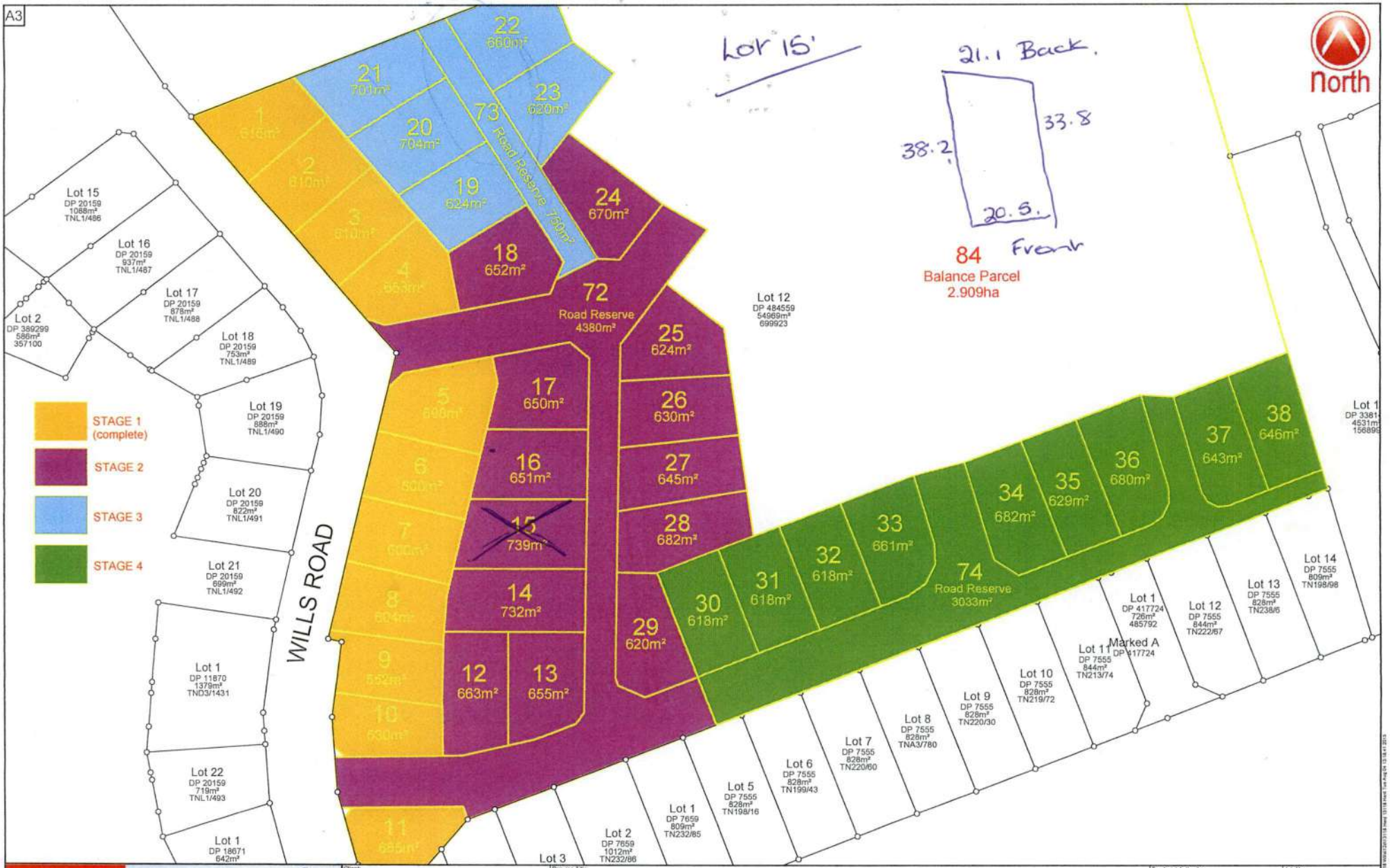
SPECIFICATIONS AND REPORTS

BC16/120985

Prepared by: TF

Document Set ID: 7768316
Version: 1, Version Date: 10/07/2018



JSL Juffermans Surveyors Ltd
51 Dawson Street
PO Box 193, New Plymouth 4340
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Client: Central Property
Site Address: 18 Wills Road, Bell Block

Drawing Title: Central Property Subdivision Scheme Plan
Lot 2 DP 417724
STAGE 2 / 3 VARIATION and STAGE 4

Territorial Authority: NPDC
Job No: 14043
Comprised in: 485793
A3 Scale: 1:1000
Drawing No: 1
Date: 4/08/2015
Rev: 2

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Te Kaunihera-ā-Rohe o Ngāmotu
NEW PLYMOUTH DISTRICT COUNCIL
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Building Consent Analysis

New Dwelling/Additions

Approved = PASS More Information Required = MIR Not Applicable = N/A
If an element or sub element is not relevant, choose N/A.

Project No:			
Building Consent No:	BC16/120985	Date	7/08/2017
Consent Officer	Tim Steedman		
Description	THREE BEDROOM DWELLING - 5 ROKA STREET, BELL BLOCK		

Approved Document ref.	Elements	Sub Elements	Comments	Result
Compliance		New building or alteration (BA04 sec 112 considerations)	new	PASS
Site	Positioning	Siting	located on plan.	PASS
	Location	Fixed site datum		PASS
		FFL in relation to site datum		PASS
		Contours (GIS) reflect consent design		PASS
		Taranaki datum specified in PIM		PASS
		Wind Zone H	urban (once development completed). Flat, sheltered.	PASS
		Durability Zone – C		PASS
B1. Structure	Foundation	SED	Firth Ribraft. Reviewed engineers subdivion report. Noted as suitable for standard foundations (and subsequently firth ribraft).	PASS
		Engineers design on Architectural plans		PASS
		Load paths addressed / pads indicated	Load bearing foundation thickenings are located inconsistently with truss layout. Revise for consistentcy. revised and in suitable locations.	PASS
		Depth / Width	details on plans consistent with firth details.	PASS
		New to existing foundation junction		
		Reinforcement		
		NZS:4229 cantilevered foundation (boundary)		
	Slab on ground / concrete floor	SED		PASS
		Engineers design on Architectural plans		
		Load paths addressed / pads indicated		
		Hard fill		N/A
		Reinforcing – Mesh cover, supplementary bars	as per firth system. Installation manual appended.	PASS
		Control Joints		
		Free joint at 24m (locate & detail)		N/A
		Approved manufacturers specific design		
	Timber subfloor	????		N/A
		Subfloor bracing & layout provided		
		Fixing / Connection		

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New Dwelling/Additions

Approved = PASS More Information Required = MIR Not Applicable = N/A
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Project No:			
Building Consent No:	BC16/120985	Date	7/08/2017
Consent Officer	Tim Steedman		
Description	THREE BEDROOM DWELLING - 5 ROKA STREET, BELL BLOCK		

Approved Document ref.	Elements	Sub Elements	Comments	Result
		Height above ground level (550mm for particle board/450mm crawl space)		
		Ventilation		
	Timber flooring	????		N/A
		Member sizing and loading (size/ spacing/ span)		
		End support / fixing / bearing		
		Flooring material		
		Lateral support, blocking		
	Wall	NZS 3604	2400	PASS
		Member sizing height / size / spacing	90 x 45 @ 600 crs.	PASS
		Lintels – engineering design required?	Locate 18kn load bearing point on floorplan to demonstrate lintel D4 is adequate. Identify and demonstrate suitability of all lintels supporting surcharged trusses. nb - including but not limited to T05, T04, T03, TG02. sizes revised. Checked on designit and all sized conservatively considering surcharge.	PASS
		Beams – engineering design required?		
		Concrete block stretcher		
		Concrete block stack (SED)		
		Fixing / Connection		PASS
		Wall Bracing & calculation	Calcs and layouts provided. Demonstrate compliance with NZS3604:2011 clause 5.4.7.2. bracing revised and ok.	PASS
	Roof	Roof Framing NZS 3604		PASS
		Truss certificate & Layout provided	Full truss documentation provided.	PASS
		Member sizing (size / spacing)		
		Fixing / connection – uplift resistance		
		Roof Bracing	Hipped roof.	PASS
		Bottom cord restraints & wind brace identified in design statement (plans reflect)	450 crs	PASS
		Ceiling framing – battens 450 crs	timber battens.	PASS
	External Structure	Post footing / connection detailed		N/A

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2 BUILDING PLATFORM SUITABILITY

Soil investigation for the proposed building sites on Lots 12-18 & 24-29 included 26 scala penetrometer tests, 13 hand augers with shear vane tests at 0.5 m intervals in the auger holes (two scala penetrometer tests and one hand auger per Lot). The test locations and results are provided in Appendix A.

The hand auger holes (one per Lot) were drilled at test locations A1-A13 (as shown in Appendix A) to a depth of 2000 mm. The hand auger holes generally indicated 150-500mm of dark brown topsoil, followed by 1000-1800mm of brown clayey loam (Taranaki Ash), dry, friable with a trace of course sand, followed by 200-700mm of light brown clayey loam, moist, with a trace of course sand (ground water table was not encountered in any hole).

Top soil is to be stripped to top of the clay material (Taranaki Ash) in the position of the building platform prior to construction. Minimal earthworks are required to develop building platforms.

Figure 2.1: Soil Samples

This soil investigation has determined that the existing soil conditions at the proposed test locations meet the NZS3604 definition of 'Good Ground' – '*any soil or rock capable of permanently withstanding an ultimate bearing capacity of 300 kPa, (i.e. an allowable bearing pressure of 100 kPa using a factor of safety of 3.0)*'.

The above statement is based on the testing undertaken for the purposes of Resource Consent only. Detailed soil investigation will be required at the Building Consent / design stage to confirm suitable soil conditions for the proposed foundations, and this report does not limit those results. The existing site is an old farm paddock and there is the potential for unknown subsoil drainage within the proposed site.

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NPDC Approved for
20 DEC 2016
Building Consent

GIB EzyBrace® 2011 Software

Demand Calculation Sheet — single storey — V06/11

Job Details

Name	MANGIN RESIDENCE
Street and Number	18 WILLS ROAD
Lot and DP Number	Lot 15 OF LOT 2 SUBDIVISION DP 417724
City/Town/District	BELL BLOCK
Designer	DAVID JONES
Company Name	DJ DRAUGHTING
Date	15/07/2016

BRANZ Appraised
Appraisal No.294 [2011]

Select Lining Option: 10 or 13 mm GIB® Plasterboard (10 or 13 mm GIB® Plasterboard)

Building Specification

Number of storeys	single		
Floor Loading	2kPa		
Foundation Type	slab		
	Single Floor	**Complete Single Floor Column only**	
Cladding Weight	medium		
Roof Weight	light	2	
Room in Roof Space	no	2	
Roof Pitch (degrees)	15	0	
Roof height above eaves (m)	2.0	0.0	
Building height to apex (m)	5.0		
Ground to lower floor level (m)	0.3		
		0.0	
Stud Height (m)	2.4	0.0	
Building Length (m)	20.0	0.0	
Building Width (m)	12.8	0.0	
Building Plan Area (m2)	209	0	

Building Location

Wind Zone	***High***	**Earthquake Zone**	**Soil Type**
Select by Building Consent Authority Map		1	D&E (deep to very soft)
or Preference	High	**Annual exceedance probability**	
Wind Region	Preference selected 1	1/500 (NZS1170.4:2011 default)	
Lee Zone	Preference selected 1		
Ground Roughness	Preference selected 1		
Site Exposure	Preference selected 1		
Topographic Class	Preference selected		

Bracing Units required for Wind

Demand W (BU)			
			Walls single
along	slab	0	671
across	slab	0	960

Bracing Units required for Earthquake

Demand along / across E (BU)			
		Walls single	
slab	636	0	0

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SINGLE OR UPPER STOREY WALLS ALONG

V06/11

Lines		Bracing Elements							
1	2	3	4	5	6	7	8	9	10
Line Total Check	Line Label	Bracing Element No.	Available Wall Length L (m)	Angle to Bracing line (degrees)	Element Height H (m)	Bracing Type	Supplier	Bracing Units Achieved	
								W	E
229	**A**	1	0.6		2.4	GS1-N	GIB®	34	35
0		2	0.6		2.4	GS1-N	GIB®	34	35
0		3	0.6		2.4	GS1-N	GIB®	34	35
0		4	0.6		2.4	GS1-N	GIB®	34	35
0		5	0.5		2.4	GS1-N	GIB®	28	29
0		6	1		2.4	GS1-N	GIB®	65	60
282	**B**	1	4.7		2.4	GS1-N	GIB®	324	282
313	**C**	1	0.5		2.4	GS1-N	GIB®	28	29
0		2	0.5		2.4	GS1-N	GIB®	28	29
0		3	0.95		2.4	GS1-N	GIB®	61	56
0		4	0.6		2.4	GS1-N	GIB®	34	35
0		5	1.1		2.4	GS2-N	GIB®	105	92
0		6	1.2		2.4	GS1-N	GIB®	83	72
0					0	0	0	0	0
0					0	0	0	0	0
0					0	0	0	0	0
0					0	0	0	0	0
0					0	0	0	0	0
0					0	0	0	0	0
0					0	0	0	0	0
0					0	0	0	0	0
0			0		0	0	0	0	0
0					0	0	0	0	0
0			0		0	0	0	0	0
0			0	0	0	0	0	0	0
0			0		0	0	0	0	0
0			0		0	0	0	0	0
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0			0		0	0	0	0	0
0			0		0	0	0	0	0
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0			0		0	0	0	0	0
0			0		0	0	0	0	0
0			0		0	0	0	0	0
0			0		0	0	0	0	0

						Wind	Earthq.
Totals Achieved	W	133%	EQ	130%		891	824
Concrete Slab						*OK*	*OK*
Totals Required (from Demand)						671	636

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SINGLE OR UPPER STOREY WALLS ACROSS

V06/11

Lines		Bracing Elements							
1	2	3	4	5	6	7	8	9	10
Line Total Check	Line Label	Bracing Element No.	Available Wall Length L (m)	Angle to Bracing line (degrees)	Element Height H (m)	Bracing Type	Supplier	Bracing Units Achieved	
								W	E
180	**M**	1	1.1		2.4	GS1-N	GIB®	74	66
0		2	1.9		2.4	GS1-N	GIB®	131	114
243	**N**	1	4.05		2.4	GS1-N	GIB®	279	243
0					0	0	0	0	0
194	**O**	1	2.8		2.4	GS1-N	GIB®	193	168
0		2	0.45		2.4	GS1-N	GIB®	24	26
106	**P**	1	0.6		2.4	GS1-N	GIB®	34	35
0		1	1.18		2.4	GS1-N	GIB®	81	71
154	**Q**	1	0.55		2.4	GS1-N	GIB®	31	32
0		2	0.55		2.4	GS1-N	GIB®	31	32
0		3	1.5		2.4	GS1-N	GIB®	104	90
0					0	0	0	0	0
0					0	0	0	0	0
0					0	0	0	0	0
0					0	0	0	0	0
0					0	0	0	0	0
0					0	0	0	0	0
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0			0		0	0	0	0	0
0			0		0	0	0	0	0
0			0		0	0	0	0	0

					Wind	Earthq.
Totals Achieved	W	102%	EQ	138%	982	877
Concrete Slab					*OK*	*OK*
Totals Required (from Demand)					960	636

Table 1: Definitions of risk levels
Paragraph 3.1.1, Figure 1

Risk Factor	Score(5)	Risk severity	Comments
A: Wind zone	0	**Low risk**	Low *wind zone* as described by NZS 3604
	0	**Medium risk**	Medium *wind zone* as described by NZS 3604
	(1)	**High risk**	High *wind zone* as described by NZS 3604
	2	**Very high risk**	Very High *wind zone* as described by NZS 3604
	2	**Extra high risk**	Extra High *wind zone* as described in NZS 3604 (4)
B: Number of storeys	0	**Low risk**	One *storey*
	(1)	**Medium risk**	Two *storeys* in part
	2	**High risk**	Two *storeys*
	4	**Very high risk**	More than two *storeys*
C: Roof/wall junctions	(0)	**Low risk**	Roof-to-wall intersection fully protected (e.g. hip and gable roof with *eaves*)
	1	**Medium risk**	Roof-to-wall intersection partly exposed (e.g. hip and gable roof with no *eaves*)
	3	**High risk**	Roof-to-wall intersection fully exposed (e.g. *parapets, enclosed balustrades* or *eaves* at greater than 90° to vertical with soffit *lining*)
	5	**Very high risk**	Roof elements finishing within the boundaries formed by the exterior walls (e.g. lower ends of aprons, *chimneys, dormers* etc)
D: Eaves width (1)(2)	0	**Low risk**	Greater than 600 mm for single storey
	(1)	**Medium risk**	451–600 mm for single storey, or over 600 mm for two storey
	2	**High risk**	101–450 mm for single storey, or 451–600 mm for two storey, or greater than 600 mm above two storey
	5	**Very high risk**	0–100 mm for single storey, or 0–450 mm for two storey, or less than 600 mm above two storey
E: Envelope complexity	(0)	**Low risk**	Simple rectangular, L, T or boomerang shape, with single *cladding* type
	1	**Medium risk**	Moderately complex, angular or curved shapes (e.g. Y or arrowhead) with no more than two *cladding* types
	3	**High risk**	Complex, angular or curved shapes (e.g. Y or arrowhead) with multiple *cladding* types
	6	**Very high risk**	As for High risk, but with junctions not covered in C or F of this table (e.g. box windows, pergolas, multi-storey re-entrant shapes etc)
F: Decks(3)	(0)	**Low risk**	None, timber slat *deck* or porch at ground floor level
	2	**Medium risk**	Fully covered in plan by *roof*, or timber slat *deck* attached at first or second floor level
	4	**High risk**	*Enclosed deck* exposed in plan or cantilevered at first floor level
	6	**Very high risk**	*Enclosed deck* exposed in plan or cantilevered at second floor level or above

NOTES:

(1) *Eaves width measured horizontally from external face of wall cladding to outer edge of overhang, including fascias* and external gutters/spoutings.

(2) Balustrades and *parapets* count as 0 mm *eaves*.

(3) The term *deck* includes balconies, as described in the Definitions.

(4) *Buildings* in Extra High *wind zones* require rigid *underlays* and *drained cavities*, refer to Table 3.

(5) Refer also to Table 2.

Errata 2 Dec 2011

Amend 2 Jul 2005

Amend 2 Jul 2005

Amend 2 Jul 2005

Amend 2 Jul 2005

Amend 2 Jul 2005

Amend 2 Jul 2005

Errata 2 Dec 2011

Amend 5 Aug 2011

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Amend 5 Aug 2011

Table 2: Building envelope risk scores
Paragraph 3.1.2, Figure 1

Risk factor	Risk severity: LOW	score	MEDIUM	score	HIGH	score	VERY HIGH (1)	score	Subtotals for each risk factor
Wind zone (per NZS 3604)(1)	0		0		1		2		1
Number of storeys	0		1		2		4		1
Roof/wall intersection design	0		1		3		5		0
Eaves width	0		1		2		5		1
Envelope complexity	0		1		3		6		0
Deck design	0		2		4		6		0

(Enter the appropriate risk severity score for each risk factor in the score columns. Transfer these figures across to the right-hand column. Finally, add up the figures in the right-hand column to get the total risk score.)

Total risk score for use in Table 3: 3

Amend 5 Aug 2011

NOTE: (1) For *buildings* in Extra High *wind zones*, refer to Tables 1 and 3 for rigid *underlay* and *drained cavity* requirements.

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Table 3: Suitable wall claddings
Paragraphs 3.1.2, 7.4, 9.1.1,9.1.7.2, 9.4.1.2, 9.4.1.3, 9.6, 9.6.1, Figure 1

Amend 5 Aug 2011

Risk Score from Table 2	Suitable wall claddings(1)	
	Direct fixed to framing	**Over nominal 20 mm drained cavity** (Amend 2 Jul 2005)
		Claddings on *parapets*, *enclosed balustrades*, and in Extra High *wind zones* shall be installed over *drained cavities*.(5)(6) (Amend 5 Aug 2011)
0 – 6	a) Timber weatherboards – all types b) Fibre cement weatherboards c) Vertical profiled metal – corrugated and symmetrical *trapezoidal* (3) d) Fibre cement sheet(4) (Jointed finish) e) Plywood sheet	a) *Masonry veneer* (2) b) *Stucco* c) Horizontal profiled metal(3) – corrugated and *trapezoidal* only d) Fibre cement – *flush-finished* e) *EIFS*
7 – 12	a) Bevel-back timber weatherboards b) Vertical timber board and batten c) Vertical profiled metal – corrugated only(3)(6)	a) *Masonry veneer* (2) b) *Stucco* c) *Horizontal* profiled metal – corrugated and *trapezoidal* only (Amend 2 Jul 2005) d) Rusticated weatherboards e) Fibre cement weatherboard f) Fibre cement sheet – flush and jointed finish (Amend 5 Aug 2011) g) Plywood sheet h) *EIFS*
13 – 20	a) Vertical profiled metal – corrugated only(3)(6)	a) *Masonry veneer* (2) b) *Stucco* c) Horizontal profiled metal – corrugated and *trapezoidal* only (Amend 2 Jul 2005) d) Rusticated weatherboards e) Fibre cement weatherboards f) Fibre cement sheet – flush and jointed finish (Amend 5 Aug 2011) g) Plywood sheet h) *EIFS* i) Bevel-back weatherboards
Over 20	a) Redesign the *building* to achieve a lower score, or b) *Specific design* – The design may need changing to reduce the risk – The *building consent authority* may require more comprehensive details and documentation providing evidence of *weathertightness* (Amend 2 Jul 2005) – The *building consent authority*, designer or *owner* may require more inspections (Amend 2 Jul 2005) – A third party audit of the design may be required.	

NOTES:
(1) The wall claddings in this table are limited to those covered in this Acceptable Solution.
(2) Traditional *masonry veneer* as per SNZ HB 4236, with minimum 40 mm cavity.
(3) Refer Figure 38 for profiles.
(4) Except *stucco* over a fibre cement backing.
(5) *Claddings* in Extra High *wind zones* require rigid *underlays* – refer to Paragraph 9.1.7.2 (Amend 5 Aug 2011)
(6) Direct fix vertical corrugated steel is included as cavity construction.

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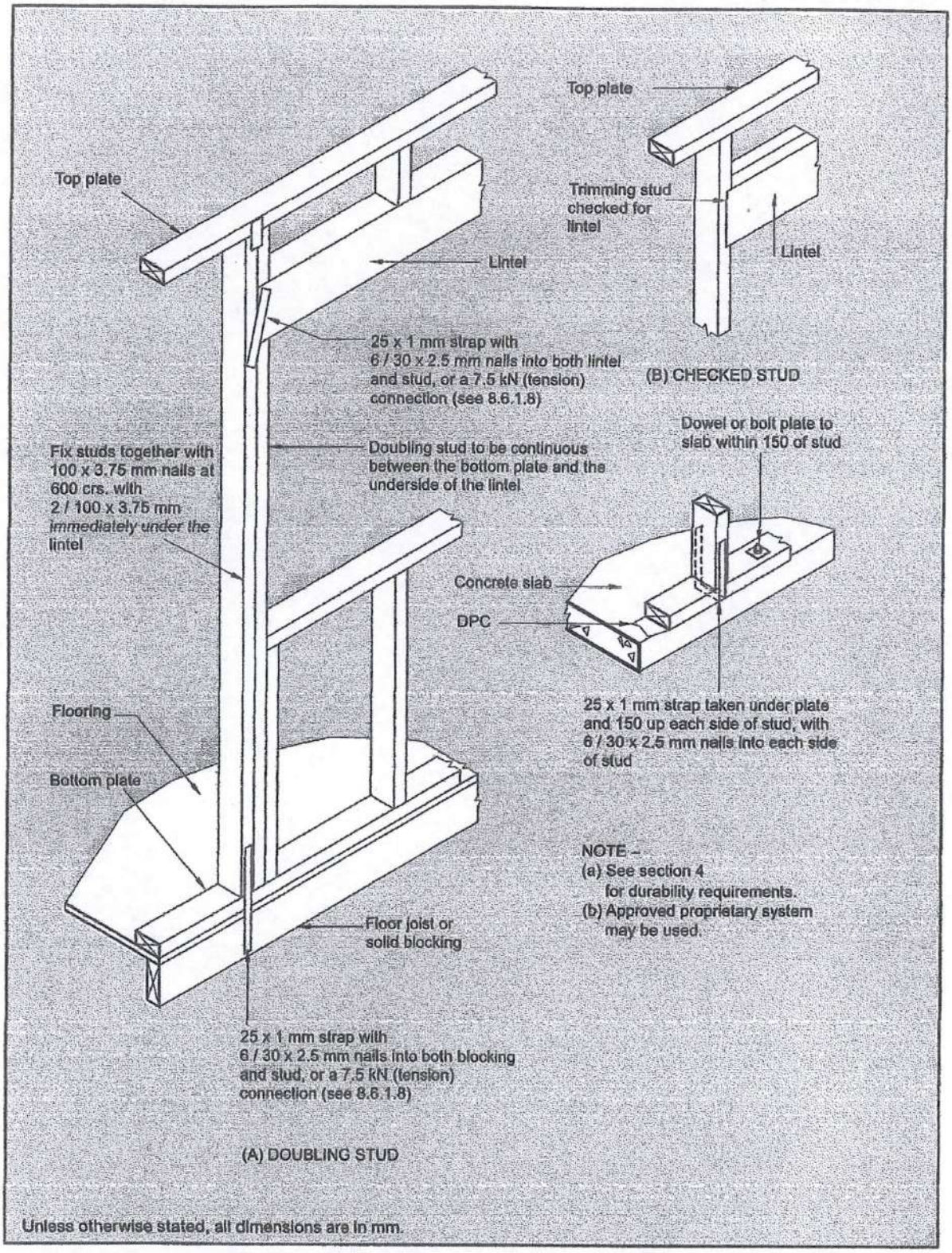

Figure 8.12 – Lintel fixing to prevent uplift (see 8.6.1.8 and table 8.14 (a) and (b))

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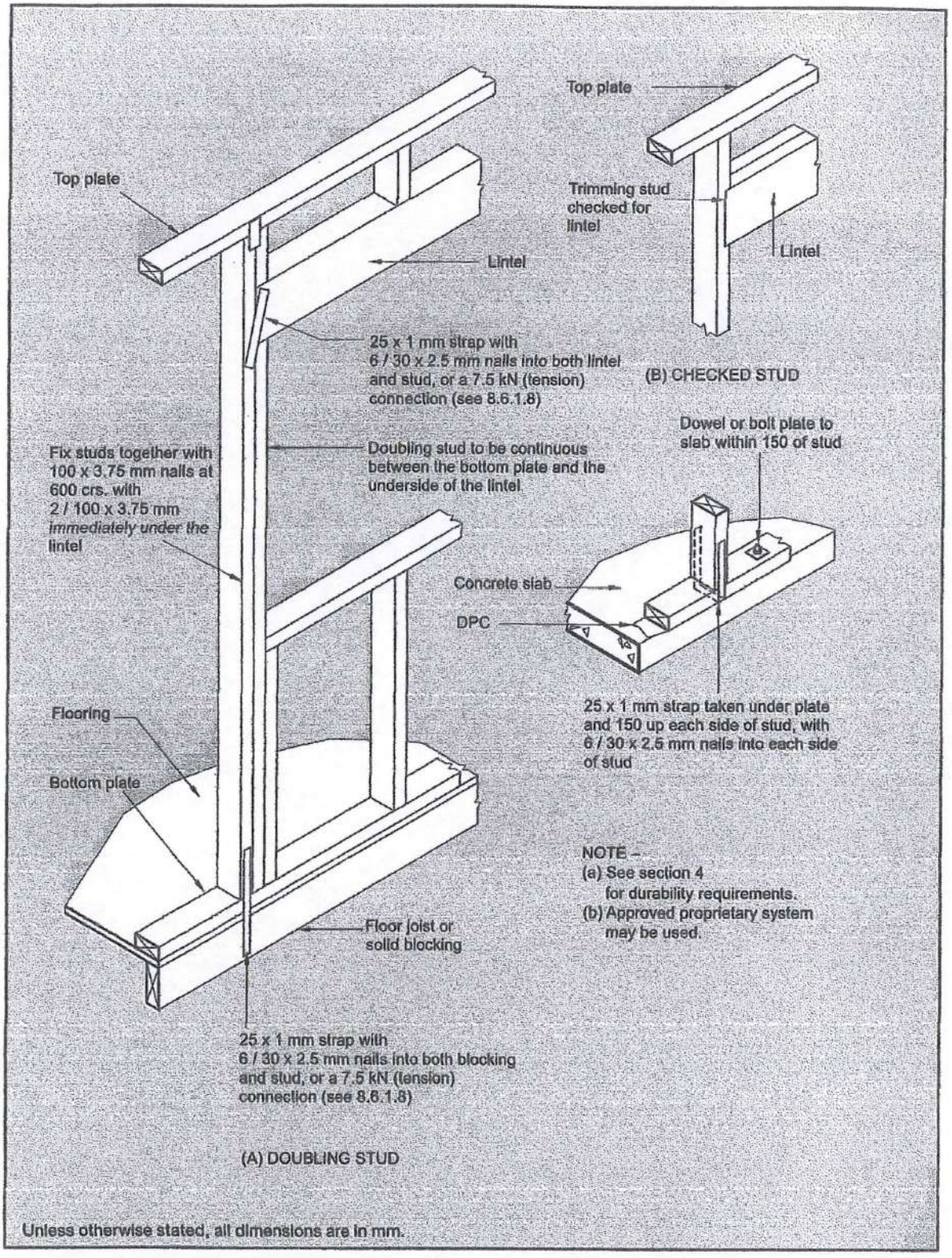

Figure 8.12 – Lintel fixing to prevent uplift (see 8.6.1.8 and table 8.14 (a) and (b))

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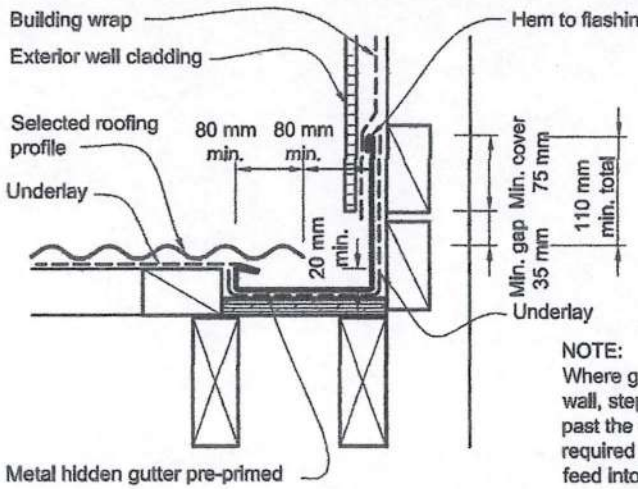
Amend 2 Jul 2005

Figure 50: Parallel hidden gutter for profiled metal
Paragraphs 4.3, 4.5, 8.1.6.2 and 8.4.16



NOTE:
Where gutter finishes within the length of the wall, step lower part of gutter out to 10 mm past the *cladding* line, while maintaining required clearances, to allow the gutter to feed into the lower *eaves* gutter.

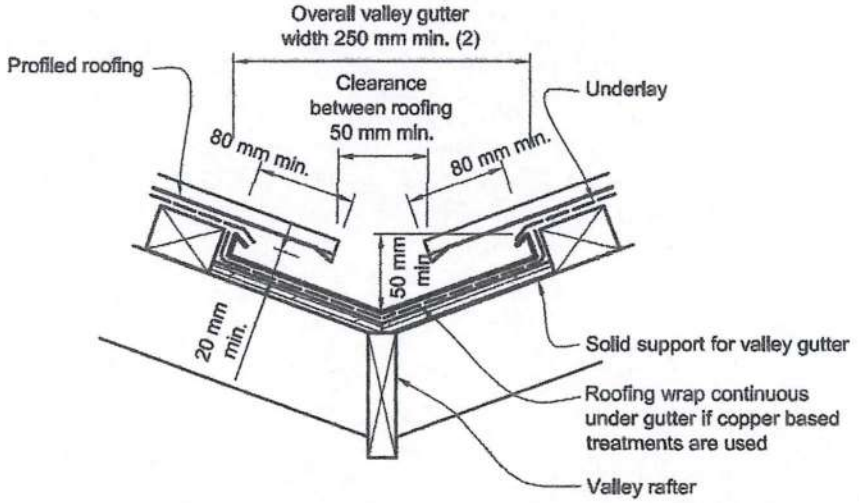
Amend 2 Jul 2005

Amend 5 Aug 2011

Figure 51: Valley gutters for profiled metal
Paragraphs 4.3, 4.5, 8.1.6.2 and 8.4.16

NOTE: (1) Refer to Table 8 for maximum roof catchment areas for *valley gutters*.
(2) Minimum width of *valley gutter* may reduce to 160 mm, providing roof catchment area is in accordance with Table 8. In this case, cover of roof cladding over gutter shall be reduced to 60 mm to provide a clearance gap of 40 mm.

Amend 2 Jul 2005



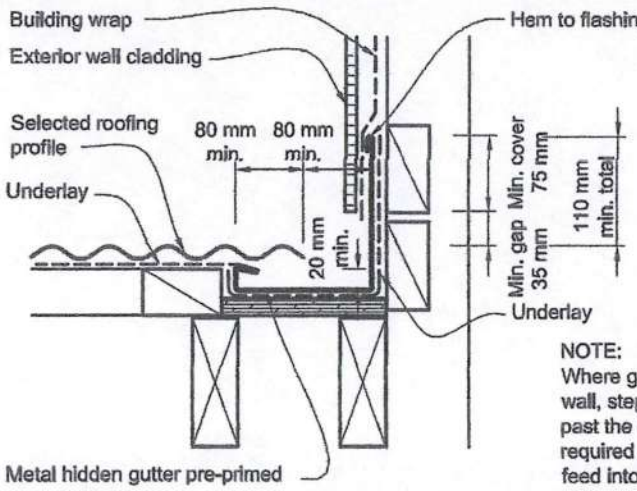
Amend 5 Aug 2011

Amend 2 Jul 2005

Document Set ID: 7768316
Version: 1, Version Date: 10/07/2018

Amend 2 Jul 2005

Figure 50: Parallel hidden gutter for profiled metal
Paragraphs 4.3, 4.5, 8.1.6.2 and 8.4.16



NOTE:
Where gutter finishes within the length of the wall, step lower part of gutter out to 10 mm past the *cladding* line, while maintaining required clearances, to allow the gutter to feed into the lower *eaves* gutter.

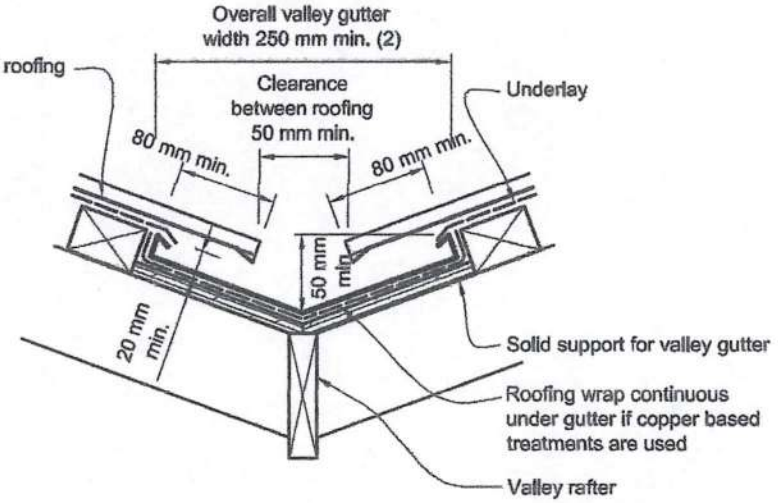
Amend 2 Jul 2005

Amend 5 Aug 2011

Figure 51: Valley gutters for profiled metal
Paragraphs 4.3, 4.5, 8.1.6.2 and 8.4.16

NOTE: (1) Refer to Table 8 for maximum roof catchment areas for *valley gutters*.
(2) Minimum width of *valley gutter* may reduce to 160 mm, providing roof catchment area is in accordance with Table 8. In this case, cover of roof cladding over gutter shall be reduced to 60 mm to provide a clearance gap of 40 mm.

Amend 2 Jul 2005



Amend 5 Aug 2011

Amend 2 Jul 2005

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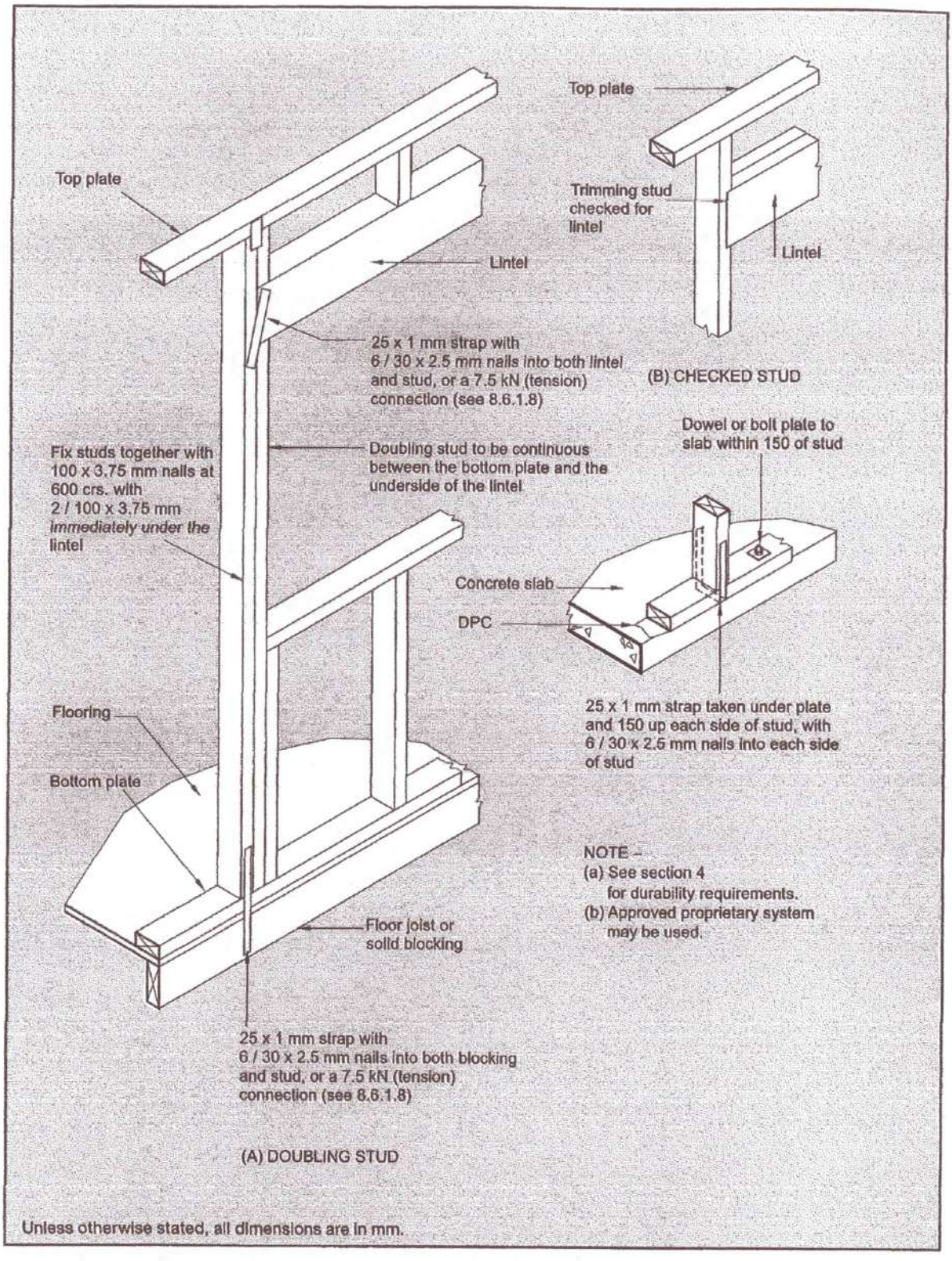

Figure 8.12 – Lintel fixing to prevent uplift (see 8.6.1.8 and table 8.14 (a) and (b))

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Job: 18WILLS

Client: THE OWNER
Phone:

Site: MANGIN
18 WILLS RD
BELL BLOCK

Description: NEW RESIDENCE

Building Consent No.:

Phone:

MITEK FABRICATOR DESIGN STATEMENT

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

MiTek 20/20® TRUSS DESIGN DATA

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

Job Details

Roof Truss		Importance Level :	2	Design Working Life :	50 years
Timber Group:	VSG8 H1.2	Pitch:	15.000 deg	Nominal Overhang:	600 mm
Roof		**Ceiling**		**Wind**	
Material:	Light	Material:	Gib Board 13mm	Area:	High (44.0 m/s)
Dead Load:	0.250 kPa	Dead Load:	0.200 kPa	Pressure Coeff:	Cpe = varies; Cpi = -0.30, 0.20
Restraints:	1200 mm centres	Restraints:	450 mm centres		
Live Load:	Qur = 0.250 kPa Qc = 1.100 kN	Live Load:	Qc = 1.400 kN		

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

MiTek® Truss List

Legend: * = detail only, ? = input only, ~~Tnx~~ = failed design, Ø = non certified, Unmarked trusses = designed successfully, LB = lateral bracing required GB = gable brace required

Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)	Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)	Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)
*HB01	2	4953	10.729	900	V03	1	2530	15.000	900	J15	1	2732	15.000	900
*HB02	2	3928	10.729	900	V04	1	1630	15.000	900	J01A	1	2902	15.000	900
*HB03	1	3951	10.729	900	*V05	1	730	15.000	900	J01B	1	2902	15.000	900
*HB04	1	2242	10.729	900	V06	1	2000	15.000	901	J09A	1	2227	15.000	900
*HB05	1	3289	10.728	900	V07	1	1099	15.000	901	J09B	1	2227	15.000	900
*HB06	2	3999	10.729	900	V08	1	2349	15.000	900	J13A	1	2527	15.000	900
*HB07	1	6969	10.729	900	V09	1	1516	15.000	834	J13B	1	2527	15.000	900
*HB08	1	3048	10.728	900	*V10	1	682	15.000	834	J15A	1	2732	15.000	900
*HB09	1	7259	10.729	900	J02A	1	2002	15.000	900	T05	1	4400	15.000	900
*HB10	1	1932	10.728	900	J02B	1	2002	15.000	900	T09	1	3079	10.729	900
J02	1	2002	15.000	900	J02C	1	2002	15.000	900	J06	1	3632	15.000	900
J04	1	1277	15.000	900	J03	1	2177	15.000	900	J11	1	1255	15.000	900
J07	1	2877	15.000	900	J04A	2	1277	15.000	900	J12	1	3427	15.000	900
J08	1	1932	15.000	900	J10A	1	1327	15.000	900	T04	1	5850	15.000	900
J10	1	1327	15.000	900	J14A	1	1627	15.000	900	T06	1	4400	15.000	730
J14	1	1627	15.000	900	J16A	1	1832	15.000	900	T13	1	4500	15.000	900
J16	1	1832	15.000	900	*R01A	1	1715	15.000	900	J06A	2	3632	15.000	900
*R01	1	1715	15.000	900	*R02A	4	913	15.000	900	J06B	1	3632	15.000	900
*R02	4	913	15.000	900	*R03A	1	990	15.000	900	J06C	2	3632	15.000	900
*R03	1	990	15.000	900	*R03B	1	990	15.000	900	J11A	1	1255	15.000	900
R04	1	873	14.999	900	*R03C	1	990	15.000	900	J11B	1	1255	15.000	900
*R05	1	1040	15.000	900	*R03D	1	991	15.000	900	J12A	1	3427	15.000	900
*R06	1	1340	15.000	900	*R03E	1	991	15.000	900	T13A	1	4500	15.000	900
*R07	1	1545	15.000	900	*R05A	1	1040	15.000	900	TG01	1	6162	15.000	900
T02	4	9110	15.000	891	*R05B	1	1040	15.000	900	TG02	1	8700	15.000	900
T07	2	4400	15.000	730	*R05C	1	1040	15.000	900	TG03	1	5928	15.000	900
T10	2	6162	15.000	900	J01	1	2902	15.000	900	T11	1D	5850	15.000	762
T12	1	5850	15.000	762	J03A	1	2177	15.000	900	T14	1	8700	15.000	900
T15	1	5928	15.000	900	J03B	1	2177	15.000	900	T01	1D	9110	15.000	891
T16	4	5928	15.000	834	J05	1	1773	15.000	900	T03	1D	9110	15.000	891
V01	1	2059	15.000	900	J09	1	2227	15.000	900					
*V02	1	1164	15.000	900	J13	1	2527	15.000	900					

Total quantity : 114

The computer design input has been carried out by:

Signed: WR Digby

Date: ...Tuesday, 26 July 2016....

Name of Detailer: .....

Qualifications and Title:

On behalf of: Timber Co Ltd

TIMBER

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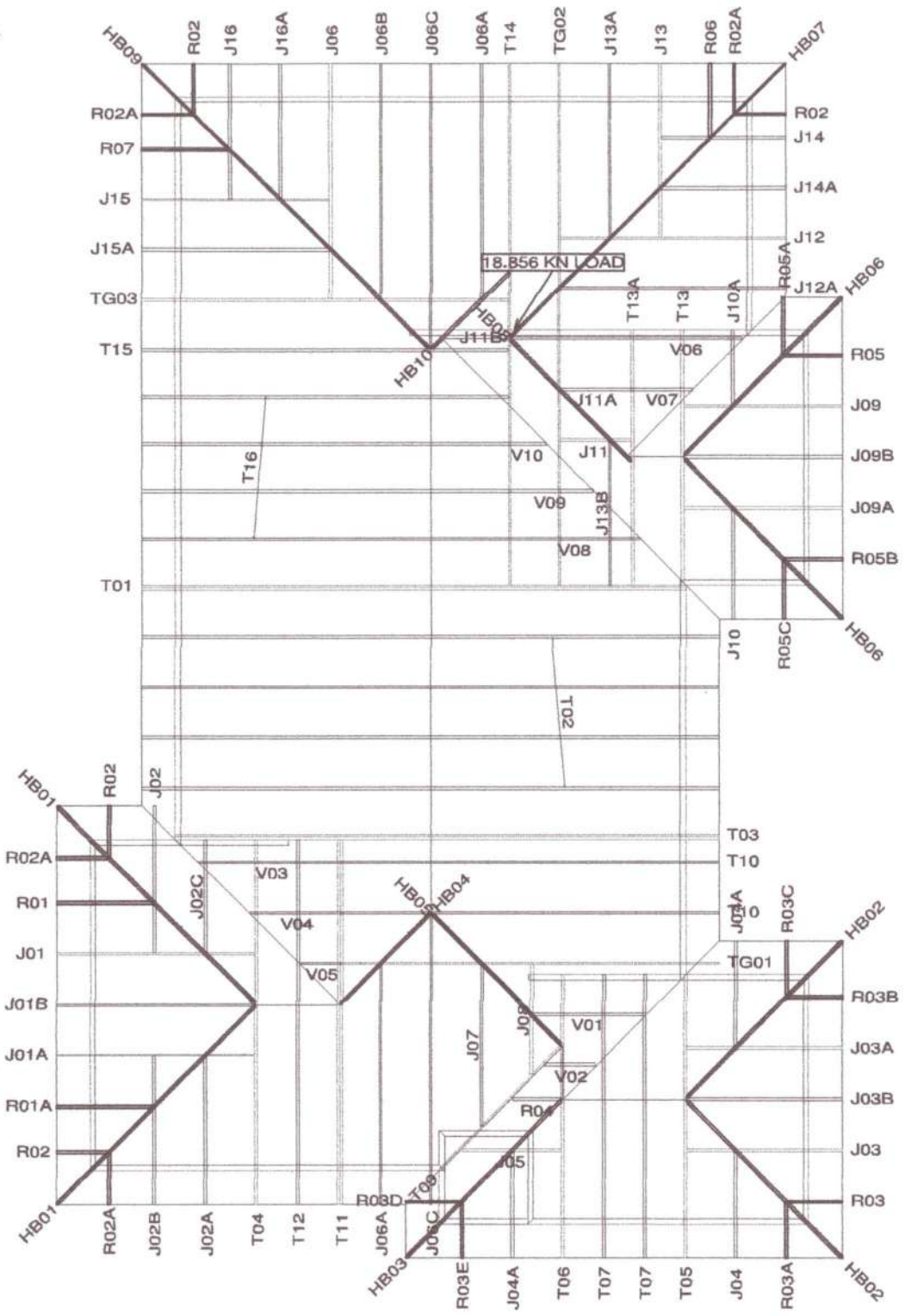

Job Details:

Snow Zone:		Snow Altitude:	0 m
Wind Area:	High	Design Wind Speed:	44.0 m/s
TC Restraints:	1200 mm	BC Restraints:	450 mm
Roof Material:	Light	Ceiling Material:	Gib Board 13mm
Roof Live Load:	0.250 kPa	Snow Load:	0.000 kPa
Roof Pitch:	15.000 deg	Truss Centres:	900 mm

Timber Co Ltd

7 Sunley St
P O Box 871
New Plymouth

Telephone: Phone : 06 7534393
Fax: Fax : 06 7534394

Name: THE OWNER
Address: 18 WILLS RD
BELL BLOCK

Telephone:

NEW RESIDENCE

Job: 18WILLS

Building Consent No.:

Scale: 1 : 112 | Date: 26/07/2016 | Drawn By: Wayne Silby

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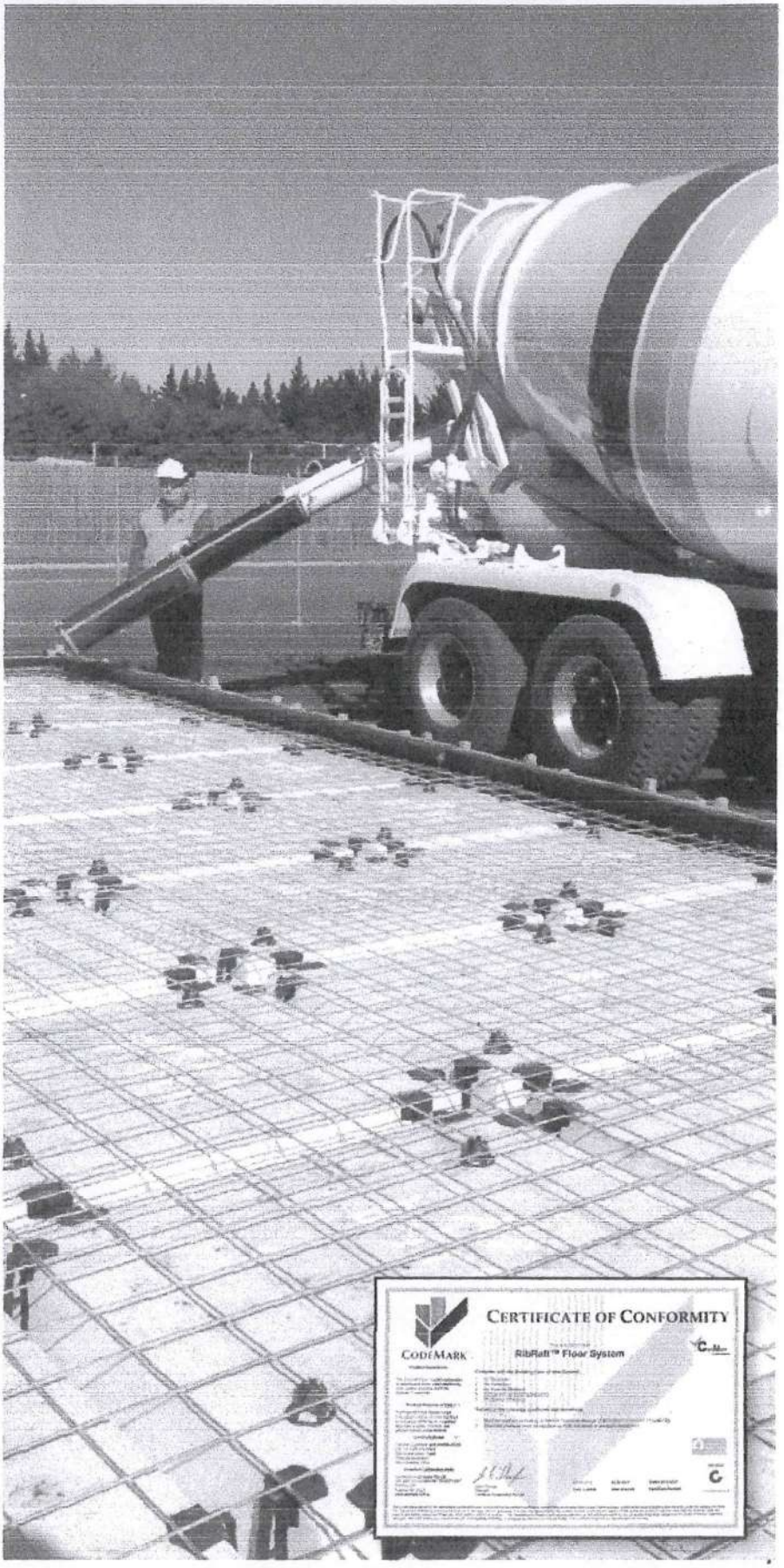
Version: 1, Version Date: 10/07/2018

Firth

RIBRAFT®
TECHNICAL MANUAL



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INSTRUCTIONS ON THE USE OF THIS MANUAL

This Manual consists of three Sections:

Section 1: Firth RibRaft Floor System Design Information

Section 2: Firth RibRaft Floor System Installation Information

Section 3: Firth RibRaft Floor System Verification

Section 1 contains information principally useful for the specifier or building designer. **Section 2** is primarily aimed at the person on site installing the Firth RibRaft Floor system. While **Section 3** describes the required verification checks.

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.

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 DBH 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 DBH 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 Concrete must be used.

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FIRTH RIBRAFT FLOOR SYSTEM

SECTION 1: DESIGN INFORMATION

1 GENERAL

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 TECHNICAL DESCRIPTION

2.1 Overview

The Firth RibRaft Floor System is a reinforced concrete waffle raft floor slab-on-ground. 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.

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 for construction following specific engineering design. Such uses are outside the scope of this document.)

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 300mm centres, and ductility class L or E, hereafter referred to as "665 mesh, or mesh". 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 structural mix available in either a 13mm or more usually a 19mm nominal aggregate size. This mix is normally placed in the floor straight from the concrete truck chute and if necessary by wheelbarrow over planks set up over the pods.

2) Raftmix Pump – a 20MPa 100mm slump pump mix available in either a 13mm or more commonly a 19mm nominal aggregate size. The selection of aggregate size may be determined either by the capability of the available concrete pump or by the concrete placer's preference.

The exception being 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 as defined as exposure zone D in 4.2.3.3 of NZS3604) in which case one of the following Firth concrete products shall be used in the system:

1) Raftmix25 – a 25MPa 100mm slump structural mix available in either a 13mm or more usually a 19mm nominal aggregate size. This mix is normally placed in the floor straight from the concrete truck chute

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and if necessary by wheelbarrow over planks set up over the pods.

2) Raftmix Pump25 – a 25MPa 100mm slump pump mix available in either a 13mm or more commonly a 19mm nominal aggregate size. The selection of aggregate size may be determined either by the capability of the available concrete pump or by the concrete placer's preference.

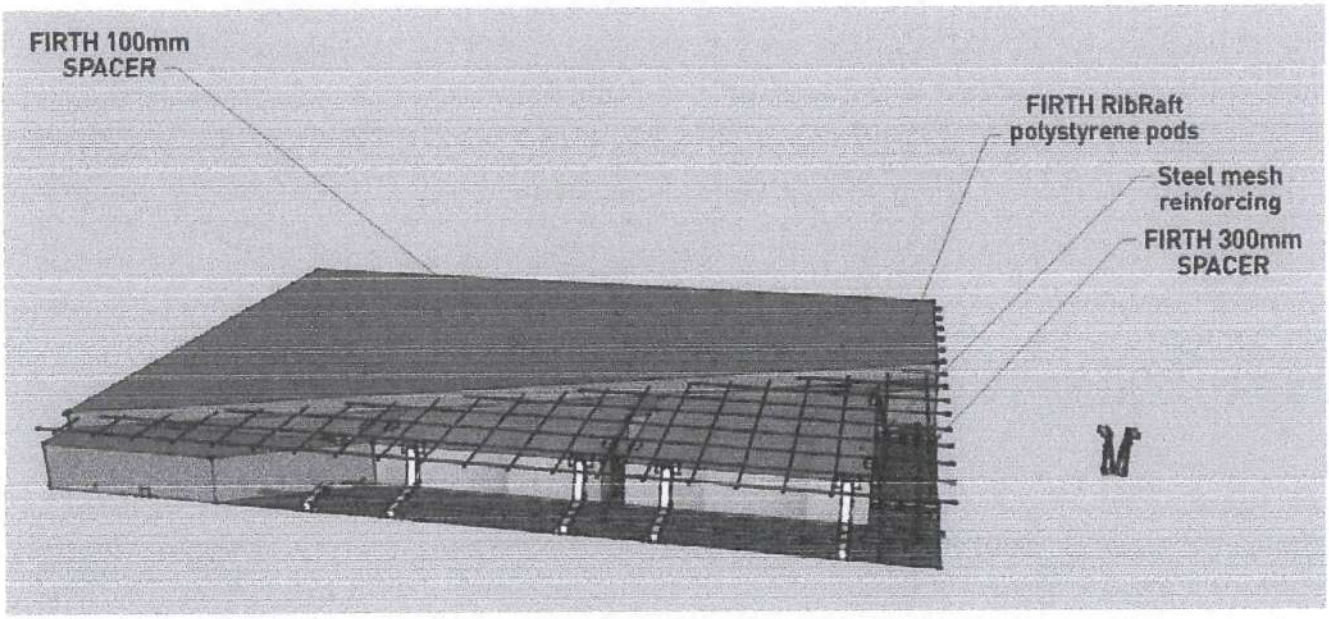

Figure 1 *The RibRaft System*

3 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, and is not stepped.
- 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 each storey of the structure supported by the system 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 load bearing walls are used to support the roof or floors, the loaded dimensions stated in Tables 8.2 and 14.10 of NZS3604:2011 shall apply, and the load bearing wall 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 NZS3604:2011.

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3.2 Live Loading

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

- 1.5kPa and 3.0kPa as per NZS 3604:2011 "Timber Framed Buildings".
- 13kN concentrated load in garage over area of 0.3 x 0.3m (vehicle limited to 2500kg gross).

3.3 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.

3.4 Building Types

The designs given in this Manual are limited to where the system supports Building Types A to D as described in Table 1. The classification of wall weights is as detailed in Clause 3.3 of this Section. Single and two storey shall be as defined in NZS 3604:2011.

3.5 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.

Where the ultimate bearing capacity required of the supporting ground is verified by Scala Penetrometer testing in accordance with Clause 3.3 of NZS 3604:2011. 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 For Determining Ultimate Bearing Capacity*

Building Type	Min. blows per 300mm depth
A	6
B	7
C	8
D	9

3.6 Flow Diagrams

The flow diagrams on the following pages (adapted from NZS 3604:2011) 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).

Table 1 *Building Identifier*

Building Type	Description	Ground Floor External Walls	Second Storey External Walls
A	Single Storey	Light	
B	Single Storey	Heavy	
C	Two Storey	Light	Light
D	Two Storey	Heavy	Light

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(Note: NZS 3604:2011 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 NZS 3604:2011).

Figure 2 *Building Check Flow Diagram*

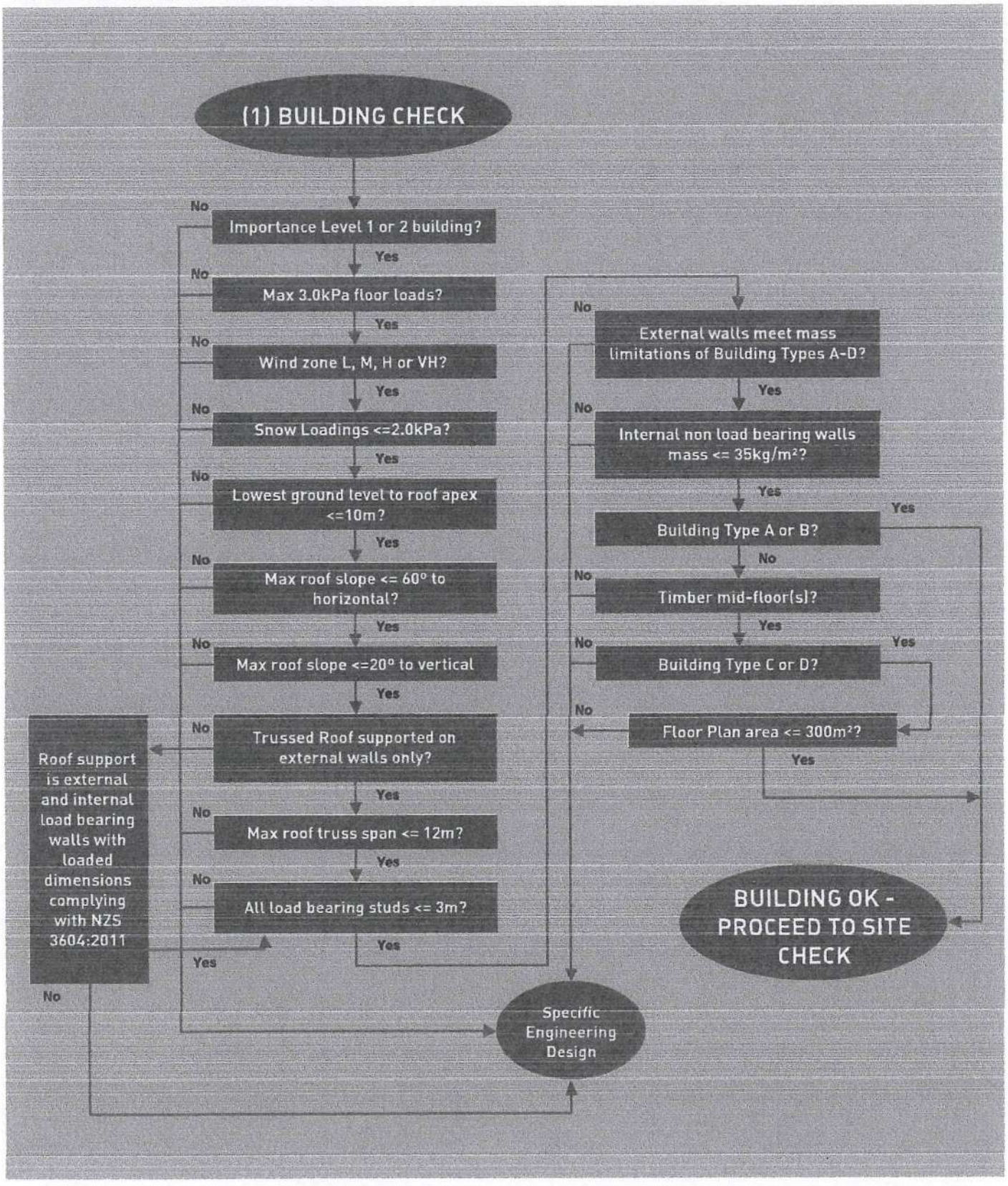

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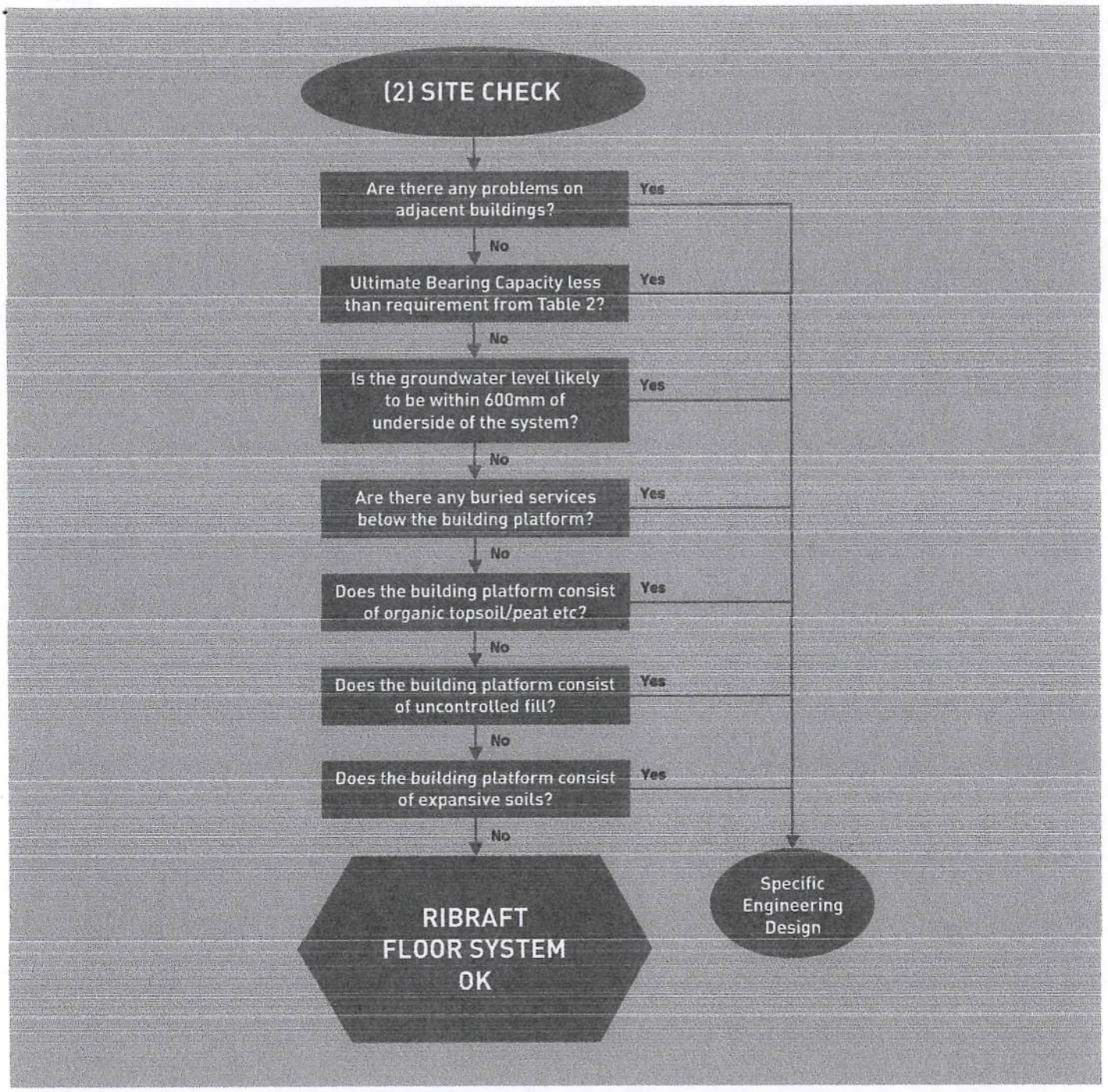
Figure 3 *Site Check Flow Diagram*



4 CONSTRUCTION DETAILS

Standard construction details for the system are provided here for buildings that fall within the above 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,

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penetrations or orientation of beams and ribs.

Figure 4 below 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 are identified and pods cut to establish 300mm wide ribs. 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.

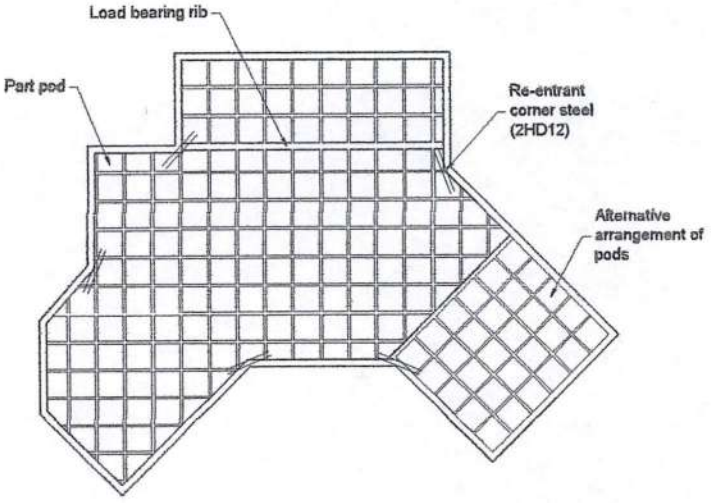

Figure 4 *Typical RibRaft Plan*

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 all load bearing walls and heavy internal walls, the pods shall be cut to create a 300mm wide rib directly under the load bearing wall, with 2-HD12 (Grade 500E) steel bars as bottom steel. 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 Mesh Reinforcement

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

4.6 Re-entrant Corners

In order to limit 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 4.

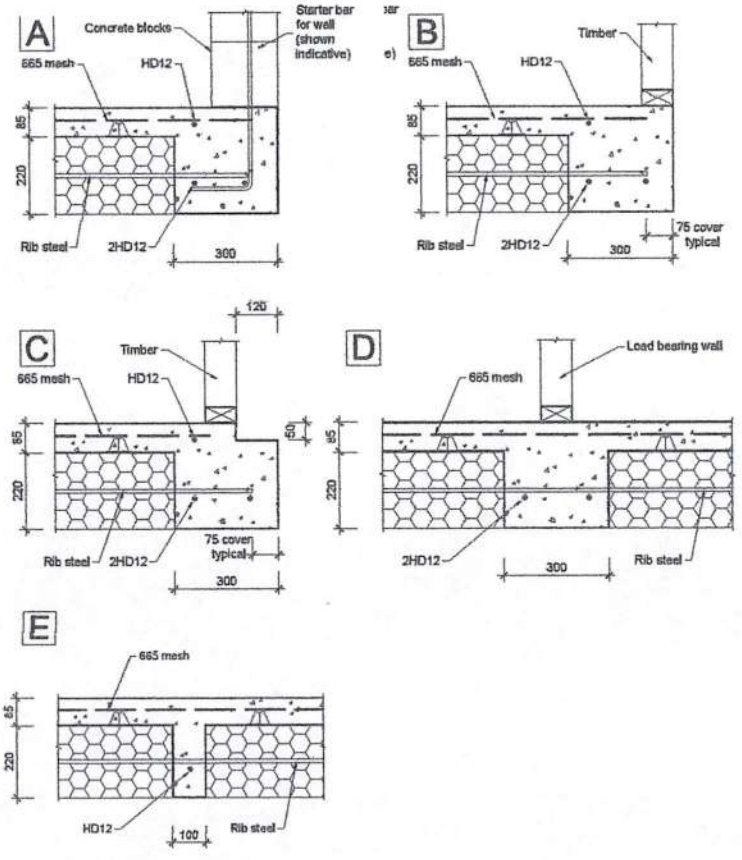

Figure 5 *Standard RibRaft Construction Details*

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5 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 may be 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.

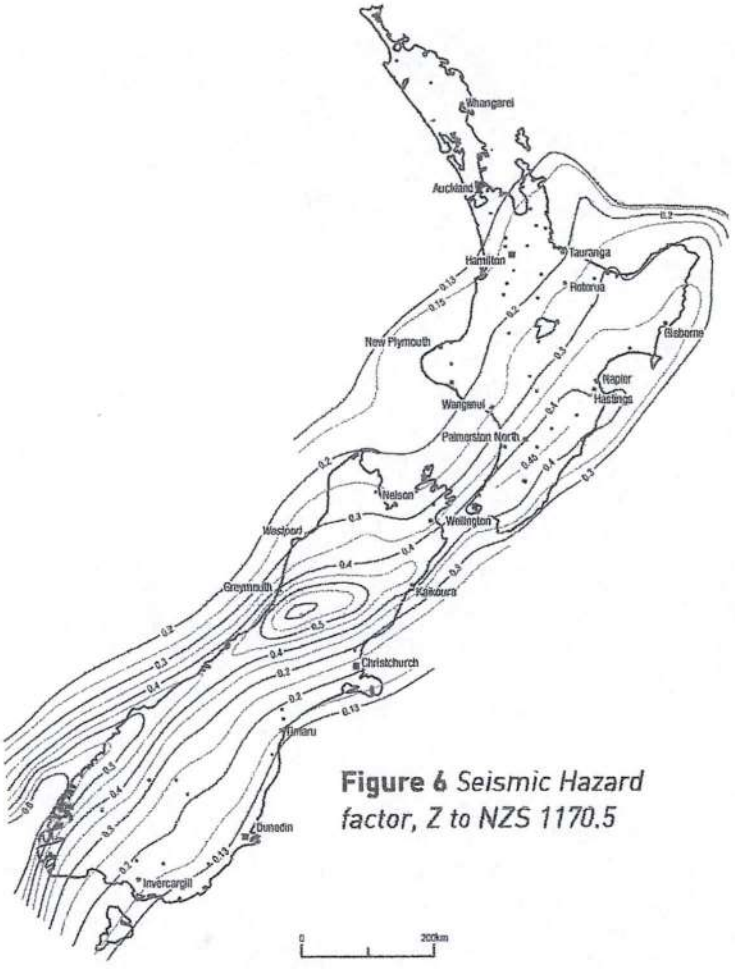

Figure 6 *Seismic Hazard factor, Z to NZS 1170.5*

For the purposes of this Manual, the ground shall be classified as clay or sand according to the following descriptions:

Clay: retains shape when moulded under hand pressure; may stick to boots and hands; cracks and becomes hard, but retains shape, when dried in direct sunlight; and when dug with a spade the cut vertical surface stands.

Sand: Individual particles visible to the unaided eye; when dry will run through the fingers and forms a conical mound if poured; when moist quickly dries out under direct sunlight; and when dug with a spade the vertical surface does not stand for long.

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 6 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	BUs provided per 100m² for live loading of:	
		1.5kPa	3.0kPa
A	Light	1150	1267
A	Heavy	1267	1383
B	Light	1800	1917
B	Heavy	1917	2033
C	Light	1617	1833
C	Heavy	1717	1950
D	Light	2267	2483
D	Heavy	2367	2600

Table 6 *Bracing Capacity provided by Frictional Resistance per 100m² of ground floor area.*

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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 below. 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.

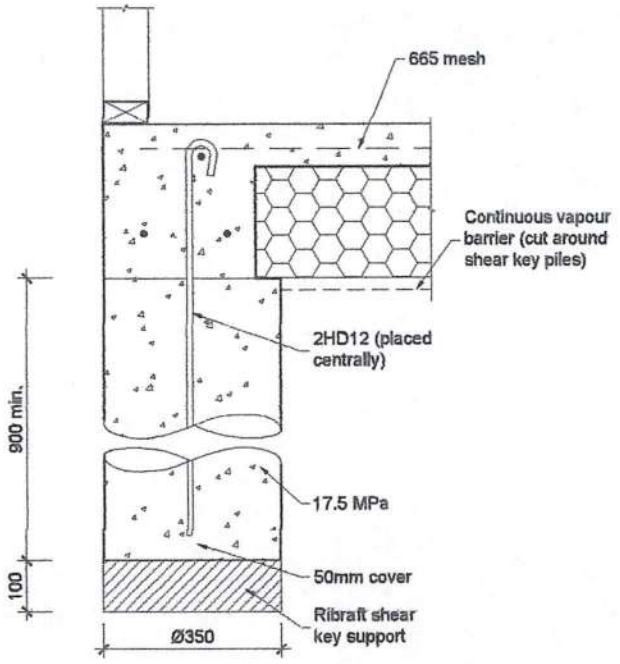


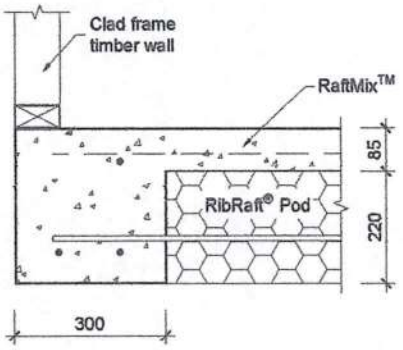
Figure 7 *RibRaft Shear Key*

6 OTHER DESIGN DETAILS

6.1 R-Values

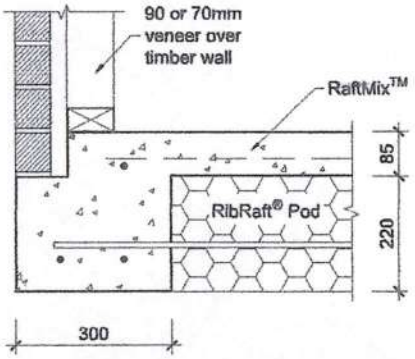
The insulation performance of a building element is measured by the "R-Value". The schedule method is the simplest method to achieve compliance with Clause H1 of the Building Code. Using this method the minimum R-Values required for floors are R1.3 for light timber frame construction, and typically R1.5 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 R-Value of a RibRaft 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.



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

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



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

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

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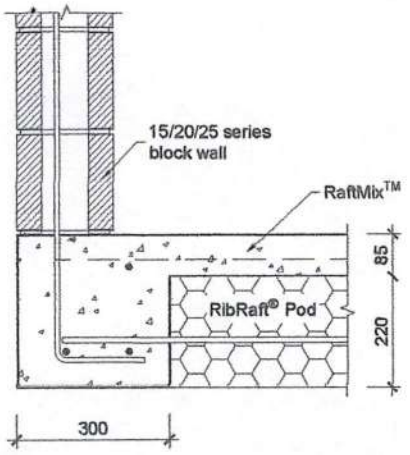
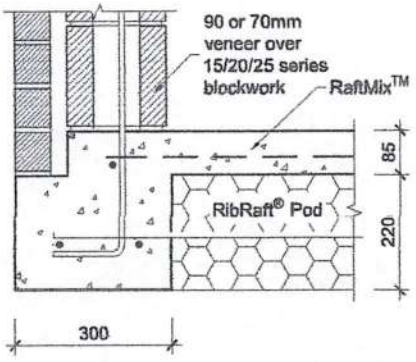


	Block	Floor Area To Perimeter Ratio m^2/m										
		1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.50	4.00
R-value $m^2\,^oC/W$	15 series	1.46	1.59	1.71	1.84	1.96	2.07	2.19	2.30	2.41	2.63	2.84
	20 series	1.52	1.66	1.79	1.92	2.04	2.17	2.29	2.40	2.52	2.75	2.93
	25 series	1.57	1.72	1.85	1.99	2.12	2.24	2.37	2.49	2.61	2.85	3.08

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	2.50	2.75	3.00	3.50	4.00
R-value $m^2\,^oC/W$	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

Figure 11 *RibRaft R-Values for 70-90mm thick veneer, cavity, and various thicknesses of masonry walls.*

6.2 Shrinkage Control

Shrinkage control joints reduce the risk of unwanted cracks, and their placement needs to be carefully considered where cracking could be unacceptable. 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. Shrinkage control joints shall be saw cut after hardening. The saw cuts shall be cut to a depth of 25mm and shall be cut no later than 24 hours. The shrinkage control joints shall be positioned to coincide with major changes in floor plan. Where the concrete is to be exposed, or brittle covering placed over, the maximum intermediate bay sizes shall be limited to 6m.

Bay dimensions formed by shrinkage control joints shall be limited to a maximum ratio of length:width of 2:1.

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 the 300mm rib.

Supplementary reinforcing using 2-HD12 bars (Grade 500E) shall be used at all re-entrant corners as shown on Figure 4. These bars shall be 1200mm long, 200mm apart, tied to the top of the mesh, with 50mm side cover and shall not be placed across any shrinkage control joints.

6.3 Services Detailing

Ideally, services ducts shall be conveyed underground to their plan location then brought up through the polystyrene pod and the concrete floor slab, but this may not always be possible. 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.

The maximum diameter of the services shall be as outlined in Table 7.

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Table 7 *Maximum Diameter of Pipe Services*

Element	Vertical Services	Horizontal Services
300m wide edge beam	50mm in a duct 50mm larger diameter than pipe	50mm in a duct 50mm larger diameter than pipe unless detailed as per note 2
500mm localised wide edge beam [1]	100mm in a duct 50mm larger diameter than pipe	50mm in a duct 50mm larger diameter than pipe, see note 2
300mm wide internal load bearing rib	50mm in a duct 50mm larger diameter than pipe	50mm in a duct 50mm larger diameter than pipe, see note 2
100mm wide internal rib	Nil	50mm in a duct 50mm larger diameter than pipe, see note 2
Slab	110mm in a duct 50mm larger diameter than pipe or for large services 450mm square [4] see also note 2.	Nil

Notes

(1) For situations where a 100mm diameter pipe is required to pass 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 12 for details.

(2) The need for a duct 50mm larger than the service diameter can be deleted when the pipe work does not cross the interface between the bottom of the RibRaft system and the ground at any point along its length. An example would be services laid within the plane of the pods and passing through the edge beam and discharging to a gully trap or similar. In these cases the diameter of the service can be increased to a maximum of 100mm and a service duct is not required. The pipe work shall be wrapped in denso tape where it crosses concrete elements to prevent adhesion between the concrete and pipe work.

(3) 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.

(4) 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).

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 12, 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 12 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.

Except as noted in table 7, all services shall be placed centrally within an opening 50mm greater in diameter than the service duct/pipe, where they pass through the system. This is to allow seismic tolerances to reduce the probability of shearing of the services during a seismic event. Where the services pass through the slab, the opening shall be sealed to prevent materials entering the subfloor cavities. (This can be achieved with Denso tape

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and a type of easily compressible foam). A pictorial of some of the above requirements is illustrated in figure 12:

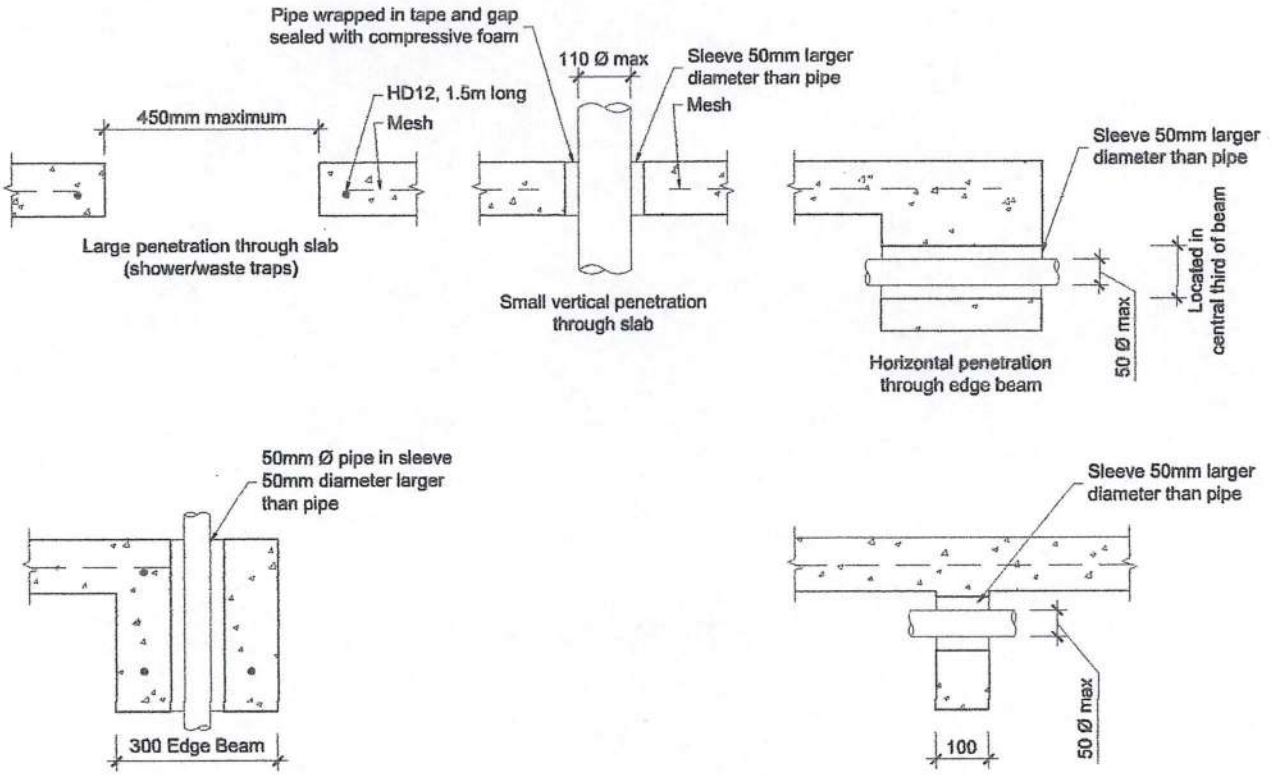

Figure 12 *Example of detailing requirements for services*

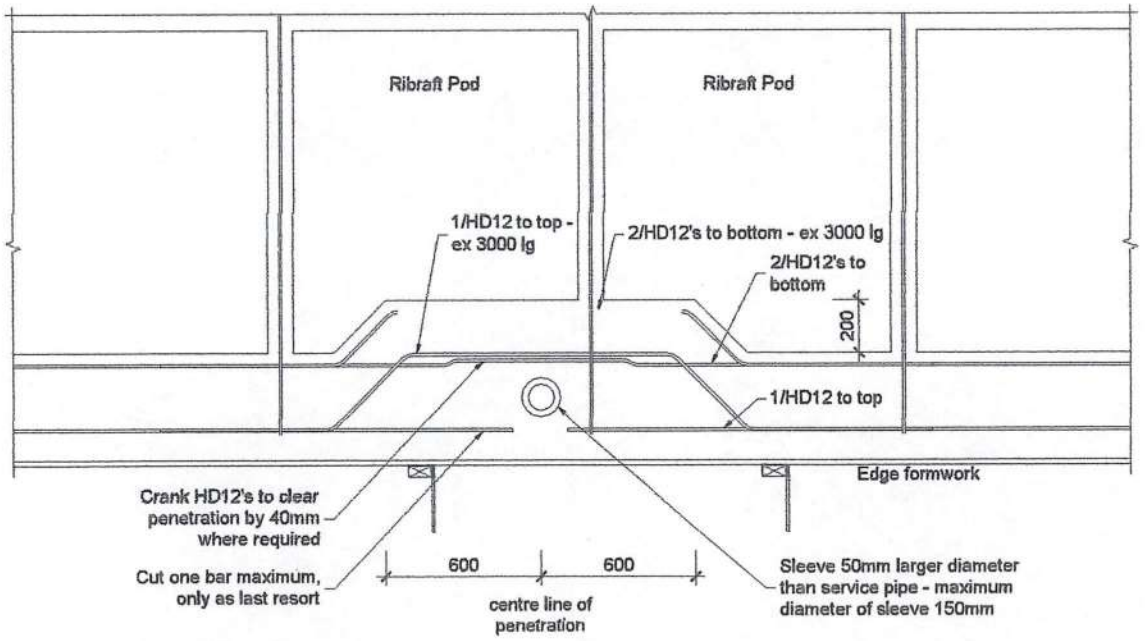

Figure 13 *Localised increase in width at edge beam where vertical services up to 100mm diameter are required*

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FIRTH RIBRAFT FLOOR SYSTEM

SECTION 2: INSTALLATION INFORMATION

1 GENERAL

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 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

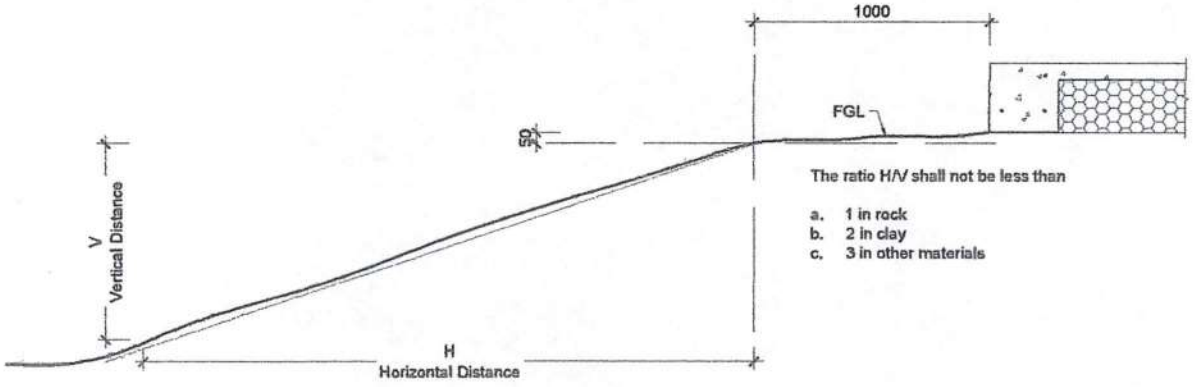

Figure 1 *Relationship of RibRaft to Sloping Ground Surface*

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ground uphill from the system shall be graded to direct any surface run-off away from the system as shown in Figure 3.

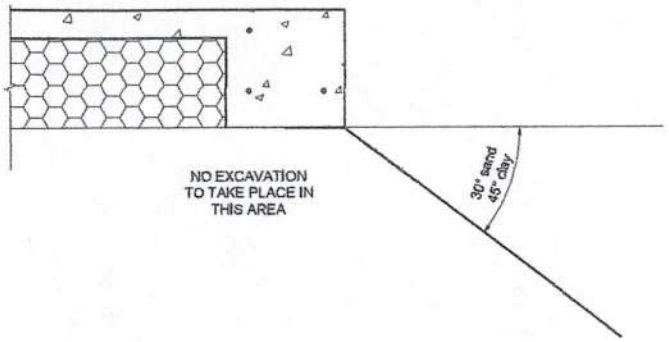

Figure 2 *Temporary Excavation Limited*

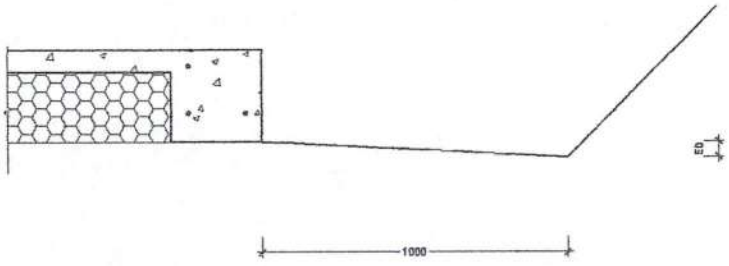

Figure 3 *Site Grading*

3 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 minimum of 1000mm beyond the slab perimeter as shown in Figure 4 below. 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.

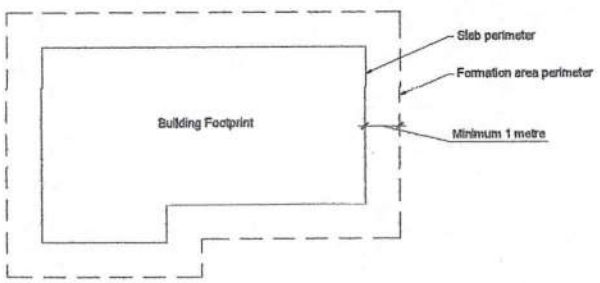

Figure 4 *Plan of Formation Area*

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 below, 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 be placed within any concrete except to cross that section of concrete i.e. services shall not run along ribs or edge beams. The maximum diameters of the services/ducts 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 12 (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 12 (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.

Except as noted in 6.3 of section 1, services shall be placed centrally within an opening 50mm greater in diameter than the service duct/pipe, where they pass through the system. This is to allow seismic tolerances to prevent shearing of the services during a seismic event. Where the services pass through the top of the system, the opening shall be sealed to

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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 will ensure that the void is sealed/covered).

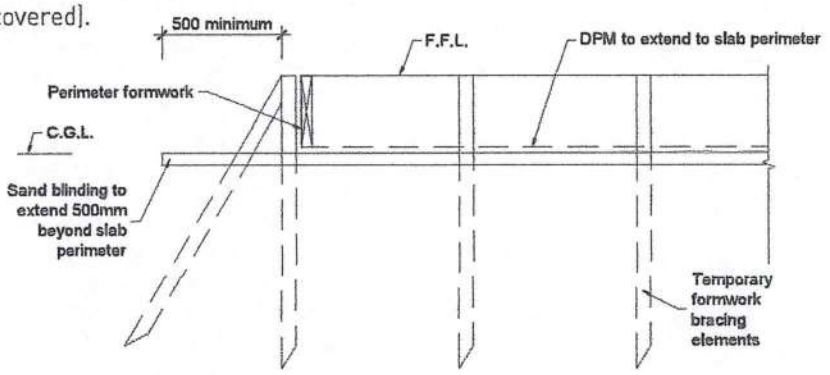

Figure 5 *Sand Blinding/DPM/Formwork Details*

3.5 Sand Blinding

A layer of sand shall be placed, screeded and compacted over the building platform, extending to at least 500mm beyond the system perimeter – 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.

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.

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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.

Where the shape of the house plan dictates, it may be more practical to consider the floor to be made up of different segments. The pods in each segment shall be in a regular waffle pattern – refer right hand side of Figure 7. Where these segments meet, the pods shall be cut to suit and the ribs made to join. The non right-angle rib junctions created by this approach are acceptable.

Alternatively, it is also acceptable to keep the orientation of the pods constant throughout the plan and have non right-angle junctions between the ribs and edge beam – refer left hand side of Figure 7.

As can be seen from Figure 7, it is not necessary for the pods to line up perfectly with the edge beam. It is acceptable to cut the pods (i.e. use part pods).

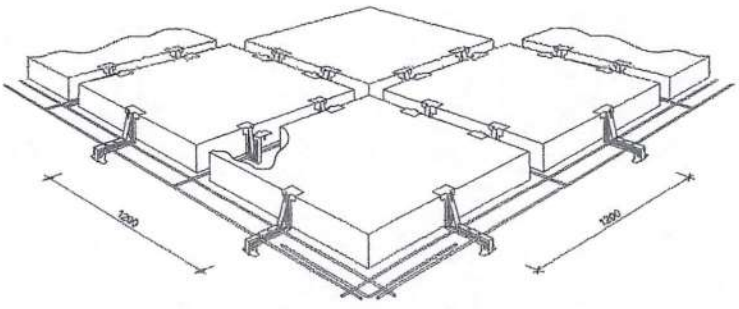

Figure 6 *Detailed Layout of Pods and Spacers (mesh and top steel omitted for clarity)*

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.

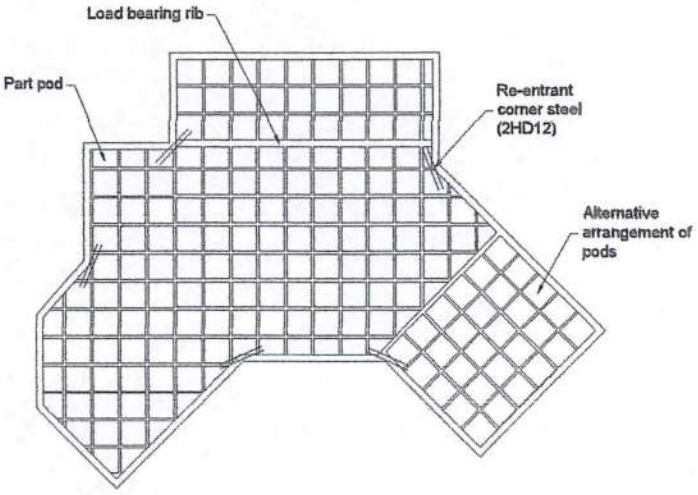

Figure 7 *Typical Pod and Rib Layout*

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 300mm centres, and ductility class L or E, hereafter referred to as "665 mesh, or mesh".
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.

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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 the junction 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 each 100mm wide rib and two HD12 bars (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

665 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. The mesh shall be lapped 225mm minimum and tied at all laps.

3.9.4 Re-entrant Corner Steel

Two HD12 bars (Grade 500E), 1200mm long shall be placed across the corner, tied to the top of the mesh at *re-entrant corners at 200mm centres, with 50mm cover* from the internal corner as detailed in Figure 7 (this steel is to control cracking at this potential weak point).

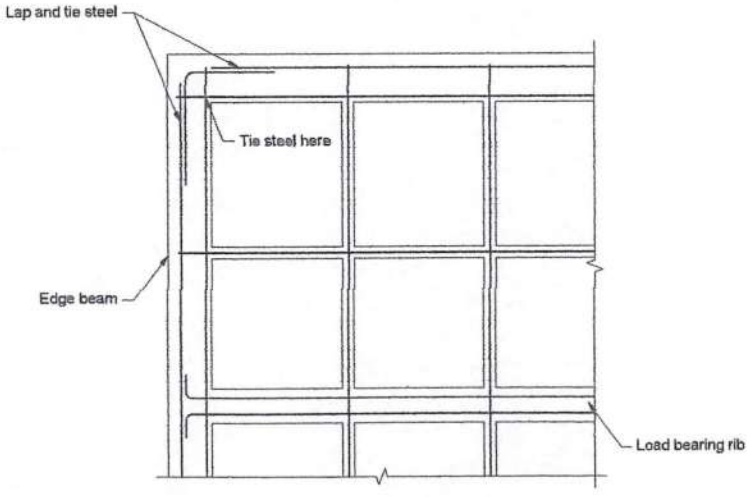

Figure 8 *Corner Steel Layout*

3.10 Concrete Installation

Concrete placing, finishing and curing shall be in accordance with NZS 3109:1997, Clause 7.

3.10.1 Placing

Only Firth Raftmix, Raftmix Pump, Raftmix25 or Raftmix Pump25 concrete shall be used in the floor. These two different concrete mixes shall be used in the following instances:

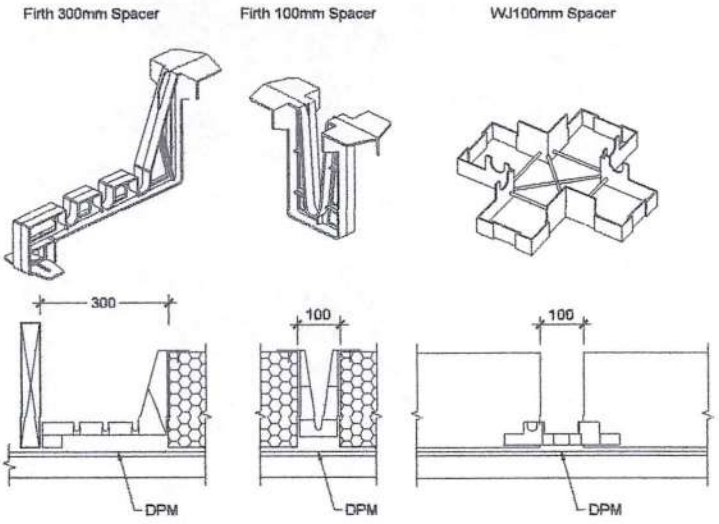

Figure 9 *Spacer Details*

- Raftmix – For placement in the floor directly from the concrete truck chute.
- Raftmix Pump – For placement in the floor by concrete pump.

Refer 2.4 of Section 1 for locations where RaftMix 25/ Raftmix 25 Pump is required.

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

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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. 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.

When warm sunny days are followed by cool nights, the change in temperature can cause cracking. Immediate and continuous wet curing to reduce the maximum temperature and/or raise the minimum temperature can reduce the risk of this type of cracking.

3.11 Shrinkage Control Joints

Shrinkage control joints shall be saw cut after hardening. The saw cut shall be cut to a depth of 25mm and shall be cut no later than 24 hours in summer, or 48 hours in winter. The shrinkage control joints shall be positioned to coincide with major changes in floor plan. Where the concrete is to be exposed or brittle covering placed over, the maximum intermediate bay sizes shall be limited to 6m. Bay dimensions formed by shrinkage control joints shall be limited to a maximum ratio of length:width of 2:1.

Shrinkage control joint 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 the 300mm rib. Supplementary reinforcing bars shall not be placed across any shrinkage control joints.

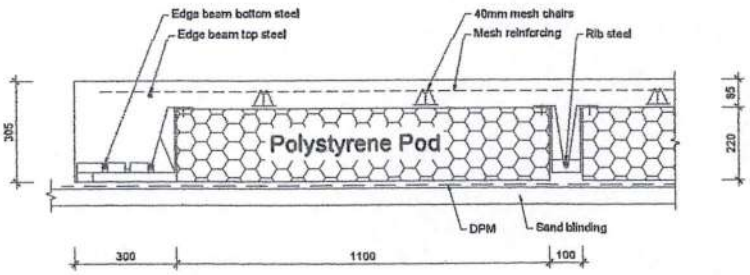

Figure 10 *Detailed Section*

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.

3.13 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.

3.14 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.

3.15 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.

This can also be ensured by maintaining the landscaping or providing a paved surface or similar around the edge of the building.

4 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

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the bars are correctly located. The concrete for the shear keys shall be placed separately to the rest of the floor and shall be finished level to the top of the sand blinding layer. The top surface of the shear key shall be finished rough to ensure a good join to the Raftmix concrete in the system and the DPM shall be neatly cut around the shear keys.

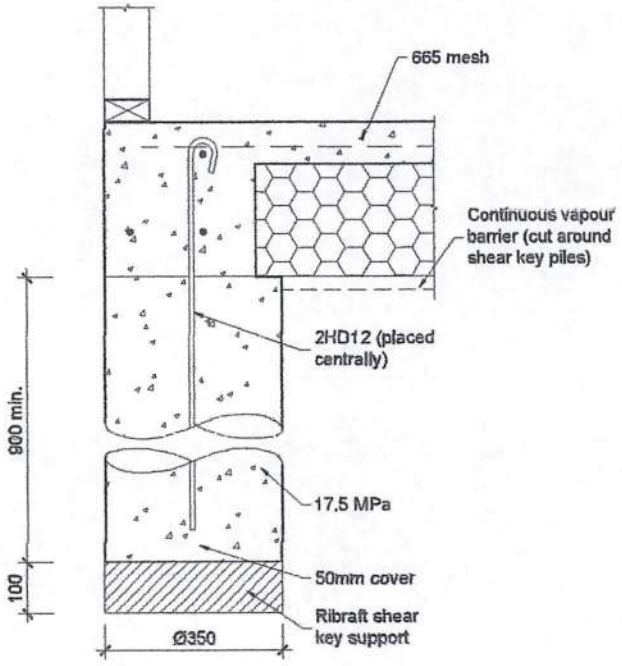

Figure 11 *Shear Pile Construction Detail*

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FIRTH RIBRAFT FLOOR SYSTEM

SECTION 3: VERIFICATION

1 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 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 checklist has been prepared for structures complying with the limitation:

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Pre-pour Inspection Check list

	Confirmed
Good Ground confirmed as per NZS3604, clause 3.1.3.	
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 1m beyond building footprint.	
No steps in the formation.	

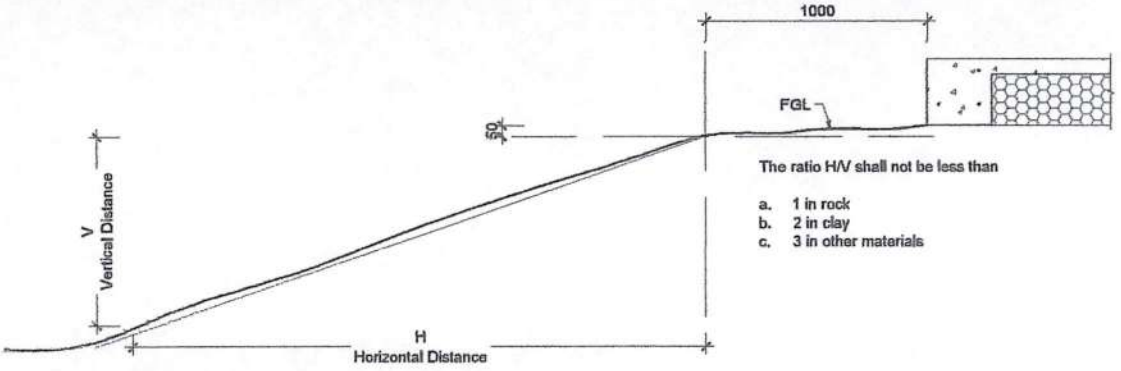

Figure 1 *Relationship of RibRaft to Sloping Ground Surface*

Pre-layout Inspection Check list

		Confirmed
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 equivalent area.	
	Mesh laps minimum of 225mm.	
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.	
	Diameter of opening for services 50mm greater that service pipe. Refer clause 6.3 of Section 1 for exceptions.	
	Diameter/size of penetrations as per Table 7, Section 1 of this manual.	

(1) At locations of service penetrations the width of the perimeter foundation maybe locally increased. Refer figure 12 section 1 for details.

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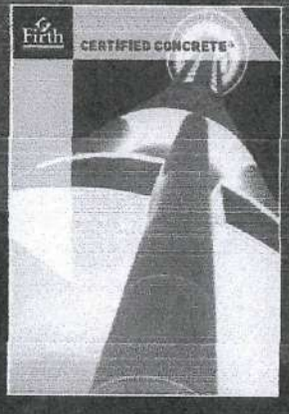

SUSTAINABILITY: THE FIRTH CONCRETE & CONCRETE MASONRY SUSTAINABILITY LIFECYCLE

- ☑ 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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Existing Masonry

Inbuilt Mock Chimney

Neo Inbuilt

This fire is hard working and a good looker. It's been designed with versatility in mind. It can be placed in renovations or new builds, as the simplicity of the Neo Inbuilt's design allows it to fit with the furniture you love. It also has a healthy energy star rating with 4+ stars.

Key benefits and features:

- Efficient: A major benefit of Neo's 4.1 star rating is that it won't burn a hole in your pocket
- Innovative: A choice of designer framing options are available, so you can individualise your fireplace to complement your décor
- Versatile: The Neo gas fires come in a range of models to suit any installation
- Control: Choose either the electronic timer remote that lets you pre-set the warmth to come on any time or the manual controls for on demand heating

Try before you buy

See centre spread for details on our free gas fire mobile app.

LIFE SIZE POSTER

Frame options:

Rinnai Neo
Frame: Black with black inner & trim. R2328

Rinnai Neo
Frame: Black with stainless steel inner & black trim. R2325

Burn media:

Driftwood logset supplied with every Rinnai Neo Inbuilt fireplace.

Natural draft flue options:

- Vertical flue
- Masonry flue

Refer to page 41 for flue options

Compare range and specifications on page 46

Rinnai Neo
Frame: Black with stainless steel inner & trim. R2326

Rinnai Neo
Frame: Stainless steel with stainless steel inner & trim. R2327

"I love the fact that I could choose the frame combination, and being a gas fire it heats the room up so quickly."
– Tom Jacobs, Lawyer

2014 Best Awards
Silver Best Effect Design

The first layer of bricks in traditional brick fireplace openings is often non-structural, so you might be able to fit a bigger fireplace than you think. To find out more, consult your installer.

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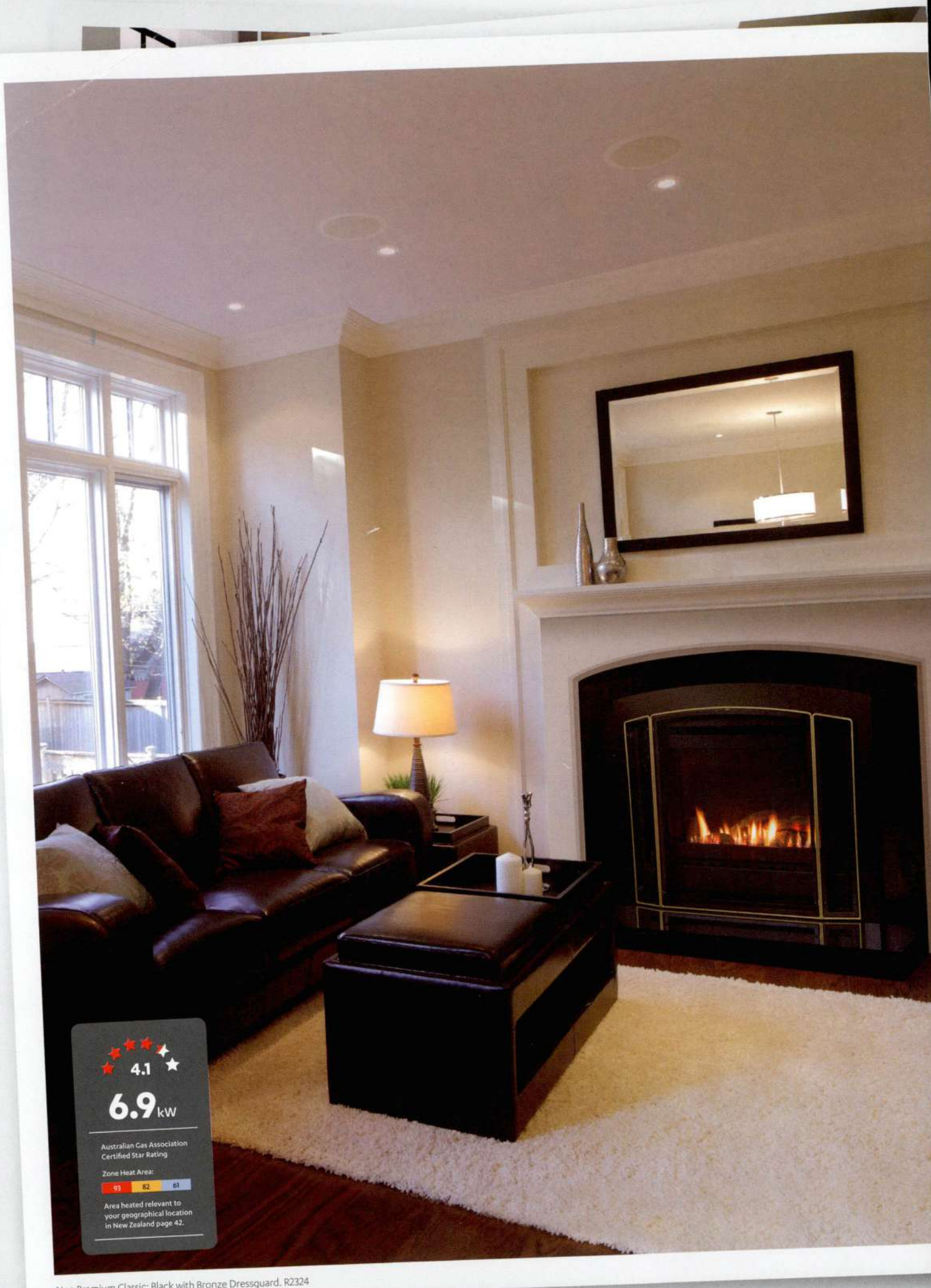

Neo Premium Classic: Black with Bronze Dressguard. R2324

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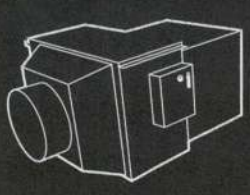
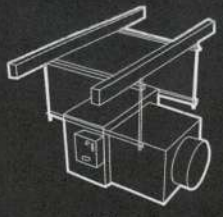
Space Heating Comparison Chart

UNIT	MODEL	Ducted	Recommended Number of Outlets	Zone Heat Area m² (up to) Area heated relevant to your geographical location			Sensitive Choice
				Upper North Island	Central & lower North Island	South Island	
CENTRAL HEATING							
IHEAT	RAHU20	✓	6-12	333*	285*	250*	✓

UNIT	MODEL	Freestanding Portable	Floor Mounted	Wall Mounted	Flued	Unflued	Minimum Room Size (m³)	Zone Heat Area m² (up to) Area heated relevant to your geographical location			Sensitive Choice	ENERGY STAR®	NATURAL GAS	LPG
								Upper North Island	Central & lower North Island	South Island				
INDOOR SPACE HEATING														
Energysavers	309FT		✓		✓			48	42	31	✓	✓	✓	✓
	561FT		✓		✓			74	65	48	✓	✓	✓	✓
	559FT		✓		✓			82	72	53	✓	✓	✓	✓
	1005FT		✓		✓			136	119	88	✓	✓	✓	✓
Portable Convectors	DYNAMO 471	✓				✓	37.5	65	57	42			✓	✓
	AVENGER 671	✓				✓	62.5	96	84	62			✓	✓
Indoor Super Ray	WMA16N / WMA16L			✓		✓		Total Area Heating 25	25	25			✓	✓
	WEA16N / WEA16L			✓		✓		Total Area Heating 25	25	25			✓	✓
	WMA24N / WMA24L			✓		✓		Total Area Heating 37	37	37			✓	✓
	WEA24N / WEA24L			✓		✓		Total Area Heating 37	37	37			✓	✓
	WMA40N / WMA40L			✓		✓		Total Area Heating 62	62	62			✓	✓
	WEA40N / WEA40L			✓		✓		Total Area Heating 62	62	62			✓	✓
OUTDOOR SPACE HEATING														
Outdoor† Super Ray Manual	ODHRAD3MN / ODHRAD3ML			✓		✓		Total Area Heating 31	31	31			✓	✓



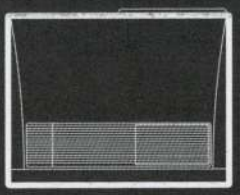
iHeat ceiling mounted



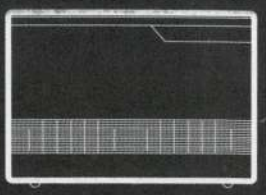
iHeat subfloor mounted

Energysaver 309FT

Energysaver 561FT



Energysaver 559FT



Energysaver 1005FT

* Each house will vary in zone heat area due to the amount of insulation, number and size of windows, floor structure etc. ** Maximum input for a standard Infinity VT units is 90MJ/h while the condensing Infinity EF units have a maximum input of 78 MJ/h. ***Heating funding only available in areas of high air pollution. Terms and conditions apply.
† Please see www.rinnai.co.nz for clearances. Please see http://www.rinnai.co.nz/product_37_rinnai_super_ray_outdoor_manual.html for clearances.

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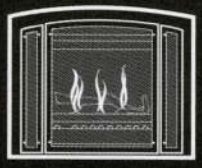
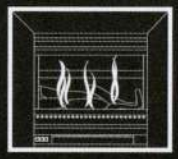
LPG	MJ/h INPUT	MJ/h INPUT	kW HEAT OUTPUT												
	Max. Input (MJ/h)	Min. Input (MJ/h)	Max. Output (kW)	Low. Output (kW)	Star Rating	Thermostat Controlled	Speed Fan	Preheat Function	Dual Timers	Remote Control	Manual Control	Electronic Ignition	Air Filter	Overheat Safety Device	Child Lock
✓	34	10	8.4*	2.3*	5.7*	✓	3	✓	✓	✓		✓	✓	✓	✓
✓	34	10	8.1^	2.3^	5.7^	✓	3	✓	✓	✓		✓	✓	✓	✓
✓	31.5	8	7.0	1.8	5.6^	✓	3	✓	✓	✓		✓	✓	✓	✓
✓	33	19	7.5	3.8	4.2	✓	2		✓	✓	✓	✓		✓	✓
✓	30	14	7.0	3.0	4.1	✓	2		✓	✓	✓	✓		✓	✓
✓	30	14	7.0	3.0	4.1	✓	2		✓	✓	✓	✓		✓	✓
✓	25	9	5.0	1.6	2.8		2				✓	✓		✓	
✓	30	14	7.0	3.0	4.1	✓	2		✓	✓	✓			✓	✓
✓	30	14	7.0	3.0	4.1	✓	2		✓	✓	✓			✓	✓

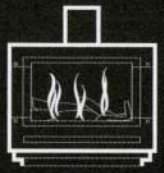


Neo Premium Classic

Compact 2



Compact 2
Black Traditional



Neo Console

Neo Plinth

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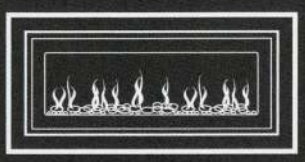
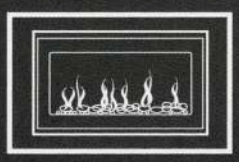
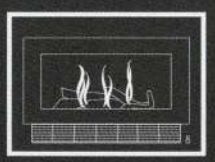
Flamefire Comparison Chart

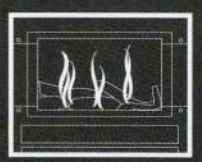
UNIT	MODEL	Flue Type	Freestanding	Inbuilt Mock Chimney	Existing Masonry	Zone Heat Area m² (up to) Area heated relevant to your geographical location: Upper North Island	Central & lower North Island	South Island	Sensitive Choice	ENERGY STAR®	NATURAL GAS
INBUILT GAS FIREPLACES											
Evolve	1250	Power flue		✓	✓~	125	111	82	✓	✓	✓
	951	Power flue		✓	✓~	125	111	82	✓	✓	✓
Arriva	752	Power flue		✓	✓~	108	95	70	✓	✓	✓
Symmetry	3611	Direct Vent		✓		116	102	75	✓	✓	✓
Neo	INBUILT	Natural Draft		✓	✓	107	93	69		✓	✓
	CLASSIC	Natural Draft		✓	✓	107	93	69		✓	✓
COMPACT 2	COMPACT 2	Natural Draft		✓	✓	77	68	50			✓
FREESTANDING GAS FIREPLACES											
Neo	CONSOLE	Natural Draft	✓			107	93	69		✓	✓
	PLINTH	Natural Draft	✓			107	93	69		✓	✓


Evolve 1250


Evolve 951


Arriva 752

Symmetry


Neo Inbuilt

~ If the existing masonry chimney had a very large opening then this is possible. Otherwise will require significant renovation and installation costs.
^ With extended flue installation running on LPG using extended flue, 2 bends.
* Output and Star ratings are indicative only subject to final testing and approval.

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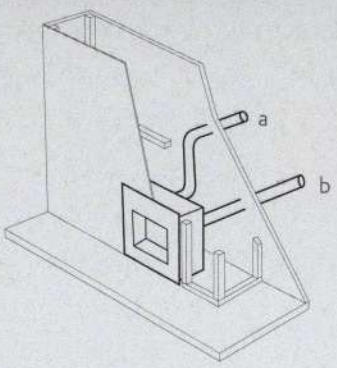
Flue Guide

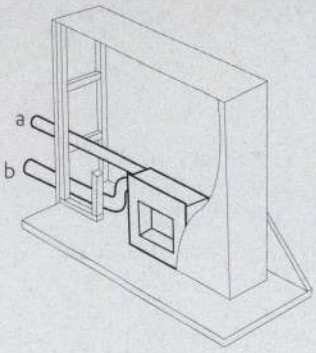


Power flue - rear

a) Extended offset

b) Direct

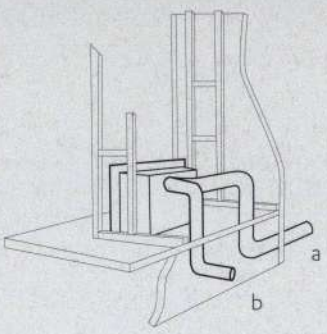
Available for:
- Evolve 1250
- Evolve 951
- Arriva 752
- Energysaver



Power flue - horizontal

a) Direct
b) Extended offset

Available for:
- Evolve 1250
- Evolve 951
- Arriva 752
- Energysaver

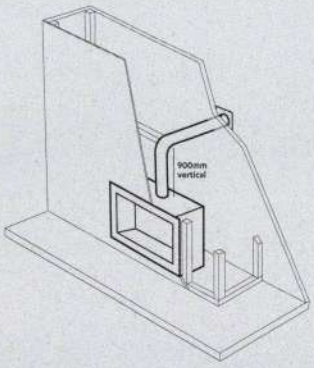


Power flue - down & out*

a) Sideways
b) Rear

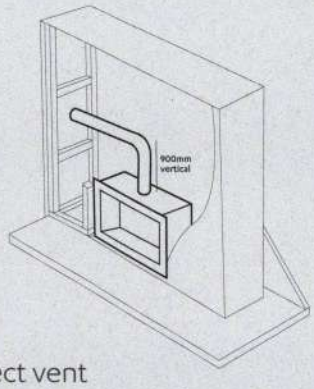
*Flue must terminate 300mm above the ground.

Available for:
- Evolve 1250
- Evolve 951
- Arriva 752
- Energysaver



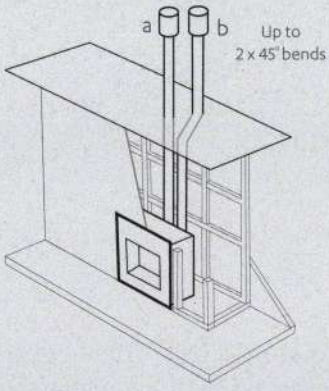
Direct vent vertical rear flue

Available for:
- Symmetry 3611



Direct vent vertical horizontal flue

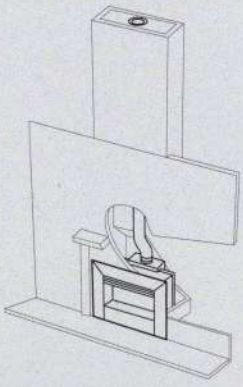
Available for:
- Symmetry 3611



Vertical flue

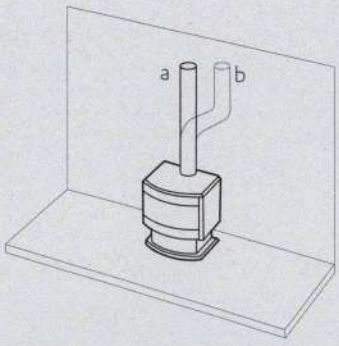
a) Vertical extension, b) Offset rear

Available for:
- Evolve 1250
- Evolve 951
- Arriva 752
- Symmetry 3611
- Compact 2
- Neo Premium Classic
- Neo Inbuilt
- Energysaver



Natural draft masonry flue

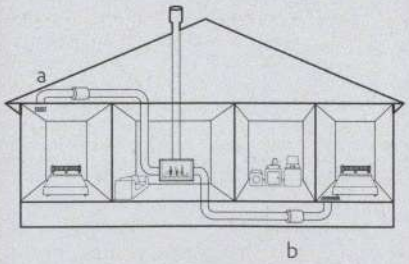
Available for:
- Compact 2
- Neo Premium Classic
- Neo Inbuilt



Natural draft freestanding flue

a) Standard vertical
b) Offset vertical

Available for:
- Neo Freestander Console & Plinth



Symmetry Ducting

a) heat an additional room using a ceiling outlet
b) heat an additional room using a floor outlet

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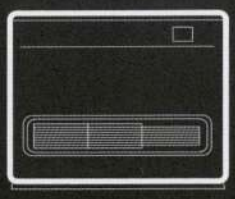
NATURAL GAS	LPG	MJ/h INPUT	kW HEAT OUTPUT		Thermostat Controlled	Speed Fan	Manual Control	Air Filter
		Max. Input (MJ/h)	Max. Output (kW)	Low. Output (kW)				
✓	✓	90**/78**	20	6	✓	3	✓	✓

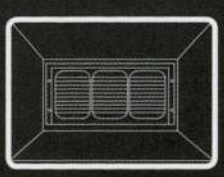
MJ/h INPUT		kW HEAT OUTPUT		Star Rating	Thermostat Controlled	Preheat Function	Dual Timers	Remote Control	Manual Control	Electronic Ignition	ECO Economy Mode	Air Filter	Overheat Safety Device	Child Lock
Max. Input (MJ/h)	Min. Input (MJ/h)	Max. Output (kW)	Low. Output (kW)											
13	5.8	3.1	1.2	4.3	✓	✓	✓		✓	✓	✓	✓	✓	✓
21	9	4.8	1.9	4.8	✓	✓	✓		✓	✓	✓	✓	✓	✓
23	9	5.3	1.9	4.8	✓	✓	✓		✓	✓	✓	✓	✓	✓
37	11	8.8	2.3	4.8	✓	✓	✓		✓	✓	✓	✓	✓	✓
15	6	4.2	1.7	5.8		✓	✓	✓	✓	✓	✓	✓	✓	✓
25	8.5	6.2	2.4	5.8		✓	✓	✓	✓	✓	✓	✓	✓	✓
16		4.4							✓					
16		4.4								✓				
24		6.6							✓					
24		6.6								✓				
40		11.1							✓					
40		11.1								✓				
24		6.6							✓					

Dynamo

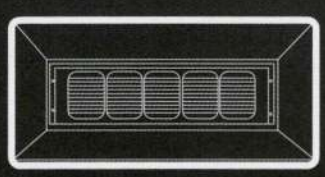


Avenger

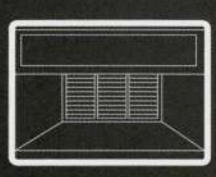
Super Ray Indoor 16MJ



Super Ray Indoor 24MJ



Super Ray Indoor 40MJ



Super Ray Outdoor

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Technical information

Measurements (mm)

Central Heating

UNIT	MODEL	Appliance				Minimum Clearance Above Unit (mm)	Minimum Clearance Each Side of Unit (mm)	Minimum Clearance Front & Behind Unit (mm)
		Height (mm)	Width (mm)	Length (mm)	Weight (kg)			
iHeat Ceiling Installation	RAHU20	600	790	1135	50	450	750	1000
iHeat Subfloor Installation	RAHU20	910	790	1135	50	450	750	1000

Flamefires

UNIT	MODEL	Appliance			Outer Flue Diameter (mm)	Inner Flue Diameter (mm)
		Height (mm)	Width (mm)	Depth (mm)		
Evolve	1250	620	1320	560	80	50
	951	620	1020	560	80	50
Arriva	752	710	1050	365	80	50
	750	675	900	365	80	50
Symmetry	3611	775	1090	510	170	100
Neo	INBUILT	660	865	359	150	100
	CONSOLE	760	865	425	150	100
	PLINTH	837	865	425	150	100
	PREMIUM CLASSIC	703	865	436	150	100
Compact	COMPACT 2	645	750	310	150	100

Super Ray Indoor

UNIT	MODEL	Ignition (mm)	Height (mm)	Width (mm)	Depth Inc Bracket	Input	Output
Indoor	WMA16N / WMA16L	Manual	310mm	400mm	400mm	16MJ/h	4.4kW
	WEA16N / WEA16L	Electric	310mm	400mm	400mm	16MJ/h	4.4kW
	WMA24N / WMA24L	Manual	310mm	500mm	400mm	24MJ/h	6.6kW
	WEA24N / WEA24L	Electric	310mm	500mm	400mm	24MJ/h	6.6kW
	WMA40N / WMA40L	Manual	310mm	700mm	400mm	40MJ/h	11.1kW
	WEA40N / WEA40L	Electric	310mm	700mm	400mm	40MJ/h	11.1kW

Super Ray Outdoor

UNIT	MODEL	Ignition (mm)	Height (mm)	Width (mm)	Depth (mm)	Approximate Area Heated		Recommended height from floor to bottom heater	Ceiling clearance from top of burner	Sideways clearance from another wall
						Spot	Total			
Outdoor	ODHRAD3MN / ODHRAD3ML	Manual	332	505	418	23m²	31m²	1.8m	300mm	500mm

Indoor Space Heating

UNIT	MODEL	Height (mm)	Width (mm)	Depth (mm)
Energysaver	309FT	695	465	257
	561FT	750	545	262
	559FT	582	760	257
	1005FT	670	930	330
Portable Convectors	DYNAMO 471	492	487	244
	AVENGER 671	482	610	239

Horizontal flue terminal

Energysaver flue

Symmetry horizontal flue

This information is not intended as an installation guide. Specifications may change without notice. Please go to www.rinnai.co.nz, then click into relevant product range then to specific product page. The installation and operation manual plus the specifications and dimension are located on these pages.

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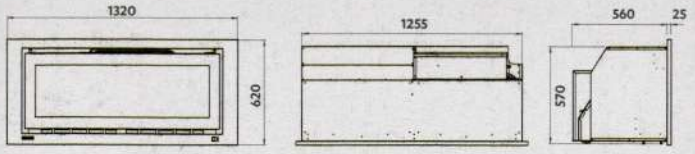
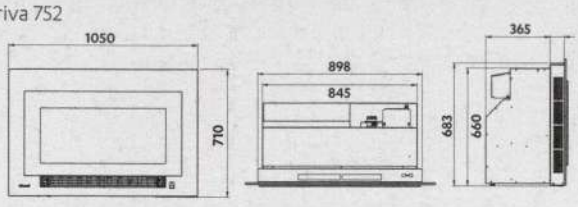
Diagrams (mm)

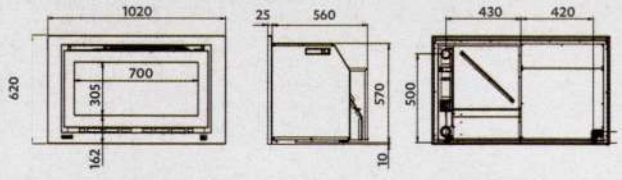
Evolve 1250



Arriva 752

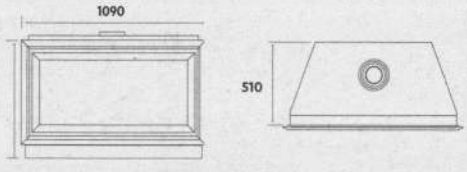


Evolve 951

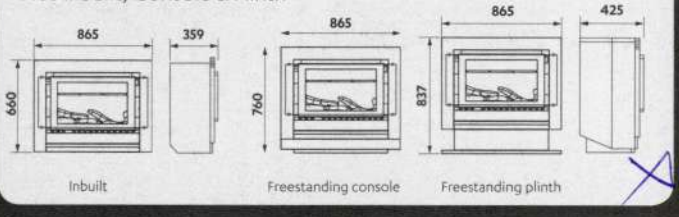


Symmetry

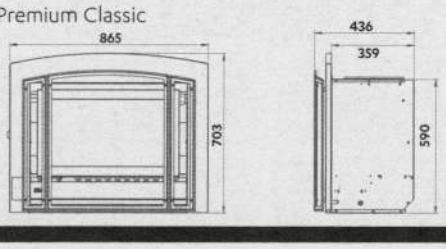
Dependent on frame - either 643 or 668



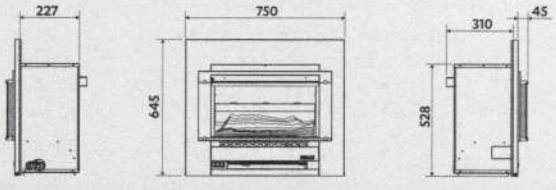
Neo Inbuilt, Console & Plinth



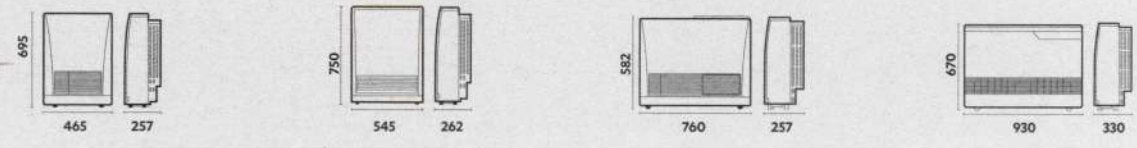
Neo Premium Classic



Compact 2



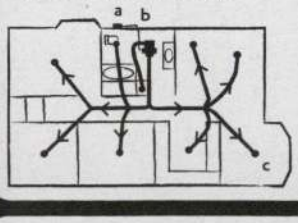
Energysaver



iHeat Ducting Layout Ceiling

Plan View - Ceiling Floor Plan

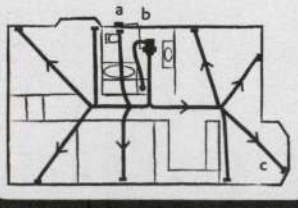
a) Infinity supplies hot water to iHeat
b) iHeat unit warms air & heats home
c) Ceiling vents are in the centre of each room to distribute heat evenly



iHeat Ducting Layout Floor

Plan View - Subfloor Plan

a) Infinity supplies hot water to iHeat
b) iHeat unit warms air & heats home
c) Floor vents extend to walls for maximum heat distribution

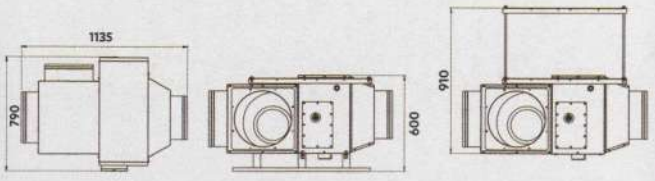


iHeat Central Heating Dimensions

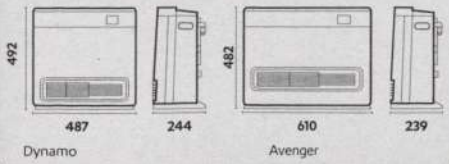
iHeat Length & Width

iHeat Ceiling Installation Height

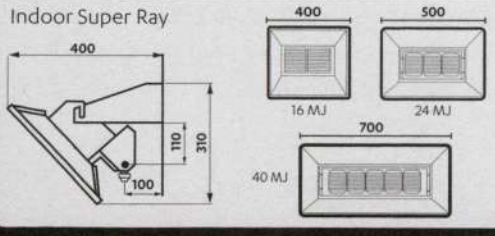
iHeat Subfloor Installation Height



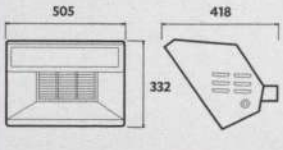
Portable Convectors



Indoor Super Ray



Outdoor Super Ray



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a touch of magic

1975–2015

40th

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Rinnai New Zealand – the proud pioneers behind many of the heating solutions Kiwi and Australian families enjoy. Now, celebrating our 40th anniversary, we keep coming up with fresh new innovations to make Australasian homes more cosy and comfortable. We're proud of our Kiwi heritage, and we believe, 40 years on, our local commitment still adds a touch of magic to the way we deliver our solutions.

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James Hardie
a smarter way™

NPDC Approved for
20 DEC 2016
Building Consent

Stria®
CLADDING

Technical Specification

CLD®
STRUCTURAL
CAVITY BATTEN

JULY 2014 | NEW ZEALAND

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Fax 0800 808 988
literaturefeedback@jameshardie.co.nz

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1 Application and scope

1.1 APPLICATION

Stria® Cladding installed as per this specification gives a panelised plastered masonry appearance on building facades. Stria Cladding can be fixed to either timber or lightweight steel-framed external walls. A wide range of colours can be used varying from light to dark. Stria Cladding is available in 405mm wide x 4200mm lengths and is 14mm thick.

If you are a specifier

Or other responsible party for a project ensure that the information in this document is appropriate for the application you are planning and that you undertake specific design and detailing for areas which fall outside the scope of these specifications.

If you are an installer

Ensure that you follow the design, moisture management and associated figures and material selection provided by the designer and this James Hardie Technical Specification. All the details provided in this document must be read in conjunction with the project specification.

Make sure your information is up to date

When specifying or installing James Hardie products, ensure that you have the current manual. Additional installation information, warranties and warnings are available at www.jameshardie.co.nz or Ask James Hardie™ on 0800 808 868.

1.2 SCOPE

This specification covers the installation of Stria Cladding on buildings that fall within the scope limitation of NZS 3604 and E2/AS1 of the New Zealand Building Code (NZBC).

This specification also covers the installation of Stria Cladding on projects, which are subject to specific engineering design (SED) up to a wind pressure of 2.5kPa (ULS).

This technical specification is intended for use by architects, designers and specifiers who may be involved with the specification of Stria Cladding and its installation. This document must be read in conjunction with the project specific drawings and specifications. The specifier or other responsible party for the project must ensure that the information and details in this specification is appropriate for the intended application and that you undertake specific engineering design and detailing for areas, which fall outside the scope of these specifications.

Note: Refer to Stria Cladding Timber Cavity Batten technical specification when fixing to timber cavity battens.

1.3 DETAILS

Various typical Stria Cladding construction details are provided in the Details section of this document. These details are available in CAD, ArchiCAD, MOD and pdf file format and can be downloaded from our website at www.jameshardie.co.nz.

All dimensions shown are in millimetres unless noted otherwise.

1.4 SPECIFIC DESIGN

For use of the Stria Cladding on specific design projects, the designer, architect or engineer must ensure that all clauses of NZBC have been considered and a specific design has been undertaken for the areas which fall outside the scope of this literature.

2 Design

2.1 COMPLIANCE

Stria Cladding installed in accordance with this specification has been tested as per E2/VM1 and complies with External Moisture - E2 Clause of NZBC. The cladding has also been tested and complies with the requirements of Structure - B1, Durability - B2, Energy Efficiency - H1 and Hazardous Building Material - F2 Clauses of NZBC.

2.2 RESPONSIBILITY

The specifier or other party responsible for the project must ensure that the information and details in this specification are appropriate for the intended application and that additional detailing is performed for specific design or any areas that fall outside the scope of this technical specification. For applications outside the scope of this literature and details, which are not provided herein, the architect, designer or engineer must undertake specific design and it should be ensured that the intent of their design meets the requirements of the NZBC.

All New Zealand Standards referenced in this manual are current editions and must be complied with.

James Hardie conducts stringent quality checks to ensure that any product manufactured falls within our quality spectrum. It is the responsibility of the builder to ensure that the product meets aesthetic requirements before installation. James Hardie will not be responsible for rectifying obvious aesthetic surface variations following installation.

2.3 SITE AND FOUNDATION

The site on which the building is situated must comply with E1/AS1 Surface Water Clause of NZBC.

Foundations design must comply with relevant regulations, standards and meet the requirements of NZBC.

The grade of adjacent finished ground must slope away from the building to avoid any possibility of water accumulation.

2.4 CLEARANCES

The clearance between the bottom edge and paved/unpaved ground of cladding must comply with section 9.1.3 of E2/AS1. The finished floor level must also comply with these requirements. These clearances must be maintained throughout the life of the building.

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Stria Cladding must overhang the bottom plate by a minimum of 50mm as required by E2/AS1.

Stria Cladding must maintain a minimum clearance of 100mm from paved ground, and 175mm from unpaved ground. On the roofs and decks, the minimum clearance must be 50mm.

Do not install external cladding such that it may remain in contact with water or ground. Refer Figures 3 and 4.

2.5 MOISTURE MANAGEMENT

It is the responsibility of the specifier to identify moisture related risks associated with any particular building design.

Wall construction design must effectively manage moisture, considering both interior and exterior environments of the building, particularly in buildings that have a higher risk of wind driven rain penetration. The buildings should also be ventilated sufficiently to control moisture accumulation due to condensation especially in artificially cooled/heated buildings.

Walls shall include those provisions as required by External Moisture Clause E2/AS1 of NZBC. In addition, all wall openings, penetrations, junctions, connections, window sills, heads and jambs must incorporate appropriate flashings for waterproofing. The other materials, components and installation methods used to manage moisture in external walls, must comply with the requirements of relevant standards and the NZBC. For further guidance on designing for weather tightness, refer to BRANZ Ltd. and the Department of Building and Housing updates on the following websites respectively, www.branz.co.nz and www.dbh.govt.nz.

In addition, the following issues must also be considered:

- Sealant must be installed where detailed in this literature.
- Where the walls are higher than two storeys, it is necessary to provide a horizontal flashing at the second floor level to drain the cavity.
- The installation of smoke chimneys, pipe penetrations and other fixtures etc. must not track moisture into the wall or restrict the drainage of moisture to the exterior.

2.6 STRUCTURE

2.6.1 Timber Framing

Timber-framed buildings must either be designed in accordance with NZS 3604 (Timber Framed Buildings) or as per specific engineering design. For a building requiring a specific engineering design, the framing stiffness must be equivalent to or more than the stiffness requirements of NZS 3604.

For specific design projects, the timber framing must be designed in accordance with NZS 3603 and AS/NZS 1170.

2.6.2 Steel Framing

Steel-framed buildings must comply with the requirements of AS/NZS 3404 'Steel Structures Standard' or specific engineering design requirements. Also refer to NASH steel framed buildings guidance document published by 'National Association of Steel Housing' (NASH).

2.6.3 Wind Pressures

Stria Cladding is suitable for use in all New Zealand wind zones up to and including EH as defined in NZS 3604.

Stria Cladding can be used for specific design projects up to wind pressures of 2.5kPa uls.

2.7 FIRE RATED WALLS

A fire rating of up to 60 minutes can be achieved when using RAB® Board in lieu of a building underlay and installing Stria Cladding as per this specification. Refer to James Hardie Fire and Acoustic Design Manual for further guidance on achieving fire ratings.

2.8 STRUCTURAL BRACING

Stria Cladding installed as per this specification cannot achieve any structural bracing. Bracing can be achieved by using RAB Board installed direct to framing instead of a building underlay or by using Villaboard® Lining bracing system on the internal face.

2.9 ENERGY EFFICIENCY

External walls constructed using Stria Cladding and bulk insulation, where the area of glazing is 30% or less of the total wall area, constructed as per this technical specification complies with the insulation requirements for walls in NZBC Acceptable Solution H1/AS1 (Energy Efficiency Clause H1), Replacement Table 1. To meet thermal insulation requirements for the construction, the bulk insulation as specified in Table 1 must be used. This insulation may be substituted with insulations having higher R-values. The thermal insulation of a wall changes when the size or spacing of timber framing is increased or decreased. The calculation used in Table 1 is based on a timber framing size 90 x 45mm and using an internal lining material such as James Hardie Villaboard Lining or a 10mm plasterboard.

Table 1

Insulation capability		
Climate Zone*	**R-Value Requirement***	**Cavity Insulation Infill Requirement**
1 and 2	1.9 m^2 °C/W	#R2.0
3	2.0 m^2 °C/W	#R2.2

Total construction R-Value depends on the insulation material used and the framing ratio. The insulation material R-Values specified in this table are for studs spaced at 600mm c/c and nogs spaced at 800mm c/c.

To achieve higher R-Values of construction the wall insulation material must be replaced with an insulation material having higher R-Values to suit the requirements.

For further guidance on insulation requirement refer to the current edition of 'House Insulation Guide' published by BRANZ.

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3 Framing

3.1 GENERAL

Stria Cladding can be fixed either to a timber-frame or steel-frame. For fixing into steel frame Ask James Hardie on 0800 808 868 for specific requirements.

- Studs must be provided at 600mm centres maximum.
- Nogs must be provided at 800mm centres maximum.

Note: For fixing Stria Cladding, fastener spacing is provided in Section 6.

3.2 TIMBER FRAMING

3.2.1 Dimensions

A 45 x 90mm minimum framing size is required.

3.2.2 Structural Grade

Minimum timber grade must be in accordance with timber grades specified in NZS 3604.

3.2.3 Durability

The external framing timber must be treated to a minimum H1.2 treatment. Higher treatment levels may be used but check for the compatibility of treatment chemicals with other materials. Refer to NZBC Acceptable Solution B2/AS1 Durability for further information about the durability requirements.

For timber treatment and allowable moisture content information refer to NZS 3602 (Timber and Wood-Based Products for use in Buildings) and NZS 3640 (Chemical Preservation of Round Sawn Timber) for minimum timber treatment selection and treatment requirements. Also refer to framing manufacturer's literature for further guidance on timber selection. Framing must be protected from moisture at sites in accordance with the framing manufacturer recommendations.

Note: Refer to NZS 3602 for information about the allowable moisture content in timber framing.

3.2.4 Frame Construction

Use of timber framing must be in accordance with NZS 3604 and the framing manufacturer's specifications. The framing must be rigid and not rely on the cladding for stability. Timber framing sizes and its set-out must comply with NZS 3604 and as specified in this technical specification.

The following framing is required:

- When studs are spaced at 600mm centres maximum, the nogs / dwangs must be provided at 800mm centres maximum
- When studs are spaced at 400mm centres then the nogs / dwangs may be provided at 1200mm centres
- An extra stud is required in internal corners
- For specific design projects exposed to wind speeds higher than 50m/sec, the stud spacing must be closed to 400mm c/c.

3.3 STEEL FRAMING

3.3.1 Dimensions and Gauge

A 38mm minimum wide stud can be used to install Stria Cladding. The thickness of steel frame must be in the range 0.55 to 1.6mm BMT (Base Metal Thickness). Considering the ease of installation, the recommended minimum BMT is 0.75mm.

3.3.2 Durability

The steel framing must have the appropriate level of coating to prevent corrosion and comply with durability requirements of NZBC.

3.3.3 Frame Construction

Steel framing must comply either with NASH 3405 or with the specific engineering design for the project. Stud and batten spacing must not be more than what has been specified in this specification. Refer to framing manufacturer's specifications or NASH 3405 for further guidance on steel frame.

3.4 SPECIAL FRAMING REQUIREMENTS

The following are special framing requirements for both timber and steel framing:

- Double studs are required at internal corners, refer Figure 13.
- Extra packers maybe required at external corners.

3.5 TOLERANCES

In order to achieve the required performance and an acceptable wall finish, it is imperative that framing is straight and true. Framing tolerances shall comply with Table 2.1 of NZS 3604 and the manufacturer's specifications. All framing shall be made flush.

4 Preparation

4.1 BUILDING UNDERLAY / HOMERAB PRECLAD LINING

Building underlay / HomeRAB® PreClad™ Lining must be provided as per the requirements of External Moisture Clause E2 of NZBC. The building underlay selected for use must comply with Table 23 of E2/AS1.

The building underlay must be fixed in accordance with section 9.1.7 E2/AS1 and underlay manufacturer's recommendations.

Walls which are not lined on the inside face e.g. garage walls or gable ends must include a rigid sheathing or an air barrier behind the cladding which complies with Table 23 of E2/AS1. James Hardie HomeRAB PreClad Lining complies with these requirements and is suitable for use in this situation. It must be installed in accordance with James Hardie Rigid Air Barriers installation manual.

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4.2 RAB BOARD

General building underlay or HomeRAB PreClad Lining is suitable for use up to very high wind speed zone (50m/sec).

For specific design projects where the wind pressure is higher than 1.5kPa, or when an EH windzone, James Hardie RAB Board must be used instead of building underlay. RAB Board is suitable to withstand wind pressures up to 4.5kPa.

To achieve the temporary weathertightness using James Hardie rigid air barriers, windows/doors can be temporarily installed. Refer to James Hardie Rigid Air Barriers installation manual for information regarding its installation.

4.3 CAVITY CLOSURE / VENT STRIP

The James Hardie Stria Aluminium Cavity Closure or uPVC cavity vent strip must be installed at the bottom of all walls constructed using the drained and ventilated cavity construction method. It is important that the openings in the cavity closure/vent strip are kept clear and unobstructed to allow free drainage and ventilation of cavities. James Hardie cavity closure / vent strip has an opening area of 1000mm^2/m length.

4.4 FLASHINGS

All wall openings, penetrations, intersections, connections, window sills, heads and jambs must be flashed prior to Stria Cladding installation. Refer to moisture management requirements in Clause 2.5. The building underlay/rigid air barrier must be appropriately incorporated with penetration and junction flashings using flashing tapes. Materials must be lapped in such a way that water tracks down to the exterior on the face of building underlay or rigid air barrier. James Hardie will assume no responsibility for water infiltration within the wall due to poor installation of flashings or building underlay.

The selected flashing materials must comply with the durability requirements of NZBC. For information refer to Table 20 of E2/AS1.

When using James Hardie rigid air barriers the entire framing around openings must be sealed with a flashing tape. The tape must be finished over the face of the rigid air barrier. Refer to James Hardie Rigid Air Barriers installation manual for further information.

4.5 JUNCTIONS AND PENETRATIONS

Refer to Clause 2.5 of this specification for moisture management requirements. All windows and doors must be detailed as per the requirements of this specification. James Hardie has developed the window details for Stria Cladding which meet the requirements of E2 External Moisture, an approved document of the NZBC. Refer to Figures 14 to 16.

5 Batten installation

5.1 CLD STRUCTURAL CAVITY BATTENS

The CLD Structural Cavity Batten is suitable to have Stria Cladding fixed into them. The battens are 2450mm long, 70mm wide and 19mm thick. The battens are fully sealed on all faces. Refer to the details for information about installation.

5.2 CLD STRUCTURAL CAVITY BATTEN FIXING

CLD Structural Cavity Batten must be fixed to the studs over building underlay or RAB Board. The battens are run continuously over the studs but they must have a gap at the floor joist level to allow for structural shrinkage and deflection in joists. Refer Figure 22.

The CLD Structural Cavity Batten can also be butt jointed over the studs within the floor height. The batten ends must be cut between 20°-45° and be installed to deflect the moisture to exterior. The ends must be sealed and butted using an adhesive sealant in the joint, Refer Figure 16.

The minimum framing width required to fix CLD Structural Cavity Batten is 45mm, refer Figure 8. All site cut ends of CLD Structural Cavity Battens must be sealed on site with Dulux Acraprime 501/1 sealer or Resene Quick Dry before installation. Refer to Table 2 for CLD Structural Cavity Batten spacing and fixing size and fixing centres.

The designer must ensure that the CLD Strutural Cavity Battens are not used in situations where design wind pressures are above 2.5kPa(uls).

CLD Structural Cavity Battens must not be used to a length smaller than 300mm.

5.3 BATTEN FASTENERS

CLD Structural Cavity Batten must be fixed to the studs with fasteners as per Table 2. The fasteners must be driven at a minimum distance of 50mm from the batten ends.

Table 2

Fixing Type	Wind Pressure (kPa)	CLD Structural Cavity Batten Spacing Max. (mm)	Fixing Centres (mm)
65 x 2.8m RounDrive ring shank nail to timber frame	Up to 1.5	600 or 400 as per framing spacing	250
	1.5 to 2.5	400mm	200

When using a rigid air barrier the batten fixing must be increased by minimum thickness of rigid air barrier.

For fixing into steel frame of thickness between 0.55 – 0.75mm BMT, use 10g x 40mm self embedding wing tek steel screw at fixing centres specified in Table 2. A thermal break is also required to be installed over the steel frame before installing the

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underlay/RAB Board. Refer to BRANZ or DBH website for further guidance on thermal break requirements. Ensure a minimum 15mm penetration of screw into steel frame.

For fastener durability information, refer to Clause 6.3 of this document.

CLD Structural Cavity Battens less than 400mm in length must have fixings at maximum 150mm centres.

5.4 INTERMEDIATE SUPPORT

Where studs are at 600mm centres an intermediate means of restraining the building underlay and insulation from bulging into the cavity shall be installed. An acceptable method to achieve this is using a:

- 75mm galvanised mesh
- polypropylene tape at 300mm centres fixed horizontally and drawn taut

No intermediate supports are required when:

- studs are spaced at maximum 400mm centres
- James Hardie Rigid Air Barriers instead of building underlay are used

6 Stria Cladding installation

6.1 GENERAL

Stria Cladding and CLD Structural Cavity Battens must be kept under cover whilst in storage or at sites and they must be dry at the time of their installation. All site cut panel edges must be sealed with Dulux Acraprime 501/1, Resene Quick Dry or similar sealer compatible with the finish coat before installation.

Stria Cladding must be fully supported and fixed into CLD Structural Cavity Battens. Ensure that cladding is hard against the battens to avoid drumminess.

To acheive best asthetic results it is recommended to position vertical jointer by the corner of openings or coinciding with the centre line of openings.

This technical specification only covers the horizontal installation of Stria Cladding. Refer to James Hardie for vertical installation supplement of Stria Cladding.

6.2 FASTENING METHOD

6.2.1 T-Head Nails With Adhesive

The combination of stainless steel straight T-head nails and an adhesive sealant provides a fast and efficient panel installation method. Use minimum of three nails per stud for each panel. Refer to Figure 10. Use Paslode 30 x 1.6mm C Series Stainless Steel Brad Nails only.

Apply a 6mm thick continuous bead of Bostik 'Seal n Flex 1' or Sika 'Sikaflex 11FC' adhesive sealant to the face of the CLD Structural Cavity Batten prior to fixing Stria Cladding. Only apply adhesive sealant to the CLD Structural Cavity Battens to suit each panel as the Stria Cladding is installed on the wall. See Figure 9 for details.

It is a good practice to set the brad nail gun to fire 2-3mm proud of the panel surface keeping a consistent pressure on the panel while fixing. Let the adhesive sealant go off for approximately 2 hours whilst continuing work on the next section of wall. Come back later and hammer the nails flush with cladding surface.

The edge distance required for fixing T-head brad nails is 12mm. Refer to Figure 6 or Figure 8.

6.2.2 Window/door opening

Use aluminium window jamb flashing on window/door jambs. Stria Cladding must be installed prior to the final installation of windows/doors. Refer to Figures 17 to 23 for further information.

6.3 FASTENER DURABILITY

Fasteners used to fix CLD Structural Cavity Batten must meet the minimum durability requirements of the NZBC. NZS 3604 specifies the requirements for fixing material to be used in relation to exposure conditions and are summarised in Table 3.

Fasteners must be fully compatible with all other materials that they are to be in contact with to ensure the durability and integrity of assembly.

For steel framing ensure that the fasteners used are compatible with steel framing.

Contact fastener manufacturers for more information.

Table 3

Exposure conditions and nail selection prescribed by NZS 3604		
Nail material		
Zone D	Zone C outside sea spay zone and Zone B and geothermal hot spots	Bracing - all zones
Grade 316 Stainless	Hot-dipped galvanised or 316 stainless	Grade 316 Stainless

(Zone C areas where local knowledge dictates that increased durability is required, appropriate selection shall be made).

Microclimate conditions as detailed in NZS 3604, paragraph 4.2.4 require SED.

Also refer to the NZBC Acceptable Solution 'E2/AS1' Table 20 and 22 for information regarding the selection of suitable fixing materials and their compatibility with other materials.

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7 Joints

7.1 VERTICAL JOINT

Stria Cladding can be jointed using a vertical joint flashing. Refer to Figure 6.

The second option is to form a butt joint by allowing a 3mm gap between the two panels with an adhesive sealant applied to the edge of the panel prior to butting with the next panel, it is recommended that the joints are formed in a straight line. Refer to Figure 8.

7.2 HORIZONTAL JOINT

Stria Cladding panels are horizontally ship lapped over the panel below as per Figure 10. There is a minimum 25mm lap between the two panels. Ensure that Stria Cladding panels are securely interlocked before nailing. Stria Cladding can run continuous over floor joists without any horizontal joint when using a LVL timber floor joists. Refer to Figure 25.

When an engineered joist is not used, a movement joint must be formed at floor joist, refer to Figure 26.

7.3 DRAINAGE JOINT

After every two floors a horizontal drainage joint flashing is required, refer to Figure 26.

7.4 INTERNAL CORNER JOINT

An internal corner flashing is to be used to form an internal corner joint, refer to Figure 14.

Alternatively, the panels can also be mitre joined to form an internal corner, refer to Figure 15.

7.5 EXTERNAL CORNER JOINT

An external box corner flashing is used to fix the external corners, refer to Figure 11 and 13.

Alternatively, the panels can be mitre joined to form an external corner, refer to Figure 12.

8 Finishes

8.1 PAINTING

Painting of Stria Cladding is mandatory to meet the durability requirements of NZBC and 15 year James Hardie product warranty. Stria Cladding must be dry and free of any dust or grime before painting. The panels must be painted within 90 days of their installation. There is no restriction on the LRV of paint to be applied on the Stria Cladding.

Stria Cladding is pre-primed and is suitable for site applied acrylic paints.

In order to seal cut edges or sanded patches, Dulux Primacryl, Resene Quick Dry or a similar product should be applied. The primer should be compatible with the paint to be used.

Where panels are fixed with brad nails, the nail heads must be finished flush with panel surface. The nail heads can be skimmed over with an exterior grade two part builders fill, if required. The skimmed area must be primed prior to painting.

James Hardie recommends a minimum of two coats of exterior grade acrylic paint. Follow the paint manufacturer's recommendations to prepare the surface and to adequately cover and conceal the panel fixings.

8.2 FLEXIBLE SEALANT

Sealant used must comply with the relevant requirements of NZBC. Application and use of sealants must comply with the manufacturer's instructions. Check with the sealant manufacturer prior to coating over sealant. Some sealant manufacturers do not recommend coating over their product.

9 Storage and handling

Stria Cladding must be laid flat on a smooth level surface. Edges and corners must be protected from chipping.

To ensure optimum performance, store panels under cover and keep dry prior to fixing. If the panels become wet, allow them to dry thoroughly before fixing.

Do not carry panels or CLD Structural Cavity Battens on the flat, carry in the vertical position to avoid excessive bending.

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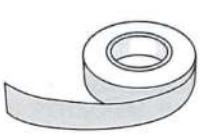
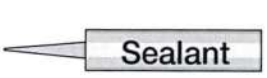
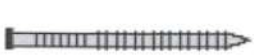
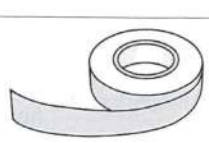
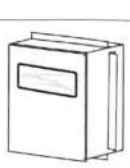
Accessories/tools not supplied by James Hardie

James Hardie recommends the following products for use in conjunction with Stria Cladding, RAB Board and CLD Structural Cavity Batten. James Hardie does not supply these products and does not provide a warranty for their use. Please contact component manufacturer for information on their warranties and further information on their products.

Product	Description
	Building underlay Must comply with Table 23 of E2/AS1.
	Flexible Window Opening Flashing Tape A flexible self-adhesive tape used in preparation of a window. Refer to the window installation section in this manual for more information. e.g. Protecto by Protecto Wrap or Aluband® by Thermakraft Protecto: 0800 776 9727 Thermakraft: 0800 806 595
	**RAB Board Vertical Joint Sealing Tape** The tape to be used to seal RAB Board vertical joints. Protecto by Protecto Wrap or Aluband® by Thermakraft Protecto: 0800 776 9727 Thermakraft: 0800 806 595
	Adhesive Sealant Sikaflex 11FC Polyurethane adhesive sealant manufactured by Sika for applying between the panels and battens. Refer to section 7 for more information. SIKA 0800 SIKANZ. 'Seal N Flex-1' Polyurethane adhesive sealant manufactured by BOSTIK for applying between the panels and battens. Refer to section 7 for more information. BOSTIK: AKL: (09) 579 6253, WGTN: (04) 567 5119, CHCH: (03) 366 2583.
	**Flexible Sealant** Required to seal the vertical joints. Bostik Seal N Flex-1, Sikaflex AT Facade, Sikaflex MS or similar.
	**30 x 1.6mm C Series Brad Nails** 304SS brad nails used to install Stria Cladding to the James Hardie CLD Structural Cavity Batten. Used in a straight bradder. Paslode: (09) 477 3000
	65 x 2.87mm RounDrive Ring Shank Nail. For fixing CLD Structural Cavity Battens to the framing. Paslode: (09) 477 3000
	**200mm wide Polypropylene Tape** Product used over building underlay at external and internal corners.
	**Electra Meter Box** Refer Electrical Suppliers

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14 Details

The following generic details have been provided in this document for cavity construction methods.

Table 5

Details		
Description	**Cavity Construction**	
	Figure No.	**Page No.**
Framing set out	Figure 1	14
Batten fixing set out	Figure 2	15
Foundation detail – option 1	Figure 3	16
Foundation detail – option 2	Figure 4	16
Soffit detail	Figure 5	17
Vertical jointing option	Figure 6	17
Stria Cladding installation	Figure 7	18
Vertical jointing option	Figure 8	19
Butt jointing on stud	Figure 9	19
Fixing detail	Figure 10	20
External aluminium box corner	Figure 11	20
External mitred corner	Figure 12	21
Alternative external aluminium box corner	Figure 13	21
Internal aluminium corner	Figure 14	22
Internal mitred corner	Figure 15	22
Jointing of CLD Structural Cavity Batten	Figure 16	23
Window sill	Figure 17	24
Window jamb	Figure 18	24
Window head with full cladding across head flashing	Figure 19	25
Window head to full board	Figure 20	25
Window jamb flashing	Figure 21	26
Window head with cladding cut around head flashing	Figure 22	26
Window head to Stria Cladding cut board	Figure 23, 24	27
Window head to CLD Structural Cavity Batten	Figure 25	28
Engineered floor joist	Figure 26	29
Drained flashing joint	Figure 27	30
Drained flashing joint at floor level	Figure 28	31
Apron flashing detail	Figure 29	32
Parapet flashing	Figure 30	32
Roof to wall junction	Figure 31	33
Meter box at sill	Figure 32	33
Meter box at jamb	Figure 33	34
Meter box at head	Figure 34	34
Enclosed deck	Figure 35	35
Door sill	Figure 36	36

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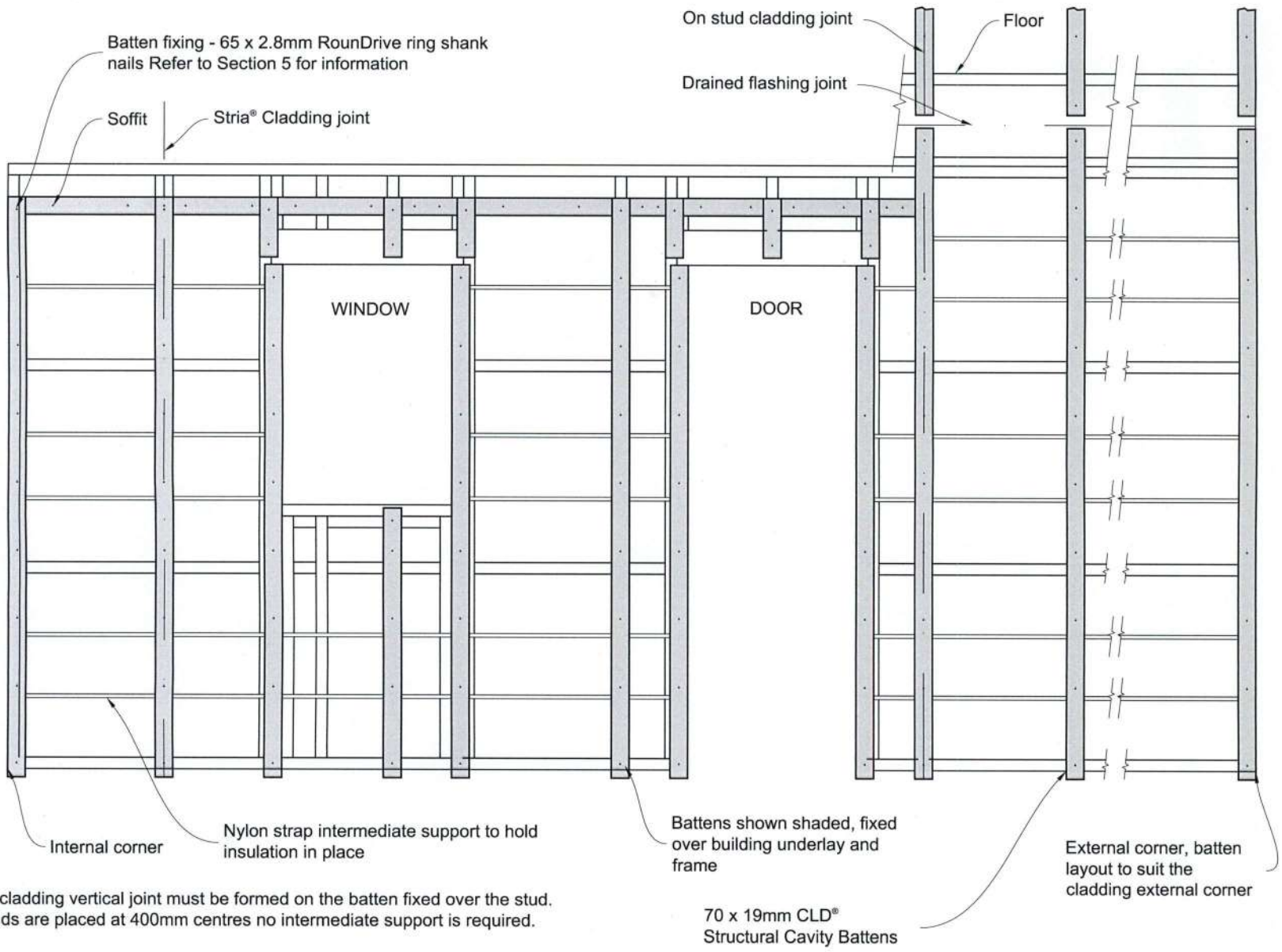

- The cladding vertical joint must be formed on the batten fixed over the stud.
- If studs are placed at 400mm centres no intermediate support is required.

Figure 1: Framing set out

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Figure 2: Batten fixing set out

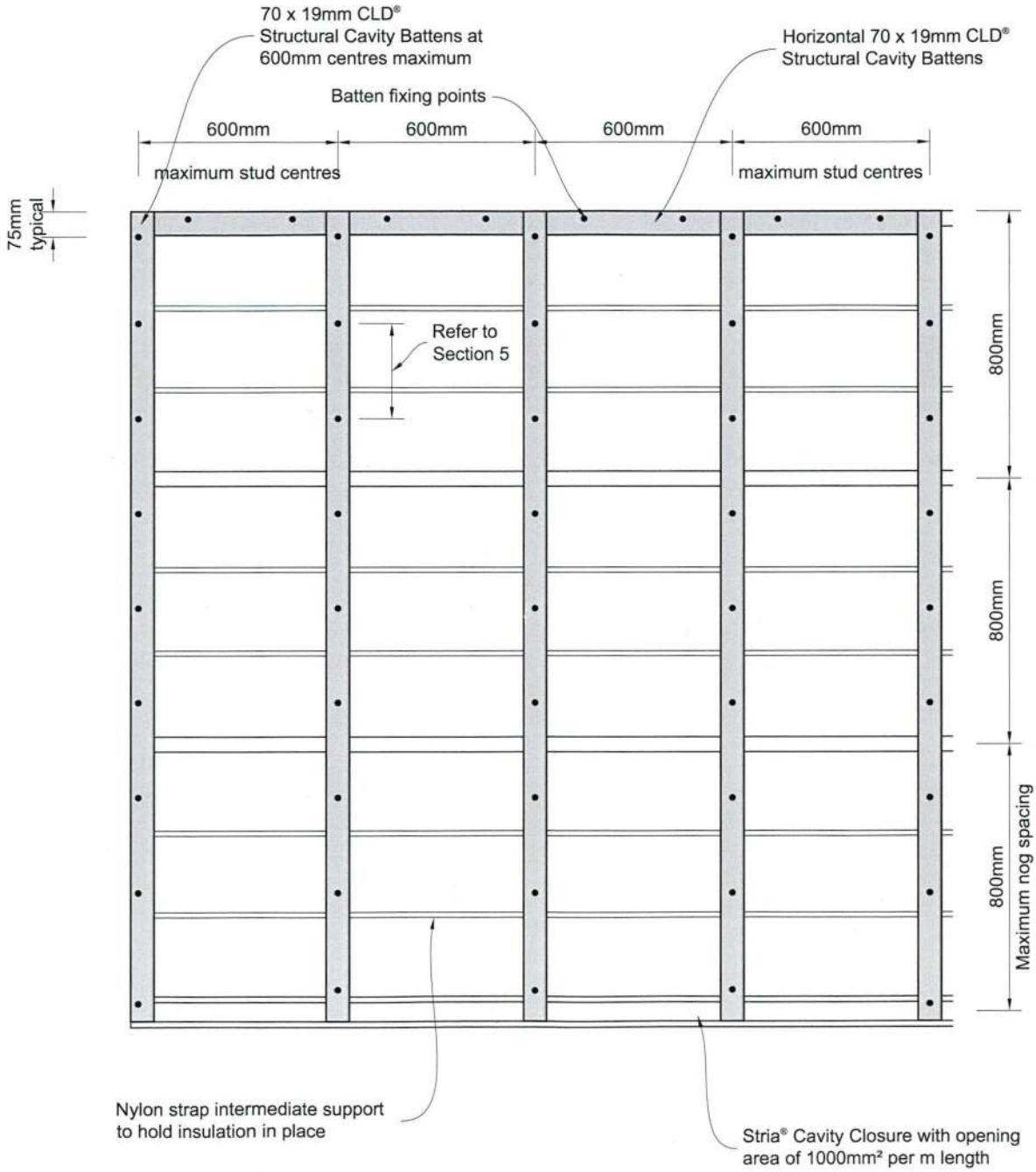

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Figure 3: Foundation detail – option 1

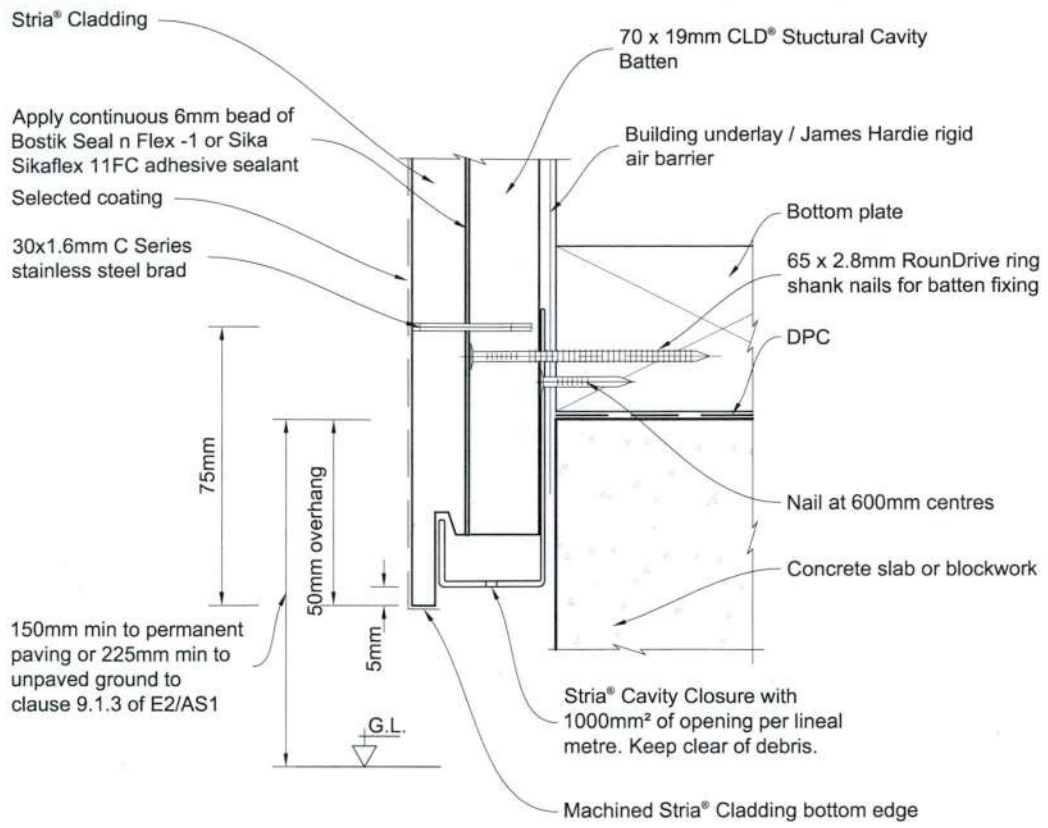

Figure 4: Foundation detail – option 2

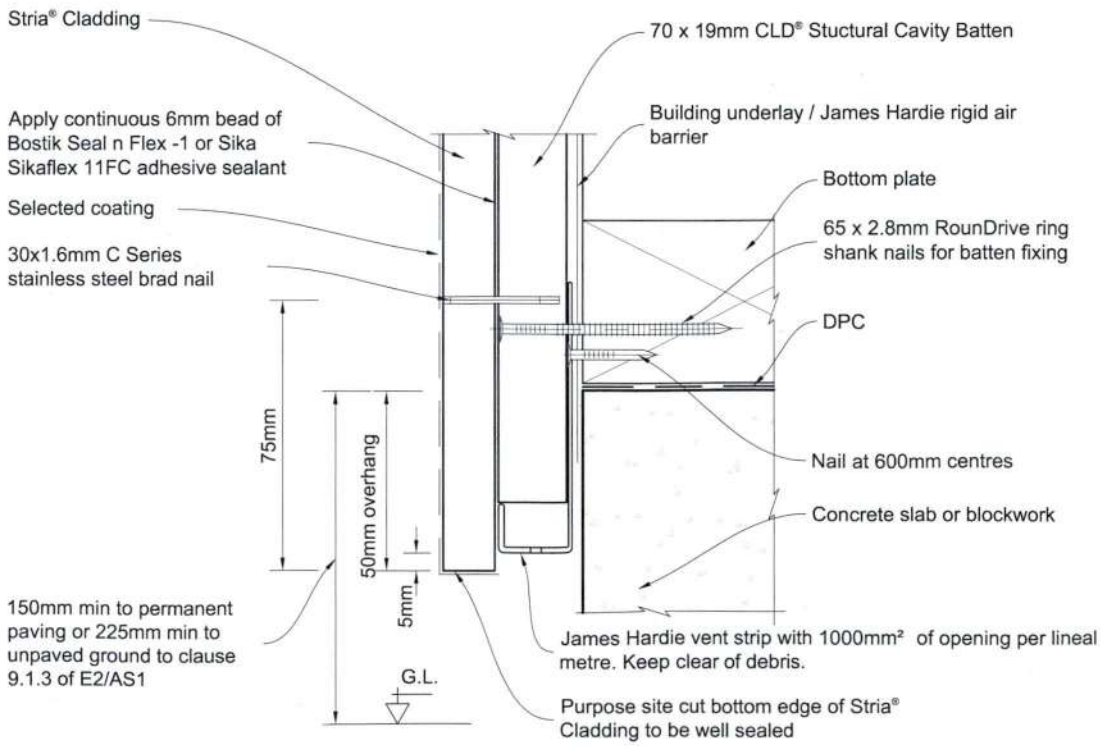

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Figure 5: Soffit detail

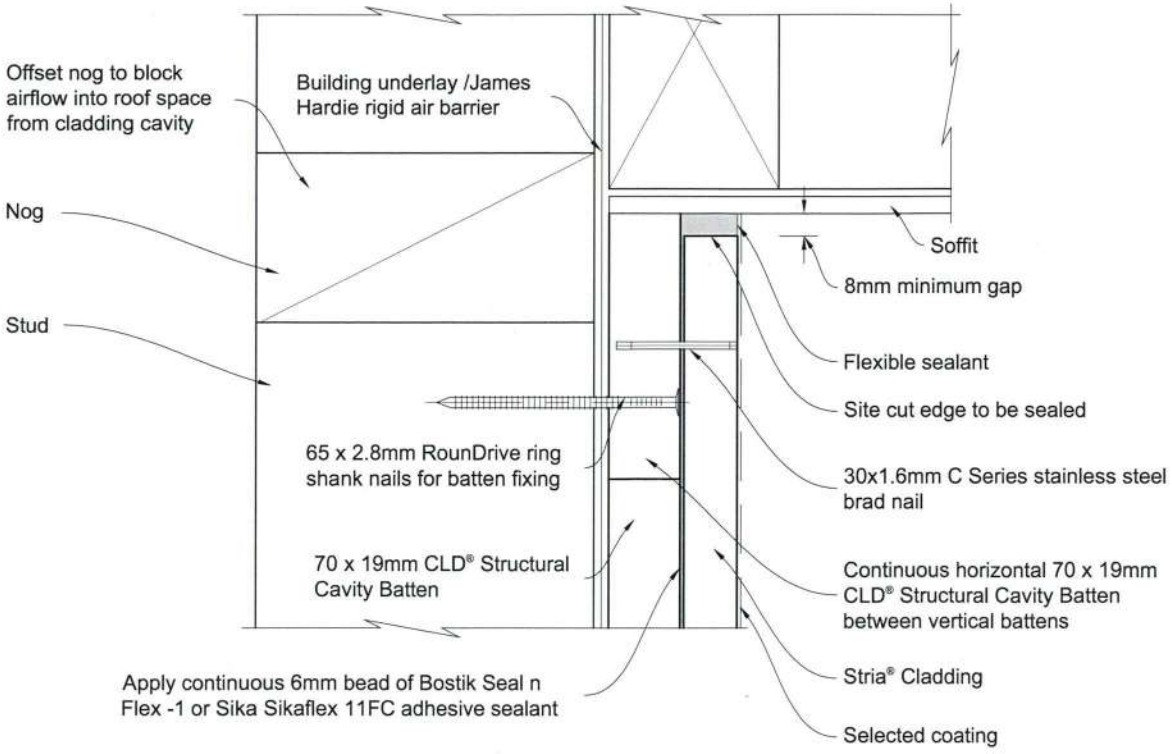
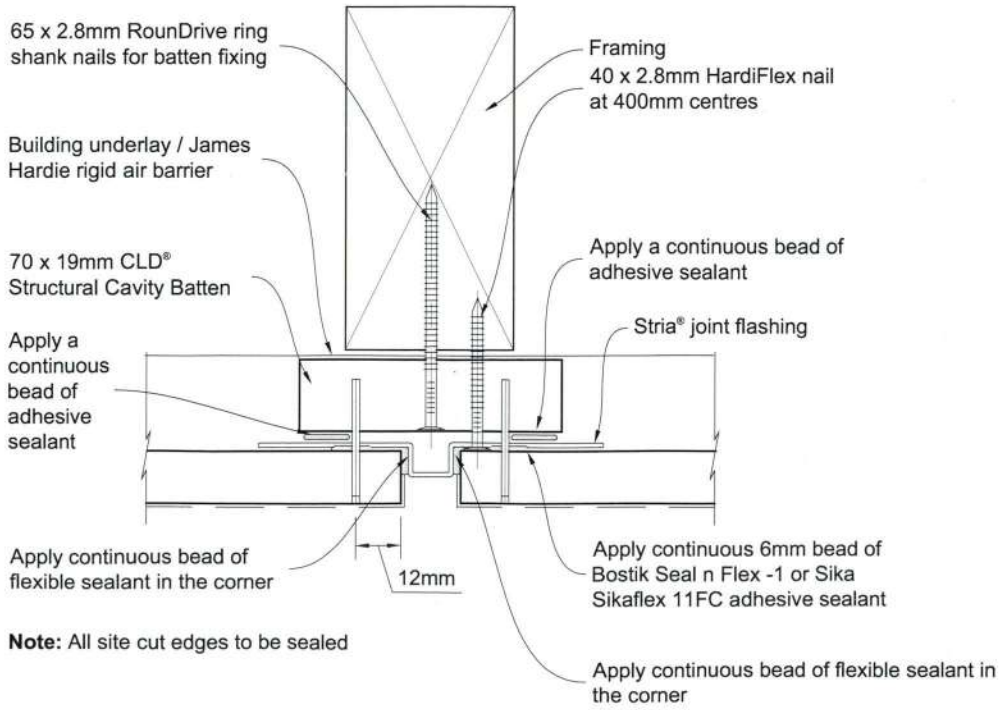


Figure 6: Vertical jointing option



Note: All site cut edges to be sealed

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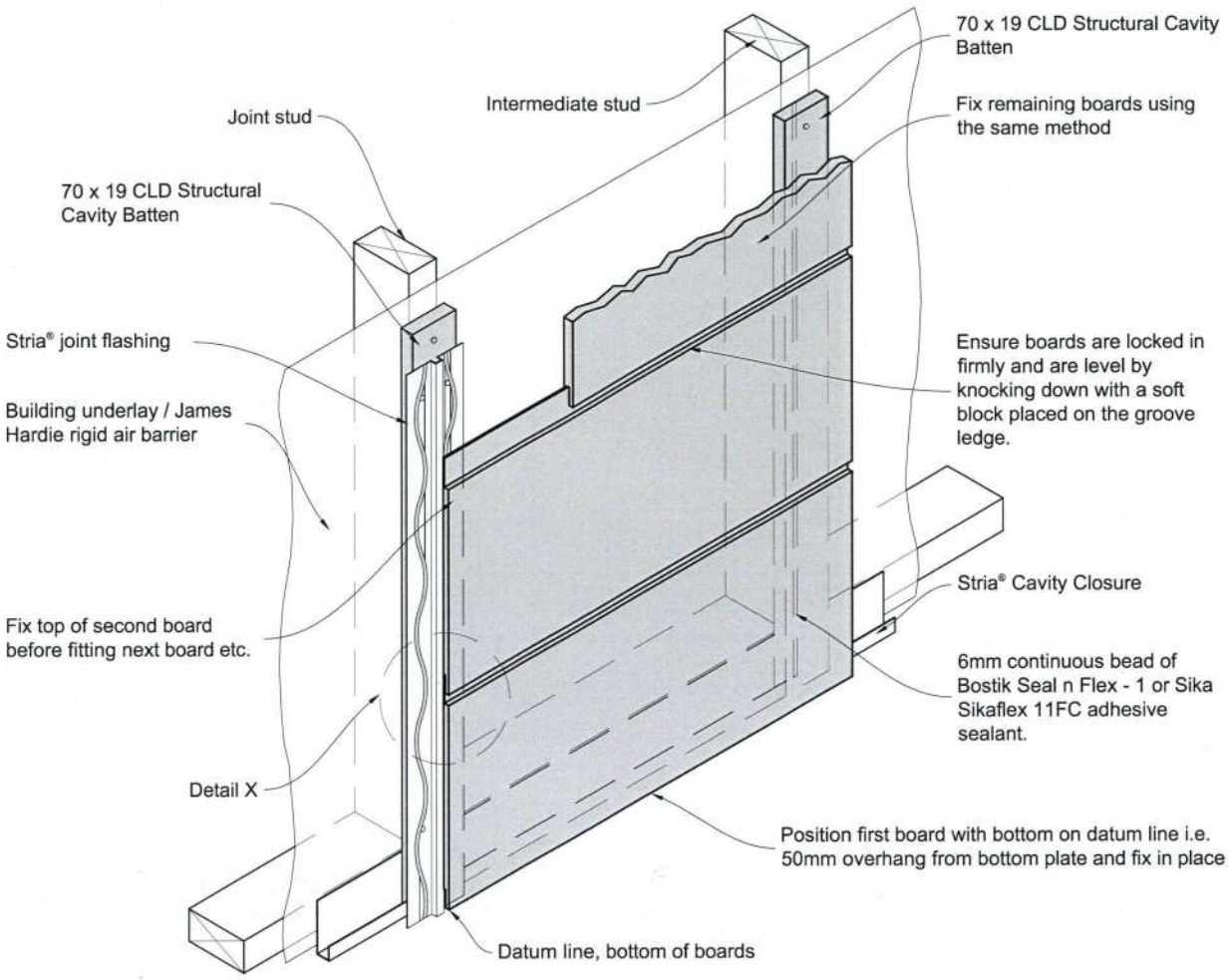
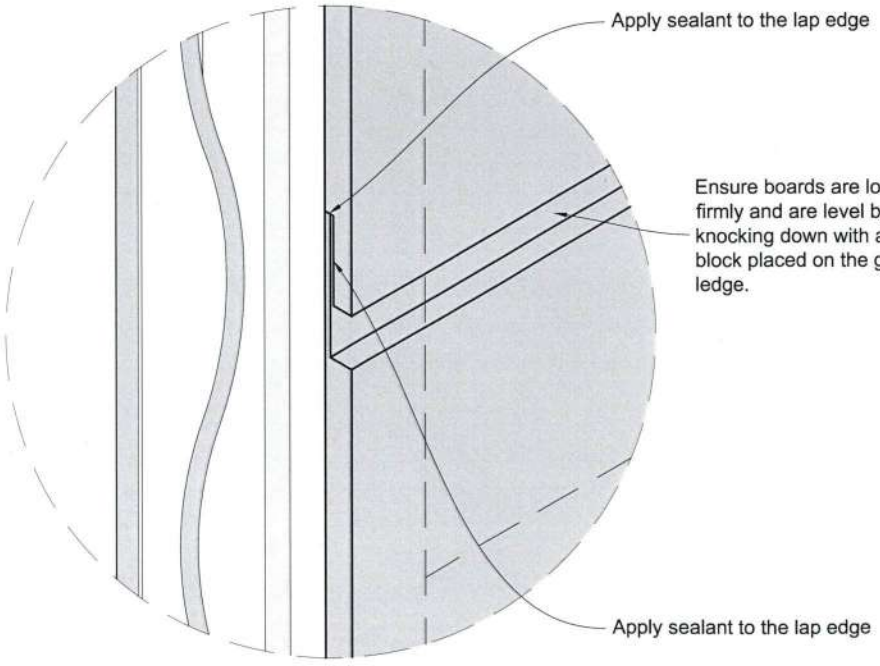
Figure 7: Stria Cladding installation





Enlarged Detail X

Note: All site cut edges to be sealed

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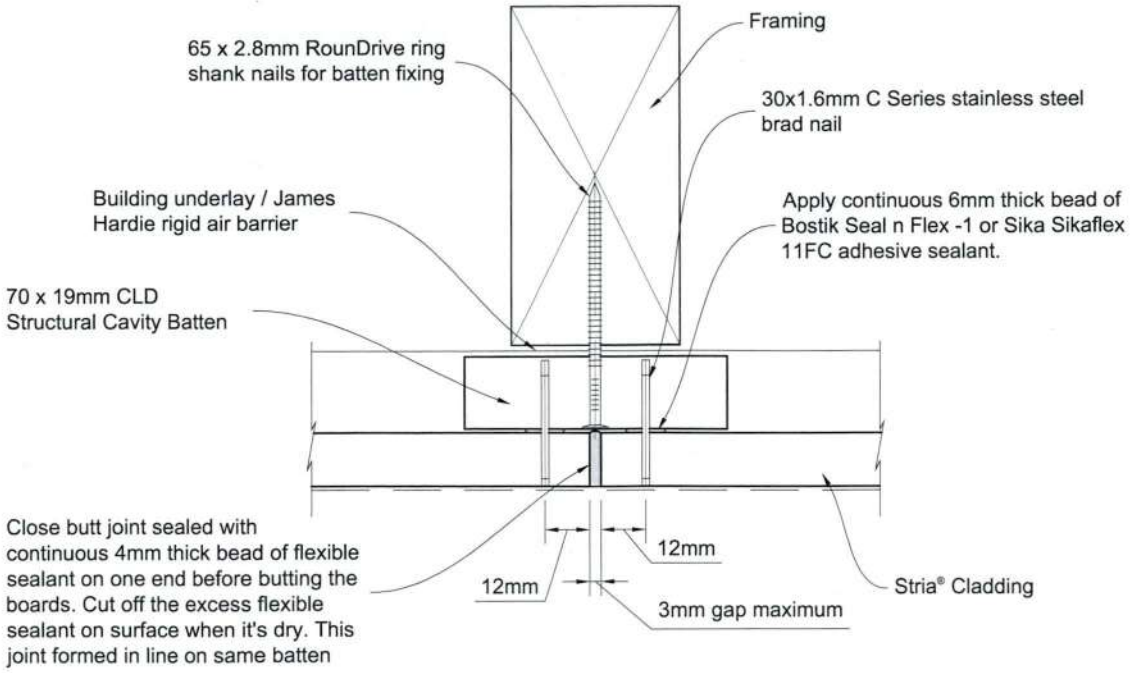
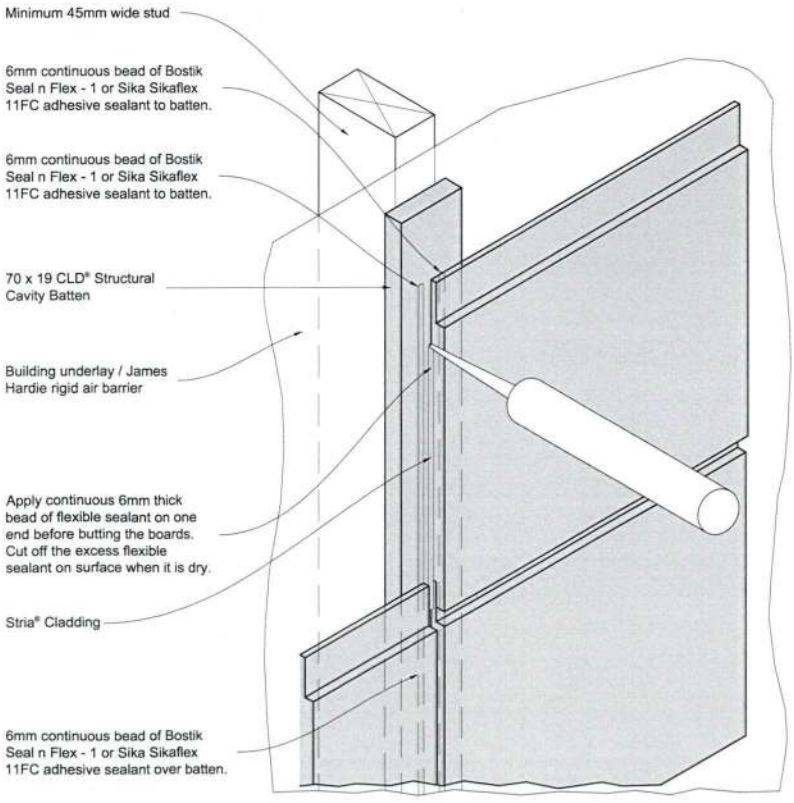
Figure 8: Vertical jointing option



Note: All site cut edges to be sealed

Figure 9: Butt jointing on stud



Note: All site cut edges to be sealed

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Figure 10: Fixing detail

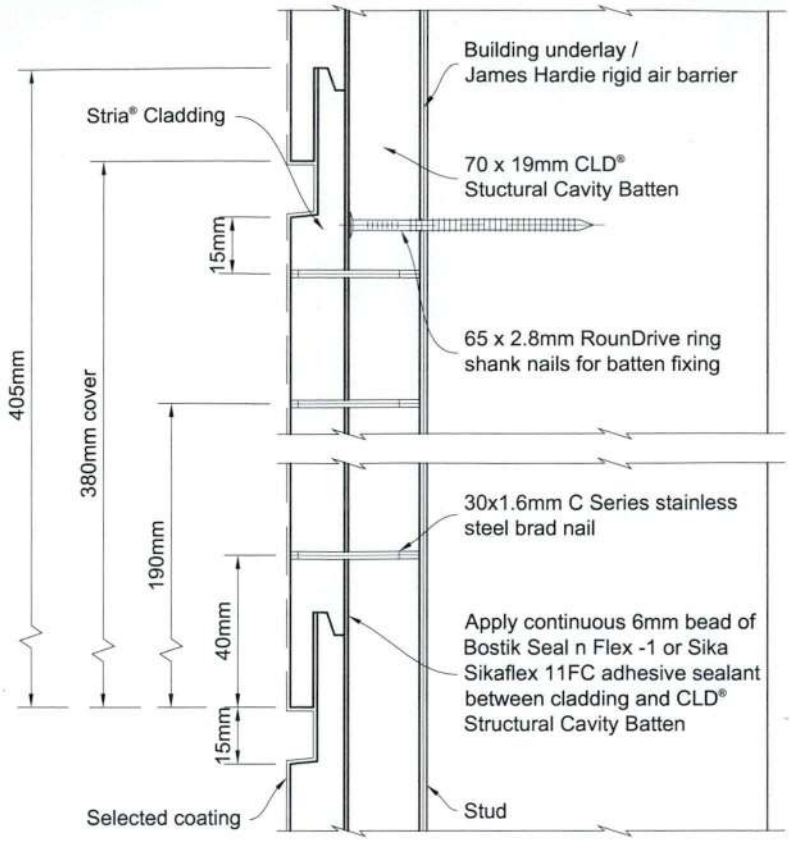

Figure 11: External aluminium box corner

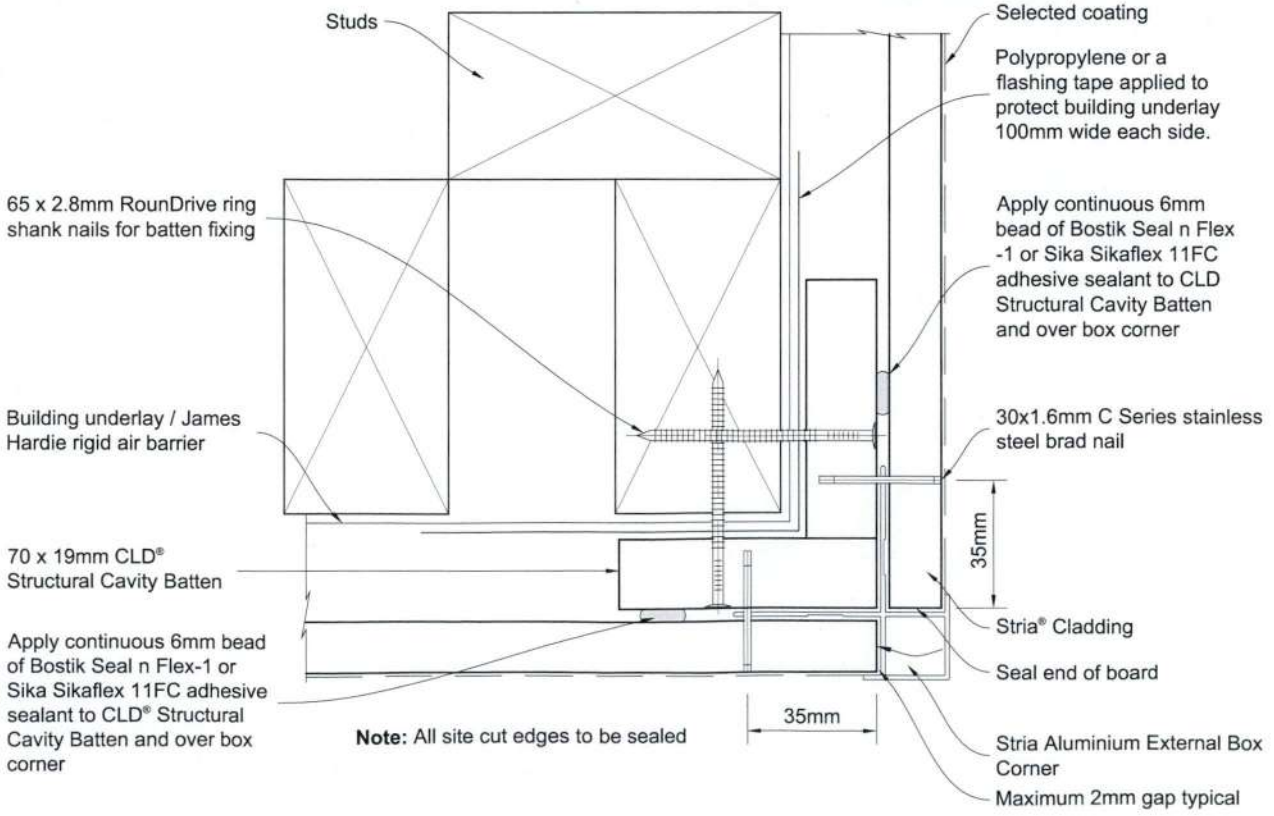

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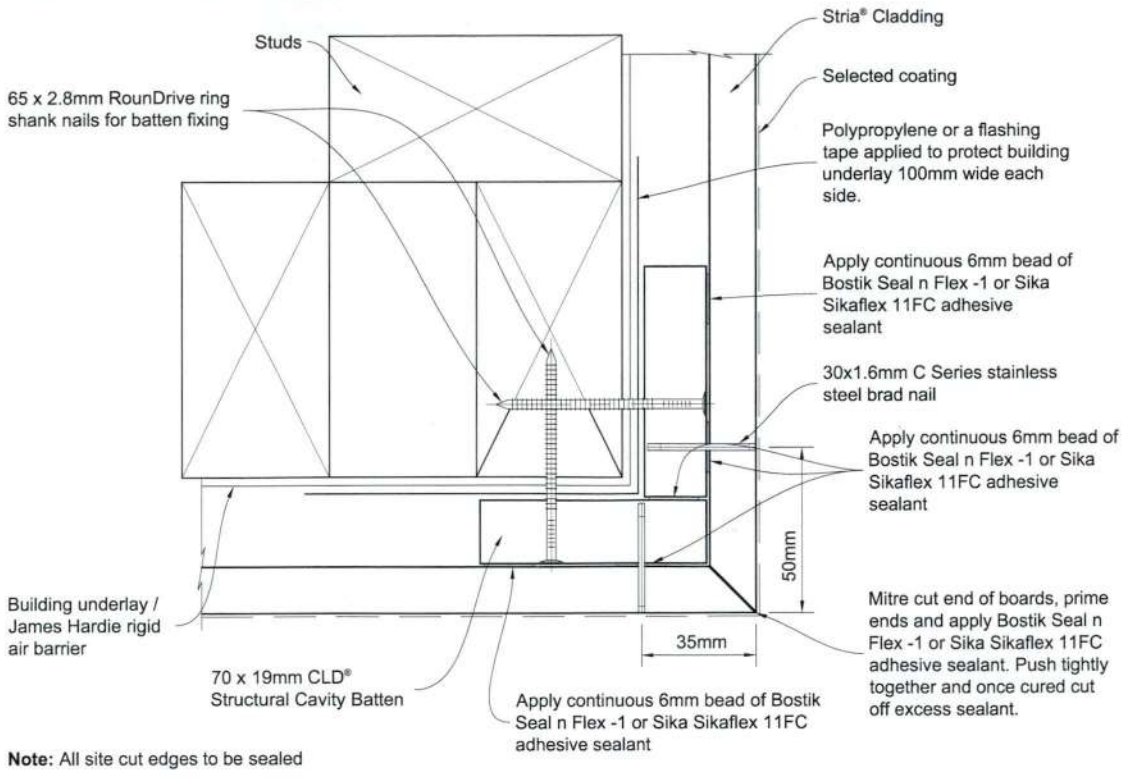
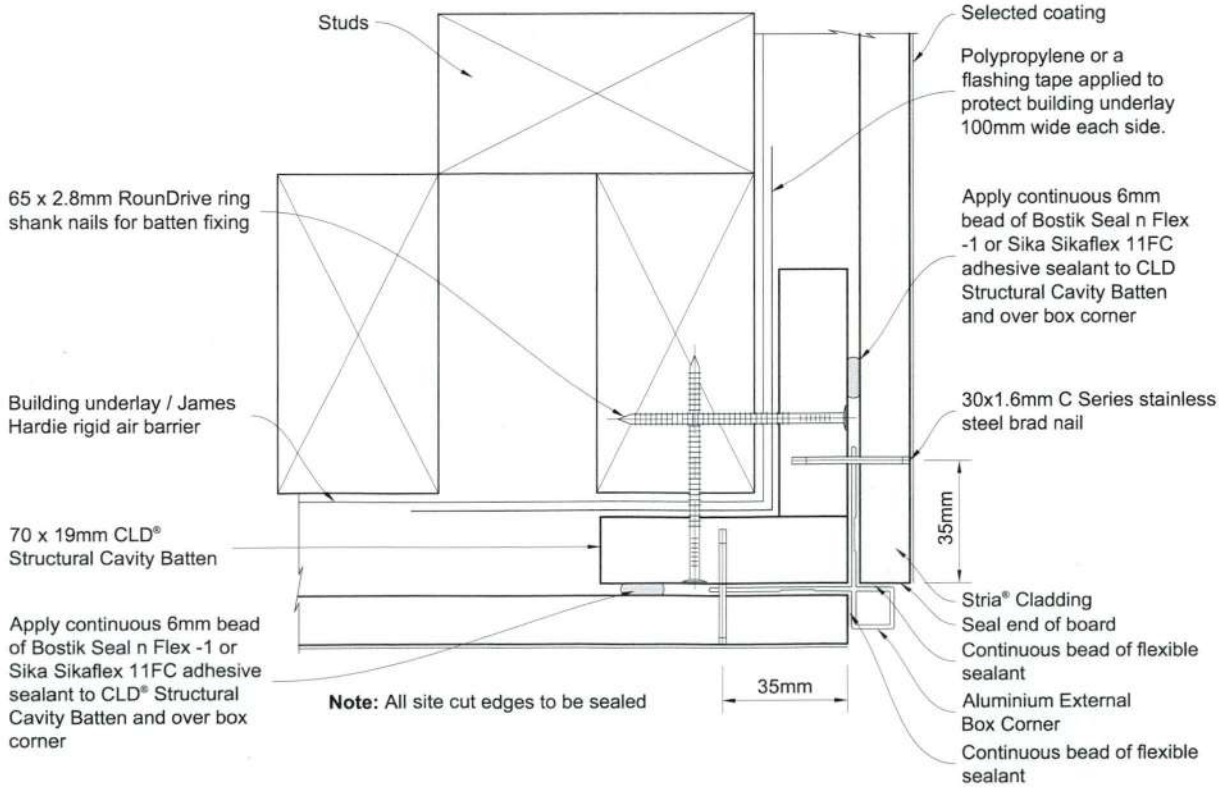
Figure 12: External mitred corner



Note: All site cut edges to be sealed

Figure 13: Alternative external aluminium corner



Note: All site cut edges to be sealed

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Figure 14: Internal aluminium corner

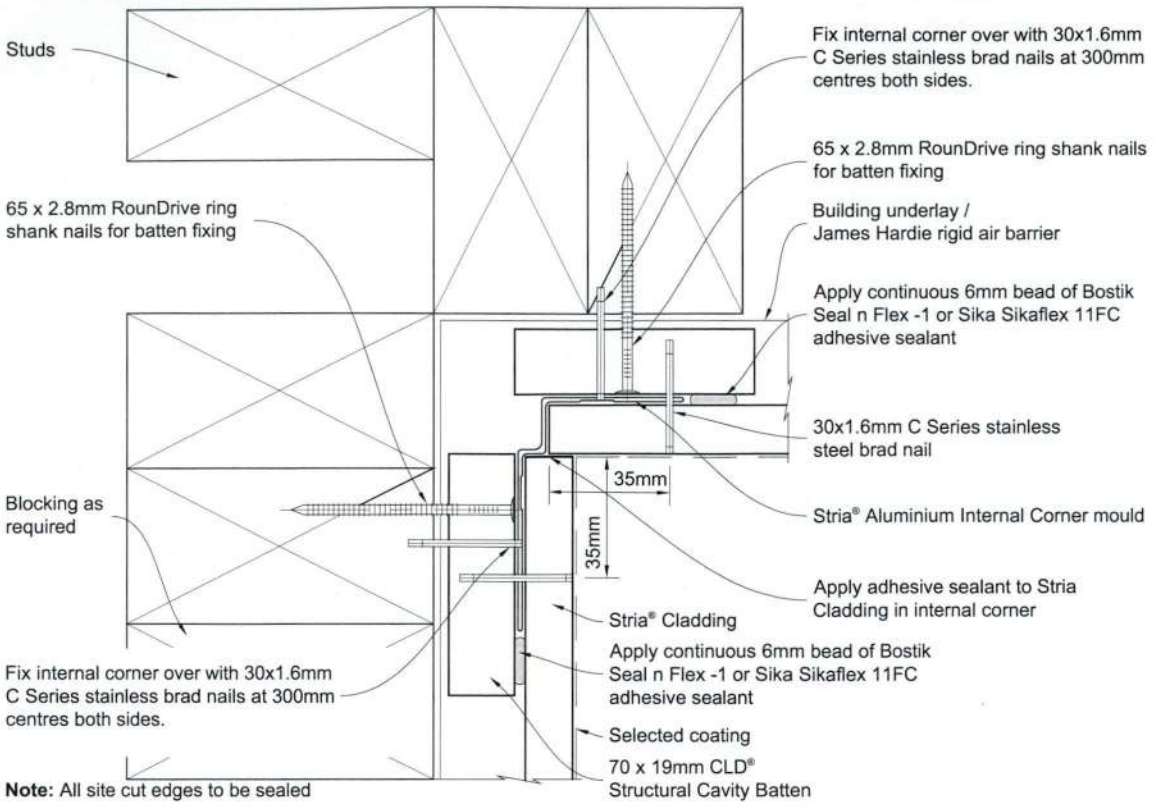

Figure 15: Internal mitred corner

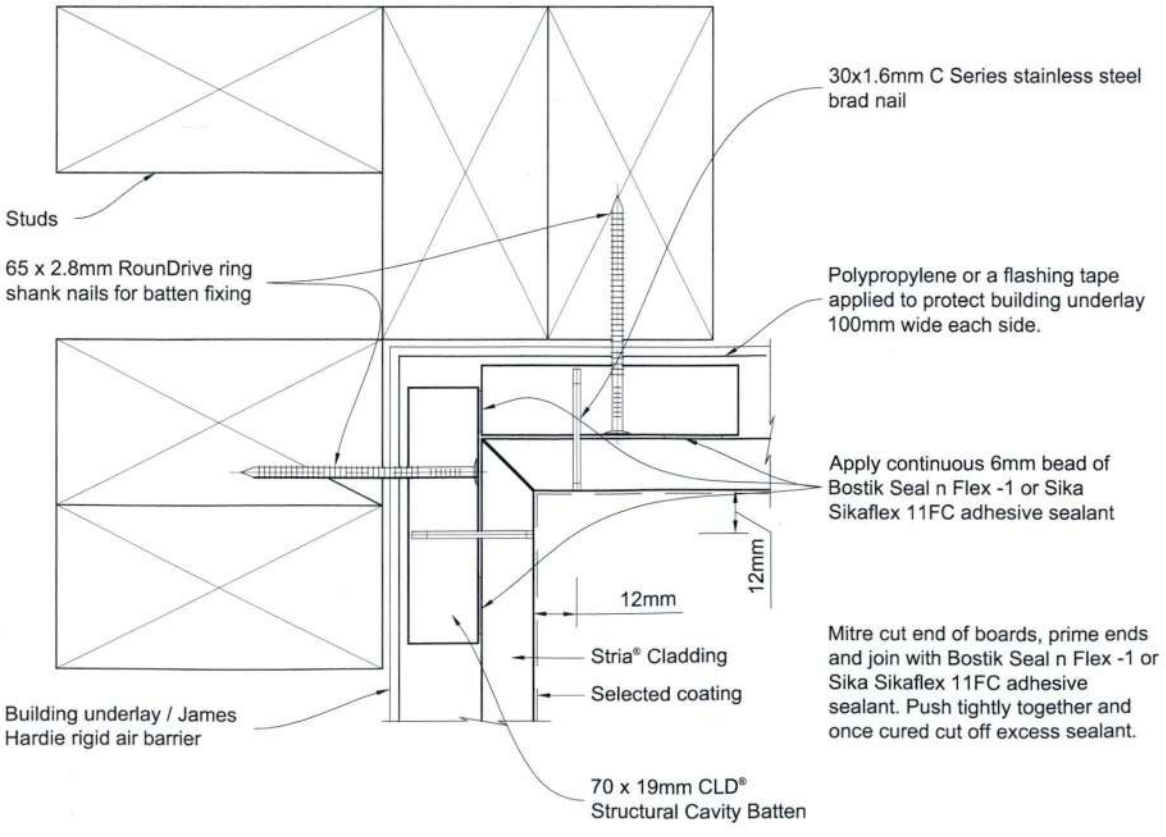

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Figure 16: Jointing of CLD Structural Cavity Batten

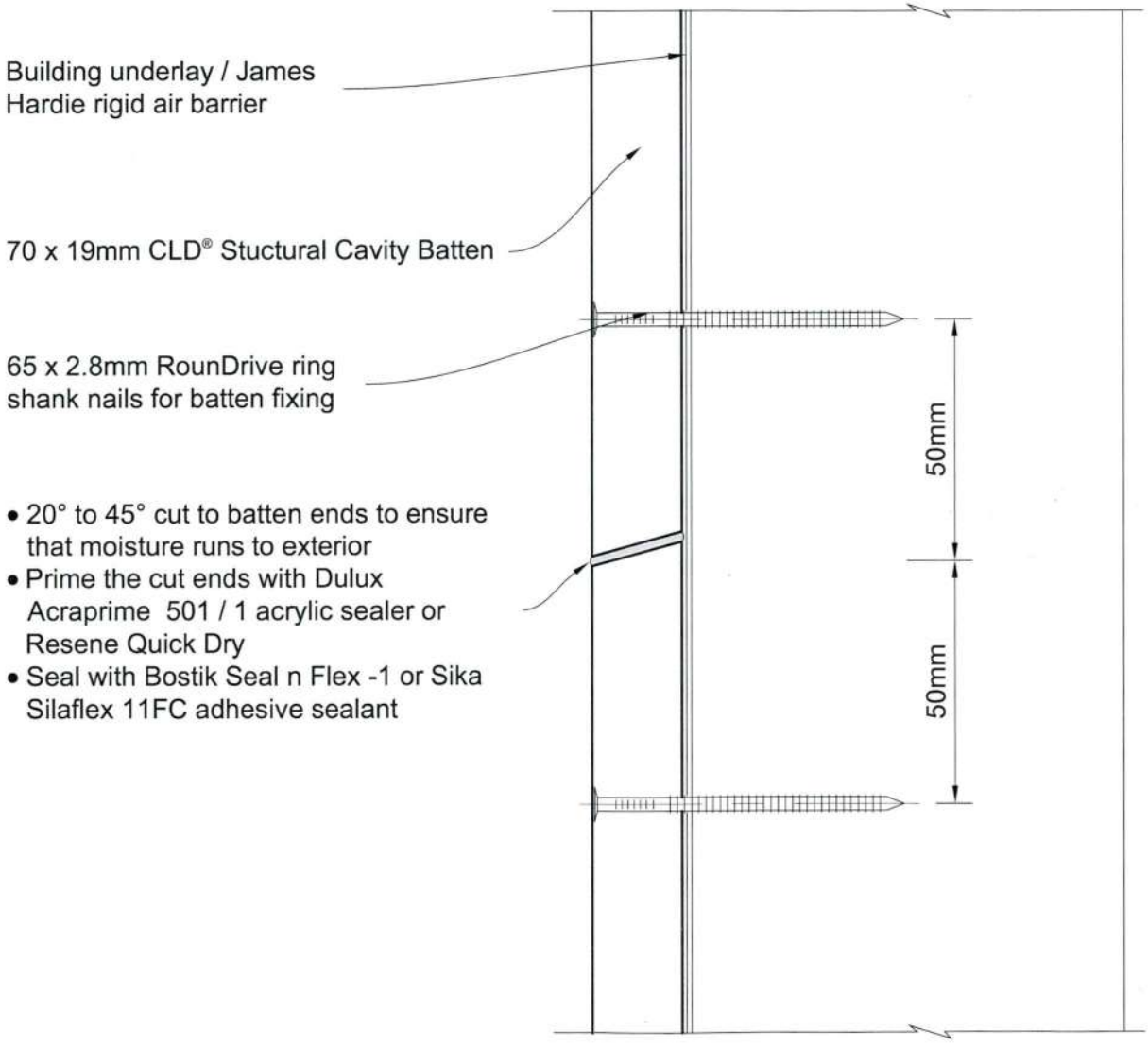

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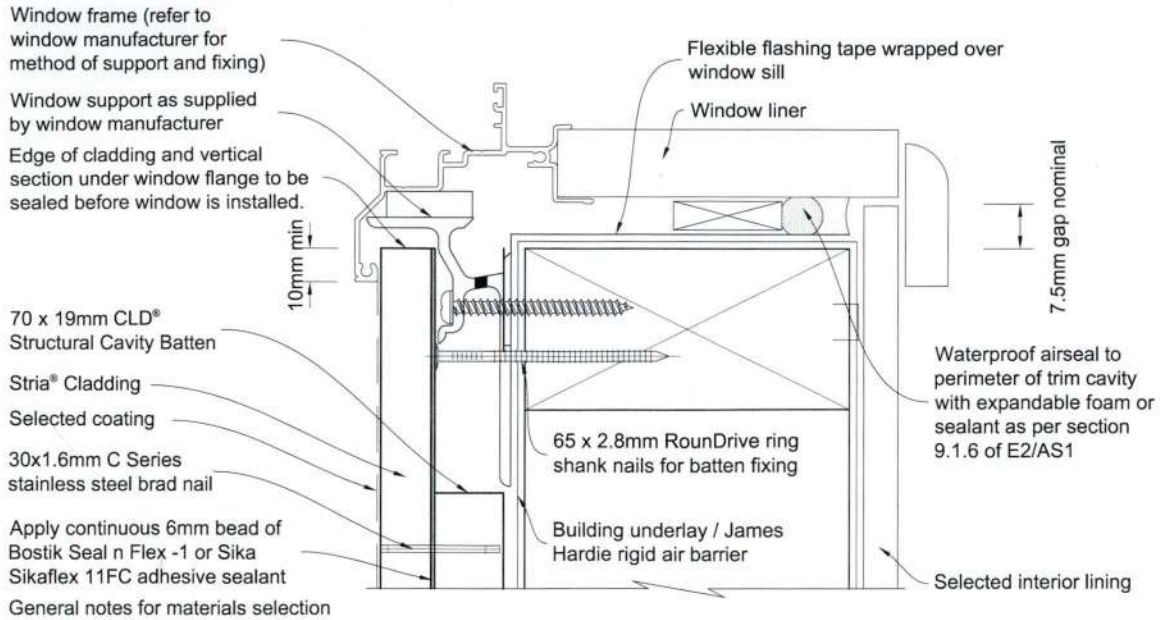
Figure 17: Window sill

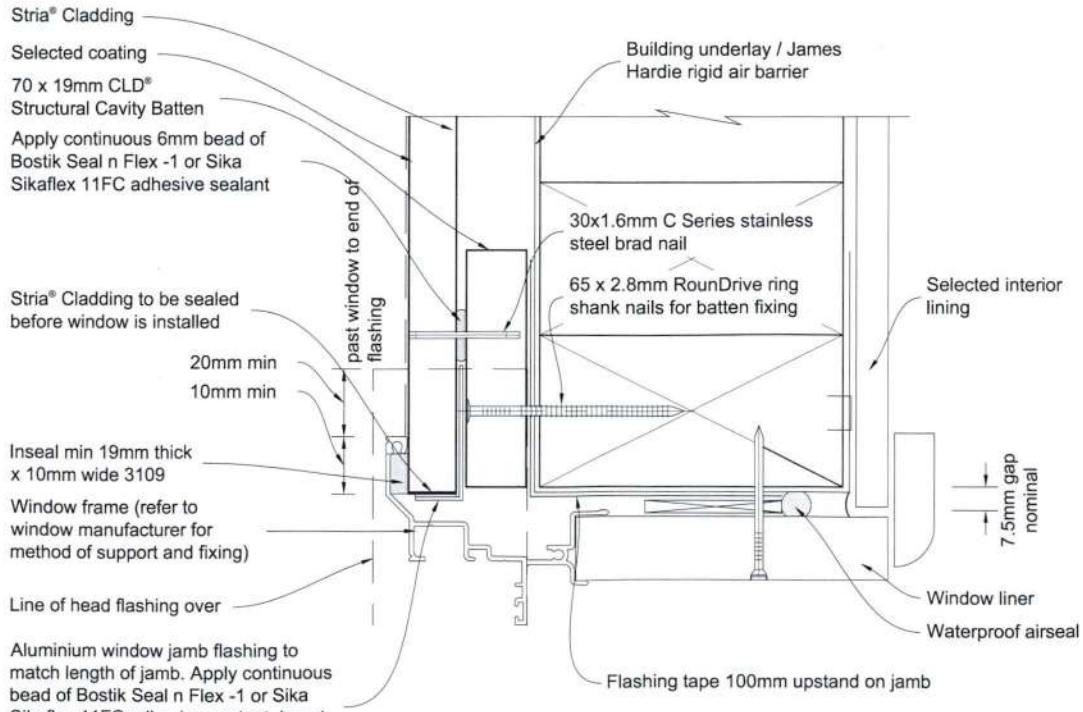


General notes for materials selection

1. Flashing materials must be selected based on environmental exposure, refer to NZS 3604 and Table 20 of NZBC E2/AS1.
2. Building underlay must comply with acceptable solution E2/AS1 and NZS 3604.
3. Flashing tape must have proven compatibility with the selected building underlay and other materials with which it comes into contact as per Table 21 of E2/AS1.
4. When James Hardie rigid air barriers are used flashing tape to be applied to the entire opening.

Refer to the manufacturer or supplier for technical information for these materials.

Figure 18: Window jamb



Note: When James Hardie rigid air barriers are used flashing tape to be applied to the entire window opening

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Figure 19: Window head with full cladding across head flashing

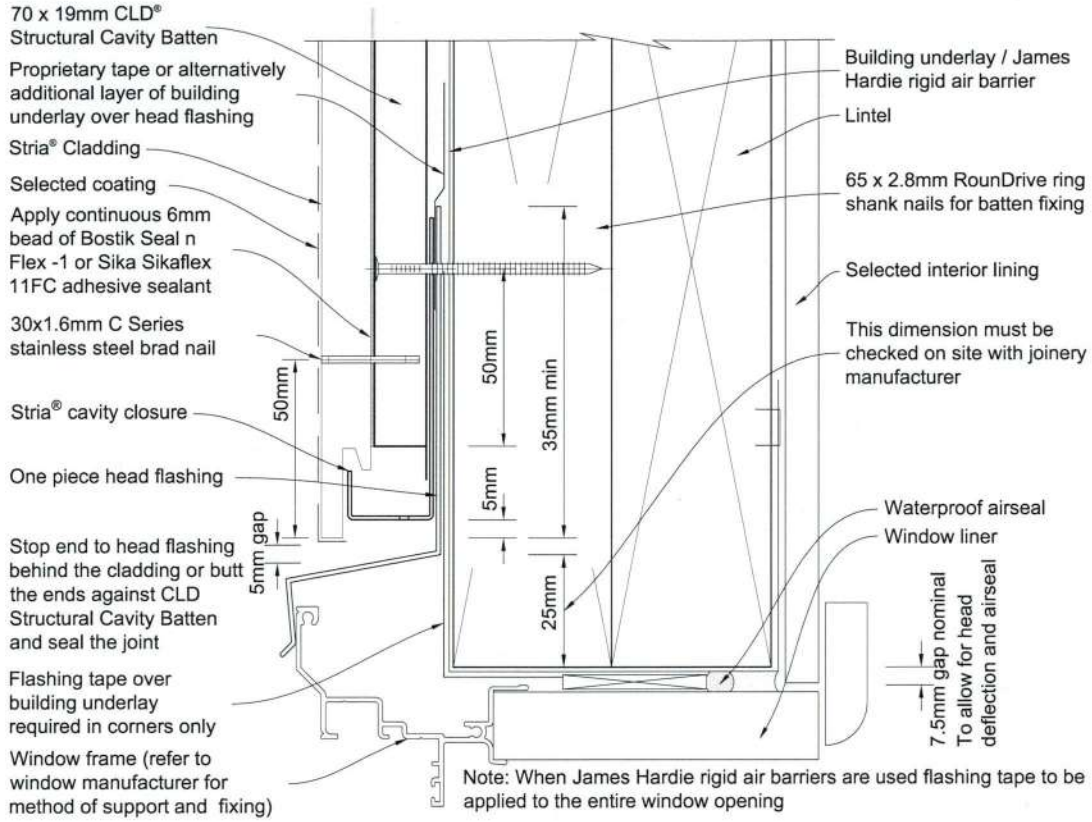

Figure 20: Window head to full board

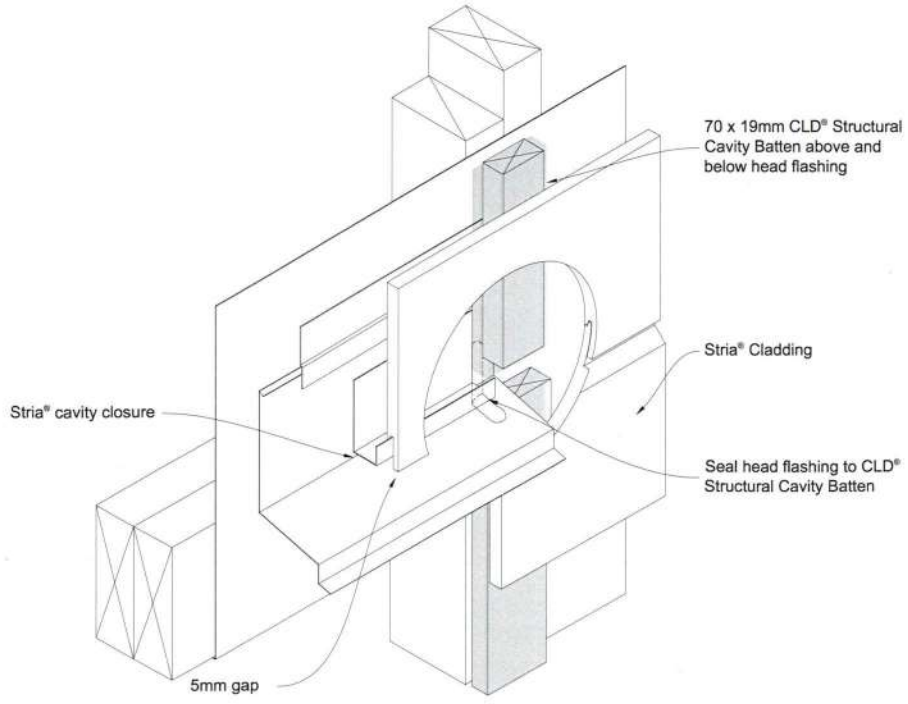

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Figure 21: Window jamb flashing

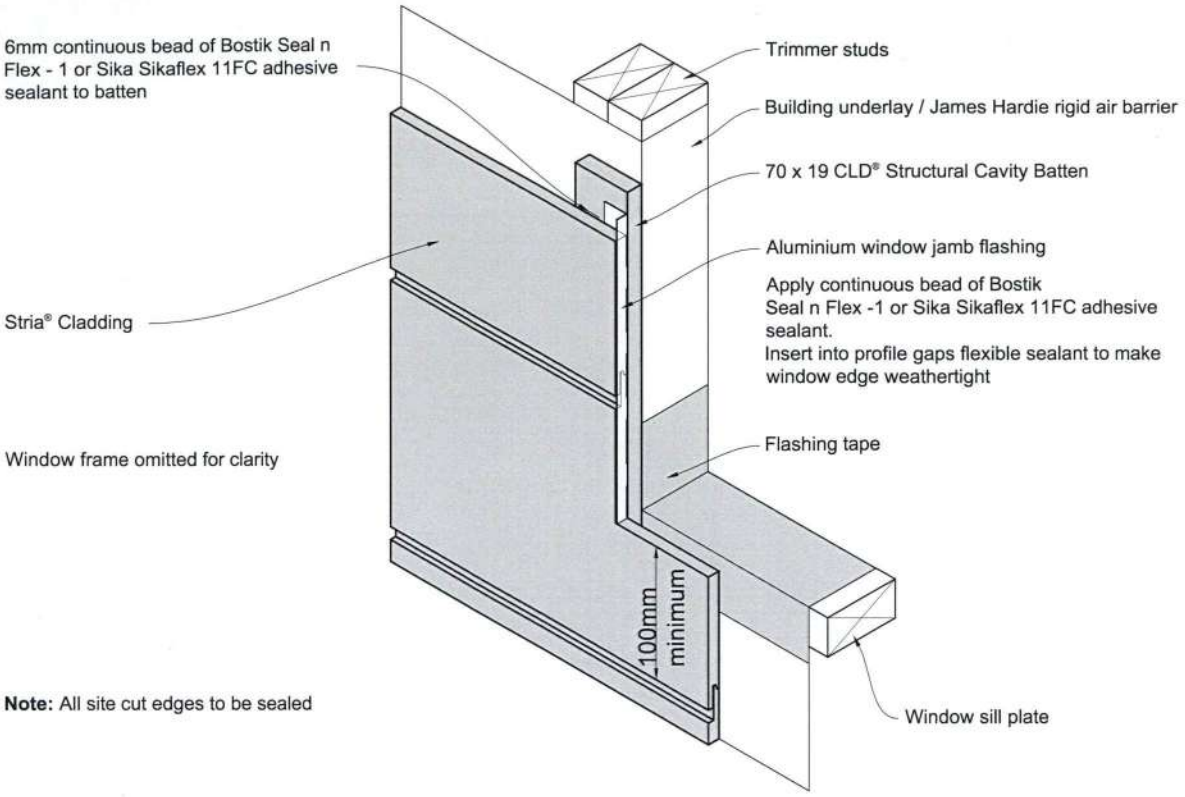

Figure 22: Window head with cladding cut around head flashing

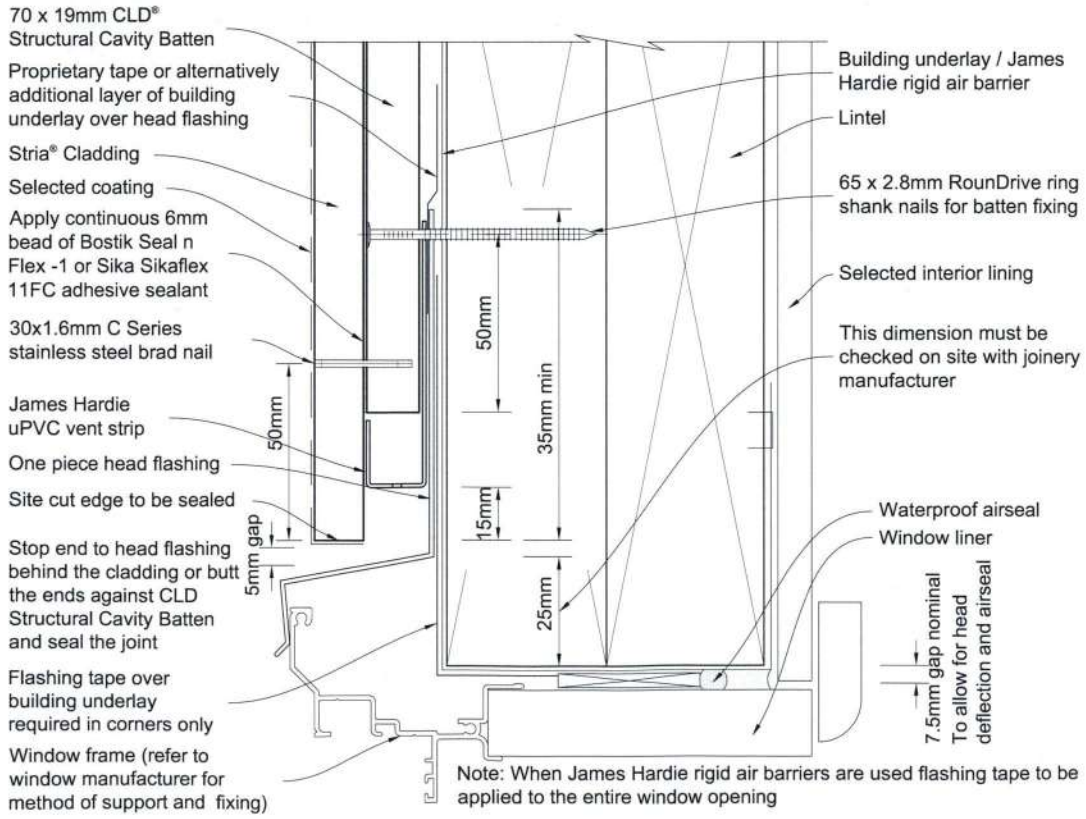

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Figure 23: Window head to Stria Cladding cut board

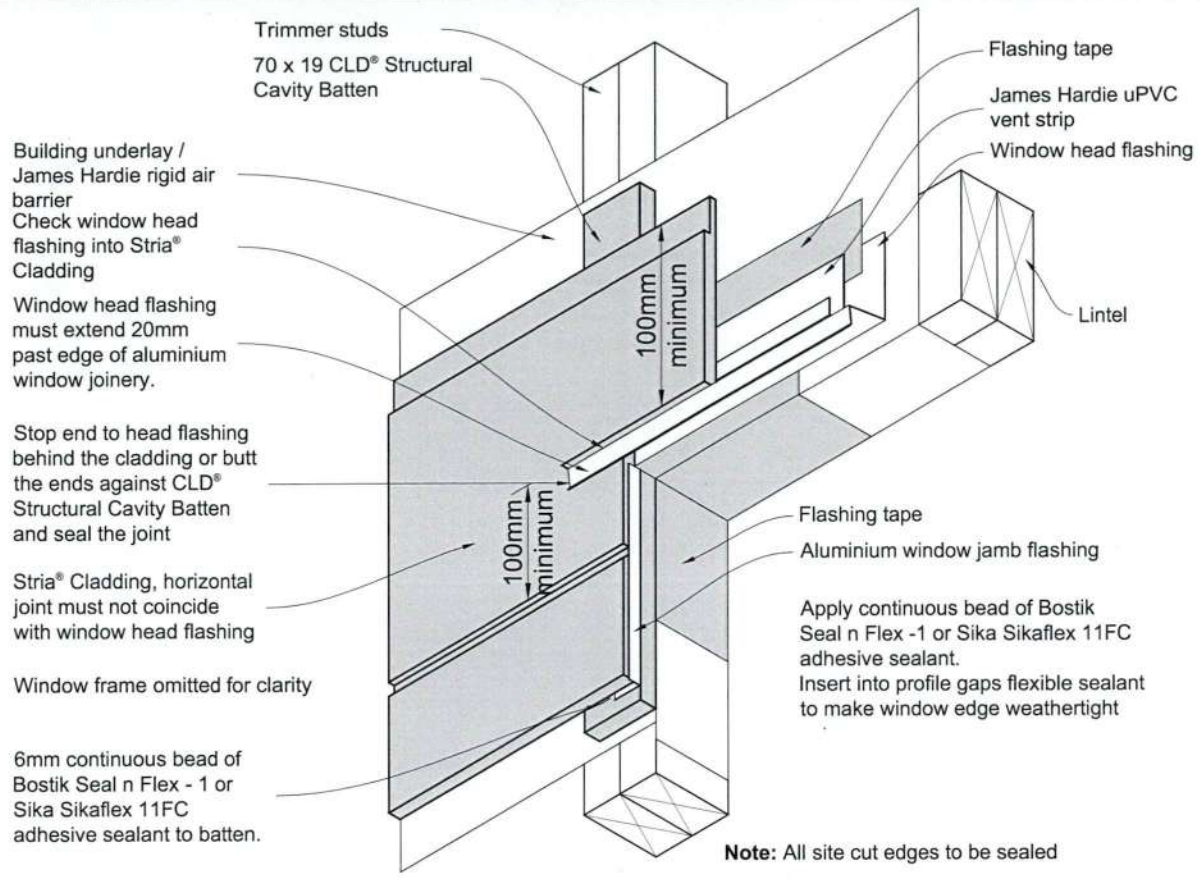

Figure 24: Window head to Stria Cladding cut board

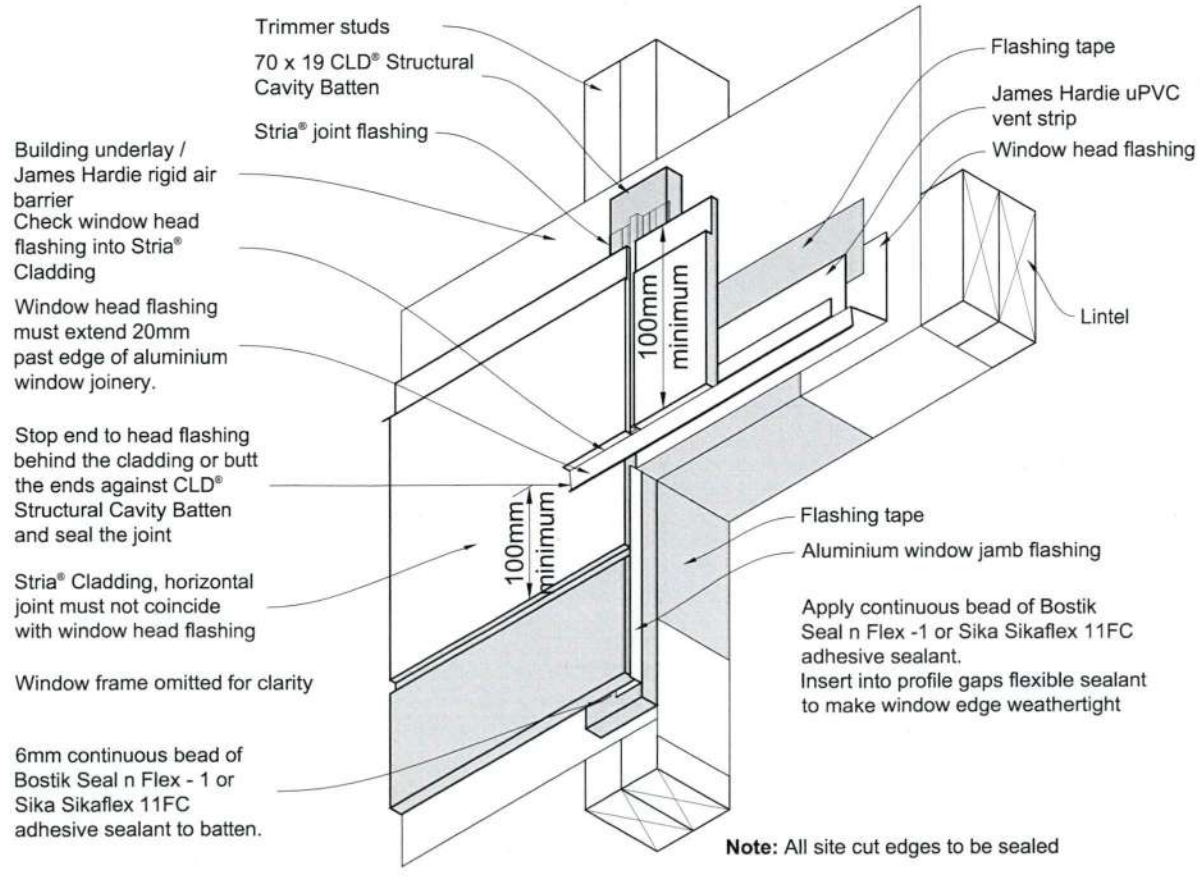

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Figure 25: Window head to CLD Structural Cavity Batten

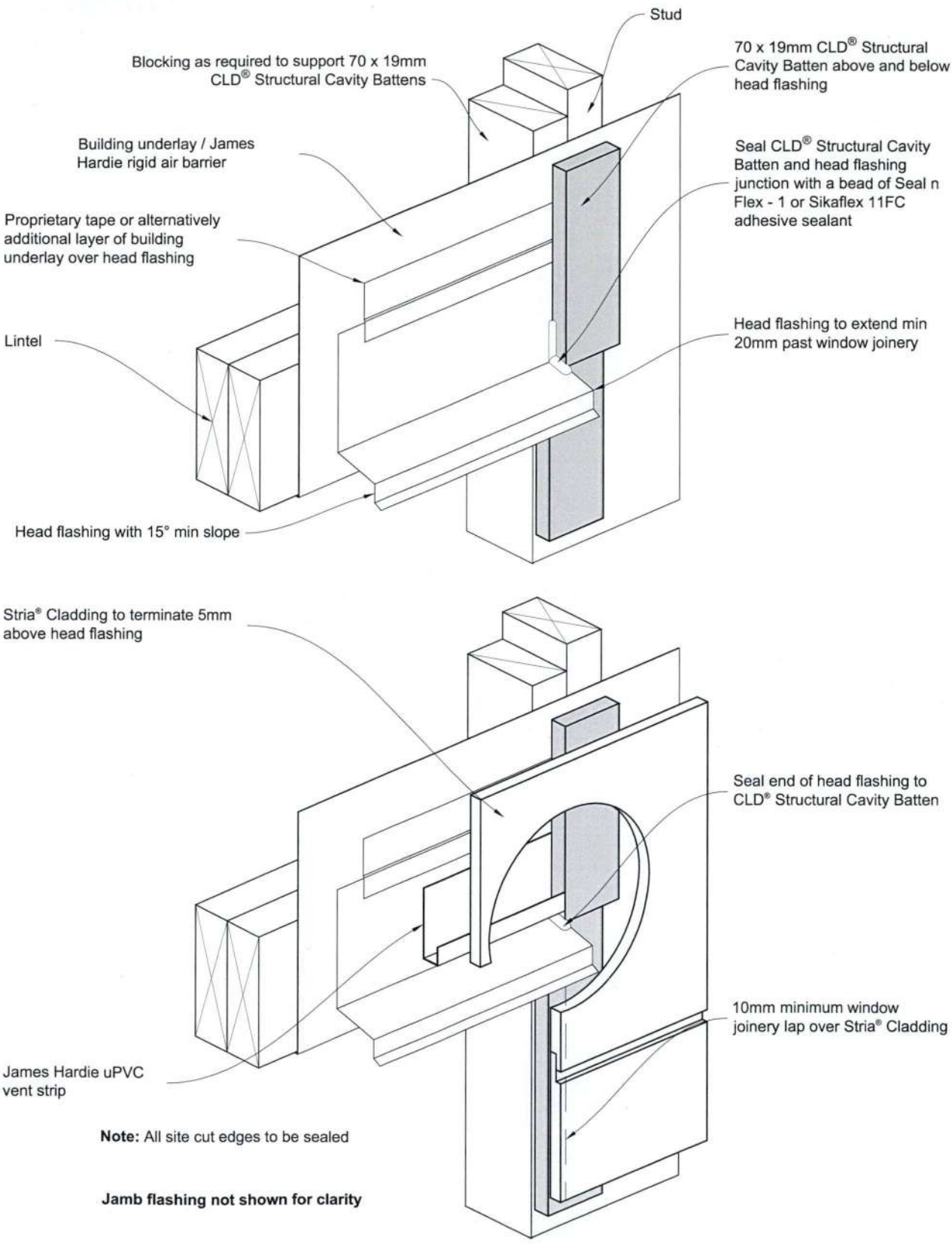

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Figure 26: Engineered floor joist

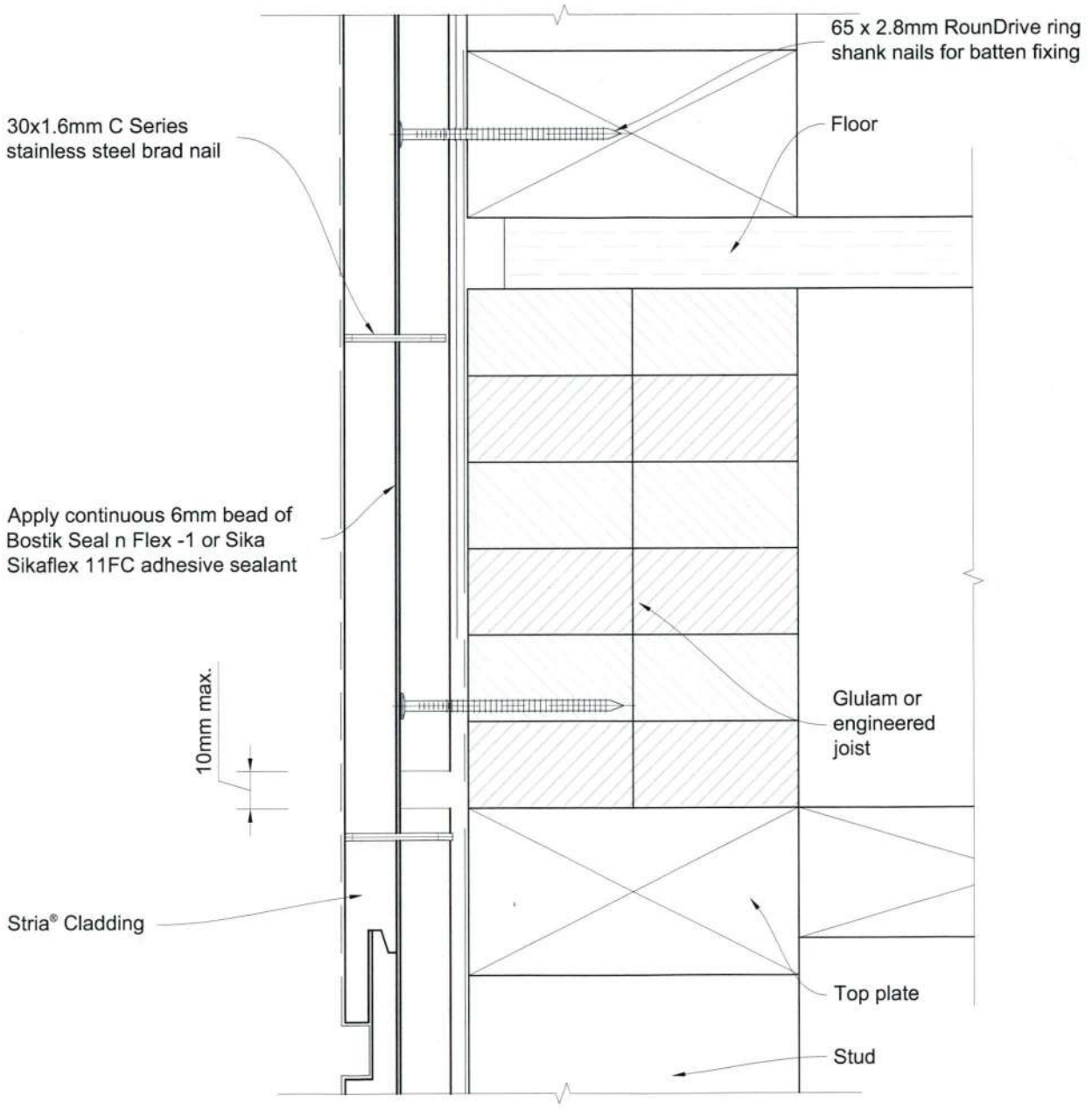

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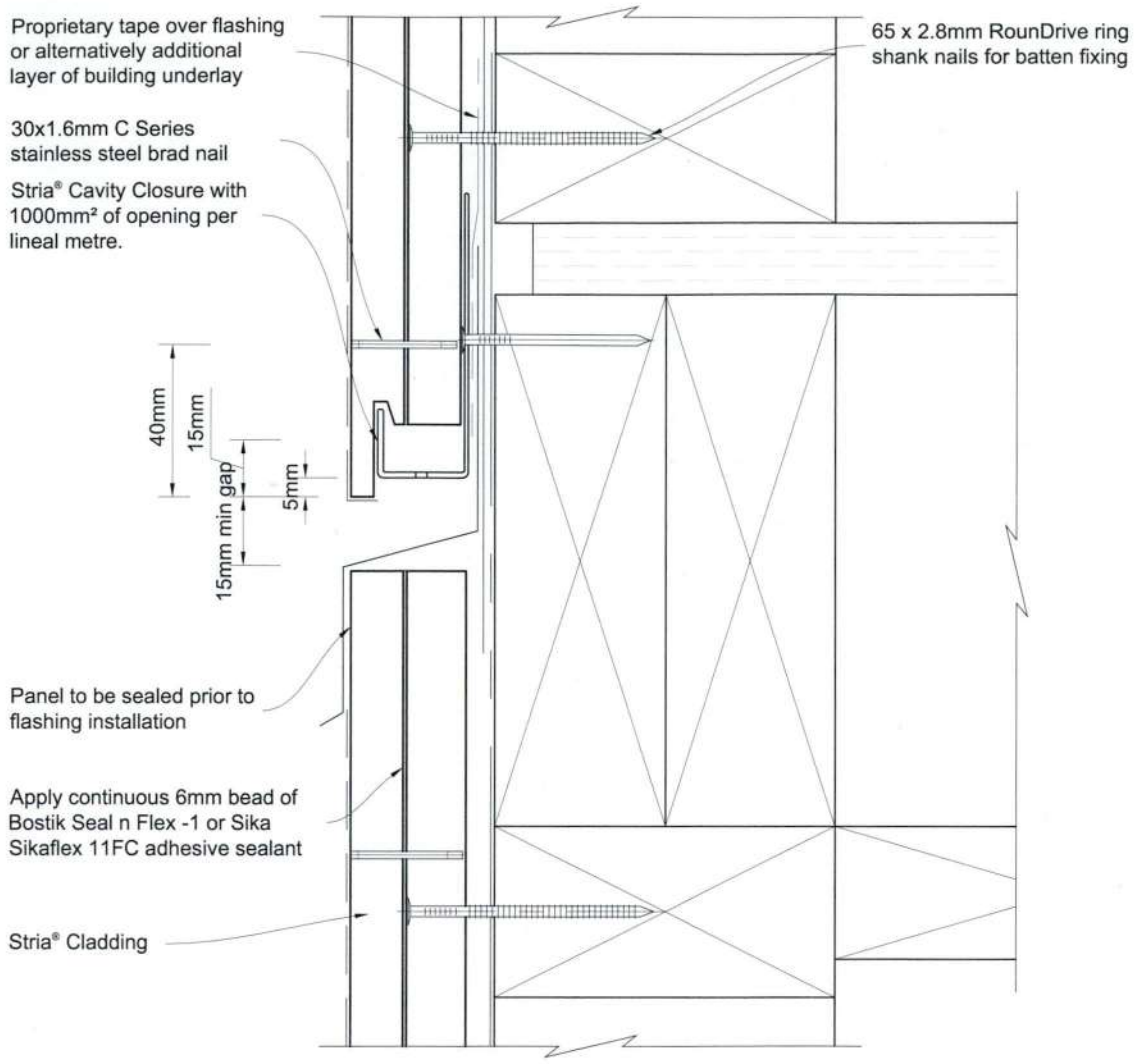
Figure 27: Drained flashing joint



STEP 1
- Check architects plans for the type of flashing to be used.

STEP 2
- Check fixing centres and edge distances.
- If top fixings are to be hidden by the Z flashing they will need to be fixed and sealed before the Z flashing is installed.
- Cut edges need to be primed with Acraprime sealer or similar.

STEP 3
- When 50 year durability is required refer Table 20 E2/AS1.

STEP 4
- The flashing to be placed in the centre of the floor joists. Do not fix CLD® Structural Cavity Battens or cladding into floor joists.

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Figure 28: Drained flashing joint at floor level

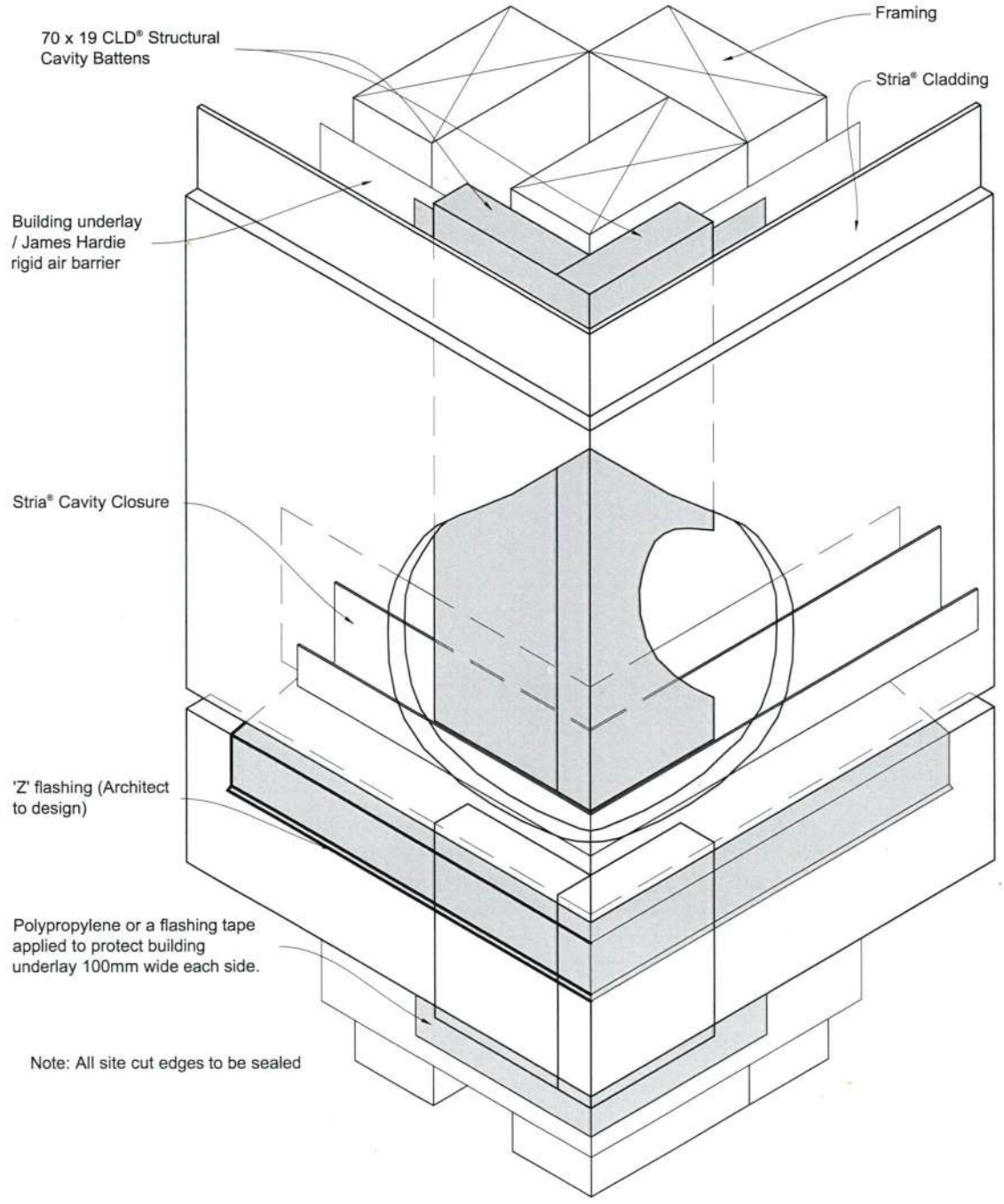

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Figure 29: Apron flashing detail

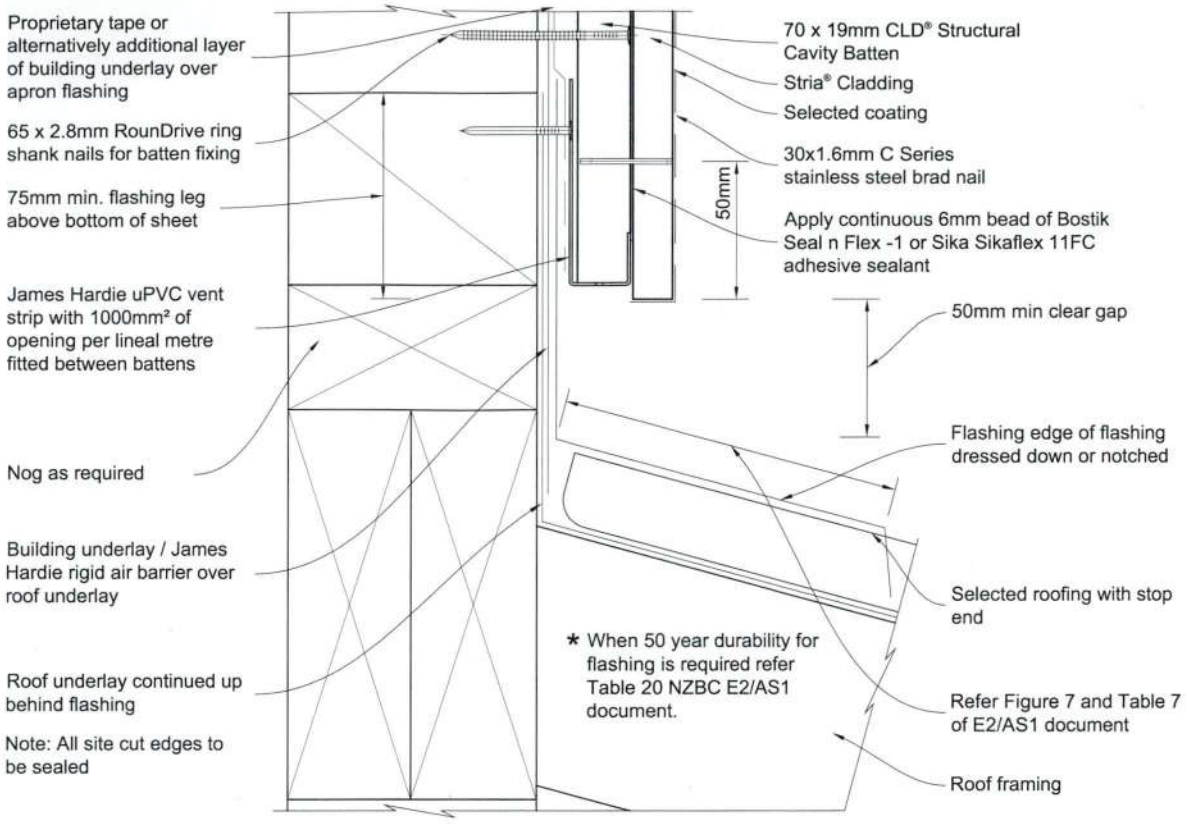

Figure 30: Parapet flashing

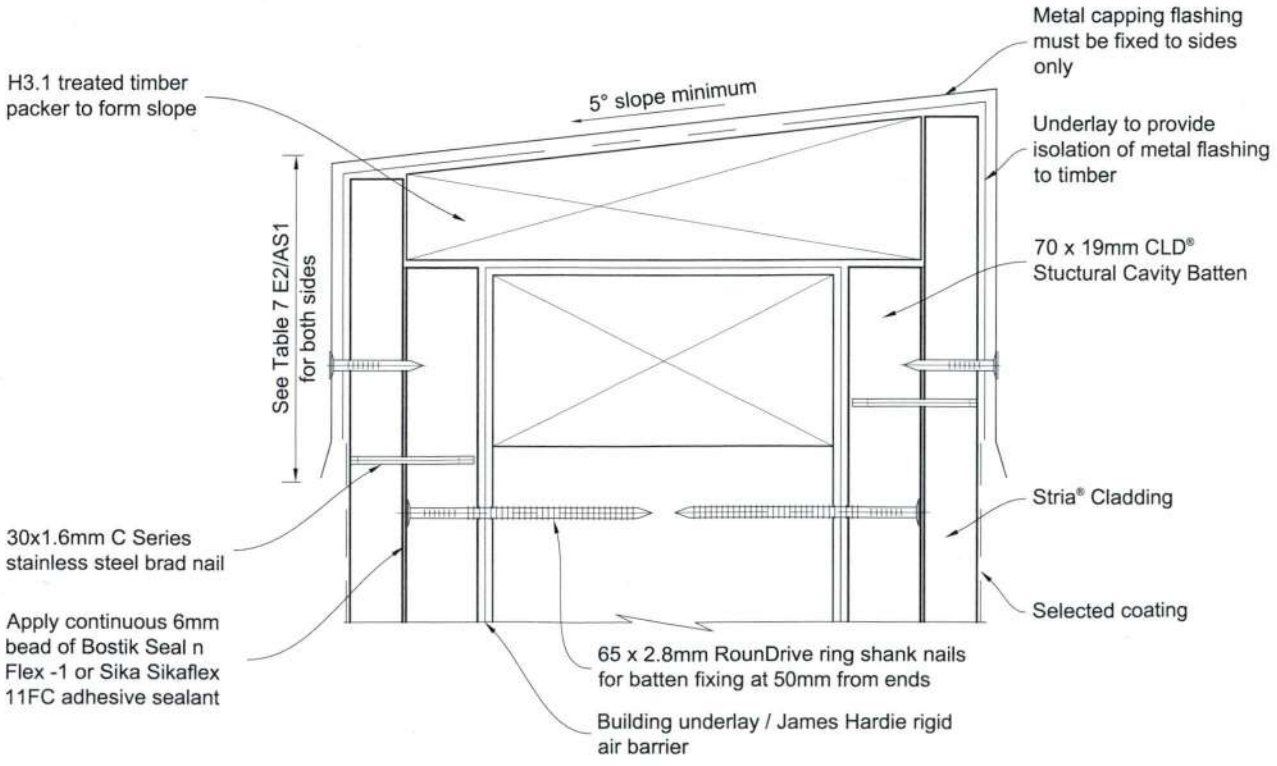

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Figure 31: Roof to wall junction

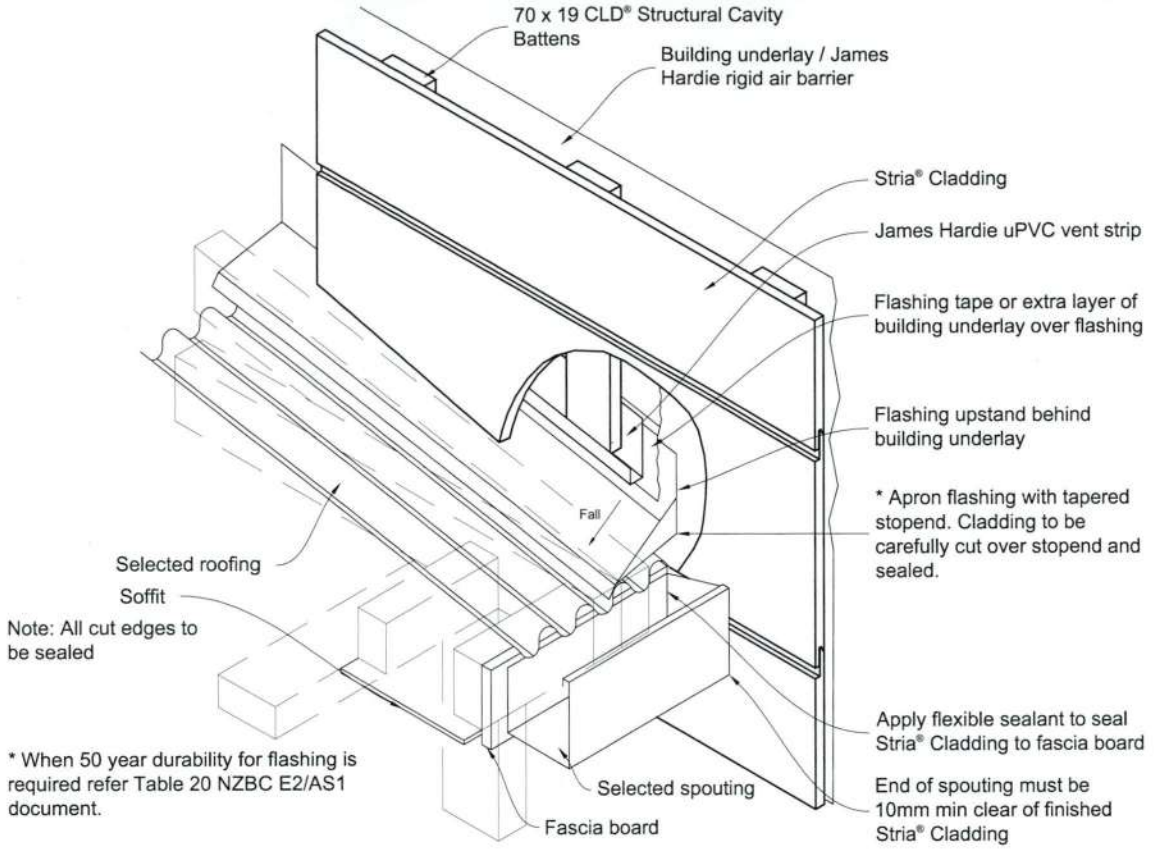

Figure 32: Meter box at sill

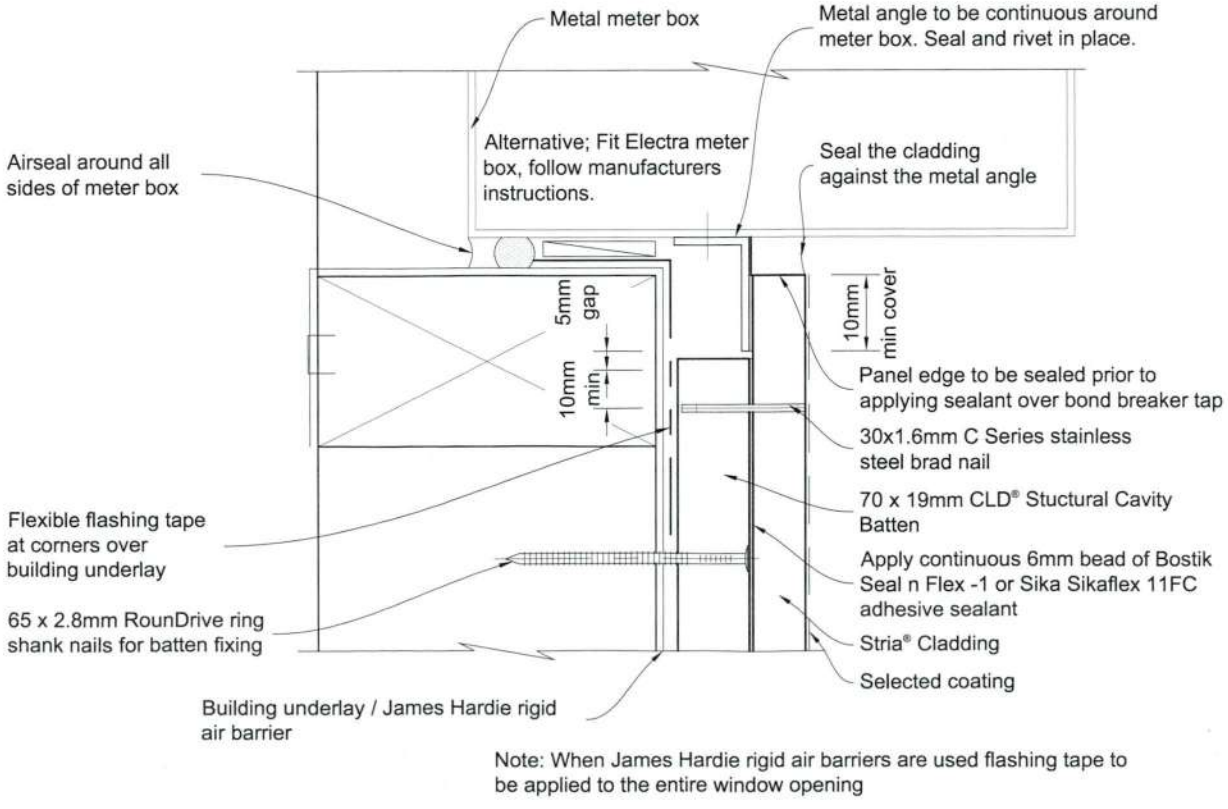

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Figure 33: Meter box at jamb

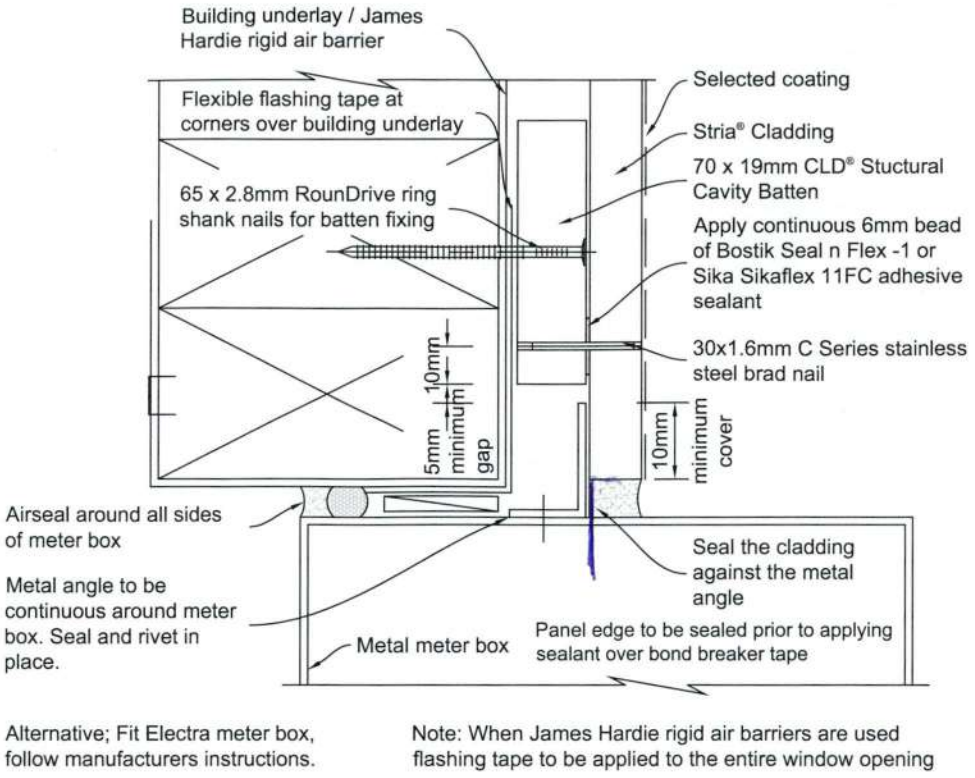

Figure 34: Meter box at head

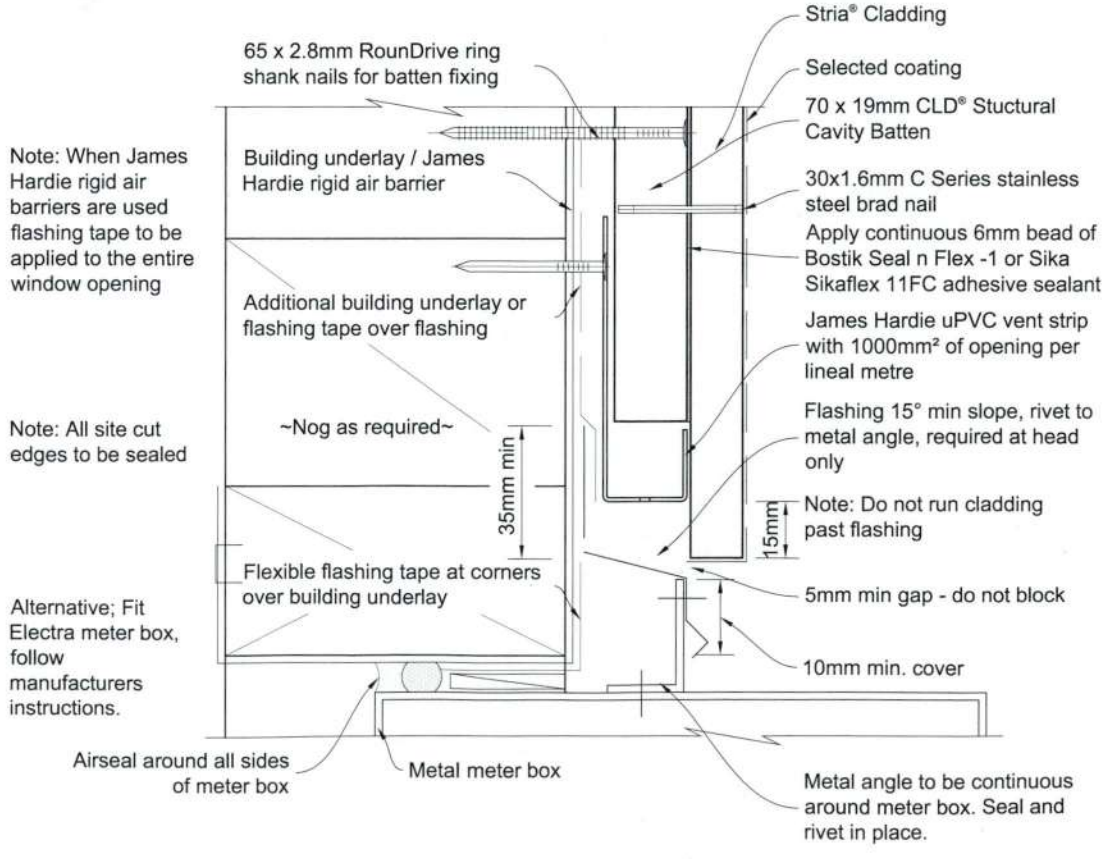

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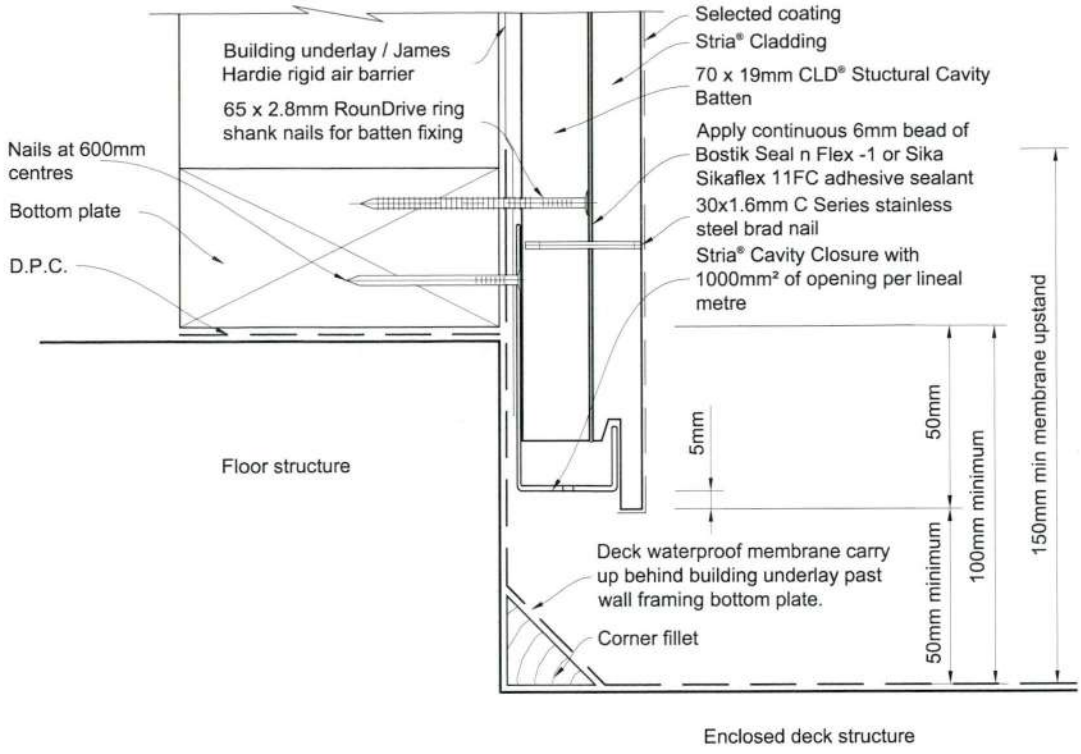
Figure 35: Enclosed deck



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Product Warranty

Stria®
CLADDING

July 2014

James Hardie New Zealand ("James Hardie") warrants for a period of 15 years from the date of purchase that the Stria® Cladding and CLD® Structural Cavity Batten (the "Product"), will be free from defects due to defective factory workmanship or materials and, subject to compliance with the conditions below, will be resistant to cracking, rotting, fire and damage from termite attacks to the extent set out in James Hardie's relevant published literature current at the time of installation. James Hardie warrants for a period of 15 years from the date of purchase that the accessories supplied by James Hardie will be free from defects due to defective factory workmanship or materials.

Nothing in this document shall exclude or modify any legal rights a customer may have under the Consumer Guarantees Act or otherwise which cannot be excluded or modified at law.

CONDITIONS OF WARRANTY:

The warranty is strictly subject to the following conditions:

a) James Hardie will not be liable for breach of warranty unless the claimant provides proof of purchase and makes a written claim either within 30 days after the defect would have become reasonably apparent or, if the defect was reasonably apparent prior to installation, then the claim must be made prior to installation;

b) this warranty is not transferable;

c) the Product must be installed and maintained strictly in accordance with the relevant James Hardie literature current at the time of installation and must be installed in conjunction with the components or products specified in the literature. Further, all other products, including coating and jointing systems, applied to or used in conjunction with the Product must be applied or installed and maintained strictly in accordance with the relevant manufacturer's instructions and good trade practice;

d) the project must be designed and constructed in strict compliance with all relevant provisions of the current New Zealand Building Code ("NZBC"), regulations and standards;

e) the claimant's sole remedy for breach of warranty is (at James Hardie's option) that James Hardie will either supply replacement product, rectify the affected product or pay for the cost of the replacement or rectification of the affected product;

f) James Hardie will not be liable for any losses or damages (whether direct or indirect) including property damage or personal injury, consequential loss, economic loss or loss of profits, arising in contract or negligence or howsoever arising. Without limiting the foregoing James Hardie will not be liable for any claims, damages or defects arising from or in any way attributable to poor workmanship, poor design or detailing, settlement or structural movement and/or movement of materials to which the Product is attached, incorrect design of the structure, acts of God including but not limited to earthquakes, cyclones, floods or other severe weather conditions or unusual climatic conditions, efflorescence or performance of paint/coatings applied to the Product, normal wear and tear, growth of mould, mildew, fungi, bacteria, or any organism on any Product surface or Product (whether on the exposed or unexposed surfaces);

g) all warranties, conditions, liabilities and obligations other than those specified in this warranty are excluded to the fullest extent allowed by law;

h) if meeting a claim under this warranty involves re-coating of Products, there may be slight colour differences between the original and replacement Products due to the effects of weathering and variations in materials over time.

Disclaimer: The recommendations in James Hardie's literature are based on good building practice, but are not an exhaustive statement of all relevant information and are subject to conditions (c), (d), (f) and (g) above. James Hardie has tested the performance of the Stria® Cladding and CLD® Structural Cavity Batten when installed in accordance with the Stria® Cladding and CLD® Structural Cavity Batten technical specification, in accordance with the standards and verification methods required by the NZBC and those test results demonstrate the product complies with the performance criteria established by the NZBC. However, as the successful performance of the relevant system depends on numerous factors outside the control of James Hardie (e.g. quality of workmanship and design) James Hardie shall not be liable for the recommendations made in its literature and the performance of the relevant system, including its suitability for any purpose or ability to satisfy the relevant provisions of the NZBC, regulations and standards, as it is the responsibility of the building designer to ensure that the details and recommendations provided in the relevant James Hardie installation manual are suitable for the intended project and that specific design is conducted where appropriate.

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