

# STRUCTURAL ENGINEERING CONTENT

## PROCESSING TIME

Date Received and Sent to Engineer :

Due Date:

21.7.95 p.m.

1-8-95

Registration No: 3909

NAME:

HARRIS

ADDRESS:

7 RURIMA RISE

NATURE OF WORK:

NEW DWELLING

ADDITIONAL ENGINE - BIC ISSUED

Dates	24/7/95				
<u>NOT</u>	15 mins				
Total				Sub Total	
				Plus GST	
				TOTAL	

## ENGINEERS COMMENTS

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# WHAKATANE DISTRICT COUNCIL

## ENVIRONMENTAL SERVICES DEPARTMENT

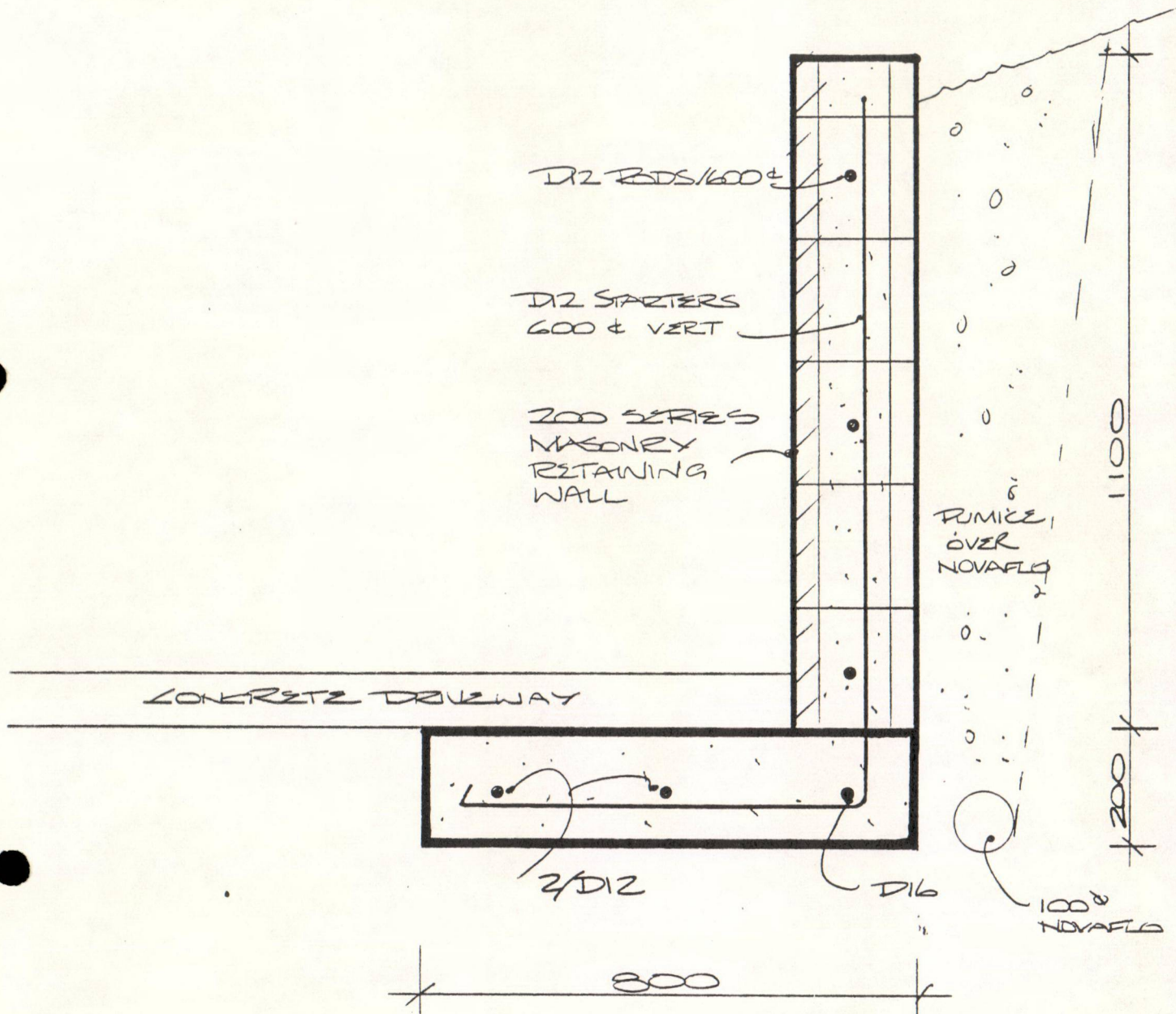
DATE: 27th August 1995 Fax No **07-3085804**  
 TO: don Bateson  
Government House  
 FAX NO: 307 14 20  
 FROM: Ross Haughey  
 RE: B.C.3909 Mr & Mrs Phil Harris

NUMBER OF PAGES (including this one) ☒ 2 (if all pages not received, please advise)

don, Re:- Proposed Boundary Retaining wall 1m High.  
after Discussion with District Inspector you  
are Requested to Provide Specific Design from  
a structural Engineer for the wall which supports a  
surcharge. Your Engineer shall also show on  
Plans Relevant to Boundary the actual ground  
heights & Building Act Barriers against Falling -  
any Questions Please get back to me -  
Ross.



Covenand Homes  
P.O. Box 373  
Whakatane.



HARRIS JOB - RURIMA RISE  
CONSTRAINTS



## FACSIMILE MESSAGE FROM

CUTFIELD CONSULTING  
CIVIL AND STRUCTURAL CONSULTING ENGINEERS

50 STRAND EAST  
TELEPHONE 07 307 1444  
FAX. No. 07 308 0239

P O BOX 37

WHAKATANE

DATE : 21 July 1995

FAX TO :

Whakatane  
District Council

ATTENTION :

Ross Haughey

FROM :

Craig Markteland

CONTENTS :

5 pages incl cover

MESSAGE :

Proposed Reservoir @ Harris  
Rurima Rise @ Coastlands

Ross,

Please find hereon the sketch  
details and calculations for the  
corner stainless tube handrail.

A copy of this has been issued  
to the contractor.

Regards

Craig Markteland

OK  
Lot  
24/7/95



CUTFIELD CONSULTING  
CIVIL AND STRUCTURAL CONSULTING ENGINEERS

50 STRAND EAST P O BOX 37 WHAKATANE  
TEL. 07 307 1444 FAX. 07 308 0239

Our file : 34545

Date : July 1995

STRUCTURAL DESIGN CALCULATIONS

for :

Proposed Residence : Harris

RIMIA RISE : COASTLANDS

CONTENTS

page

1.0 CONCRETE TUBE HANDRAIL 1



Project

Proposed Residence

Harris Rise &amp; Constlands

File

Date

By

C.D.M.

Page

1

1.0 Corner stainless tube handrail.

- Loadings.

Handrail

top edge

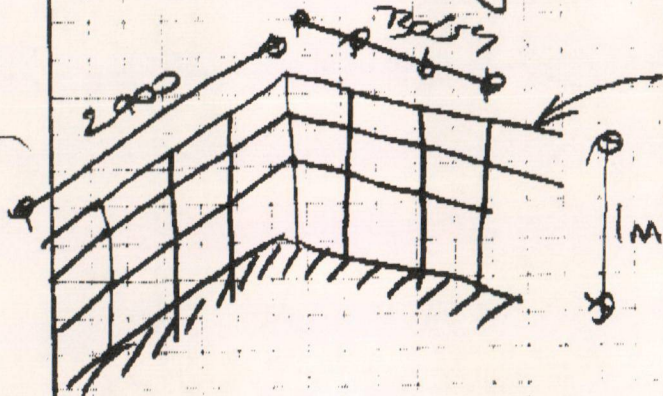
Infill

$$Q_8 = 0.36 \text{ kN/m}$$

$$Q_{15} = 0.75 \text{ kPa}$$

$$= 0.25 \text{ kN/m}$$

- handrail design.



$$38 \phi \times 2.0 \text{ mm wall}$$

$$Z = \frac{\pi}{32} \times \frac{(38^4 - 34^4)}{38}$$

$$= 1.93 \times 10^{-6} \text{ m}^3$$

$$S = 2.64 \times 10^{-6} \text{ m}^3$$

$$I = 2.86 \times 10^{-8} \text{ m}^4$$

- bending (1.60)

$$M^* = 0.75 \times 1.60 \times 0.75 \times \frac{1.0^2}{2} = 0.44 \text{ kNm}$$

$$\phi M_s = 0.90 \times \frac{2.64}{S_x} \times 210 = 0.49 \text{ kNm}$$

Member capacity ok

- deflection

$$\Delta(\text{mm}) = \frac{25 \times 10^3 \times 1.0^3}{3 \times 200 \times 10^9 \times 2.86 \times 10^{-8}} = 14.57 \text{ mm}$$

ok for handrail

$$\frac{h}{b_0} = \frac{1000}{60} = 16.67 \text{ mm}$$

Provide 38  $\phi$  x 2.0 mm stainless tube  
 balusters at 730 JS max  
 (304)



Project .....

Proposed Residence @ Harms  
Runma Rise @ Coastlands

File .....

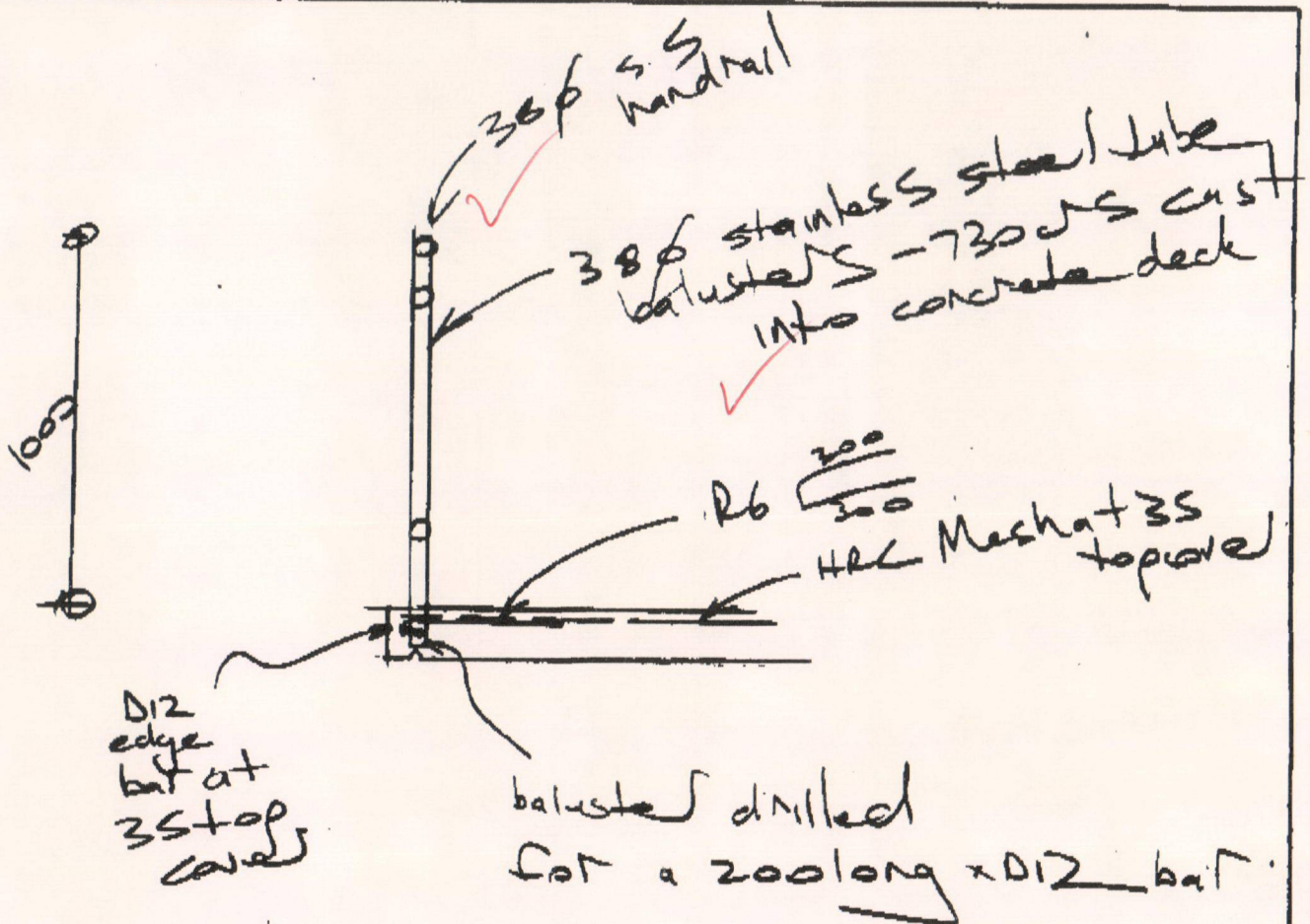
34595

Date .....

July 1995

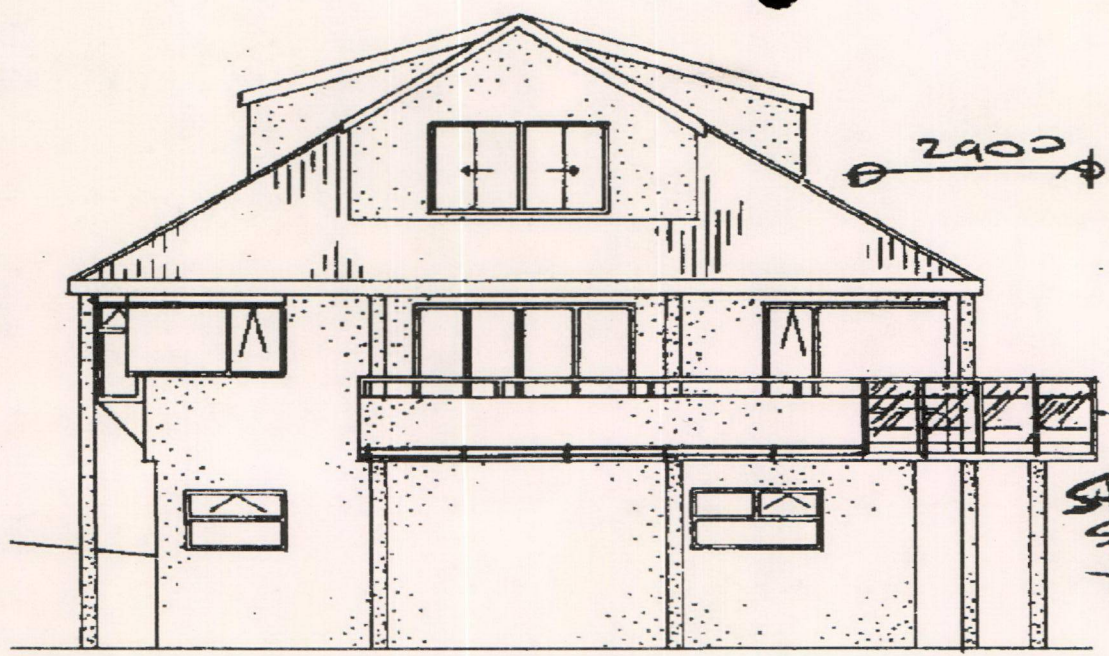
By .....

CDM Page 1

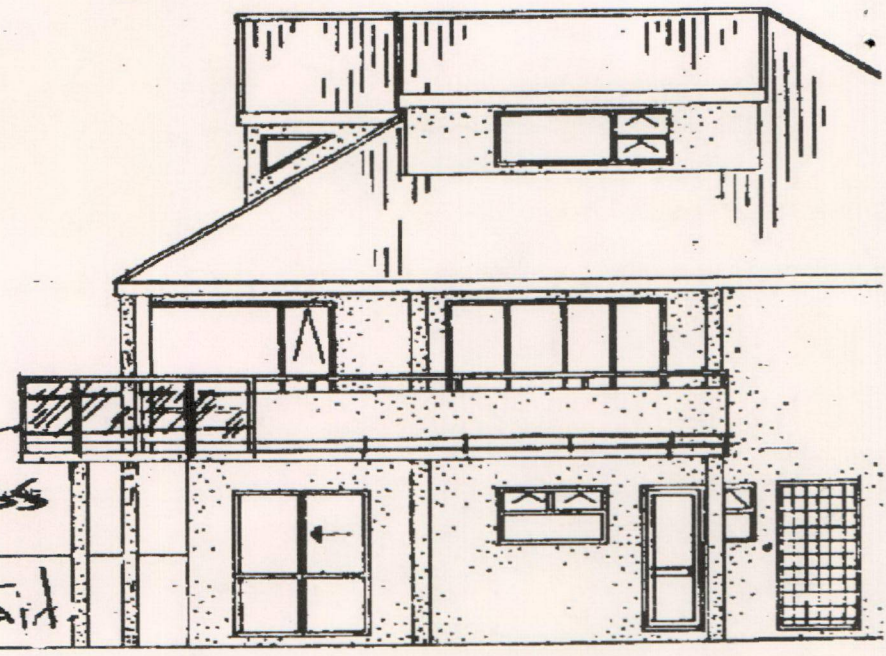


Typical Section 1:20

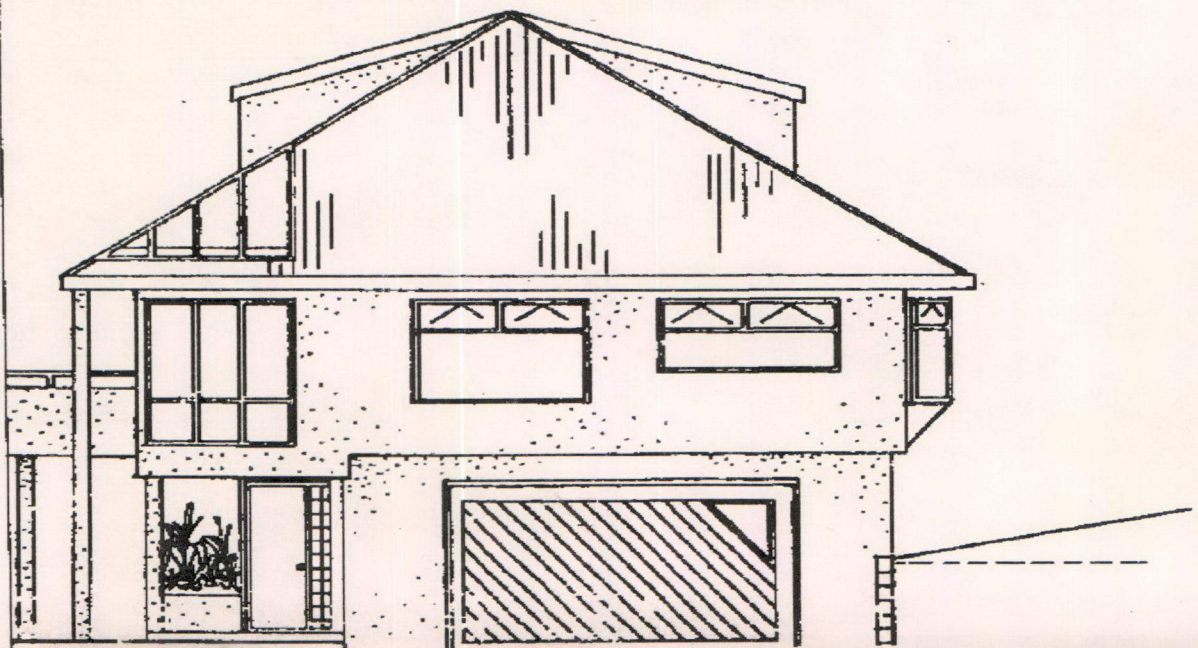




EAST



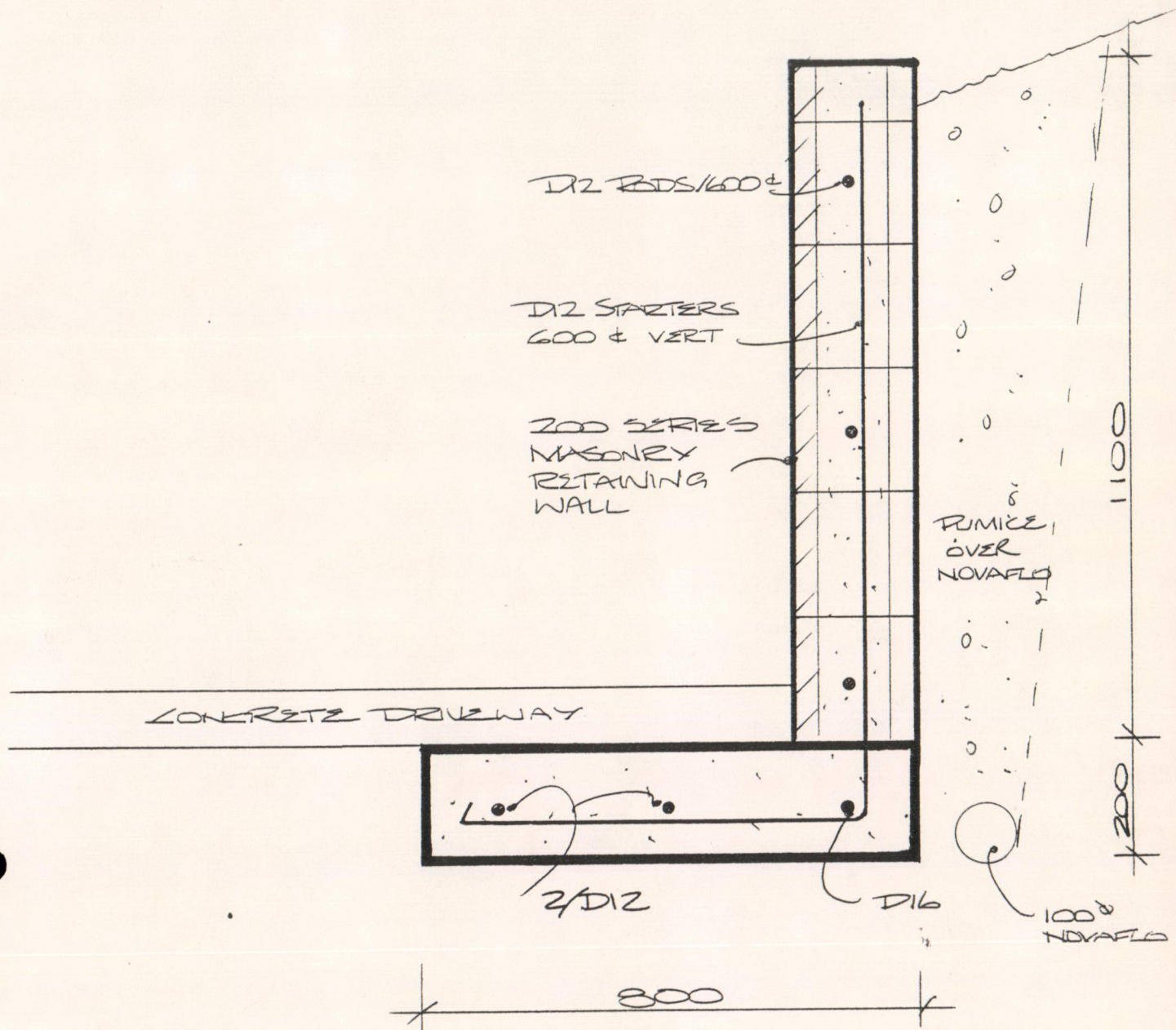
NORTH



SOUTH



Covenant Homes  
P.O. Box 378  
Whakatane.



1:10

BC3909

HARRIS JOB - RURIMA RISE  
CONSTLANDS

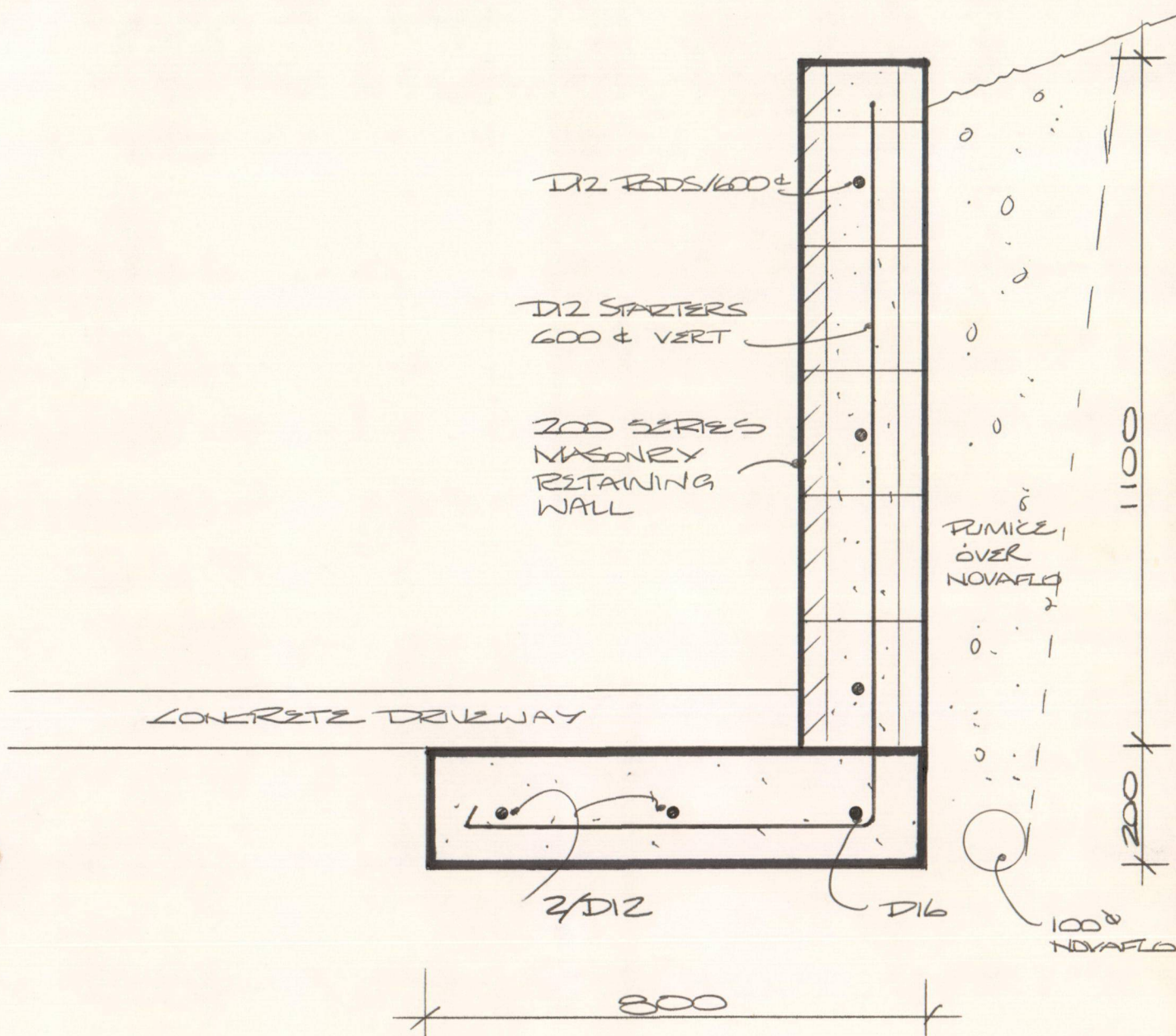






Covenant Homes  
P.O. Box 378  
Whakatane.

Phil Harris  
BC 3909.



1:10

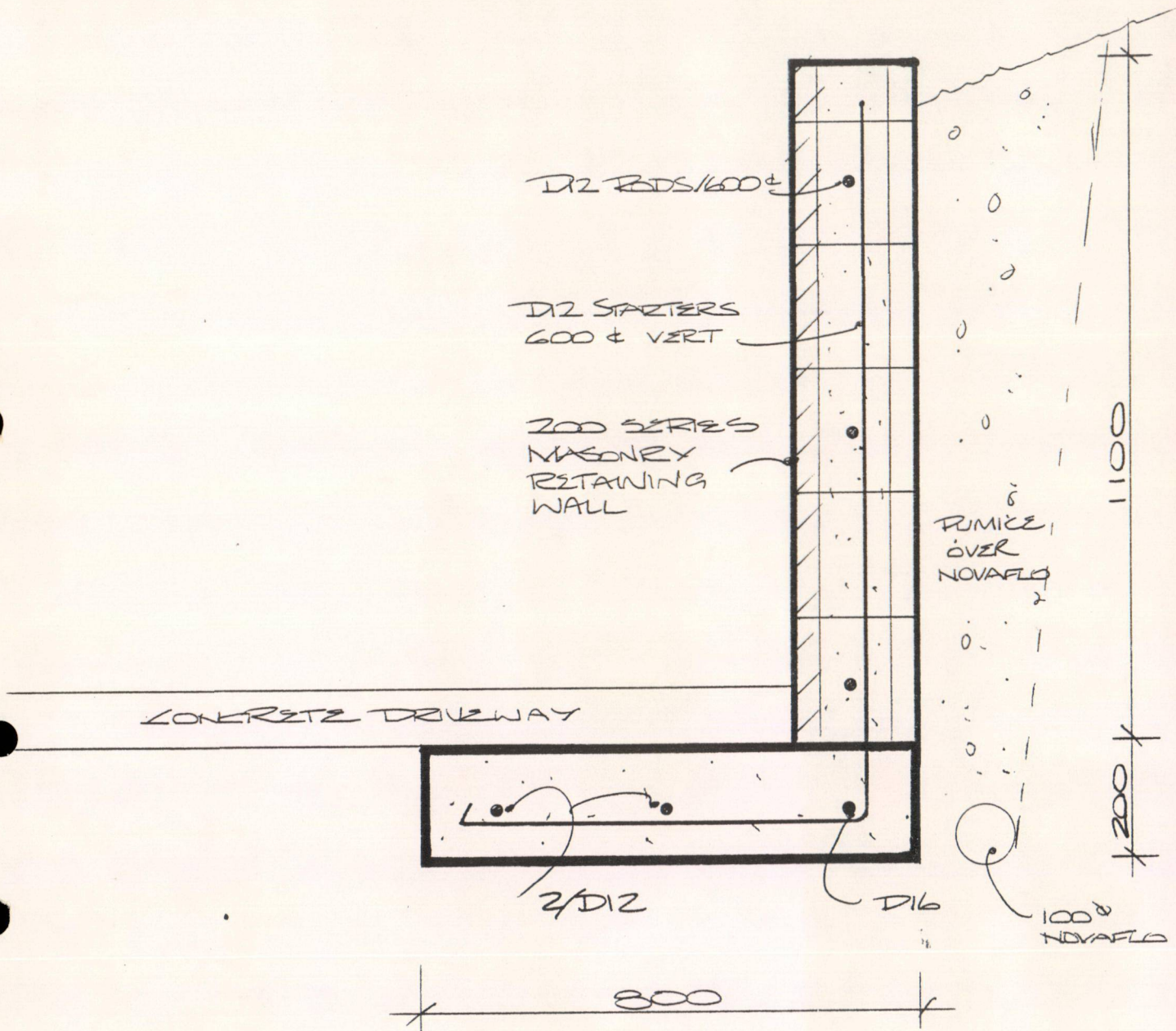
HARRIS JOB - RURIKA RISE  
COASTLANDS



Covenant Homes

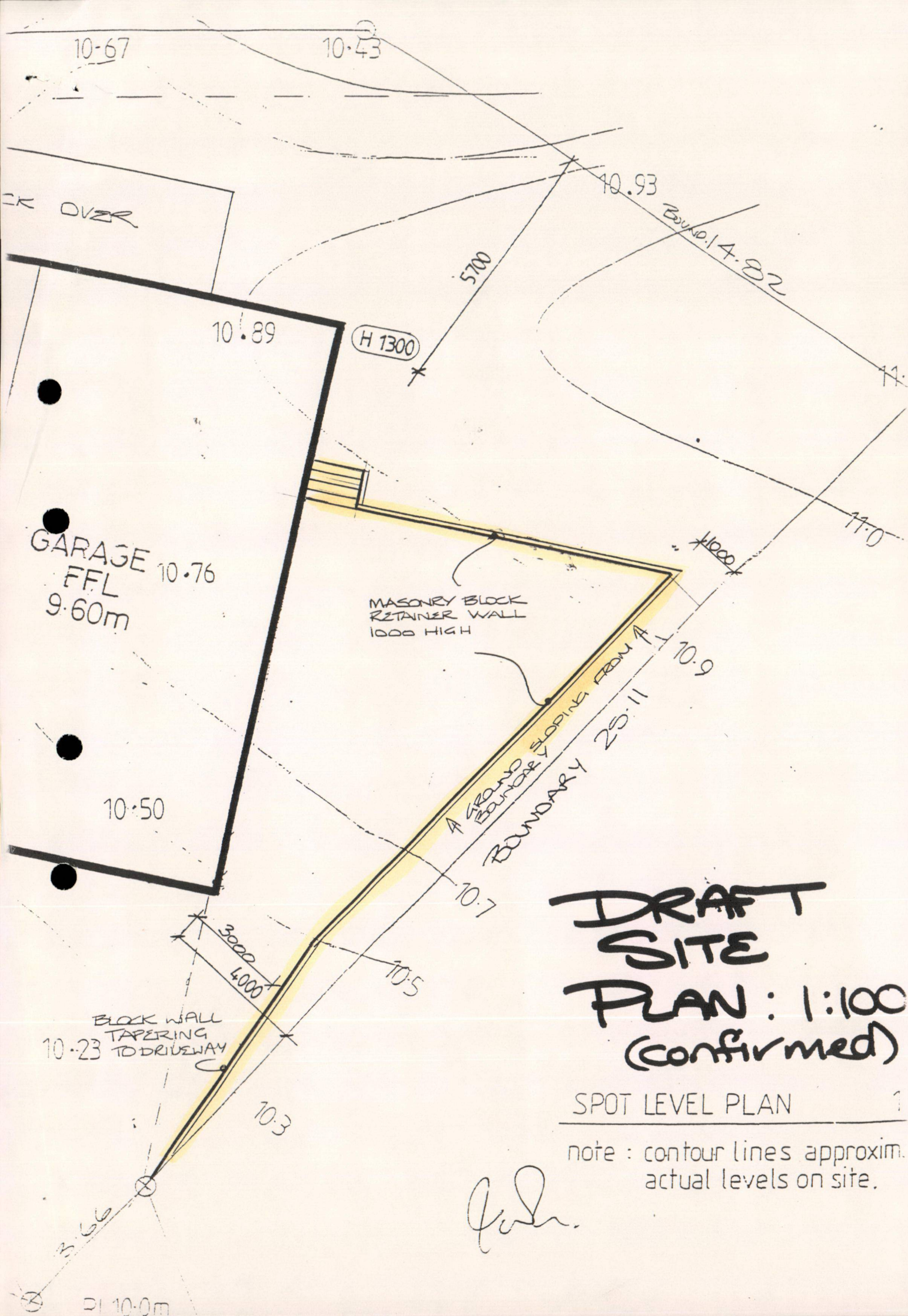
P.O. Box 378

Whakatane.



HARRIS JOB - RURI MA RISE  
CONSTRAINTS





**DRAFT  
SITE  
PLAN : 1:100  
(confirmed)**

SPOT LEVEL PLAN

note : contour lines approx.  
actual levels on site.

*John*



Received Fri 9-6-95

## STRUCTURAL ENGINEERING CONTENT

Given to Mark  
12/6/95

### TIME SPENT ON THIS APPLICATION

Due Date: 19-6-95

Registration No: 3909

NAME: HARRIS

ADDRESS: RURIMA RISE

NATURE OF WORK: Dwelling

Additional Engineering

DATES	14/6/95				
MCT	30ms				
TOTAL					

### ENGINEERS COMMENTS

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CUTFIELD CONSULTING  
CIVIL AND STRUCTURAL CONSULTING ENGINEERS

50 STRAND EAST P O BOX 37 WHAKATANE  
TEL. 07 307 1444 FAX. 07 308 0239

RECEIVED WITH THANKS  
8/6/95

Our file : 34545  
Date : June 1995

STRUCTURAL DESIGN CALCULATIONS

for :

Proposed Residence : HARRIS :  
RURIMA RISE : COASTLANDS

CONTENTS

page

With reference to our calculations  
dated April 1995

1.0 Floor BEAMS OVER GARAGE

OK/CT

14/6/95



## CONSTRUCTION NOTES

- ✓ 1. Concrete construction shall be in accordance with NZS 3109. Minimum concrete compressive strength at 28 days shall be 25 MPa for the floor slab and beam.
2. Temporary propping shall be provided for the first floor concrete beams and shall not be removed until the beams have attained its specified strength.
3. Reinforced hollow concrete masonry construction shall be in accordance with NZS 4210 for Grade B construction. The Design Engineer shall be notified at least two working days in advance of any grouting.
4. Check all dimensions on site.
5. Proprietary systems, and products, shall be installed strictly in accordance with the manufacturers' recommendations.
6. All construction shall meet the requirements of the New Zealand Building Code Approved Documents.
7. Refer Covenant homes drawings, 7 sheets, for details not shown.

Sketch Details of HARLES  
RURIMA DISTRICT COASTLANDS.

C.M.  
Ref 34695  
JUNE 1995



800 x 800

laundry  
shute

GARAGE

U-BEAM  
CAST INSITU  
CONCRETE  
BEAM

U-BEAM

2300 x 4800 tilt door

STEPS.

BEDROOM 4  
3.8 x 3.6 m

760

760

900  
760  
shower

BATH

WC

710

710

dry

LAUNDRY

19

760

WM

ENTRY

glass  
blocks

2000



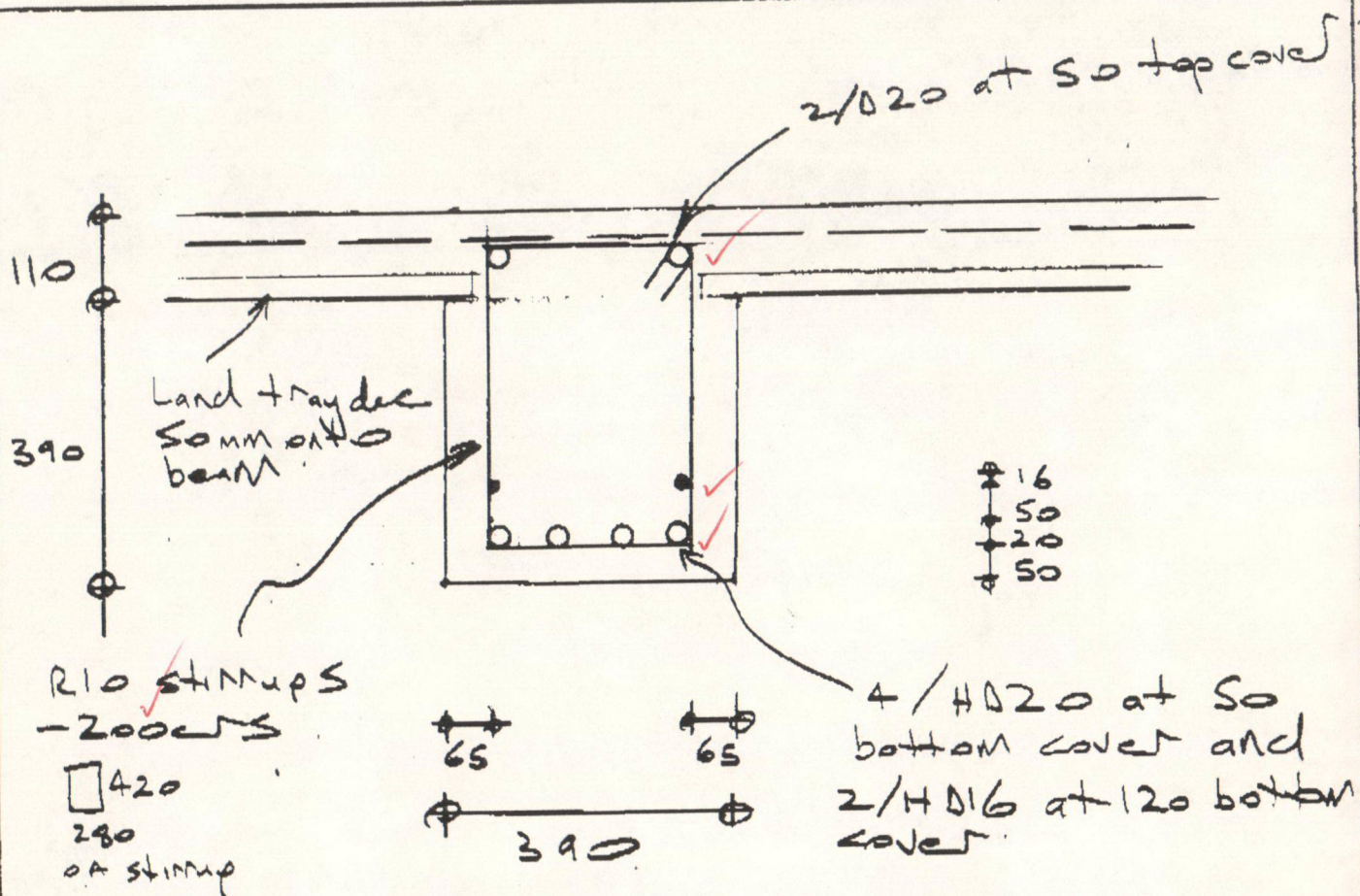
Project .....

File .....

Date .....

By .....

Page 1



Minimum laps (lap and tie)

HD20 = 1450 mm

HD16 = 1150 mm

Ø20 = 1000 mm

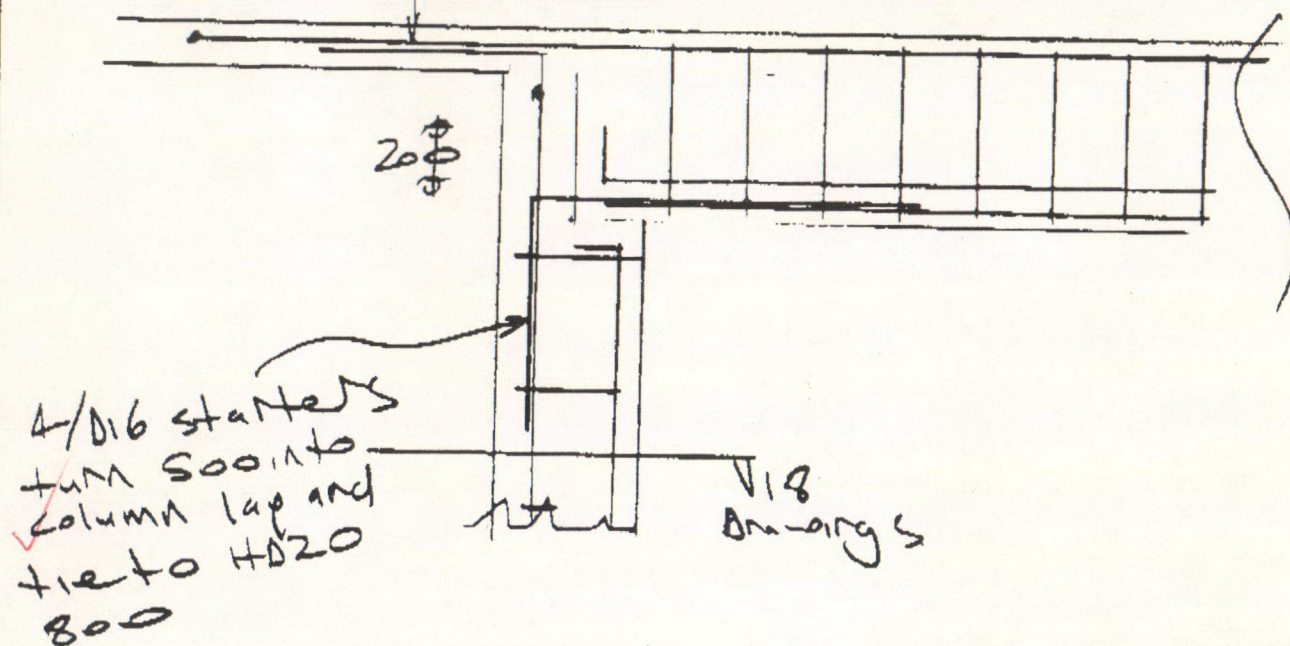
Section A 1:10

CAST IN SITU CONCRETE BEAM

Section B similar to above except only 4/HD20 at 50 bottom cover



2/020 esotop cable  
extend 800 past support  
turn 200 at ends. (turn 800 into wall  
on external wall)



Section C 1:20

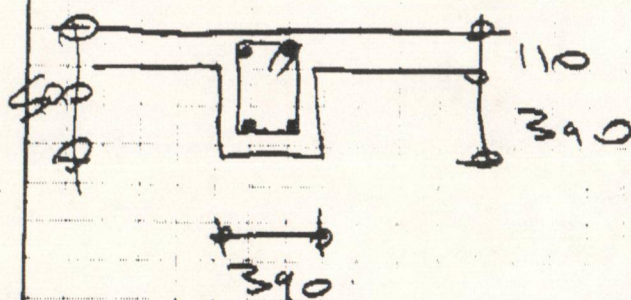


## Runima Rise / Coastlands

## Floor Beam over Garage

with reference to our calculations dated April 1995.

It is proposed to substitute the ~~steel~~ beam with a cast in situ concrete beam.



Page 18 of our above calculations  
for beam loading

$$S_{pl} = 6.60$$

$$(6 + a) \sim = 19.64(6) + 12.45(a) = 32.09 \text{ kN}$$

$$(1.26 + 1.6a) \sim = 43.49 \text{ kN}$$

flexure

$$M^* = \frac{43.49 \times 6.60^2}{8} = 236.79 \text{ kNm}$$

$$\phi = 0.85$$

$$A_{sny} = 2155.75 \text{ mm}^2$$

too high

$$A_{sry} = 1504.01 \text{ mm}^2$$

$$b = 1650 \text{ mm}$$

$$d = 440 \text{ mm}$$

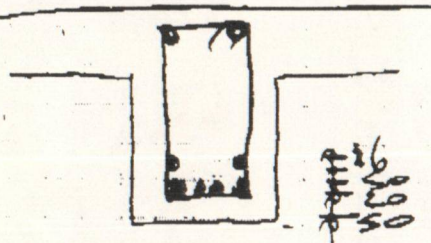
$$f_c = 25 \text{ MPa}$$

$$f_y = 300 \text{ MPa}$$

$$\phi = 0.85 \text{ flexure}$$

$$f_y = 430 \text{ MPa}$$

$$1636 \text{ mm}^2 \text{ reqd.}$$



$$A_{sry} = 1600.50 \text{ mm}^2$$

$$d = 405$$

$$A_s 4 \times 420 + 2 \times 40.6 = 1658.76 \text{ mm}^2 \therefore \text{ok}$$



- shear

$$V_u = 43.49 \times (3.30 - 0.405) = 125.90 \text{ kN}$$

$$\frac{V_u}{A_{bs}} = \frac{125.90 \times 10^3}{0.80 \times 340 \times 405} = 1.00 \text{ MPa}$$

$$V_c = (0.07 + 100 \rho) \sqrt{f_c}$$

$$= 0.88 \text{ MPa}$$

$$A_{sreq} = 0.35 b_w d$$

$$= 11 \text{ mm}^2$$

$$A_{s10} = 157.08 \text{ mm}^2$$

$$C_w = \frac{165876}{340 \times 405}$$

$$= 1.05 \times 10^{-2}$$

$$f_c = 300 \text{ MPa}$$

$$f_t = 200 \text{ MPa}$$

Provide  $340 \times 340$  floor beam with  
 4/H020 + 2/H016 bars at so bottom  
 cover to H020 with so spacing to  
 H016 bars with a 110 slab over

R10 stirrups - 200 ✓

$$V_{smin} = 0.35 b_w d$$

$$= 60.1 \text{ kN} \quad \text{ok}$$

check  $\leq 80 \text{ m}$  span

- flexure

$$M^* = 43.49 \times 5.80^2 = 182.88 \text{ kNm}$$

$$A_{s10} = 1158.52 \text{ mm}^2 \quad 1263 \text{ mm}^2$$

$$A_{s \text{ H020}} = 1256.64 \text{ mm}^2$$

$$b = 1450$$

$$d = 440$$

$$f_c = 30 \text{ MPa}$$

$$f_t = 25 \text{ MPa}$$

Provide  $340 \times 340$  beam with 4/H020  
 and R10 stirrups - 200 ✓



CUTFIELD CONSULTING  
CIVIL AND STRUCTURAL CONSULTING ENGINEERS

50 STRAND EAST P O BOX 37 WHAKATANE  
TEL. 07 307 1444 FAX. 07 308 0239

RECEIVED WITH THANKS

8/6/95

Our file : 34545

Date : June 1995

STRUCTURAL DESIGN CALCULATIONS

for :

Proposed Residence : HARRIS :  
RURIMA RISE : COASTLANDS :

CONTENTS

page

With reference to our calculations  
dated April 1995

1.0 Floor BEAMS OVER GARAGE



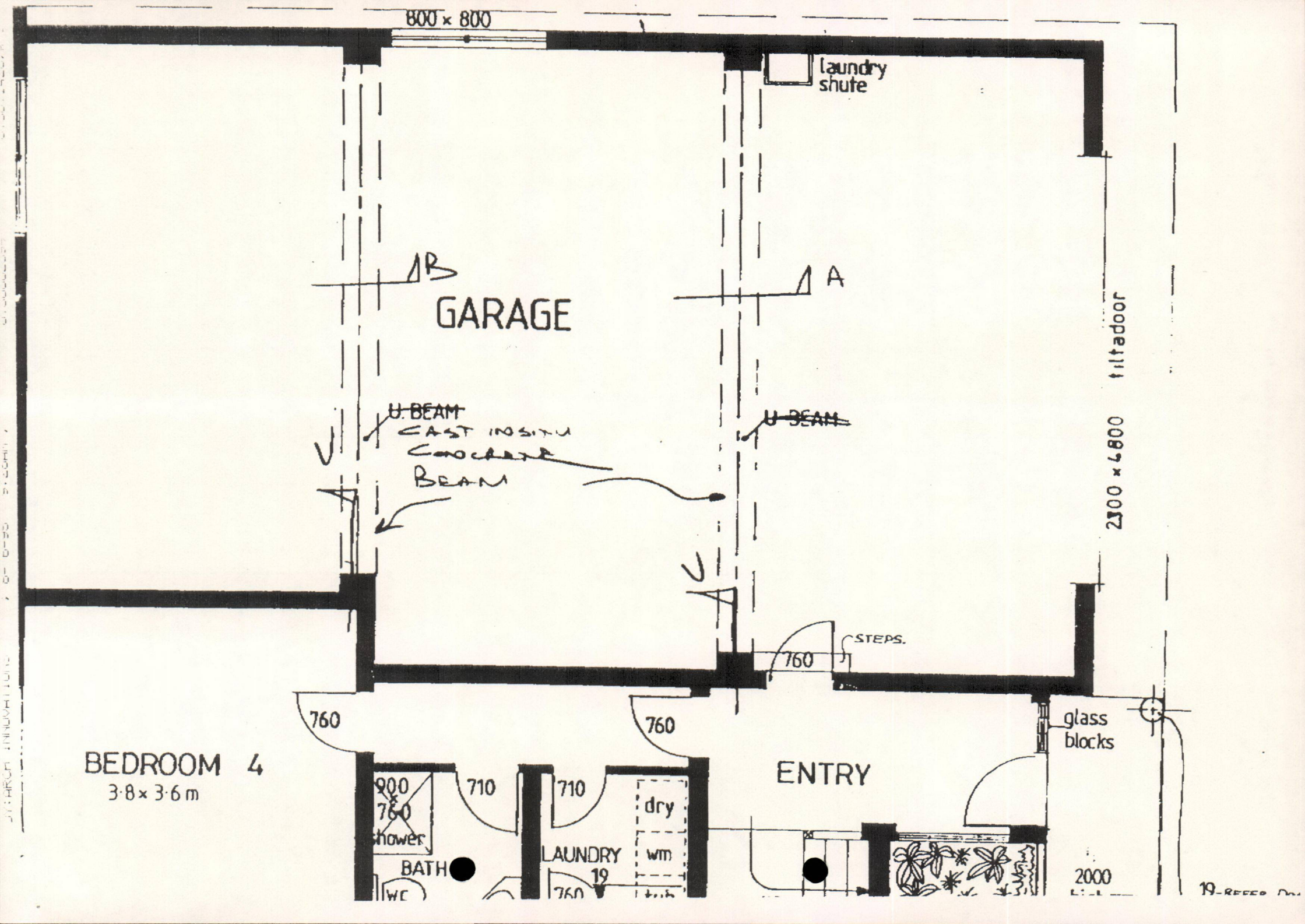
## CONSTRUCTION NOTES

1. Concrete construction shall be in accordance with NZS 3109. Minimum concrete compressive strength at 28 days shall be 25 MPa for the floor slab and beam.
2. Temporary propping shall be provided for the first floor concrete beams and shall not be removed until the beams have attained its specified strength.
3. Reinforced hollow concrete masonry construction shall be in accordance with NZS 4210 for Grade B construction. The Design Engineer shall be notified at least two working days in advance of any grouting.
4. Check all dimensions on site.
5. Proprietary systems, and products, shall be installed strictly in accordance with the manufacturers' recommendations.
6. All construction shall meet the requirements of the New Zealand Building Code Approved Documents.
7. Refer Covenant homes drawings. 7 sheets. for details not shown.

Sketch Details : HALLS  
RURIMA DIST : COASTLANDS.

C.M.  
Ref 34595  
JUN 21 1995







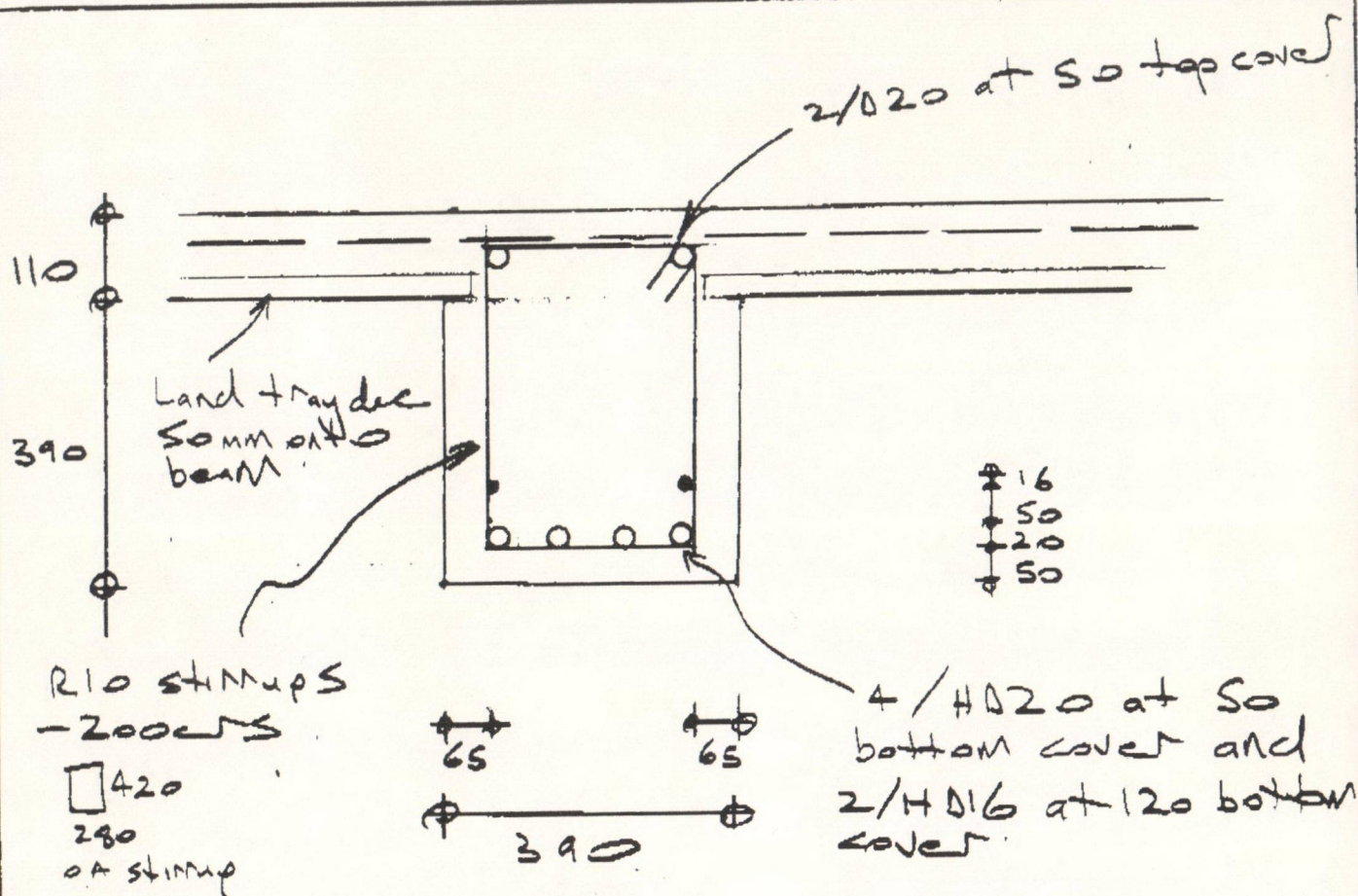
Project .....

File .....

Date .....

By .....

Page 1



Minimum laps (lap and tie)

Ø20 = 1450 mm

Ø16 = 1150 mm

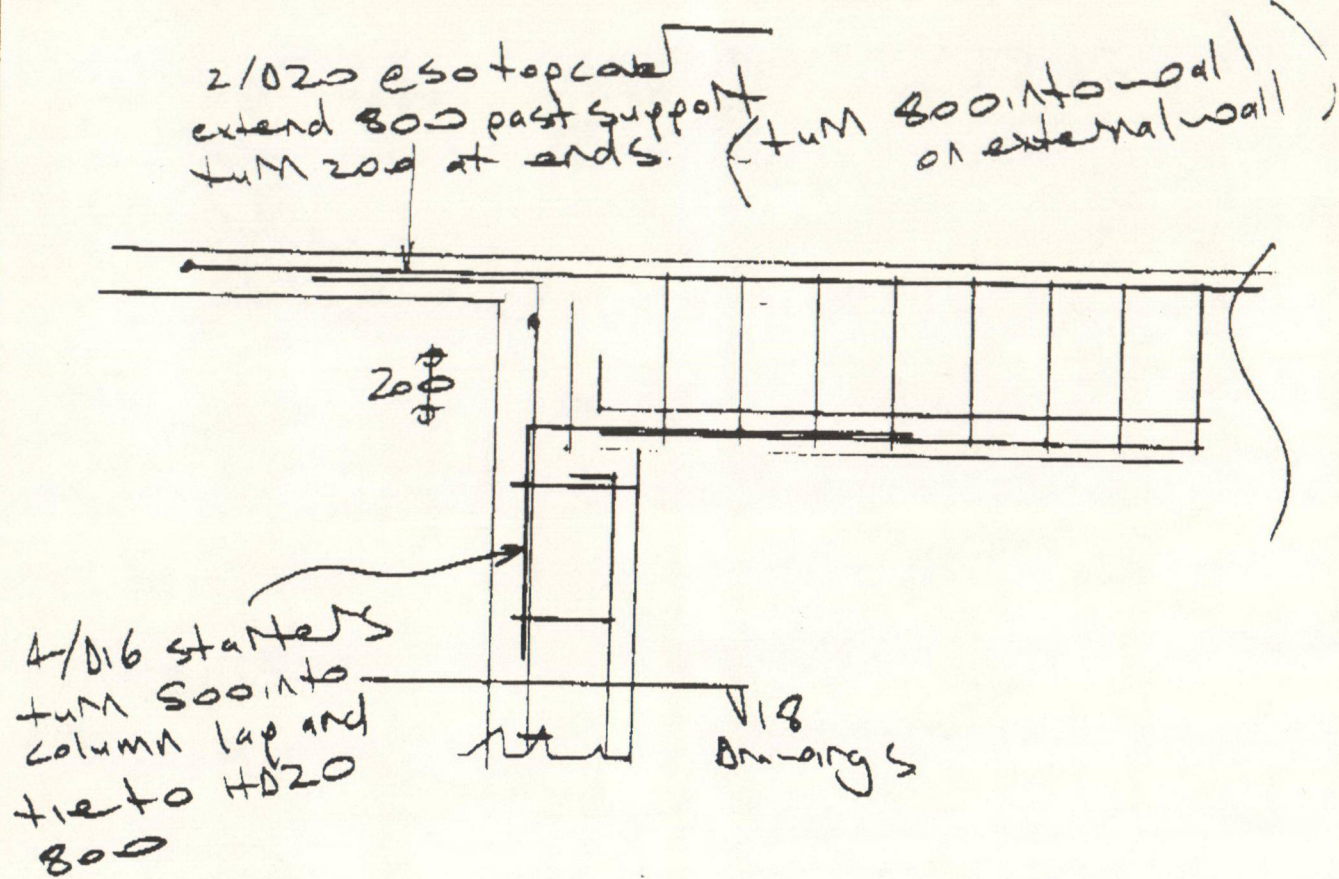
Ø20 = 1000 mm

Section A 1:10

CAST IN-SITU CONCRETE BEAM

Section B similar to above  
except only 4/Ø20 at 50 bottom  
cover





Section C 1:20



11/0/01

Runima Rise, Coastlands

File 54347

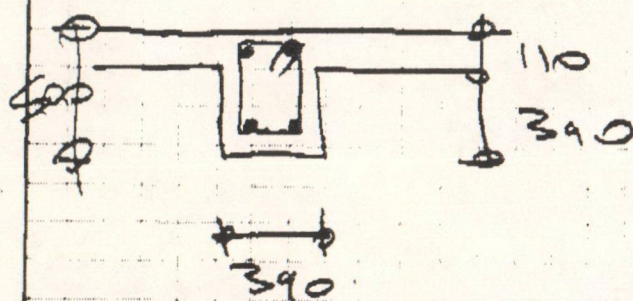
Date June 1995

By CDM Page 1

Floor Beam over Garage

with reference to our calculations dated April 1995.

It is proposed to substitute the fifth steel beam with a cast in situ concrete beam.

Page 18 of our above calculations  
for beam loading

$$S_{pl} = 660$$

$$(6 + a) \sim = 19.64(6) + 12.45(a) = 32.09 \text{ kN}$$

$$(1.26 + 1.6a) \sim = 43.49 \text{ kN}$$

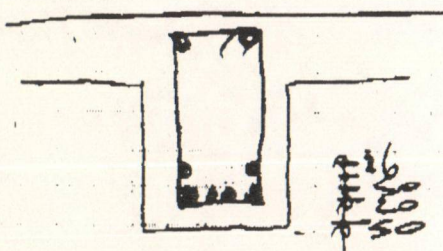
flexure

$$M^* = \frac{43.49 \times 6.60^2}{8} = 236.79 \text{ kNm}$$

$$A_{sny} = 2155.75 \text{ mm}^2$$

too high

$$A_{sry} = 1504.01 \text{ mm}^2$$



$$b = 1650 \text{ mm}$$

$$d = 440 \text{ mm}$$

$$f_c = 25 \text{ MPa}$$

$$f_y = 300 \text{ MPa}$$

$$\alpha = 0.85 \text{ flexure}$$

$$f_y = 430 \text{ MPa}$$

$$A_{sry} = 1620.50 \text{ mm}^2$$

$$d = 405$$

$$A_s = 4 \times 1020 + 2 \times 401.6 = 1658.76 \text{ mm}^2 \therefore \text{OK}$$



- shear

$$V_u = 43.49 \times (3.30 - 0.405) = 125.90 \text{ kN}$$

$$\frac{V_u}{b d} = \frac{125.90 \times 10^3}{0.80 \times 340 \times 405} = 1.00 \text{ MPa}$$

$$\tau_c = (0.07 + 100 \rho) \sqrt{f_c}$$

$$= 0.88 \text{ MPa}$$

$$A_{sreq} = 0.35 b d$$

$$= 11 \text{ mm}^2$$

$$A_{s10} = 157.08 \text{ mm}^2$$

$$C_w = \frac{165876}{340 \times 405}$$

$$= 1.05 \times 10^{-2}$$

$$f_y = 300 \text{ MPa}$$

$$f_c = 200 \text{ MPa}$$

Provide 340x340 floor beam with

4/H020 + 2/H016 bars at so bottom

cover to H020 with so spacing to

H016 bars with a 110 slab over

R10 stirrups - 200 JS

Check 5.80 m span

- flexure

$$M^* = 43.49 \times 5.80^2 = 182.88 \text{ kNm}$$

$$A_{sreq} = 1156.52 \text{ mm}^2$$

$$A_s \text{ of H020} = 1256.64 \text{ mm}^2$$

$$b = 340$$

$$d = 440$$

$$f_y = 300 \text{ MPa}$$

$$f_c = 25 \text{ MPa}$$

Provide 340x340 beam with 4/H020

and R10 stirrups - 200 JS



# STRUCTURAL ENGINEERING CONTENT

## TIME SPENT ON THIS APPLICATION

10/5/95

Due Date: 24.5.95

Registration No: 3909

NAME: HARRIS

ADDRESS: 7 Rurima Rise

NATURE OF WORK: Dwelling

DATES	23/5				Totals
BSC	2 hrs.			\$	120
				GST	15
TOTAL					\$135

### ENGINEERS COMMENTS

OK.



# RETAINING WALL DESIGN

H= 1.30 L= 2.70 pg= 12.00 c'= 35.00  
w'= 0.00 P1= 0.00 h1= 0.00 S= 0.00

3.14 0.82 1.00 0.33 ka= 0.27  
Pa= 4.12 P= 0.00

Pure Cantilever Ma= -1.79 mPh= 0.00  
@h= 2.00  
Mh= 0.28

mPa= -1.20 mPs= 0.00 mPh= 0.00  
rPa= 0.22 rPs= 0.00 rPh= 0.00

Propped Cantilever Ma= -1.20  
Rb= 0.22 mP= 1.79 mPh= 0.00 mRb= 0.22  
@h= 0.00  
Mh= -1.20

Formula:  $(c10*c5/3+f10*c5/2+f6*16)*-1$

retwall \* c12

## 1 FOOTING DESIGN

Dimensions b = 1.00  
(m) L = 0.60  
lw = 0.60  
fr = 0.00  
bw = 0.00

Imposed Loads  
(kN)

G 10.80 0.00 0.09  
G 2.88 0.00 0.30  
G 0.00 0.00 0.00  
G 0.00 0.00 0.00

Stem moment Ma = -1.79 (kNm) imposed

11(G)stabilising Ms = 1.89 (moments about y=0, for +ve Ma)

12(G)stabilising Ms = 6.32 (moments about v=L, for -ve Ma)

for factored loads:

G 1.00 0.00 1.00

15load resultant R1 = 13.68 kN @ 0.27(y1)

16 soil bearing @y = 0.00 m is 29.87 kPa 3 "Error" signals  
17 @v = 0.60 m is 15.73 kPa 3 -ve bearing,

20 if "Error" signals -ve bearing, then guess zero pressure point (yo)  
21 and compare bearing resultant (R1) with load resultant(R1) above

22 trial yo = 0.22 for triangular distribution. 2.54  
23 pa = 13.44 @v= 0.60 and R1= foot \* qE





# WHAKATANE DISTRICT COUNCIL

*Inspectors*

## ENVIRONMENTAL SERVICES DEPARTMENT

DATE: 12th June 1995 Fax No 07-3085804  
 TO: Mr & Mrs Phil Harris  
of Vally Road Panelbeaters  
 FAX NO: 308-8517  
 FROM: Ross Haughey Building Officer  
 RE: Proposed new Dwelling 7 Huruma Rise, Coastlands  
 NUMBER OF PAGES (including this one) 3 (if all pages not received, please advise)

*Please find information affecting a stop work  
 on site until approved by WDC Inspectors.  
 Main copy is also posted to your box No.*

*Ross Haughey*

### MEMORANDUM

Address all letters to:  
 THE GENERAL MANAGER, WHAKATANE DISTRICT COUNCIL, PRIVATE BAG 1002, WHAKATANE 3080

TEL: 07-307-9600  
 FAX: 07-3085804

## TRANSMISSION REPORT

THIS DOCUMENT WAS CONFIRMED  
 (REDUCED SAMPLE ABOVE - SEE DETAILS BELOW)

### \*\* COUNT \*\*

TOTAL PAGES SCANNED : 3  
 TOTAL PAGES CONFIRMED : 3

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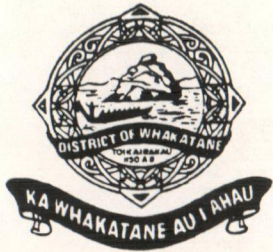
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TOTAL 0:02'50" 3

### NOTE:

No. : OPERATION NUMBER 48 : 4800BPS SELECTED EC : ERROR CORRECT G2 : G2 COMMUNICATION  
 PD : POLLED BY REMOTE SF : STORE & FORWARD RI : RELAY INITIATE RS : RELAY STATION  
 MB : SEND TO MAILBOX PG : POLLING A REMOTE MP : MULTI-POLLING RM : RECEIVE TO MEMORY





# WHAKATANE DISTRICT COUNCIL

## ENVIRONMENTAL SERVICES DEPARTMENT

DATE: 12 June 1995 Fax No **07-3085804**  
TO: Alon Bateson  
of Government Homes  
FAX NO: 307-1420  
FROM: Ross Haughey  
RE: Phil Harris 7 Rurima Rise Coastlands

NUMBER OF PAGES (including this one) 3 (if all pages not received, please advise)

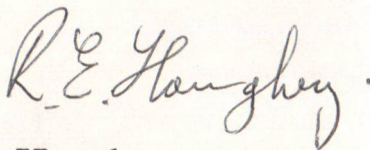
Alon, as discussed this morning - also copy to Box No.  
Ross.



# PARTICULARS OF CONTRAVENTION

## BUILDING CONSENT NO.3909

- 1 Concrete floor poured without the required inspection by Whakatane District Council.
- 2 Provide evidence of compliance with the New Zealand Building Act 1991.
- 3 Provide proof of steel content and placement of reinforcement steel within the floor slab.
- 4 Provide copies of all concrete delivered documents.



**R Haughey**  
**BUILDING INSPECTOR**



# NOTICE TO RECTIFY BUILDING WORK NO. R3909

*Section 42, Building Act 1991*

Issued by **Whakatane District Council**

To: Mr & Mrs Phill Harris  
And Covenant Homes Limited  
Building Consent No 3909

PROJECT	PROJECT LOCATION
NEW OR RELOCATED BUILDING <input checked="" type="checkbox"/>	STREET ADDRESS: 7 Rurima Rise Coastlands Whakatane
Intended use: Dwelling	LEGAL DESCRIPTION: LOT 52 DPS 27360 V/R No 7111/187/00
Intended life: Indefinite but not less than 50 years <input checked="" type="checkbox"/>	

You are hereby notified to rectify building work on the project described above that was not done in accordance with the Building Act 1991 or the building code, as detailed in the attached page headed "Particulars of Contravention".

You are also notified that building work, except for work necessary to properly secure and protect the building and to keep the site in a safe condition, is to cease forthwith on:-

☒ the entire project.

Signed for and on behalf of the Council:

*R E Haughey*

R Haughey  
BUILDING INSPECTOR



# HARRIS - BC

o columns

- ① Eng. design
- retaining walls + footings
  - ~~prestressed slab, shell beams~~
  - full height masonry walls + lintels
  - cantilevered lintel
  - 150 UB 18, 180 UB 22.2.
  - ~~deck~~ 1st floor beams supporting attic o beam connections
  - 300 x 100 beam - master bedroom
  - ~~alum balustrading~~ unless approved prior.

info requested  
contact Home  
23/5.

- \* ② Bed + (Basement)
- ~~drag + line~~ - insulation advised 24/5

③ ~~Insulation details~~

③ ~~Design for trusses - e.g. top chord/rafter.~~



Harris -

Glenn Connell 19/5/95

- (1) Details required under safety of use for Laundry chute -  
P. 50 shows 3.5m basement & needs to Wardrobe? -
- (2) Retaining wall - P. 11 E2/AS1 5.22 Geotextile Filter Fabric
- (3) Stairs D1/AS1 P. 10 & 11  $13 \div 2.5m = 0.192$   $11R \div 2.3m = 0.209$
- (4) Blue glass corners: (1) Kitchen (2) <sup>5mm concealed</sup> Dining window seat Landing  
Stairs & Handrails Particularly where glass is - falling -
- (5) in Bathrooms - vent the Light/Fan/Heater -  
also Hot water cylinder seismic straps Req - Put in spec with Temping V
- is Bracing - why in spec is Table 1 crossed out - & yet it is Handwritten Bracing  
no Bracing for attic floor level?



- d) Be laid on a surface which is unlikely to damage the vapour barrier being used, and
- e) Have penetrations by services, reinforcing or other objects, sealed by taping, or by the application of a wet-applied vapour barrier material.

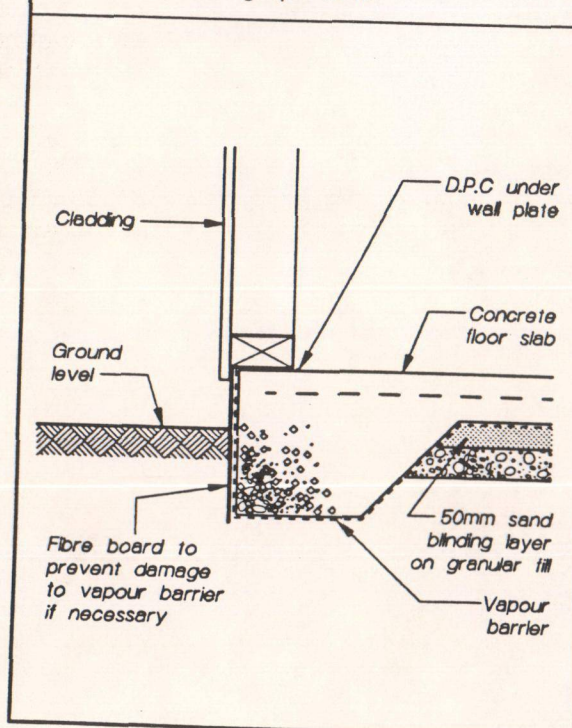
**4.2.4** The materials listed in Paragraph 5.1.3 are acceptable vapour barriers for concrete floor slabs.

#### 4.2.5 Floor level

The height of the finished floor level above adjacent ground shall be no less than:

- a) For masonry veneer wall claddings
  - 100 mm if ground permanently paved
  - 150 mm if unpaved.
- b) For cladding other than masonry
  - 150 mm if ground permanently paved
  - 225 mm if unpaved

**Figure 5: Laying of vapour barriers**  
Paragraph 4.2.3



## 5.0 BASEMENTS

**5.0.1** Water or water vapour shall be prevented from penetrating to the interior face of basement retaining walls. An acceptable solution is the provision of a vapour barrier against the exterior face of the walls, and drainage at the base of the walls as shown in Figure 6.

### 5.1 Vapour barriers

**5.1.1** The floor and wall vapour barriers shall be continuous to ensure effective tanking of the buried part of the building.

**5.1.2** The vapour barrier material shall:

- a) Have a vapour flow resistance of no less than 90 MN s/g,
- b) Have all joints and penetrations sealed, and
- c) Be adequately protected against damage during backfilling.

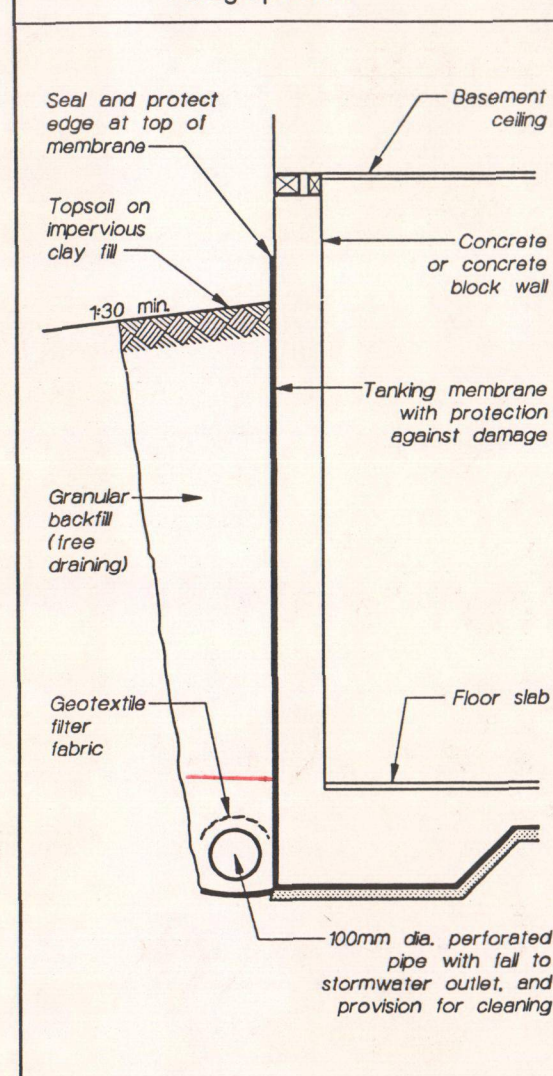
**5.1.3** The following are acceptable vapour barrier materials:

- a) Mastic asphalt complying with BS 6925, and which is applied in at least two layers to give a membrane thickness of no less than 30 mm under floor slabs and 20 mm on walls.
- b) Modified bituminous sheet comprising modified bitumen on a polyethylene backing, with or without layers of fabric reinforcement.
- c) Synthetic rubber sheet.
- d) Polyethylene sheet having a minimum thickness of 0.25 mm.
- e) Liquid coatings, such as bitumen or tar emulsions, and those based on epoxies or urethanes.

### 5.2 Drainage

**5.2.1** Subsoil drainage shall be provided to divert groundwater from behind the basement wall, to a drain beyond the building.

**Figure 6: Basement waterproofing**  
Paragraph 5.0.1



**5.2.2** The subsoil drainage system shall:

- a) Use a pipe of at least 100 mm diameter, with openings to collect water. (A proprietary geotextile drainage system of similar capacity may be a suitable alternative),
- b) Have the subsoil pipe at the base of the wall,
- c) Incorporate a geotextile fabric or other filter material to prevent silting of the pipe,
- d) Have access for cleaning the subsoil pipe, and
- e) Have for the height of the buried wall, free draining backfill above the pipe.

## 6.0 CONSTRUCTION MOISTURE

**6.0.1** Moisture contained in the building structure at completion of construction, shall not be permitted to damage the building elements. Construction moisture includes the moisture contained in:

- a) Timber products as a result of a treatment or manufacturing process,
- b) Timber or other materials as a result of exposure to the weather, and
- c) Concrete, mortar or plaster which is not completely cured.

**6.0.2** Maximum acceptable moisture contents are:

- a) For timber framing at the time of installing interior linings; 24 % for insulated buildings, or 30 % for uninsulated buildings.

**Comment:**

Some lining manufacturers recommend lower moisture contents where their products are being used.

- b) For timber weatherboards and exterior joinery at the time of painting, 20 %.

- c) For reconstituted wood products, 15 % at all times.

- d) For concrete floors at the time of laying fixed floor coverings – sufficiently dry to give a relative humidity reading of less than 75 %.

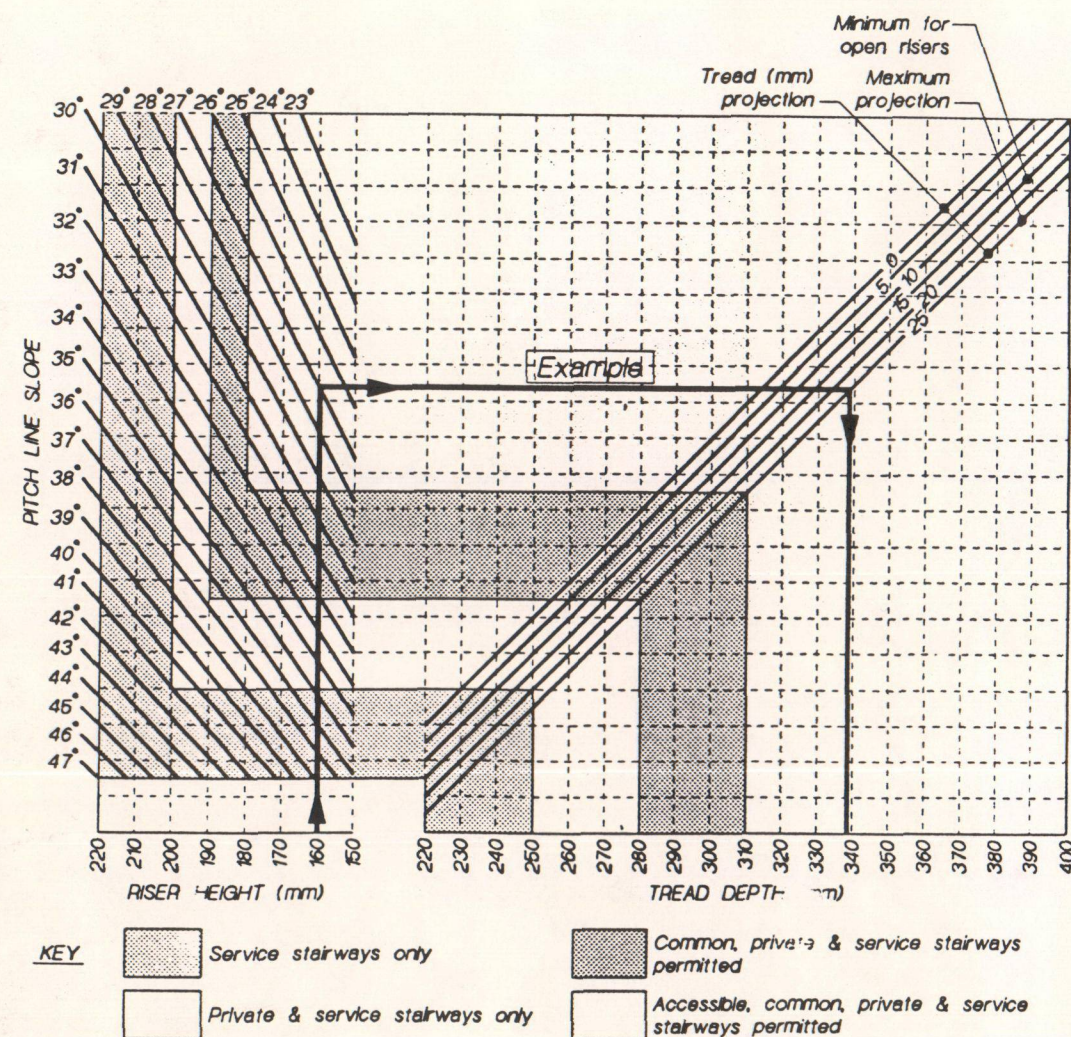
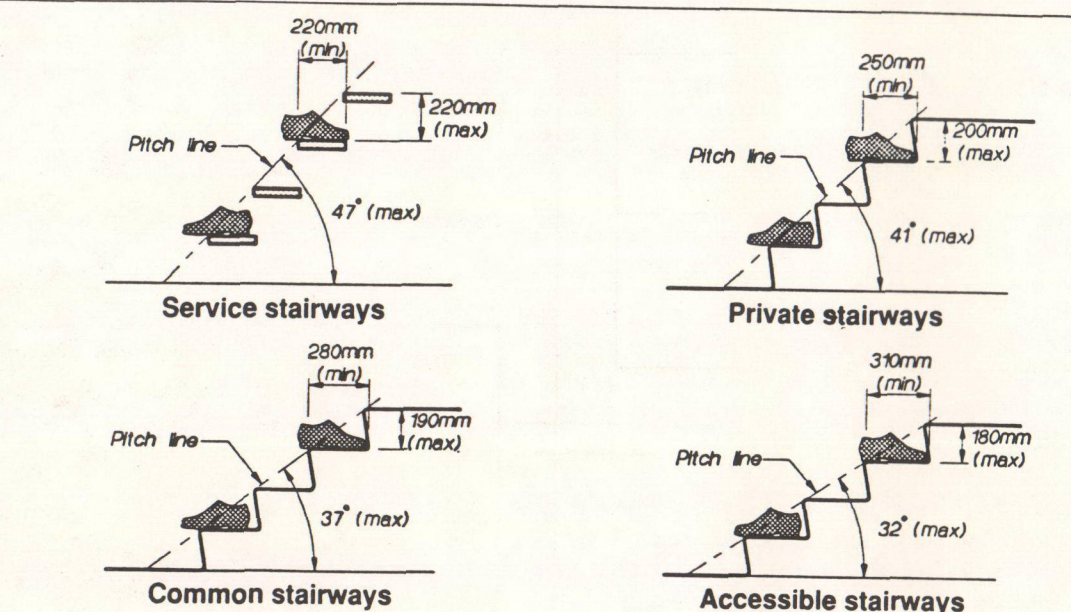
**Comment:**

A method of measuring the moisture content of concrete floor slabs is given in BRANZ Bulletin 223.



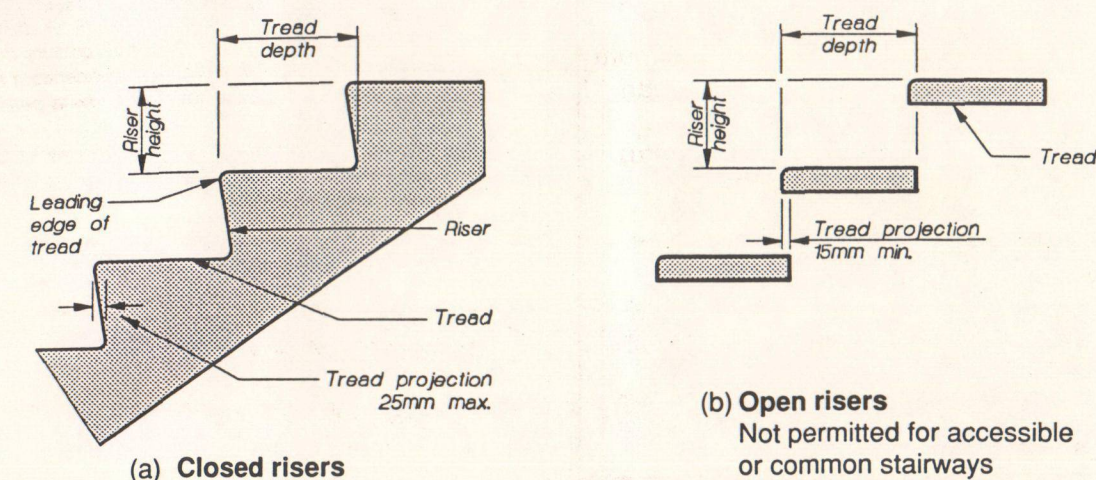
2.670 2.520 168  
178 - 14 = 180

Figure 11: Pitch, risers and treads for stairs  
Paragraphs 4.1.1, 4.1.4, 4.4.2 and Figure 17



**Example of accessible stairway**  
For a riser height of 160 mm, pitch line slope of 27°, and tread projection of 25 mm, the design tread depth is 340 mm.

Figure 12: Measurement of rise and tread depth  
Paragraphs 4.1.2 and 4.1.6



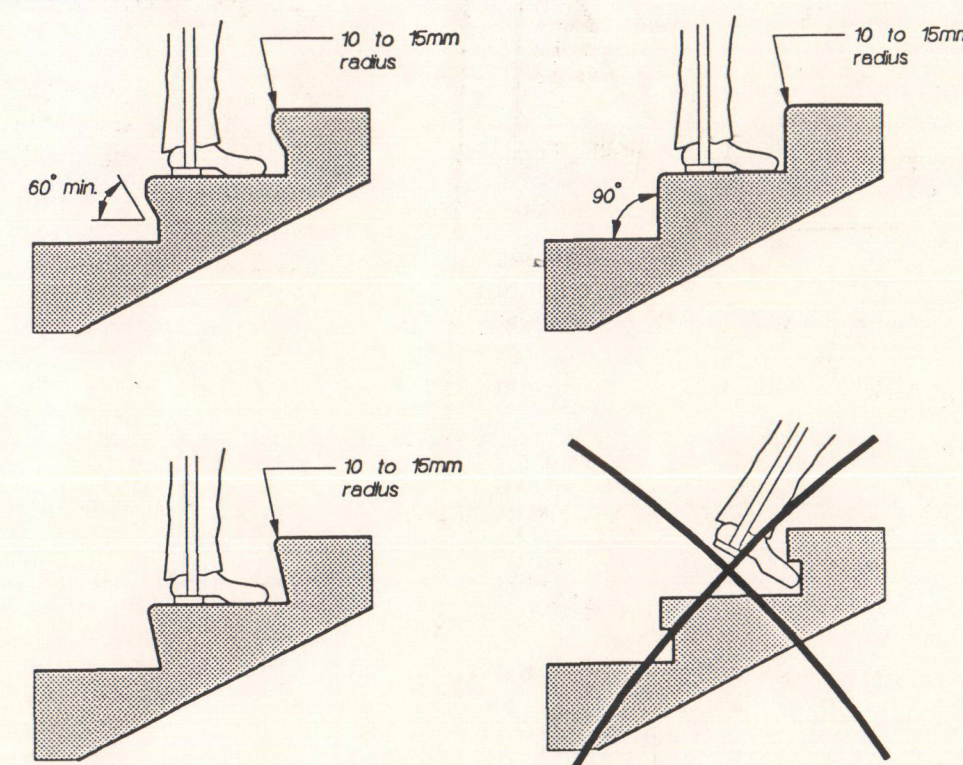
4.1.2 The method of measuring risers and treads is shown in Figure 12. If a landing on an outside stairway is formed by ground sloping across the width of the flight, the rise is measured at mid-width.

4.1.3 Uniformity - Riser height and tread depth shall be uniform within the tolerance of  $\pm 5$  mm at the pitch line for all steps in one flight.

**Comment:**

The foot is normally only lifted a few mm above the treads during ascent. A riser variation of more than 10 mm can cause someone to stumble.

Figure 13: Accessible stairway projections  
Paragraph 4.1.7





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STRUCTURAL DESIGN CALCULATIONS

for :

PROPOSED RESIDENCE : HARRIS  
RARIMU RISE : COASTLANDS

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1.0 Roof

- Loadings

Roof

color steel trusses btr @ 30°  
@ 15°  
no accessG = 420 Pa  
G = 400 Pa  
QB = 250 Pa  
= 1.0 kN/m

Wind

$$V(z) = V_{Mes} M(z, cat) M_s M_r$$

$$V = 43 \text{ m/s (non directional)}$$

$$M_{es} = 0.75 \text{ (sea)}$$

$$= 0.92 \text{ (ult)}$$

$$M(z, cat) = 0.96$$

$$M_s = M_t = M_r = 1.0$$

$$H = 8.0 \text{ m}$$

$$\text{Serviceability } V(z) = 30.96 \text{ m/s}$$

$$q = 575 \text{ Pa}$$

$$\text{Ultimate } V(z) = 38.39 \text{ m/s}$$

$$q = 804 \text{ Pa}$$

$$C_{pi} = 0.05 - 0.30$$

$$\text{Roof } \theta = 90^\circ$$

$$C_{pe} = -0.90 \text{ U}$$

$$= -0.40 \text{ D}$$

1.01 Roof Beam over Master Bedroom

$$\text{span} = 4.52 \text{ m}$$

$$\begin{aligned} (6 + q) \rightarrow &= 2.95 \times (0.40 + 0.25) \text{ Roof} \\ &= 1.18 (6) + 0.74 (q) \\ &= 1.92 \text{ kN/m} \end{aligned}$$

$$\begin{aligned} (w_s) \rightarrow &= 2.95 \times -0.90 \times (0.575) \\ &= -1.53 \text{ kN/m} \end{aligned}$$

$$(1.46) \rightarrow u = 1.65 \text{ kN/m}$$

$$(1.46 + 1.60) \rightarrow u = 2.60 \text{ kN/m}$$



(0.96 + u<sub>u</sub>)  $\sigma_1 = -1.29 \text{ kN/m}$   
 - deflection  $k_2 (6 + 4.02)$   $k_2 = 20$   
 $\Delta_{allow} = \frac{span}{400} = 11.30 \text{ mm}$   $4.02 = 0$

$I_{req} = \frac{S}{384} \times \frac{2 \times 1.18 \times 10^3 \times 4.52^4}{8 \times 10^9 \times 11.30 \times 10^{-3}}$   
 $= 141.88 \times 10^{-6} \text{ m}^4$

$300 \times 100 \text{ mm} = 164.64 \times 10^{-6} \text{ m}^4$

- bending (1.46)

$M^* = \frac{1.65 \times 4.52^2}{8} = 4.21 \text{ kNm}$

$\phi M_n = 0.80 \times 0.60 \times 17.70 \times 117.6 = 9.99 \text{ kNm}$

Provide  $300 \times 100$  roof beam

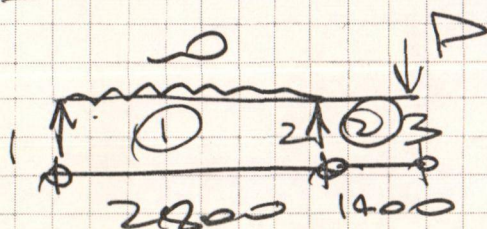
- connection to framing

(0.96 + u<sub>u</sub>)  $S^* = 2.30 \times -1.29 = -2.97 \text{ kNm}$

Provide  $1/25 \times 120 \text{ mm galv strap}$  with 6/30  
 $\times 3.15 \text{ F11 nails per strap end}$

$\phi Q_n = 0.80 \times 1.0 \times 6 \times 1.25 \times 0.631 = 3.79 \text{ kN}$

1.02 Cantilevered Linel over Kitchen



Refer computer printouts for results

$w = \frac{4.0^2}{2 \times 3.0} \times (0.43)$   
 $= 1.15 \text{ kN/m}$

Roof



$$P = 2.50 \times 2.6 \times (0.43 + 0.25) \quad \text{Roof}$$

$$= 2.80(6) + 1.63(2) = 4.43 \text{ kN}$$

$$w = \frac{4.0^2}{2 \times 3.0} \times -0.90 \times (0.575)$$

$$= -1.38 \text{ kN/m}$$

$$P = 2.50 \times 2.60 \times -0.90 \times (0.575)$$

$$= -3.36 \text{ kN}$$

-deflection

$$l_2 = 2.0$$

$$y_2 = 0$$

Try 2/300x50

$$l_2(6 + 400) = 9.0 \text{ m}$$

$$\text{Span} = \frac{2 \times 1400}{300} = 9.33 \text{ m}$$

too close decrease cantilever span to 1200

$$l_2(6 + 400) = 6.0 \text{ m}$$

$$= \frac{\text{span}}{400} \times 2.4$$

-bending (1.26)

$$M^* = 4.20 \text{ kNm}$$

$$\phi M_n = 0.80 \times 0.60 \times 1.14 \times 17.70 \times 1176$$

$$= 1139 \text{ kNm}$$

Provide 2/300x50 maximum  
cantilevered span = 1200 build back into  
framing 2.80 minimum

-connection to framing

$$(0.96 + 0.00) S^* = 5.32 \text{ kN}$$



Provide 2/25x120mm galv strap  
 with 6/30x3.15 FH nails per strap end.

$$\phi Q_n = 2 \times 3.79 = 7.58 \text{ kN}$$

It is proposed to provide a 2400  
 wide window in Bed 3. It is  
 proposed to build back the cantilevered  
 lintel back over the window.

A floor beam will land in span  
 some 250mm. With inspection of the  
 reaction from this beam, lintel will  
 be able to resist this load.

Provide 2/300x50



## 2.0 First Floor

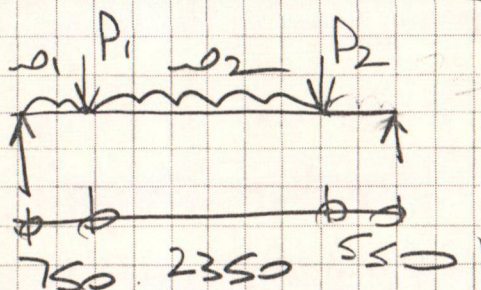
- Loadings as entire Floor incl partitions + ceiling  $G = 600 \text{ kg}$   
 $Q = 1500 \text{ kg}$   
 $W = 1.80 \text{ kN}$

### 2.0.1. Boundary Joint over Dining Room

Span = 3.65m

(G+Q)

Refer computer printouts for results



$$P_1 = 0.40 \times (0.43 + 0.25) \text{ Roof}$$

$$= 0.17(G) + 0.10(Q) = 0.27 \text{ kN}$$

$$P_2 = (2.10 + 1.45) \times (0.43 + 0.25) \text{ Roof}$$

$$+ 0.23 \times (0.60 + 1.50) \text{ Floor}$$

$$= 1.66(G) + 1.23(Q) = 2.89 \text{ kN}$$

$$P_1 = 1.30 \times 2.40 \times (0.30) \text{ Ext Wall}$$

$$= 0.94 \text{ kN}$$

$$P_2 = 1.30 \times 2.40 \times (0.30) \text{ Ext Wall}$$

$$+ 0.30 \times 1.30 \times (0.60 + 1.50) \text{ Floor}$$

$$+ 2.26 \times (1.14 + 0.74) \text{ Roof}$$

$$= 3.84(G) + 2.26(Q) = 6.10 \text{ kN}$$

- deflection

Check  $150 \text{ kN}$   $18.0$

$$D(1.26 + 1.5Q) = 3.07 + 1.33 = 4.4 \text{ mm}$$

Span = 9.12mm stiffened by presence of external wall



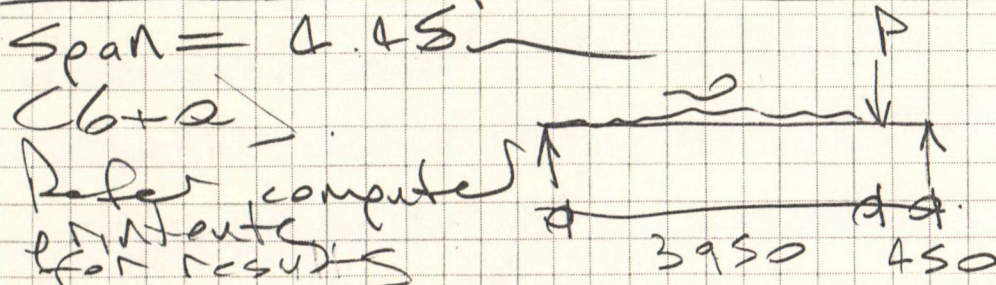
-bending (1.20+1.60)

$$M^* = 1.20 \times 3.46 + 1.60 \times 2.11 = 7.53 \text{ kN} -$$

$$\phi M_s = 0.90 \times 135 \times 250 = 30.38 \text{ kN} -$$

Provide 150 uB 18.0

2.02 Multiple Joist over Lounge



$$w = 0.45 \times (0.60 + 1.50) = 0.27(6) + 0.68(2) = 0.95 \text{ kN/m} -$$

$$D = 2.26 \times (1.18 + 0.74) + 1.0 \times 2.40 \times (0.30) = 3.39(6) + 1.67(2) = 5.06 \text{ kN} -$$

Floor  
Roof Beam  
Reaction  
Ext - Coll

Try 3/250 x 50

-deflection

$$\Delta(6+2) = 5.33 + 2.48 = 7.81 \text{ mm} -$$

$h_y = 2.0$   
 $\psi = 0.70$

Span = 11.00

-bending (1.26+1.60)

$$M^* = 1.20 \times 1.54 + 1.60 \times 1.98 = 5.02 \text{ kN} -$$

$$\phi M_n = 0.90 \times 0.80 \times 1.20 \times 17.20 \times 124899 = 16.98 \text{ kN} -$$



Provide 3/250x50

2.03 Floor Beam Lounge/Dining

Span = 3.90m



1500 1500

$$w_1 = 4.0 \times (0.60 + 1.50) \text{ Floor} \\ + \frac{0.65}{3.70} \times 2.40 \times (0.30) \text{ Part wall}$$

$$= 2.53(6) + 6.00(a) = 8.53 \text{ kN/m}$$

$$w_2 = 2.50 \times (0.60 + 1.50) \text{ Floor}$$

$$= 1.50(6) + 3.75(a) = 5.25 \text{ kN/m}$$

$$P_1 = 5.52(6) + 3.45(a) \left. \begin{array}{l} 2.01 \text{ Reaction} \\ 2.02 \text{ Reaction} \end{array} \right\}$$

$$+ \frac{0.45}{4.40} \times (3.39 + 1.67)$$

$$= 5.87(6) + 3.62(a) = 9.49 \text{ kN}$$

$$P_2 = 1.50 \times 2.50 \times (0.43 + 0.25) \text{ Roof}$$

$$+ 2.30 \times (0.30) \times 2.20 \text{ Part wall}$$

$$= 3.13(6) + 0.94(a) = 4.07 \text{ kN}$$

- deflection

Check 180 UB 222

$$\Delta (1/26 + 1/50) = 3.74 + 2.80 = 6.54 \text{ mm}$$

$$\frac{\text{Span}}{600} = 9.75 \text{ mm}$$



- bending (1.26 + 1.60)

$$M^* = 1.20 \times 7.16 + 1.60 \times 8.06 = 21.49 \text{ kN}\cdot\text{m}$$

$$\phi M_s = 0.90 \times 250 \times 195 = 43.88 \text{ kN}\cdot\text{m}$$

Provide 140 uB 22.2

- connection multiple joist over dining

$$(1.26 + 1.60) V_F^* = 1.20 \times 5.87 + 1.60 \times 3.62 = 12.84 \text{ kN}$$

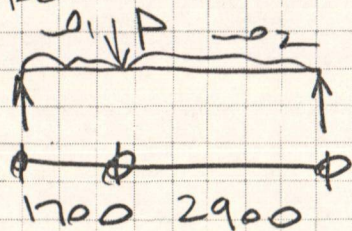
Provide 2/M12 bolts with 6mm

clear  
OK by inspection

2.04 Floor Joists over Lobby

$$S_{eff} = 4.60 \text{ m}$$

Consider unit width of joist  
Refer computer printouts for results



$$w_1 = 0.60(6) + 1.50(2) = 2.10 \text{ kN/m}$$

$$w_2 = 0.25 \text{ kN/m}$$

$$P = 1.50 \times (0.18 + 0.25) + 2.10 \times (0.30)$$

$$= 0.99(6) + 0.38(2) = 1.37 \text{ kN}$$

- deflection

Check 250 x 50 joists - 400



$$D(4.26 + 2.52) = 8.00 + 2.38 = 10.38 \text{ m}$$

$$\frac{\text{Span}}{200} = 11.5 \text{ mm i.d.}$$

- bending (4.26 + 1.60)

$$M^* = 1.20 \times 2.00 + 1.60 \times 1.77 = 5.23 \text{ kN}$$

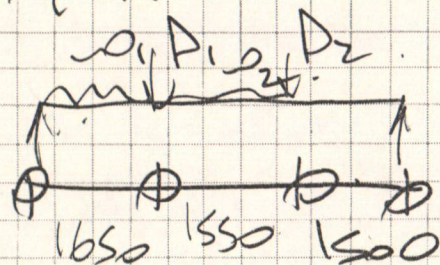
$$\phi M_n = 0.80 \times 0.80 \times 17.70 \times 1040.81$$

$$= 11.4 \text{ kN}$$

Provide 250 x 50 Joists - 4005

2.05 = 1000 Beam over Lounge

$$\text{Span} = 4.70 \text{ m.}$$



Refer computer printouts  
for results  
(6+2)

$$w_1 = 2.20 \times (0.60 + 1.50) \quad \text{Floor}$$

$$+ 1.68(6) + 2.32(2) \quad 2.01 \text{ Joist}$$

$$= 3.00(6) + 5.62(2) = 8.62 \text{ kN}$$

$$w_2 = 2.20 \times (0.60 + 1.50) \quad \text{Floor}$$

$$+ 2.00 \times (0.43 + 0.25) \quad \text{Roof}$$

$$= 2.35(6) + 3.40(2) = 6.25 \text{ kN}$$

$$P_1 = \frac{3.95}{0.40} \times (3.34 + 1.67) \quad 22 \text{ seats}$$

$$+ 1.30 \times 1.40 \times (0.43 + 0.25) \quad \text{Roof}$$

$$+ 2.30 \times 2.00 \times (0.30) \quad \text{Ext. wall}$$

$$= 5.48(6) + 1.95(2) = 7.43 \text{ kN}$$



$$\begin{aligned}
 P_2 &= 1.50 \times 2.25 \times (0.43 + 0.25) \quad \text{Roof} \\
 &\quad + 2.80 \times 2.20 \times (0.30) \quad \text{Ext wall} \\
 &= 3.30(6) + 0.84(2) = 4.14 \text{ kN}
 \end{aligned}$$

- deflection

try 200 UP 25.40

$$\begin{aligned}
 \Delta (6 + 2) &= 6.14 + 3.21 \\
 &= 9.35 \text{ mm}
 \end{aligned}$$

$$\frac{\text{span}}{400} = 11.75 \text{ mm}$$

- bending  $(1.26 + 1.60)$

$$M_t = 20 \times 13.16 + 1.60 \times 9.41 = 30.85 \text{ kNm}$$

$$\phi M_n = 0.90 \times 250 \times 260 = 58.50 \text{ kNm}$$

Provide 200 UP 25.40

2.06 Floor Joist Sides Dring

By inspection

Provide 250 x 50 Joists - 4505

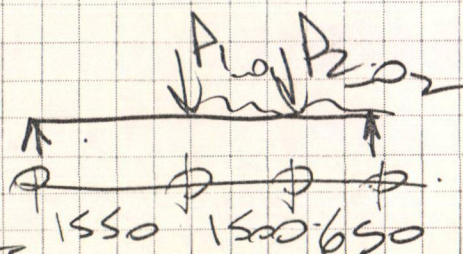
ok by inspection

2.07 Floor Beam over B-100-3

$$\text{span} = 3.70 \text{ m}$$

(6 + 2)

Refer computer printouts for results





$$w_1 = 1.40 \times (0.60 + 1.50) + 1.20 \times (0.43 + 0.25) \left\{ \begin{array}{l} \text{Floor} \\ \text{conservative outside} \\ \text{Roof} \end{array} \right.$$

$$= 1.60(6) + 3.00(2) = 4.60 \text{ kN/m}$$

$$w_2 = 4.00 \times (0.60 + 1.50) + 2.40(6) + 6.00(2) = 8.40 \text{ kN/m}$$

$$P_1 = 2.50 \times 2.20 \times (0.30) + 2.20 \times 1.50 \times (0.43 + 0.25) \left\{ \begin{array}{l} \text{Ext Wall} \\ \text{Roof} \end{array} \right.$$

$$= 3.07(6) + 0.83(2) = 3.59 \text{ kN}$$

$$P_2 = 3.50 \times 2.50 \times (0.30) + (3.70 \times 3.60) \times (0.43 + 0.25) \left\{ \begin{array}{l} \text{Ext Wall} \\ \text{Roof} \end{array} \right.$$

$$= 8.25(6) + 3.33(2) = 11.68 \text{ kN}$$

- deflection

Check 180 UB 22.2

$$\Delta (w_{26} + w_{50}) = 3.32 + 1.77 = 5.09 \text{ mm}$$

$$\frac{\Delta_{span}}{L_{span}} = \frac{9.25 \text{ mm}}{1.8 \text{ m}} = 0.0051$$

- bending (1.26 + 1.60)

$$M^* = 1.20 \times 7.10 + 1.60 \times 5.64 = 17.55 \text{ kN-m}$$

$$\phi M_s = 43.88 \text{ kN-m} \quad \text{as per table}$$

Provide 180 UB 22.2



## 3.0 Ground floor

### 3.01 Floor Slab

Try using 1 tray-dec 300 - 0.75m  
 Floor system. Span = 4.0

Check slab over garage.

With reference to manufacturer's design manual, refer attached copy

A preliminary sizing of slab.

~~Superimposed loads~~

$(6 + \alpha)$  Consider unit width of slab

$$w = 0.20$$

$$+ 1.50$$

$$= 0.20(6) + 1.50(\alpha) = 1.70 \text{ kN/m}^2$$

$$(1.26 + 1.6\alpha) w_u = 2.84 \text{ kN/m}^2$$

With a 90 mm slab

allowable superimposed loads = 6.10 kN/m<sup>2</sup>

check single span

$$q_{SL} = 2.30 \text{ kN/m}^2 \quad \text{too low}$$

100 mm slab

$$q_{SL} = 3.50 \text{ kN/m}^2 \quad \text{ok}$$

Check negative reinforcement over supports

Consider unit width of slab.

$$(6 + \alpha) w = 0.12 \times (24)$$

$$+ 0.20$$

slab partition



$$0 = 308(6) + 1.50(2) = 4.58 \text{ kN/m}$$

$$(1.26 + 1.60) M^* = 4.58 \times 4.0^2$$

$$= 8.12 \text{ kNm}$$

Try 35L

$$A_{s \text{ req}} = 448.10 \text{ mm}^2$$

too high

check 110mm slab

$$A_{s \text{ req}} = 370.84 \text{ mm}^2$$

check reinforcement normal to this direction.

$b = 1000$   
 $d = 56 \text{ mm}$   
 $f_y = 414 \text{ MPa}$   
 $f_c = 25 \text{ MPa}$   
 $\phi = 0.85$   
 $d = 66 \text{ mm}$

$$A_{s \text{ min}} = \frac{0.0018 \times 380 \times 1100 \times 1000}{414} = 181.74 \text{ mm}^2$$

HPL 664 mesh e 3 stop cover.

$$A_s = 186 \text{ mm}^2$$

$$A_{s \text{ req}} = 370.84 - 186 = 184.84 \text{ mm}^2$$

$$A_{s \text{ D12-400 JS}} = \frac{300}{414} \times 242.75 = 204.9 \text{ mm}^2$$

- deflection

$$I_{NA} = 6.38 \times 10^6 \text{ mm}^4$$

$\delta_1$  = under superimposed load alone

$$\delta_1 = \frac{0.0054 \times q_3 (L)^4}{E I_{NA}} \leq \frac{2L}{350} \text{ and } \leq 20 \text{ mm}$$

$$= \frac{0.0054 \times 1.70 \times 4.0^4}{2.10 \times 10^5 \times 6.38 \times 10^6} = 1.75 \text{ mm}$$



$\delta_2$  = underweight of composite slab  
 plus superimposed load.

$$= \frac{0.0054 \times (q_2 + q_3) \times L^4}{EI_{NA}} \leq \frac{L}{250}$$

$$= \frac{0.0054 \times (4.58) \times 4000^4}{2.10 \times 10^5 \times 6.38 \times 10^6}$$

$$= 4.73 \text{ mm}$$

$$\frac{L}{250} = \frac{4000}{250} = 16 \text{ mm} \quad \text{manufacturers}$$

no cover limit to  $\frac{L}{500} = 8.0 \text{ mm} \therefore \text{ok}$

Provide 110 mm slab with HRC  
 664 mesh at 35 top cover with  
 512 bars at 29 top cover  
 over supports

- cantilevered slab over garage door

Cantilever span = 0.90 m

$$(6+a) P = 2.0 \times (0.43 + 0.45) \quad \text{Roof}$$

$$+ 2.40 \times (0.30) \quad \text{Ext Wall}$$

$$+ 0.50 \times (0.60 + 1.50) \quad \text{1st floor}$$

$$= 1.88(6) + 1.25(a) = 3.13 \text{ kN}$$

$$D = 0.12 \times 24 + 0.20 \quad \text{slab parts}$$

$$+ 1.50$$

$$= 3.08(6) + 1.50(a) = 4.58 \text{ kN}$$

$$(1.26 + 1.60)$$



$$P_u = 4.26 \text{ kN}$$

$$w_u = 6.10 \text{ kN/m}$$

flexure

$$M^* = 4.26 \times 0.90 + \frac{0.90^2 \times 6.10}{2} = 6.31 \text{ kNm}$$

as active

HRC 664 Mesh at 3st c and D12 bars  
- 400mm at 2a top cover

shear

$$V_u = 4.26 + (0.90 - 0.066) \times 6.10$$

$$= 9.35 \text{ kN}$$

$$\frac{V_u}{\phi b d} = \frac{9.35 \times 10^3}{0.80 \times 1000 \times 66}$$

$$= 0.18 \text{ N/mm}^2$$

$$\rho = 0.80$$

$$V_{c \min} = 0.08 \times \sqrt{25} = 0.40 \text{ N/mm}^2$$

Provide 110mm slab with HRC  
664 mesh at 3st c and D12 bars  
- 400mm at 2a top cover

3.02 Deck Slab

try a 90 deep slab.

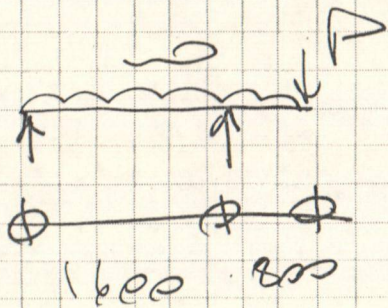
$$A_{s \min} = \frac{0.0018 \times 380 \times 90 \times 1000}{2412}$$

$$= 148.70 \text{ mm}^2$$

HRC 665 Mesh 145 mm<sup>2</sup>

$$f_y \text{ actual} = 485 \text{ N/mm}^2$$





(6+a)  
Consider unit width of slab

$$w = 0.12 \times (24) + 2.0$$

$$= 2.88(6) + 2.00(a)$$

$$= 4.88 \text{ kN/m}$$

Slab  $Q_R$

$$P = 1.0 \times (0.30) + 1.80 \text{ kN}$$

$$= 0.30(6) + 1.80(a) = 2.10 \text{ kN}$$

Handrail  $Q_s$

$$(1.26 + 1.60) w_u = 6.66 \text{ kN/m}$$

$$(1.26) P = 0.36 \text{ kN}$$

Handrail  $w_u$

→ bend

$$M = - \frac{6.66 \times 0.80^2}{2} + 0.36 \times 0.80 = 2.42 \text{ kNm}$$

$$A_{s \text{ req}} = 144.51 \text{ mm}^2 \quad \text{90 Slab}$$

$$b = 1000$$

$$d = 49$$

$$\phi = 0.85$$

$$f_c = 41.7$$

$$f_y = 250 \text{ MPa}$$

OK for HRC 66S at 35 top cover in 90 slab

to match interior slab provide the 66S at 35+ C, check positive moment

$$M = + \frac{6.66 \times 1.60^2}{8} = 2.13 \text{ kNm}$$

$$A_{s \text{ req}} = 166.41 \text{ mm}^2$$

$$d = 38$$

as above

$$A_s \text{ HRC 664} = 186 \text{ mm}^2$$



- sh -

$$V_u = 5.33 \text{ kN}$$

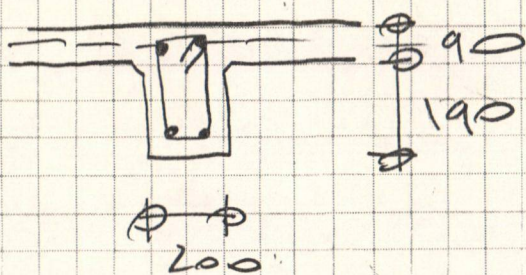
$$\frac{V_u}{A_{bd}} = \frac{5.33 \times 10^3}{0.75 \times 1000 \times 38} = 0.19 \text{ MPa}$$

ok

Provide a minimum of 90mm slab with  
 66 Mesh at 35 top cover

### 3.03 Deck Support Rec

span = 4.0



(6 + 2) Slab

$$D = \frac{2.40^2}{2 \times 1.80} \times (2.88 + 2.00)$$

$$+ \frac{2.40}{1.80} \times (0.30) \text{ Handrail}$$

$$+ 0.15 \times 0.20 \times (24) \text{ Self}$$

$$W = 5.73(6) + 3.20(2) = 8.93 \text{ kN/m}$$

$$(1.26 + 1.60) W_u = 12.00 \text{ kN/m}$$

$$(1.26) W_u = 6.84 \text{ kN/m}$$

- flexure continuous over 2 spans

Check negative moment at internal support

$$M^* = \frac{12.00 \times 4.0^2}{8} = 24.00 \text{ kN}$$

$$A_{s \text{ req}} = 315.72 \text{ mm}^2$$

$$A_{s2} (H16) = 402.12 \text{ mm}^2$$

$$A_{s3} (H12) = 339.30 \text{ mm}^2$$

b = 200  
 d = 224  
 $\rho = 0.85$   
 $E_c = 25 \text{ MPa}$   
 $E_s = 430 \text{ MPa}$   
 $f_y = 300$   
 $A_s = 452.53 \text{ mm}^2$



Check positive moment

$$M^* = \frac{12 \times 4.0^2}{10} = 19.20 \text{ kNm}$$

as earlier

$$A_{sreq} = 236.63 \text{ mm}^2$$

$$A_{sreq} = 339.16 \text{ mm}^2$$

$$A_{sD16} = 402.12 \text{ mm}^2$$

$$b = 1200$$

$$f_y = 420$$

$$f_c = 300 \text{ MPa}$$

shear

$$V_u = 1.25 \times (2.0 - 0.224) \times 12.00$$

$$= 26.64 \text{ kN}$$

$$\frac{V_u}{\phi b d} = \frac{26.64 \times 10^3}{0.80 \times 224 \times 200} = 0.74 \text{ MPa}$$

$$v_c = (0.07 + 10 \times \rho_w) \sqrt{f_c}$$

$$= 0.73 \text{ MPa}$$

$$\rho_w = \frac{339.30}{200 \times 224}$$

$$= 7.57 \times 10^{-3}$$

$$A_v = 0.35 b \times s$$

$$= 25.6 \text{ mm}^2$$

$$s = 110 \text{ mm}$$

Provide a 280 deep x 200 wide concrete base with 2/D16 at 50 top and bottom cover with 6 stirrups - 110 mm

use 2/D16 at top as  $A_{sreq} = 42.53 \text{ mm}^2$   
 $A_{s2/D16} = 402.12 \text{ mm}^2$  however mobilise  
 HRC 664 mesh at 35 top cover ok  
 inspection



$$\frac{V_1}{\phi b d} = \frac{11.26 \times 10^3}{0.80 \times 1000 \times 66} = 0.21 \text{ MPa}$$

$$v_c = (0.07 + 10 \rho_w) \sqrt{f_c'} \quad f_c' = 20 \text{ MPa}$$

$$\rho_w = \frac{186 + 452.39}{1000 \times 66} = 0.60$$

$$v_c = 0.20 \sqrt{f_c'} = 0.89 \text{ MPa} \quad \text{ok}$$

~~Provide a minimum of 110 mm slab with the 66 mesh at 25 top cover and D12 - 250 JS at 25 top cover~~



3.04 Cantilevered slab over Entry  
Consider unit width of slab.

(6+2)

$$D = \frac{3.6^2}{2.6 \times 2} \times (0.40 + 0.25)$$

Roof

$$+ 2.40 \times (0.30)$$

Ext. Wall

$$= 1.72(6) + 0.62(2) = 2.34 \text{ kN}$$

$$w = 0.12 \times 24 + 1.50$$

Slab

$$= 2.88(6) + 1.50(2) = 4.38 \text{ kN}$$

(1.26 + 1.60)

$$D_u = 3.06 \text{ kN}$$

$$w_u = 5.86 \text{ kN/m}$$

flexure

$$\text{Cantilever Span} = 1.40$$

$$M^* = 3.06 \times 1.40 + \frac{5.86 \times 1.40^2}{2}$$

$$= 10.03 \text{ kN}$$

as page 11 110 slab

$$A_{s \text{ req}} = 376.84 \times \frac{10.03}{8.14} = 456.92 \text{ mm}^2$$

$$A_s \text{ HLC 664 Mesh} = 186 \text{ mm}^2$$

$$A_{s \text{ req}} = 300 \text{ MPa} = \frac{414}{300} \times (456.92 - 186)$$

$$= 373.90 \text{ mm}^2$$

$$D12 - 250 \text{ JS} = 452.39 \text{ mm}^2 \therefore \text{ok}$$

sheet

$$V_u = 3.06 + 1.40 \times 5.86 = 11.26 \text{ kN}$$



## 305 - Floor Beam over Garage

Span = 6.60

Check a 400x400 Shell Beam

Check with a conservative uniform load

$$(6.60) \times 4.0 \times (0.12 \times 24 \text{ Slab} + 0.20 \text{ Partitions} + 1.50 \text{ RB})$$

$$+ 3.84 \text{ Shell Beam}$$

$$+ 3.80 \times (0.60 + 1.50) \text{ First Floor}$$

$$+ 3.0 \times (0.40 + 0.25) \text{ Roof}$$

$$= 19.64(6) + 12.45(2)$$

$$= 32.09 \text{ kN/m}$$

$$(1.46 + 1.72) \times 4.0 = 48.66 \text{ kN/m}$$

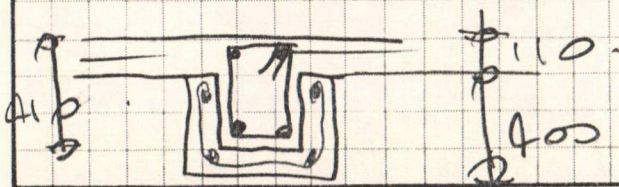
- Flexure

$$M^* = \frac{48.66 \times 6.60^2}{8} = 264.96 \text{ kNm}$$

Section capacity of precast unit only

$$M_s = 215 \text{ kNm}$$

Check Composite Section



Try 2 D20 top and bottom  
 with 50 cover



$$A_s = 628.32 \text{ mm}^2$$

$$M_{req} = 59.00 \text{ kN}$$

$$\begin{aligned} f_c &= 30 \text{ MPa} \\ f_y &= 250 \text{ MPa} \\ b &= 1200 \\ \phi &= 0.90 \\ d &= 410 - 50 - 8 \\ &= 352 \text{ mm} \end{aligned}$$

$$\begin{aligned} M_{req \text{ total}} &= 215 + 59.0 \\ &= 274.0 \text{ kN} \end{aligned}$$

... of 264.46 kN

- shear

$$\begin{aligned} V_u &= 3.30 \times 48.66 \\ &\quad + 2.20 \times 2.30 \times (0.60 + 1.50) \\ &\quad + 3.60 \times 2.40 \times (0.30) \\ &= 181.36 \text{ kN} \end{aligned}$$

this load includes and increase to account for reaction on floor beam over lounge which lands close to one support

Section capacity of precast unit

$$\phi V_s = 210 \text{ kN}$$

~~Provide a minimum of 400x400  
steel beam with 2 D20 at 50 top  
and bottom cover with R10 stirrups  
- 400x5 max~~



3.05 Lintel over garage door

span = 4.80m

$$\begin{aligned}
 (6+0) \quad W &= \frac{5.70^2}{2 \times 4.70} \times (0.13 + 0.25) \text{ Roof} \\
 &+ \frac{5.70}{4.70} \times 2.40 \times (0.30) \text{ Ext Wall} \\
 &+ \frac{4.70^2}{2 \times 3.90} \times (0.12 \times 2.4 + 1.50) \text{ Int Wall} \\
 &+ 0.10 \times 0.20 \times 2.4 \text{ Lintel} \\
 &= 12.44 (6) + 5.11 (0) = 17.55 \text{ kN/m}
 \end{aligned}$$

$$(1.26 + 1.60) W_u = 23.10 \text{ kN/m}$$

- Flexure

$$M^* = \frac{23.10 \times 4.80^2}{8} = 66.54 \text{ kNm}$$

$$A_{sreq} = 660.54 \text{ mm}^2$$

too high for masonry  
look at cast in situ  
concrete lintel

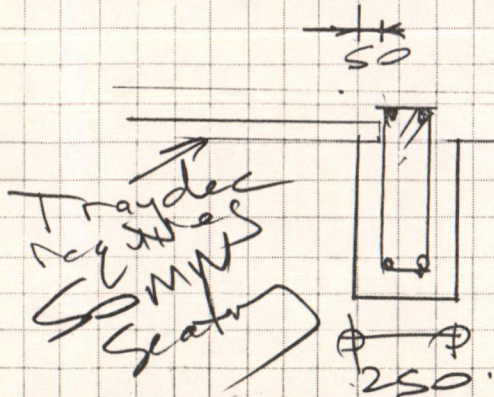
$b = 1200$   
 $d = 307$   
 $\phi = 0.80$   
 $f_y = 430 \text{ MPa}$   
 $f_{ct} = 8 \text{ MPa}$   
 as above

$$M^* = \frac{23.10 \times 4.80^2}{10} = 53.22 \text{ kNm}$$

$$A_{sreq} = 444.88 \text{ mm}^2$$

Still too high look at  
reinforcement up into slab

$b = 1200$   
 $d = 232$   
 $f_y = 430 \text{ MPa}$   
 $f_{ct} = 20 \text{ MPa}$   
 $\phi = 0.85$   
 negative



$$\begin{aligned}
 d &= 452 \\
 f_y &= 430 \text{ MPa} \\
 A_{sreq} &= 324.61 \text{ mm}^2 \\
 A_{s2H016} &= 402.12 \text{ mm}^2
 \end{aligned}$$



Try masonry again with a 24 Series block lintel.

$$A_{s req} = 370.83 \text{ mm}^2 \quad \text{75 b.c.} \quad \begin{matrix} b = 1200 \\ d = 427 \\ \phi = 0.80 \end{matrix}$$

$$A_s 2H016 = 402.12 \text{ mm}^2 \quad \phi = 0.80$$

$\therefore$  ok

shear

$$V_u = (2.40 - 0.427) \times 23110 = 45.58 \text{ kN}$$

$$\frac{V_u}{\phi b d} = \frac{45.58 \times 10^3}{0.75 \times 240 \times 427} = 0.59 \text{ MPa}$$

$$v_{i max} = 1.4 \text{ MPa} \quad \therefore \text{ok}$$

$$V_m = 0.21 \text{ MPa}$$

$$A_{s req} = \frac{(0.59 - 0.21) \times 240 \times 200}{300} = 56 \text{ mm}^2$$

$$A_{s R6 steps} = 56.54 \text{ mm}^2 \quad \therefore \text{ok}$$

~~Provide 24 Series Masonry lintel with 2H016 bars at 50 mm c/c and 15 bottom code with R6 steps - 200 mm max~~  
 300 R.H.M lintel over Redroom.

$$S_{eff} = 1.80$$

$$C_b + Q = \frac{4.0^2}{2 \times 3.0} \times (0.43 + 0.25) \text{ Red Slab} \\ + 1.90 \times (0.12 \times 24 + 1.50) \text{ Floor} \\ + 0.90 \times (0.12 \times 24 + 2.0) \text{ Deck}$$



$$+ 0.40 \times 0.20 \times 20 \quad \text{Link}$$

$$= 10.82(6) + 5.32(2) = 16.14 \text{ kN} -$$

$$(1.26 + 1.60) \Rightarrow \Rightarrow = 21.50 \text{ kN} -$$

- flexure

$$M^* = \frac{21.50 \times 1.80^2}{9} = 7.74 \text{ kN}$$

$$A_{s \text{ req}} = 108.83 \text{ mm}^2$$

$$A_{s 012} = 113.10 \text{ mm}^2$$

$$b = 190$$

$$d = 309$$

$$\phi = 0.80$$

$$f_c = 30 \text{ MPa}$$

$$f_t = 8 \text{ MPa}$$

- shear

$$V_u = 21.50 \times (0.90 - 0.309) = 12.71 \text{ kN}$$

$$\frac{V_u}{abd} = \frac{12.71 \times 10^3}{0.75 \times 190 \times 309} = 0.29 \text{ MPa}$$

$$A_{u \text{ req}} = \frac{0.15 \times 190 \times 200}{300} = 19 \text{ mm}^2$$

$$A_{u \text{ R6}} = 28.27 \text{ mm}^2 \quad \text{ok}$$

Provide 340x190 masonry lintel with  
R6 at 75 top and bottom core with  
R6 links - 200



## 1.0 Basement Wall Bracing

It is proposed to check the wall elements in the across direction. However along the building there are long lengths of wall and is considered OK by inspection.

- Loading

Seismic

$$C = C_n(T_{1,1}) S_p R Z L_u$$

$$C_n(0.20/1.25) = 0.69 \text{ Elastic masonry}$$

$$S_p = 0.67$$

$$R = 1.0$$

$$Z = 1.20$$

$$L_u = 1.0$$

UH

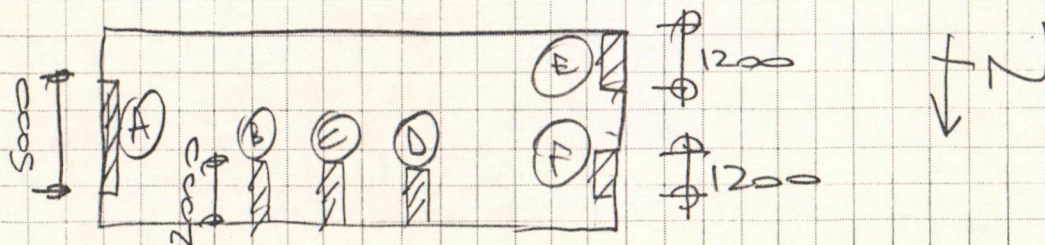
$$C = 0.55$$

$$V = 0.55 u_d$$

- design

Seismic loads critical by inspection.  
 (Eu)

$$V_{TOT} = 0.55 \times (12.60 \times 15.30 \times (0.03) \text{ Roof} \\ + 51.7 \text{ m}^2 \times (0.60) \text{ Floor} \\ + 141 \text{ m}^2 \times (0.12 \times 24 + 0.20) \text{ Floor} \\ + 45 \times 2.40 \times (0.30) \text{ External} \\ + 32 \times 1.20 \times (4.0) \text{ Masonry} \\ + 41 \text{ m}^2 \times 0.10 \times 24 \text{ Deck}) \\ = 395.27 \text{ kN}$$





Due to the length of wall (A) its stiffness will mean that it will attract a high percentage of the overall suiting load.

However it is proposed to distribute a tributary proportion of this load onto the other elements - elements (E) and (F).

Height = 2700  
 Length = 12000 (E)

$$V_{\text{element}} = \frac{3.60}{14.0} \times \frac{1}{2} \times 395.27 = 50.82 \text{ kN}$$

Due to the presence of the lintel over the door - any double curvature can be assumed. However assume single curvature with an element height = 2.30

Shear

$$M^* = 50.82 \times 2.30 = 116.89 \text{ kNm}$$

$$M_{\text{res}} = \phi A_s \times \left( \frac{0.702 \times 1}{s} \right) \times f_y \times 0.61$$

Try D12 - 600 JS  $A_s = 113.10 \text{ mm}^2$   
 $M_{\text{res}} = 46.90 \text{ kNm}$  - where  $\phi = 0.80$   
 $f_y = 300 \text{ MPa}$   
 too low

#D16 - 600 JS  $A_s = 201.06 \text{ mm}^2$   
 $M_{\text{res}} = 119.52 \text{ kNm}$  - where  $\phi = 0.80$   
 - shear

$$V_u = 50.82 \text{ kN}$$



Solid grout walls

$$d = 0.85 \times 1000 = 850$$

$$\frac{r_u}{\phi b d} = \frac{50.82 \times 10^3}{0.75 \times 190 \times 850} = 0.37 \text{ MPa}$$

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

$$A_{sreq} = 0.15 \times \frac{190 \times 850}{300} = 57 \text{ mm}^2$$

$$A_{sD12} = 113.10 \text{ mm}^2$$

Provide 2 / 1200 long x 20 Series  
masonry walls with H16-600JS  
starters central extend to H=1000  
and lap D12-600JS verticals and  
D12 bond bars-600JS

elements

(B), (C) and (D)

$$\text{Height} = 2.40 \text{ m}$$

$$\text{Length} = 2.00 \text{ m}$$

$$V/\text{element} = \frac{5.0}{14.0} \times \frac{1}{3} \times 395.27$$

$$= 47.06 \text{ kN}$$

flexure

$$M^* = 47.06 \times 2.40 = 112.94 \text{ kNm}$$

as earlier

try D12-600JS

$$M_{res} = 108.58 \text{ kNm} \quad \text{too low just}$$

D12-600JS

$$M_{res} = 146.58 \text{ kNm}$$

Provide 20 Series masonry walls  
with D12 verticals - 600JS



and D12 band h/s - 600's  
shear ok by inspection.

- element (A)

Provide 20 Series Masonry  
with D12 - 600's both ways



## 3.0 Basement Retaining Walls

- Loading

Backfill Sand or River gravel  $\gamma = 18 \text{ kN/m}^3$   
 $\phi = 35^\circ$   
 $\mu = 0.27$

- Retaining  $H = 1300 \text{ mm}$   
 Consider unit length of a cantilevered wall

$$M_a = -1.79 \text{ kNm} \quad P_a = 4.12 \text{ kN}$$

(1.6a)

$$M_u = 2.86 \text{ kNm} \quad V_u = 6.59 \text{ kN}$$

- flexure

$$A_{s \text{ req}} = 129.33 \text{ mm}^2$$

$$A_{s \text{ 12} \times 600 \text{ S}} = 188.50 \text{ mm}^2$$

$$\begin{aligned} b &= 1000 \text{ mm} \\ d &= 950 \text{ mm} \\ f_y &= 300 \text{ MPa} \\ f'_c &= 30 \text{ MPa} \\ \phi &= 0.80 \end{aligned}$$

- shear

$$V_u = 6.59 \text{ kN} \quad \text{ok by inspection}$$

Provide 20 Series Masonry with  
 12 vertical bars - 600 JS with  
 12 bond bars - 600 JS max.

- footing requirements

$$(a) M_a = -1.79 \text{ kNm}$$

(b) Axial loads  $\times 2000 \text{ deep concrete footing}$

$$e_y = 0.025 \text{ wall}$$

$$P = 2.70 \times (4.0) = 10.80 \text{ kN}$$

$$e_y = 0.30 \text{ Foot}$$

$$P = 0.60 \times 0.20 \times 24 = 2.88 \text{ kN}$$



- over 100mm

$$M_{stab} = 6.32 \text{ kNm}$$

- soil bearing

$$p_{\text{toe}} = 29.87 \text{ kPa} < 100 \text{ kPa}$$

Provide 600 wide x 200 deep concrete footing



## 6.0 Reinforced Concrete Columns

250φ concrete column.

Provide 250φ concrete column with 6/110 bars at 600pvc with 16 spiral reinforcement at

## 4.0 Footing Requirements

Subsoils assumed to comply with NZS 3604:1990.

### 4.01 Deck Column Footings

$$\begin{aligned}
 (6 \times 2) P &= \left( \frac{2.40^2}{2 \times 1.60} \times (0.11 \times 24 + 2.0) \right. \\
 &\quad \left. + 0.19 \times 0.20 \times 24 \right) \times 4.10 \text{ Bar Deck} \\
 &\quad + 2.40 \times 0.25^2 \times \pi \times (24) \text{ Column.} \\
 &\quad + 3.50 \text{ kN Footing} \\
 &= 29.55(6) + 1476(2) = 44.31 \text{ kN}
 \end{aligned}$$

$$(1.26 \times 1.60) P_u = 59.08 \text{ kN}$$

$$A_{req} = \frac{59.08}{300 \times 0.50} = 0.39 \text{ m}^2$$

Provide 650x650x300 deep concrete footing  
 $A = 0.43 \text{ m}^2$



7.02 Internal Footing below garage beam support

$$\begin{aligned}
 (4a) \quad D &= 3.50 \times (19.64 + 12.45) \quad \text{3rd Reaction} \\
 &+ 8.0 \text{ kN} \quad \text{footing Dk} \\
 &+ 0.39 \times 0.39 \times 27 \times 20 \quad \text{P.C.} \\
 &= 84.95(6) + 43.58(2) \\
 &= 128.53 \text{ kN}
 \end{aligned}$$

$$\begin{aligned}
 (1.26 + 1.60) \quad P_u &= 171.67 \text{ kN} \\
 A_{req} &= \frac{171.67}{300 \times 0.50} = 1.14 \text{ m}^2
 \end{aligned}$$

Mobilise 1.0m of 300 wide strip

$$A_{req} = 1.14 - 0.30 = 0.84 \text{ m}^2$$

Provide a minimum of 1000 x 1000 x 300 deep concrete footing.

7.03 External Strip footing

Consider unit length of foot

$$\begin{aligned}
 (6a) \quad D &= 2.0 \times (0.13 + 0.25) \quad \text{Roof} \\
 &+ 1.80 \times (0.60 + 1.50) \quad \text{1st floor} \\
 &+ 2.40 \times (0.30) \quad \text{External} \\
 &+ 1.80 \times (0.12 \times 2 + 0.20) \\
 &+ 0.80 \times (0.12 \times 2 + 1.50 + 2.0) \quad \text{2nd floor} \\
 &\quad \quad \quad \text{Deck}
 \end{aligned}$$



$$\begin{aligned}
 &+ 2.70 \times 0.0 \\
 &+ 3.0 \\
 &= 24.31(6) + 7.50(2) = 31.81 \text{ kN}
 \end{aligned}$$

Masonry  
 Fastening

$$\begin{aligned}
 &(1.26 + 1.60) \\
 &P = 41.17 \text{ kN}
 \end{aligned}$$

$$A_{\text{req}} = \frac{41.17}{300 \times 0.50} = 0.27 \text{ m}^2$$

Provide a minimum of 300 wide  
 x 300 deep concrete foot



## CONSTRUCTION NOTES

1. Concrete construction shall be in accordance with NZS 3109. Minimum concrete compressive strength at 28 days shall be 25 MPa for the first floor slab, 20 MPa for circular columns and retaining wall footings, 17.5 MPa elsewhere.
2. Reinforced hollow concrete masonry construction shall be in accordance with NZS 4210 for Grade B construction. The Design Engineer shall be notified at least two working days in advance of any grouting.
3. Reinforced hollow concrete masonry shall be grouted solid.
4. Retaining walls shall not be backfilled until concrete has attained its specified strength, unless adequate temporary bracing has been installed.
5. Temporary propping shall be installed in the following locations until the first floor slab has attained its specified strength.
  - traydec 300 - 0.75mm shall be propped at midspan.
  - firth shell beams shall be propped at 300 mm from supports and at midspan unless instructed otherwise from manufacturer.
6. Structural steel shall be Grade 250 (AS 1204) or equivalent. Fabrication and erection of structural steelwork shall meet the requirements of NZS 3404:1992 and shall be in accordance with best trade practice.
7. Prior to painting, structural steelwork shall be solvent cleaned to SSPC SP1 specification, and power tool cleaned to SSPC SP3. Protective coatings shall comprise zinc chromate shop primer (40 micron dft).
8. Structural timber shall be No.1 Framing Grade Pinus Radiata, or Standard Building Grade Douglas Fir, unless specified otherwise.
9. Light timber framed construction shall be in accordance with NZS 3604:1990 unless specified otherwise on the plans.
10. Check all dimensions on site.
11. Proprietary systems, and products, shall be installed strictly in accordance with the manufacturers' recommendations.
12. Foundation design assumes that the site requirements of NZS 3604:1990 are met, and that the foundation subsoils have a safe allowable bearing pressure of 100 kPa.
13. All construction shall meet the requirements of the New Zealand Building Code Approved Documents.



	a	b	c	d	e	f	g	h
1 BEAM ANALYSIS	simple supports. uniform section							
2 BEAM #	2.03							
3 l (m)=	3.90		w=		0.70			
4 E (MPa E3)=	200.00		w1=		0.40			
5 I (mm4 E6)=	15.30							
6 x (m)=	1.50		K2=		1.00			
7	(G)		(Q)		a			
8 U.D.L. for (kN.m)	1.50		3.75		2.40			
9 a/l	-		1.03		2.25			
10	-		0.00		0.00			
11	(G)		(Q)		a			
12 Point Load (kN.m)	5.87		3.62		0.85			
13 @ a	-		3.13		0.94			
14	-		0.00		0.00			
15	-		0.00		0.00			
16	(G)		(Q)		K2(G)		(w=Q) K2(w1Q)	
17 Ra=	9.07		11.13					
18 Rb=	4.41		4.35					
19 Mx=	7.16		8.06					
20 defl(1/2)=	3.74		4.00		3.74		2.80	
21 defl. limits							1.50	
22 sp/500 =	7.80		sp/300 =		13.00			
23 sp/400 =	9.75		sp/250 =		15.60			

beamsedd \* c5

	a	b	c	d	e	f	g	h
1 BEAM ANALYSIS	simple supports. uniform section							
2 BEAM #	2.04							
3 l (m)=	4.60		w=		0.70			
4 E (MPa E3)=	8.00		w1=		0.40			
5 I (mm4 E6)=	121.44							
6 x (m)=	1.70		K2=		2.00			
7	(G)		(Q)		a			
8 U.D.L. for (kN.m)	0.25		0.00		4.60			
9 a/l	-		0.35		1.50			
10	-		0.00		0.00			
11	(G)		(Q)		a			
12 Point Load (kN.m)	0.99		0.38		1.70			
13 @ a	-		0.00		0.00			
14	-		0.00		0.00			
15	-		0.00		0.00			
16	(G)		(Q)		K2(G)		(w=Q) K2(w1Q)	
17 Ra=	1.68		2.32					
18 Rb=	1.05		0.61					
19 Mx=	2.00		1.77					
20 defl(1/2)=	4.00		3.40		8.00		2.38	
21 defl. limits							2.72	
22 sp/500 =	9.20		sp/300 =		15.33			
23 sp/400 =	11.50		sp/250 =		18.40			

beamsedd \* c5



	a	b	c	d	e	f	g	h
1 BEAM ANALYSIS	simple supports, uniform section							
2 BEAM #	2.01							
3 l (m)=	3.65							
4 E (MPa E3)=	200.00							
5 I (mm4 E6)=	9.05							
6 x (m)=	1.36							
7	(G) (Q) a							
8 U.D.L. for (kN.m)	1.66 1.23 3.10							
9 a/l	- -1.49 -1.13 0.75							
10	- 0.00 0.00 0.00							
11	(G) (Q) a							
12 Point Load (kN.m)	0.94 0.00 0.75							
13 @ a	- 3.84 2.26 3.10							
14	- 0.00 0.00 0.00							
15	- 0.00 0.00 0.00							
16	(G) (Q) K2(G) (wsg) K2(wlg)							
17 Ra=	3.28 1.77							
18 Rb=	5.52 3.45							
19 Mx=	3.46 1.11							
20 defl (1/2)=	3.07 1.90 3.07 1.33 0.75							
21 defl. limits								
22	sp/500 = 7.30 sp/300 = 12.17							
23	sp/400 = 9.12 sp/250 = 14.60							

beamsedd \* cb

	a	b	c	d	e	f	g	h
1 BEAM ANALYSIS	simple supports, uniform section							
2 BEAM #	2.02							
3 l (m)=	4.40							
4 E (MPa E3)=	8.00							
5 I (mm4 E6)=	145.73							
6 x (m)=	2.72							
7	(G) (Q) a							
8 U.D.L. for (kN.m)	0.27 0.68 3.95							
9 a/l	- 0.00 0.00 0.00							
10	- 0.00 0.00 0.00							
11	(G) (Q) a							
12 Point Load (kN.m)	3.39 1.67 3.95							
13 @ a	- 0.00 0.00 0.00							
14	- 0.00 0.00 0.00							
15	- 0.00 0.00 0.00							
16	(G) (Q) K2(G) (wsg) K2(wlg)							
17 Ra=	0.93 1.65							
18 Rb=	3.52 2.70							
19 Mx=	1.54 1.98							
20 defl (1/2)=	2.66 3.54 5.33 2.48 2.84							
21 defl. limits								
22	sp/500 = 8.29 sp/300 = 14.67							
23	sp/400 = 11.00 sp/250 = 17.60							

beamsedd \* cb



	a	b	c	d	e	f	g	h
1 BEAM ANALYSIS	simple supports, uniform section							
2 BEAM #	2.05							
3 l (m)=	4.70		ws=		0.70			
4 E (MPa E3)=	200.00		wl=		0.40			
5 I (mm4 E6)=	23.60							
6 x (m)=	1.65		K2=		1.00			
7	(G)		(Q)		a			
8 U.D.L. for (kN.m)	2.35		3.90		3.20			
9 a/l	-		0.65		-1.58		1.65	
10	-		0.00		0.00		0.00	
11	(G)		(Q)		a			
12 Point Load (kN.m)	5.48		1.95		1.65			
13 e a	-		3.30		0.84		3.20	
14	-		0.00		0.00		0.00	
15	-		0.00		0.00		0.00	
16	(G)		(Q)		K2(G)		(wsQ) K2(wlQ)	
17 Ra=	10.45		7.62					
18 Rb=	6.92		5.05					
19 Mx=	13.16		9.41					
20 defl(1/2)=	6.14		4.58		6.14		3.21 1.83	
21 defl. limits								
22 sp/500 =	9.40		sp/300 =		15.87			
23 sp/400 =	11.75		sp/250 =		18.80			

beamsedd \* c5

	a	b	c	d	e	f	g	h
1 BEAM ANALYSIS	simple supports, uniform section							
2 BEAM #	2.07							
3 l (m)=	3.70		ws=		0.70			
4 E (MPa E3)=	200.00		wl=		0.40			
5 I (mm4 E6)=	15.30							
6 x (m)=	2.49		K2=		1.00			
7	(G)		(Q)		a			
8 U.D.L. for (kN.m)	2.40		6.00		3.70			
9 a/l	-		-0.80		-3.00		3.05	
10	-		-1.60		-3.00		1.55	
11	(G)		(Q)		a			
12 Point Load (kN.m)	3.07		0.83		1.55			
13 e a	-		8.35		3.33		3.05	
14	-		0.00		0.00		0.00	
15	-		0.00		0.00		0.00	
16	(G)		(Q)		K2(G)		(wsQ) K2(wlQ)	
17 Ra=	4.30		3.11					
18 Rb=	11.08		9.45					
19 Mx=	7.10		5.64					
20 defl(1/2)=	3.32		2.53		3.32		1.77 1.01	
21 defl. limits								
22 sp/500 =	7.40		sp/300 =		12.33			
23 sp/400 =	9.25		sp/250 =		14.80			

beamsedd \* c5



## NODAL LOADS

Num	Node	XLoad	YLoad	ZMoment
1	3	0.000	-2.800	0.000

## MEMBER UDLs

Num	Member	St-UDL	Fin-UDL	Direction
1	1	-1.150	-1.150	0

## NODAL LOADS

Num	Node	XLoad	YLoad	ZMoment
1	3	0.000	-1.630	0.000

## NODAL LOADS

Num	Node	XLoad	YLoad	ZMoment
1	3	0.000	3.360	0.000

## MEMBER UDLs

Num	Member	St-UDL	Fin-UDL	Direction
1	1	1.380	1.380	0

TurboFRAME+ v3.0 #0

Evaluation Version

Pg: 1

# STRUCTURE INPUT DATA

File: CANT-1 .DAT

## STRUCTURE DATA

## NODAL DATA

Node	Xcoord	Ycoord	Xrestr	Yrestr	Zrestr
1	0.000	0.000			
2	2.800	0.000	1	1	0
3	4.000	0.000	0	1	0
			0	0	0

## MEMBER DATA

Member	LHNode	RHNode	PropRef	EndFixity	Length
1	1	2	2	1	2.800
2	2	3	2	1	1.200

## PROPERTY DATA

Ref	Elasticity	XArea	Inertia	Sect-Mod	Description
1	8.000E+06	1.620E-02	4.374E-05	4.860E-04	2/200X50
2	8.000E+06	2.520E-02	1.646E-04	1.176E-03	2/300X50
3	8.000E+06	1.260E-02	2.058E-05	2.940E-04	2/150X50

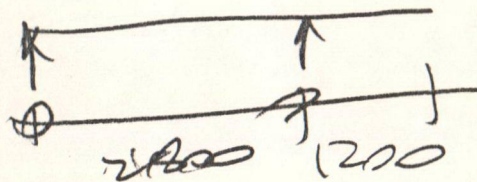


# STRUCTURE OUTPUT DATA

File: CANT-1 .DAT

## LOAD COMBINATION

Number: 1  
 Title: DEAD  
 Factor: 1.40



## NODAL DEFLECTIONS &amp; SUPPORT REACTIONS

Node	X-Defln	Y-Defln	Z-Rotn	X-React	Y-React	Z-React
1	0.000	0.000	0.001	0.000	0.574	0.000
2	0.000	0.000	-0.002	0.000	7.854	0.000
3	0.000	-0.004	-0.004	0.000	0.000	0.000

## MEMBER AXIAL LOADS, SHEARS, &amp; MOMENTS

Memb	Node	Axial	Shear	Moment	Node	Axial	Shear	Moment
1	1	0.000	0.574	0.000	2	0.000	3.934	-4.704
2	2	0.000	3.920	4.704	3	0.000	-3.920	-0.000

## MEMBER STRESS AXIAL, SHEAR, &amp; BENDING

Memb	Node	AxialStr	ShearStr	BendStr	Node	AxialStr	ShearStr	BendStr
1	1	0.000	0.023	0.000	2	0.000	-0.156	4.000
2	2	0.000	0.156	4.000	3	0.000	0.156	0.000

## EQUILIBRIUM SUMMARY

	Horizontal	Vertical
Applied Loads	0.000	-8.428
Support Reactions	0.000	8.428



# STRUCTURE OUTPUT DATA

File: CANT-1 .DAT

## LOAD COMBINATION

Number: 1  
 Title: DEAD  
 Factor: 2.00

## NODAL DEFLECTIONS &amp; SUPPORT REACTIONS

Node	X-Defln	Y-Defln	Z-Rotn	X-React	Y-React	Z-React
1	0.000	0.000	0.001	0.000	0.820	0.000
2	0.000	0.000	-0.003	0.000	11.220	0.000
3	0.000	-0.006	-0.006	0.000	0.000	0.000

## MEMBER AXIAL LOADS, SHEARS, &amp; MOMENTS

Membr	Node	Axial	Shear	Moment	Node	Axial	Shear	Moment
1	1	0.000	0.820	0.000	2	0.000	5.620	-6.720
2	2	0.000	5.600	6.720	3	0.000	-5.600	-0.000

## MEMBER STRESS AXIAL, SHEAR, &amp; BENDING

Membr	Node	AxialStr	ShearStr	BendStr	Node	AxialStr	ShearStr	BendStr
1	1	0.000	0.033	0.000	2	0.000	-0.223	5.714
2	2	0.000	0.222	5.714	3	0.000	0.222	0.000

## EQUILIBRIUM SUMMARY

	Horizontal	Vertical
Applied Loads	0.000	-12.040
Support Reactions	0.000	12.040



## STRUCTURE OUTPUT DATA

File: CANT-1 .DAT

## LOAD COMBINATION

Number: 1 3  
Title: DEAD + WIND  
Factor: 0.90 1.54

## NODAL DEFLECTIONS &amp; SUPPORT REACTIONS

Node	X-Defln	Y-Defln	Z-Rotn	X-React	Y-React	Z-React
1	0.000	0.000	-0.000	0.000	-0.389	0.000
2	0.000	0.000	0.002	0.000	-5.318	0.000
3	0.000	0.003	0.003	0.000	0.000	0.000

## MEMBER AXIAL LOADS, SHEARS, &amp; MOMENTS

Membr	Node	Axial	Shear	Moment	Node	Axial	Shear	Moment
1	1	0.000	-0.389	0.000	2	0.000	-2.654	3.185
2	2	0.000	-2.654	-3.185	3	0.000	2.654	0.000

## MEMBER STRESS AXIAL, SHEAR, &amp; BENDING

Membr	Node	AxialStr	ShearStr	BendStr	Node	AxialStr	ShearStr	BendStr
1	1	0.000	-0.015	0.000	2	0.000	0.106	2.709
2	2	0.000	-0.105	2.709	3	0.000	-0.105	0.000

## EQUILIBRIUM SUMMARY

	Horizontal	Vertical
Applied Loads	0.000	5.707
Support Reactions	0.000	-5.707



# COVENANT HOMES (1988) LTD.

Cnr. Marshalls Road & State Highway 30. P.O. Box 378, Whakatane.  
Telephone (07) 307-0042, Facsimile (07) 307-1420, Mobile (025) 96-44-74



specifications for :

NEW DWELLING

name: MR & MRS PHIL HARRIS

site address:

RURIMA RISE

COASTLANDS

legal description:

LOT 52 OPS 21360

date: 5.95





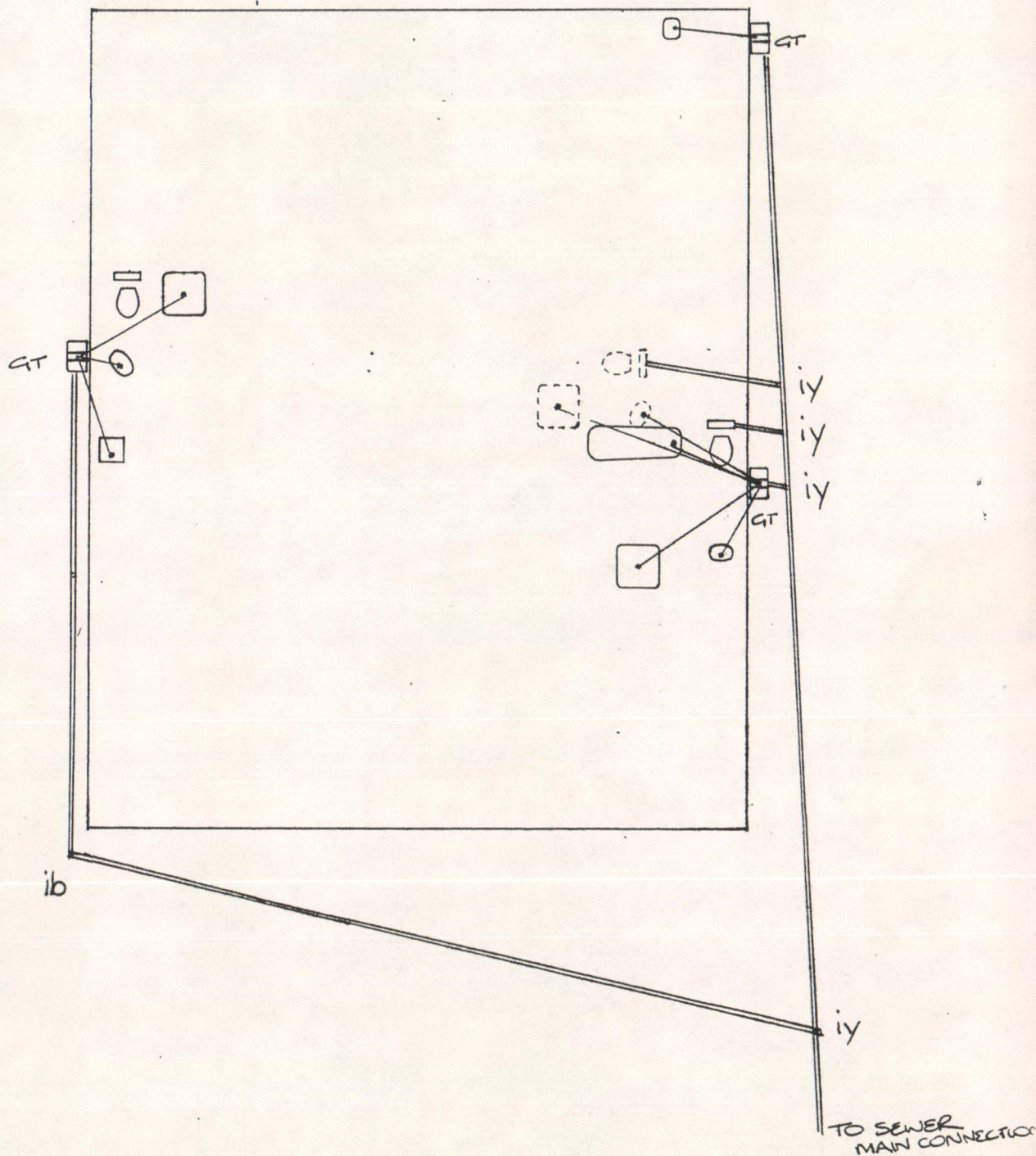
# COVENANT HOMES (1988) Ltd

DRAINAGE PLAN

Scale: 1/100

Site address... HARRIS JOB... TURIMU RISE .....

Legal Description.....





# STORMWATER DISPOSAL

Client: P. HARRIS

Address: RURUMA RISE

ALL WORK IN ACCORDANCE WITH NZBC E1/AS1

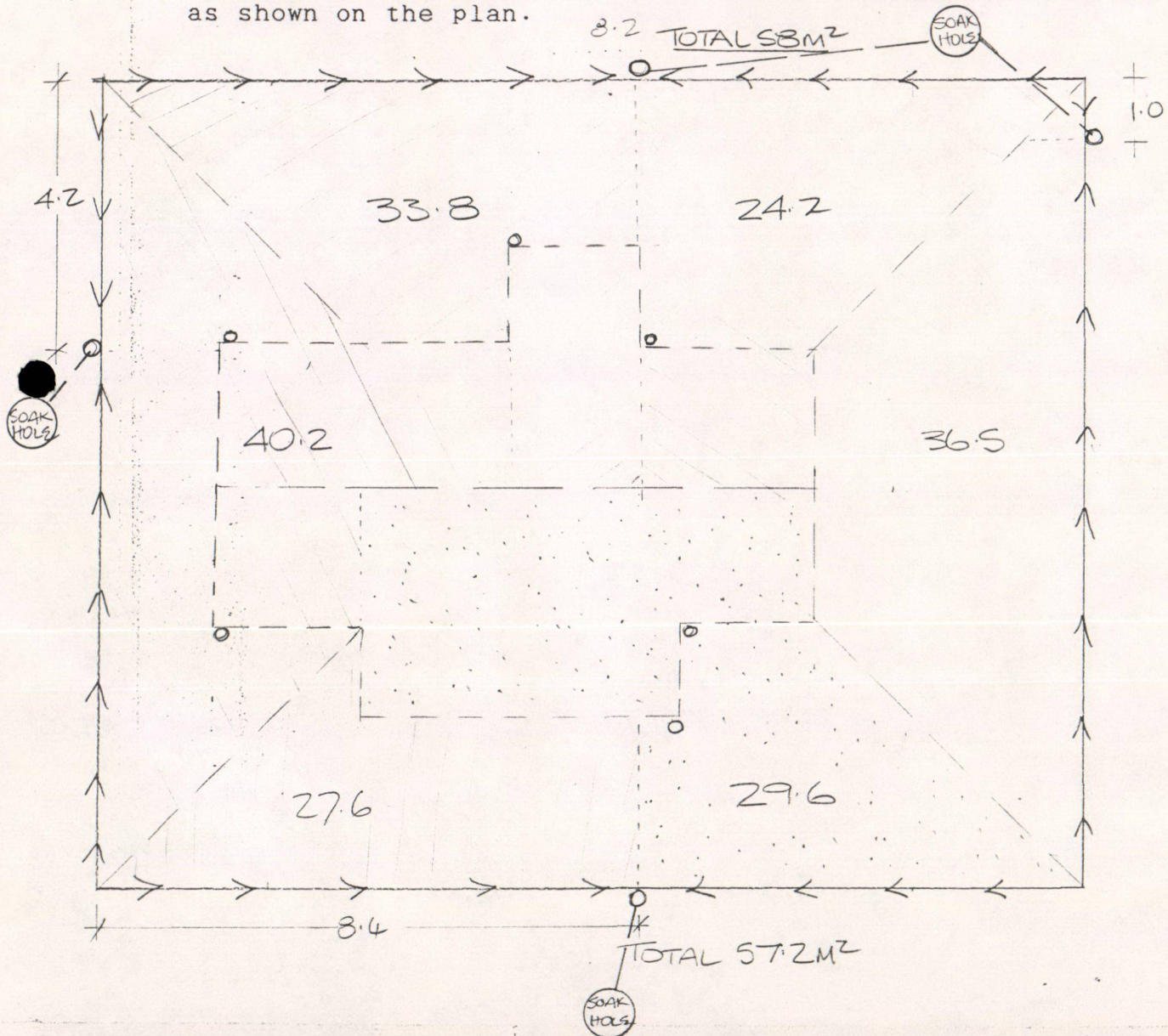
Total Roof area: 191.5 m<sup>2</sup>  
(Whakatane area 115mm/hr intensity)  $\times 1.15$

Effectual calculated catchment area: 220.2

DOWNPIPES: 100x50 size 100 m<sup>2</sup> capacity  
(area  $\div$  capacity)  $220.2 \div 100 = 3$  No DP's

SPOUTING : KLASS type 78.3 m<sup>2</sup> capacity  
(area  $\div$  capacity)  $220.2 \div 78.3 = 4$  to DP's

With required high points as arranged spouting is adequate as shown on the plan.





# Wall Bracing Calculation Sheet A

## Job Details

box 1

Name P HARRIS

Street and Number KURIMA RISE COASTLANDS

Lot and DP Number \_\_\_\_\_

City/Town/District \_\_\_\_\_

Location of Storey: single/upper of two lower of two

Building height to apex 3.9 m Roof weight light/heavy

Roof height above eaves 3.8 m Cladding weight light/heavy

Stud height 2.4 m Room in roof space Yn

Average roof pitch 22 1/2° AV.

Building length BL = 13.2 m Gross Building \_\_\_\_\_

Building width BW = 10.6 m Plan Area, GPA = 191.5 m2

Note: When the average roof pitch is over 25 degrees, use the eaves length and width to determine BL and BW.

Note: For heavy roofs use the roof plan at eaves level to determine GPA.

## Wind Zone

box 2

Region: R1 0 ✓ Terrain: Inland 0 Exposure: Sheltered C Topography: Gentle 0 ✓

R2 1 Coastal 1 ✓ Exposed 1 ✓ Moderate 1 Extreme 3

Total points \_\_\_\_\_

Wind zone: Low (0) Very high (3)

Medium (1) Specific Design (4)

High (2)

## Earthquake zone

box 3

From figure EQ1 select Earthquake Zone: (A) B C

## BU's required Wind

box 4

From Table W1A/W1B

W along = 90 BU's/m

W across = 109 BU's/m

Total wind load,

W ALONG:

W along x BW = 954 BU's

W ACROSSL

W across x BL = 1433.8 BU's

## BU's required Earthquake

box 5

From Table EQ1

E = 40 BU's/m2

Note: For a room in the roof space use E+1

Total earthquake load,

EQ ALONG and EQ ACROSS:

E x GPA BU's = 766 BU's

# Wall Bracing Calculation Sheet B

## Along

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BU's Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m	BU's Achieved (BU/m x L)	Rating BU/m	BU's Achieved (BU/m x L)
A	132		HTX4	2.4	103	247.2	90	216
			HTX3	1.2	97	116.4	90	108
B	70		GIB2	3.6	80	288	70	252
C	70							
			GIB2	3.6	80	288	70	252
D	132		HTX3	1.2	97	116.4	90	108
			HTX4	3.6	103	370.8	90	324
E								

Totals Achieved		W	11426.8	EQ	1260
From Sheet A Totals Required		W	954	EQ	766
Wreq/EQreq =					

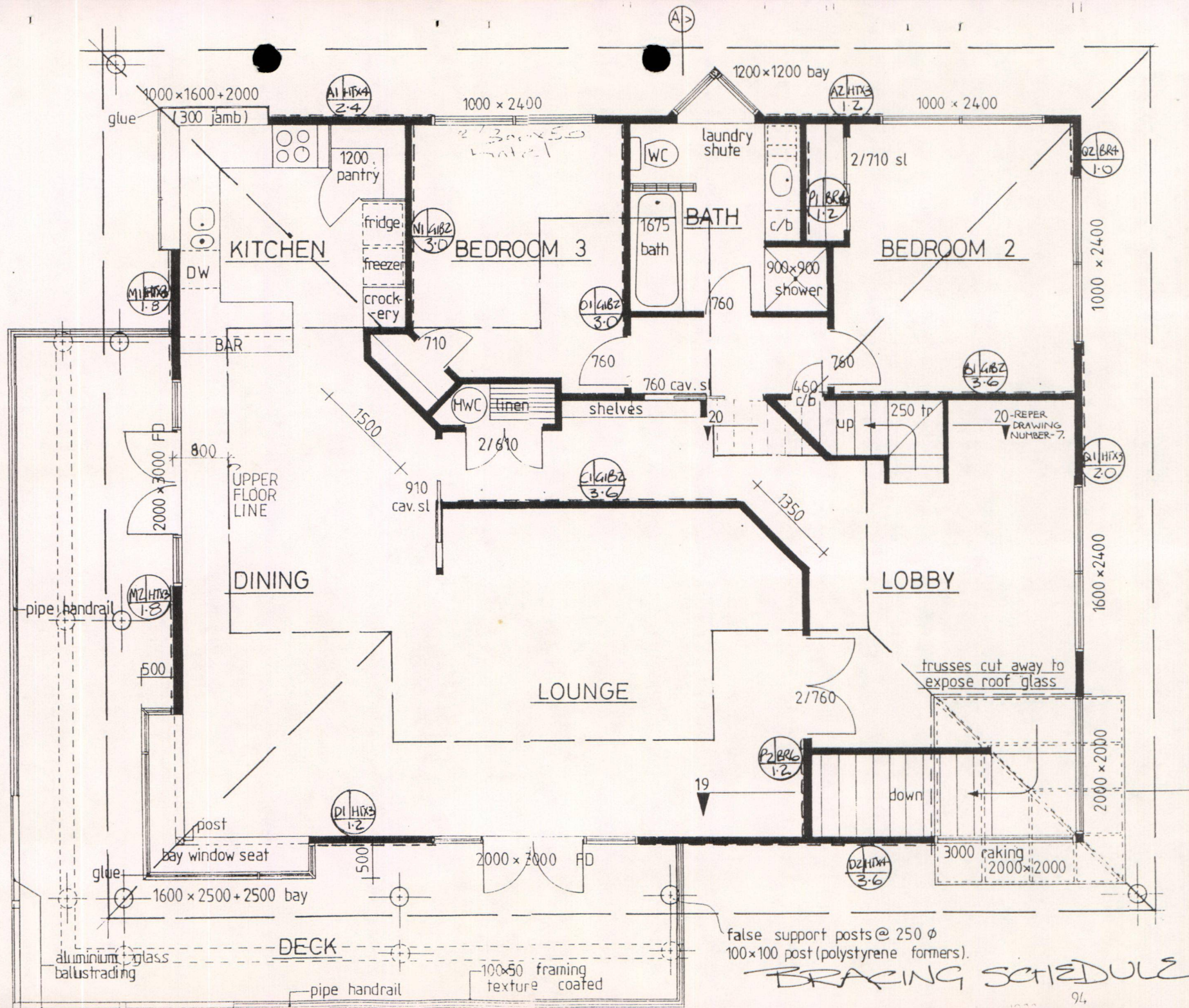
\*If Wreq/EQreq is 1 or less complete EQ column only  
If Wreq/EQreq is 1.5 or more complete W column only  
Otherwise complete both W and EQ

## Across

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BU's Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m	BU's Achieved (BU/m x L)	Rating BU/m	BU's Achieved (BU/m x L)
M	106		HTX3	1.8	97	174.6	90	162
			HTX3	1.8	97	174.6	90	162
N	70		GIB2	3.0	80	240	70	210
O	70		GIB2	3.0	80	240	70	210
P	70		BR6	1.2	150	180	110	132
			BR6	1.2	150	180	110	132
Q	106		HTX3	2.0	97	194	90	180
			BR4	1.0	100	100	85	85

Totals Achieved		W	1483.2	EQ	1273
From Sheet A Totals Required		W	1433.8	EQ	766
Wreq/EQreq =					







# Wall Bracing Calculation Sheet A

## Job Details

box 1

Name Mr & Mrs P Harris

Street and Number Ruma Rise

Lot and DP Number \_\_\_\_\_

City/Town/District Coastlands

Location of Storey: single/upper of two/lower of two

Building height to apex \_\_\_\_\_ m Roof weight light/heavy

Roof height above eaves 1.6 m Cladding weight light/heavy

Stud height 2.4 m Room in roof space y/n

Average roof pitch 22.12

Building length BL = 9.2 m Gross Building \_\_\_\_\_

Building width BW = 7.6 m Plan Area, \_\_\_\_\_ GPA = 517 m<sup>2</sup>

Note: When the average roof pitch is over 25 degrees, use the eaves length and width to determine BL and BW.

Note: For heavy roofs use the roof plan at eaves level to determine GPA.

## Wind Zone

box 2

Region: 0 Terrain: 0 Exposure: 0 Topography: 0

R1 0 Inland 0 Sheltered 0 Gentle 0

R2 1 Coastal 1 Exposed 1 Moderate 1

Extreme 3

Total points 2

Wind zone: Low (0) Very high (3)

Medium (1) Specific Design (4)

High (2)

WHAKATANE DISTRICT COUNCIL

1 - JUN 1995

*approved*

## Earthquake zone

From figure EQ1 select Earthquake Zone: (A) B C

## BU's required Wind

box 4

From Table W1A/W1B

W along = 58 BU's/m

W across = 46.4 BU's/m

Total wind load,

W ALONG:

W along x BW = 441 BU's

W ACROSS:

W across x BL = 427 BU's

## BU's required Earthquake

box 5

From Table EQ1

E = 4.0 BU's/m<sup>2</sup>

Note: For a room in the roof space use E+1

Total earthquake load,

EQ ALONG and EQ ACROSS:

E x GPA BU's = 202.8 BU's

# Wall Bracing Calculation Sheet B

## Along

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BU's Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BU's Achieved (BU/m x L) W	Rating BU/m EQ	BU's Achieved (BU/m x L) EQ
A	71	A	GIB1	2.4	75 x 75%	135	50	90
B	70	B	GIB2	2.4	30	192	70	168
C	92	C	GIB1	2.4	75	180	50	120
D	47	D	BR4	1.1	115 x 75%	107	39 x 75%	74.8
E								

Totals Achieved		W	614	EQ	452.8
From Sheet A Totals Required		W	441	EQ	202.8
Wreq/EQreq =					

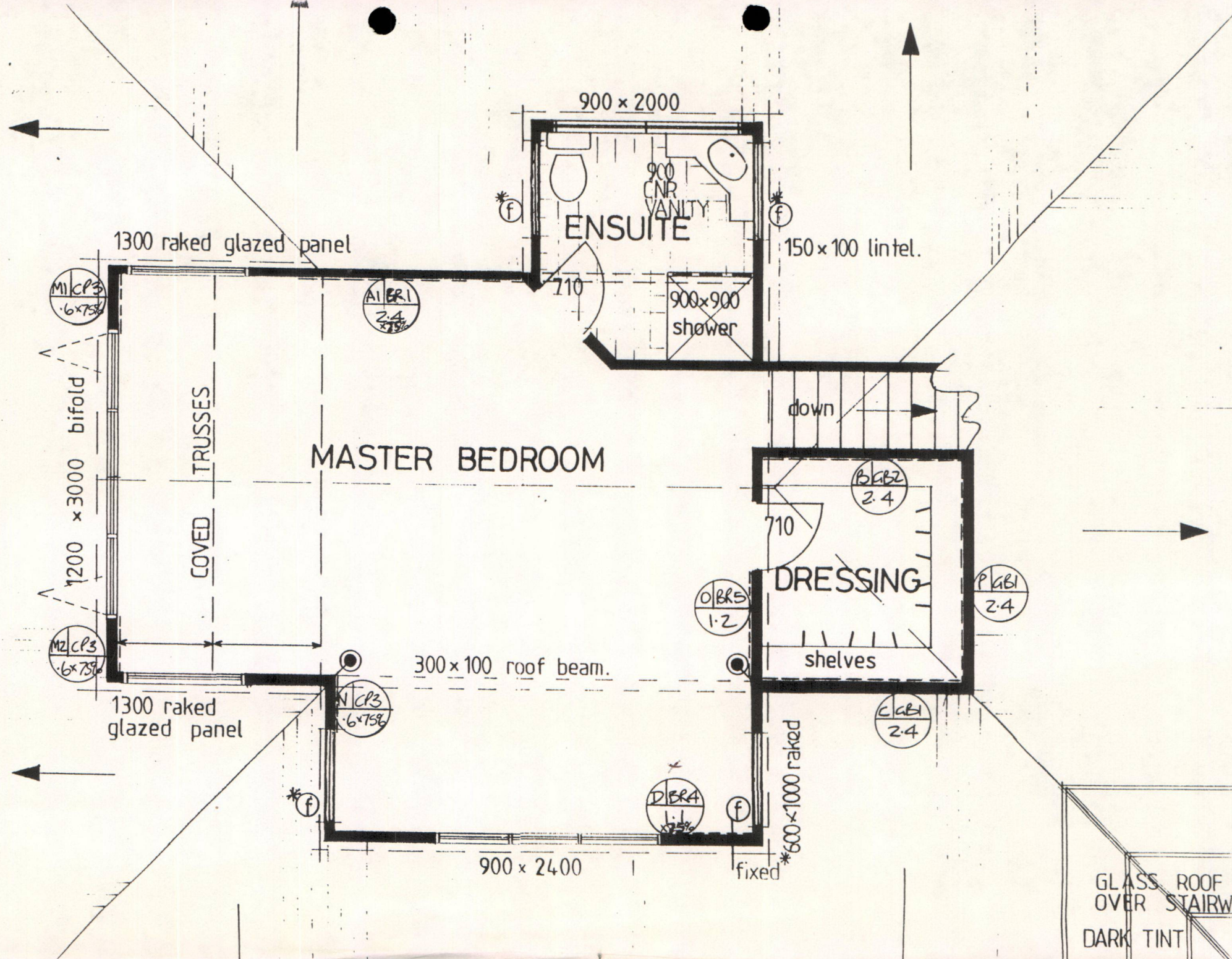
If Wreq/EQreq is 1 or less complete EQ column only  
If Wreq/EQreq is 1.5 or more complete W column only  
Otherwise complete both W and EQ

## Across

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BU's Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BU's Achieved (BU/m x L) W	Rating BU/m EQ	BU's Achieved (BU/m x L) EQ
M	44	M1	CP3	.6	88 x 75%	66	88 x 75%	62.2
		M2	CP3	.6	88 x 75%	66	88 x 75%	62.2
N	60	N	CP3	.6	88 x 75%	66	88 x 75%	62.2
O	76	O	BR5	1.2	115	138	35	102
P	26	P	GIB1	2.4	75	180	50	120
Q								

Totals Achieved		W	516	EQ	408.6
From Sheet A Totals Required		W	427	EQ	202.8
Wreq/EQreq =					





GLASS ROOF  
OVER STAIRW!  
DARK TINT



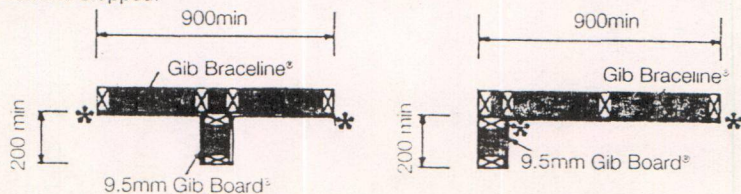
# Gib Board® Wall Bracing Systems Construction Guide

(complies with NZS 3604 : 1990)

Specifications			
Type	Description	Additional Requirements	Nailing & Stopping
Gib 1	9.5mm Gib Board <sup>2</sup> on one face. Min. length 1800mm	Diagonal brace	Gib 1, 2 and 3
Gib 2	9.5mm Gib Boards <sup>1</sup> on both sides. Min. length 1800mm	Diagonal brace	30 x 2.5 Gib Clouts <sup>2</sup> at 150mm ccs. around the perimeter of the bracing element and at 300mm ccs. to intermediate framing.
Gib 3	9.5mm Gib Boards <sup>1</sup> on both sides. Min. length 1200mm	No additional requirement	Tape and stop all joints within the bracing element.
BR 1	Gib Braceline <sup>2</sup> on one face. Min. length 1800mm	Diagonal brace	BR 1, 2, 3, 4, 5, 6, 7 and 8
BR 2	Gib Braceline <sup>2</sup> vertical on one face. Min. length 1800mm	No additional requirement	30 x 2.5 Gib Clouts <sup>2</sup> fitted with Gib Braceline <sup>2</sup> washers at 150mm ccs. around the perimeter of the bracing element.
BR 3	Gib Braceline <sup>2</sup> horizontal on one face. Min. length 1800mm	No additional requirement	
BR 4	Gib Braceline <sup>2</sup> on one face. Length 900 to 1200mm	6 kN end-stud fixings	Standard nailing to intermediate framing.
BR 5	Gib Braceline <sup>2</sup> on one face. Length 1200 to 2400mm	6 kN end-stud fixings	Tape and stop all joints within the bracing element.
BR 6	Gib Braceline <sup>2</sup> and Gib Board <sup>2</sup> on opp. sides. Length 1200 to 2400mm	12 kN end-stud fixings	
BR 7	Gib Braceline <sup>2</sup> on one face 7.5mm ply on other. Length 900 to 2400mm	6 kN end-stud fixings	
BR 8	Gib Braceline <sup>2</sup> on one face 4.75mm hardboard on other. Length 900 to 2400mm	6 kN end-stud fixings	

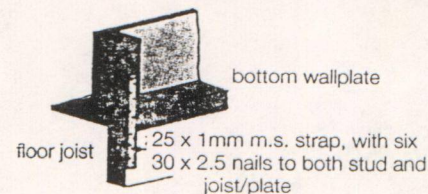
## Guidelines for Intersecting Walls

Types BR1 to BR8 may have standard 9.5mm Gib Board<sup>2</sup> intersecting walls with a min. length of 200mm. Gib Braceline<sup>2</sup> nails and washers are required around the perimeter of the bracing element (\*). Intermediate vertical joints may be nailed with standard Gib Clouts<sup>2</sup> at 300mm ccs. and should be tape reinforced and stopped.



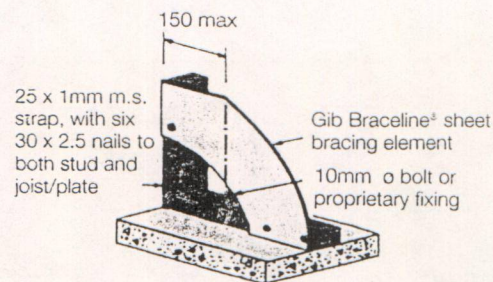
## Detail 1

6kN connection to timber sub-floor (both sides of stud strapped for 12kN)



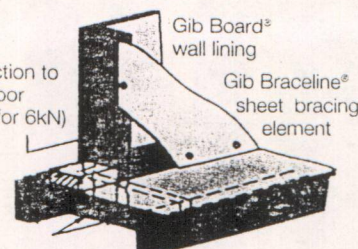
## Detail 2

6kN connection to concrete (both sides of stud strapped for 12kN connection)



## Detail 3

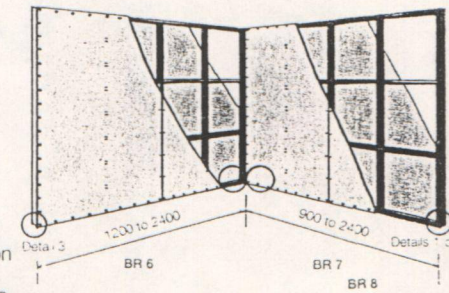
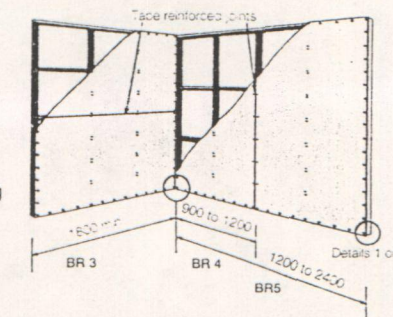
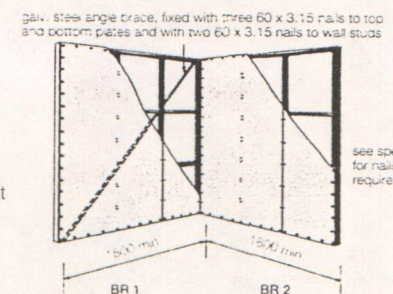
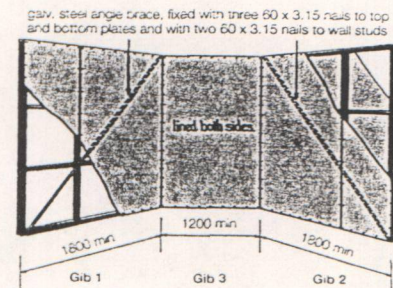
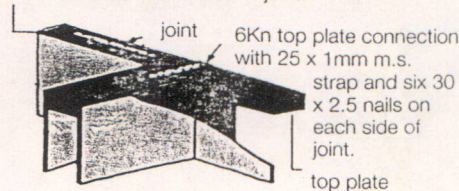
12kN connection to timber sub-floor (single strap for 6kN)



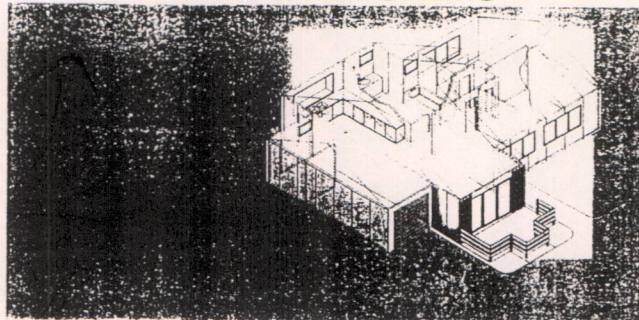
two 25 x 1mm m.s. straps, with six 30 x 2.5 nails to both stud and blocking piece between floor joists

## Top Plate Connections

3kN top plate connection, with 25 x 1mm m.s. strap and three 30 x 2.5 nails on each side of joint.







This data sheet can be used to determine the bracing ratings of Harditex 7.5mm for external wall cladding and bracing. Bracing ratings have all been determined by BRANZ testing and are suitable for use in conjunction with NZS 3604:1990.

### Description

Harditex is a sheet material manufactured from fibre cement which is a composition of treated cellulose fibre, Portland cement and finely ground sand. Following forming into sheets the product is cured by high pressure steam autoclaving.

Harditex 7.5mm thick is used as the required bracing to exterior timber framing whilst also being the exterior cladding system when jointed and coated.

The product is identified by the nail pattern on the face of the sheets and also by a pink tint through the thickness.

### New Zealand Building Code (NZBC)

Harditex, when used in accordance with this specification and the statements and conditions of the BRANZ Appraisal Nos. 229 and 243 will meet the relevant provisions of:

NZBC Clauses B1 Structure  
B2 Durability  
E2 External Moisture

### Durability

The Harditex bracing system meets the performance requirements of NZBC Clause B2.3.(a) of 50 years.

### Serviceable Life

The ability of Harditex to perform as bracing for at least 50 years is dependent on remaining dry in service (one or two accidental brief wettings per year excepted). The various coatings and jointing systems will need to be maintained so as to continue to exclude water and this may require the replacement of some of these items during the life of the building.

### BRANZ Appraisal

Harditex has received the following appraisals: BRANZ Appraisal Certificates Nos. 229 (1993) and No. 243 (1993).

### Maintenance

The coatings will require regular maintenance. Regular inspections will be required by owners to ensure that there are no cracks at sheet joints which may allow water entry.

### Framing

The timber framing shall be in accordance with the Building Regulations 1992. It shall conform with NZS 3604:1990 Code of Practice for light timber frame buildings or be as for a specific design in accordance with the NZS 4203:1992.

The studs may be spaced at up to 600mm centres with nogs or blocking at 1200mm maximum centres.

### Fixing

Harditex sheets must be fixed vertically with all sheet edges on framing. Sheet joints must be avoided at the corners of openings (except for control joints). Fix all Harditex sheets to the timber framing with 40 x 2.5mm hot dipped galvanised Hardiflex nails.

Nail at 150mm centres to sheet edges and to intermediate framing and nogs. Nails are driven a minimum of 12mm from the sheet edge and 50mm from corners. The sheets must be held hard against the framing during nailing to minimise nail break out.

Drive all nails flush with the Harditex sheet surface. Do not punch as this can weaken the nails holding.

Fix all Harditex sheets from the centre working towards the outside to avoid drumminess.

Certain bracing applications require the use of straps or fixings. These must be rebated into the framing behind the sheets. (Refer Table 1 and Figs. 8 and 9)

### Technical Details

For full technical details, specifications and work

ing instructions for Harditex refer to the 'Harditex Exterior Cladding Systems' technical information brochure, and the Harditex video (both are available on request).

### Sheet Sizes

Harditex sheets are 7.5mm thick. Lengths and widths of sheets are given below:

1800mm x 1200mm  
2400mm x 1200mm  
2700mm x 1200mm  
3000mm x 1200mm  
2700mm x 900mm

### Sheet Mass

The approximate mass of 7.5mm Harditex (based on Equilibrium Moisture Content) is 10.7kg/m<sup>2</sup>.

### Handling and Storage

The product should be stacked on a smooth level surface. Edges and corners should be protected from damage. Storage should be under cover and the sheets kept dry prior to fixing. The sheets should be carried on edge.

### Bracing

Harditex will provide bracing for buildings designed and constructed in accordance with NZS 3604. For details of this aspect of the product refer to BRANZ Appraisal Certificate No. 229 (1993) Hardies Wall Bracing Systems.

Harditex shall be used as the required bracing with the appropriate fixings as set out in Table 1. Refer also to Figs. 1 to 7 for Harditex sheet bracing details.

Harditex meets the wall bracing element requirements of NZS 3604. (NZS 3604 is cited in NZBC Approved Document B1/AS1 Clause 4.0).

TABLE 1: Bracing Ratings for HARDITEX 7.5mm thick				
System Number	Bracing Element Length	Figure Reference	NZS 3604:1990 Rating in bracing units per metre of element length	
			Wind	Earthquake
HT1	1200mm or more	Refer Fig. 1 and 2 End straps not required	100	90
HT2 HT3	900-1200mm 1200mm or more	Refer Fig. 3 and 4 End straps required (Refer Figs 8 or 9)	100 115	100 100
HT4 HT5	1200-2400mm 2400mm or more	Refer Fig. 5 End straps not required	130 130	110 120
HT6 HT7 HT8	900-1200mm 1200-2400mm 2400mm or more	Refer Fig. 6 and 7 End straps not required	100 115 120	80 90 100

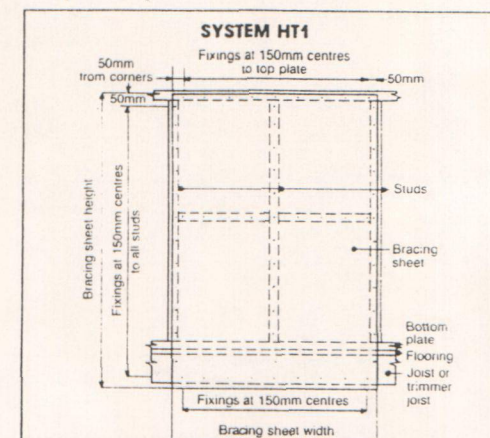


Fig. 1. Harditex to Timber Joists without End Straps

#### NOTE

1. Trimmer joists to be a continuous member nailed to the ends of joists and not to be nogged between.
2. For Harditex bracing ratings refer Table 1.
3. End strap fixing between studs and joists are not required for this system.

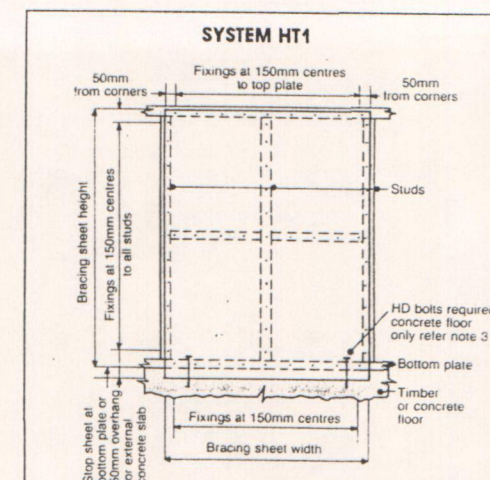


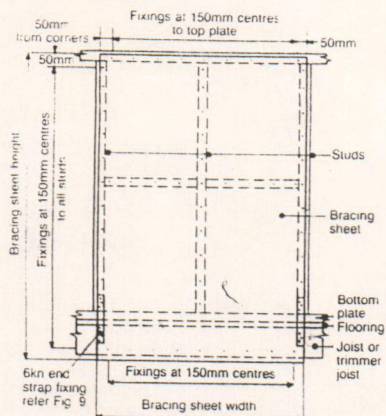
Fig. 2. Harditex to Timber or Concrete Floors without End Straps

#### NOTE

1. End strap fixing to studs are not required for this system.
2. For Harditex bracing ratings refer Table 1.
3. HD bolts to be M10 hot dip galvanised with 50 x 50 x 3mm galvanised washers.



## SYSTEMS HT2 AND HT3

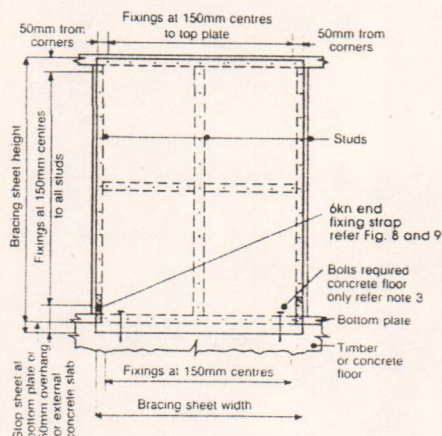


**Fig. 3. Harditex to Timber Joists with End Straps**

### NOTE

1. Trimmer joists to be a continuous member nailed to the ends of joists and not to be nogged between.
2. Galvanised steel end Fixing straps to be as detailed by Fig 9.
3. For Harditex bracing ratings refer Table 1.

## SYSTEMS HT2 AND HT3

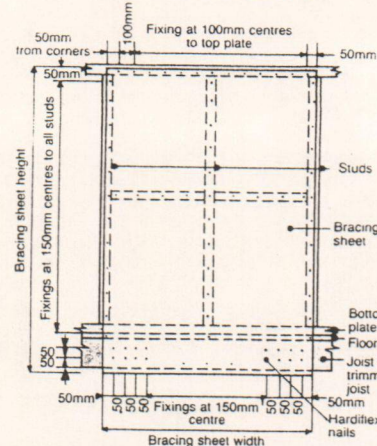


**Fig. 4. Harditex to Timber or Concrete Floors with End Straps**

### NOTE

1. Galvanised steel end fixing straps to be as detailed by Fig. 8.
2. For Harditex bracing ratings refer to Table 1.
3. HD bolts to be M10 hot dip galvanised with 50 x 50 x 3mm galvanised washers.

## SYSTEMS HT4 AND HT5

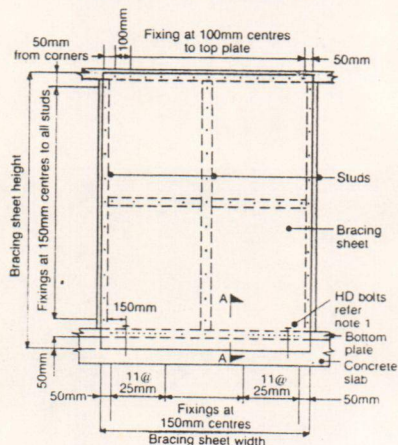


**Fig. 5. Harditex Special Fixing to Timber Joists**

### NOTE

1. Trimmer joists to be a continuous member nailed to the ends of joists and not to be nogged between.
2. For Harditex bracing ratings refer Table 1.
3. End strap fixing between studs and joists are not required for this system.

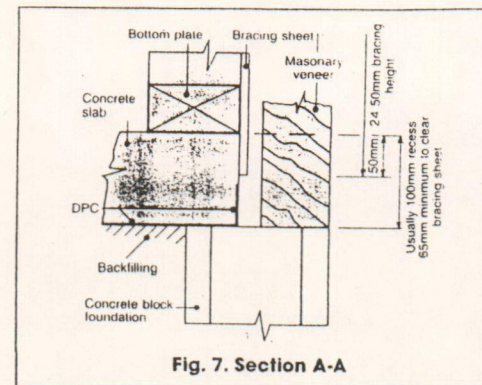
## SYSTEMS HT6, HT7 AND HT8



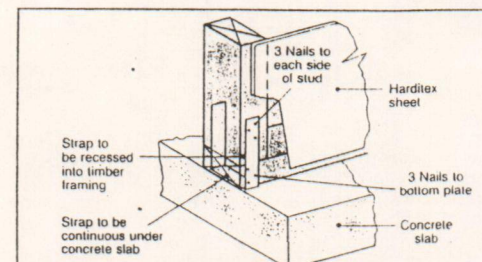
**Fig. 6. Harditex Special Fixing to Concrete Slab**

### NOTE

1. HD bolts to be M10 hot dip galvanised bolts with 50 x 50 x 3mm washers.
2. End strap fixing between stud and bottom plate are not required for this system.
3. For Harditex bracing ratings refer to Table 1.



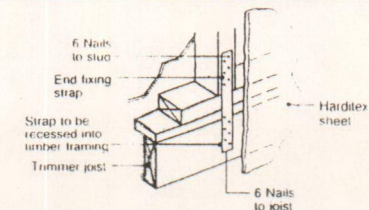
**Fig. 7. Section A-A**



**Fig. 8. End Fixing Strap to Concrete Slab**

### NOTE

1. Straps to be 25mm x 1mm galvanised steel or a proprietary system of 6kN capacity.
2. Strap nails to be 30 x 3.15mm diam galvanised.



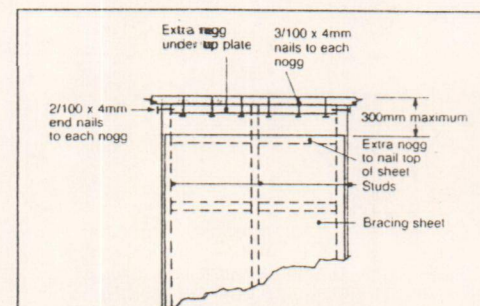
**Fig. 9. End Fixing Strap to Timber Floor**

### NOTE

1. Strap to be 25mm x 1mm galvanised steel or a proprietary system of 6kN capacity.
2. Strap nails to be 30 x 3.15mm diam galvanised.

## Sheets Stopped Below Top Plate

Where bracing sheets are stopped below the level of the top plate refer to Fig. 10.



**Fig. 10. Detail When Bracing Sheet Stopped Below Top Plate**

### NOTE

1. All sheet nailing to be as shown for the various bracing systems.
2. The full bracing values for full height sheets for each system can be used when this detail is followed.
3. This detail is to be used instead of the detail shown in Fig. K1 NZS 3604:1990.

## SYSTEM WARRANTY

The systems recommended in this Brochure are formulated along the lines of good building practice and are intended to assist experienced tradespeople in construction procedures. However, the Brochure is not intended to be an exhaustive statement of all relevant data. Further, as the successful installation of these systems depends on numerous factors outside the Company's control (e.g. quality of workmanship, particular design requirements, etc.) the Company accepts no responsibility for or in connection with the quality of the systems, or their suitability for any purpose when installed.

All conditions, warranties, obligations and liabilities of any kind which are or may be implied or imposed to the contrary by any statute, rule or regulation or under the general law and whether arising from the negligence of the Company, its servants or agents or otherwise are hereby excluded except to the extent that the Company may be prevented by any statute, rule or regulation from doing so.

Hardies reserve the right to revise without notice information and specification herein.

**HARDIES**  
fibre cement  
building products

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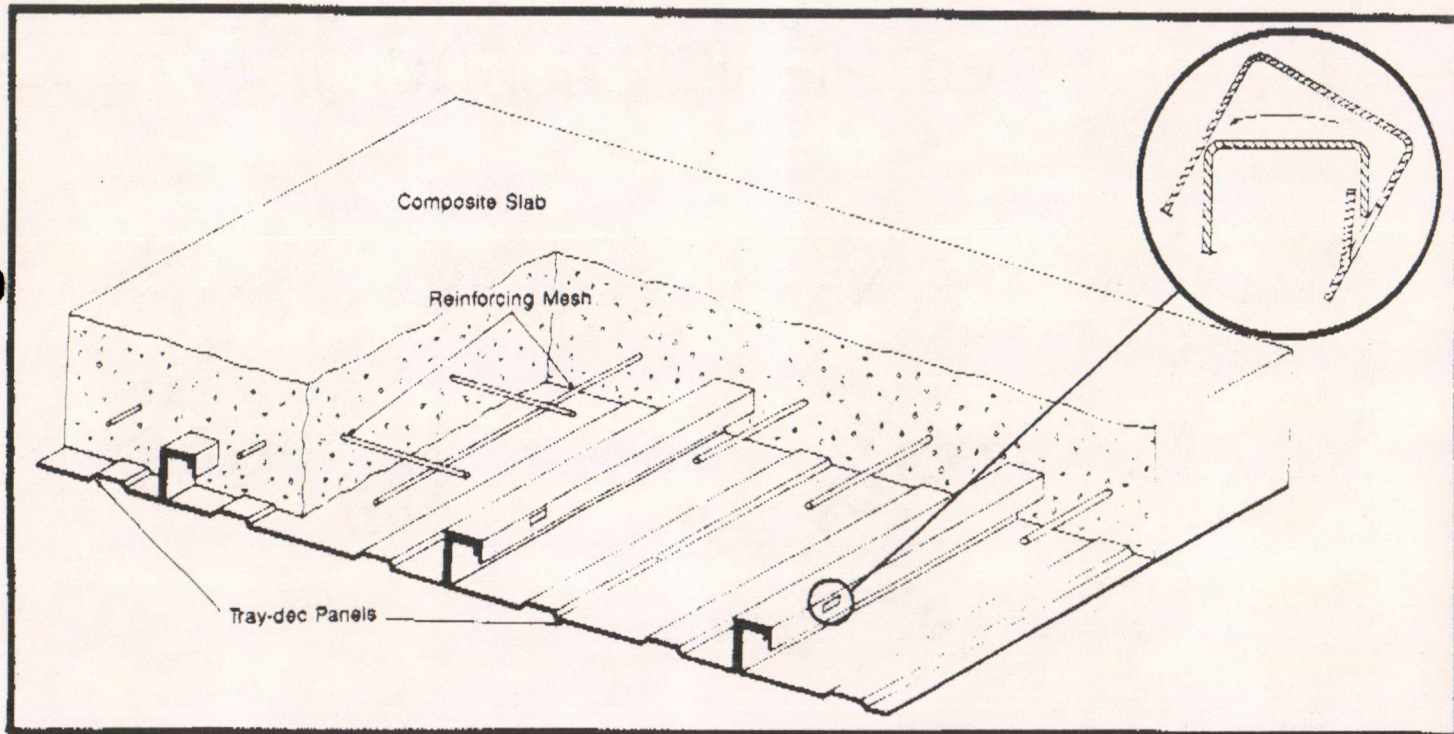
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# Tray-dec 300

TRADEMARK

## FLOORING SYSTEM



## **BUILDERS' GUIDE**



FORGAN JONES COMPANY LIMITED  
**Hercules Structural Components**  
14-16 Hebron Road, Browns Bay, Auckland, New Zealand  
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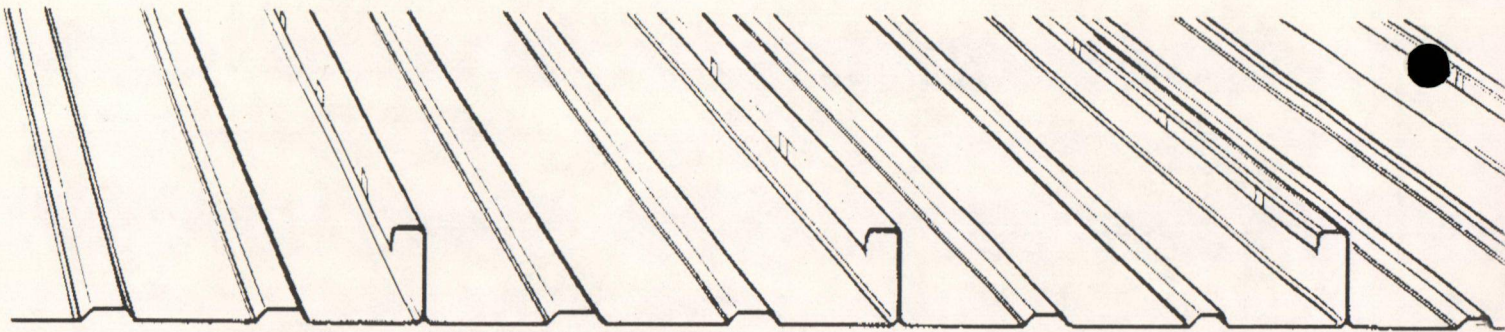


# Tray-dec 300

TRADEMARK

## FLOORING SYSTEM

### SUSPENDED FLOORS



### Introduction:

**Tray-dec 300** is a "steel deck-concrete topping" floor system using galvanised steel trays which act both as permanent formwork and as tensile reinforcement. Each tray interlocks with its neighbour to form a continuous steel deck. The appropriate shrinkage mesh can then be placed and the concrete poured. Laying **Tray-dec** is quick and easy and keeps labour time to a minimum; **Tray-dec** is easily handled on site weighing only 3kg per linear meter. **Tray-dec** trays do not need to be screwed or crimped to each other, but simply clip together. The flat underside of the profile prevents spillage of wet concrete at the tray ends so there is no need for installing time consuming end-caps. The effective width of each tray is 304mm.

The **Tray-dec 300** system complies with all the relevant New Zealand Standards and has been designed to BS5950 Part 4:1982.

The base metal used is 0.75mm thick high tensile 550MPa steel, galvanised with 200g of zinc per square meter.



## Quotes and Orders:

The **Tray-dec 300** system provides an economical solution to virtually any situation in which a suspended concrete floor is required. This includes upper floors, as well as ground floors on sloping sections.

Upon request, we will submit a written quotation showing a rate per square meter for the manufacture and delivery of **Tray-dec** to your building site.

When an order is placed, the exact lengths and number of lengths are determined either from detailed drawings or from direct measurements taken on site. For sites in greater Auckland area, we can send a representative to take the measurements required. If you intend to specify the exact lengths of **Tray-dec** required yourself, please keep in mind that the **Tray-dec** sheets need at least 50mm overlap onto the supporting blockwork and that the effective width of individual sheets is 304mm.

**Tray-dec** will arrive in bundles, free on truck. Where requested, a laying schedule can be made available showing where each sheet belongs in the layout and at which point to start laying the trays.

Our delivery times are very short; in most cases we can have your order manufactured within 24 to 48 hours.

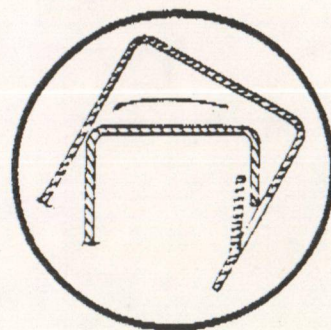
## Installation:

The trays must be carefully laid in accordance with this guide and the design engineer's drawings.

If a tray appears to be the wrong length, it is likely to belong elsewhere in the layout.

Place the first full width tray on one side of the area to be covered so that it overlaps by at least 50mm on to both the side and the end supports. The punched web side of the tray must be laid on the side support (see next page).

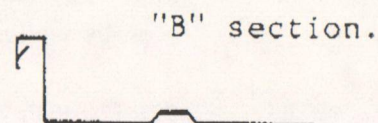
Now hold the next tray by its plain web so that it hangs vertically at right angles to the first tray. Engage the punched fixing tabs with the plain web of the first tray, then rotate through 90 degrees away from the first tray until the two lie neatly side by side. Check all punched tabs are engaged with the plain lip of the first tray. Repeat the process for the third and subsequent trays.





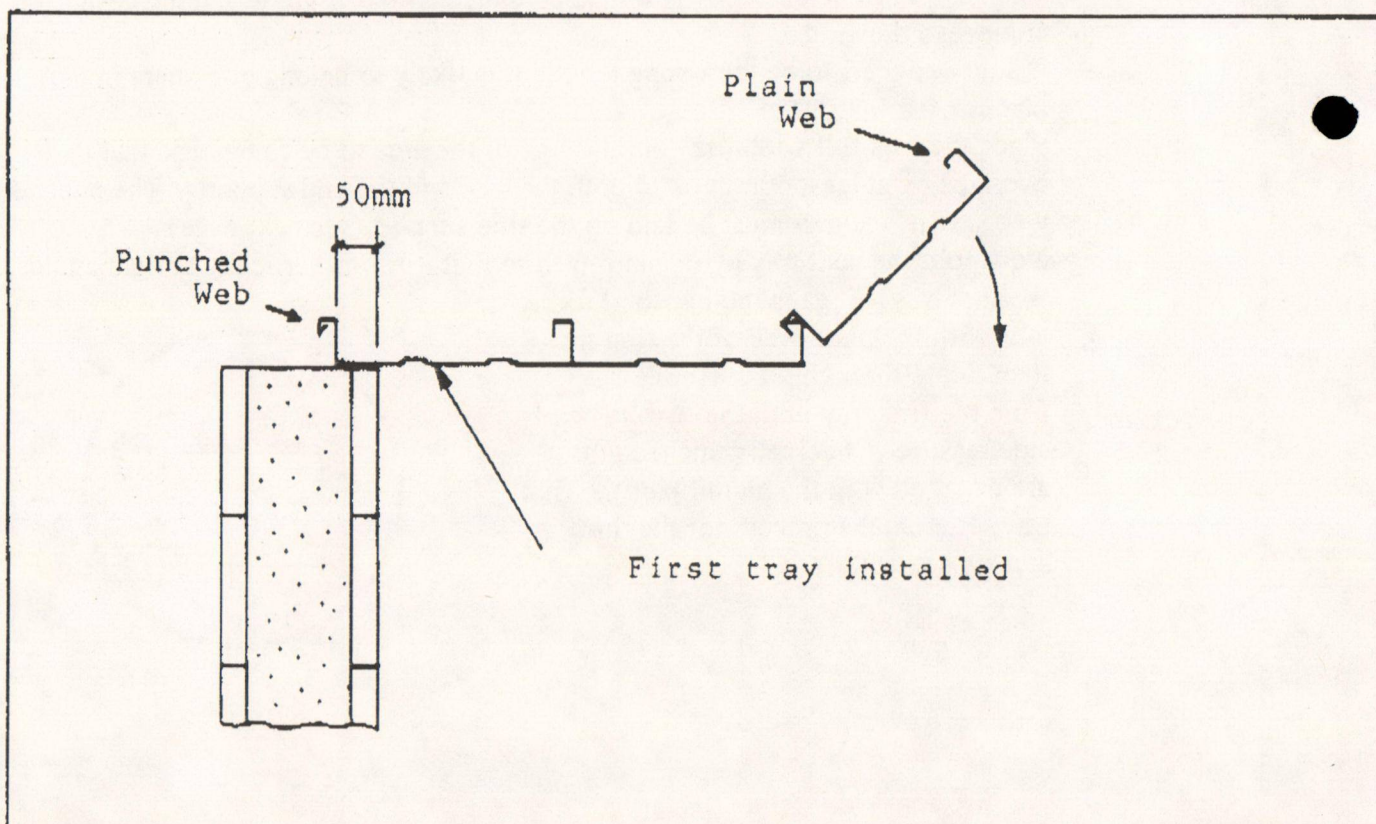
Where the slab width is not an exact multiple of the 304mm width of a tray, a special section is slit lengthwise to complete the coverage. These are called "B" sections and *should be laid last*.

The reason for this is that both parts of the slit tray will be delivered with the order, only one part of which is to be used. If the wrong section is used, it may not be able to complete the coverage.



After the Tray-dec trays have been placed over the supports, they should be secured immediately against wind uplift. The tray ends should have one fastener each, located adjacent to the upstanding rib. Where trays run continuously over an intermediate support, a fastener should be placed adjacent to every third tray. Where the sheets rest on blockwork, use 25mm thin-shank masonry nails or 4mm dia. powder actuated drive pins with a washer fitted. Sheets resting on steel beams can be secured with 4mm dia. powder actuated drive pins with a washer fitted.

Where the trays are used as a work platform during construction, care must be taken not to overload them. Timber bearers should be used to distribute loads for walkways and work areas, especially when placing wet concrete. Prior to placing the concrete, the trays are to be clean, dry, free of contaminants such as oil or grease and cleared of miscellaneous construction debris. Concrete is to be compacted using a vibrator; hand compaction is not recommended.





## Propping:

When concrete is pumped onto **Tray-dec**, the trays will deflect somewhat. The degree of deflection depends on the distance spanned and the slab thickness. To determine the minimum number of temporary propping lines required, refer to the table below.

For example, a 120mm slab spanning 5000mm requires a single propping line placed at mid span. If, however, the underside of the **Tray-dec** will be left exposed as a ceiling rather than it being strapped afterwards, we recommend the installation of additional propping lines. By keeping the distance between propping lines about 1200mm, a flatter, more attractive underside finish will be the result. Naturally, where the appearance of the underside of the **Tray-dec** is of little concern (eg. floors over sloping sections, ceilings in garages etc.), there is no need to install more than the minimum number of propping lines given by the table.

### ALLOWABLE SUPERIMPOSED LOADS (kPa)

#### TRAY-DEC 300 — 0.75mm

SINGLE SPAN SLAB.  
NO NEGATIVE MOMENT REINFORCEMENT.  
NORMAL DENSITY HIGH GRADE CONCRETE.  
MODULAR RATIO = 15

SPAN mm	THICKNESS SLAB (mm)											
	90	100	110	120	130	140	150	160	170	180	190	200
2000												
2200												
2400												
2600												
2800												
3000												
3200												
3400												
3600												
3800												
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6600												
6800												
7000												
7200												
7400												

Propping should consist of stiff timber or steel bearers with a minimum 100mm wide upper face to avoid damage to the trays when the concrete is poured. The vertical props supporting these bearers must be strong enough and sufficiently stiff to support in a stable manner both the weight of the wet concrete and any temporary construction loads.



There are two typical propping systems;

**1) using timber only;** two 100x50 's sandwiched together as supporting bearer and a single 100x50 placed at 800mm centres as vertical supports. If possible, use a 100x50 on the ground below the vertical props to spread the load evenly and provide some form of bracing to give the vertical props some lateral restraint. This particular propping arrangement may not be sufficient for every job. To make sure that it is, please contact Forgan Jones Co. to get propping details specific to your particular project before constructing propping lines.

The advantage of this method is that the timber can be used again as framing in the rest of the building.

**2) using acrow props;** provided that a steel bearer is used to support the Tray-dec, acrow props can be spaced at 1200mm centres.

Although acrow props need to be hired and hence are generally more expensive, they are quicker to erect and are more stable than timber prop.

The point to keep in mind is that good preparation of propping lines is essential in achieving a good underside finish.

At all times during the construction phase, care must be taken to avoid localised dumping or heaping of concrete on the Tray-dec. Failure to do so will result in deflections in those areas.

Do not remove temporary propping until the concrete slab has reached at least 70% of its design strength. In general, suppliers of concrete guarantee that full design strength is reached after 28 days of curing. However, if it is necessary to remove the propping lines sooner, the best way to determine the concrete strength is to ask the concrete supply company *at the time of ordering the concrete* to take samples for a cylinder test. Usually, 70% of design strength is reached within 7-10 days from pouring.

The above information provides general guidelines only. For advice relating specifically to your particular project, please feel free to contact us here at **Forgan Jones Company Ltd.**



**Table 1: Examples of building elements required to have 5 and 15 year durabilities**

Paragraph 1.0.1 Comment 2

5 Year durability	15 Year durability
<p>Wall and ceiling linings</p> <p>Floor coverings in wet areas (bathrooms and laundries etc.)</p> <p>Interior and exterior coatings used as protection against moisture</p> <p>Exposed plumbing and electrical fittings</p> <p>Signs</p> <p>Hot water cylinders</p>	<p>Structural suspension systems for ceilings</p> <p>Internal wall &amp; floor secondary elements (doors, windows, trapdoors)</p> <p>Internal stairs/ramps/balustrades</p> <p>Waterproof linings in showers and around wet areas such as baths</p> <p>Impervious barriers to protect adjoining occupancies</p> <p>External wall (cladding/sheathing)</p> <p>External wall secondary elements (windows/doors)</p> <p>Roof (cladding/sheathing)</p> <p>Roof secondary elements (windows/skylights/doors)</p> <p>Services: High temperature flues. (A 5 year durability is acceptable for high temperature flues which are readily accessed and easy to replace).</p>

Amd 1  
Sept '93



## SECTION 1

### PRELIMINARY AND GENERAL

#### PRELIMINARY AND GENERAL

This specification is of a general type covering all the basic requirements of the building. Should there be any words that do not pertain to this contract, eg unit instead of house etc, the wording shall be read to mean this contract. All work is to comply with the Building Act 1991, the New Zealand Building Code 1992 and current New Zealand Standard specifications unless otherwise specified.

#### CONTRACT

This contract includes the supply and delivery of all materials, labour, tools, fittings, plant etc, necessary for the due and proper completion of the building shown on plans and herein specified in a thorough and workmanlike manner in strict accordance with the New Zealand Building Code and the territorial authority concerned. Amendments to, or new bylaws instituted by the territorial authority or new or special requirements after the date of tendering and which involve additional cost, will be carried out and such additional cost added to the contract.

#### BUILDING CONSENT AND NOTICES

Contractor to comply with labour and building laws of the district, to apply for and obtain the necessary building consents and pay all fees for the same. The contractor shall be responsible for the giving of all notices to the territorial authority for all works which require inspection and approval before they are covered in. Should any such notices not be given and works have to be uncovered, any expense caused by this shall be paid by the contractor for that particular works.

#### SITE

Tenderers shall visit the site to ascertain conditions as no extras will be allowed through failure to ascertain works required below and above ground.

#### PROVIDE AND FIX

The words 'provide and fix' shall be construed to mean 'provide and fix' where mentioned separately unless otherwise specified.

#### INSURANCE

The contractor is to take out a builder's risk insurance for a sufficient sum to cover the contract cost. This policy is to remain in force unless taken over by the owner. Proof of such insurance shall be lodged with the building owner.

#### MATERIALS AND WORKMANSHIP

The contractor shall provide all materials and labour of every description necessary, whether or not particularly noted or specified, needed for the completion of the building. All plant, haulage and cartage shall be allowed for the work carried out according to the true intent and meaning of the drawings and specification. All workmanship must be careful and thorough and in accordance with normal trade practices and all materials to the approval of the territorial authority. Any specified materials non procurable when required and thus retarding progress of contract, may be substituted with others similar provided that such substituted materials conform to the territorial authority bylaws and are approved by the owners.

#### INTERPRETATION

Materials shown and not specified must be of the kinds commonly used for the services they are intended to perform. Any figured dimensions shall be taken in preference to scale. Any difference between specification and plan, to be read as plans being right. Anything shown on plan and not mentioned in specifications and vice-versa and that is necessary to complete job to be read as being included in both.

#### STABILITY OF STRUCTURE

The contractor shall, in all cases, use proper care and diligence in bracing and supporting all parts of his work against damage by wind. He shall also support and protect the work from damage by water. His work shall at all times be self-supporting, absolutely strong and fully equal to resist all strains to which it may be subject.



## **LEVELS**

The contractor shall check all levels on the site. It is the contractor's responsibility to confirm the accuracy of any levels.

## **SETTING OUT**

The contractor shall perform all setting out and he shall be responsible for its accuracy and shall amend any errors without cost to the employer.

## **MAINTENANCE**

Maintenance period is thirty (30) days after the owner has taken possession. Any defects in materials, workmanship, or any part(s) that require replacing or adjusting which have been included in this contract shall be adjusted or replaced as specified in this specification at the contractor's own expense.

## **TEMPORARY CONVENIENCES**

The contractors upon the works shall make provision for the installation of adequate latrines for the use of the workmen in accordance with the requirements of the local Environmental Health Officer. Such latrines shall be removed and filled in upon completion of the works.

## **WATER AND POWER**

Allow for all temporary water and power connections from reticulation laid to the head of the drive, and remove on completion.

## **PROTECTION OF WORK**

The contractor shall substantially cover and protect all parts of his work exposed to damage either during progress of the work or when same is finished and shall deliver the same done by him or his sub-contractors upon completion of the contract in a new, sound, clean and perfect condition.

## **VARIATION AND EXTRA WORKS**

After the final approval of plans by the owner, no variation or extra works shall be carried out by the contractor except with the written authority of the owner. Before such works are proceeded with, the owner shall pay for the same.

## **DAMAGE TO PROPERTY**

The contractor shall provide for making good all damage to any adjoining buildings, footpaths, fences, right-of-ways, trees, shrubs, garden walls and all damage of every kind arising during or out of his works.

## **PROGRESS PAYMENTS**

Progress payments shall be made at monthly intervals in accordance with the general conditions of the contract on receipt of the contractors written claim. The contractor shall also make written application for liens and maintenance moneys as these become due.

## **FLUCTUATION IN COST**

If there should be either a rise or fall in the award of ruling rate of labour or price of materials between the date of the quotation and the date when such labour is employed or such materials are procured for this contract, then on final settlement a compensating adjustment of the contract price shall be made and the owner shall make such additional payment or receive such allowance from the contract price as such a rise or fall shall cause.

## **CLEANING**

At conclusion of the work, premises shall be careful cleaned out, windows washed and glass left free from scratches or paint, etc. and the entire building left in perfectly clean and immaculate condition for occupation. The site shall be generally tidied up and all signs of building debris removed.



## **SECTION 2**

### **EXCAVATION**

#### **PRELIMINARY AND GENERAL**

Refer to the preliminary and general section which also applies to this section of the work.

#### **EXCAVATION**

Excavate as required for all foundations, footings, steps, piles, water pipes, drainage, etc, to the various depths, levels and grades as required for the proper excavation of the works. All footings to have a solid bottom and all to the approval of the territorial authority. Keep all excavations clear of water and fallen material. Allow for taking foundations down through filling into original undisturbed clay.

#### **BACKFILL**

No ancillary trades shall commence, nor shall filling-in be commenced until the work has been inspected and approved. Back fill where required in layers not exceeding 150mm and consolidate with ramming.



## SECTION 3

### CONCRETE WORK

#### IMPORTANT:

All concrete work shall comply with NZS 3109 minimum concrete compressive strength at 28 days shall be:

..... MPa for .....

..... MPa for .....

At least 24 hours notice **MUST BE GIVEN** to the Inspector's Office **BEFORE POURING** CONCRETE FOUNDATIONS, BOND BEAMS SUSPENDED TERRACE SLABS, CONCRETE FLOORS ETC.

#### PRELIMINARY AND GENERAL

Refer to the preliminary and general section which also applies to this section of the work.

#### WORKMANSHIP

Placing - before placing, all boxing and reinforcing steel shall be inspected and approved. Clean out and hose down all formwork before placing concrete. Concrete shall be finally deposited in place within 15 minutes of delivery from the mixer or agitator truck as the case may be. Thoroughly tamp concrete in place and protect with damp sacks or other approved method as directed.

#### FORMWORK

Formwork shall be of timber of nonstaining quality, accurately and securely set up with adequate bracing and close joints. Fillet all external and internal angles if directed. Formwork shall be removed without shock or vibration to the concrete after setting time has expired.

#### BUILD IN

Build in all iron work, pipe sleeves, H D bolts, plumbing work, plugs, etc as required. Box for and form all openings and recesses as required. Allow for 12mm diameter holding down bolts complete with nuts and washers built into the concrete wall band, maximum 1400mm centres, for fixing plates, etc or as required and 150mm in from all angles.

#### FOOTINGS, ETC

Box for and reinforce concrete work as shown on the drawings. Allow for stepping the foundations down to ensure adequate bearing on undisturbed ground. Where foundations step down reinforcement shall be bent down and shall be continuous at this point.

#### SLABS

Lay 100mm thick reinforced concrete slabs over D P C membrane, reinforced with a single layer of 668 HRC mesh 35mm down from top of slab. Lap mesh joints 225mm and wire tie. Screen off and trowel and finish off with a steel float. Econo-mesh of the equivalent grade may be substituted.

#### WATERPROOF MEMBRANES

Under all concrete slabs provide and lay .250 thick polythene D P C membrane. Heat seal or tape joints using approved tapes and overlay and wrap around all penetrations through this membrane. Care shall be taken not to puncture and any such puncture shall be repaired by overlapping with a patch extending 150mm beyond the puncture in all directions. Tape in position. Extend polythene up around perimeter walls. When pouring adequately protect the film from damage from boots, wheel barrows, planks and other damage. Repair all damage as previously specified.



## SECTION 4

### CONCRETE MASONRY

Reinforced concrete masonry construction shall be in accordance with NZS 4210 Grade ..... masonry.

#### PRELIMINARY AND GENERAL

Refer to the preliminary and general Clauses which also apply to this section of the work.

#### WALL CONSTRUCTION

(a) **Protection of Masonry Units**

Concrete masonry units shall not be wetted prior to laying in the walls. Units shall be stacked on site clear of the ground and shall be sheltered from rain prior to erection.

(b) **Bond**

All masonry walls shall be built to the thickness and to the bond pattern and mortar joint treatment indicated on plans, where no bond pattern is shown the walls shall be laid up in regular running bond.

(c) **Special Units**

The masonry contractor shall provide and place such special units as required to form all corners, returns, offsets, etc and to maintain the proper bond. Should block cutting be necessary it shall be neat and regular.

(d) **Face Shell Bedding and Mortar**

Face shell bedding shall be used with complete coverage of horizontal and vertical face shells. Mortar joints shall be 10mm thick unless otherwise shown on the drawings. Where joints occur in masonry walls to be plastered, stuccoed, tiled or used as a back-up to brick work the joints shall be cut flush with the face of the wall. In walls which will be either exposed or painted, the joints shall be struck off flush with the walls surface and when partially set shall be firmly compacted with a pointing tool.

#### WORKMANSHIP

(a) **General**

All masonry walls shall be laid true and plumb and to the plane surface.

(b) **Joints**

Mortar joints shall be straight, clean and uniform in thickness and shall be tooled as shown on the plans. Where no joint detail is shown, exposed walls shall have joints tooled with a round bar to produce a dense slightly concave surface well bonded to the block at the edges. Tooling shall be done when the mortar is partially set, but still sufficiently plastic to bond. All tooling shall be done with a tool which compacts the mortar, pressing the excess mortar out of the joint rather than dragging it out. Where walls are to receive plaster, the joints shall be struck flush to provide uniform bending surface.

(c) **Provision for Other Trades**

The masonry contractor shall provide chases, openings, install anchors, nailing strips, bolt hanger, etc in masonry walls where shown on the drawings.

(d) **Mortar Droppings**

Extreme care shall be taken to prevent mortar droppings. All framework shall be made tight, and any concrete or mortar spilled on the wall shall be washed off before it can set.

(e) **Clean-up**

At the conclusion of the masonry work, the masonry contractor shall clean down all masonry walls, remove his scaffolding and equipment, clean up all debris and surplus materials and remove them from the site.



## SECTION 5

### BRICKLAYER

#### PRELIMINARY AND GENERAL

Refer to the preliminary and general Clauses which also apply to this section of the work.

#### WORKMANSHIP AND JOINTING AND AS DETAILED IN CURRENT NZS SPECIFICATIONS

Build the whole of the brickwork as shown on the drawings, wet bricks thoroughly before use. Fully flush all joints with mortar. Carry up in even heights with no part rising more than 900mm above adjoining work. Properly bond angles and inter-sections keeping all perpend true. Form all openings and chases necessary to accommodate ventilators, flashings, pipes, etc. Joints shall not exceed 10mm thickness. All joints in exposed facing brickwork shall be weather-struck as work proceeds or deep raked. Where brick work is to be colour washed or cement painted, joints shall be finished flush. Rake out joints as work proceeds to accommodate plumber's flashings.

#### BRICKS

Type:.....

Procedure for 100mm masonry: Form block veneer walls where shown on drawings. Blocks must be kept dry on site and laid dry. Fully flush all joints with mortar. Carry up in even heights with no part rising more than 900mm above adjoining work. Properly bond angles and intersections, keeping all perpend true. Form all openings, windows, weep holes on soldier course to top of wall as drawn. Joints shall be 100mm thickness, struck square 6mm deep. Bricks to finish under frieze board where required.

#### MORTAR

Shall be in accordance with NZS 4210, attaining a strength of 12.50 MPa at 28 days. Nominal proportions by volume: 1 part cement, 1 part slaked lime, 4-6 parts sand. Proprietary admixtures may replace lime, wholly or partially or approval of supervisors.

#### WIRE TIES

Brickwork is to be secured to timber frame with stiff veneer ties fixed with fall outward at 600mm centres horizontally and not more than 400mm vertically or 450mm in each direction giving a cavity of 40mm between frame and brickwork. Building paper is required on outside of studs, and surface mounted wall ties will be used.

#### CAVITY

Bottom of cavity to have fall outwards and brickwork shall have open joints at 450mm centres maximum to allow for moisture to escape. Care must be taken to keep framing, wire ties and vermin proofing free from mortar droppings and at completion of works, cavity and vermin proofing thoroughly cleaned.

#### FLASHING TRAYS AND WEATHER PROOFING

To houses with basement garage or rooms, weep holes shall be left at every second brick on the bottom course of bricks.

See that adequate weather grooves are provided in the joinery to make weather-proof. All windows and door frames where exposed to cavity must be well primed with an approved primer.

#### SEAL OF OPENINGS

Particular attention is to be paid to waterproofing of openings at doors and windows, completely fill space behind bead and up surface of same wherein contact with brickwork with an approved mastic as the work proceeds. On completion, along edge of bead, mastic is to be forced into joints of brickwork and the whole struck off. Clean along edge of bead.



## SECTION 6

### CARPENTRY AND JOINERY

#### PRELIMINARY AND GENERAL

Refer to the preliminary and General section which also applies to this section of the work.

All timber to comply with NZSS 3631 for classification and grading National Grading Rules.

#### GENERAL

- (a) The whole of the timber shall be the best of all the several kinds specified free from shakes, sapwood, all large or loose knots, large gum streaks and shall be thoroughly seasoned and all timber including joinery, shall be put in hand immediately the contract is signed. Any timber not up to standard or warps excessively must be removed from the job on the instruction of the owner.
- (b) Care must be taken when ordering lengths of timber as no butts will be allowed where it is possible to avoid them.
- (c) Framing timber when delivered to the site shall be stacked on skids and if unseasoned shall be fillet stacked. Finishing lines and joinery shall be stacked in a similar manner and covered or stored inside the closed-in building.
- (d) All nails, screws and iron work used externally shall be galvanized. Junctions of all woodwork and concrete shall be separated by 3 ply Malthoid.
- (e) All exposed timber shall be planed sanded and primed before fixing and all inside work shall be hand-dressed and glass papered to a smooth surface. All nails shall be carefully punched and all bruises and tool marks shall be removed. All framing timber shall be gauged.
- (f) Provide totara grounds in concrete work for fittings or approved purpose made fixings.
- (g) All scantlings and thickness of timber in carpentry work and joinery are to be finished the given dimensions unless otherwise stated.

#### WORKMANSHIP

All work to comply with NZS 3604 1990 and the New Zealand Building Code unless otherwise stated.

- (a) All carpentry work shall be set up and constructed to the dimensions given. The carpenter shall set out and ensure the proper execution of the work carried out by other tradesmen and shall attend on and make good for all other trades. He shall provide and fix all necessary plant and temporary structure including formwork, centring, boxing, shoring, strutting, and scaffolding and shall remove them as required; he shall provide and maintain any temporary coverings for any finished work subject to likely damage; he shall ensure the proper closure for the works during construction and shall clean up on completion.
- (b) **Framing**  
To existing walls where required. All work shall be according to the best trade practice. The framework shall be so arranged and will provide all necessary support and fixing for the linings, and all post beams, studs, joists and walings shall extend in one piece between supports and shall only be joined over solid bearings. Spacings of all framing shall be regular throughout and shall be to suit the sizes and standards of all linings and sheathings specified. Joints shall be constructed to transmit the loads and stresses to which they are subjected. Plates shall be joined by 3 kn and 6 kn connections and shall be double nailed to every stud. Framework shall be well anchored to foundations, the steel framework and the roof structure.



(c) **Finishing**

Finishing timbers generally shall be machine dressed, hand finished, free from blemishes, machine and hammer marks. Changes in direction shall be made by mitring or scribing. Butt ends shall be bored for nailing. Door frames shall be constructed with the jambs housed into the head and stops shall be mitred at corners. All beading and timber trim shall be scribed to irregular surfaces as required and shall be mitred at external angles. All linings shall be fixed with nails neatly punched ready for painting and polishings.

**FRAMING SCHEDULE** (Unless stated on plans)

Timber exposed to the weather to be Pinus Radiata H3 treated. All other framing shall be Pinus Radiata H1 treated (or other approved) unless specified otherwise. All framing shall be machine gauged.

(a) **Floor Framing**

Bearer plates Pine 100 x 75 or as set out in table 4.2 NZS 3604.

Floor joists Pine 150 x 50 at 600mm centres maximum (table 5.1).

(b) **Wall Framing**

Top and bottom plates	Pine	100 x 50/75 x 50
Studs	Pine	100 x 50 at 600mm crs max. 75 x 50 at 600mm crs max.
Nogging	Pine	100 x 50 and 75 x 50 at 800mm crs max and to suit linings.
Bracing		(Refer Bracing Sheets)
Beams Over Openings	Pine	As NZS 3604 Table 6.7

(c) **Roof Framing**

Ceiling joists/rafters	Pine	100 x 50 or as NZS 3604 Table 10.2 x 10.4
Nogging	Pine	75 x 50 at 600mm crs max. and to suit linings.

(d) **Finishing Timbers**

Door frames internal	DOB	Rimu	) Owner to
Skirting	DOB	Rimu 66mmx12mm fin	) advise on
Architrave	DOB	Rimu 32mmx12mm fin	) use of Dressed Radiata Pine
Cornice	Pine or Plaster		
Kitchen fittings etc	Customwood or as owner advises.		

Place on all external walls from floor joists to top plate breathing type Flame Stop building paper.

**JOINERY** (If not shown as Aluminium on Plans)

All external door frames to be grooved, throated and constructed in a proper tradesmanlike manner. Prime before fixing. Doors to be of cedar, redwood or totara, grooved all round, or aluminium.

Remaining joinery shall be aluminium awning windows to comply with NZS 4211 and aluminium window handbook. Aluminium sliding exterior doors as shown on drawings.

All aluminium windows and doors shall be supplied, powder coated to colour as advised by owner, glazed to conform with NZS 4223.

**DOOR SCHEDULE** (As shown on Plans to 1980mm in height).

Kitchen cupboards etc 18 mm thick to owners specification.

**FLOOR**

Before laying floor, check that top of all joists are flush and level. Lay 20 mm H.D particleboard flooring. Nail with 60 mm galvanized nails on an angle and at 150 mm centres maximum to edge and 300 mm centres maximum to body of sheets. Punch all nails below surface.

**CEILINGS**

All interior ceilings shall be lined with ..... fixed in approved manner. Line cupboards and wardrobe ceilings with Gibraltar Board or plasterglass as required.



## WALL LININGS

Line all walls unless specified otherwise with Gibraltar Board. Line walls of shower cubicle and walls above bath with Formica or other approved wet area linings.

### Gibraltar Board - Internal Walls

Where scheduled, line walls with the best quality 9.5mm thick Gibraltar Board. Check that all framing is true to line and fix sheets using nails or screw as per Winstone Wall Boards specifications. Before stopping fix all necessary architraves, skirting trim, fillings, etc. No nailing being permitted after stopping. On completion stop all joints and all nails etc ready for painting or wall paper as scheduled.

## INSULATION

Perforated foil to be installed beneath floor, with 100mm sag between joists. All exterior walls and ceiling to have fibreglass batts R1.8, R2.4 installed respectively. Building paper to be Firestop Flame Retardant Building Paper unless specified on plans.

## CUPBOARDS AND FITTINGS

### (a) Kitchen

Form sink units, dressers and cupboards and servery to dining room where shown on the plans. Construct fittings with 25mm timber, 50 x 25mm framing and 18mm customwood shelving and drawers positioned where directed by the owner. Cover dresser tops with selected Formica, S S sink benches to complete with upstand, or as shown on plans.

### (b) Bathroom

Form bench type vanity units with Formica or Aarkronite tops complete with Acrylic or Aarkronite bowl, cupboards under. Fix in porcelain on steel or acrylic bath to suit.

### (c) Wardrobes

Frame up for wardrobes with hinged doors, 2/300mm shelves and hanging rail.

### (d) Hot Water Cupboard

Construct cupboard where shown and fit with slatted shelves above and around cylinder as space allows. Provide low stand for cylinder with access to sludge valve (when concrete floor).

### (e) Linen Cupboard

To have five full width slatted shelves.

### (f) Laundry Tub Cabinet

To suit S S tub.

### (g) Pantry

7 Shelves, also see plan.

## FIXING JOINERY

Co-operate with Joiner in the fixing of joinery items and attend upon as required.

## CO-OPERATE WITH SUB-TRADES

And do all necessary cutting away for trimming, Nogging, etc as required.

## ARCHITRAVE, CORNICE AND TRIM

To all interior door, window and other openings provide all architraves, cornices and trim. Mitre and scribe in accordance with good trade practice. Provide cornices to all wardrobes, coat cupboards etc.

## HARDWARE P C SUM \$.....

Provide and fix good quality hardware. Type..... All external hinges shall be galvanized and all internal hinges shall be A C loose pin.

Front door locksets shall be push button locking type. Laundry doors shall be the same.



Internal doors C P latch set and furniture  
Bathroom and toilet C P snib-set

) Or nylon roller bolts and furniture  
) to owners specifications.

Sliding wardrobe doors wooden recessed finger pulls.

All hardware shall be left in working order.

## PLATES

All to be straight and in long lengths, butted at all joints fixed together with nail plates of the correct Kn capacity (refer NZS 3604).

## STUDS

To be shown as scheduled and double nailed to all plates with 100mm nails. Provide 2/100 x 50 mm studs to any openings over 1800 mm wide with trimmers checked into studs.

## BRACING

Pryde galvanised bracing (see Bracing Calculation Sheets). Or selected sheet bracing.

## ROOF

### Framing

To be framed up properly in the manner shown, with ..... degree pitch. Rafters to be 100 x 50 mm spaced at 900 mm centres, properly birdsmouthed and securely nailed to all plates and ridges; with 100mm and 75 mm nails. Fix 75 x 50 mm purlins at 900 mm centres or 50 x 40 tile batten as required for tiles. Fix 75 x 100 mm under purlins to rafters and cut braces and round same.

### Alternative

Use nail trusses at 900 mm centres with 100 x 50 mm ceiling joists between and held by 100 x 50 mm runners.

## EAVES

Allow rafters to overhand 600 mm or maximum of 750 mm as shown and finish with ..... fascia and gutter. Line eaves with 4.75 mm Flat Hardie flex sheets. Fix joints with extruded plastic mould and house sheets in fascia. Fix 150 x 25 Frieze board to cover heads of windows if shown on plan.

## NOGGING

To be 50 mm material on all walls and ceilings, spaced at approximately 600 mm centres and cut between the studs. Nogging to ceiling maximum of 600 mm centres includes backing to all margins or as directed by ceiling lining manufacturer.

## TELEPHONE AND T V

Arrange with Telecom to run a telephone cable whilst in the framing stage. Similarly have a T V cable to aerial and points installed during construction.

## METER BOX

Form recess for meter box in thickness of wall where directed to the requirements of the local power authority.

## EXTERIOR SHEATHING

- (a) Walls: .....
- (b) Gable ends: .....
- (c) Roof: .....

## FIREPLACE

If required, as shown on plan.



## SECTION 7

### PLUMBING

#### PRELIMINARY AND GENERAL

Refer to the preliminary and general Clauses which also apply to this section of the work.

#### GENERAL

All work shall be carried out in accordance with the drawing, specifications, and of the New Zealand Building Code. All materials shall be of the best of their respective kinds. Water pipes and tubes shall be set out in straight runs of even gradients, where possible avoiding all places where air locks are likely to occur. Secure copper tubing in position with copper straps. All piping including water, waste and vents shall be concealed. Provide for wet-back to fireplace if indicated on plans.

#### FLASHINGS

Flash as necessary to render building water-tight. All flashings shall accurately fit the work and cut in as long lengths as possible with all joints well lapped and fixed with 19 mm flat head galvanized nails. Flashings required for frieze boards on gable ends. Also refer to Section 5: Bricklayer flashing trays. Flashings must be provided over all windows and doors.

#### SPOUTING AND DOWNPIPES

..... Fascia ..... and gutter where shown supported with clips to manufacturer's instructions. Downpipes shall be as required by Table 5 New Zealand Building Code, galvanised iron seamed and welted and strapped off walls with 1mm galvanised iron stand-off brackets fixed with galvanised iron screws, or PVC if required.

#### VENTS AND SOIL STACK

Provide terminal vent and soil pipes as required. Soil pipe shall be 80 mm PVC. Fix PVC cage to top.

#### WASTES

All wastes to be 40 mm except hand basin 32 mm galvanised trays and PVC pipes. All wastes to be discharged over gully traps. Provide and fix back vents to all wastes over 3.600 metres in length.

#### ELECTROLYSIS

The contractor shall ensure that no dissimilar metals are in electrolytic contact. Dissimilar metals shall be installed from each other by painting or insertion of a bituminous felt insulator to the satisfaction of the owner.

#### COLD WATER

Lay water from supply in 12 mm copper, close cap up with all necessary bends, tees, elbow, etc lead off with 12mm copper branches to sink, basin, laundry tubs, washing machine, W C, shower and two stand pipes and 12 mm branch to bath. Connect from branch to 'Ajax' valve and to hot water cylinder with 12 mm copper pipe.

#### HOT WATER

Provide and fix one 180 litre copper electric cylinder complete with 1.5 Kw element and thermo-stat control and all necessary connections to make the same in working order. Lay water through 19 mm copper piping to bath, then with 12mm to sink, hand basin, laundry tub, washing machine and shower. All hot water pipes to be lagged. Provide anti spill tray beneath cylinder if required. Provide tempering valve to hot water line.

#### BATHROOM AND SHOWER

Provide acrylic hand basin to vanity unit, 1675 mm ..... bath, shower tray as shown. Provide large type soap recesses over bath and to shower.

#### W C

Provide and fix WC earthenware pan complete with double flap white plastic seat, buffer, etc, 14 litre push button twin flush cistern, flush pipes, approved soil pipes, fittings, stop-cocks and vents. Cisterns to have silent valves and overflow. One toilet roll holder to be fixed in suitable position.

#### LAUNDRY

Provide and fix where shown in laundry a pressed S S tub with cupboard under and large type soap recess in suitable position.

#### TAPS

All taps and extensions except hose taps to be chrome plated, streamlined bibcocks marked 'hot' and cold'.



## SECTION 8

### ELECTRICAL

#### PRELIMINARY AND GENERAL

Refer to the preliminary and general section which also applies to this section of the work.

#### SCOPE OF WORK

The work includes the provision and installation of all electrical work in the contract, providing meter board, fuse box and taking out and paying all fees to the electrical supply authority, all to comply with the New Zealand Electrical Codes of Practice.

#### POINT OF ENTRY, METERS ETC

Apply to the power authority for the provision of the electrical supply connection to the building. From the point of entry run appropriate cable to the meter box. Neatly mount MOB's and label switches on board.

#### POWER POINTS

Power points shall be PDL 3 pin 10 amp. with combined switches in flush boxes. Provide power points where shown at heights as directed by the owner. Provide shaving outlet in bathroom above vanity unit. Make connections for hot water cylinder, stove, washing machine and drier.

#### SWITCHES

Shall be PDL in flush boxes.

#### CABLES

Shall be TPS of regulation size.

#### LIGHT FITTINGS

Allow for light points to be wired for and fixed in rooms and places as shown. Provide and fix bayonet type PDL lampholders complete with galleries.

#### ELECTRIC RANGE

Allow for connecting electric range and a PC sum of \$..... for range.

#### EXPELAIR FAN

Provide expelair fan if shown on plan.

#### SWITCH BOARD

Allow for the provision of switchboard complete as required by local authority.

#### INSPECTION AND TESTING

On completion of the whole installation, arrange for the installation to be tested by the local authority inspector. Remedy all faults and replace all faulty bulbs and/or damaged fittings.

#### COMPLETION

On completion, clean all fittings, check the correct operation of all fittings including power points and lodge any and all guarantees with the principal.



## **SECTION 9**

### **DRAINAGE**

#### **PRELIMINARY AND GENERAL**

Refer to the preliminary and general section which also applies to this section of the work.

#### **DRAINAGE**

The drainage will be carried out strictly in accordance with the New Zealand Building Code and the local bylaws. Provide and lay in first grade glazed earthenware pipes of 110mm diameter, or PVC, all to have the necessary junction bends, angles, gully traps, inspection pipes, grease traps and chambers, buchan traps, etc and all vents and fittings necessary to complete the system to the Environmental Health Officers satisfaction. Stormwater to be carried out in materials specified by the inspector.

#### **STORMWATER**

To local authority requirements and the New Zealand Building Code.

#### **SEPTIC TANK**

Build septic tank to local authority requirements and the New Zealand Building Code.

#### **SEWER**

Connect to sewer where available as shown on plans. All to comply with the New Zealand Building Code.

## **SECTION 10**

### **ROOFING**

#### **PRELIMINARY AND GENERAL**

Refer to the preliminary and general section which also applies to this section of the work.

#### **ROOFING**

Supply and lay to roof joists.....  
Allow for all necessary flashings in materials to match roof. All work shall be in strict accordance with the manufacturer's instructions.



## SECTION 11

### DECORATING

#### PRELIMINARY AND GENERAL

Refer to the Preliminary and General Clauses which also apply to this section of the work.

#### WORKMANSHIP

All work shall be done by skilled tradesmen. Protect all work from weather, dust, etc and provide protection for other work against all paint drops, stains, and other defects. No paint is to be applied to damp surfaces and no external surfaces are to be painted during frosty or unsuitable weather. Between each coat, rough patches etc shall be rubbed down with glass paper to obtain a good surface. Any work damaged by dust, rain or any other cause shall be rubbed down and recoated. Paint shall impinge upon glass for weather protection.

#### EXTERIOR WORK

##### Timber: Stain

All timber to be stained to receive two full coats of an oil base stain. All laps etc to be stained before fixing of timber.

##### Timber: Paint

Prime and stop. Apply two full coats of gloss acrylic, or one coat of undercoat and one coat of enamel.

##### Hardieflex Products

Clean any dusty surfaces and apply two full coats of a gloss acrylic.

##### Galvanised Steel

Apply one coat of galvanised primer followed by two coats of acrylic.

#### INTERIOR WORK

Varnish work to receive three full coats of polyurathane Satin, or two coats of polyurathane Satin and one coat of polyurathane Gloss.

##### Timber: Painted

Apply two full coats of interior primer-undercoat, stopping nail holes etc after first coat, followed by one coat of the highest quality enamel, tints and gloss to the approval of the owners.

##### Ceilings: Plasterglass or Gib-board

Lightly sand and brush down. Apply one coat of Sealer, one undercoat and one coat of Satin. Lightly sand and brush down between coats.

##### Pinex Tiles: Factory Undercoated

Apply two full coats of a water base paint.

#### PAPERHANGING

Allow for papering all rooms of a new dwelling, or any areas affected by alterations etc. All surfaces to be papered are to be perfectly smooth and prepared with size. Allow for cutting in all angles and hanging with butt joints and with patterns truly matched and plumb. All papers to be selected by owner. Allow the PC sum of ..... dollars per roll for paper. Paste to contain a fungicide. Kitchen, WC, Bathroom and Laundry to be vinyl paper at a PC sum of ..... dollars per roll.



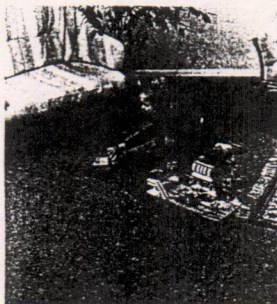
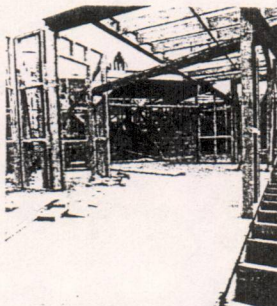
# Pynefloor • Superfloor

particle board flooring panels



(43) Rj7  
APRIL 1993

## PRODUCT DATA AND INSTALLATION RECOMMENDATIONS



### INTRODUCTION

#### Description

Pynefloor and Superfloor are 20mm thick wood based structural particle board panels intended for residential and commercial floor platform applications in interior locations.

#### Conditions of use

Pynefloor and Superfloor must be stored, handled, installed and maintained in accordance with this brochure. Certain factors will affect its durability and performance and these are contained within the brochure.

The purchaser and installer of the product should make every effort to ensure the occupiers of the building are informed of the required maintenance schedule as laid down in this brochure.

#### Applications

- For use as pre or post laid flooring over timber or steel joist supports.
- For use in single and double layer applications.
- As an overlay on concrete floor slabs or wooden floors.
- Pynefloor and Superfloor panels are ideal for additions and alterations as they are quickly laid and easily cut for penetrations or fitting around irregular shapes.
- Both products can be used as a floor diaphragm for the transfer of wind and earthquake loadings.

- High impact resistant wall linings.
- Tiered seating in indoor sporting/cultural complexes.
- Stair treads.

(For applications other than flooring please refer to Fletcher Wood Panels Limited for technical information.)

#### Limitations

Pynefloor must not be exposed to the weather during initial construction, for more than two months. Superfloor must not be exposed to the weather, during initial construction, for more than three months (see *Weathering*).

After the building is completed and before occupation, Pynefloor and Superfloor must be finished with polyurethane or floor coverings such as carpet or vinyl (see *Finishing*). It is not intended that these products be used in a permanently raw, unfinished condition.

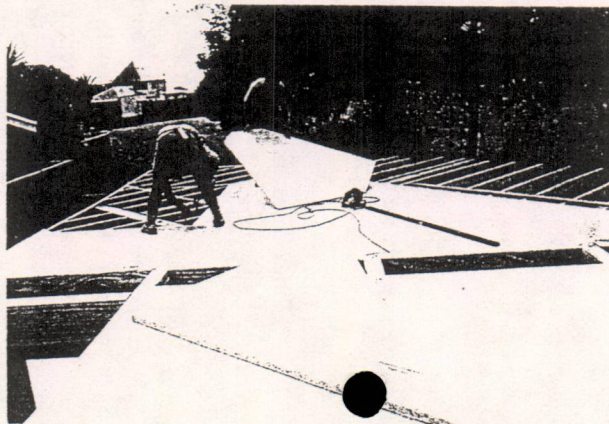
These products must not be used as a substrate for roofing or decking membranes.

#### Identification

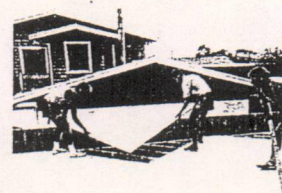
Each panel is identified on the underside with the brand name and production batch number.

Pynefloor is marked with black ink. Superfloor is marked with green ink.

All sheet edges have a factory applied brown sealant.



## DURABILITY



### Manufacture and Composition

Both products are manufactured from wood particles of various timber species, predominantly pine, which provide a range of colour tones within the panel. The wood flake particles in Pynefloor are bonded with a urea formaldehyde resin. A melamine-urea formaldehyde resin is used in Superfloor.

Both panel types contain a wax emulsion as a water repellent. This is incorporated with the adhesive during the manufacturing process, to impart moisture resistance throughout the sheet. To further control the effects of moisture during the construction process the edges of the panels have been factory sealed.

### Physical Properties – Behaviour in Use

Property	Unit	Target	Minimum Mean	Manufacturer's Limited
Moisture content	%	8-12	—	6-14
Density	kg/m <sup>3</sup>	710	680	660
Bending Strength (MOR)	MPa	26	21	16
Modulus of elasticity	MPa	4000	3500	3000
Internal bond	kPa	780	630	580
Surface soundness	N	2700	1700	1500
Formaldehyde content	mg/100gms of board	<10	—	—
<b>24 hour water absorption and thickness swelling:</b>				
<b>PYNEFLOOR</b>				
Water absorption	%	16	22	25
Thickness swelling	%	9	13	15
<b>SUPERFLOOR</b>				
Water absorption	%	12	15	18
Thickness swelling	%	8	10	13

\* Minimum Mean – The lowest value a board can have as a result of averaging three individual tests. All testing to BS5669.  
† Modulus of rupture

## STANDARDS

### For manufacture:

BS 5669 1989 Part 1 – Specification for Test methods of Particle Board

AS 1859 1980 Flat Pressed Particle Board – Appendix J – Test Method For Determining Strength and Stiffness

### For design:

NZS 3602 1990 Code of Practice for Specifying Timber and Wood Based Products For Use in Buildings

NZS 3604 1990 Code of Practice for Light Timber Frame Building not Requiring Specific Design

NZS 4203 1992 Code of Practice for General Structural Design and Design Loadings for Buildings

### For installation:

NZS 3602 1990 Code of Practice for Specifying Timber and Wood Based Products For Use in Buildings

NZS 3604 1990 Code of Practice for Light Timber Frame Building not Requiring Specific Design

### Formaldehyde Content

Pynefloor and Superfloor are manufactured with an extractable formaldehyde content below 10 milligrams per 100 grams of board and this is less than half the level required by BS 5669 1989.

Covering or sealing the top surface of Pynefloor and Superfloor prior to occupation of the building will further control formaldehyde emission. Adequate ventilation is an effective way of controlling the internal air quality.

## DURABILITY

### New Zealand Building Code

Pynefloor and Superfloor panels have B.I.A. accreditation for use under N.Z.B.C. B2.3 (a) – 50 years, when stored, handled, installed and maintained in accordance with this document. This is supported by BRANZ Appraisal Certificate No 254 and B.I.A. Accreditation No. 93/001.

### Weathering

The maximum period of temporary exposure to weather during initial pre-laid construction is

- Pynefloor 2 months
- Superfloor 3 months

## Pynefloor • Superfloor

particle board flooring panels

### Dimensions

#### Table 1 Sheet Sizes and Weights

Sheet Sizes (mm)	Weight per Sheet (kg)	Mean Weight (kg/m <sup>2</sup> )
3600 x 1800 x 20	89.4	13.8
2400 x 1800 x 20	59.6	13.8
2400 x 1200 x 20	39.7	13.8
3600 x 900 x 20	44.7	13.8

#### Table 2 Sheet Tolerances

Length	± 5mm
Width	± 5mm
Thickness	± 0.15mm
Board Edge	0.4mm/metre maximum deviation from line
Squareness	The difference between the measured diagonals is no greater than 3.0mm

This includes the time the flooring is in an exposed condition when being transported, or when stored on site.

Water which has ponded on the surface of the flooring at any stage must be removed as soon as possible.

Any cut edges or penetrations should be sealed with a timber primer. This should be applied prior to weathering the raw edge. If the flooring is to be clear finished care must be taken not to contaminate the top surface with the timber primer (see *Finishing*).

If the building will not be enclosed within the specified exposure time, the floor must be laid after the building is closed in. Where a superior clear finish is required the floor should be laid after the building is enclosed.

If these products are pre laid and therefore exposed during the construction period they must be weathered in their supplied raw condition to allow the ready release of any moisture.

### DO NOT:

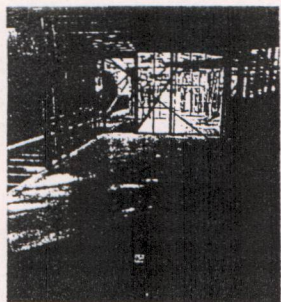
- Apply liquid sealers to the top surface.



**Pynefloor • Superfloor**  
particle board flooring panels



## DESIGN AND USE



- Cover with impervious sheet materials such as polythene;
- Tape sheet joints.

Note: Double layer flooring systems allow the installation of the second layer after closing in and when all subtrade work is completed. This should provide a clean unweathered surface for clear finishing.

### Heat

Pynefloor and Superfloor must be protected from localised heat sources such as free standing heating appliances, space heaters, hot air ducts and pipes containing water or steam.

Temperatures in excess of 60°C could affect the durability and finish of the product. Therefore it is important to ascertain from the fuel burning appliance manufacturer etc, what clearances or protection is required to ensure 60°C is not exceeded.

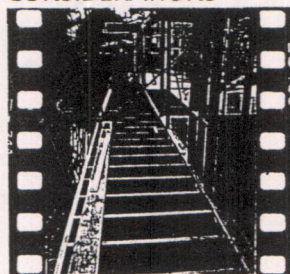
### Fungal Decay

Pynefloor and Superfloor are resistant to fungal decay provided the board moisture content does not exceed 18% for prolonged periods.

### Insect Resistance

Where moisture content does not exceed 18% and when installed as recommended in this brochure, attack of Pynefloor and Superfloor from common NZ insect household borer will be at an acceptably low level.

## DESIGN AND USE CONSIDERATIONS



Residential Housing (Detached, multi unit dwelling, group dwelling)

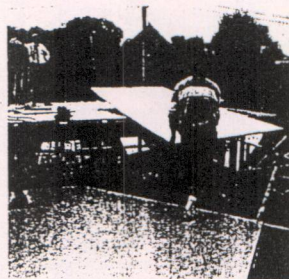
600mm maximum joist support centres are suitable for use in residential housing. However for reduced deflection under load the use of joists spaced at 450mm centres maximum is recommended.

Large floor areas may require allowances for sheet expansion (see *Large Floor Areas*).

Adequate ventilation must always be provided in subfloor areas (see *Ventilation*).

## Pynefloor • Superfloor

particle board flooring panels



### Commercial and Industrial Applications (All other activities).

It is recommended that joist spacings do not exceed 450mm centres in a single layer system. Where a double layer floor system is used, joists can be spaced up to 600mm centres maximum.

Special attention must be given at the design stage to the effects of concentrated loadings. For example point loads such as storage racks and hand trolleys. Please consult Fletcher Wood Panels Limited for additional information.

As a guide, maximum design loads are as follows:

Single layer	5kPa
Double layer	10kPa

Where larger areas of particle board are laid (e.g. *gymnasiums, community halls, institutional type dwellings, etc*) it is important to ensure that careful consideration is given to sub floor ventilation and allowance is made for sheet expansion (see *Ventilation and Large Floor Areas*).

Where an optimum clear finish is required, consideration should be given to post laying the flooring (see *Finishing*).

### Diaphragms

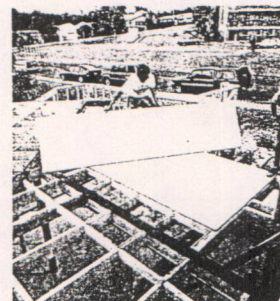
Pynefloor and Superfloor may be used for structural diaphragms. Refer to NZS3604 1990 Clause 5.3. For further design information please contact Fletcher Wood Panels Limited.

Note: Nail spacing on all diaphragms must not exceed the spacings given in the Fastening Schedule (Table 3) of this document.

### Ventilation

Adequate cross flow ventilation is essential to provide the required sub-floor conditions. A minimum of 3500mm<sup>2</sup> of clear unobstructed ventilation opening must be provided per m<sup>2</sup> of floor area. Refer Acceptable Solution E2/AS1 paragraph 4.1.4 or NZS3604 1990. The ventilation openings must be evenly distributed around the entire perimeter in the substructure walling.

## DESIGN AND USE



A ground cover vapour barrier must be installed in sub-floor areas where the following conditions exist.

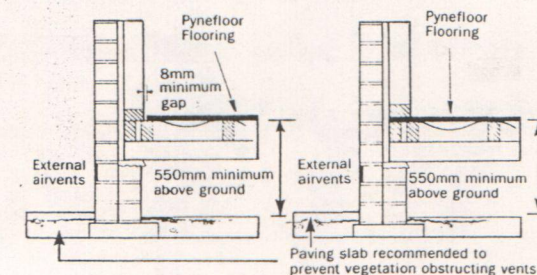
- The minimum ventilation requirement can not be met (see above).
- Ventilation openings are not evenly spaced around the entire perimeter.
- The ground will be permanently or seasonally damp.
- The airflow is obstructed by party walls, internal foundation walls or attached terraces.
- Where any part of the subfloor space is more than 7.5m from the nearest ventilation opening.
- A forced draught ventilation system is specified.

The type, position and installation of the vents is important. Most vent products available have an airflow rate efficiency of less than 100% of the opening. Ensure there are sufficient vents placed in the foundation perimeter to give the minimum required 3500mm<sup>2</sup> of ventilation per m<sup>2</sup> of floor area.

### Ground Clearance

It is recommended that a minimum clearance of 550mm between the surface of the ground beneath the building and the underside of the flooring sheets be provided in order to give adequate subfloor air capacity and to provide access for inspection of the subfloor structure. See Fig. 1.

Fig 1. Post Laid Flooring



### Fire Ratings

Pynefloor and Superfloor may be used as flooring in detached dwellings (purpose group SH) which have no specific fire resistance rating requirements under the N.Z.B.C.

For other types of occupancy, product use depends on the number of storeys, the number of full and intermediate floors involved, and whether the building is sprinklered etc.

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Reference should be made to Acceptable Solution C3/AS1 Paragraph 2.2 for required fire resistance ratings for floors and paragraphs 2.16 and 8.2 for surface finish requirements.

### Insulation

When used in conjunction with correctly placed draped foil or other alternatives (see below) Pynefloor and Superfloor can contribute toward the building performance index requirement in N.Z.B.C. H 1.3.1.

Note: When using Pynefloor and Superfloor in conjunction with insulation materials please ensure all relevant installation instructions from the insulation manufacturer are followed.

### Draped Foil

A drape must be provided in the foil to ensure insulation performance and protection of Pynefloor and Superfloor from moisture. It is recommended that a 100mm drape be provided.

When Pynefloor and Superfloor are pre-laid, underfloor foil insulation must be perforated.

If Pynefloor and Superfloor are to be pre-laid it is important that moisture build up in the foil drape does not occur during the construction period. Additional holes in the lowest part of each foil drape must be provided if the perforations in the foil are not at the lowest point of the foil trough between the joists.

Pre Laid Flooring

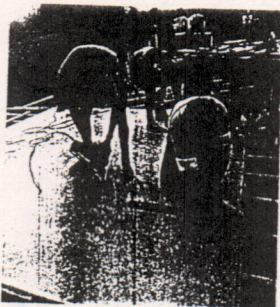
### Alternatives

Alternatives to draping foil over joists to achieve the required thermal insulation in floors are:

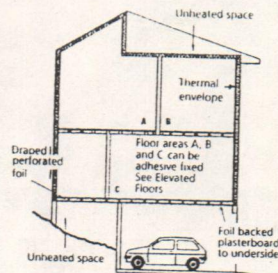
- Fix foil to underside of floor joists.
- Fix two layers of Triple S (bitumen impregnated fibre board) to underside of joists.
- Fix foil backed fibreglass insulation to underside of joists.



## INSTALLATION PROCEDURES



When using alternative insulation it is important to ensure that moisture which has entered the joist cavity during construction and from spillages can dissipate easily. Steps must be taken to ensure a clearance is left between the top surface of the insulation and the underside of the flooring.



### Timber Supports

The moisture content of the support system at time of laying and fixing the flooring panels can affect the performance of the total floor system. As this framing dries it will shrink. This can lead to distortion of the framing or can reduce the effectiveness of the fixing, allowing movement of panels resulting in squeaking.

To reduce the effect of moisture loss, control of moisture content at time of fixing the panel in place is important.

As a guide NZS 3602 Table 7 lays out suggested moisture contents of framing at time of installation.

Please note that air conditioned or centrally heated buildings are subjected to greater "drying out" than other buildings therefore greater care is required to ensure the moisture of the timber supports is as set out in NZS 3602 Table 7, at time of installing the panels.

### Site Storage

When on-site storage is necessary, Pynefloor and Superfloor must be protected from the weather.

The board must be stored clear of the ground on level bearers. A breather type cover must be supported clear of the top board surface using battens, to allow air to circulate freely around the stack.

## INSTALLATION PROCEDURES

### Layout

Sheets can be laid with long edges supported by the joist,

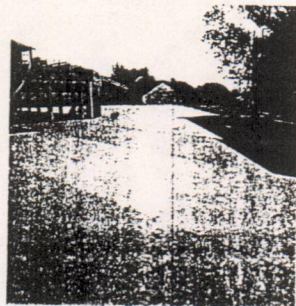
## Pynefloor • Superfloor

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however it is recommended that when laying over joists at 600mm centres the long edges of the sheets are laid out at right angles to the joists. Support must be provided at all edges of sheets and part sheets by way of joist or nogging.

Sheets should be close butted together without being placed under pressure by mechanical cramping. Ensure the sheet edges meet in the centre of the joist or nog. Each sheet must span two floor joist spacings (*i.e. fixed over three consecutive joists*) except where part sheets provide the necessary infill at the building edge.

Provide a minimum of 8mm clearance between sheet edges and any fixed object e.g. bottom plates, masonry walls, abutting concrete floors, structural columns, etc. This should accommodate linear expansion that may occur during the weather exposure period and help to reduce moisture transfer from concrete to particle board.



### Large Floor Areas

Where any part of the subfloor space is more than 7.5m from the nearest ventilation opening, a polythene sheet or equivalent vapour barrier must be placed directly on the ground. It is strongly recommended that the entire subfloor area be covered in such cases.

When prelaying large floor areas, provision must be made at both the design and set out stages to accommodate any accumulated sheet expansion that may take place during normal moisture uptake.

Options that may accommodate expansion include:

- Post lay the floor – e.g. delay installation of flooring on joists until the building is closed in.
- Leave a 20mm expansion gap under partition lines at no greater than 18m intervals.
- Leave one row of flooring sheet and nogging across the building width at centres not exceeding 18m until the structure is completely closed in.

## FINISHING



waterproof and dry. The last laid sheets and nogs should then be remeasured and cut to size for final fitting. If the floor is to be clear finished it is important to ensure these sheets are of the same batch as the surrounding laid floor to eliminate colour mismatch. This is necessary when laying continuous flooring in gymnasiums and halls where the floor is to be clear finished making leaving of a gap visually unacceptable.

**Note:** All floors greater than 18 metres in length or width must have some provision for sheet expansion.

### Fixing

#### Table 3 Fastening Schedule

Fastener	Pitch	Pitch	
		Edges	Intermediate
Timber Joists			
Annular grooved particle board flooring nail	60 x 2.8mm	150	200
Galvanised Jolt head nail	60 x 2.8mm	150	200
Surefast screw (zinc chromate)	50 x 8 gauge	150	200
Steel Joists			
Tek self drilling screw	50 x 12 gauge	150	200

The type and position of the fastening chosen for the job is important for long term performance. Incorrectly fixed sheets may lead to troublesome squeaking which can be difficult to remedy at a later date.

All nail fastenings must be galvanised.

All screw fastenings must be corrosion resistant (e.g. zinc chromate plating).

Staple fastening is not acceptable.

### Nail Fastening

Hand driven nails should initially be nailed flush with surface. Punching of nails should take place just prior to sanding. This reduces the opportunity for squeaking by taking up the movement of the joist timber away from the board due to shrinkage.

Power driven nails must not be overdriven into the board. If the prepunching mechanism is utilised with power driven nails then nail penetration must not exceed 2mm below the top surface of the board. Use a depth adjuster attachment on the power tool.

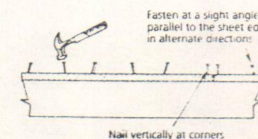
**Please note:** The prepunching mechanism may increase the opportunity for squeaking, as any shrinkage that occurs as the timber supports dry is not taken up at a later stage as would happen when the punching process was carried out.

To improve lateral holding nails should be slightly angled and be driven parallel to the sheet edge. See Fig 2.

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Fig 2



Hand driven nail fastening usually provides a better finish for clear coatings than power driven nail fastening.

### Screw Fastening

Screw fastening can be used as an alternative to nail fastening when floors are not designed as a diaphragm.

When clear finishing screw fastening may be inappropriate due to head size.

### Adhesive Fastening

To reduce the likelihood of future squeaking the use of a construction adhesive to bond sheets to the joists is recommended in conjunction with mechanical fastening. This will also reduce the possibility of drumming and sound transfer to any lower rooms in a multi-storey construction. When using adhesive fastening where underfloor insulation is required ensure the particle board is bonded directly to the joists. See *Insulation Alternatives* to draped foil if adhesive fastening is required.

## FINISHING

Both Pynefloor and Superfloor provide an ideal substrate for most types of floor finishes.

Flooring intended for clear finishing must be kept clean and free from staining, soiling and abrasion. When clear finishing large floor areas e.g. halls and gymnasiums etc, post laying is strongly recommended. Clear finishing is not suitable in areas such as bathrooms, toilets, shower rooms, laundries (see *Wet Area Floor Protection*). All floors must be sanded just prior to coating or covering.

Moisture content of flooring panels should be checked prior to any sanding or covering. It is recommended that a maximum moisture content of 18% is obtained, especially at board edges



## FINISHING



before any finishing takes place. Coating or vinyl covering of board with a higher moisture content can result in an unsatisfactory visual appearance due to panel shrinkage as it dries over a period of time.

### Sanding

Table 4 Floor Sanding

Clear coating	First	Drum	40-80
	Second	Drum	80-100
	Third	Spinner	80-100
Carpet and resilient overlays	Single	Drum	40-80

**Note:** Excessive sanding of particle board or use of coarse papers can reduce the thickness of the board, thereby affecting the structural strength of the board and result in colour variations when polyurethane coatings are applied.

### Clear Finishes

Do not mix sheet sizes, types and production runs when clear finishing as colour variation may occur.

Hand driven nail fastening usually provides a better finish than power driven nail fastening.

Polyurethane coatings should provide protection in normal residential applications for up to five years if properly applied and maintained. This does not apply to areas such as laundries, bathrooms, showers and toilets. For specific details see *Wet Area Floor Protection* below.

### Coating

Product	Quantity
Epiglass Polyvar (thinned)	1
Epiglass Polyvar	2
Epiglass Polyvar	3
Manufacturer: Courtaulds Coatings	
Parthane P/B 60 (thinned)	1
Parthane P/B 60	2
Parthane P/B 60 (if required)	3
Manufacturer: Handley Chemical Industries Ltd	
Fulathane (thinned)	1
Fulathane	2
Fulathane	3
A fourth coat may be required Manufacturer: H. B. Fuller	

The following sequence is suggested for clear coating.

- Ensure floor panels are dry (below 18% moisture content).
- Punch nails just prior to sanding.
- Carefully grade sand the entire floor area as recommended in the floor sanding table.
- Remove dust from the entire floor surface and skirtings by broom and vacuum cleaner.

## Pynefloor • Superfloor

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- Apply the first coat of polyurethane in accordance with manufacturer's instructions.
- Fill nail holes with a compatible filler colour matched to the particle board, e.g. DAP Wood Dough.

- Apply further coats of polyurethane (number required determined by coating manufacturers recommendations).
- Lightly sand between coats.
- Follow coating manufacturer's recommendations.

Best results are achieved when specialist coating applicators are engaged to carry out the work.

Should any imperfection appear in the surface of the board during coating, cease application and contact the board supplier or coating manufacturer.

### Sports Court Markings

It is normally recommended that painted court markings be carried out prior to the three coat clear finishing system shown above. Follow procedures for court marking as below.

### Court Marking

Product	Quantity
Epiglass Epiguard 199	1
Epiglass Reaction Lacquer Gloss	2
Epiglass Reaction Lacquer Gloss	3
Manufacturer: Courtaulds Coatings	

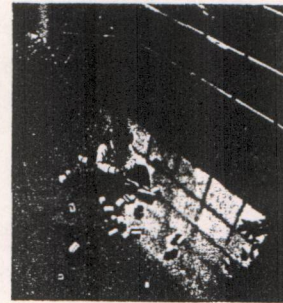
Refer to coating manufacturers for specification and technical backup service for coatings and markings.

### Wet Area Floor Protection

The long term performance of Pynefloor and Superfloor in bathrooms, toilets, shower rooms, changing rooms, laundries, kitchens or similar, will be adversely affected by contact with water. Particular attention should be given to protect Pynefloor and Superfloor from water.

This can be achieved by the use of sheet vinyl floor coverings. Refer Acceptable Solution E3/AS1 paragraph 3.1.2 (a). It is recommended that the vinyl is coved at the wall/floor and cabinet toe space intersections and that a central floor waste outlet which drains to the outside of the building is provided.

## MAINTENANCE AND USE



Vinyl must also extend under WC pans.

**Note:** Polyurethane coatings can be used in kitchens however these must be maintained in line with coating manufacturers recommendations.

If ceramic tiles, vinyl tiles and/or carpet are to be laid in bathrooms, toilets, shower rooms or laundries a correctly installed impervious membrane must be applied to the particle board prior to the tiles etc being installed. These membranes include sheet rubber, flexible rubber coating, and fibreglass reinforced coatings. Central wastes that drain to the outside of the building should be provided in the floor.

Polyurethane coatings must not be used in wet areas other than kitchens.

### MAINTENANCE AND USE FOR THE OCCUPIER

- Floor coverings in "wet areas" including polyurethane coatings in kitchens (see *Wet Area Floor Protection*) must be maintained to ensure water cannot penetrate through to the particle board. Floor wastes, if present, must remain unobstructed and drain to the outside of the building. To ensure performance of the product, the surface protection system must be repaired at the first sign of any damage.
- Other floor coverings and coatings must be maintained to ensure the particle board surface is protected.
- The subfloor air space must continue to receive the necessary ventilation throughout the life of the building. The air vents around the perimeter of the building must not be obstructed by shrubs etc and any building extensions must allow for continued compliance with the subfloor ventilation requirement.
- Vapour barriers required to provide adequate moisture control in the subfloor area must be maintained in an effective condition.
- Do not allow clothes drier vents or steam vents to exit into the subfloor area. All relief or overflow pipes must drain to the outside of the building.
- If accidental flooding should occur care must be taken to ensure the particle board flooring can dry out quickly. Removal of carpets or other loose laid floor coverings may be necessary and slitting of the underfloor foil to ensure water is not trapped in the drape may also be required.

## Pynefloor • Superfloor

particle board flooring panels

- The product must not be exposed to the weather during renovation and or extensions.
- Care should be taken when applying loads to the flooring. Specific design from an engineer should be considered before loading the flooring with items such as heavy framed pianos and full sized billiard tables as these could cause undesired deflection, or surface failure.

### SUPPLY

Pynefloor and Superfloor are manufactured by Fletcher Wood Panels Limited in their plant at Kumeu and are available from leading building supplies merchants.

### TECHNICAL ADVISORY SERVICE

Not all product use options can be described herein.

For further discussion and guidance on specifying and installation of these products please contact Fletcher Wood Panels Limited.

**Free Phone**  
0-9 (toll free)  
579-4355

The information in this brochure applies only to Pynefloor and Superfloor which is manufactured by Fletcher Wood Panels Limited and sold and installed in New Zealand.

Fletcher Wood Panels Limited reserves the right to revise without notice, the information and specification herein.

This product information may not be reproduced in whole or in part without the prior consent of this manufacturer.

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This brochure supercedes all previously issued Pynefloor/Superfloor technical information.

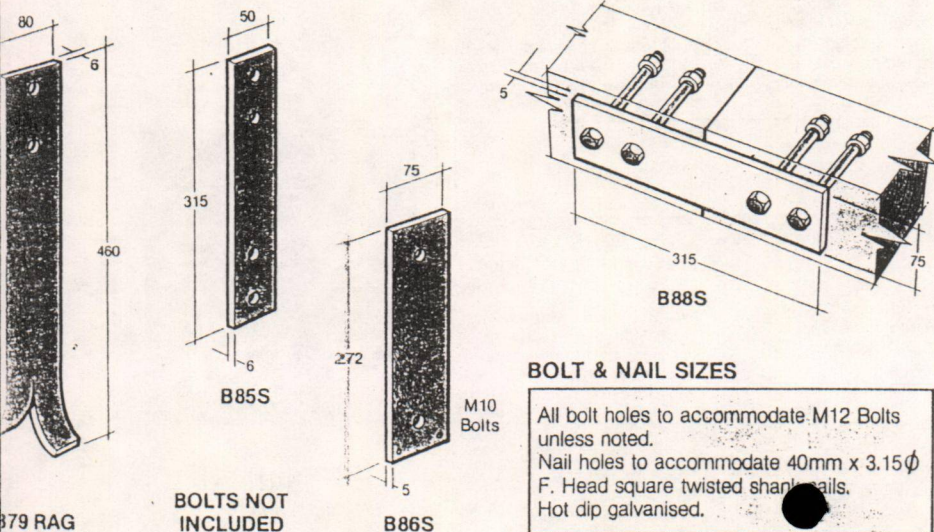
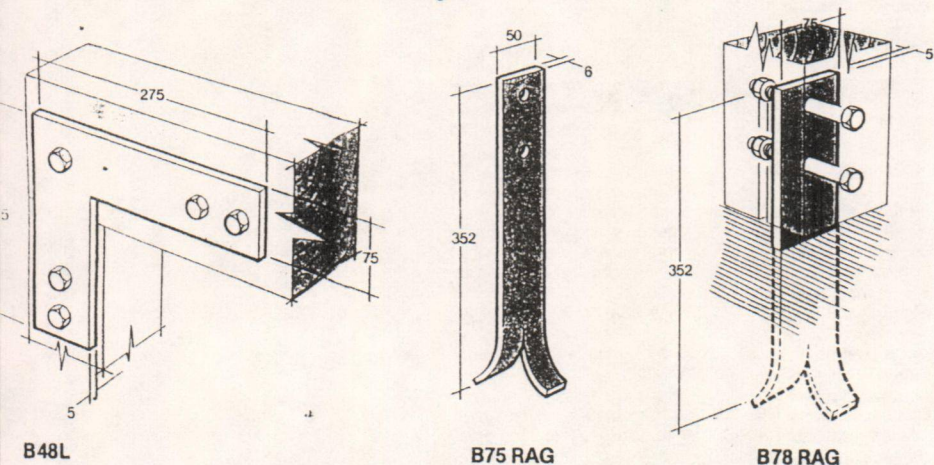
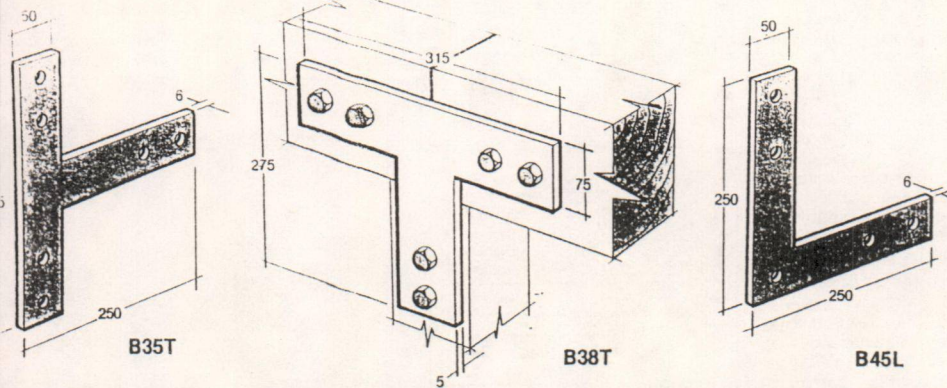
**FWP**

**Fletcher Wood Panels Limited**

289 Great South Road, Greenlane, Auckland  
P.O. Box 57-021, Auckland 5, New Zealand  
Ph 04-526-0700 Fax 04-526-1175

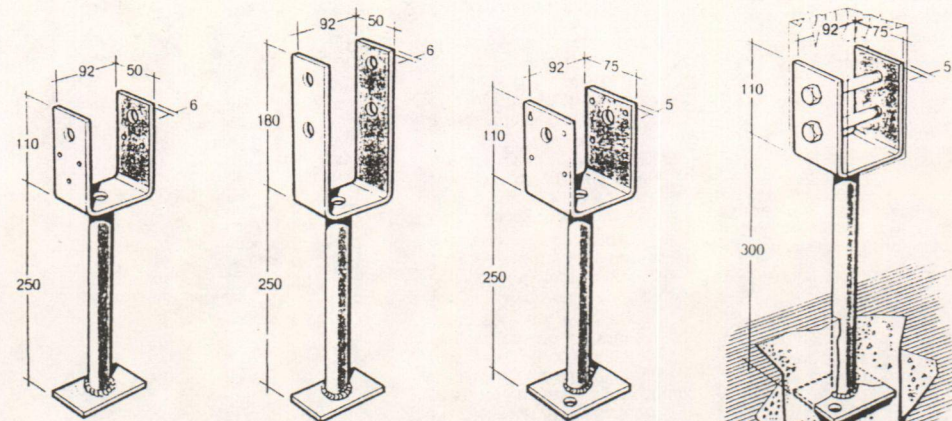
**Further References:**  
B.I.A. Accreditation No. 93/001;  
BRANZ Appraisal Certificate No. 254;  
BRANZ Appraisal Certificate No. 96,  
Pynefloor Commercial and Industrial Floors;  
BRANZ Bulletins: 233  
- Insulating Suspended Timber frame Floors, 237 - Dry Rot in Timber, 245 - Subfloor Ventilation, 272 - Moisture in the Building Structure;  
TRADA: Timber and Wood Products manual Sections  
1a-2 Guide to Use of Standards  
Effecting Timber and Wood Products,  
8a-3 Particle Board for Flooring, 9b-1 Particle Board Clear and Pigmented Finishes.





#### BOLT & NAIL SIZES

All bolt holes to accommodate M12 Bolts unless noted.  
Nail holes to accommodate 40mm x 3.15φ F. Head square twisted shank nails.  
Hot dip galvanised.

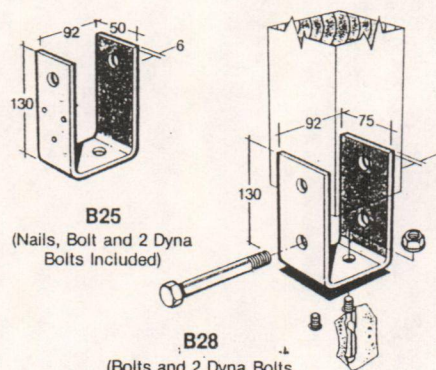


**B15**  
(Nails & Bolt Included)

**B16 (High Wind)**  
(Bolts Not Included)

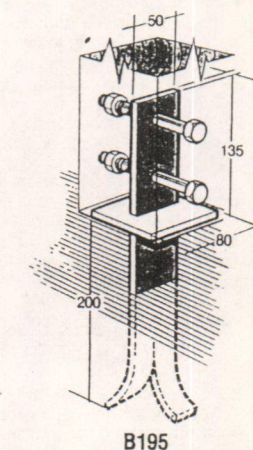
**B17**  
(Nails & Bolt Included)

**B18**  
(Bolts Included)

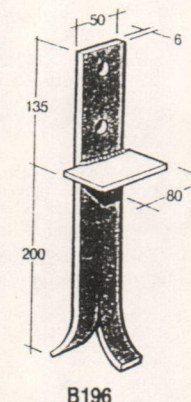


**B25**  
(Nails, Bolt and 2 Dyna Bolts Included)

**B28**  
(Bolts and 2 Dyna Bolts Included)



**B195**



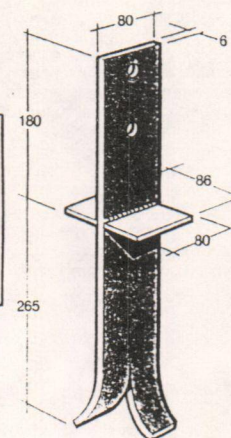
**B196**

#### BOLT & NAIL SIZES

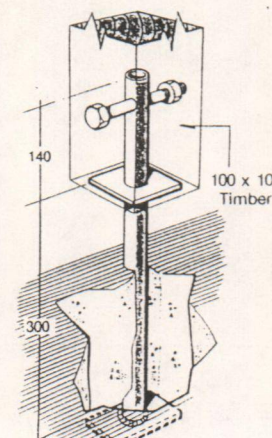
##### FIXING NOTE

All bolt holes accommodate M12 Bolts unless noted.  
Nail holes to accommodate 40mm x 3.15φ F. Head square twisted shank nails.  
Hot dip galvanised.

#### BOLTS NOT INCLUDED UNLESS NOTED



**B197**



**B198**



- BS 2782: 1976: Methods of testing plastic. Part 3 Method 360B:1980/ Determination of tear strength of sheet and sheeting (trouser tear method).
- BS 3137:1972/Method of determination of bursting strength of paper and board.
- BS 3177:1959. Permeability to water vapour of flexible sheet materials.
- MOAT 2:1970. Directive for the assessment of floorings.
- MOAT 27: 1983. General directive

for the assessment of roof waterproofing membranes.

- New Zealand Building Code Handbook and Approved Documents, Building Industry Authority, 1992.
- NZS 2295:1988 (BS 4016:1972) Specification for building papers (breather type).
- NZS 3604:1990 Code of practice for light timber frame buildings not requiring specific design.
- The Building Regulations 1992.



#### Conditions of Certification

This Certificate is valid until further notice. Certificate Validity is subject to the following conditions:

1. The product is manufactured by, and complies with, the manufacturing specifications of Du Pont De Nemours Engineering Products Belgium.
2. Du Pont De Nemours Engineering Products continue to maintain their ISO 9002 certification and validity of BBA Agrément Certificate Nos 87/1941 and 90/2548.
3. The product is installed in accordance with the instructions of Insulation New Zealand given in the Data Sheet entitled "Tyvek® Housewrap Breather-Type Building Membrane", dated April 1994.
4. Du Pont (New Zealand) Limited continue to have the product reviewed by BTL.
5. The overall quality and expected performance of the product are maintained.

*R J Wells*

R J Wells for BTL

*D P Sharp*

D P Sharp for BTL  
July 1994

In the opinion of BTL, Tyvek® 1055B Waterproof Breather-Type Building Membrane is suitable for the appraised use. This opinion is conditional on the statements and conditions within this Certificate.

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LIMITED 1994

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New Zealand  
Fax: 0-4-235 6070  
Telephone: 0-4-235 7604

A company wholly owned by BRANZ



### APPRAISAL CERTIFICATE No. 274 (1994)

### TYVEK® 1055B BREATH-ER-TYPE BUILDING MEMBRANE

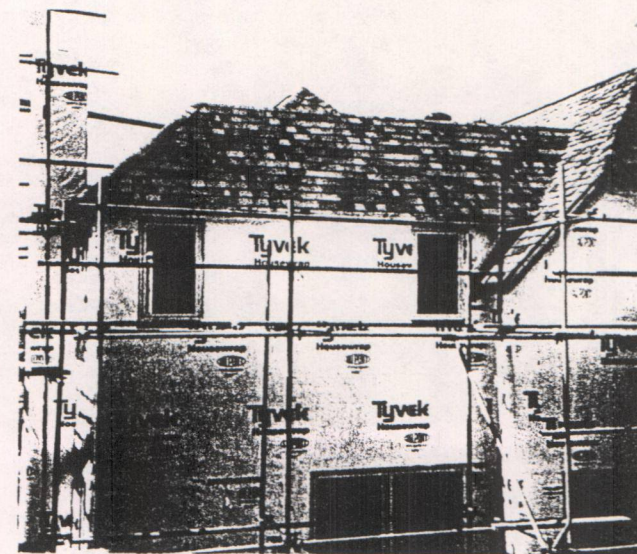
Du Pont (New Zealand) Limited  
PO Box 76 256  
Manukau City  
Tel 0-9-262 1712  
Fax 0-9-262 1722

Readers are advised to check that this Certificate has not been withdrawn or superseded by a later issue, by either referring to the "Current Certificates Index" in BUILD, the bi-monthly magazine published by BRANZ, or by contacting Building Technology Limited (Tel 0-4-235 7604).

#### Product

This Certificate relates to Tyvek® 1055B, which is a polyethylene-based sheet breather-type building membrane. The product is supplied Du Pont De Nemours and Company Incorporated, imported by Du Pont (New Zealand) Limited, and is marketed in New Zealand by Insulation New Zealand, P O Box 12 069, Auckland, Tel (09) 579 2139, Fax (09) 579 8806.

The product has been appraised for use as a breather-type building membrane for use under wall claddings as an alternative to breather-type building papers, and as a temporary weather protection.



#### Building Regulations

##### New Zealand Building Code (NZBC)

In the opinion of BTL, if Tyvek® 1055B Breather-Type Building Membrane is used in accordance with the statements and conditions of this Certificate, the relevant provisions of the following NZBC Clauses will be met:

B2 DURABILITY; E2 EXTERNAL MOISTURE; AND F2 HAZARDOUS BUILDING MATERIALS.

Specific NZBC compliance details are contained within this Certificate.

#### Technical Specification

##### Description

Tyvek® 1055B is a 50 g/m<sup>2</sup> white membrane material approximately 0.15 mm thick which is manufactured from spun-bonded strands of high density polyethylene (HDPE) containing a heat and ultra-violet light (uv) stabiliser. It is supplied in rolls 2.73 m wide and 19 m or 36.5 m long.

Tyvek is the registered trademark of Du Pont de Nemours and Company Incorporated.



## Packaging

Rolls are identified with the marketing company's name, Tyvek® grade, and a British Board of Agrement (BBA) identification mark.

## Handling and Storage

Until used, rolls must be stored on end in clean dry conditions under cover, protected from the weather and damage.

## Design Information

### General

Tyvek® 1055B is intended for use as an alternative to conventional building papers which are fixed over timber frame walls in order to: limit the entry of wind into the building cavities; to act as a secondary barrier to wind-driven rain; and to absorb temporary condensation in wall cavities. The material also provides temporary weather protection during construction.

The use of synthetic breather-type building membranes such as Tyvek® 1055B under wall claddings is allowed for by Section 8.6.6 of NZS 3604 and Acceptable Solution E2/AS1 Paragraph 2.4.2(c). The water vapour flow resistance of Tyvek® 1055B meets the requirements of NZS 3604 Section 8.6.6(b).

In walls, with support centres at 600 mm maximum, Tyvek® 1055B may be used under most claddings, including masonry veneer. Tyvek® 1055B is also a suitable alternative material for backing solid plaster as described in NZS 3604 Appendix G3.1, G3.4, and G3.5, when fixed over battens. The exceptions are non-absorbent claddings such as vinyl or metal-based sidings or weatherboards. These require the use of building paper or equivalent material complying with Amendment A of NZS 2295. The water absorbency of Tyvek® 1055B does not meet the requirements of this Amendment.

### Durability

#### New Zealand Building Code

When used and installed as directed by this Certificate, Tyvek® 1055B will meet the provisions of B2.3(c), 15 years.

### Serviceability

Tyvek® 1055B will be serviceable for at least 50 years, provided it is not exposed to the weather for a total of more than eight weeks.

### Outbreak of Fire

Tyvek® 1055B must be separated from any flues, chimneys, and fuel-burning appliances. NZBC Acceptable Solution C1/AS1 covering the protection of combustible materials gives methods of achieving this separation.

## Spread of Fire

Tyvek® 1055B has an AS 1530 Part 2 Flammability Index of 1.

Tyvek® 1055B meets the requirements of Acceptable Solution C3/AS1 Table 4 for the surface finish requirements for suspended flexible fabrics, and may be used in all buildings with no restrictions.

## External Moisture

When Tyvek® 1055B is properly installed in conjunction with claddings meeting the requirements of the NZBC, e.g., such as those described in Acceptable Solution E2/AS1 Paragraph 2.0, the provisions of NZBC E2.3.2 will be met.

## Hazardous Building Materials

At no stage during the handling, installation, or serviceable life does BTL consider that Tyvek® 1055B constitutes a hazard to people. Tyvek® 1055B will therefore meet the provisions of NZBC F2.3.1.

## Energy Efficiency

The thermal insulation resistance of Tyvek® 1055B is insignificant. However, when properly installed so that an effective barrier to air infiltration is achieved, the insulation performance of the building envelope will be improved.

## Weather Exposure

Tyvek® 1055B must not be exposed to the weather for a total of more than eight weeks.

## Installation

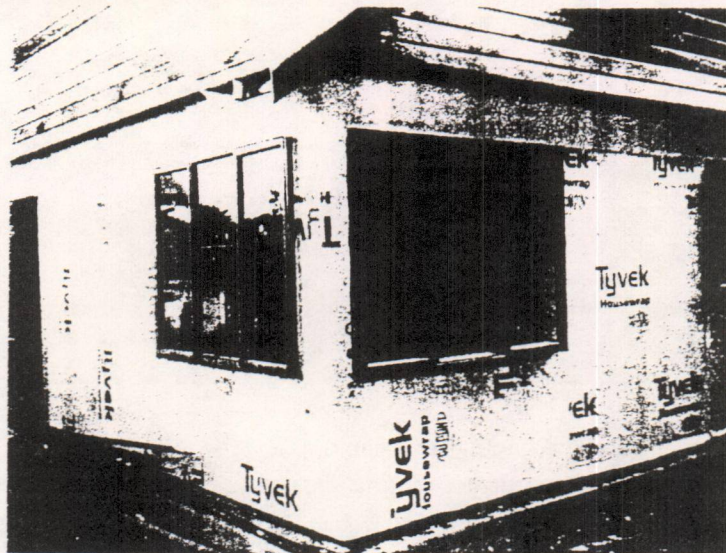
Installation must be in accordance with the Data Sheet provided by Insulation New Zealand entitled "Tyvek® Housewrap Breather-Type Building Membrane", dated April 1994.

Installation requirements generally follow those specified for the fixing of building papers to timber frame walls in Acceptable Solution E2/AS1 Paragraph 2.4.3 or NZS 3604 Section 8.6.2.

Lap joint made at the ends of a roll, which must be at least 150 mm wide, are made over framing.

Tyvek® 1055B is fixed in place with small hot-dipped galvanised clouts, e.g. 20 x 2.8 mm, small zinc plated staples, e.g. 20 x 10 mm, or 20 mm minimum wide polypropylene strapping held in place with similar clouts or staples, as appropriate for the severity of the weather exposure anticipated.

All holes, tears, and gaps around services must be covered with new material lapping by at least 50 mm.



## Basis of Appraisal

### Tests

The following tests have been carried out by the British Board of Agrement on Tyvek® 1055B: thickness, width, and weight per unit area; tensile strength and elongation at break according to BS 2782:1976:320A - before and after aging 28 and 56 days at 60°C, 24 hour and 56 day water soak, and 100 and 250 hours UV aging; nail tear, dimensional stability, head of water, and low temperature flexibility according to MOAT 27: 5.4.1, 5.6.1.1; 5.1.4.2, and 5.4.2 respectively; trouser tear according to BS 2782: Part 3: Method 360B: 1980; Mullen burst according to BS 3137:1972; water vapour permeability according to BS 3177:1959; wind resistance to a BBA internal specification; coefficient of dynamic friction according to MOAT 2: 1970; and resistance to water penetration to BS 4016:1972 (NZS 2295).

The AS 1530 Part 2 Flammability Index has been determined by BTL, a Telarc registered testing facility.

BTL have examined the test results and found them to be satisfactory.

### Other BTL Investigations

The satisfactory performance of a similar Tyvek® product in New Zealand for over 10 years, which was covered by BRANZ Appraisal Certificate No. 1081/84, and the satisfactory use of Tyvek® and a number of similar materials overseas has been noted. No work has also been taken of the water resistance, durability, and non-hazardous nature of the material.

The manufacture of Tyvek® 1055B has not been examined by BTL, but details of the methods adopted for quality control and the quality and composition of the materials used have been obtained.

The manufacturing process is certified for compliance with ISO 9002 by the German Association for the Certification of Quality Systems (DQS Certificate No. 31 093-01/1), and has been inspected by the British Board of Agrement (BBA) during the validity period of Agrement Certificates 87/1941 and 90/2548.

Site inspections in New Zealand to examine installation methods and completed installations have been made.

The Data Sheet entitled "Tyvek® Housewrap Breather-Type Building Membrane" available from Insulation New Zealand, dated April 1994, has been examined and found to be satisfactory.

BTL is satisfied the testing and other investigations demonstrate Tyvek® 1055B is fit for purpose and that it can be used to meet the relevant provisions of the NZBC.

## Sources of Information

- AS 1530: Part 2 - 1973 Test for the Flammability of Materials.
- Bishop R C and Bassett M R BRANZ Study Report 22(1990) Weathertightness of domestic claddings.
- BRANZ Bulletin No. 277 Building papers, vapour barriers, and wind barriers.
- British Board of Agrement Certificate No. 87/1941 Tyvek.
- British Board of Agrement Certificate No. 90/2548 Tyvek construction membranes.



# THE HARDITEX SYSTEM

In conjunction with the Harditex cladding sheets, proven exterior finishing systems are available that are ideal for residential and light commercial projects.

The Harditex system is comprised of four basic components:

- Harditex sheets
- jointing systems
- architectural shapes
- coating systems

## HARDITEX SHEETS

The Harditex cladding sheet is a lightweight fibre cement substrate which is immune to permanent water damage, and which

will not rot or burn. This sheet is securely fixed to the timber framing by nailing.

Harditex base sheets are a light-grey fibre cement sheet. The required nail fixing positions are marked on the face side while the name 'Harditex' is printed on the reverse side.

## JOINTING SYSTEM

The sheets are jointed by approved applicators with tape reinforced flexible compounds to give a long term durable jointing system. (Refer Fig. 1)

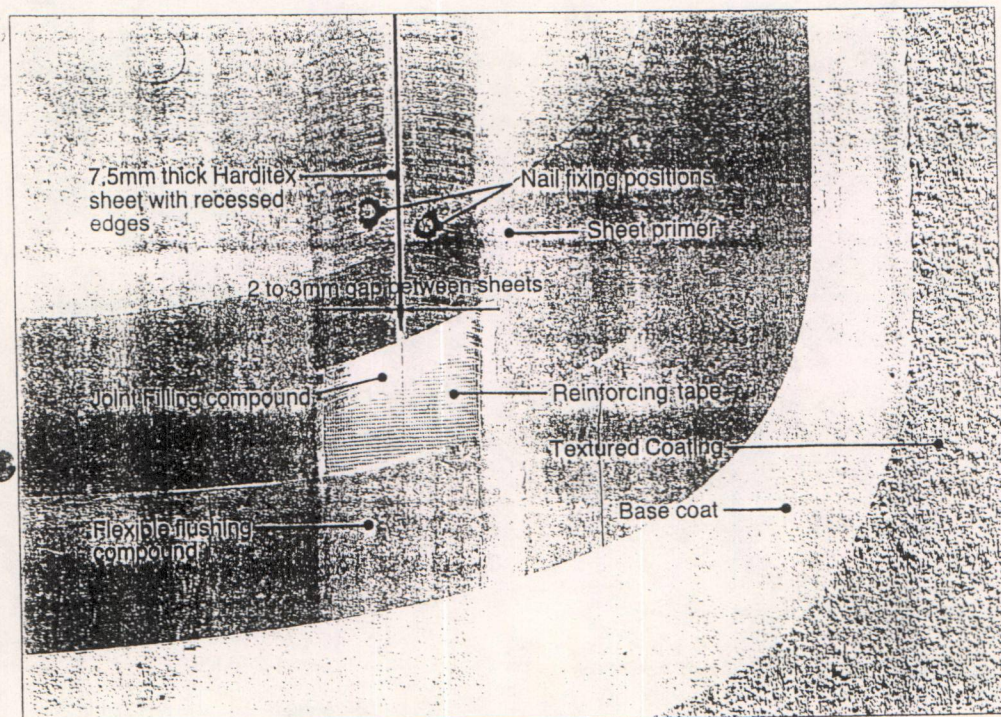


Fig. 1 The recessed edge sheet jointing system

### NOTE

- The details of the tape reinforced flexible compounds vary depending on the proprietary finishing system used.
- Maximum dimensions between relief joints is 5400mm and control joints 9600mm.
- Recessed edge joints are required at all sheet joints.

# STRUCTURAL DETAILS

## APPLICATIONS

- Harditex cladding systems are suitable for both commercial and domestic applications. These should be limited to two storeys in height unless specific design is undertaken for the attachment of the Harditex sheets to the structure. This is because the Harditex sheets form a very rigid element and can act as a structural diaphragm. If a high wall is incorrectly designed the lateral forces on the building may be absorbed by the Harditex sheets before the structural bracing systems. This could lead to serious damage to the sheet fixings and jointing. This aspect must be structurally considered by an engineer before work of greater than two storeys is undertaken. Harditex does have substantial sheet bracing performance. Refer Bracing Performance page 12.

- When the wall height exceeds the sheet length and horizontal joints need to be introduced, all timber framing must be thoroughly dry to minimise vertical shrinkage. ONLY KILN DRIED OR THOROUGHLY AIR DRIED TIMBER IS TO BE USED FOR THESE APPLICATIONS.

- UNLESS KILN DRIED TIMBER IS UTILISED FOR THE FLOOR JOISTS AND WALL FRAMING IN A TWO STOREY CONSTRUCTION, A HORIZONTAL CONTROL JOINT WILL BE REQUIRED. Deep floor joists can shrink significantly therefore this aspect must be considered in the design of applications with two or more storeys.

- All sheets should be installed vertically as this method gives the best overall performance.

- Sheets may however be laid horizontally when a depth of cladding not more than 1200mm high is required (one width of sheet). Examples are fascias, spanrels or narrow bands of cladding along the building.

- Harditex should not be used in full pole house construction where excessive structural movement could be encountered. It can be used on the upper level of pole platform construction where the poles terminate at the underside of the floor level.

## CURVED APPLICATIONS

- Harditex can be used for curved applications and the following is the minimum recommended radius for convex fitted sheets. The sheets must be bent only along the length.

7.5mm thickness

4000mm radius

### NOTE

- The framing is to be closed up to 400mm centres for curved applications to give extra support to the curve.
- Only commence fixing from the centre of the sheet and work outwards to avoid any possibility of drumminess.

## JOINTING PROCEDURES

- The recessed edge sheet joint is formed between each sheet of Harditex (Refer Fig. 2) and at internal and external corners.

- The panel sizes must be limited in size by the use of vertical and horizontal relief and control joints.

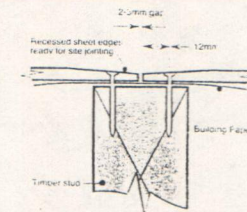


Fig. 2 Recessed edge sheet joint detail

### NOTE

- The recessed edge of the Harditex sheet is designed to accommodate a tape-reinforced flexible jointing system, to achieve a monolithic flush finish with textured coatings. Refer also Fig. 1.
- When the sheet recessed edge is cut away, site grinding of the edge to form a recessed joint is recommended before the sheet is fixed. (Refer Fig. 16)

## RELIEF JOINTS

- Vertical and horizontal relief joints must be provided to limit the monolithic cladding area to 25m<sup>2</sup>. Vertical relief joints must be provided at 5400mm maximum centres. Provide a maximum 6.0mm gap between the sheets.

- Horizontal relief joints are to be provided at a maximum of 5400mm centres.

- For details of alternative vertical relief joints refer Figs 3, 4 and 5.

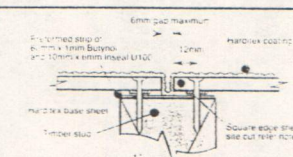


Fig. 3 Vertical Butynol Inseal relief joint alternative 1

### NOTE

- Butynol Inseal strip is available in 12 metre rolls from James Hardie stockists.
- This alternative can be left open to give an expressed joint appearance.
- The finish coating can be sprayed into the joint to give a complete seal to the Butynol and the sheet edge.
- The sheet edge is to be site cut to give a square edge as shown in Figs 3 and 4. Refer also to the site cutting recommendations on page 11. The frame set out and joint positioning in the wall will need to allow for this reduced sheet width.



# THE HARDITEX SYSTEM

In conjunction with the Harditex cladding sheets, proven exterior finishing systems are available that are ideal for residential and light commercial projects.

The Harditex system is comprised of four basic components:

- Harditex sheets
- jointing systems
- architectural shapes
- coating systems

## HARDITEX SHEETS

The Harditex cladding sheet is a lightweight fibre cement substrate which is immune to permanent water damage, and which

will not rot or burn. This sheet is securely fixed to the timber framing by nailing.

Harditex base sheets are a light-grey fibre cement sheet. The required nail fixing positions are marked on the face side while the name 'Harditex' is printed on the reverse side.

## JOINTING SYSTEM

The sheets are jointed by approved applicators with tape reinforced flexible compounds to give a long term durable jointing system. (Refer Fig. 1)

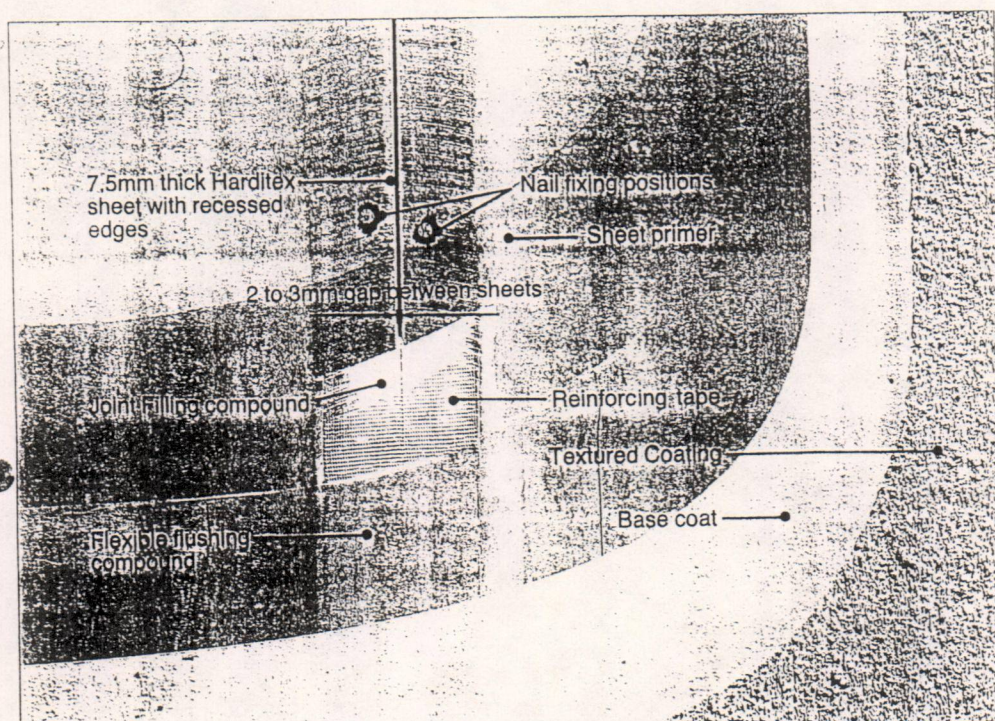


Fig. 1 The recessed edge sheet jointing system

### NOTE

- The details of the tape reinforced flexible compounds vary depending on the proprietary finishing system used.
- Maximum dimensions between relief joints is 5400mm and control joints 9600mm.
- Recessed edge joints are required at all sheet joints.

# STRUCTURAL DETAILS

## APPLICATIONS

- Harditex cladding systems are suitable for both commercial and domestic applications. These should be limited to two storeys in height unless specific design is undertaken for the attachment of the Harditex sheets to the structure. This is because the Harditex sheets form a very rigid element and can act as a structural diaphragm. If a high wall is incorrectly designed the lateral forces on the building may be absorbed by the Harditex sheets before the structural bracing systems. This could lead to serious damage to the sheet fixings and jointing. This aspect must be structurally considered by an engineer before work of greater than two storeys is undertaken. Harditex does have substantial sheet bracing performance. Refer Bracing Performance page 12.

- When the wall height exceeds the sheet length or horizontal joints need to be introduced, all timber framing must be thoroughly dry to minimise vertical shrinkage. ONLY KILN DRIED OR THOROUGHLY AIR DRIED TIMBER IS TO BE USED FOR THESE APPLICATIONS.

- UNLESS KILN DRIED TIMBER IS UTILISED FOR THE FLOOR JOISTS AND WALL FRAMING IN A TWO STOREY CONSTRUCTION, A HORIZONTAL CONTROL JOINT WILL BE REQUIRED. Deep floor joists can shrink significantly therefore this aspect must be considered in the design of applications with two or more storeys.

- All sheets should be installed vertically as this method gives the best overall performance.

- Sheets may however be laid horizontally when a depth of cladding not more than 1200mm high is required (one width of sheet). Examples are fascias, spandrels or narrow bands of cladding along the building.

- Harditex should not be used in full pole house construction where excessive structural movement could be encountered. It can be used on the upper level of pole platform construction where the poles terminate at the underside of the floor level.

## CURVED APPLICATIONS

- Harditex can be used for curved applications and the following is the minimum recommended radius for convex fitted sheets. The sheets must be bent only along the length.

7.5mm thickness 4000mm radius

### NOTE

- The framing is to be closed up to 400mm centres for curved applications to give extra support to the curve.
- Only commence fixing from the centre of the sheet and work outwards to avoid any possibility of drumminess.

## JOINTING PROCEDURES

- The recessed edge sheet joint is formed between each sheet of Harditex (Refer Fig. 2) and at internal and external corners.

- The panel sizes must be limited in size by the use of vertical and horizontal relief and control joints.

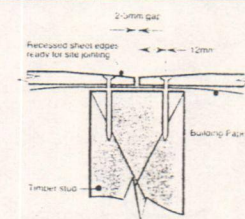


Fig. 2 Recessed edge sheet joint detail

### NOTE

- The recessed edge of the Harditex sheet is designed to accommodate a tape-reinforced flexible jointing system, to achieve a monolithic flush finish with textured coatings. Refer also Fig. 1.
- When the sheet recessed edge is cut away, site grinding of the edge to form a recessed joint is recommended before the sheet is fixed. (Refer Fig. 1b)

## RELIEF JOINTS

- Vertical and horizontal relief joints must be provided to limit the monolithic cladding area to 25m<sup>2</sup>. Vertical relief joints must be provided at 5400mm maximum centres. Provide a maximum 6.0mm gap between the sheets.

- Horizontal relief joints are to be provided at a maximum of 5400mm centres.

- For details of alternative vertical relief joints refer Figs 3, 4 and 5.

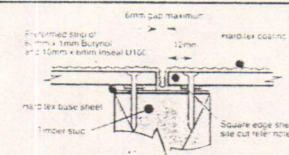
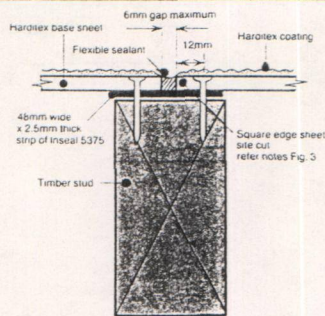


Fig. 3 Vertical Butynol Inseal relief joint alternative 1

### NOTE

- Butynol Inseal strip is available in 12 metre rolls from James Hardie stockists.
- This alternative can be left open to give an expressed joint appearance.
- The finish coating can be sprayed into the joint to give a complete seal to the Butynol and the sheet edge.
- The sheet edge is to be site cut to give a square edge as shown in Figs. 3 and 4. Refer also to the site cutting recommendations on page 11. The frame set out and joint positioning in the wall will need to allow for this reduced sheet width.

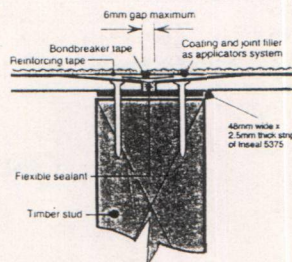




**Fig. 4 Vertical sealant relief joint alternative 2**

**NOTE**

- Mask out the sheet both sides of the joint to apply the flexible sealant.
- Use only a good quality paintable silicone sealant such as Expandite Silaflex MS, Nuplex HE 300 or similar.
- The finish coating preferably should be stopped each side of the flexible sealant to avoid rippling of the textured surface.
- In some cases the sealant can colour match the finish coating.
- Joint preparation and primers to be carried out as per the manufacturers instructions.

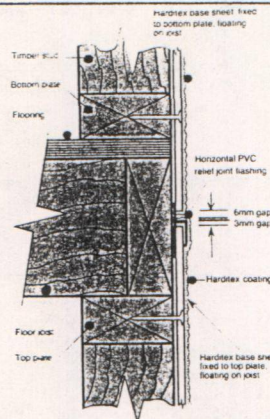


**Fig. 5 Vertical flexible compound relief joint alternative 3**

**NOTE**

- This joint is designed to maintain the monolithic appearance and to give movement control between jointed panels. The following points need to be considered during the design stage:
  - The design and finishing of this detail will vary depending on the coating contractor selected.
  - A rippling of the coated surface can occur with this detail due to any long term joint movement.
  - Use only solvent free flexible sealants such as Expandite Silaflex MS, Nuplex HE 300 or similar to avoid solvent migration onto the surface coating.

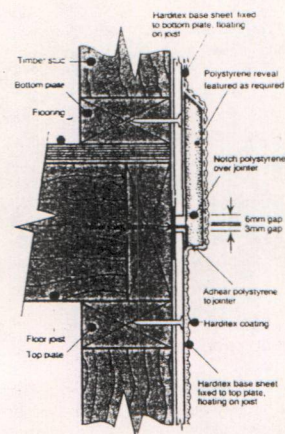
- For details of alternative horizontal relief joints refer figs. 6, 7 and 8.



**Fig. 6 Horizontal flashing relief joint alternative 1**

**NOTE**

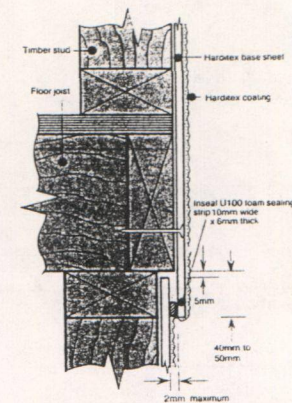
- The PVC horizontal jointer is available from James Hardie stockists.
- The jointer colour is off white.
- The horizontal jointer is to be tacked into place before the top sheet is installed.



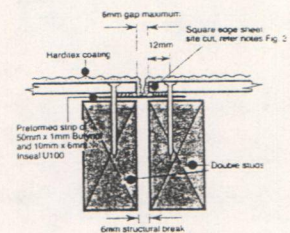
**Fig. 7 Horizontal reveal relief joint alternative 2**

**NOTE**

- Dimensions of polystyrene reveal to be to the specifiers choice.
- For methods of adhering and finishing the polystyrene reveal refer to the architectural shapes section page 20.



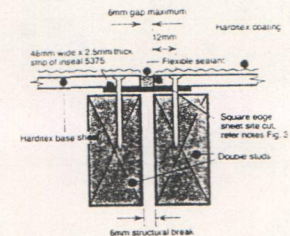
**Fig. 8 Horizontal overlap relief joint detail alternative 3**



**Fig. 10 Vertical Butynol Inseal control joint alternative 1**

**NOTE**

- Refer to Fig. 3 for general notes relating to this as the details are similar except for the double studs.



**Fig. 11 Vertical sealant control joint alternative 2**

**NOTE**

- Refer to Fig. 4 for general notes relating to this as the details are similar except for the double studs.

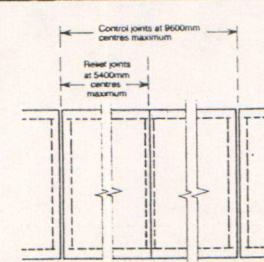
- After all Harditex sheets are securely and correctly fixed to the framework the recessed joint between sheets is ready to accept the jointing procedures of the selected coating contractor. (Refer Figs. 1 and 2). The detail is the same for vertical and horizontal sheet joints. With the horizontal joint, dry framing must be used, refer page 7.

**CORNERS**

- At external and internal corners adhere a strip of Inseal 5375 in position before fixing sheets. (Refer Figs. 12 and 13). The sheets can then be finished with the standard tape reinforced flexible jointing system. (Refer Fig. 1).

**CONTROL JOINTS**

- Vertical structural control joints are to be provided where walls exceed 9600mm in length. These control joints are to be correctly designed structural joints. They must have total framing, including top and bottom plate, lining and cladding separation to allow for the structural framing expansion and contraction that can occur. A well designed long wall will therefore have full control joints at 9600mm centres with intermediate relief joints at 5400mm centres maximum from a control joint. (Refer Fig. 9).



**Fig. 9 Relief joint and control joint set out**

- For details of alternative vertical control joint refer Figs. 10 and 11.



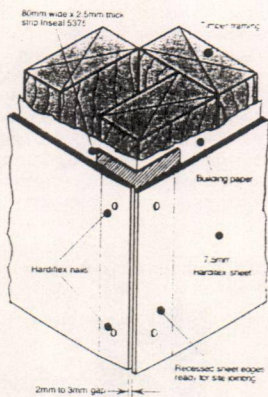


Fig. 12 Recessed edge external corner detail

NOTE

- Refer Fig. 2 for general notes.
- A galvanised slim line angle can be used for alignment and finishing of this external corner. Slimline angle to be of exterior quality galvanising.

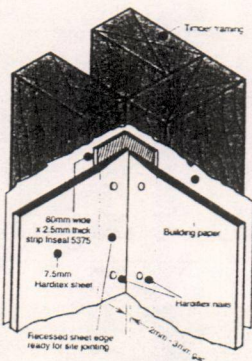


Fig. 13 Recessed edge internal corner detail

NOTE

- Refer Fig. 2 for general notes.
- Alternative methods for internal and external corners are to use the expressed joint and the sealant joint. Refer Figs. 3 and 4 for similar details. Note that sheets are to be site cut to give a square edge for these two details.

## FRAMING AND FIXING REQUIREMENTS

Correct design of the framework and careful consideration of the sheet set out to minimise joints will significantly contribute to the long term success of all flush jointed wall systems. Allowance must be made for the provision of both horizontal and vertical relief joints and control joints at the design stage.

- All timber framing should be in accordance with NZS 3604:1990 'Code of Practice for Light Timber Frame Buildings'.
- Hardiflex should not be fixed to timber framing with a moisture content in excess of 24% and for fully air conditioned buildings moisture content must not exceed 18% in accordance with NZS 3602:1975. KILN DRIED TIMBER IS REQUIRED TO MINIMISE SHRINKAGE. THIS IS PARTICULARLY IMPORTANT FOR MULTI STOREY BUILDINGS AND APPLICATIONS WHICH ARE MORE THAN ONE SHEET IN HEIGHT. Refer also to 'Applications' page 7 for further information.
- Studs and noggings are to be a minimum of ex. 50mm wide to give sufficient width to fix sheets at joints. Studs shall be at maximum 600mm centres and nogs at 1200mm centres. (Refer Fig. 14)

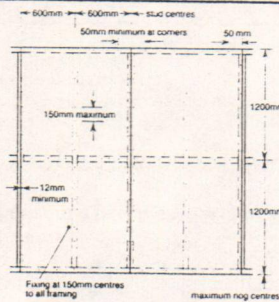


Fig. 14 Vertical sheet fixing

- All Hardiflex sheet edges must be fully supported by the framing. Framing must be rigid and not rely on the Hardiflex for stability.
- All studs and nogs are to be checked with a long straight edge before the Hardiflex is fixed for line and face accuracy to ensure the timber stud wall has a true and accurate outside face to fix the sheet.
- A breather type building paper is to be fixed to the outside face of the framing before fixing the Hardiflex sheet. Note that for clarity building paper is not shown in the drawings for this brochure.
- Sheets must be thoroughly dry before fixing is commenced. Refer Page 15.
- The sheet is to be held firmly against the stud when nailing to minimise nail break out at the back of the sheet.

- Commence fixing from the centre of all sheets and work outwards to ensure they are hard against the framing to eliminate any 'drumminess'.
- Fix in conjunction with the dot pattern on the sheet which is set out for normal vertical sheet fixing. Use 40mm x 2.5mm galvanised flat head Hardiflex nails (Refer Fig. 15).

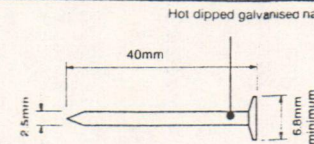


Fig. 15 Hardiflex nail

- Nail at 150mm centres to the perimeter of sheets and intermediate studs and nogs. Nails must be hammer driven flush with the sheet surface. Do not fix closer than 12mm to the sheet edge or 50mm to the corner of the sheet. Do not over-drive the nails below the sheet surface as this can lower the nail holding.
- Where it is necessary to produce a tapered edge on site, use a portable angle grinder fitted with a strong, thick carbide blade or similar. Run down the edge at an acute angle to the face to produce a taper approximately 40mm wide but not exceeding 1.5mm at its deepest point. (Refer Fig. 16).

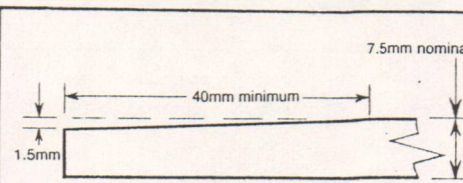


Fig. 16 Site ground recessed edge detail

- Where sheet end joints are above and below door or window lines, joints may crack due to structural movement. Fix sheets across door and window openings so sheet edges do not coincide with the sides of the window or door, then cut away waste. (Refer Fig. 17).

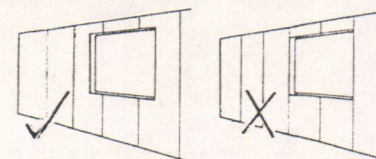


Fig. 17 Sheet layout for openings

- An alternative method to accommodate this possibility is to provide an expressed joint flashed with insole or a sealant lead joint. (Refer Figs. 3 and 4).
- For fire rated applications, sheets can be fixed directly to gypsum plaster boards. Building paper must be placed directly over the gypsum board before fixing the Hardiflex sheets. Care must be taken with this method to ensure the gypsum board is kept dry during the construction period before final coating of the Hardiflex. Longer 50mm Hardiflex nails may be required to give a minimum of 25mm penetration into the timber framing. (Refer Fig. 18).

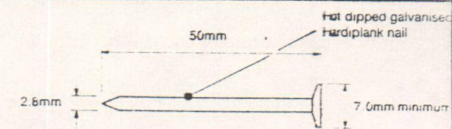


Fig. 18 Hardiplank nail

- Timber battens for fixing the Hardiflex are required when:
  - The gypsum board exceeds 16mm in thickness.
  - Sheets are to be fixed over softboard, polystyrene or similar sheets.
  - Where sheets are to be fixed over concrete, masonry block or brick walls.
- Battening is to be a minimum of ex 50mm wide x 40mm gauged timber to give adequate sheet nail penetration. Battening centres and sheet fixing is to be strictly in accordance with the framing and fixing specifications required for Hardiflex. Care is to be taken to ensure the battens are packed and aligned to give a true even surface for the sheets to be fixed. Check the face of the battens with a long straight edge before fixing sheets.
- IT WILL BE MORE ECONOMICAL WHEN THE TIMBER FRAMING IS PRE-CUT OR SET OUT TO SUIT THE EXTERIOR CLADDING RATHER THAN THE INTERIOR GIB BOARD LINING OR SIMILAR. FOR A TYPICAL EXAMPLE OF THIS REFER FIG. 19.

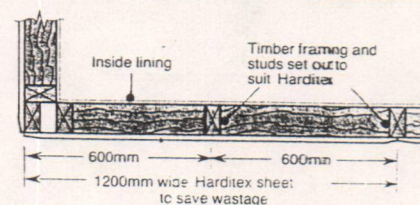


Fig. 19 Frame and stud set out



## BRACING PERFORMANCE

Harditex sheets (7.5mm thick) fixed as an external cladding system give excellent sheet bracing ratings and performance. They have been tested by BRANZ to technical paper P21 and are suitable for use in conjunction with either NZS 3604:1990 or NZS 3604:1984. The bracing ratings given are specific for Harditex claddings only.

### Fixings

- Harditex has been tested as sheet bracing fixed with 40mm x 2.5mm Hardiflex nails at standard 150mm centres to all framing. For nail fixing refer Fig. 14.

### End Stud Fixings

- The end studs for 1200mm to 2400mm wide panels require holding down with end straps of 6kN capacity as given in Table 1.

## Bracing Performance

- When construction is in accordance with NZS 3604:1984 or NZS 3604:1990, the bracing ratings given in Table 1 apply.

- These bracing ratings are based on wall heights of 2.4 metres. For other heights bracing ratings must be multiplied by 2.4 and divided by the element height in metres. Elements less than 1.8 metres are rated as if they were 1.8 metres high.

- Harditex has been extensively tested and evaluated, and in the opinion of BRANZ, the bracing ratings shown are appropriate for use with NZS 3604:1990.

## Specific Design – NZS 4203

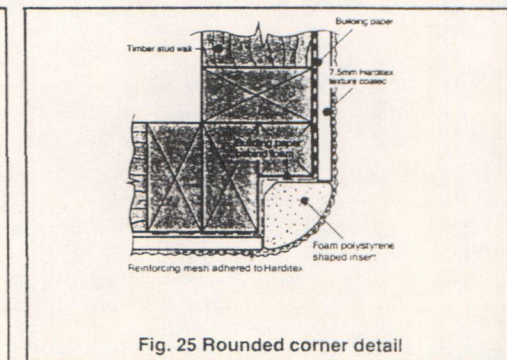
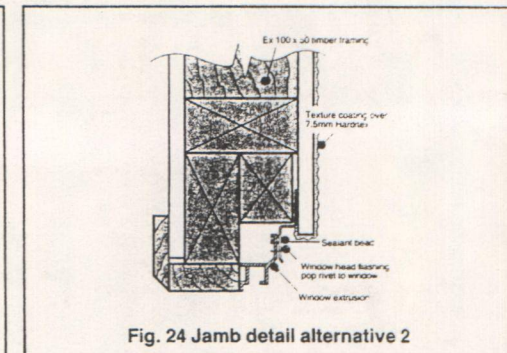
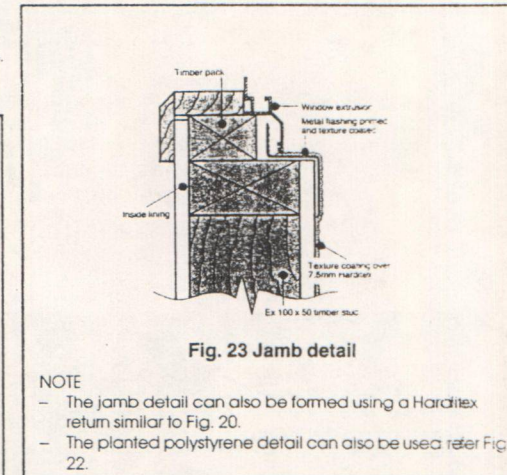
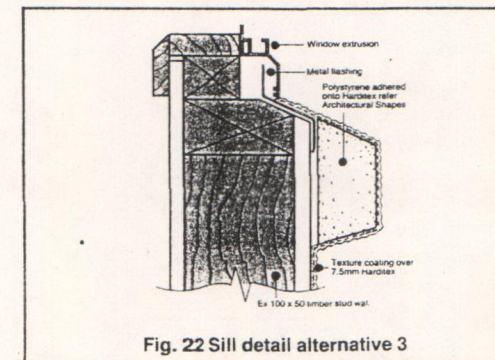
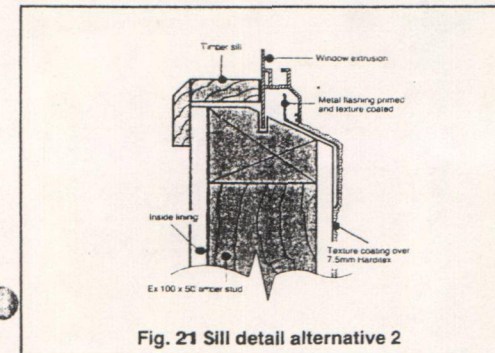
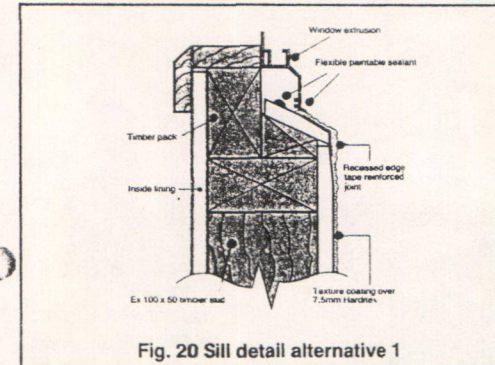
- When specific design is in accordance with the 'alternative method' outlined in NZS 4203, allowable design racking loads (kN) shall be taken as the NZS 3604:1984 bracing rating divided by a factor of 20.

TABLE 1. HARDITEX BRACING RATINGS

Product Application		NZS 3604:1990		NZS 3604:1984	
Primary Bracing Element	End-stud Fixing	Rating in bracing Units per metre of element length		End-stud Fixing	Rating in bracing units per metre of element length
		Wind	Earthquake		
Harditex cladding on outside face Length 2400mm and longer	End straps not required for timber framing. For concrete slabs fix as clause E13.2 and Fig. E8 NZS 3604:1990	107	91	Steel strap as clause 6.9.4.5 (Fig 47) or fixing as clause E13.2 (Fig 67)	56
Harditex cladding on outside face Length 1200mm to 2400mm maximum	End straps required as clause K4.5 and Fig. K1 NZS 3604:1990 for timber floors. For concrete slabs fix as clause E13.2 and Fig. E8 NZS 3604:1990.	121	118	Steel strap as clause 6.9.4.5. (Fig 47) or fixing as clause E13.2 (Fig 67)	67

## WINDOWS AND CORNERS

The following are suggested details for deep reveal windows. (Refer Figs. 20 to 25)





the total thermal resistance of parts of buildings.

- NZS 4218P:1977 Minimum thermal insulation requirements for buildings.
- NZS 4220:1982 Code of practice for energy conservation in non-residential buildings.
- NZS 4222:1985 Specification for materials for the thermal insulation of buildings.
- The Building Regulations 1992.

#### Conditions of Certification

This Certificate will remain valid until further notice. Certificate Validity is subject to the following conditions:

1. The product is manufactured by, and complies with, the manufacturing specifications of CSR Gyprock-Bradford Insulation.
2. The product is installed in accordance with the instructions of CSR International Pty Limited given in their September 1994 information entitled "Bradford Gold Glasswool Insulation Products"
3. CSR Gyprock-Bradford Insulation continues to have the product reviewed by BTL.
4. The overall quality and expected performance of the product are maintained.

*R J Wells*

R J Wells for BTL

*D G Waple*

D G Waple for BTL  
December 1994

In the opinion of BTL, Bradford Gold (Glasswool Insulation) is suitable for the appraised use. This opinion is conditional on the statements and conditions within this Certificate.

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BTL, Private Bag 50908, Porirua  
New Zealand  
Fax: 0-4-235 6070  
Telephone: 0-4-235 7604

A company wholly owned by BRANZ

## APPRAISAL CERTIFICATE No. 301 (1994)

## BRADFORD GOLD (GLASSWOOL INSULATION)

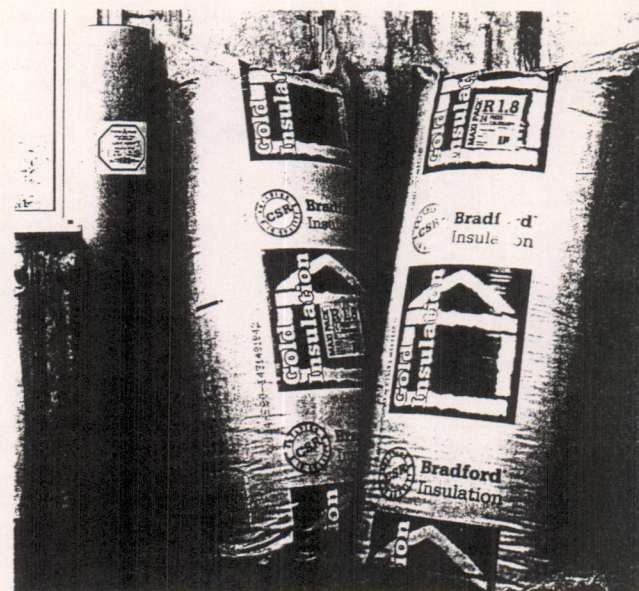
CSR Gyprock-Bradford  
Insulation  
Locked Bag No.26  
Wetherill Park  
NSW 2164  
Australia  
Tel 0061-2-844 7899  
Fax 0061-2-844 7803

Readers are advised to check that this Certificate has not been withdrawn or superseded by a later issue, by either referring to the "Current Certificates Index" in BUILD, the bi-monthly magazine published by BRANZ, or by contacting Building Technology Limited (0-4-235 7604).

## Product

This Certificate relates to Bradford Gold (Glasswool Insulation), which consists of pieces and blankets of insulation material manufactured from resin-bonded glass fibre. The product is manufactured in Australia by CSR Gyprock-Bradford Insulation, and marketed in New Zealand by CSR International Pty Limited, P O Box 34 121, Birkenhead, Auckland. Tel 0-9-480 5315, Fax 0-9-480 6596.

The product has been appraised for use as a thermal insulating material in walls, ceilings, and roofs of buildings.



## Building Regulations

### New Zealand Building Code (NZBC)

In the opinion of BTL, if Bradford Gold (Glasswool Insulation) is used in accordance with the statements and conditions of this Certificate, the relevant provisions of the following NZBC Clauses will be met:

B2 DURABILITY; E3 INTERNAL MOISTURE; F2 HAZARDOUS BUILDING MATERIALS; AND H1 ENERGY EFFICIENCY.

## Technical Specification

### Description

Bradford Gold is insulation material manufactured from resin-bonded fibreglass.

The insulation material covered by this appraisal is marketed in two forms: pieces (as Wall Insulation, and Ceiling Insulation); and Building Blankets. Wall Insulation, Ceiling Insulation, and Building Blankets are available in a range of thicknesses in order to meet different thermal insulation performance requirements. Details are given in Table 1.



Table 1 - Product Information Details

Product Type	Sizes (Length, Width, and Thickness)	Nominal R-Value (m <sup>2</sup> C/W)
Wall Insulation	1160 x 580 x 105 mm	1.8
Ceiling Insulation	1160 x 430 x 105 mm	2.0
	1160 x 430 x 130 mm	2.5
	1160 x 430 x 160 mm	3.0
	1160 x 430 x 185 mm	3.5
Building Blankets	15 m x 1.2 m x 65 mm	1.5
	15 m x 1.2 m x 83 mm	2.0

### Packing

Bradford Gold is supplied compression-packed in polythene bags labelled with product type (Wall Insulation, Ceiling Insulation, or Blankets), size, coverage, number of pieces or blankets, and nominal R-Value. On each bag are also printed handling and installation instructions.

### Handling and Storage

Handling must be in accordance with the instructions printed on each bag of Bradford Gold.

Long-term storage must be under dry cover. Short-term storage on site should be within the building to be insulated once it has been closed in.

## Design Information

### General

Bradford Gold (Glasswool Insulation) is supplied in a range of product types (Wall Insulation, Ceiling Insulation, and Blankets) and thicknesses to suit many applications in buildings which require a thermal insulation material to meet energy efficiency needs.

Bradford Gold Wall Insulation is intended to be friction fitted between studs spaced at 600 mm centres, but it may also be used in ceilings and under roofs when fitted between joists and rafters spaced at 600 mm centres. When stud or ceiling joist centres are less than 600 mm, the pieces may need cutting to size.

Bradford Gold Ceiling Insulation is intended to be used over ceilings or under roofs when friction fitted between joists or rafters spaced at 450 mm centres. At larger centres, several pieces of insulation cut to size will be required. In this case, generally the ceiling linings or other means of support such as wire netting or roofing underlay will need to be in place before installation proceeds. Bradford Gold Ceiling Insulation should not be used in walls unless CSR International Pty. Ltd. is consulted first.

Bradford Gold Blankets are intended for use in ceilings when laid over the ceiling joists or between the rafters, or under roofs when laid between purlins, or dummy rafters.

If used in buildings such as garages, workshops and warehouses etc. Bradford Gold

insulation should be covered by suitable lining materials.

### Underlays and Vapour Barriers

Building papers and roofing underlays must be installed as required by the cladding manufacturer, or as required by Acceptable Solution E2/AS1.

If used, vapour barriers must be installed on the warm side of the insulation. This will be next to the external cladding in buildings such as cool stores and freezers.

### Durability

#### New Zealand Building Code

When used and installed in accordance with this Certificate, Bradford Gold will meet the provisions of NZBC B2.3(b), 50 years when used in dry, protected construction cavities where the provisions of NZBC E2 and E3 are met.

### Outbreak of Fire

Although there is minimal risk of Bradford Gold igniting and contributing to the outbreak of fire, the manufacturer recommends that Bradford Gold be separated from chimneys and flues by a 50 mm gap.

### Spread of Fire

The AS 1530, Part 3 Indices for all thicknesses of Bradford Gold covered by this appraisal are 0.

### External Moisture

The moisture content of the construction materials, including framing and claddings, at the time of enclosing the insulation must not exceed 24% as required by Acceptable Solution E2/AS1 Paragraph 6.0.2(a), or less if required by the wall or ceiling lining manufacturer.

If Bradford Gold insulation is wetted by rain penetrating the cladding system, or other external sources such as leaking water pipes, its thermal insulating performance will be reduced significantly. If wetted, the product should be removed and be allowed to dry before reinstating.

### Internal Moisture

When Bradford Gold insulation is used and installed in accordance with this Certificate, the thermal resistance provisions of NZBC E3.3.1 will be met.

The correct thickness of thermal insulation for walls and roofs must be used to meet the minimum performance requirements of Acceptable Solution E3/AS1 Paragraph 1.1, and adequate ventilation must be provided, e.g., as required by Acceptable Solution E3/AS1 Paragraph 1.2.

In skillion roofs, a ventilation gap of at least 25 mm must be left between the underside of the roof cladding or roofing underlay and the top of the insulation in order

to minimise the risk of condensation. Provision must also be made for ventilation through the roof from the soffits to the eaves, using if necessary, perforated soffit linings and ridge vents.

In areas of high indoor humidity, for example, saunas, spa pools, swimming pools and wet industrial process areas, CSR International Pty Limited must be consulted for advice on the use of appropriate vapour barriers.

### Hazardous Building Materials

If handled, installed, and used in accordance with this Certificate, BTL considers that Bradford Gold will not constitute a hazard to people (refer to Installation). Bradford Gold will therefore meet the provisions of NZBC F2.3.1.

### Energy Efficiency

When Bradford Gold is used and installed in accordance with this Certificate, the provisions of NZBC H1.3.1 will be met for Housing.

NZBC H 1.3.1 requires Housing to have a building performance index of no more than 0.13 kWh. The performance index of the building envelope of Housing must be determined in accordance with an approved method, e.g., as given in Verification Method H1/VM1 Paragraph 1.1. Alternatively, a building envelope meeting the requirements of NZS 4218P Clause 2 is acceptable.

For other buildings, a building envelope meeting the requirements of Clause 2 of NZS 4218P may be acceptable if the building is less than 200 m<sup>2</sup> in area. For larger buildings, reference should be made to NZS 4220 for energy conservation in non-residential buildings.

## Installation

### General

Installation, including safe handling, use of protective clothing, and disposal of waste, must be in accordance with the instructions given on each bag of Bradford Gold.

Workmanship of installation is the responsibility of the installer.

Attention is drawn to the following:

Prior to installation, the building must be closed in, or temporary weather protection provided, and the framing allowed to dry to the required maximum permitted moisture content as required by the wall lining manufacturer or Acceptable Solution AS1/E2 Paragraph 6.0.2.

Neat and careful installation is required to ensure there are no gaps between pieces, blankets, and framing, except at ventilation openings, and around chimneys, and flues.

When pieces or blankets are used under roofs, support must be provided in the form of wire netting, roofing underlay or foil insulation and/or vapour barriers etc.

## Sasis of Appraisal

BTL is satisfied the following testing and other investigations below show Bradford Gold is fit for purpose, and that it can be used to meet the relevant provisions of the New Zealand Building Code.

### Tests

By BRANZ - water absorption tests according to NZS 4222.

By CSR Bradford Research and Development Centre - AS 1530 Part 3 Indices, thermal resistance according to AS 2464.6 and AS 2464.7, thickness according to AS 2464.4, surface density according to AS 2464.7, density, and water absorption according to BS 2972. The CSR Bradford Research and Development Centre is a NATA certified testing laboratory for carrying out AS 1530, Part 3 tests.

### Other Investigations

The extensive use of glass fibre thermal insulation products for many years both in New Zealand and overseas has been noted, including thermal performance, durability, and handling.

The manufacture of Bradford Gold in Australia has not been inspected by BTL, but CSR Gyprock-Bradford Insulation, who is responsible for the quality assurance of manufacture, is an ISO 9002 quality endorsed supplier (QAS Licence No. QEC 2073).

Details have been obtained of the materials used, and manufacturing, quality control, and quality assurance procedures.

The September 1994 technical information supplied by CSR International Pty Limited, which is entitled "Bradford Gold Insulation Products", has been examined.

Installation procedures have been assessed, and typical installations examined by BTL.

### Sources of Information

- AS 1530, Part 3 - 1989 Simultaneous determination of ignitability, flame propagation, heat release, and smoke release.
- AS 2464 Methods of testing thermal insulation. Part 4:1981 Length, width, and thickness of batt or blanket type thermal insulation. Part 6:1983 Steady-state thermal transmission properties by means of the guarded hot box. Part 7:1990 Determination of the average thermal resistance of low-density mineral wool insulation - batt or blanket.
- BRANZ Bulletin 292 Thermal insulation of buildings. June 1992.
- BS 2972:1989 Methods of test for inorganic thermal insulating materials.
- New Zealand Building Code Handbook and Approved Documents. Building Industry Authority, 1992.
- NZS 4214: 1977 Methods of determining



## PAINING OF GALVANIZED STEEL ROOFING

### To Comply with New Zealand Building Code (B2) "Durability"

It is the owner's responsibility to paint the entire roof immediately after installation or fixing, thereafter a five (5) yearly painting program is to be implemented.

#### *1     Retreatment*

*Thoroughly clean the surface with a household detergent to remove dirt and grime, using a soft bristle brush if necessary. Do not use a wire brush. Wash down with plenty of fresh water and allow to dry.*

#### *2     Primer*

*Primer entire Area with a good quality galvanized iron primer.*

#### *3     Top Coats*

*Apply a minimum of two (2) top coats of Dulux Spruce or equivalent acrylic roof paint.*

*Always ensure the use of top coats and primers from the same paint manufacture.*

The owner shall make annual inspections of the roof areas and touch up any areas where paint break-down has taken place. This is to ensure a life-span of the roof to a minimum of fifteen (15) years. In the event of dwelling changing ownership within fifteen (15) years, the current owner shall inform the new owner of these responsibilities.



#### Important:

- Sloping soffits are not possible.
- Suitable for roof pitches between 15° and 25°.
- For steeper pitched roofs consult your local agent for advice.

DIAGRAM SHOWING GABLE END DETAILS

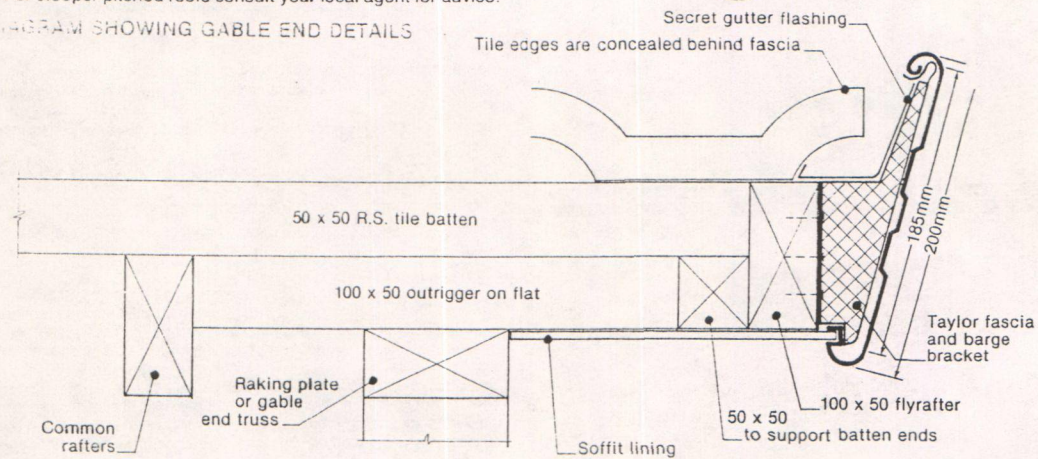
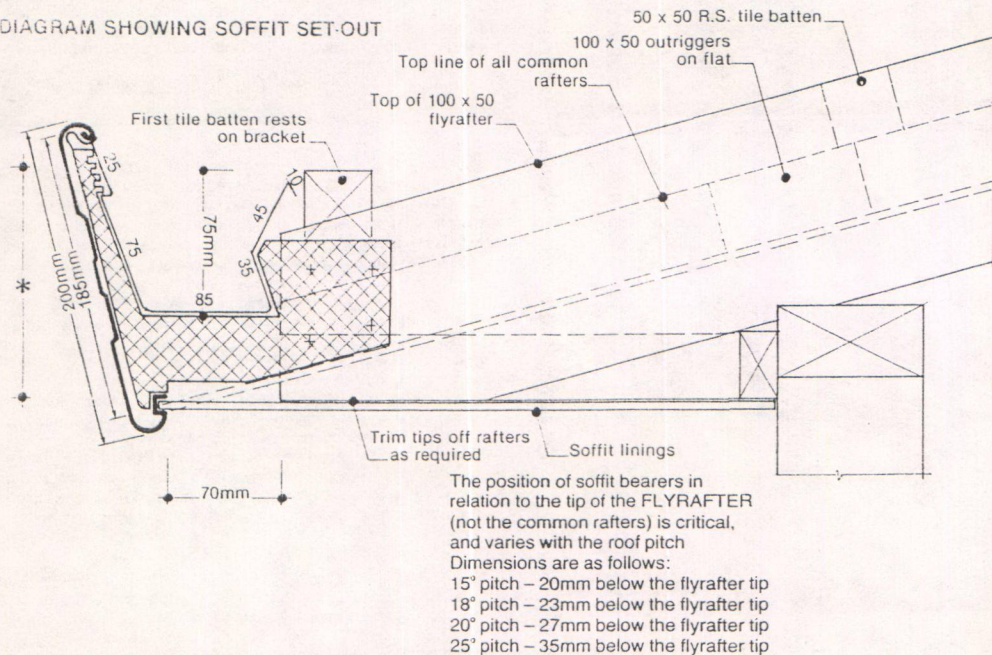


DIAGRAM SHOWING SOFFIT SET-OUT



For 50 x 25 battens - setout is similar with the following exceptions

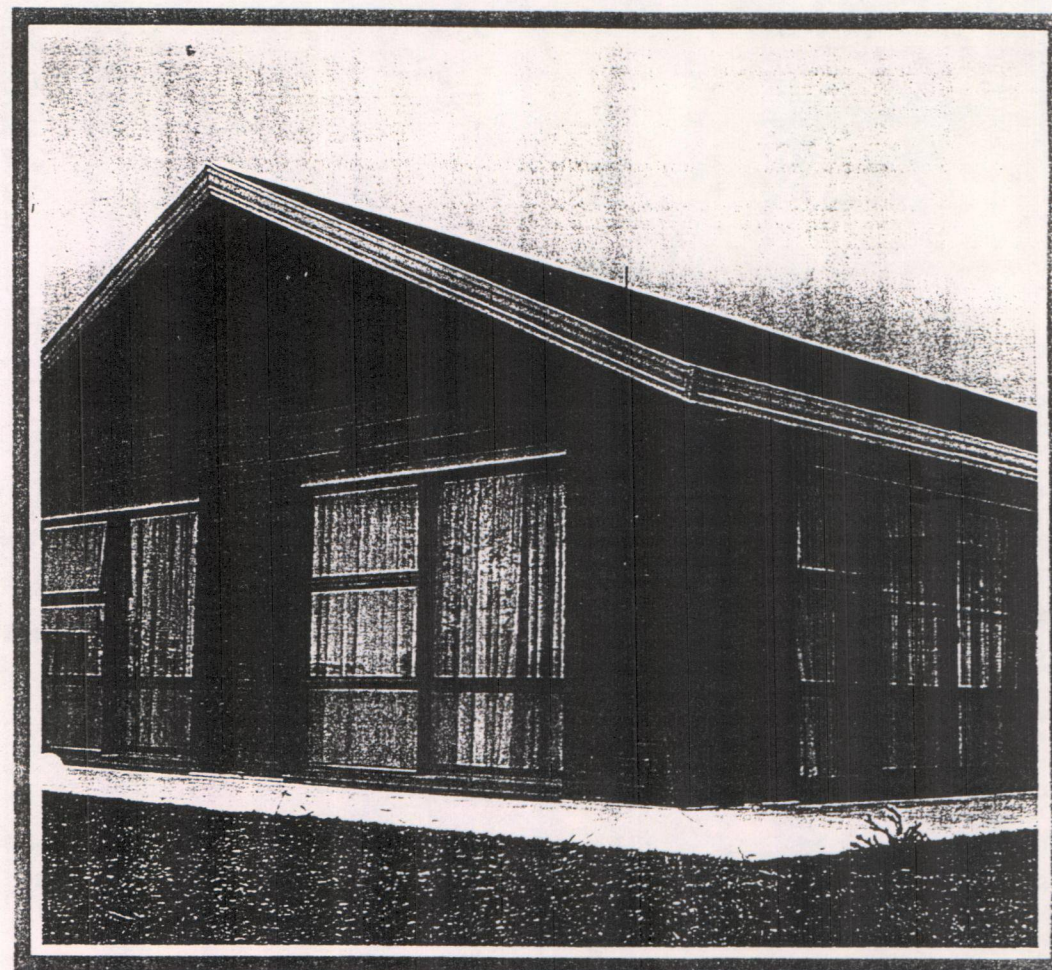
- Outriggers are 75 x 50 on EDGE.
- Raking plate is lowered 25mm.
- Soffit level drops accordingly.

\* H/P ROOFS Distance from top of tiles batten to bottom of soffit bearer to remain constant at between 165mm and 170mm regardless of pitch or roof

Manufacturer: G.W. Taylor Industries Ltd  
Birch Avenue, Judea, Tauranga.  
P.O. Box 2092 Phone 85 012  
New Zealand

# Taylor Fascia

## Specifications





## Components of Taylor Fascia Gutter

### Fascia

**Description:** A pre-finished metal fascia, suitable for use in most installations using a 100mm x 50mm rafter set-out. Can be used on fascia gutter and barge runs.

**Material:** 0.55 B.M.T. zinc coated by N.Z. Steel to 300 grams, per square metre.

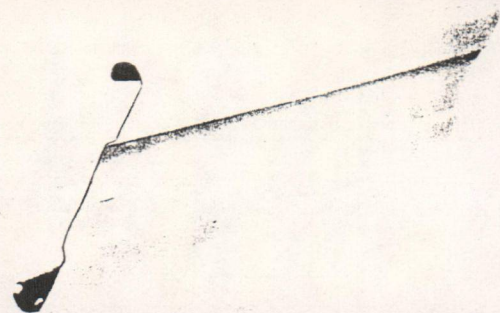
**Finish:** Colorsteel 5000 Silicone modified polyester paint with an etch primer on the reverse side.

**Standard colour range:** Bone white, Karala, Scoria, Nut Brown and Tussock.

**Fixing:** Spring clipped to specially designed brackets.

**Expansion and contraction:** As the fascia is neither rivetted nor nailed to the brackets or the structure, any movement from expansion and contraction of the fascia itself or the structure will not cause damage to the fascia or gutter.

**Soffit groove:** Will take soffit linings up to 6mm thick.



### Gutter

**Description:** A concealed gutter, for use with Taylor Fascia only.

**Gauge:** 0.55 B.M.T. zinc coated by N.Z. Steel to 400 grams, or Coloursteel 5000 Silicone modified polyester paint.

**Finish:** Galvanised, also paint finished as above.

**Fixing:** Spring fitted inside Taylor Fascia gutter bracket.

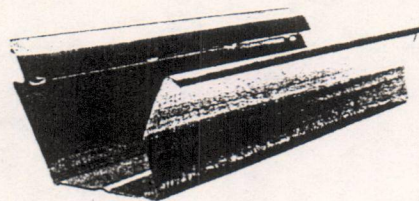
**Fall:** 13mm standard provision 25mm with modifications.

**Capacity:** Equivalent to 125mm 1/4-round gutter.

**Downpipe outlets:** Square or rectangular only. One square centimetre of downpipe outlet area is required for every 1.5 square metres of roof area. The maximum recommended distance between outlets is 18 metres; i.e. 9 metres each way from the high point of the gutter.

**Overflow:** An emergency overflow system which discharges over the weir edge of the gutter into the bottom channel of the fascia and out through holes in this channel, prevents flooding of the soffits should the downpipes become blocked. **N.B.** Where gutters are likely to be blocked with leaves additional precautions must be taken to prevent the leaves from entering the gutter. Special purpose netting is available.

**Replacement:** The gutter can be replaced without removing the fascia, and roofing only needs lifting or removing in the areas where joints and corners are to be soldered.



### Gutter Bracket

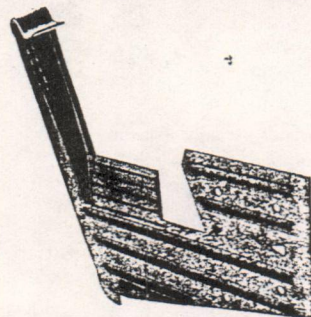
**Description:** This is a pressed, one piece combination fascia and gutter bracket. Supports Taylor Fascia and gutter on hip roofs and fascia gutter runs on gable roofs.

**Galvanising:** 400 grams zinc per square metre.

**Fixing:** Side fixed to rafters or soffit bearers at up to 1 metre centres with 30mm long galvanised nails. The bracket can be modified for face-fixing to existing or dummy fascia at 750mm centres, but the strength of this combination is reduced to that of a normal guttering system.

**Fall adjustment:** Is achieved by adjusting the gutter support flap and the holding lugs to suit.

**Strength:** Each side-fixed bracket can withstand a 100kg downward load without distorting. This ensures that fascia remains straight throughout the life of the product. Sideways deflection during fixing is prevented by ribs pressed across the body of the bracket.



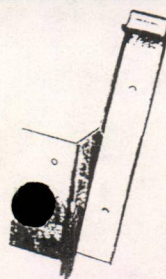
### Barge Bracket

**Description:** This is a pressed, one piece fascia bracket for supporting Taylor Fascia on gable ends.

**Galvanising:** 400 grams zinc per square metre.

**Fixing:** Face fixed to fly-rafter with 30mm long galvanised nails at 750mm centres.

**Flashing:** Metal tiles, and most long run metal roofing can be turned up under the top roll of the fascia and into the top section of the barge bracket which eliminates the need for a barge flashing. For concrete tiles the bracket allows sufficient room to fit a secret gutter.



### Corner Soakers

Provide a tidy method of finishing all external corners on Taylor Fascia.

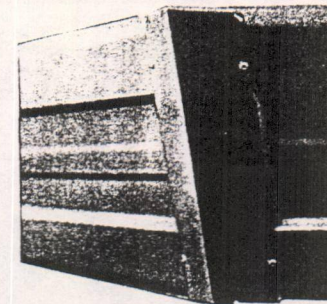
**Specifications:** As for Fascia.

**Type:**

Hip: For all hip roofs.

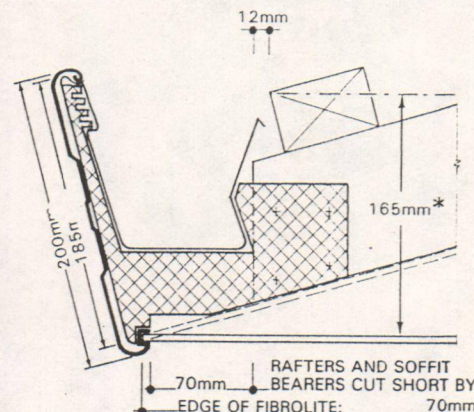
Left gable: For gable corners to the left of a fascia gutter run.

Right gable: For gable corners to the right of a fascia gutter run.



## Set out details for Taylor Fascia on Metal Roofing Systems

### HIP ROOF-USING METAL ROOFING SYSTEMS

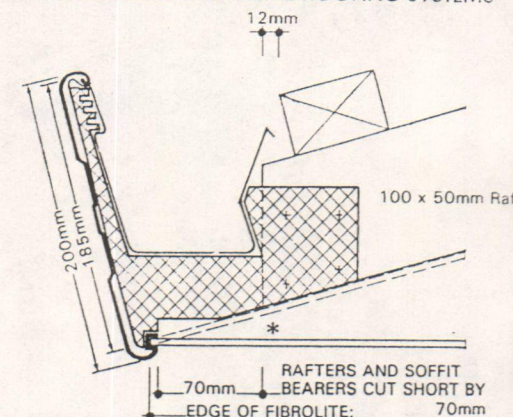


\* Important:

This measurement is taken at end of rafter, not at end of fibrolite. This means that the bottom of the soffit bearer is a minimum of 15mm below the tip of the rafter.

(Not suitable for roof with a sloping soffit of over 20°)

### GABLE ROOF USING METAL ROOFING SYSTEMS



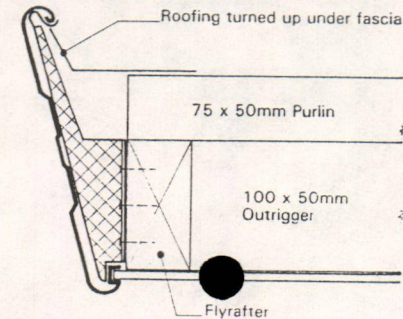
\* Important:

For Gable Roofs with flat soffits, keep bottom of soffit bearers below the tip of the rafter as follows:

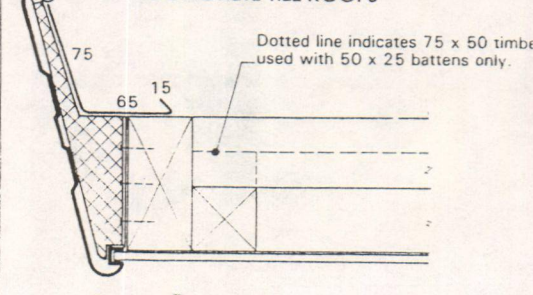
12 1/2° pitch - 15mm      18° pitch - 23mm  
15° pitch - 20mm      20° pitch - 27mm

(Not suitable for roof with a sloping soffit of over 20°)

### GABLE ENDS-USING METAL ROOFING SYSTEMS



### RECOMMENDED SHAPE FOR SECRET GUTTER FOR CONCRETE TILE ROOFS



N.B.: On gable ends timber framework is the same set-out as



**GTW Taylor Roofing**

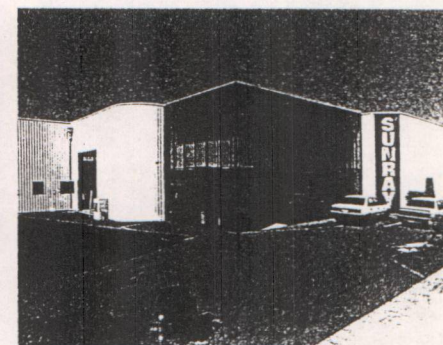
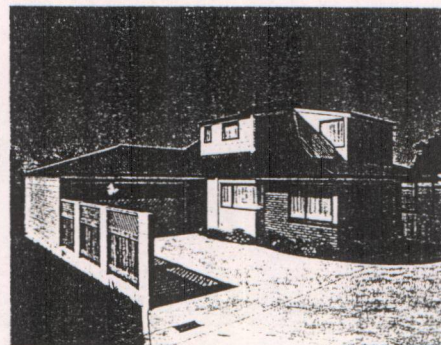
# SIX RIB

## STANDARDS

- Six Rib conforms to the following standards NZS 3441:1978 "Hot Dipped Zinc Coated Steel Coils and Cut Lengths" NZS 4203 : 1984 "General Structural Design and Design Loadings for Buildings"
- An additional Reference is the "Profiled Metal Roofing Design and Installation Handbook" 1983

## MATERIALS

- **GALVANISED STEEL** : 0.40 BMT 450 gm/sqM G550 MPa Yield Stress; 0.55 BMT 450 gm/sqM G550 Yield Stress.
- **PREPAINTED** : Continuously coil coated over ZM 275 galvanised steel.
- **COATING SELECTION** : Several coating types are available from the prepainted range to ensure maximum service life in any location. Product Data is available at all Taylor Roofing Offices to assist with specification.



## DESIGN REQUIREMENTS

- The spans indicated in the Six Rib Span Table (See over) are MAXIMUMS calculated to comply with NZS 4203 : 1984 for buildings with an eaves height of less than 10 metres. Consideration should be given during the building design stage to practical purlin spacing. As a guide use 2/3 of the maximum span as the purlin spacing.
- Where maximum spans are employed in exposed locations care should be taken not to exceed the basic requirement for adequate fastening of Six Rib to purlins, purlins to rafters and rafters to top plates to ensure correct transmission of wind loads through the structure.
- It is recommended purlin spacings adjacent to gutter runs be reduced to avoid construction and maintenance traffic damage.
- The recommended MINIMUM fall for Six Rib is 1 : 19 (3°) however for sheet lengths in excess of 9 metres the roof pitch should be increased to avoid water back-up during extreme conditions.
- The following information will assist your supplier when ordering Six Rib roofing or cladding.
  1. The cover (if the exact number of sheets required is unknown)
  2. The length of each sheet
  3. The colour and Coating Type where prepainted material is required
  4. The roof pitch (where flashings and accessories are required)
  5. The colour side on non-standard flashings

## SITE STORAGE

- It is very important that during Site Storage care be taken to avoid the formation of 'white rust' or storage stains due to incorrect stacking.
- Sheets of Six Rib either galvanised or prepainted steel should be fully stacked and slightly inclined to enable run-off of any accumulated moisture.
- If 'white rust' or storage stains should appear on galvanised material these may be removed by washing the affected area with Lithofarm or Deoxidene 424 available from paint stockists. After such treatment the entire area should be painted after applying an approved Galvanised Primer.

SIX RIB

SIX RIB

SIX RIB

SIX RIB



## INTRODUCTION

## SIX RIB

Six Rib is a roll formed Trapezoidal ribbed profile with pleasant, unimposing lines and wide economic cover.

Six Rib has a wide, double-swaged pan for safe footing during construction and spanning capabilities ideally suited to residential roofing.

Six Rib features a low rib height which avoids the often unsightly 'end-view' of roofing over standard guttering profiles.

## DESIGN APPLICATIONS

## SIX RIB

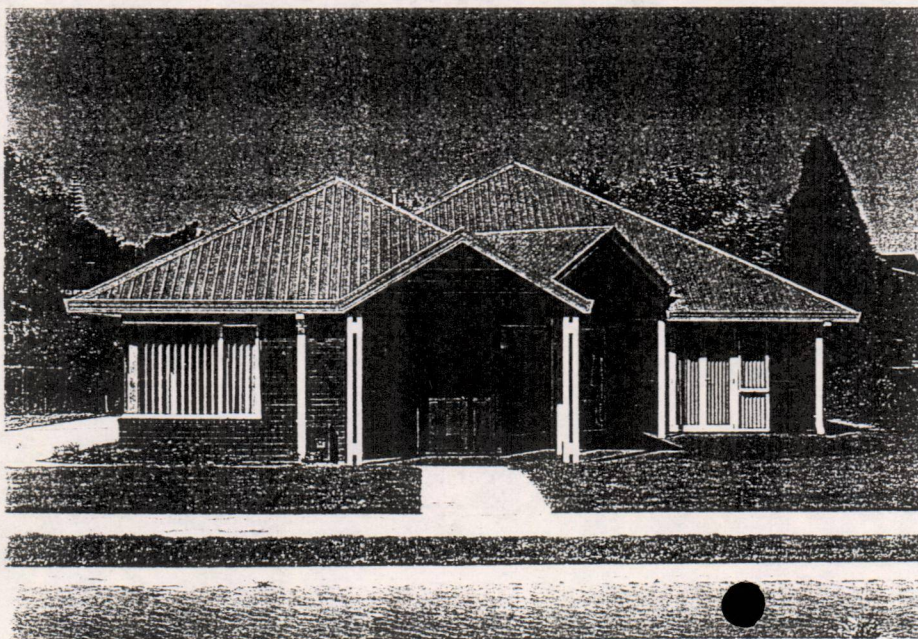
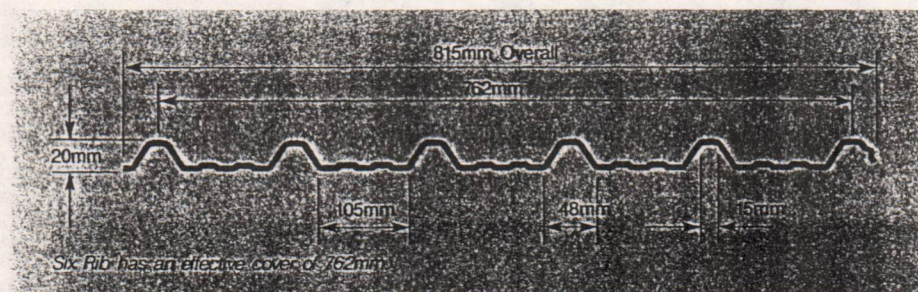
Six Rib is the most popular ribbed profile in use in New Zealand with widespread acceptance in all market sectors.

Six Rib is suitable for most applications covering:

- Residential Dwellings
- Garages
- Factory Cladding
- Flats & Units
- Fences
- Implement Shed Cladding

## SIX RIB PROFILE

## SIX RIB



## STANDARDS

## SIX RIB

Six Rib conforms to the following standards NZS 3441:1973 'Hot Dipped Zinc Coated Steel Coil and Cut Lengths', NZS 4203:1984 'General Structural Design and Design Loadings for Buildings'.

An additional Reference is the 'Profiled Metal Roofing Design and Installation Handbook' 1988.

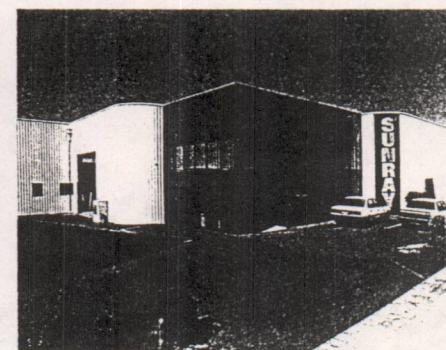
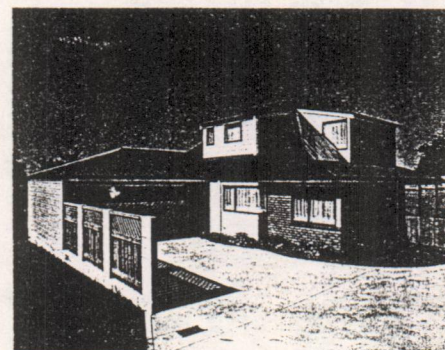
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## SIX RIB

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2. The length of each sheet
3. The colour and Coating Type where prepainted material is required
4. The roof pitch (where flashings and accessories are required)
5. The colour side on non-standard flashings

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## SIX RIB

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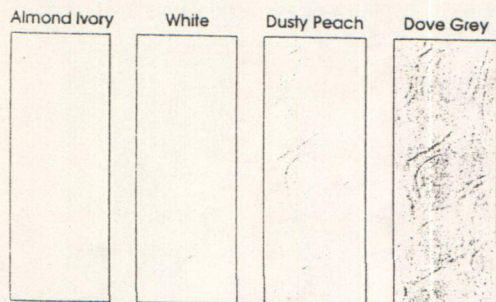
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If 'white rust' or storage stains should appear on galvanised material these may be removed by washing the affected area with Lithoform or Deoxidene 424 available from paint stockists. After such treatment the entire area should be painted after applying an approved Galvanised Primer.



## HARDIGLAZE WALLS FOR WET AREAS

Hardiglaze is a pre-finished wet area lining available in a range of subtle designer colours – Almond Ivory, White, Dusty Peach and Dove Grey. All colours have their own colour matched PVC accessories.



### PVC HARDIGLAZE JOINTERS

White and colour matched 4.5mm Hardiglaze PVC accessories are available as follows – Sheet jointer, internal and external corner mould, capping mould, bath mould and dado mould.

For best results use only Hardie's specially designed PVC accessories. (Refer Fig. 1)

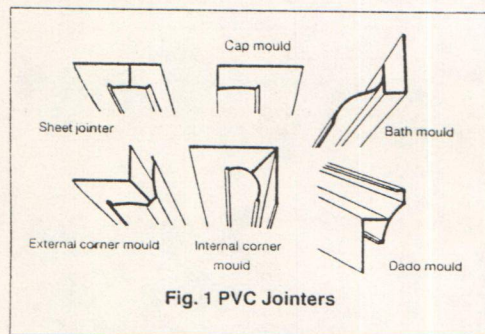


Fig. 1 PVC Jointers

### FRAMING AND FIXING REQUIREMENTS

- Framing is to be in accordance with NZS 3604:1990 'Code of Practice for Light Timber Frame Buildings' or as specifically designed. Timber should be selected to minimise shrinkage. Kiln dried Radiata is preferred. Use tanalised framing as required.
- Hardiglaze should not be fixed to timber framing with a moisture content in excess of 24% for non centrally heated buildings and 18% for those centrally heated. For stud and nog centres (Refer Fig. 2)

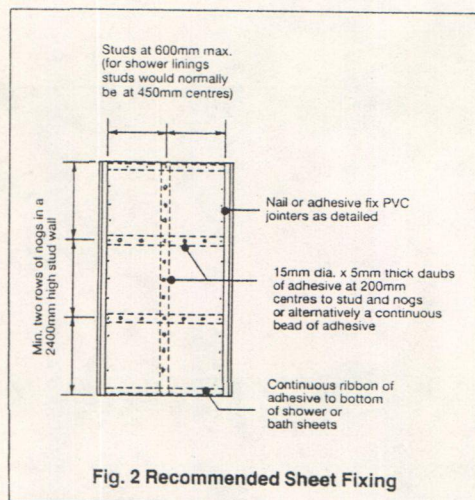


Fig. 2 Recommended Sheet Fixing

- Sheets are not to be fixed directly over Gib Board in wet areas such as showers and around baths. Remove the existing Gib Board sheets and fix directly to the timber framing.
- The fixing sequence of the sheets is important. (Refer Fig. 3)

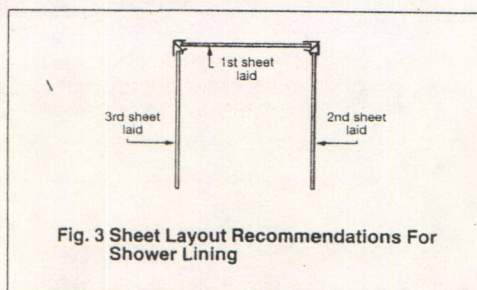


Fig. 3 Sheet Layout Recommendations For Shower Lining

- Fix Hardiglaze sheets to the framing with a good quality solvent based wall board contact adhesive, working from the centre of the sheet to both outside edges. Support and trim sheets during adhesive setting in accordance with the adhesive manufacturer's instructions, or use the contact method. A suitable wallboard adhesive is Expandite construction adhesive SB or similar.
- Sheets should never be forced or sprung into position.
- Place daubs of wallboard adhesive on intermediate studs or battens and noggings at 200mm centres. (Refer Fig. 2)

- Fit PVC sheetholders to both sides of the Hardiglaze sheet. (Refer Fig. 4)

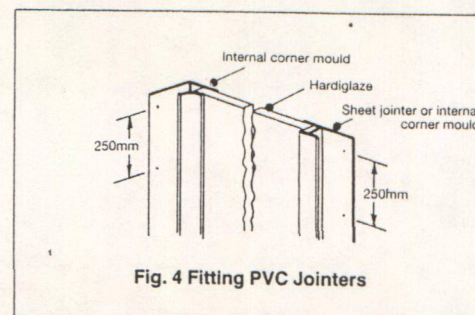


Fig. 4 Fitting PVC Jointers

- Align the sheet and nail or screw it to the frame through the wide edges of the sheetholders at 250mm centres.
- If a cap mould is being used it will be necessary to cut the sheetholder to allow for the cap mould. (Refer Fig. 5)

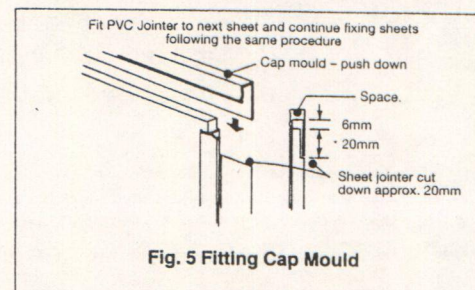


Fig. 5 Fitting Cap Mould

- For wet area applications all the sheet edges should be sealed into Hardiglaze PVC jointers. (Refer Fig. 6)

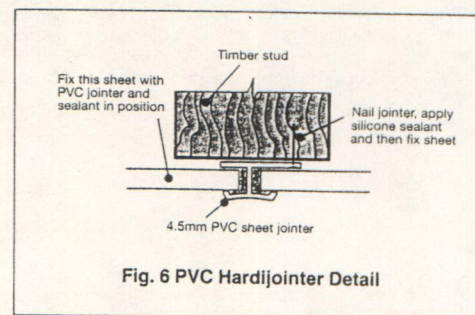


Fig. 6 PVC Hardijointer Detail

- Around baths alternative details can be used. When bath moulds or capping moulds are used the sheet edges must be well sealed with a flexible silicone sealant. A suitable silicone sealant is Expandite Silaflex RTV, or similar, colour matched to the sheets. (Refer Figs. 7, 8 and 9)

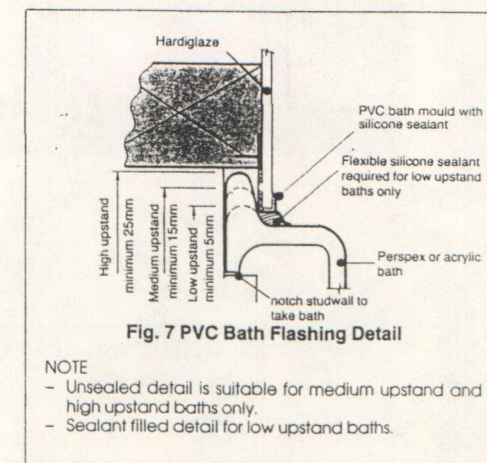


Fig. 7 PVC Bath Flashing Detail

#### NOTE

- Unsealed detail is suitable for medium upstand and high upstand baths only.
- Sealant filled detail for low upstand baths.

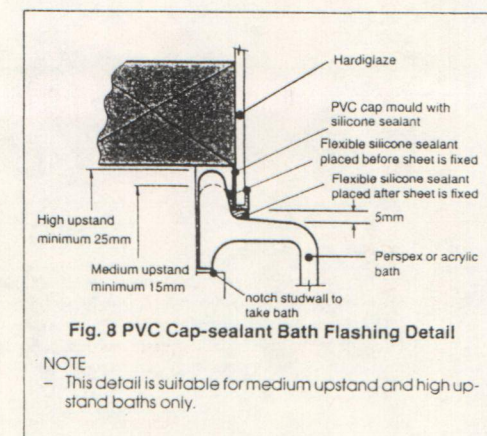


Fig. 8 PVC Cap-sealant Bath Flashing Detail

#### NOTE

- This detail is suitable for medium upstand and high upstand baths only.



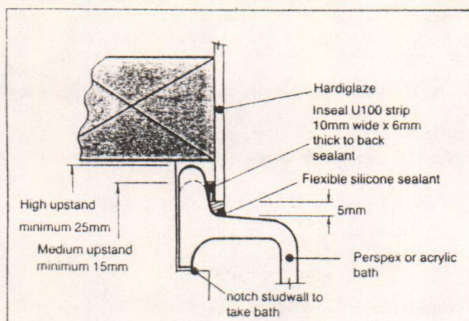


Fig. 9 Sealant Bath Flashing Detail

NOTE

- A similar detail can be used for a medium upstand bath.
- A suitable flexible silicone sealant is Expandite Silaflex RTV or similar colour matched to the Hardiglaze.
- Adhere the Inseal U100 to the bath before fixing the Hardiglaze sheet.
- Acrylic shower base detail can be finished to a similar detail.

- For an acrylic shower base a sealant joint is formed. (Refer Fig. 11)

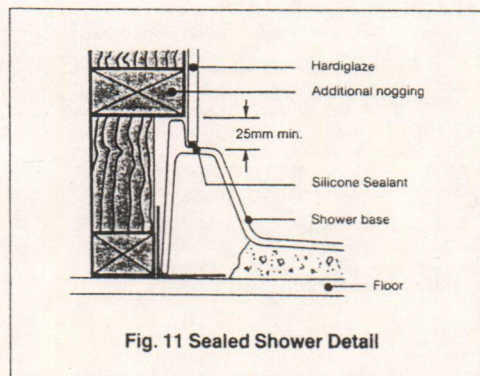
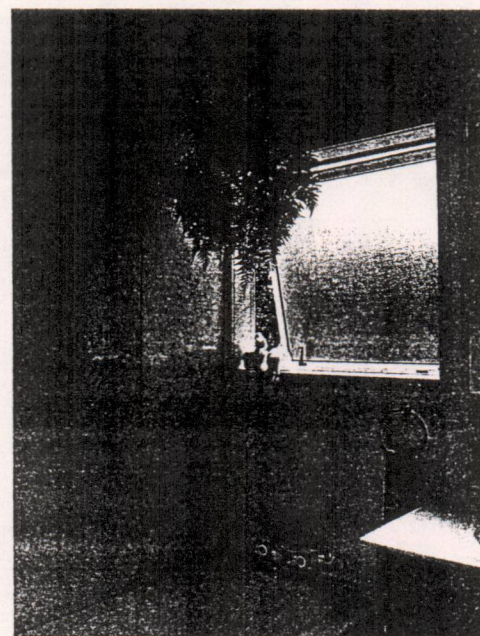


Fig. 11 Sealed Shower Detail

- Seal all fittings to the sheet surface with a silicone or similar sealant, especially in wet areas. This prevents water seepage to the framing.



Hardiglaze

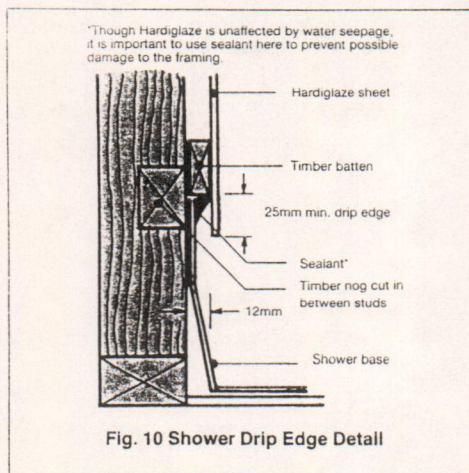


Fig. 10 Shower Drip Edge Detail

"Though Hardiglaze is unaffected by water seepage, it is important to use sealant here to prevent possible damage to the framing."

## BEAUTIFULLY FASHIONABLE, PERMANENT, EASY TO CLEAN

Hardiglaze can be used as a wall and/or ceiling lining material for all wet areas in your home including:

- Bathrooms
- Showers
- Laundries
- Kitchens
- Toilets

Hardiglaze can also be used for no maintenance soffits and as a ceiling lining, especially in areas of steam or cooking fats. It is equally suitable for hotel/motel, office and institutional applications where there is a need for durability as well as good looks.

Hardiglaze will provide you with the security and peace of mind that the wet area lining you choose will stand the test of time and moisture.

## COMPOSITION

Hardiglaze is manufactured from durable fibre cement and coated with a tough two pack polyurethane finish. Hardiglaze comprises a one coat epoxy primer and a one coat full glass polyurethane coating, factory applied to a 4.5mm thick Hardiflex base sheet. The Hardiflex base sheet is an environmentally friendly building sheet manufactured from cement, silica sand and cellulose fibre.

## WHY CHOOSE HARDIGLAZE?

The Hardiflex base sheet is:

- Extremely durable even under prolonged exposure to moisture and steam.
- Will not rot or decay.
- Stable within the normal range of moisture and temperature changes.
- Resistant to impact damage.
- Fire resistant and does not burn.
- Easily cut.
- The simple fixing techniques will ensure a great looking job every time.

The polyurethane coating is:

- Hard wearing and scratch resistant.
- Easy to clean - just wipe the surface with a damp cloth. More stubborn marks can be removed with a **non-abrasive** domestic cleaner. To remove soap build up, Hardiglaze can be wiped down periodically with Polycell Sugar Soap or kerosene on a damp cloth.
- Completely impervious to moisture and will not support mould growth.

Hardiglaze is not affected by water and therefore is the most suitable lining for shower situations as natural water seepage can occur behind the lining caused by capillary action. This seepage can cause decay and rotting to alternative wood-based products but it cannot damage Hardiglaze. (Refer Fig. 12)

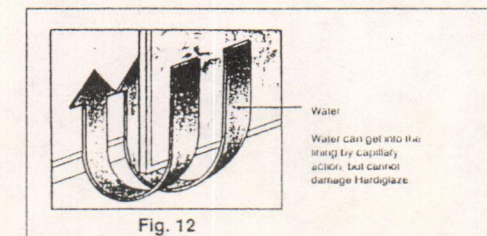


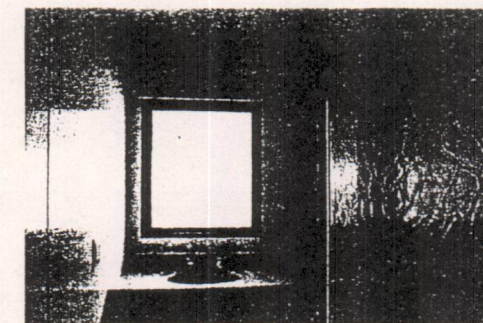
Fig. 12

Other extra benefits of fibre cement building products are that they will not warp or twist on the framing and because it has Zero Fire Indices. It will not burn, which makes fibre cement one of the safest building products on the market today.

In four attractive co-ordinated fashion colours complete with matching PVC mouldings, Hardiglaze is a product of proven performance.

## Sheet Sizes

Length:	2400mm
Width:	900mm, 1200mm
Nominal Thickness:	4.5mm





## Fixing the Ceilings

### Adhesive/Screw or Adhesive/Nail Fixing

- 9.5mm Gib Board® to span max 450mm centres.
- 12.5mm Gib Board® to span max 600mm centres.
- Apply daubs of Gib® Fix to the battens or joists at the 200mm and 400mm points from the sheet edge as illustrated.
- Always fix ceiling sheets across the battens or joists.
- Position the sheet hard up to the framing and double nail or single screw at the centre line. Fasten the perimeter edges of the sheet at each batten or joists and the ends at 200mm centres.
- Commence fixing from the centre of each sheet.
- Where a perimeter nog is used, the board should be screwed or nailed at 300mm centres at the ceiling perimeter.
- Ensure the adhesive has full contact between the lining and framing by pressing the board with an open hand at each daub.
- Back blocking of sheet end butt joints is the preferred option but if these joints are made on framing they should be staggered 600mm ie: occur on different battens or joists.
- 12.5mm Board Fixed with adhesive/screws and with back block sheet end butt joints provides a superior surface for achieving a high quality finish.

#### Important Note:

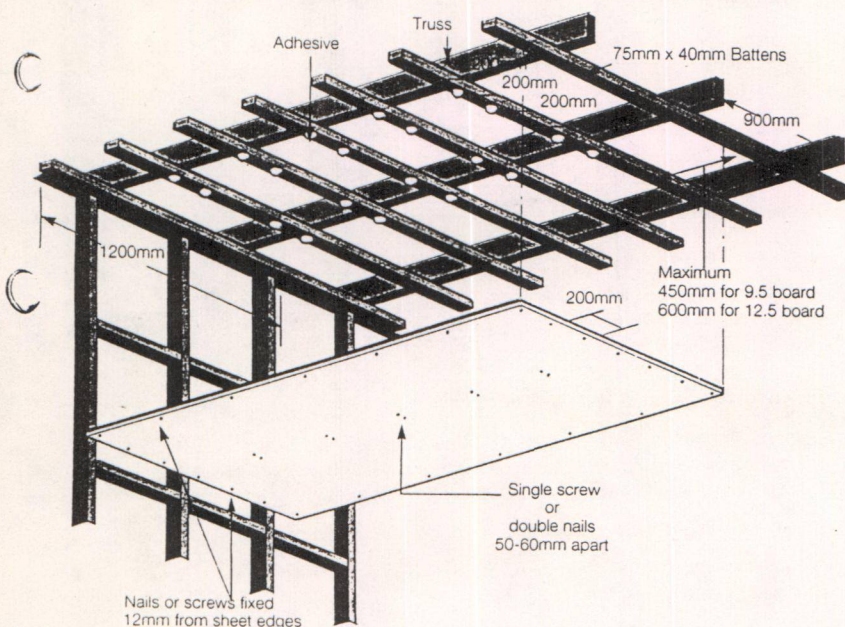
Do not place adhesive at sheet perimeters or under nails or screws. This may lead to nail or screw pops.

Fastenings shall be:

Gypsum drywall screws: 25mm x 6 gauge for 9.5mm and 32mm x 6 gauge for 12.5mm Gib Board®

Gib® Clouts: 30mm x 2.5mm for 9.5 mm Gib Board®

40mm x 2.5mm for 12.5 mm Gib Board®



## Butt Joints in Ceiling and Walls – Back Blocking

A butt joint occurs where the square cut ends of sheets meet, and should be made between joists, battens or studs. Butt joints should be staggered to avoid a continuous run of jointing, and should not coincide on opposing sides of walls. Recessed back blocking of butt joints is particularly recommended for Levels of Gib Board® Finish 4 and 5. Recessed back blocking is generally easier to apply during the Gib Board® Fixing stage as per the following procedures.

#### Note:

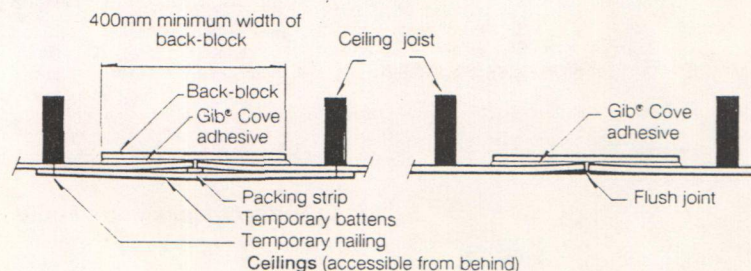
- Where Gib® Foil is used, the foil should be torn away over the area that is to receive the back block.

### Butt Joints Accessible from Behind – Walls and Ceilings

- Fix sheets with ends butted neatly together within 50mm of the mid-span point between framing members.
- Place a packing strip along the face of the butt joint and nail on sufficient temporary battens to form a depression approximately 5mm deep evenly across the full length of the joint.
- Cut back block strips of Gib Board® to a minimum width of 400mm.
- Adhere back-block with Gib® Cove adhesive applied in beads with a notched spreader to form 12mm x 12mm beads at 40-50mm centres over the full face of the back-block.
- Allow adhesive to thoroughly set before removing temporary battens and packing strip.
- When temporary battens and packing strip are removed, a hollow formation suitable for jointing will remain.
- Flush-jointing should be carried out in accordance with instructions in the publication entitled "Gib Board® Stopping and Finishing Systems".

### Ceiling Butt Joints not Accessible from Behind

- Fix sheet with the end finishing within 50mm of the mid-span point between framing members.
- Cut back-blocks 400mm wide and to span the full width of the sheet.
- Cut next sheet to correct length.
- Apply Gib® Cove adhesive to back-block in beads with notched spreader to form 12mm x 12mm beads at 40-50mm centres, and place back-block in position over end of first sheet.
- Immediately fix next sheet.
- Apply packing strip and battens.
- Allow adhesive to thoroughly set before removing temporary battens and packing strips.
- When temporary battens and packing strips are removed, a hollow formation suitable for jointing remains.
- Flush-jointing should be carried out in accordance with instructions in the publication entitled "Gib Board® Stopping and Finishing Systems".





## Fixing the Walls – Vertical Method

### Adhesive/Screw or Adhesive/Nail Fixing

- Allow for a 10mm gap at the floor line to allow for timber movement and settling.
- Apply daubs of Gib® Fix adhesive at 300mm centres to the intermediate studs and the centre of each nogging as illustrated.
- Position the sheet hard up to the timber framing. Insert single screws or nails at 300mm centres to the top and bottom plates and to the studs where sheet edges occur as illustrated.
- Ensure the adhesive has full contact between the lining and framing by pressing the board with an open hand at each daub.

#### Important Note:

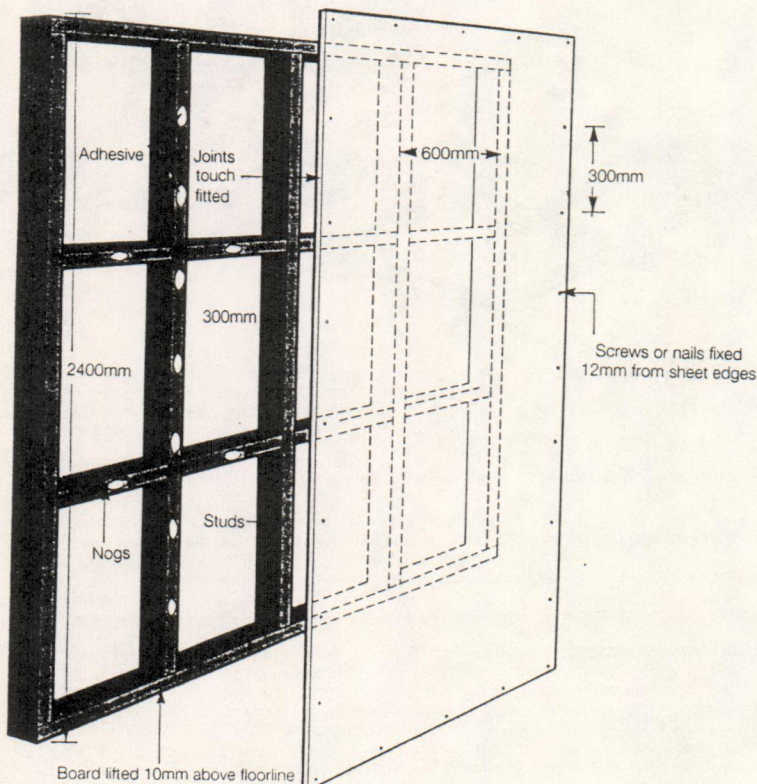
- Do not place adhesive at sheet perimeters or under nails or screws. This may lead to nail or screw pops.

Fastenings shall be:

Gypsum drywall screws: 25mm x 6 gauge for 9.5mm and 32mm x 6 gauge for 12.5mm Gib Board®

Gib® Clouts: 30mm x 2.5mm for 9.5 mm Gib Board®

40mm x 2.5mm for 12.5 mm Gib Board®



ALLOW GIB® BEDDING COMPOUND TO HARDEN AND DRY BEFORE OVERCOATING

## Jointing and Finishing Instructions

This section illustrates a standard method for jointing Gib Board® using Gib® Bedding Compound or Gib Tradeset™ for the first coats and Gib® Finishing Compound as top coat. For details on the various jointing options available, see the publication entitled "Gib Board® Stopping and Finishing Systems".

See the pack for mixing instructions on Gib Tradeset™ or Gib® Bedding Compound.

Gaps in excess of 4mm should be filled with Gib Tradeset™ or Gib® Bedding Compound and allowed to harden before normal jointing commences.

### 1. Taping for Standard Tapered Edge Joints

1. Fill the recess formed by the tapered edges of the Gib Board® sheets with Gib Tradeset™ or Gib® Bedding Compound using a 150mm broad knife.
2. Centre the Gib® reinforcing paper tape in the filled joint then roll out to the required length firmly pressing the tape into the compound using a 150mm broad knife. Use sufficient pressure with the knife to ensure that the tape is firmly bedded and positioned below the face surface of the board. Apply a thin skim coat of the compound to prevent the tape curling at the edges, and allow to harden. The tape should be free from trapped air bubbles and sufficient compound should be under the tape to ensure good adhesion.
3. Apply a second coat of Gib Tradeset™ or Gib® Bedding Compound using a 200mm trowel. Note that this trowel is 50mm wider than the previously used broad knife, thus completely covering the first coat. Ensure that the tape is completely covered. Feather joint edges to eliminate build-up of compound. Allow to harden then lightly scrape back if required.

### 2. Finishing (top) Coat for Standard Tapered Edge Joints

1. Apply a finishing coat of Gib® Finishing Compound using a 280mm trowel. The second taping coat should be completely covered. Feather joint edges at least 50mm beyond the second coat. Allow to dry (24 hrs in good drying conditions).
2. The joint is then lightly sanded in the same direction of the joint using 220 grit sandpaper. Take care not to scuff the face paper as this can lift the paper fibres and mar the finish.

### 3. End Butt Joints and Jointing to Cut Edges

To minimise the apparent surface build-up of jointing materials, the same basic procedure as for tapered edge joints is followed, except that each of the three stages is doubled in width, resulting in a 600mm finished joint width. Ensure that sufficient material remains under the tape for proper adhesion.

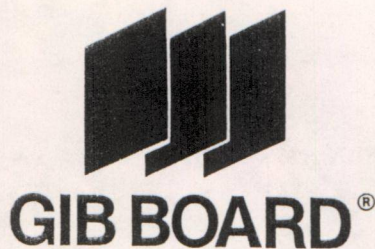
### 4. Nail and Screw Spotting

1. Apply two successive coats of Gib Tradeset™ or Gib® Bedding Compound using a 100mm broad knife. Allow each application to harden before applying the following coat.
2. Apply Gib® finishing compound using a 150mm broad knife. Lightly sand if necessary. Take care not to scuff the face paper.

### 5. "Boxed Corners" (Tape Reinforced Internal Angles)

1. Using a 75mm chamfered broad knife, the internal angles formed by the junction of the wall or wall/ceiling linings should be evenly filled with Gib Tradeset™ or Gib® Bedding Compound. Keep the high point of the knife directed into the corner – this will prevent the operative's hand from touching the wall.
2. Centre the Gib® reinforcing paper tape into the internal angle pressing it firmly into the Gib® Bedding Compound or Gib Tradeset™ using the 75mm knife or corner tool. Take care not to cut the internal corner of the paper with the knife. The corner tool can also be used for placing the tape. Clean surplus compound away. Lightly skim and feather out edges, then allow to harden.
3. Apply a top coat of Gib® Finishing Compound, using a 100mm broad knife. Feather out the edges.
4. Finally, run the corner tool through the wet compound. When dry (approx 24 hours in good drying conditions), lightly sand. Take care not to scuff the face paper.





# Gib System Accreditation

**TO ASSIST GIB BOARD CUSTOMERS IN THE TRANSITION FROM EXISTING BUILDING CODES TO THE NEW NZ BUILDING CODE (NZBC) WINSTONE WALLBOARDS WILL OBTAIN ACCREDITATIONS FOR KEY PRODUCTS AND SYSTEMS.**

Because the NZBC will state only what a building component must do rather than what it must be, builders, designers and Territorial Authorities (TA's) may have difficulty in deciding whether new or existing products meet performance criteria.

The Building Industry Authority (BIA) will maintain a national scheme for the accreditation of products that meet the NZBC provisions.

Once a product or process is accredited, TA's will be obliged to accept it as a means of compliance with the specified provisions of the NZBC. Accredited products will gain greater acceptance and be used more readily than non-accredited products.

## APPROVAL PROCESSES

Essentially there will be four processes of approval for products or systems depending on the circumstances; accreditations, approved documents determinations and specific approvals.

### a) Accreditations

Accreditations of products and systems will be given by the BIA and will constitute National approval to be accepted by all Territorial Authorities (TA's) and Building Certifiers (BC's). Accreditations will be based on an appraisal of a product or system by an independent party and will be for compliance with one or more specific provisions of the NZBC. They will be for specific proprietary products (Gib Board) and will include evaluation of any reference to appropriate technical literature prepared by the proprietor (Winstone Wallboards Ltd).

### b) Approved Documents

The BIA will give Approved Document status to a generic (non-proprietary) Validation Method or Acceptable Solution. These will not mention a product by other than a generic name, and most probably the document, or documents referred to in it, will have been prepared by the BIA, SANZ,



BRANZ or an industry association on behalf of a number of proprietors. Proprietary technical literature will not be able to obtain Approved Document status by the BIA, the only way of that being endorsed by the BIA will be as part of an accreditation of a product or system.

Where an Acceptable Solution has Approved Document status and refers to a generic product for which there is referred a NZ Standard or other document, then demonstrated compliance with that Standard by a product or system will mean automatic acceptance by TA's and BC's.

### c) Determinations

Where there is a difference of opinion between a TA or BC and an owner (builder) about a product or system included in a building consent, then the matter can be referred to the BIA. The BIA will issue a determination, binding on both parties, regarding the particular issue.

Most often determinations will be project specific and may remain private between the BIA, owner and TA. Some may have general application in which case they will probably be published in some form. Determinations will not generally be a mechanism whereby proprietors can get BIA endorsement for a product or system.

### d) Specific Approvals

Approval to use a product or system can be given by a TA or BC and is specific to the single Building Consent. The TA or BC will need to be satisfied that the product or system satisfies the NZBC for the intended application and may require documentary evidence of performance (eg, an appraisal, test reports, opinions – usually from a third party). This is essentially the system we have at present.

For products or systems currently being used there will probably be a "setting in" process initially where TA's check that these do in fact comply with the provisions of the NZBC.

As under the current building control system, Winstone Wallboards will continue to have its innovations appraised by independent authorities such as BRANZ. BRACELINE and the GIBRALTAR BOARD Wall Bracing Systems are examples of the recent past.

Under the NZBC control system independent appraisal will also be sought for our more established products and systems. These appraisals will then be submitted to the BIA for accreditation of technical aspects which are the subject of statutory control, such as; structural stability, durability, acoustics, fire, moisture, and energy efficiency.



Auckland Tel 0-9-634 2184 Fax 0-9-634 3972  
Wellington Tel 0-4-568 4293 Fax 0-4-568 7844  
Christchurch Tel 0-3-332 3159 Fax 0-3-337 1014



## 1.1 INTRODUCTION

'Decor-Rail' is a system of aluminium balustrading, railings and fences. It is designed to provide a system which has all the low maintenance qualities of aluminium construction, in a contemporary style, and at a cost comparable with alternative materials.

### Features and Benefits

(a) Decor-Rail is fabricated virtually entirely from aluminium. This gives on-going structural integrity, and a stable surface for quality coating systems to adhere to. Unsightly rust marks, decaying timber, and flaking paint are eliminated.

This results in:

- Virtually no maintenance requirements.
- Low life-cycle costing.
- Original appearance and value are maintained.

(b) The Decor-Rail system has been engineered for strength. When appropriately installed it meets or exceeds the requirements of the following standards:

NZS 4203:1984 Code of Practice for General Structural Design and Design Loadings for Buildings.

N.Z. BUILDING CODE Refer to Section 1.2 of this Manual.

AS 1657-1985 SA Code for Fixed Platforms, Walkways, Stairways and Ladders.

(c) Decor-Rail has a modern high quality appearance. This is achieved using designer styled extrusions with concealed fixings, and quality coating systems.

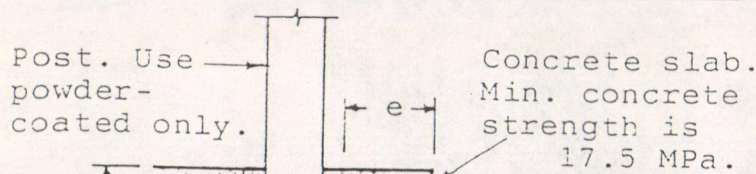
(d) The system is fabricated from pre-finished materials. Coating quality is assured, and the need for wet-finishes on site is eliminated.

- (e) The system allows a wide range of configurations, heights, colours and options.
- (f) It is simple to fabricate and install using common tradesmans tools.
- (g) Decor-Rail provides a complete pre-designed and engineered system which is 'easy-to-specify' for architects and designers.



## 1.5 POST FIXING METHODS (INDICATIVE ONLY)

### METHOD 1: EMBEDMENT IN CONCRETE SLAB

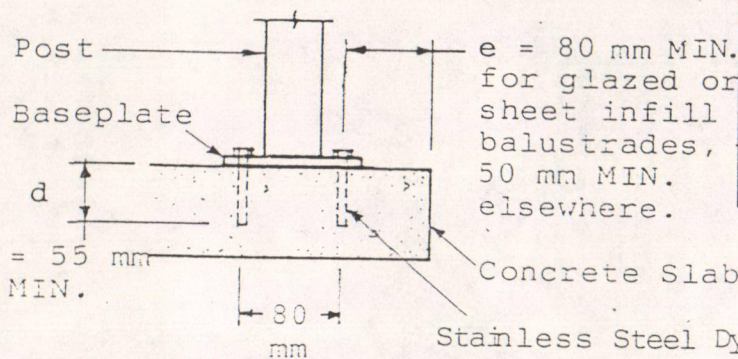


	d mm	e mm
Reinforced	95 min.	50
Unreinforced Slab	95 min. 120	105 80

Reinforced Slabs: D10 min. reinforcing along slab edge, with cross reinforcing also.

Mortar Pocket: 75 mm square or 90 mm diameter. Avoid mortar splashes on aluminium. Wash off immediately.

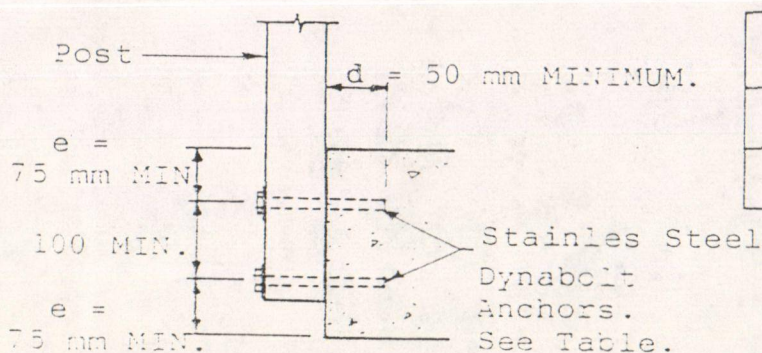
### METHOD 2: BASEPLATE BOLTED TO CONCRETE SLAB



CONC. MPa	Anchor Size
17.5	D12
25	D10

Stainless Steel Dynabolt Anchors. See Table.

### METHOD 4: SIDE FIXED TO CONCRETE



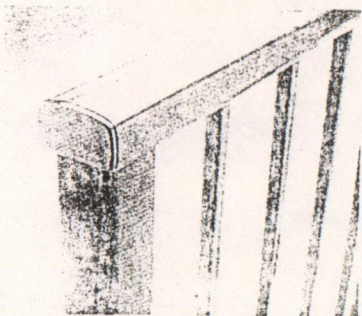
CONC. MPa	Anchor Size
17.5	D12
25	D10

Stainless Steel Dynabolt Anchors. See Table.



# Aluma Balustrades

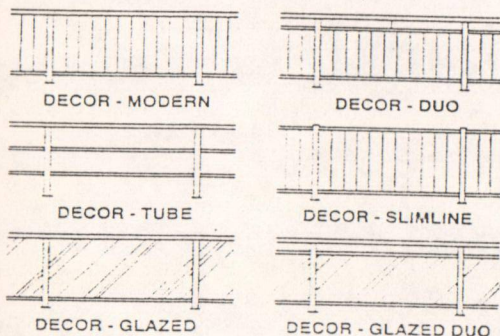
Aluma brings to balustrades and pool fences the quality of design and low maintenance features required by the architecture of today.



- Powdercoated or anodized aluminium
- Durable and non-rusting
- Eliminates constant repainting
- Attractively designed
- Rounded edges
- No unsightly welds - concealed fasteners
- Easy colour co-ordination with aluminium window joinery etc.
- Engineered and tested to comply with the NZ Building Code.
- Custom built to individual requirements

Aluma has a range of balustrades, screen and fence systems to suit all applications.

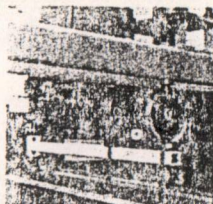
The DECOR-RAIL system is available in a variety of simple contemporary styles:



Options include

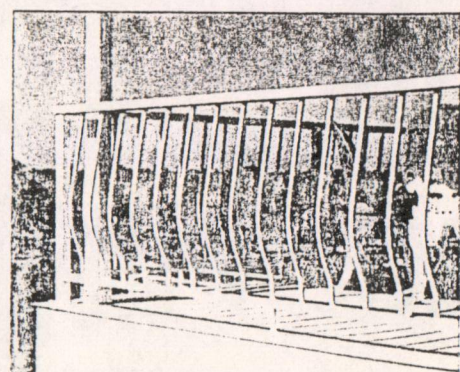
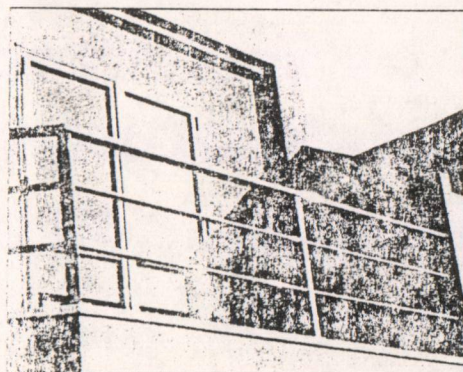
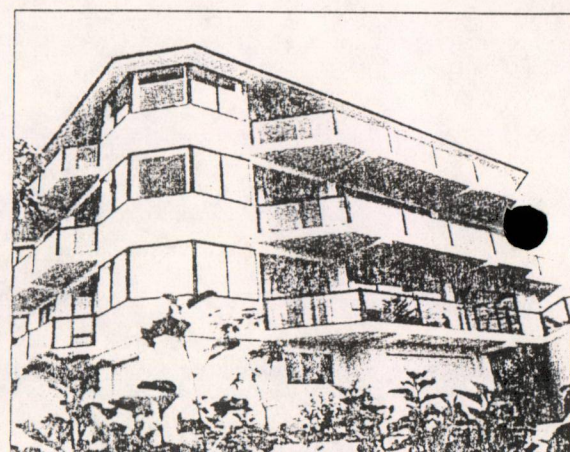
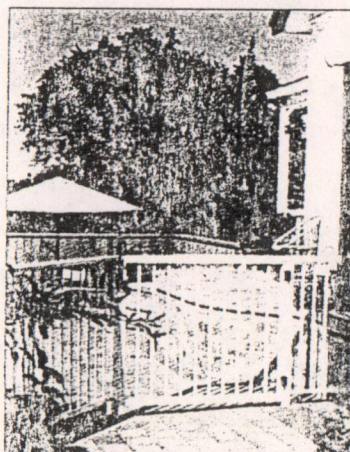
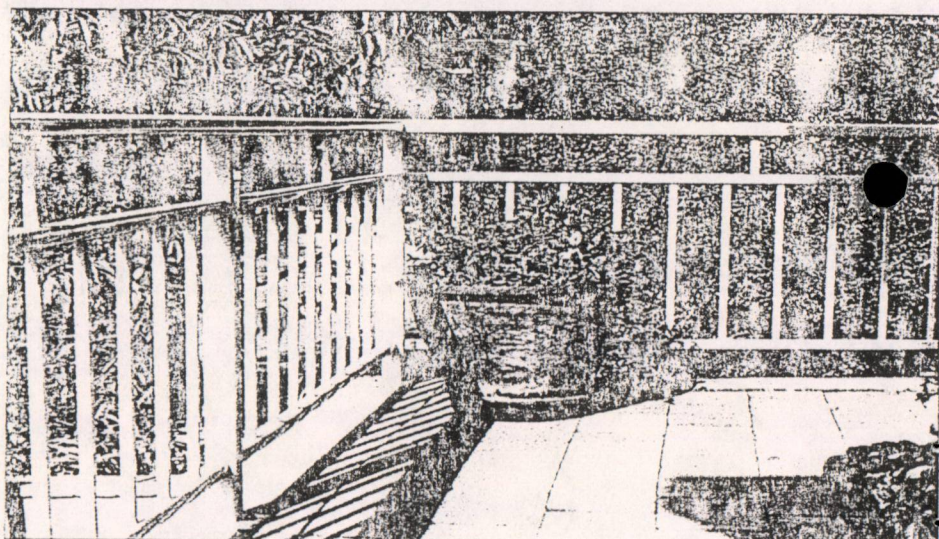
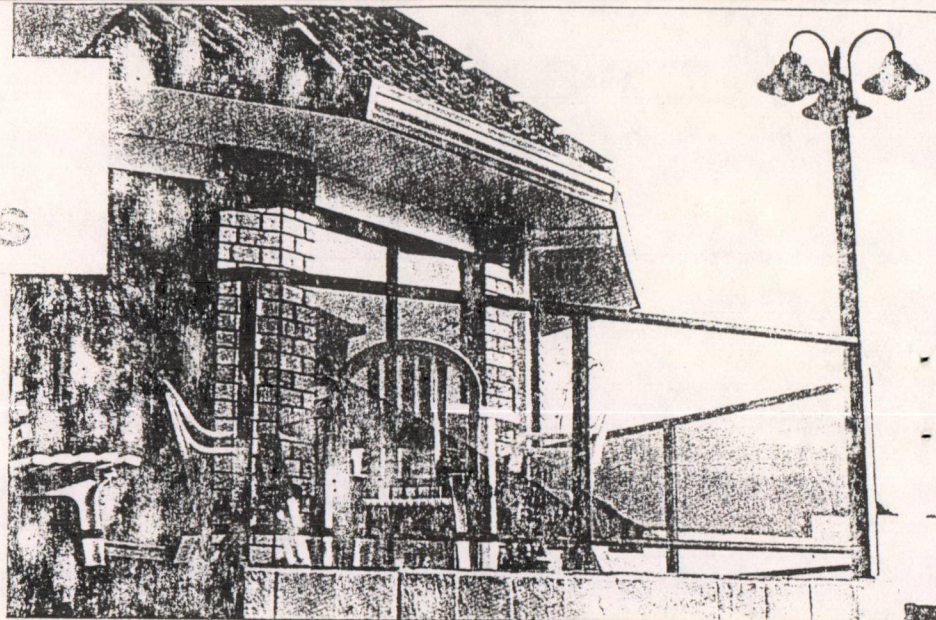
- pool fences and gates
- clear, tinted, or reflective glass
- tall screens
- wall mounted handrails
- parapet top rails
- decorative castings

Design services are available for special applications. Illustrated is a load test at Aluma's testing facilities.



Contact your local ALUMA fabricator early in design or construction, and save on installation costs.

YOUR LOCAL FABRICATOR IS:



Distributed throughout New Zealand by Aluma Products Ltd,  
PO Box 92, Hamilton. Phone Toll Free 0508 800 809

NZ BUILDING DESIGN REGISTRATIONS APPLY.



## 1.2 THE N.Z. BUILDING CODE

The Aluma Decor-Rail system complies with the requirements for Barriers of the N.Z. Building Code when the appropriate style is selected and correctly installed. The relevant clauses of the Building Code are:

- B1 - **STRUCTURES:** Refer to Section 1.6 of this Manual.
- B2 - **DURABILITY:** Powdercoated & Anodised Aluminium easily achieve the required 15 year durability based on 'In Service History'.
- F4 - **SAFETY FROM FALLING:** The essential requirements of this clause and the corresponding Approved Solution are reproduced below. To comply, the proposed style, height, maximum gap etc., should be checked against these requirements. Refer to your Territorial Authority.

### NZBC Clause F4 SAFETY FROM FALLING

#### OBJECTIVE

F4.1 The objective of this provision is to safeguard people from injury caused by falling.

#### FUNCTIONAL REQUIREMENT

F4.2 *Buildings* shall be constructed to reduce the likelihood of accidental fall.

#### PERFORMANCE

F4.3.1 Where people could fall 1 metre or more from an opening in the external envelope or floor of a *building*, or from a sudden change of level within or associated with a *building*, a barrier shall be provided.

F4.3.2 Roofs with permanent access shall have barriers provided.

F4.3.3 Swimming pools having a depth of water exceeding 400 mm, shall be constructed with a barrier to restrict access to the pool or the immediate pool area, by children under 6 years

F4.3.4 Barriers shall:

- (a) Be continuous and extend for the full extent of the hazard,
- (b) Be of appropriate height,
- (c) Be constructed with *adequate* rigidity,
- (d) Be of *adequate* strength to withstand the foreseeable impact of people and, where appropriate, the static pressure of people pressing against them,

(e) Be constructed to prevent people from falling through them, and

(f) Restrict the entry of children under 6 years of age, when located in areas likely to be frequented by them.

F4.3.5 Barriers to swimming pools shall have in addition to performance F4.3.4:

(a) All gates constructed so that they close, and latch automatically with latching devices not readily operated by children, and

(b) No permanent objects on the outside of the barrier that could provide a climbing step.

### ACCEPTABLE SOLUTION F4/AS1

#### 1.0 BARRIERS IN BUILDINGS

##### 1.1 Barrier heights

1.1.1 Minimum barrier heights shall be 1000 mm on floors and landings, and 900 mm on stairs or ramps, measured from the *pitch line* or *nosings*.

*Comment:*

*A handrail can be constructed as an integral part of a barrier. Refer NZBC D1 "Access Routes".*

##### 1.2 Barrier construction

###### 1.2.1 Buildings used by young children

In any *building* likely to be used by young children barriers shall have:

- a) No openings through which a 100 mm diameter sphere can pass,
- b) No components between the heights of 150 mm and 760 mm above floor (or stair nosing) level which can provide a toehold, and
- c) The triangular opening formed by the riser, tread and bottom rail at the open side of a stairway shall be of such a size that a 150 mm diameter sphere cannot pass through it.

###### 1.2.2 Low risk areas

In areas used exclusively for emergency or maintenance purposes in *buildings*, and in other *buildings* not frequented by children, barriers may have openings with maximum dimensions of either:

- a) 300 mm horizontally (between vertical balusters), or
- b) 460 mm vertically (between longitudinal rails).

##### 3.1 Fencing

3.1.1 Fencing for swimming pools shall comply with the requirements of the Schedule to the Fencing of Swimming Pools Act 1987.



## 1.3 BALUSTRADE DESIGN NOTES

1. Select the desired Balustrade Style from Section 1.4.
2. Select the Post Fixing Method required from Section 1.5.
3. Choose an appropriate Height from Table 1.3B opposite.  
Note: Any Height may be manufactured where required.
4. Find the Maximum Post Spacing applicable to the design;  
(REFER TO ALUMA PRODUCTS)
5. Determine all critical Post positions, where a Post must be placed:  
eg. - at changes in direction.  
- near to changes in slope,  
(see Fig. 1.3C).
6. Between these critical Posts, (and any other points where the rail end is supported, eg. - at an existing wall); evenly space Intermediate Posts along each run. Do not exceed the Maximum Post Spacing.

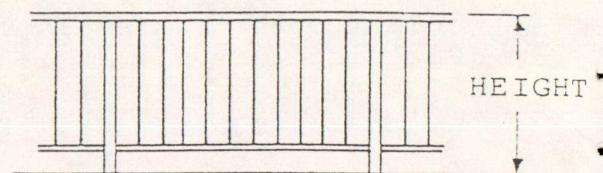


FIG. 1.3A

TABLE 1.3B NZ BUILDING CODE  
Barrier Heights (Fig. 1.3A)

Floors and Landings .....	1000
Above the Pitch Line of Stairs and Ramps .....	900
Pool Fences .....	1200 MIN.

The above are minimum values.

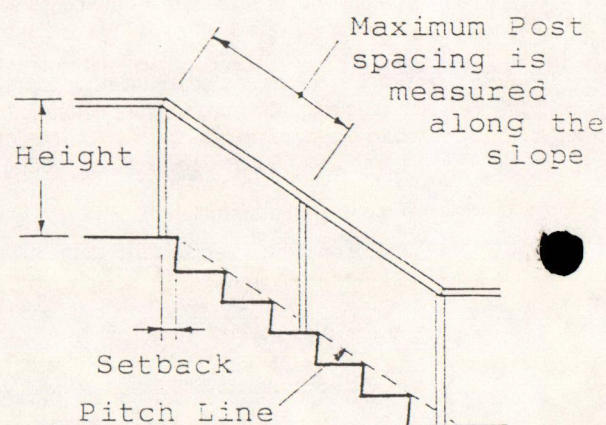


FIG. 1.3C

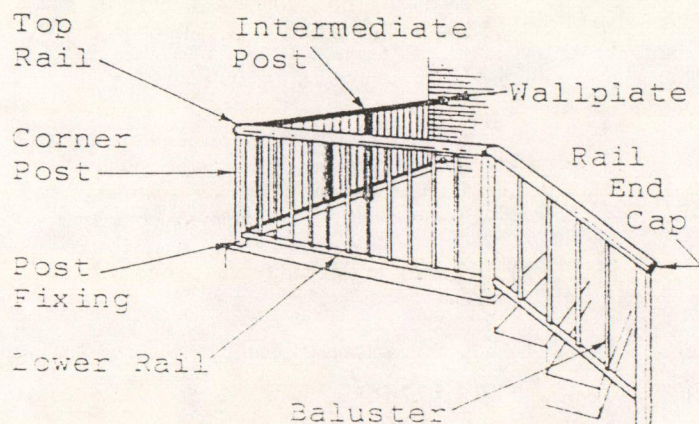


FIG. 1.3E - TYPICAL BALUSTRADE

TABLE 1.3D - Recommended  
Baluster Spacings, (mm)  
Centre - Centre,

Where required by NZBC for a 99 mm max. gap .....	115 MAX.
Elsewhere .....	140 NOMINAL



Figure 3: Baluster fixed to intermediate joist  
Paragraphs 2.3.2, 2.4.1 and 2.5.3

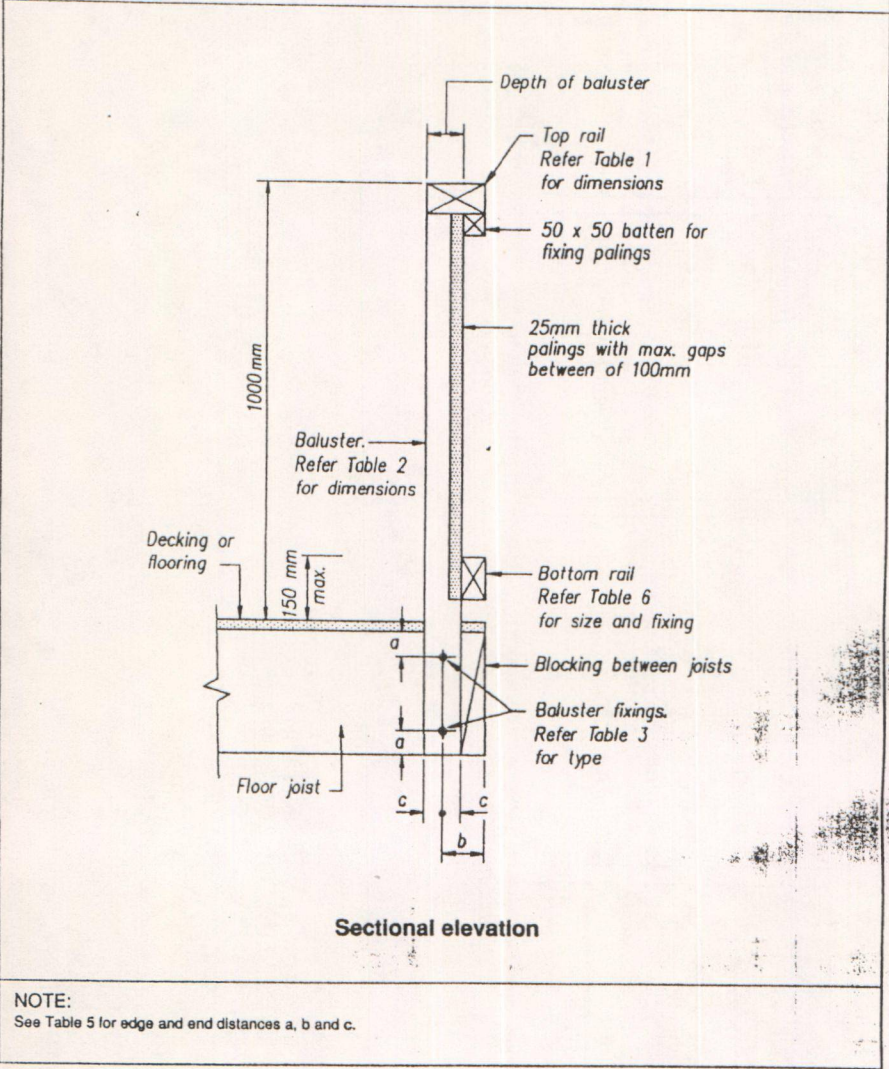
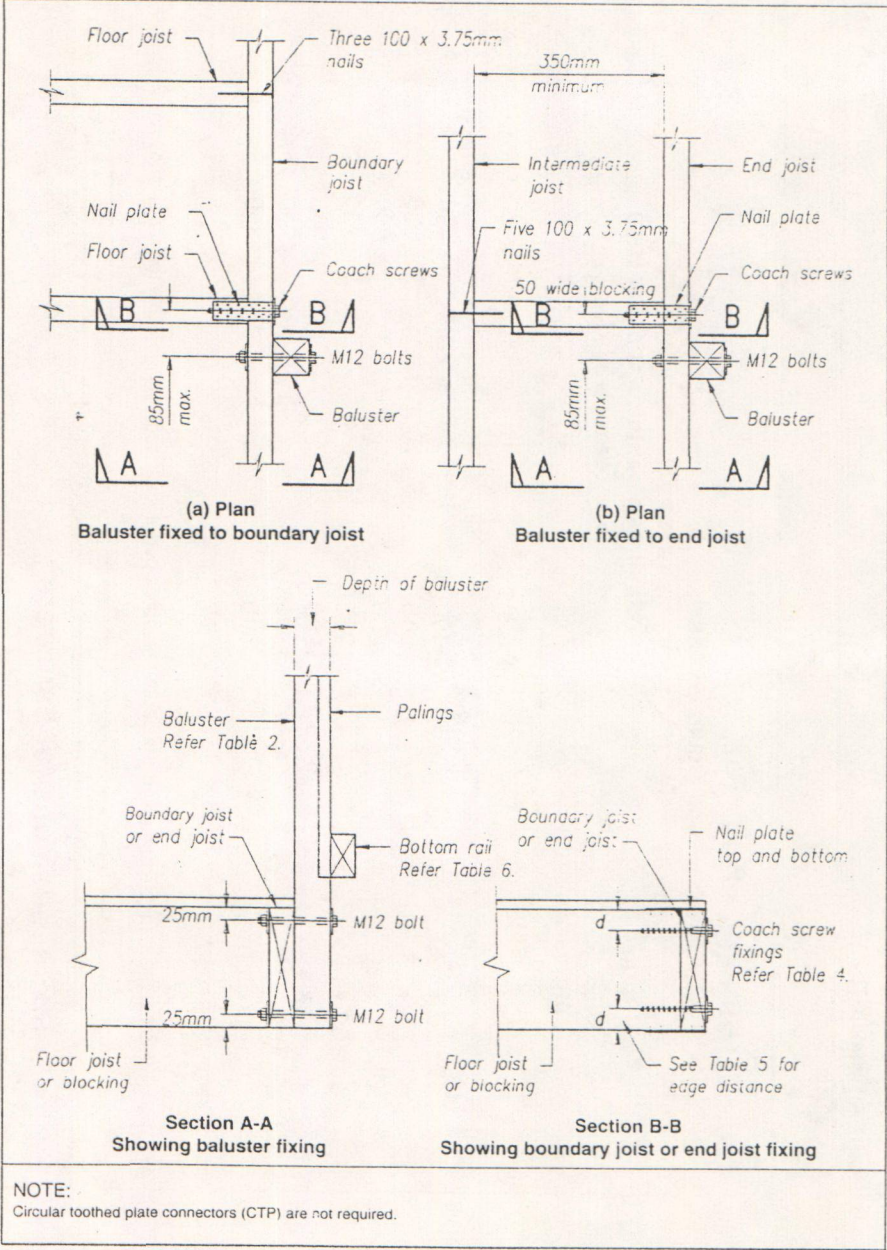


Figure 4: Baluster fixed to boundary joist or end joist  
Paragraphs 2.3.2, 2.3.4, 2.3.5, 2.3.6 and 2.4.1



Amd 1  
Sept '93

Amd 1  
Sept '93



**Table 2: Baluster sizes**

Paragraph 2.3.1 and Figures 3 and 4

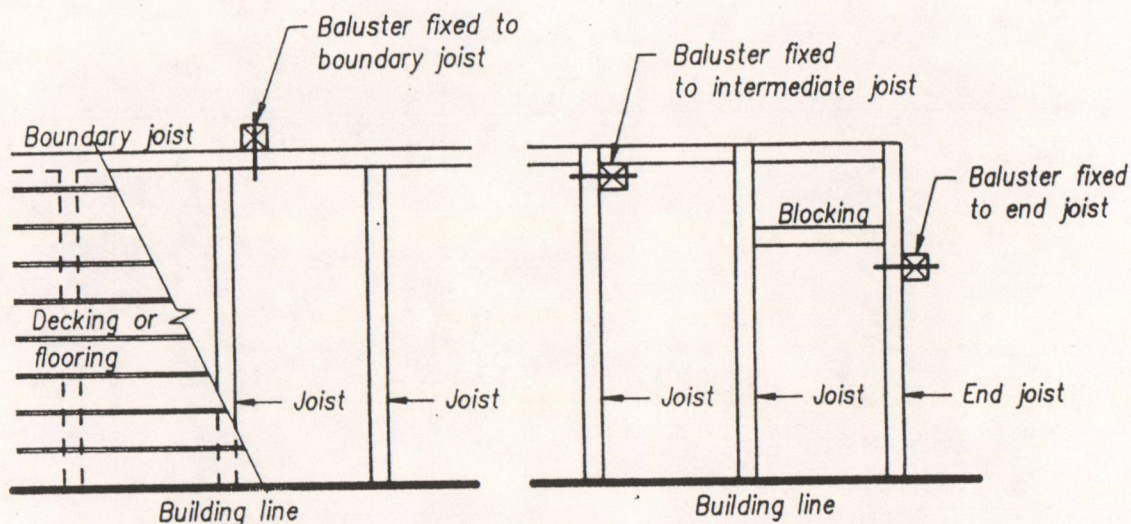
Baluster size (mm)	Maximum baluster spacing (c-c) for top rail (mm)	
	Type 1	Type 2
50 x 100	400	400
75 x 50	600	600
75 x 75	800	800
100 x 50	1200	1200
75 x 100	1200	1200
100 x 75	1800	1700
100 x 100	2000	1800

**NOTE:**

The first dimension given for the baluster is the depth measured perpendicular to the line of the top rail as shown in Figures 3 and 4.

**Figure 2: Fixing positions for balusters**

Paragraph 2.3.2

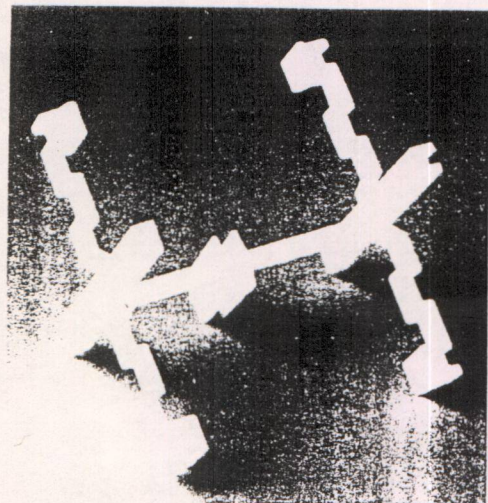


**Plan**





**SPACER** For exclusive use with PC GlassBlock® Products



## A labor-saving device to speed installation of PC GlassBlock® Products

### VeriTru™ Spacers

- **Expedite installation.** More courses can be laid at once because Spacers help support the block and prevent floating during mortar set.
- **Allow uniform placement.** Helps to maintain a consistent 1/4" mortar joint thickness.
- **Keep panels flush.** Faces of the glass block stay even with each other.
- **Ease installer's job.** Saves labor because proper placement is always achieved the first time, with minimal effort. Spacers can easily be modified for use at sill and jambs.
- **Build curved walls.** With a minimum inside joint of 1/4", the following radii are possible:

BLOCK SIZE	INSIDE RADIUS REGULAR SERIES	INSIDE RADIUS THINLINE SERIES
4"x 8"	41 1/2"	33 1/2"
6"x 6"	62"	50"
8"x 8"	83"	67"
12"x 12"	124"	NA

- Also available for THINLINE SERIES

### Application recommendations

When constructing panels, follow the general recommendations in Pittsburgh Corning's Installation Specifications literature (GB-185). See sections on interior and exterior panel construction, specifically structural support at heads, jambs and sills, as well as on panel reinforcement.

VeriTru™ Spacers are not approved for use in fire rated panels.

### Materials/tools needed

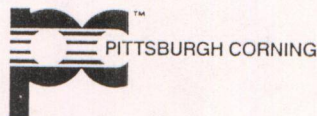
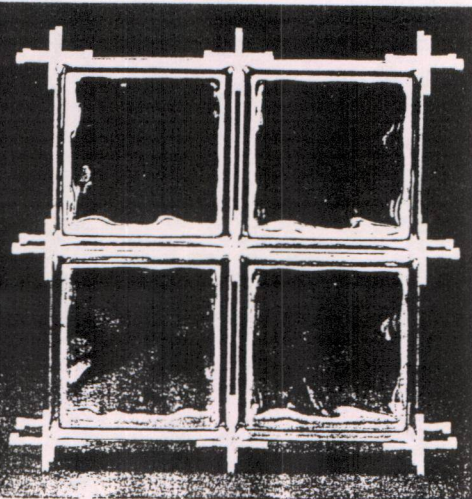
- Striking tool • Small trowel with rubber-tipped handle • VeriTru™ Spacers (1.5 per block) • Mortar • Clean, soft cloths • PC GlassBlock® Units • Panel Anchors • Expansion Strips

### Availability

VeriTru™ Spacers are available from the PC GlassBlock® Products Distributor in your area. Look in the Yellow Pages under "Glass Block"; or call the PC GlassBlock® Products Hotline at 800-992-5769.

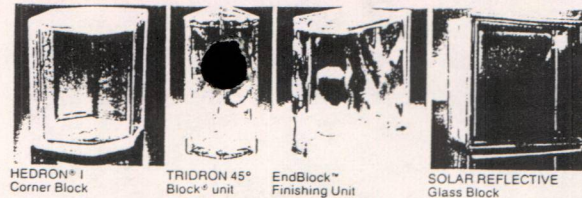
## PRODUCT DATA SHEET

PITTSBURGH CORNING  
**PC GLASSBLOCK®**  
PRODUCTS



Pittsburgh Corning Corporation  
800 Presque Isle Drive  
Pittsburgh, PA 15239

PC GlassBlock® is a registered trademark and VeriTru™ is a trademark owned by Pittsburgh Corning Corporation. A patent has been filed for the VeriTru™ Spacer.



HEDRON® I  
Corner Block

TRIDRON 45°  
Block unit

EndBlock™  
Finishing Unit

SOLAR REFLECTIVE  
Glass Block

## PRODUCTS & PATTERNS

HEDRON® I corner block are hexagonal units used to form gently rounded 90° bends. They are compatible with square block in the REGULAR and THINLINE® SERIES and available in the DECORA® and VUE® patterns.

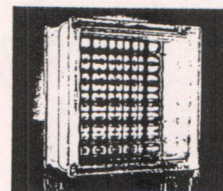
TRIDRON 45° Block® are triangular units allowing the creation of angles from 45° to 360° in 45° increments. They can be installed with all 200mm nominal (8") REGULAR and THINLINE® SERIES block and are available in the DECORA® and VUE® patterns.

EndBlock™ finishing units allow all-glass vertical or horizontal edging for interior panels. Offered in the DECORA® and VUE® patterns, they are compatible with 200mm nominal (8") square

REGULAR SERIES units.

SOLAR REFLECTIVE glass block are REGULAR SERIES VUE® and DECORA® pattern block with a highly reflective, thermally bonded oxide surface coating that reduces both solar heat gain and transmitted light. Recommended for use where heat must be decreased to reduce ventilating and air conditioning requirements and operating costs. Available with a gray reflective finish on one or both faces. Bronze appearance is achieved with a bronze edge coating.

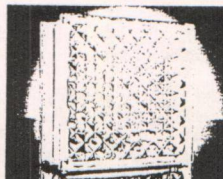
NOTE: Special design, application, installation and cleaning requirements are necessary to protect the integrity of the reflective finish. Contact Pittsburgh Corning for details.



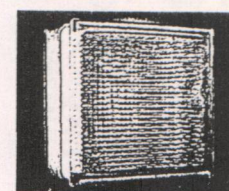
Rounded flutes—at right angles to each other on each inner face—diffuse light into attractive beams. The ARGUS® pattern provides maximum light transmission, brightness and a high degree of privacy. Units may be installed with flutes running parallel or in alternating directions.



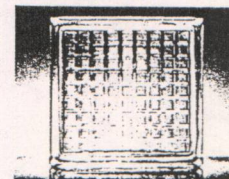
With its distinctive, wavy undulations, the DECORA® pattern provides maximum light transmission with modest distortion. This classic pattern is non-directional, so installation proceeds swiftly.



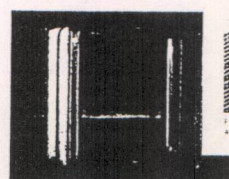
The DELPHI® pattern's multiple-diamond design transmits light with a prismatic effect to provide the greatest combination of light transmission and privacy.



With its fine grid design of closely spaced ridges at right angles to each other, the ESSEX® AA pattern offers moderate light transmission while providing the greatest privacy of all PC GlassBlock® patterns.



The TEXTRA® pattern's ribbed, check-board design interspersed with transparent areas creates a dynamic, three-dimensional effect. A transition between the highly visually distorting and more visually expansive products, the TEXTRA® pattern provides moderate light transmission.



Because its faces are smooth and undistorted, the VUE® pattern provides the greatest combination of light transmission and visibility. The VUE® pattern may be used to provide visibility ports in panels of other, more visually distorting PC GlassBlock® patterns.

## PC GlassBlock® Products Patterns/Sizes/Weights

		METRIC SIZES									
		190.0mm ± 190.0mm									
PATTERNS		REGULAR SERIES (100.0mm thick)									
DECORA*		X									
VUE*		X									
PATTERNS		THINLINE® SERIES (80.0mm thick)									
ARGUS*		X									
DECORA*		X									
VUE*		X									
		ENGLISH SIZES (with metric conversions)									
		8" x 8" Nominal 5 1/4" x 5 1/4" Actual (140mm)	8" x 8" Nominal 5 1/4" x 5 1/4" Actual (140mm)	12" x 12" Nominal 9 1/4" x 9 1/4" Actual (235mm)	12" x 12" Nominal 9 1/4" x 9 1/4" Actual (235mm)	12" x 12" Nominal 9 1/4" x 9 1/4" Actual (235mm)	12" x 12" Nominal 9 1/4" x 9 1/4" Actual (235mm)	12" x 12" Nominal 9 1/4" x 9 1/4" Actual (235mm)	12" x 12" Nominal 9 1/4" x 9 1/4" Actual (235mm)	12" x 12" Nominal 9 1/4" x 9 1/4" Actual (235mm)	12" x 12" Nominal 9 1/4" x 9 1/4" Actual (235mm)
PATTERNS		REGULAR SERIES (3 1/4" x 98mm thick)									
ARGUS*		X	X	X							
DECORA*		X	X	X							
ESSEX*AA		X									
TEXTRA*		X									
VUE*		X	X	X							
Weight, kg (lb)		1.81 (4)	2.72 (6)	7.26 (16)				1.59 (3.5)			
PATTERNS		THINLINE® SERIES (3 1/4" x 79mm thick)									
DECORA*		X	X					X	X		
DELPHI*		X	X					X	X		
VUE*		X	X					X	X		
Weight, kg (lb)		1.36 (3)	2.27 (5)					1.36 (3)	2.04 (4.5)		
PATTERNS		SOLAR REFLECTIVE Block (3 1/4" x 98mm thick)									
DECORA*		X									
VUE*		X	X								
Weight, kg (lb)		1.81 (4)	2.72 (6)								
PATTERNS		HEDRON® I Corner Block (Compatible with both series)									
DECORA* & VUE*		X	X								
Weight, kg (lb)		1.95 (4.3)	2.72 (6)								
PATTERNS		TRIDRON 45° Block® Units (Compatible with both series)									
DECORA* & VUE*		(8" High)									
Weight, kg (lb)		1.36 (3)									
PATTERNS		EndBlock™ Finishing Units (3 1/4" x 98mm thick)									
DECORA* & VUE*		X									
Weight, kg (lb)		2.72 (6)									
PATTERNS		THICKSET™ Block (3 1/4" x 98mm thick)									
VUE*		X									
ENDURA*		X									
Weight, kg (lb)		2.72 (6)	4.54 (10)								
PATTERNS		VISTABRIK® Solid Glass Block (3" x 76mm thick)									
VISTABRIK*		(7 1/4" x 194mm Actual)						X			
Weight, kg (lb)		6.80 (15)						2.72 (6)			
PATTERNS		PAVER UNITS									
DELPHI*		6" x 6" x 1" (152 x 152 x 25mm)									
Weight, kg (lb)		1.27 (2.8)									
VISTABRIK*		7 1/4" x 7 1/4" x 1 1/4" (194 x 194 x 38mm)									
Weight, kg (lb)		3.4 (7.5)									

\*Block are manufactured to a ± 1/16" (2mm) tolerance.

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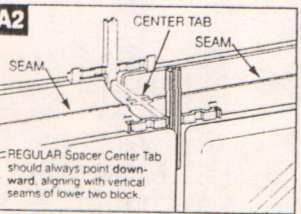
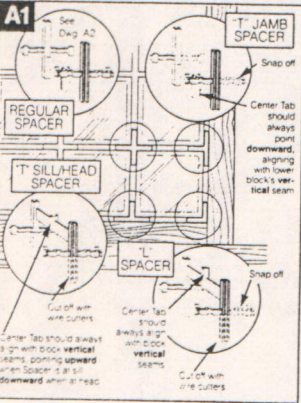
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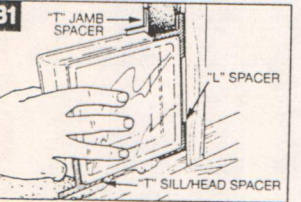
Installation

General

- 1. Cover sill with heavy coat of water based asphalt emulsion. Allow two hours to dry.
- 2. Install panel anchors and expansion strips at jambs and head.
- 3. Trowel a full mortar bed to sill area. Use enough mortar to assure 1/4" mortar joints.
- 4. "Regular" Spacers (used as supplied) are installed where four block come together (Drawings A1 and A2); "T" and "L" Spacers should be modified now for use at head, sill and jambs (Drawing A1).

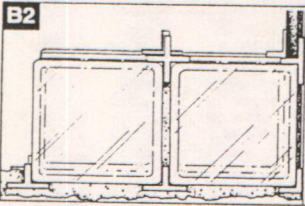


Laying The First Course



- 1. Install first block in corner on mortar at sill and against expansion strip along jamb using modified "L" and "T" Spacers (Drawing B1).

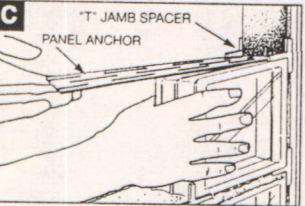
- 2. Push block tightly into place against Spacers.
- 3. Apply full mortar bed to vertical edge of next block. Install block on sill in contact with first block using appropriate Spacers (Drawing B2).



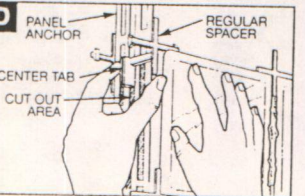
- 4. Continue laying first course by repeating steps 2 and 3.
- 5. Periodically check all courses for plumb and level. Adjust if necessary before proceeding to next course.
- 6. Point any joints where mortar has fallen out.

Laying Remaining Courses

- 1. Apply mortar to the top edge of the course of block just laid. Spread and smooth the mortar, keeping cross legs of Spacers as free of mortar as possible.
- 2. Install remaining courses, repeating steps used in first course.

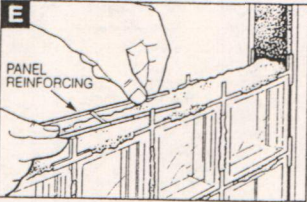


- 3. When panel anchors are encountered at jambs, the top edge of the block with Spacer should fit just under the anchor (Drawing C). Position the anchor itself within mortar joints so that it is surrounded on both sides by mortar. Where the upper block meet the head anchors these anchors should be positioned between the Spacer and the block. Make sure the center Spacer tab fits in the cut out area of the anchor (Drawing D).



Placement of Panel Reinforcing

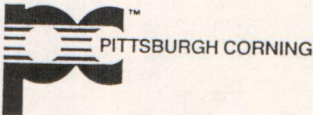
- 1. For panels over 25 ft², install panel reinforcing after every third course for 6" block; after every second course for 8" and 12" block (Drawing E).



Finishing/Cleanup

- 1. Remove excess mortar from block faces.
- 2. Strike all joints smooth and concave while mortar is still plastic.
- 3. Use clean, wet sponge or cloth for final mortar removal. Allow any remaining film on block to dry to a powder.
- 4. After mortar sets, install packing and sealant at jambs and head.

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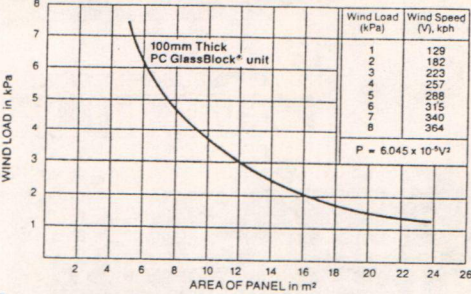


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PHYSICAL & DESIGN DATA

Wind Load Resistance



For a panel of approximately 13m², and a design wind load of 1 kPa, the maximum wind load resistance of the panel is approximately 2.7 kPa, which provides a safety factor of 2.7 (2.7 + 1).

Maximum Panel Dimensions

Perimeter Support Method	REGULAR SERIES			THINLINE™ SERIES		
	Area m²	Height m	Width m	Area m²	Height m	Width m
*EXTERIOR Channel Type Restraint	14	6	8	8	3	8
Panel Anchors	14	6	8	8	3	8
Channels or Panel Anchors w/Intermediate Stiffener	24	6	8	14	6	8
INTERIOR Channel Type Restraint	24	6	8	14	6	8
Panel Anchors	24	8	8	14	6	8

\*Maximum exterior panel sizes are based on a design wind load of 0.89 kPa (20 lbs. per sq. ft.) with a 2.7 safety factor.

Thermal Performance/Light Transmission<sup>1,3</sup>

Block Type	Heat Transmission <sup>1</sup> "U" Value W/m²K	Thermal Resistance <sup>2</sup> "R" Value m²K/W	Thermal Expansion Coef. cm/cm/°C	Visible Light Transmission (%)	Shading Coef. <sup>4</sup>
REGULAR SERIES 100mm nom.	2.9 (2.7 with "LX")	0.35 (0.37 with "LX")	8.4x10⁻⁴	75 (50 for ESSEX AA) <sup>4</sup>	0.65 (0.45 for ESSEX AA) <sup>4</sup>
SOLAR REFLECTIVE	2.9	0.35	8.4x10⁻⁴	5-20	0.20-0.25
THINLINE™ SERIES (2.7 with 80mm nom. "LX")	3.24 (3.07 with "LX")	0.308 (0.33 with "LX")	8.4x10⁻⁴	75	0.65
VISTABRIK®	4.94	0.20	8.4x10⁻⁴	80	
FLAT SHEET GLASS	5.91	0.17	8.4x10⁻⁴	90	1.00

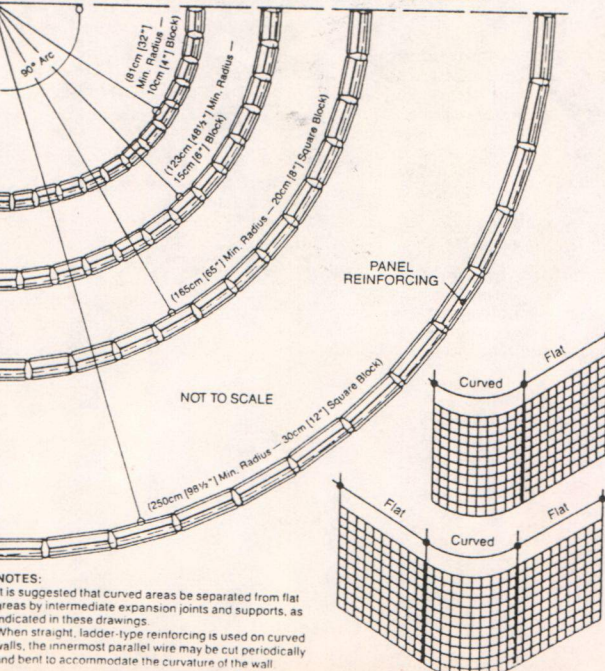
<sup>1</sup>Values ±5%  
<sup>2</sup>Winter night values  
<sup>3</sup>To calculate instantaneous heat gain through glass block panels, see ASHRAE HANDBOOK OF FUNDAMENTALS, 1985-SECTION 22.41.B  
<sup>4</sup>Estimated figures based on accumulated data  
<sup>5</sup>Based on 100mm (8") square units; ratio of heat gain through glass block panels vs. that through a single light of double-strength sheet glass under specific conditions.

Sound Transmission<sup>1</sup>

S.T.C. <sup>1</sup>	Size (cm)	Pattern	Assembly Construction
31	20x20x8	All	KWIK'N EZ® Silicone System
37 <sup>2</sup>	20x20x10	All	Mortar
40	20x20x10 (w/LX Fibrous Filter)	All	Mortar
50	THICKSET™ Block 20x20x10	ENDURA™	Mortar
53	20x20x7.6 Solid Units	VISTABRIK®	Mortar

<sup>1</sup>Tested in accordance with ASTM E90-90 "... Measurement of Airborne Sound Transmission Loss..."  
<sup>2</sup>STC rating value in accordance with ASTM E413-87 "Classification for Rating Sound Insulation."  
<sup>3</sup>Test method and STC rating value in accordance with ASTM E90-81 and ASTM E413-73 accordingly.

Inside Radius Minims for Curved Panel Construction



NOTES:  
1. It is suggested that curved areas be separated from flat areas by intermediate expansion joints and supports, as indicated in these drawings.  
2. When straight, ladder-type reinforcing is used on curved walls, the innermost parallel wire may be cut periodically and bent to accommodate the curvature of the wall.

Radius Minims for Curved Panel Construction

Block Width (cm)	Inside Radius (cm)	Number of Block in 90° Arc	Vertical Joint Width (mm)	Inside	Outside
10	81	13	3	16	
15	123	13	3	16	
20	165	13	3	16	
30	250	13	3	16	

Formula to Determine Exterior Joint Width

$$E = (W + I) \times (1 + [T + R]) - W$$

$E$  = External joint width (mm)  
 $I$  = Internal joint width (mm)  
 $R$  = Radius to interior of wall (mm)  
 $T$  = Thickness of block (mm)  
 $W$  = Width of block (mm)

Pittsburgh Corning recommends a minimum joint size of 3mm (1/8") and a maximum joint size of 16mm (5/8").

