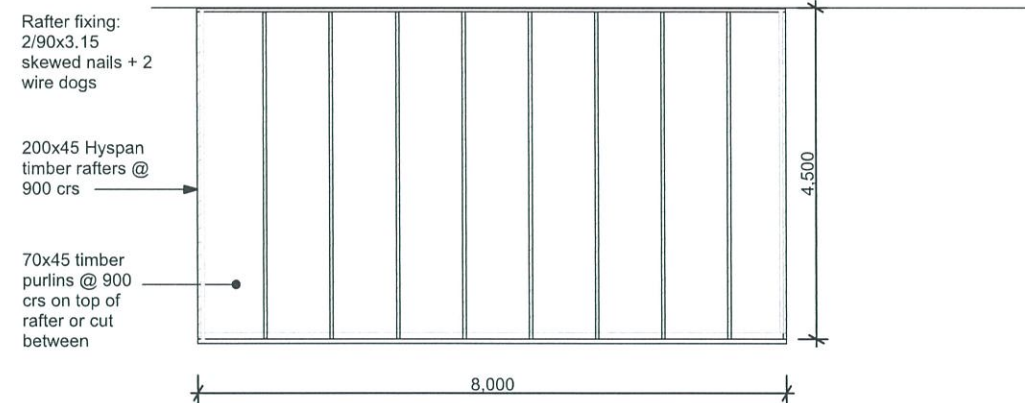
FLOOR PLAN
Scale 1:100



BRACING PLAN
Scale 1:100



ROOF PLAN
Scale 1:100



ROOF FRAMING PLAN
Scale 1:100



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#Notes

client:
LOWE

project:
RELOCATE PERMIT

design by: Manor Build

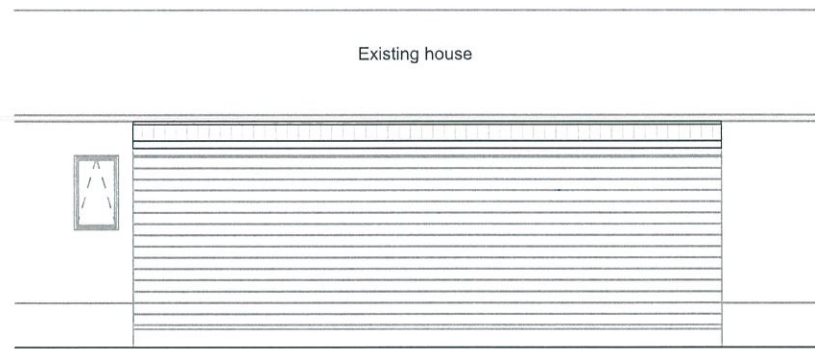
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date: 27/10/2020

PLANS

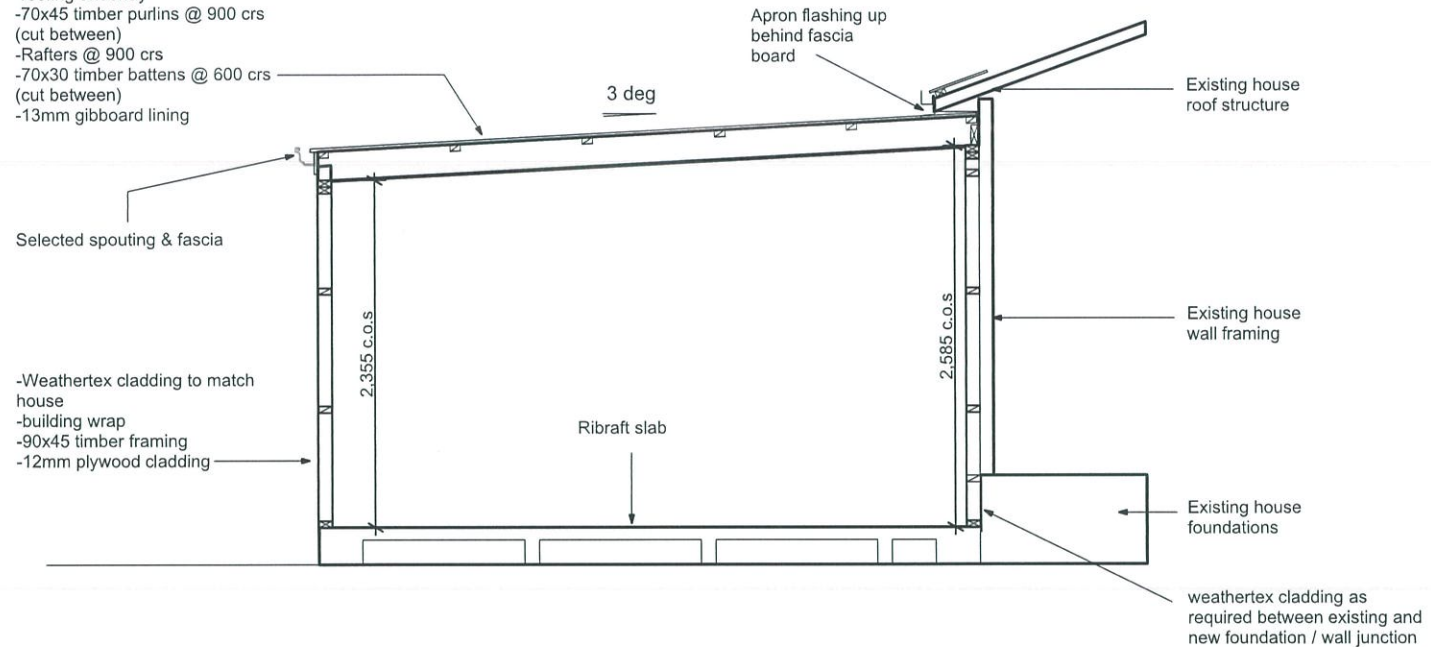
job no:
MG181

sheet no:
A2-2

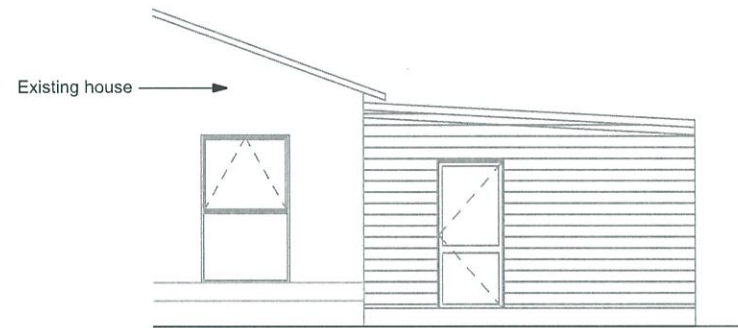


ELEVATION E1
Scale 1:100

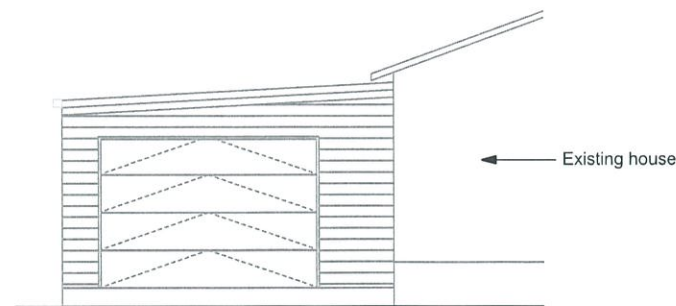
- MC760 roofing
- roofing underlay
- 70x45 timber purlins @ 900 crs (cut between)
- Rafters @ 900 crs
- 70x30 timber battens @ 600 crs (cut between)
- 13mm gibboard lining



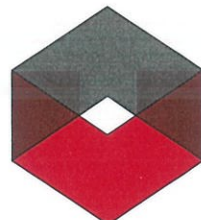
SECTION A
Scale 1:50



ELEVATION E2
Scale 1:100



ELEVATION E3
Scale 1:100



HOUSE NOT PART OF PERMIT



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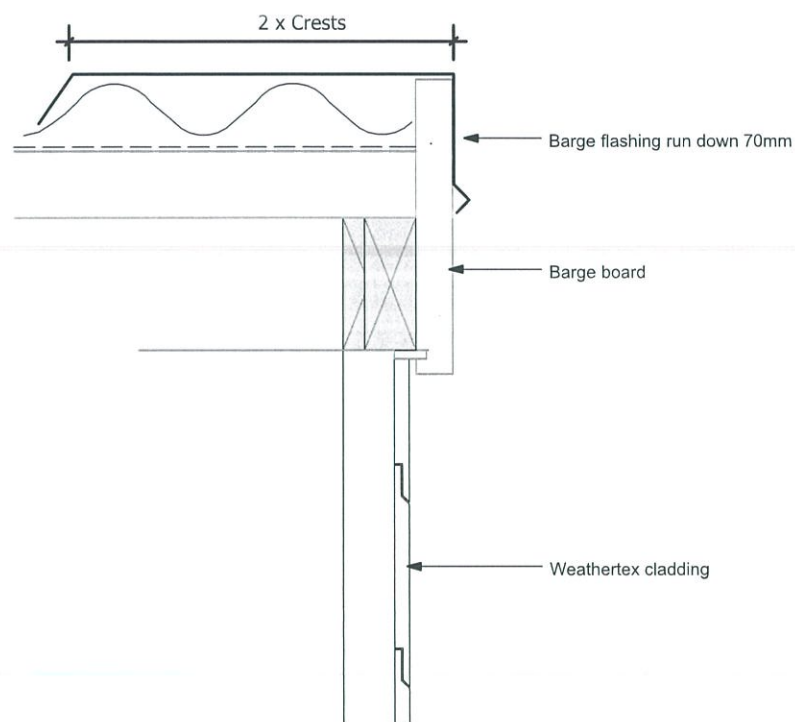
scale: As Noted

date: 27/10/2020

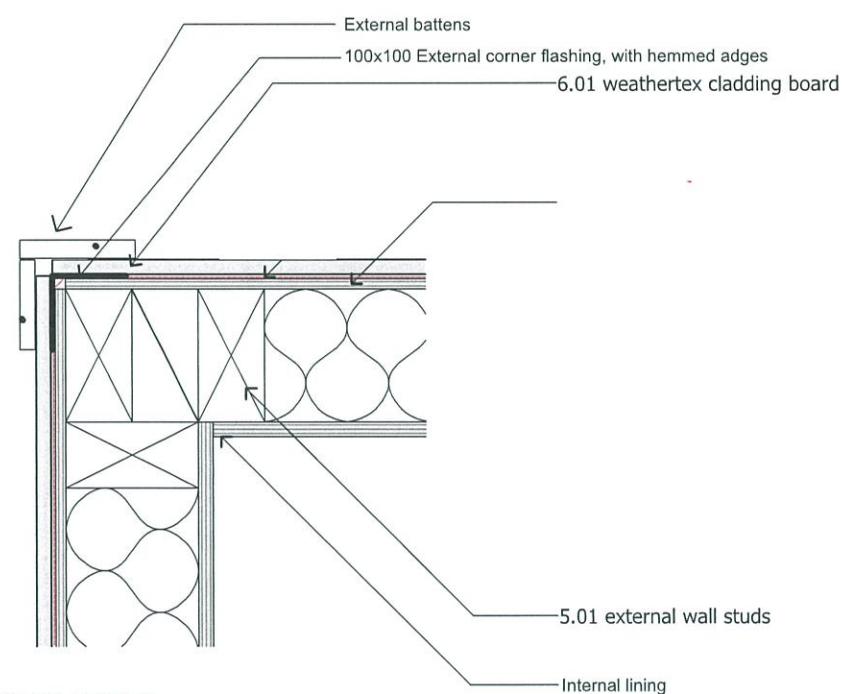
ELEVATIONS

job no:
MG181

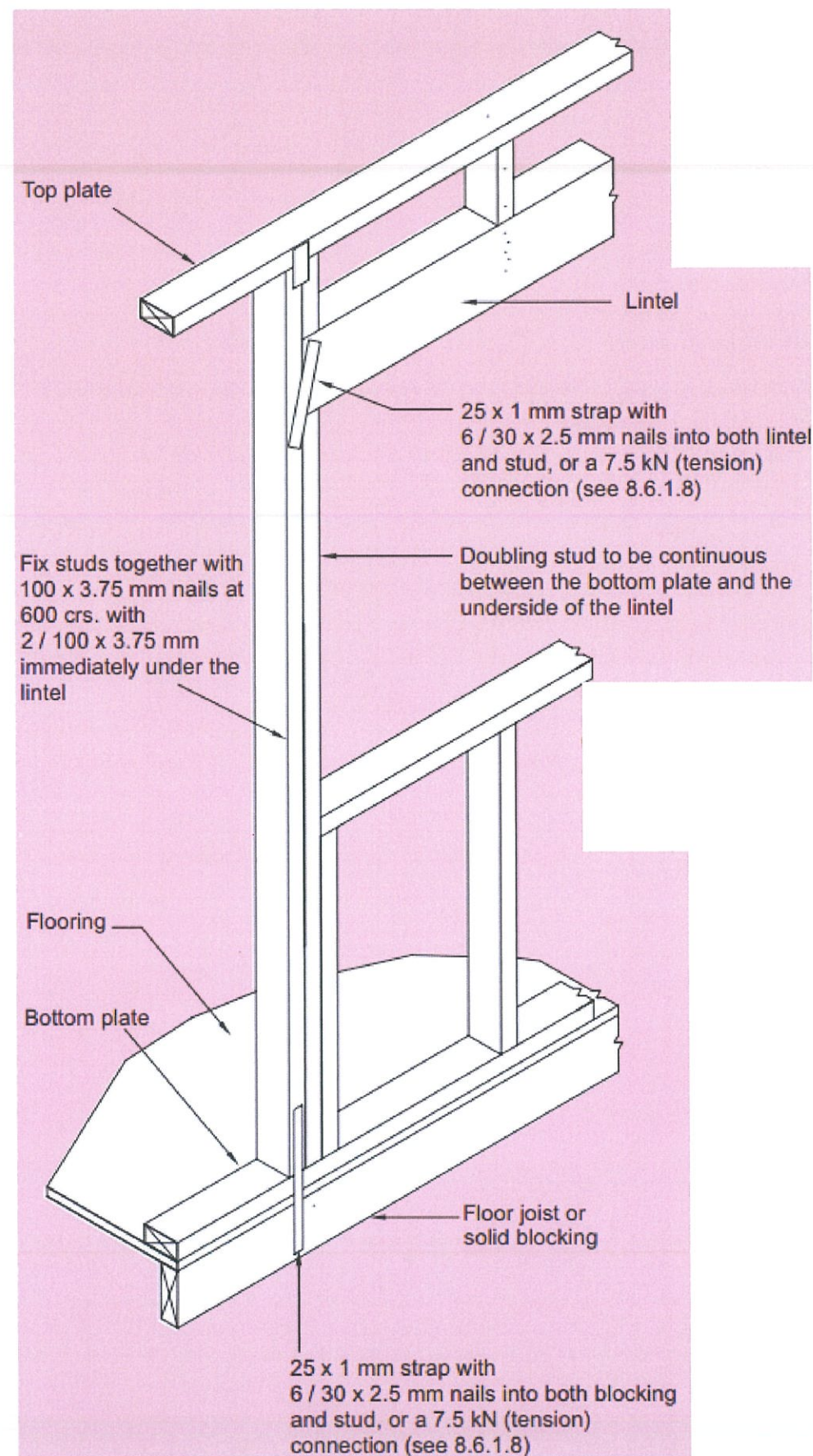
sheet no:
A2-3



BARGE DETAIL
Scale 1:5



EXTERNAL CORNER DETAIL
Scale 1:5



LINTEL FIXING DETAIL
Scale NTS



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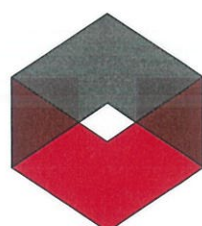
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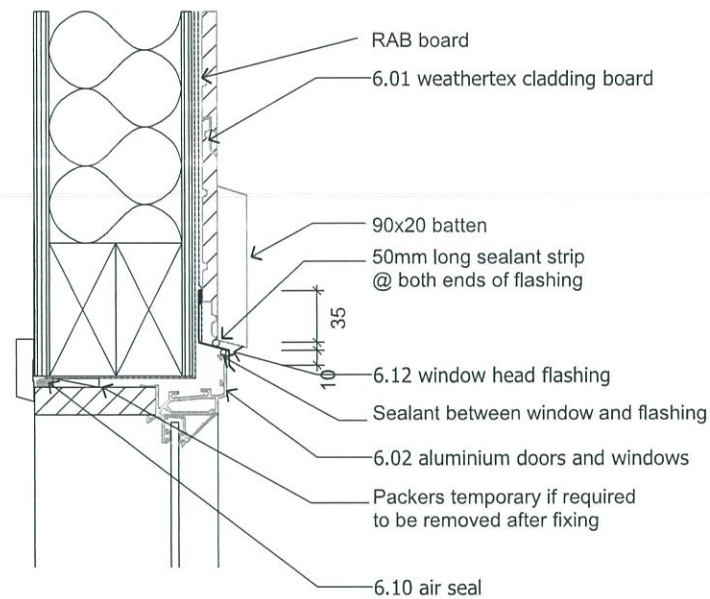
date: 27/10/2020

CONSTRUCTION DETAILS

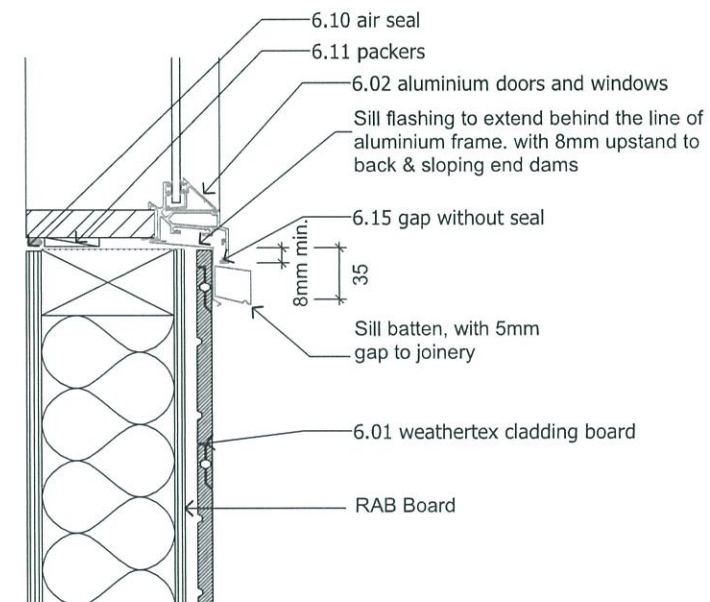
job no:
MG181

sheet no:
A3-1

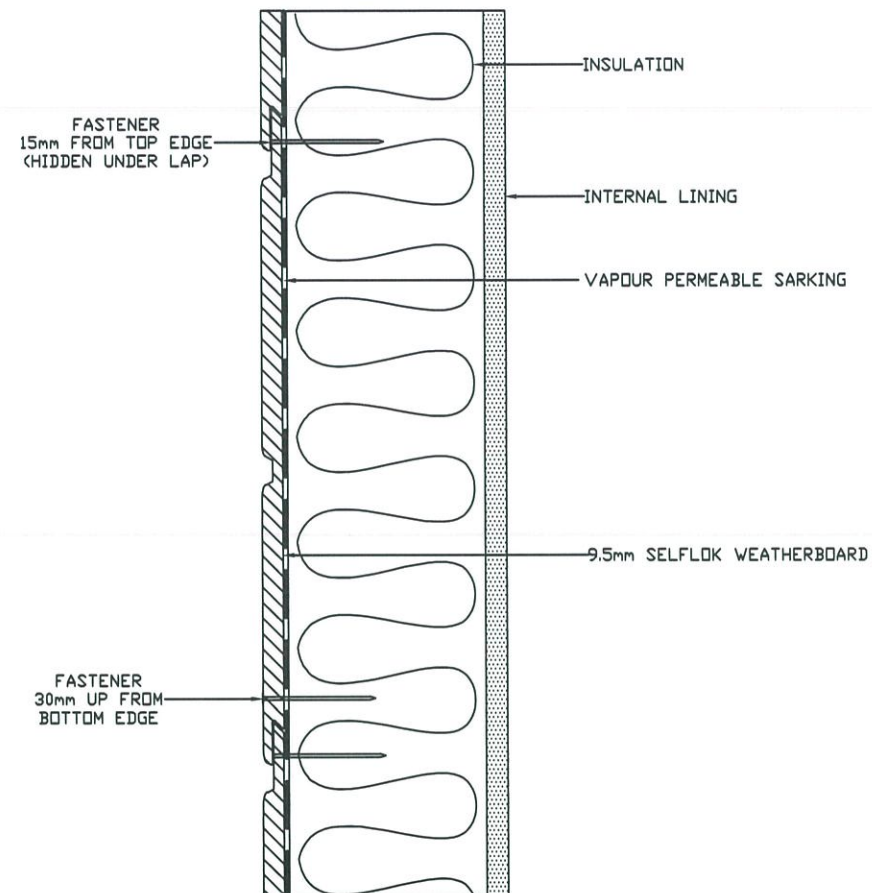




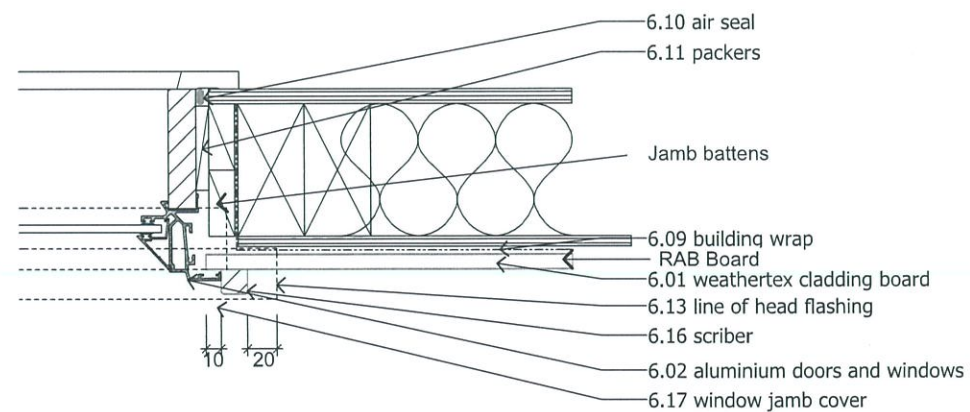
JOINERY HEAD
Scale 1:5



JOINERY SILL
Scale 1:5



CLADDING FIXING
Scale NTS



JOINERY JAMB
Scale 1:5



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project:
RELOCATE PERMIT

design by: Manor Build

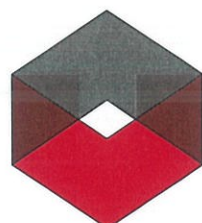
scale: As Noted

date: 27/10/2020

CONSTRUCTION DETAILS

job no:
MG181

sheet no:
A3-2





Amendment to Building Consent - Form 2 - 200394.01

Submission Details

| | |
|----------------------------|--|
| Submission Ref | STDC047749 |
| Status | RFI |
| Consent Number | 200394.01 |
| Submitter | Arthur Brown Construction (2017) (Matt Phillips) |
| Legal Description | No related land |
| Building Consent Authority | South Taranaki District Council |
| Site Address | 27 County Drive, Hawera, Hawera 4610 |
| Building Complexity | R1 |
| Date Submitted | Tue 19 Jan 2021, 8:53 AM |

Amendment to Building Consent - Form 2

Application for amendment to building consent - Form 2

[Section 33](#) or [section 45](#), Building Act 2004

Building Consent Information

Building consent number *

200394

Issued by *

South Taranaki District Council

What Building Work Are You Doing

What type of building work are you doing *

☒ Residential

☐ Multi-Residential

☐ Commercial / Industrial

Residential *

☒ New detached dwelling

☐ Plumbing works

☐ Major alterations / additions - any work that includes altering or attaching to the exterior of a building

☐ Minor alterations - any internal work that does not include altering the exterior of the building

☐ Garage / detached carport

☐ Seismic strengthening

☐ Other

Select all applicable boxes. If your building work is not listed, select Other and provide details.

Where Is The Building Work

What is the street address *

27 County Drive, Hawera

Legal Description *

LOT 42

Deposited Plan

DP 412125

Building Name

na

Location of building within site/block including near street access

Is the subdivision of an existing site involved *

☐ Yes

☒ No

Does the building or site have any cultural or heritage significance, or is it a marae? *

☐ Yes

☒ No

Who Owns The Building Or Land

Owner name *

Raewyn Stockman

Owner title

Mss

Owner email address *

stockys@xtra.co.nn

Owner contact number *

274468006

Owner mobile number

Owner mailing address *

27 County drive Hawera

Proof of Ownership

The [Building \(Forms\) Regulations 2004](#) requires evidence of ownership to be provided, proof of ownership less than 3 months old ensures the ownership is current.

Proof of ownership *

☒ Record of Title

☐ Other

A Record of Title (RT) is the most common and preferred type of proof of ownership, however other forms of proof of ownership maybe able to be used. Please check with the Building Consent Authority (BCA) or Council you are applying to if other types of proof of ownership will be accepted, before selecting other and submitting the application.

A Record of Title (RT) can be ordered online from Land Information New Zealand ([click here](#)), alternatively you may be able to request a RT from the Building Consent Authority or Council.

Request a Record of Title (RT) from the Building Consent Authority (BCA) or Council *

☒ Yes

☐ No

Please check with the Building Consent Authority (BCA) or Council that you are applying to, if they provide this service before requesting a RT directly from them

Who Is The Applicant

Is the application being made on behalf of the owner *

☒ Yes

☐ No

Agent Contact Information

Please note that the nominated first point of contact must be in New Zealand.

Who is the first point of contact for further correspondence *

☐ Owner

☒ Agent

☐ Other

Who is the first point of contact for invoicing *

☒ Owner

☐ Agent

☐ Other

Payee name for the invoice *

Raewyn Stockman

Agent name *

Matt Phillips

Agent title

Agent email address *

matt.abc@xtra.co.nz

Agent contact number *

021 743 790

Agent mobile number

Agent mailing address *

PO box 266

Who's Involved In The Build

Select who's involved *

☒ Licensed Building Practitioner

☐ Other

If there are others involved in the build who aren't licensed building practitioners please provide their details by selecting the other option.

Licensed Building Practitioner/s

Name *

Matt Phillips

Email address

Contact number

Mailing address

Licensed Building Practitioner *

Carpenter

Other

If the licensed building practitioner type was not listed please provide details

License class *

- Design 1
- Design 2
- Design 3
- Site 1
- Site 2
- Site 3
- Carpentry
- Roofing
- External Plastering
- Brick and Block Laying

Select one or more licence classes in the list

Licensed Building Practitioner registration number *

130111

What Are The Specifics Of The Site?

What is the wind zone *

| | | |
|---------------------------------|----------------------------------|---------------------------------------|
| <input type="radio"/> Low | <input type="radio"/> Medium | <input checked="" type="radio"/> High |
| <input type="radio"/> Very High | <input type="radio"/> Extra High | <input type="radio"/> Specific Design |

What is the exposure zone *

| | | |
|-------------------------------|---|--|
| <input type="radio"/> Low (B) | <input checked="" type="radio"/> Medium (C) | <input type="radio"/> High/Sea spray (D) |
|-------------------------------|---|--|

Does the proposed building work cover two or more allotments *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Are there public drains on the site *

| | |
|--------------------------------------|--------------------------|
| <input checked="" type="radio"/> Yes | <input type="radio"/> No |
|--------------------------------------|--------------------------|

Is the site subject to natural or created hazards such as erosion, subsidence, flooding, slips, cut and fill or contamination *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Are there any alterations to land contours (e.g. earthworks) *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Are there new or altered connections to public utilities *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Are there new or altered locations and/or external dimensions of buildings *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Is there new or altered access for vehicles *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Is the building work over or adjacent to any road or public place *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Does the building work involve the disposal of storm-water or wastewater *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Is the building work over any existing drains or sewers or in close proximity to wells or water mains *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Are there any other matters known to the applicant that may require authorisation from the territorial authority *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

What Are The Details Of The Building Work

Original building consent application description *

| |
|------------------------------|
| New dwelling on timber piles |
|------------------------------|

Description of work for the original building consent application, if the original application was completed through the portal the information will be pre-populated.

Provide a full description of the building work for the amendment *

| |
|---|
| Adding 8m x 4.5m attached garage with internal access of firth ribraft floor system |
|---|

Original building consent application estimated value for the building work (including GST) *

| | |
|----|--------|
| \$ | 200000 |
|----|--------|

Value of work for the original building consent application, if the original application was completed through the portal the information will be pre-populated.

Will the amendment change the original applications estimated value *

| | | |
|---|---------------------------------------|--------------------------------------|
| <input checked="" type="radio"/> Additional value | <input type="radio"/> Decreased value | <input type="radio"/> Not Applicable |
|---|---------------------------------------|--------------------------------------|

Additional value from the original applications estimated value (including GST) *

| | |
|----|-------|
| \$ | 30000 |
|----|-------|

What is the intended life of the building *

| | |
|--|------------------------------------|
| <input checked="" type="radio"/> 50+ years | <input type="radio"/> Limited Life |
|--|------------------------------------|

Proposed Use

You must select at least one of the following seven proposed use 'types'. Where you select Housing, Communal residential or Communal non-residential, you must also specify a proposed use 'sub type'

☒ **Housing****Housing selections ***

| | | |
|--|--|---|
| <input checked="" type="checkbox"/> Detached dwellings | <input type="checkbox"/> Multi-unit dwelling | <input type="checkbox"/> Group dwelling |
|--|--|---|

☐ **Outbuildings**☐ **Ancillary****Will the building work effect an existing building and/or parts of an existing building ***

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Total number of floor levels ***Levels below ground (if applicable)****Total floor area ***

| | |
|----------------------------------|---------------------------------|
| <input type="text" value="130"/> | <input type="text" value="m2"/> |
|----------------------------------|---------------------------------|

Please provide measurements in square metres i.e. if the building is 220m2 please put 220

Is the building used for anything other than a single household unit? *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Does the project include Restricted Building Work? *

| | |
|--------------------------------------|--------------------------|
| <input checked="" type="radio"/> Yes | <input type="radio"/> No |
|--------------------------------------|--------------------------|

Are you applying for Owner/Builder exemption to complete the Restricted Building Work? *

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

IMPORTANT – PLEASE READ**MEMORANDUM FROM LICENSED BUILDING PRACTITIONER: CERTIFICATE OF DESIGN WORK - FORM 2A**

Is required to be submitted as part of your Building Consent application where restricted building work is part of the design.

To complete the Memorandum from Licensed Building Practitioner: Certificate of Design Work - Form 2A you can save and close this form at any stage before submitting, and add the form by clicking on the form Tab.

Alternatively, you can complete the form separately as a PDF document by clicking on the following link.

Please Note: you will need to attach the Memorandum from Licensed Building Practitioner: Certificate of Design Work - Form 2A **to the Architectural Specifications** document in the “**Have You Attached All Required Documentation**” section of this form.

[Link to – Memorandum from Licensed Building Practitioner: Certificate of Design Work - Form 2A – PDF Version](#)

Have you discussed this project with Building Consent Authority prior to applying?

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Does the building work involve a swimming pool?

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

Does the building work involve any Recladding?

| | |
|---------------------------|-------------------------------------|
| <input type="radio"/> Yes | <input checked="" type="radio"/> No |
|---------------------------|-------------------------------------|

What Clauses Of The Building Code Does Your Work Comply With?

☒ *** I understand that this application is to be assessed against Acceptable Solutions, unless otherwise stated in this section.**

Please tick to indicate your agreement

☒ **B - Building Code**



☒ **B1 - STRUCTURE**

Buildings will withstand likely loads, including wind, earthquake, live and dead loads (people and building contents).

Provide any additional information

Provide details of Verification Method/s being used

Include relevant code clauses and means of compliance

☒ **B2 - DURABILITY**

Confirming the use of materials that will remain functional for the minimum periods specified (5, 15 or >50 years).

Provide details of Alternative Solution/s being used

Include relevant code clauses and means of compliance or details of any waiver and modifications (including applicable code clauses)

☐ **C - Building Code**



☐ **D - Building Code**



☒ **E - Building Code**



☒ **E1 - SURFACE WATER**

Disposal of rainwater from external surfaces and confirmation surface water cannot enter the building.

☒ **E2 - EXTERNAL MOISTURE**

External roof, wall claddings and external openings will prevent external moisture from causing undue dampness or damage.

☐ **E3 - INTERNAL MOISTURE**

Surfaces in wet areas must be impervious, easily cleaned, and have ventilation to meet conditions for health and safety.

Provide any additional information

Provide details of Verification Method/s being used

Include relevant code clauses and means of compliance

Provide details of Alternative Solution/s being used

Include relevant code clauses and means of compliance or details of any waiver and modifications (including applicable code clauses)

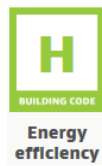
☐ **F - Building Code**



☐ G - Building Code



☐ H - Building Code



☐ Specific Buildings - Building Code



What Specified Systems Are In The Building?

Does your building work involve or affect any Specified Systems (SS)? *

☐ Yes

☒ No

Have You Attached All Required Documentation?

Document Categories for Residential Applications

The following document categories are associated to a residential application:

- **Architectural Plans**
- **Architectural Specifications**

If you have selected that there are structural requirement/s for the application, the following document categories will also be displayed to upload a document against.

- **Structural Plans**
- **Structural Specifications**

You will only be able to upload a maximum of 4 documents for a residential application, please ensure you have combined the documents for the application into the correct categories. Your application may be rejected by the Building Consent Authority you are submitting the application to if the documents are not provided in the correct format.

- ☒ *** I have the appropriate documentation prepared for a residential application and I have combined the documents into the appropriate categories**

The document upload selections will be provided once you have ticked this selection.

There are structural engineering requirements associated to my application. *

☒ Yes ☐ No

If you have structural plans, specifications and supporting documents associated to your application please click 'Yes'.

Do you have supporting documentation associated to the application. *

☒ Yes ☐ No

If you have supporting documentation that can't be merged into the main categories please click "Yes" and you will be able to add additional documents.

Residential Document Upload

Architectural Plans - BC200394_plans.pdf

Residential Structural Document Upload

Residential Supporting Documentation

Submitter Declaration

Submitter Name

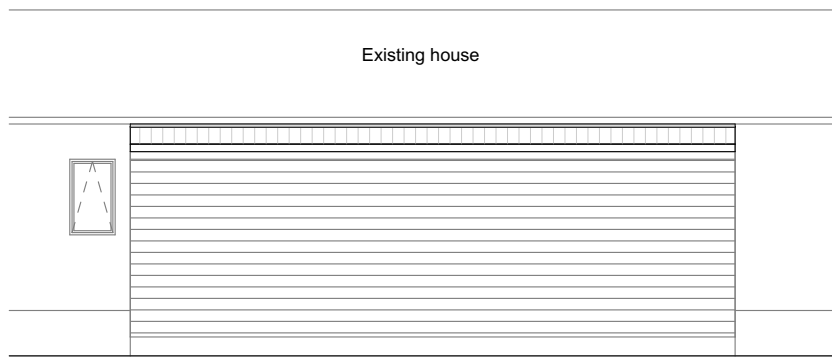
Matt Phillips

Date

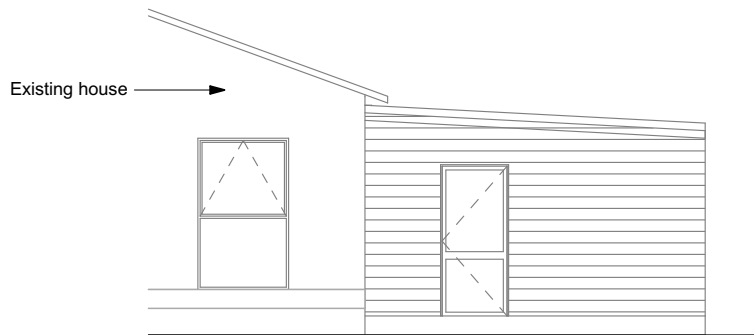
19/01/2021

I understand that by ticking the following boxes, I am agreeing to the following statements:

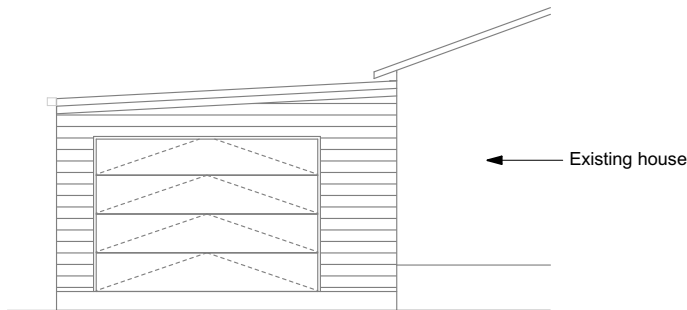
- ☒ *** As the agent I confirm that I am submitting this application on behalf of and with the authority of the owner and confirm that all the information within the application is, to the best of my knowledge, true and correct.**
- ☒ *** I request that you issue an amendment to the building consent for the building work described in this application.**



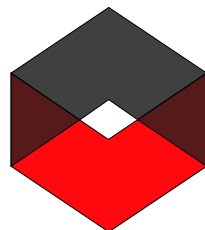
ELEVATION E1
Scale 1:100



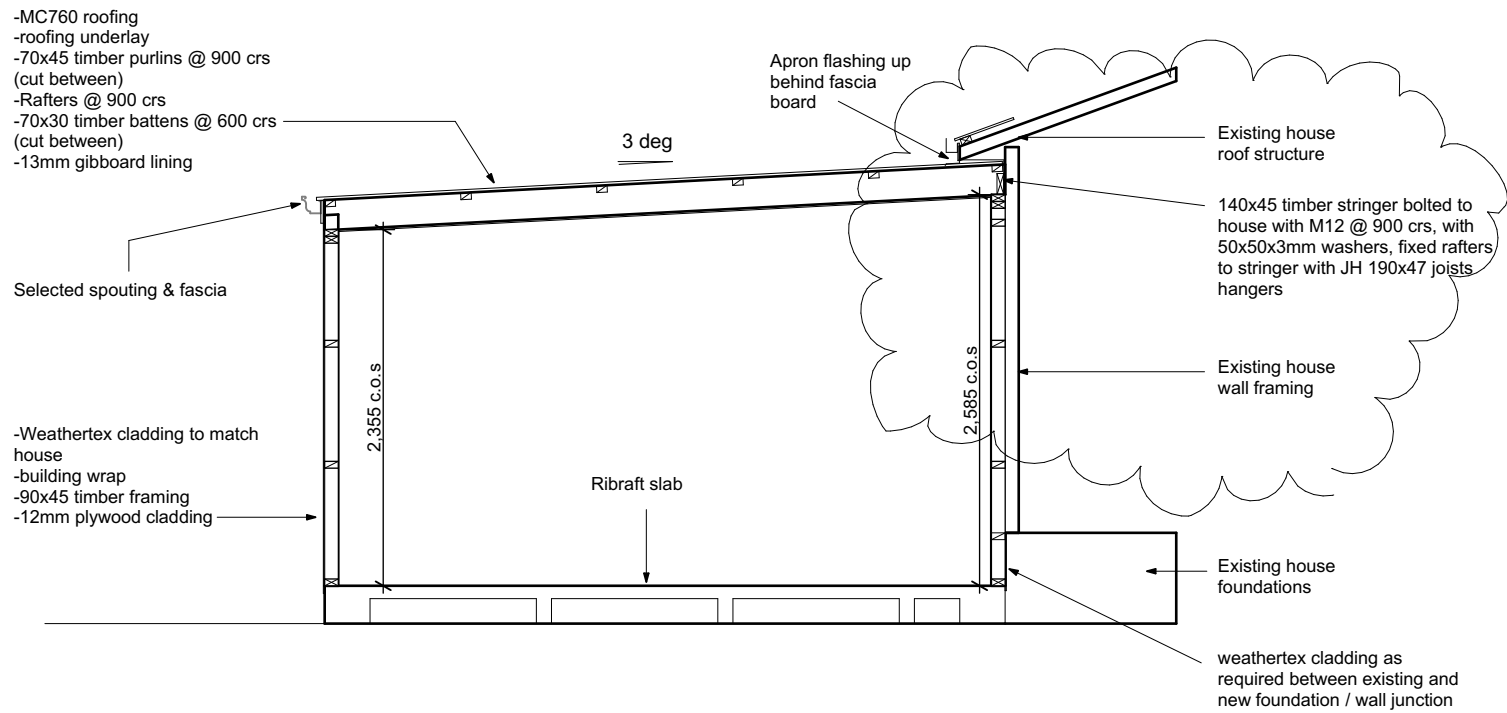
ELEVATION E2
Scale 1:100



ELEVATION E3
Scale 1:100



HOUSE NOT PART OF PERMIT



SECTION A
Scale 1:50



NEW PLYMOUTH
40 Ocean View Parade | New Plymouth
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#Notes

client:
LOWE

project:
RELOCATE PERMIT

design by: Manor Build

scale: As Noted

date: 15/02/2021

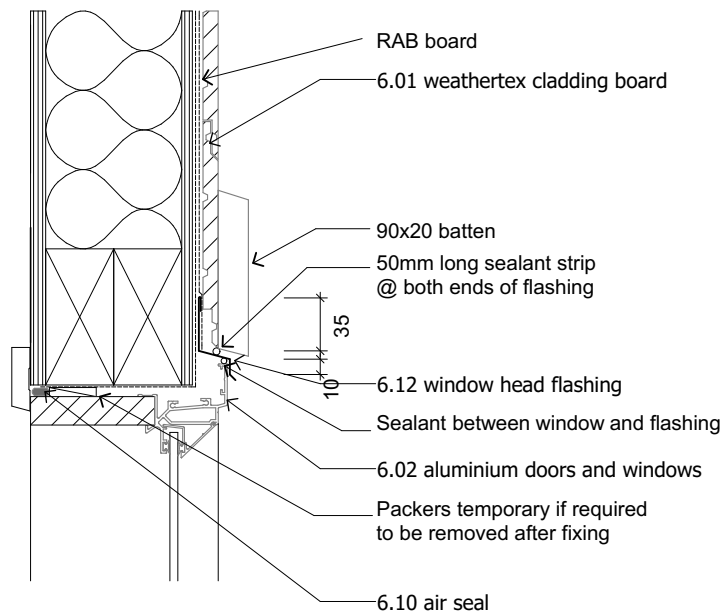
ELEVATIONS

job no:

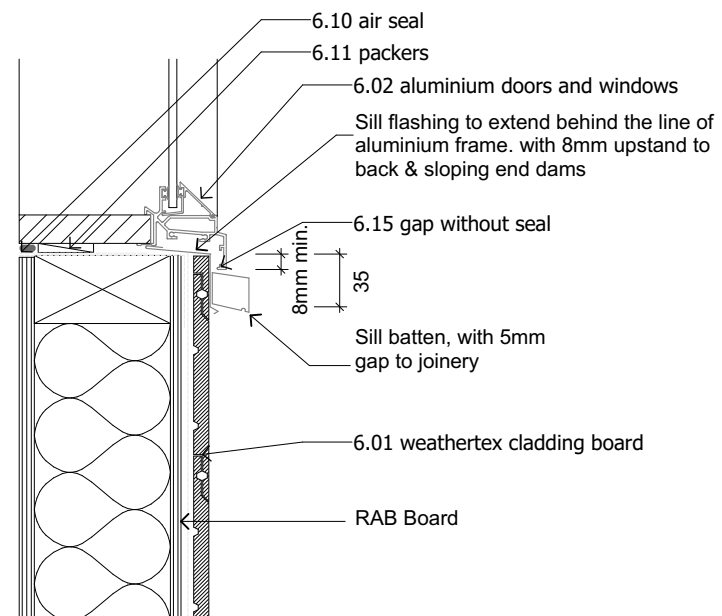
MG181

sheet no:

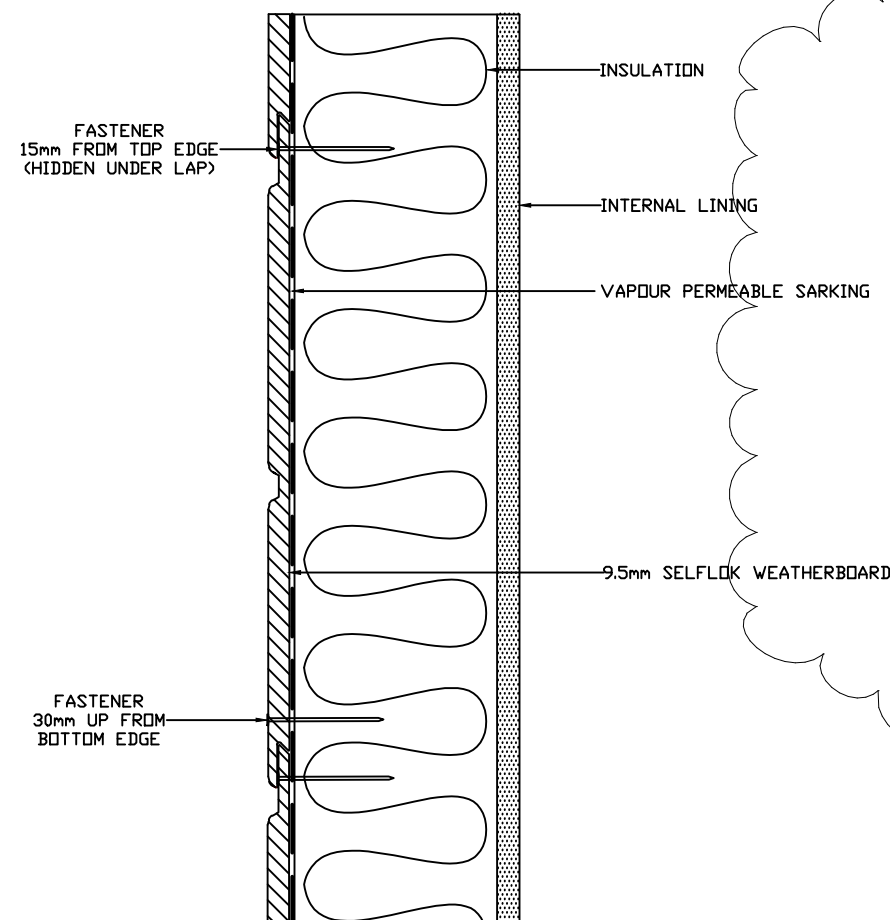
A2-3



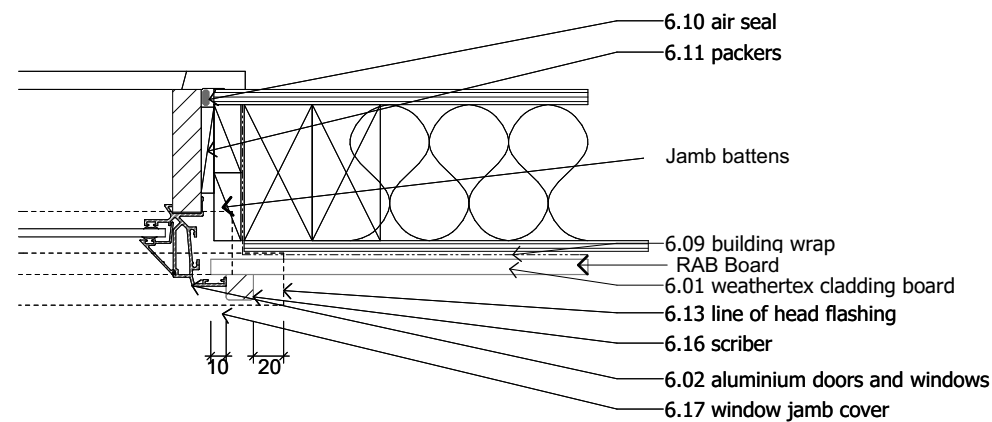
JOINERY HEAD
Scale 1:5



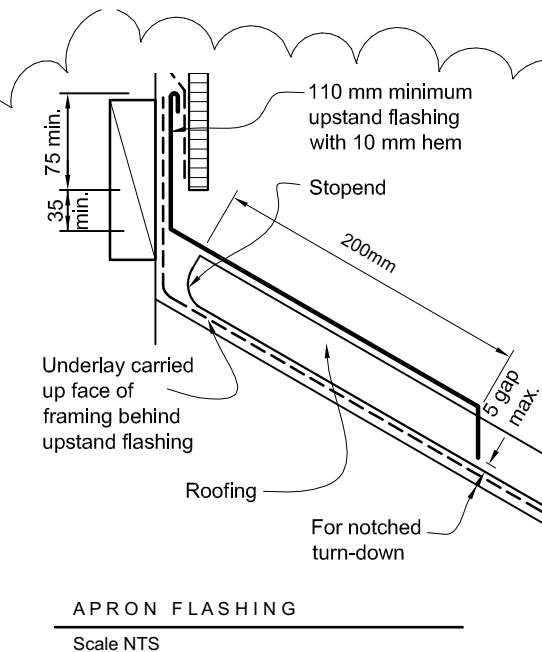
JOINERY SILL
Scale 1:5



CLADDING FIXING
Scale NTS



JOINERY JAMB
Scale 1:5



APRON FLASHING
Scale NTS



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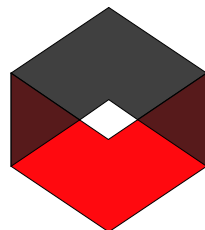
CONSTRUCTION DETAILS

job no:

MG181

sheet no:

A3-2



Ecoply® Bracing Specification – EP1

April 2009

Single sided structural plywood brace

| Specification No. | Minimum Wall Length | Lining Requirements | BUs/m Wind | BUs/m Earthquake |
|-------------------|---------------------|--|------------|------------------|
| EP1 | 0.6 m | 7mm Ecoply® or 12mm Shadowclad® one side | 130 | 130 |

Framing

Wall framing must comply with:

- NZBC B1 - Structure: AS1 Clause 3 Timber (NZS3604)
- NZBC B2 - Durability: AS1 Clause 3.2 Timber (NZS3602)

Framing dimensions and height are as determined by the NZS3604 stud and top plate tables for load bearing and non load bearing walls. Kiln dried verified structural grade timber must be used. Machine stress graded timber, such as Laserframe®, is recommended.

Bottom Plate Fixing

Use GIB Handibrac® hold-down connections at each end of the bracing element. Refer to installation instructions supplied with the connectors for correct installation instructions and bolt types to be used for either concrete or timber floors. Within the length of the bracing element, bottom plates are fixed in accordance with the requirements of NZS 3604:1999.

Lining

One layer 7mm Ecoply structural ply wood or 12mm Shadowclad exterior wall cladding fixed directly to framing or over cavity battens. If part sheets are used, ensure nailing at required centres is carried out around the perimeter of each sheet or part sheet. A 2-3mm expansion gap should be left between sheets.

Fastening the Ecoply®

Fasteners

Fasten with 50 x 2.8 mm galvanised or stainless steel flat head nails for direct fix or 60 x 2.8mm over cavity battens. Place fasteners no less than 7 mm from sheet edges.

Where fasteners are in contact with CCA treated timber or plywood, or the bracing panel forms part of an exterior envelope, fasteners must be stainless steel. Stainless steel fasteners must be annular grooved.

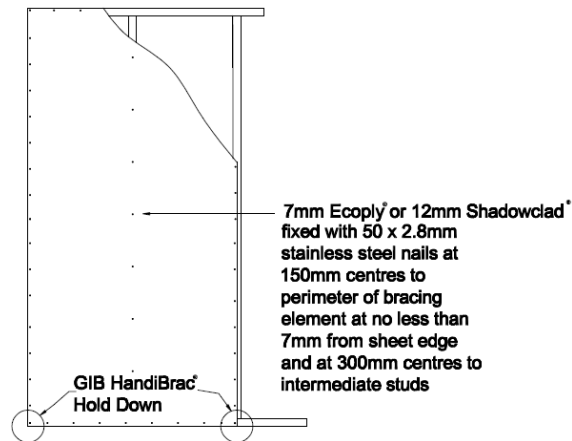
Fastening Centres

Fasteners are placed at 150 mm centres around the perimeter of each sheet and 300 mm centres to intermediate studs.

Fastening to Cavity Battens

The brace element may be fixed over cavity battens.

The cavity battens must be a minimum of 40 x 20mm nailed staggered formation at 150mm centres to studs around the perimeter of the brace element, and nailed to the intermediate studs within the element at 300mm centres, with 50mm x 2.8mm flat head galvanised or annular grooved stainless steel nails.



Ecoply® Bracing Systems are designed to meet the requirements of the NZBC and have been tested and analysed using the P21 method referenced in NZS3604:1999 listed as an acceptable solution B1/AS1 Structure. Testing was carried out using Ecoply, Shadowclad and Laserframe MSG8 timber framing manufactured by Carter Holt Harvey Limited trading as Carter Holt Harvey Woodproducts New Zealand, and GIB® products manufactured by Winstone Wallboards Ltd. **Substituting materials may compromise performance of the system.** GIB® and GIB HandiBrac® are registered trade marks of Fletcher Building Holdings Ltd.