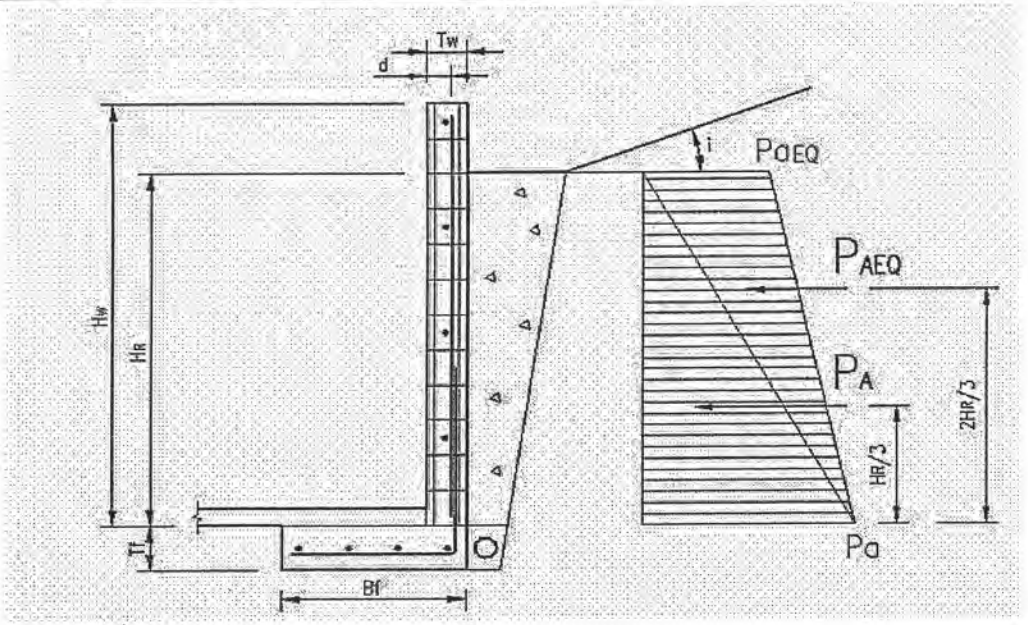
Job Name: 125 Nikau Palm road **Job Number:** 23040
Location: **Date:** 27-Feb-09
Engineer: M.Y

CALCULATIONS

Seismic Cantilever Masonry Retaining Wall Calculation Sheet



$$\theta = \tan^{-1}\left(\frac{k_h}{1-k_v}\right)$$

Kh (ZR)= 0.30
Kv= 0.00

Kh/1-Kv = 0.30

Gives θ = 0.291

$$K_a(\phi,\delta) := \frac{\cos(\phi-\alpha)^2}{\cos(\alpha)^2\cdot\cos(\delta+\alpha)\cdot\left(1+\sqrt{\frac{\sin(\delta+\phi)\cdot\sin(\phi-i)}{\cos(\delta+\alpha)\cdot\cos(i-\alpha)}}\right)^2}$$

$$K_{aEQ}(\phi,\delta,\theta) := \frac{\cos(\phi-\alpha-\theta)^2}{\cos(\alpha)^2\cdot\cos(\theta)\cdot\cos(\delta+\alpha+\theta)\cdot\left(1+\sqrt{\frac{\sin(\delta+\phi)\cdot\sin(\phi-i-\theta)}{\cos(\delta+\alpha+\theta)\cdot\cos(i-\alpha)}}\right)^2}$$

(Mononobe-Okabe Theory)

HR = 3.1 m
Hw = 3.2 m
γ = 18 kN/m3
ϕ = 36 degrees
δ = 18 degrees
α = 0 degrees
i = 0 degrees

Gives K_a = **0.236**
Gives K_{aEQ} = **0.459**

Ultimate Limit State

(kN/meter length)

$P_A = K_a\gamma H^2/2$ = **20.42 kN**
$P_a = P_A/0.5H_R$ = 13.18 kPa

Static case = **1.6P_A**

M^*_{static} = $1.6xP_AxH_R/3$ = **33.77 kNm**

P^* = $P_{AEQ} = K_{aEQ}\gamma H^2/2$ = 39.67 kN
$\triangle P_{AEQ} = P_{AEQ} - P_A$ = **19.25 kN**
$P_{aEQ} = \triangle P_{AEQ}/0.5H_R$ = 12.42 kPa

Seismic case = **$P_A + \triangle P_{AEQ}$**

$M^*_{seismic}$ = $P_AxH_R/3 + \triangle P_{AEQ}x2H_R/3$ = **60.89 kNm**

M* = 60.89 kNm

Wall Capacity

Restoring Moment

B_f = 2.50 m
T_f = 0.4 m

Weights
$W_w = 22kN/m^3 \times T_w \times H_w$ = 16.9 kN/m
$W_f = 24kN/m^3 \times T_f \times B_f$ = 24 kN/m
Wt = 40.896 kN/m

ϕM_R = $0.9[W_w \times ((b_f-T_w/2) + W_f \times Bf/2]$ = **63.19 kNm**
>M* - OK Restoring Moment

Flexural Capacity

f'_c = 12 MPa
d = 170 mm
Tw (wall thickness) = 240 mm
f_y = 500 MPa
Bar Diameter 16 mm
Bar Spacing 200 mm
Gives As = 1005 mm^2/m
Compressive Block Centroid Depth a = 49.3 mm

ϕM_b = $0.85A_sf_y(d-a/2)$ = **62.11 kNm**
>M* - OK Flexural

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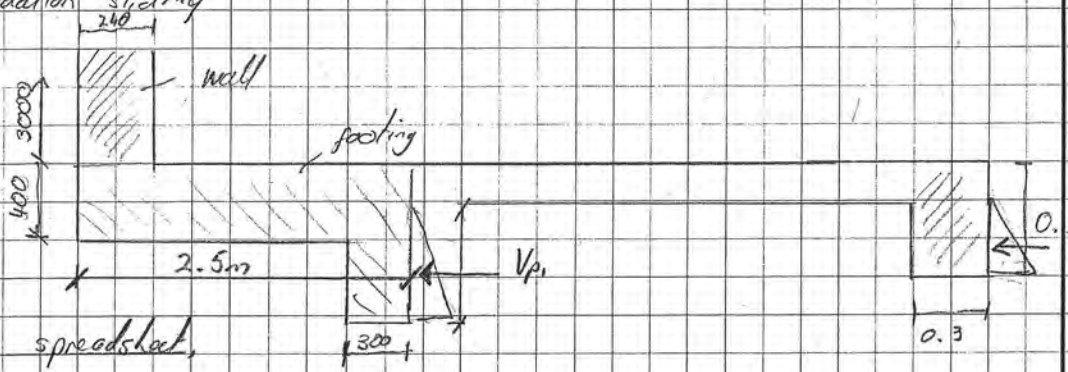
Project: 125 Nikau Palm Road

CALCULATIONS

Check retaining Wall for Earthquake sliding

Foundation sliding



From spreadsheet,

Active pressure, $V_a^* = 1.6\ K_a\ \gamma\ H^2/2 = 38.53$ KN (per m length) (non cohesive) — see spreadsheet overpage

Sliding resistance (friction factor = 0.35 for DMA)

Frictional resistance

W_w of $W_{footing} = 40.1$ KN/m $\times$ 0.35 = 14.0 KN per m length

$W_{end\ footing} = 0.3m \times 0.3m \times 24 KN/m^3 \times 0.35 = 0.756$ KN per m length

Passive pressure required

$\phi V_p = \phi\ K_p\ \gamma_{soil}\ depth^2/2$

$\phi V_{p2} = K_p\ \gamma_{soil}\ d^2/2 = 3.333 \times 18 \times 0.5^2/2 = 7.3$ KN/m length

$\phi = 0.6$

$K_p = 1/K_a = 1/0.3 = 3.333$

$\gamma_{soil} = 18 KN/m^3$

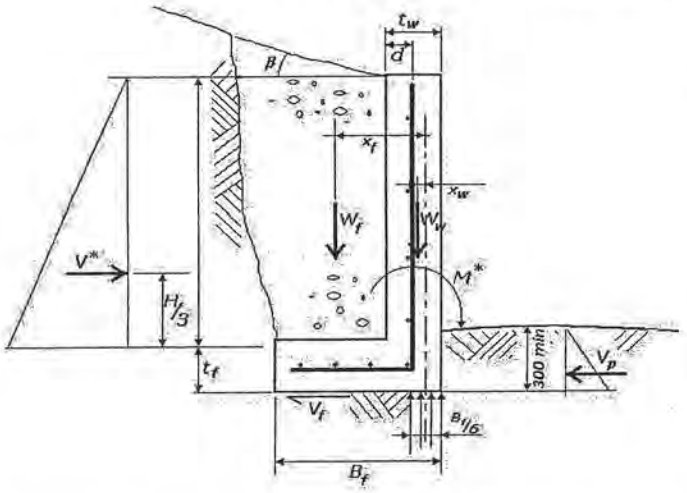
$$V_p = \frac{38.53}{0.6} - 14.75 - 7.3 = 42.1$$

$\Rightarrow = K_p\ \gamma_{soil}\ d^2/2$

$$d^2 = \sqrt{\frac{2 \times 41.2}{K_p \times \gamma_{soil}}} = 0.72m$$

Check $\phi V_p = 0.6 \times K_a \times 18 \times 0.72/2 + 14.75 = 40.5$ - OK

CANTILEVERED CONCRETE RETAINING WALL



Date: 9-Mar-09 Job. No: 23040
Engineer: M.Y
Job Name: 125 Nikau Palm
Item:

Soil & Wall Properties

Total Wall Height H_T =	3.2	m		
Retaining Height H =	3	m	Put B_f =	1.50 m
Angle of Internal Friction ϕ =	30	°	t_w =	0.24 m
Soil Weight Per Unit Volume γ =	18	kN/m³	t_f =	0.40 m
Angle of Friction on Back of Wall δ =	20	°	Gives x_w =	0.12 m
Angle of Surcharge β =	0	°	and x_f =	0.75 m
			and x_s =	0.87 m
			and d =	120 mm

From Coulomb Theory — Coefficient of Active Pressure K_a = 0.30

$$Ka = \left(\frac{\sin(\alpha-\phi)/\sin\alpha}{\sqrt{[\sin(\alpha+\delta)]} + \sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\beta)}{\sin(\alpha-\beta)}}} \right)^2$$

Gives $V^* = 1.6\ K_a\ \gamma\ H^2/2$ = 38.53 kN (per m length)

Overturning Moment — **$M^* = V^*\ H/3$ = 38.53 kNm (per m length)**

Restoring Moment

Wall Weight $W_w = 24kN/m^3 \times H_T \times t_w$ =	18.43	kN	(per m lgth)
Soil Weight $W_s = \gamma \times H \times (B_f - t_w)$ =	68.04	kN	(per m lgth)
Footing Weight $W_f = 24kNm^3 \times t_f \times B_f$ =	14.40	kN	(per m lgth)
Weight per m W =	100.87	kN	(per m lgth)
$\phi M_R = 0.9(W_f x_f + W_w x_w + W_s x_s)$ =	**59.19**	**kNm (per m length)**	**Okay**

Wall Flexural Strength

Vertical Bar Diameter	16	mm	Bar Spacing	200 mm
Gives Area Longitudinal Steel A_s =	1005	mm^2 per m		
Steel Yield Strength f_y =	500	MPa		
Concrete Compressive Strength f'_c =	12	MPa		

Depth of Compression Block

$a = A_s f_y / (0.85 f'_c b)$ =	49.3	mm	
(where b = 1000mm)			
$\phi M_b = 0.85 A_s f_y (d - a/2)$	**40.74**	**kNm (per m length)**	**Okay**

Sliding Resistance

Passive Pressure $V_p = K_p \gamma x t_f^2/2$ =	4.84	kN	ϕ_p =	0.6
$V_f = (W_f + W_w + W_s) \tan\delta$ =	58.24	kN	ϕ_f =	0.9
(Where $\delta = \phi$)			$K_p = K_a^{-1}$ =	3.36
$\phi Vs = \phi_p V_p + \phi_f V_f$ =	**55.32**	**kN(per m)> 38.53**		**Okay**

Bearing Pressure Check

$e = (M_r - M^*)/W$ =	**0.270**	**m**	
$q^* = W / 2e$ =	**186.8**	**kPa**	
Dependable Ultimate Bearing Pressure ϕq_u =	**150**	**kPa**	**No Good**

$\phi = 36$

$i = 0$

$\gamma = 18$

$\gamma_s = 0.5$

Factor $= 0.88$

$\gamma_p = 9.24$

REDUCTION FACTOR OF K_P FOR VARIOUS RATIOS OF $-\delta/\Phi'$

δ/φ' / φ'	+0.7	+0.6	+0.5	+0.4	+0.3	+0.2	+0.1	+0.0
10	.978	.962	.946	.929	.912	.898	.881	.865
15	.961	.934	.907	.881	.854	.830	.803	.774
20	.939	.901	.862	.824	.787	.752	.716	.678
25	.912	.850	.808	.759	.718	.666	.620	.574
30	.878	.811	.746	.686	.627	.574	.520	.467
35	.838	.752	.674	.603	.536	.475	.417	.362
40	.783	.682	.592	.512	.439	.375	.316	.262
45	.718	.600	.500	.414	.339	.276	.221	.174

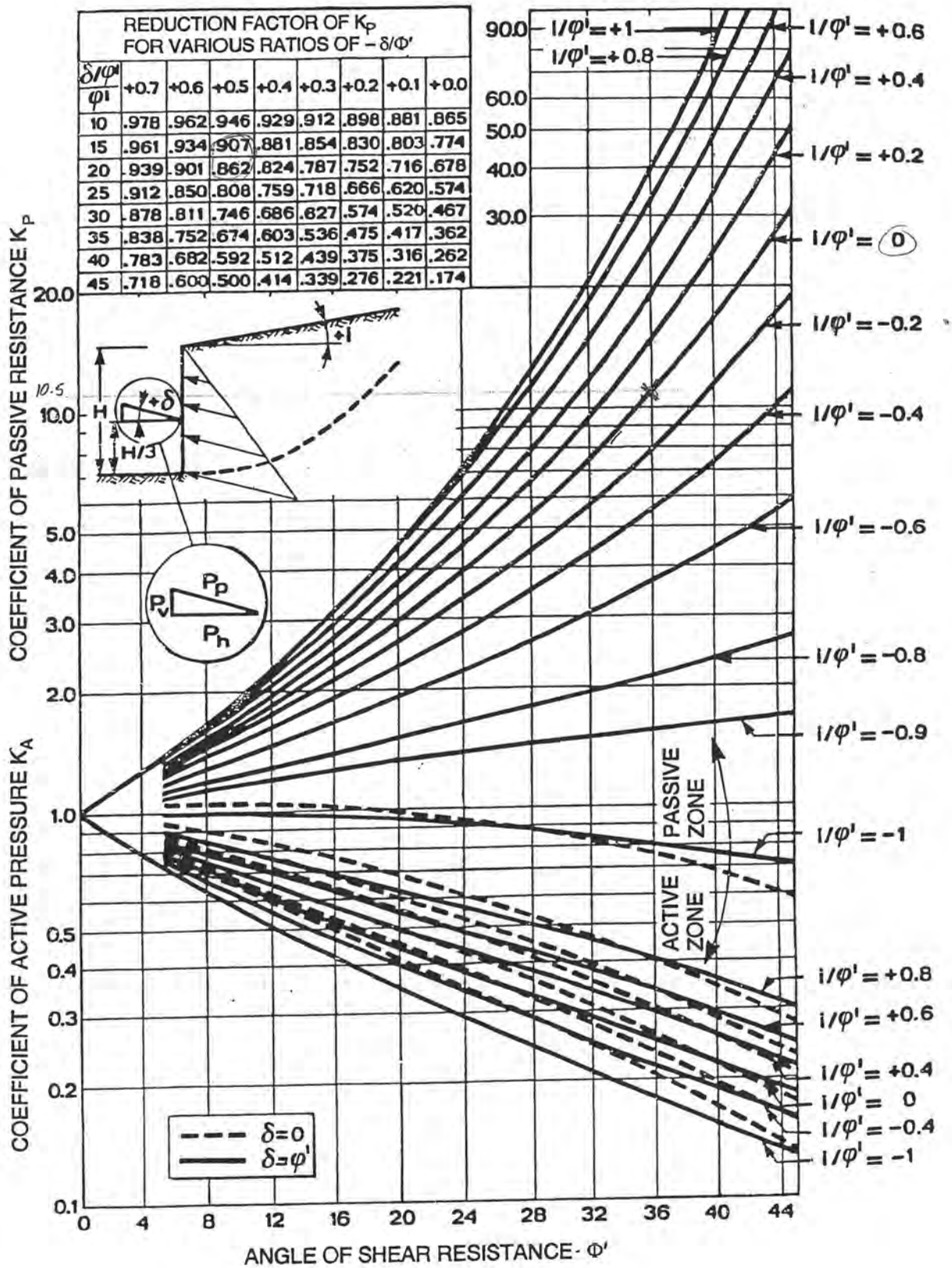


Fig. 3.9 Active and passive earth pressure coefficients for a vertical wall with sloping backfill, based on logarithmic spiral failure surfaces

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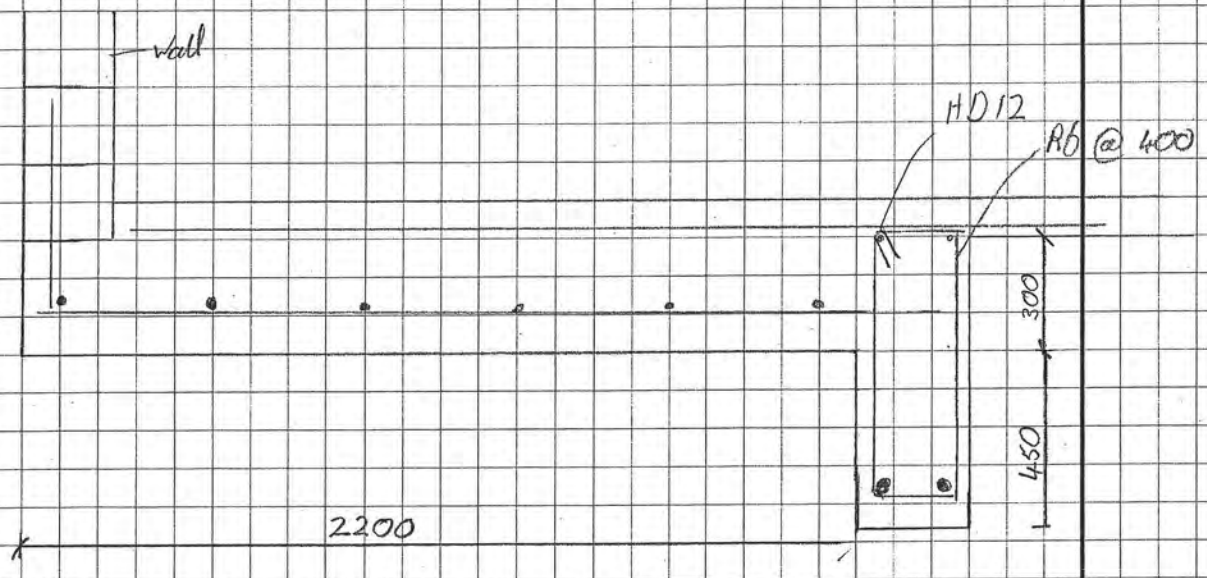
Project

CALCULATIONS

Footing details



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Project
125 Nikau Palm

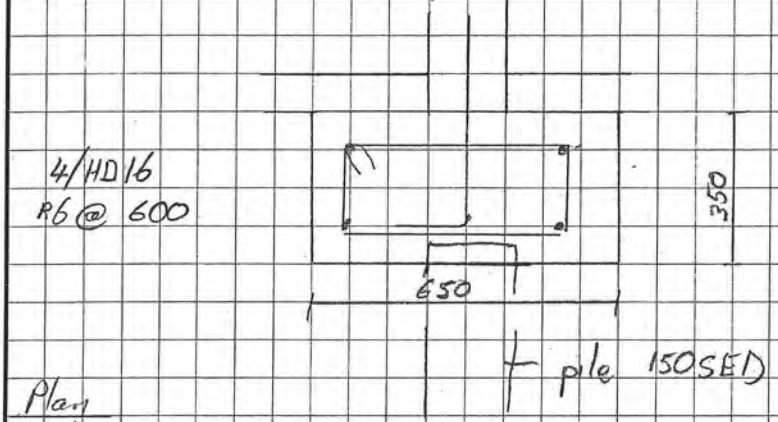
CALCULATIONS

Footing of block wall in Garage

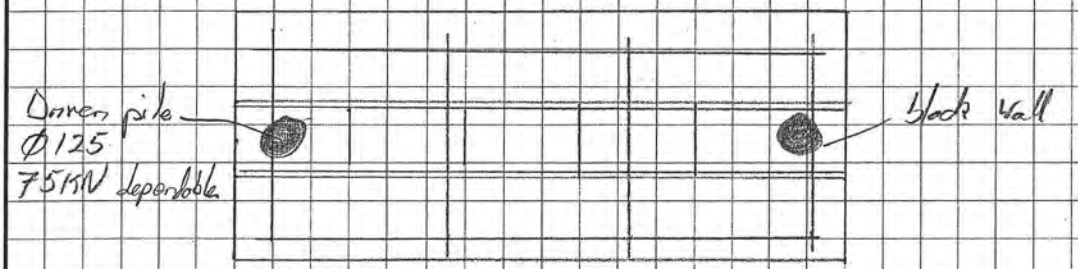
Load on wall

Selfweight = 27 KN/m
1.2G + 1.5Q = 100KN / 1.6 = 62.5

load = 90.0 KN/m
NZS 4229



Plan



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Project 125 Nikau Palm

CALCULATIONS

Shear

$V_n = v_n b_w d$

$V_n = V_m + V_p + V_s$

$V_m = (C_1 + C_2) V_{bm}$

$C_1 = 33 \rho_w \frac{f_y}{300}$ if ρ_w > 0.07% $\rho_w = \left(\frac{\pi}{4} \times 12^2 \times 3\right) / (190 \times 0.8 \times 1.6) \times 100$

$C_1 = 0.076$ $= 0.14\%$

$C_2 = 1.0$ $l_e / l_w > 1.0$

$V_m = (0.076 + 1) \times 0.519$

$= 0.558$ $(\mu = 1.0)$

$V_p = 0.9 \times \frac{N^*}{b_w d} \tan\alpha$

$\frac{0.9 \times 100}{(0.19 \times 0.8 \times 1.6)} \tan 28$

$= 0.196$

$V_s = C_3 \frac{A_v f_y}{b_w s}$

$A_v = 0.15 \times \frac{190 \times 600mm}{500}$

$= 34.2\ mm^2$

$V_s = \frac{10 \times 34.2 \times 500}{190 \times 600}$

$V_s = 0.15$

$V_n = 0.558 + 0.196 + 015 = 0904$

$V_n = 0.904 \times 190 \times 0.8 \times 1600$

$V_n = 219.9\ kN$

$\phi V_n = 0.65 \times 214.9 = 142.9$ - OK (HD12 @ 600mm)

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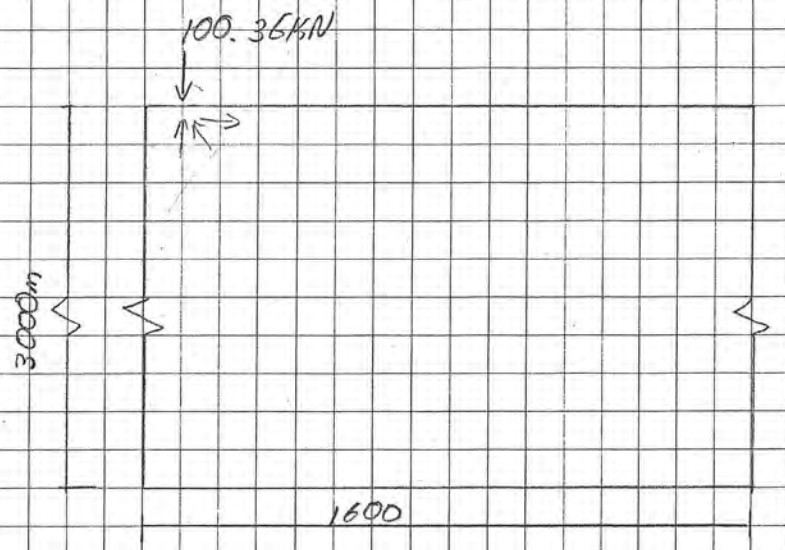
Project
125 Nikau Palm Road

CALCULATIONS

Point load of Beam 2a / Beam 2 / beam 9 / beam 10

52.15KN + 33KN + 12.0 + 8.2 = 105.2 KN



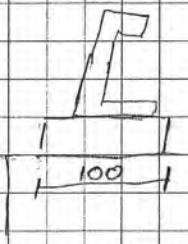
Loads

G: 7.63KN (2a) + 4.66 (2) + 4.31 (9) + 2.95 = 19.55

Q: 28.34KN + 18.28 + 2.38 + 2.27 = 51.27

1.2G + 1.5Q = 100.36

Check bearing failure



Bearing area = 100mm x 190mm
= 19000mm²

$\frac{N}{m^2} = Pa$

Bearing stress = 100.36KN/19000mm²

$\frac{N}{mm^2} = MPa$

= 0.0053 KN/mm²

= 5.3 N/mm²

N² = 5.3 MPa

ØMn = Ø f'm An
= 0.65 x 12MPa x 19000
= 148 KN

OK

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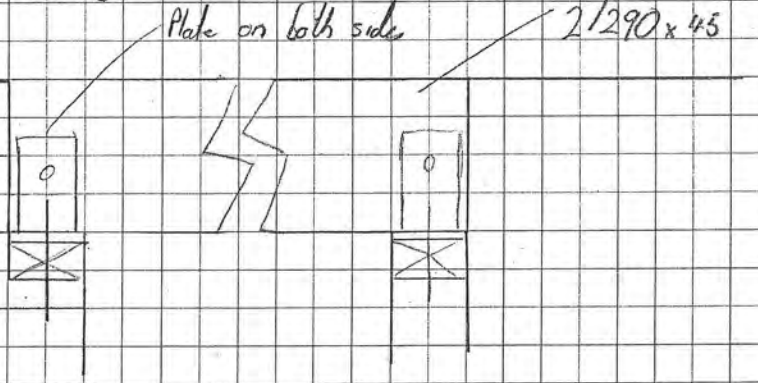
Project
125 Nikau Palm street

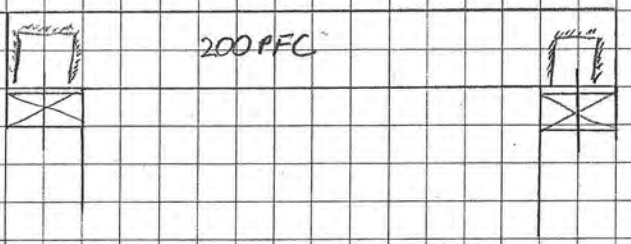
CALCULATIONS

Lintel Connections

(Lintel 1)



Lintel 2



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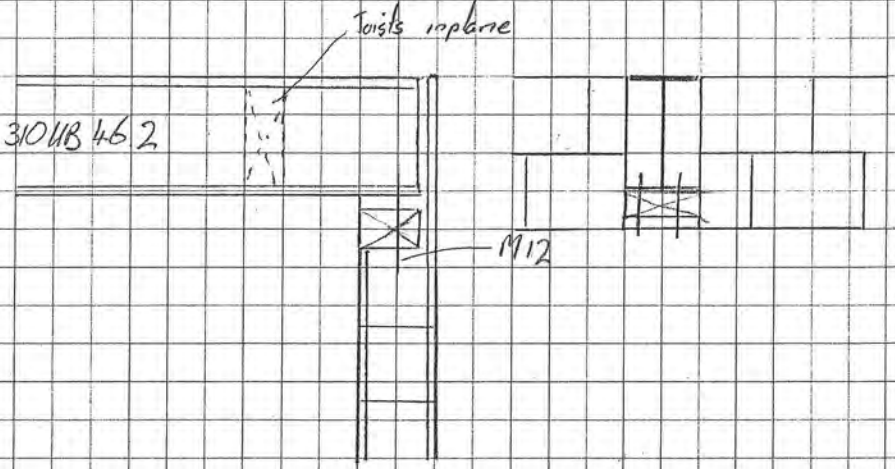
Project 125 Nikau Street			

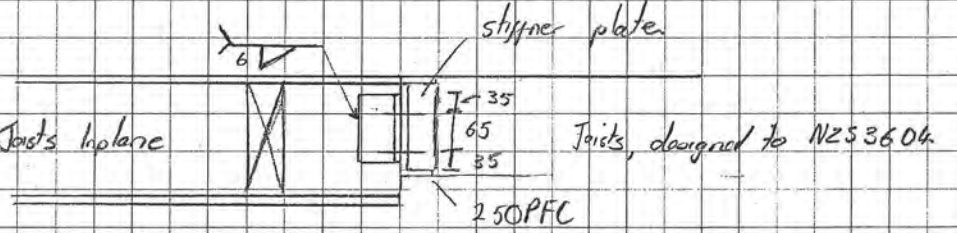
CALCULATIONS

Connections

Beam 1 to block



Beam 1 to Beam 2



Shear force = 20.37 KN

From Table 7.2.4.2 Design capacities of equal leg fillet weld

$\phi = 0.6$

$\Rightarrow \phi V_w = 0.626$ KN/mm for 6mm weld.

$\Rightarrow$ for 50mm weld $\Rightarrow$ 50mm x 0.626 = 31.3 - OK

2 M12 bolts $\Rightarrow$ Grade 4.6, threads included

$\Rightarrow$ 15.1 KN/bolt $\Rightarrow$ 2 bolts needed.

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Project: 125 Nikau Street.

CALCULATIONS

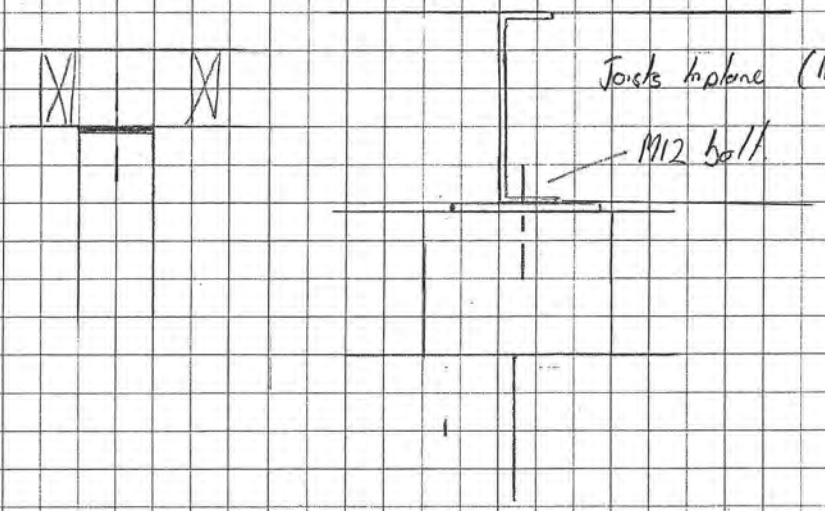
Connections Continued

Beam 2 and 2a

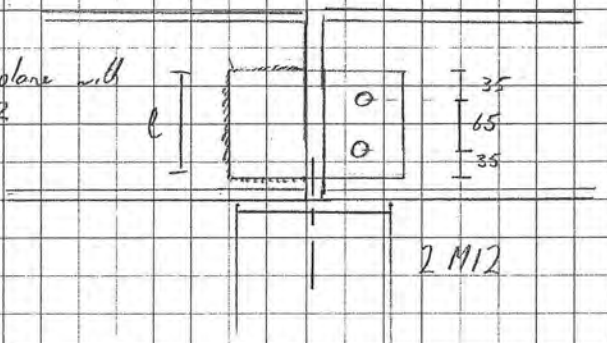
BEAM 2 — BEAM 2a

Connection 1 (block wall) — Connection 2 (block wall) — connection 3 (timber wall)

Connection 1



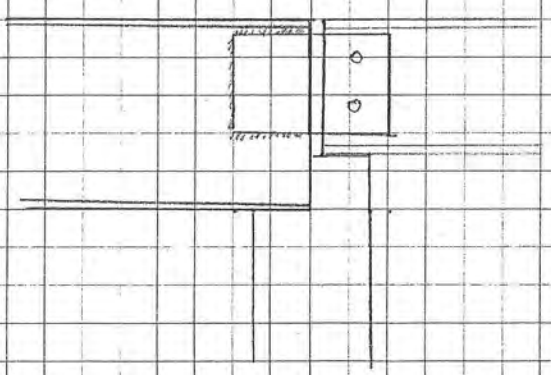
Joists Inplane with beam 2



$V^* = 33\,kN$

$l > 33/0.626 = 53\,mm$

Connection 3



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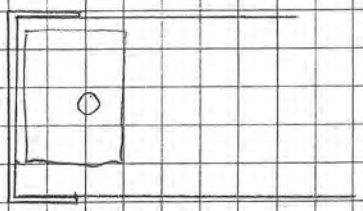
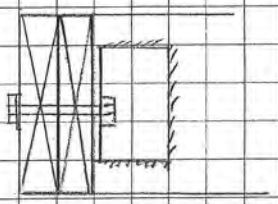
Project
125 Nikau Palm

CALCULATIONS

Beam 2 - Beam 3





Checking strength of Multigrip attaching posi strut to PFC load:

$1.2G + 1.5Q = 1.2(0.4m \times 0.3kPa) + 1.5(0.4 \times 1.5kPa)$
$= 1.04kN/m$

⇒ Shear force demand

$V^* = 1.04kN \times \text{length}/2$

$= 1.04kN/m \times 7.5/2$

$= 3.91kN$

lumberlock .91

7 Nails on each side of the connector and 2 connectors on each Posistrut

$S^* \leq \phi Q_n \quad (\phi = 0.8)$ lateral loading.

$Q_n = nkQ$ $r_{max} = 65$

$k = .85 \times 0.8^{1.65} \times 1.25 \times 0.631kN \times 10$ < 30mm steel

$= 0.536$

$Q_n = 14 \times 0.536 = 7.5kN > 3.9$ OK

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Date 03/03/09	Eng. M.Y	Job No.	Sheet No. 63
Project 125 Nikau Palm			

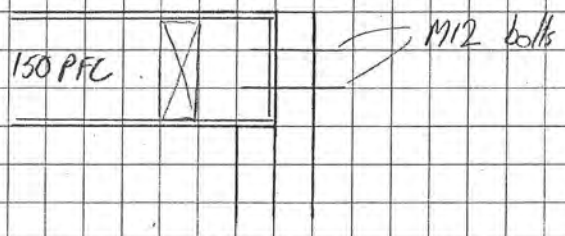
CALCULATIONS

Beam 4

RHE Same as Beam 1 to block Wall

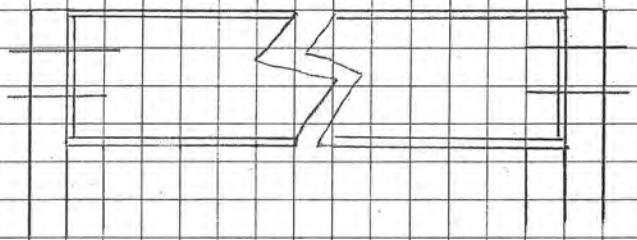
LHE

Joists Inplane



Beam 7

Inplane with Joists

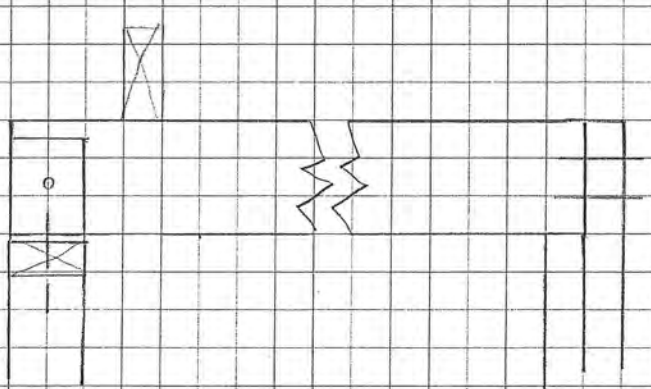


Beam 5 (Inplane with joists

LHS : See end connection of beam 2a

RHS : Same as Beam 7

Beam 6 (Below Joists)



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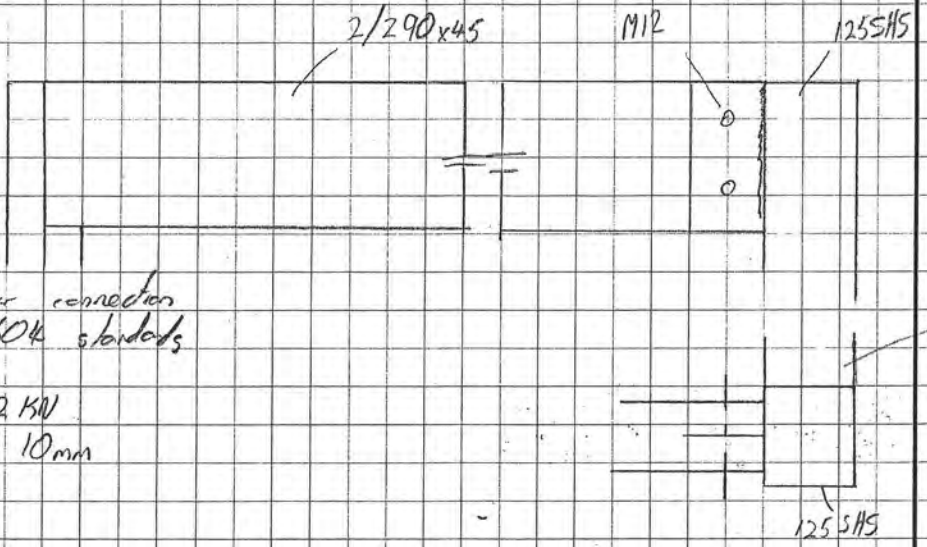
Project
125 Nikau Palm

CALCULATIONS

Connections

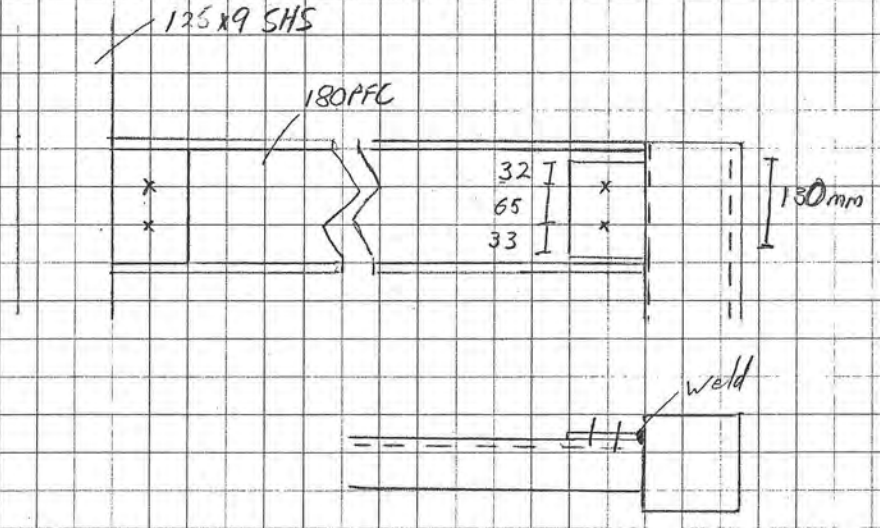
Beam 8



Timber - Timber connection
⇒ To NZS3604 standards

$W_{t\,up}$ = 6.22 KN
Weld length > 10mm

Beam 9



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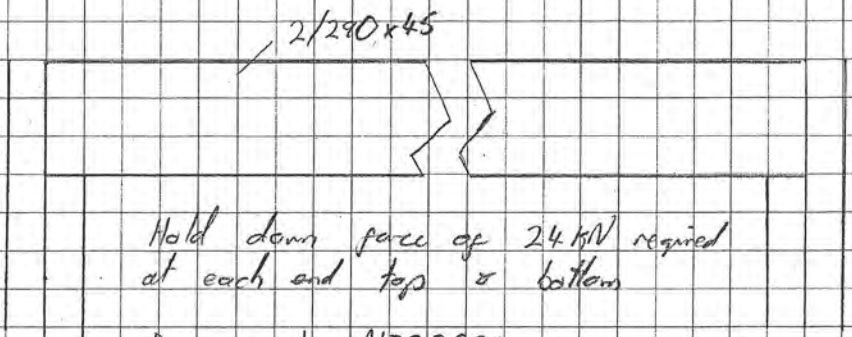
Project 125 Nikau Palm			

CALCULATIONS

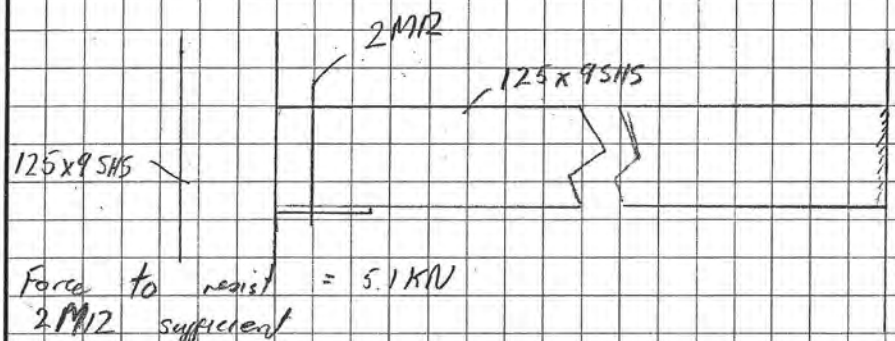
Beam 10



Hold down force of 24 kN required at each end top & bottom

Design to NZS3604

Beam 11

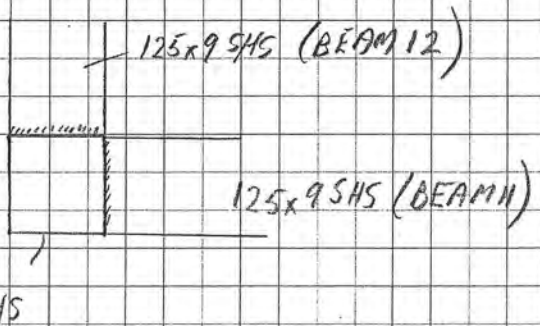


Force to resist = 5.1 kN
2M12 sufficient

Beam 12

Same as 11

Column between beam 11 & 12



F14-06/02

Date	Eng.	Job No.	Sheet No.
5/03/09	M.Y	23040	67

Project: 125 Nikau Street

CALCULATIONS

Columns

Column 1

load

G: 0.35kPa x (1.5m x 2.5m) = 1.31 KN

Q 2.0 kPa x (1.5m x 2.5m) = 7.5KN

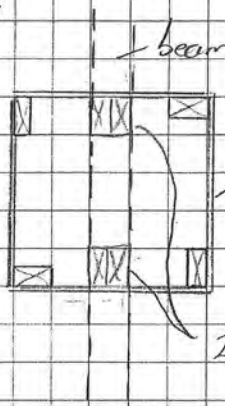
Combinations

1.2G + 1.5Q = 12.8 KN

Column

4 x 90 x 45 MSG8 members (One in each corner)

Bracing for columns covered by NZS3604.



Cladding is self supporting for gravity.

Seismic loads

The cladding around column can be covered by NZS3604

F14-06/02

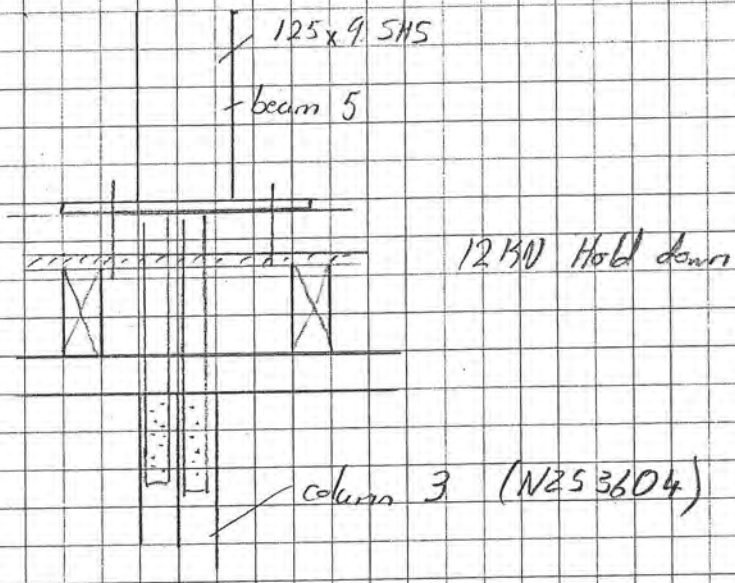
Date 6/03/09	Eng. M Y	Job No.	Sheet No. 68

Project
125 Nikau Palm

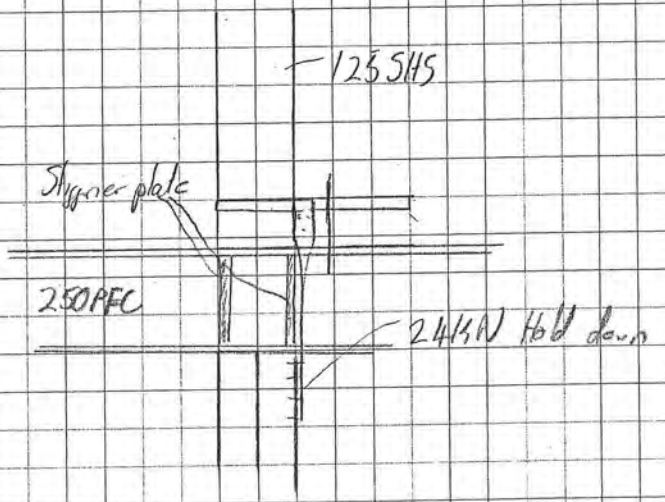
CALCULATIONS

Column Connections

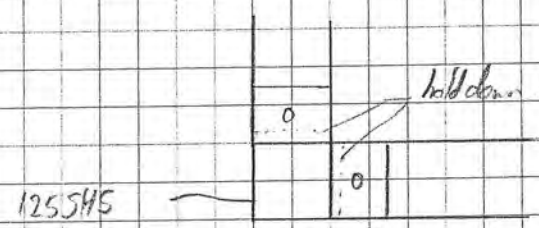
Column 5 base (top of Column 3)



Column 6 base (top of Column 4)



Plan



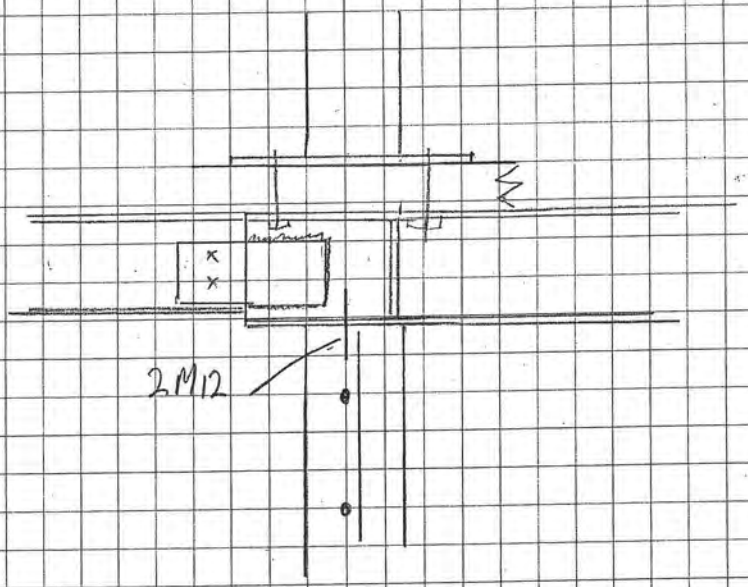
F14-06/02

Date	Eng.	Job No.	Sheet No.
6/03/09	M.Y	23040	69

Project
125 Nikau Palm

CALCULATIONS

Column 7



Job Number	23040		ISP Consulting Engineers Ltd
Date	6-Mar-09	Signed	Scala Penetrometer Results Sheet
Location	125 Nikau Palm Road		ISP Centre, 14 Laings Road
	Paraparaumu		P O Box 30535, Lower Hutt
Client			Tel (04) 566 8004 Fax (04) 566 8037

Notes

Probe Number 1

Depth	No.
50	1
100	4
150	6
200	8
250	6
300	5
350	4
400	6
450	11
500	14
550	12
600	12
650	17
700	0
750	0
800	0
850	0
900	0
950	0
1000	0
1050	0
1100	0
1150	0
1200	0
1250	0
1300	0
1350	0
1400	0
1450	0
1500	0
1550	0
1600	0
1650	0
1700	0
1750	0
1800	0
1850	0
1900	0
1950	0
2000	0
2050	0
2100	0
2150	0
2200	0
2250	0
2300	0
2350	0
2400	0
2450	0
2500	0
2550	0
2600	0
2650	0
2700	0
2750	0
2800	0
2850	0
2900	0
2950	0
3000	0
3050	0
3100	0
3150	0
3200	0
3250	0
3300	0
3350	0
3400	0
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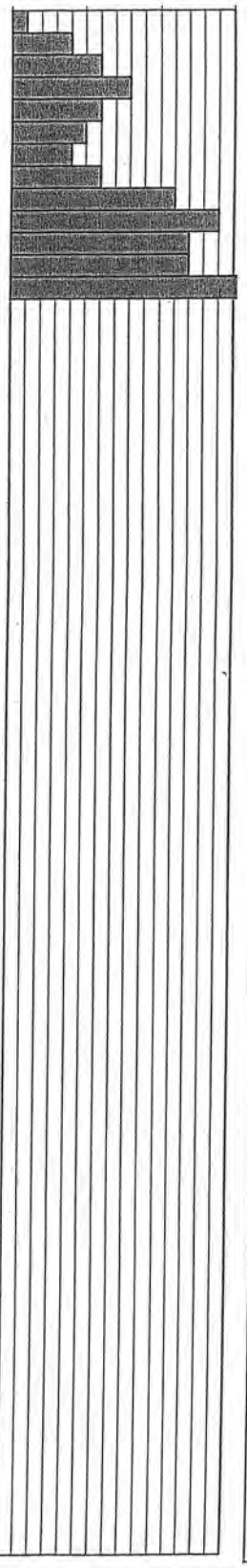
3500	0



Probe Number 2

Front

Depth	No.
50	1
100	1
150	2
200	2
250	2
300	3
350	2
400	3
450	3
500	4
550	3
600	4
650	4
700	3
750	3
800	2
850	4
900	4
950	4
1000	7
1050	6
1100	5
1150	5
1200	5
1250	6
1300	9
1350	9
1400	12
1450	0
1500	0
1550	0
1600	0
1650	0
1700	0
1750	0
1800	0
1850	0
1900	0
1950	0
2000	0
2050	0
2100	0
2150	0
2200	0
2250	0
2300	0
2350	0
2400	0
2450	0
2500	0
2550	0
2600	0
2650	0
2700	0
2750	0
2800	0
2850	0
2900	0
2950	0
3000	0
3050	0
3100	0
3150	0
3200	0
3250	0
3300	0
3350	0
3400	0
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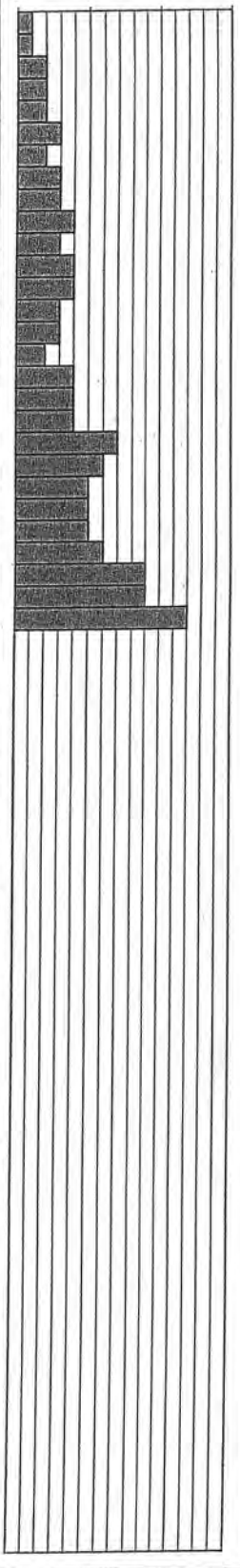
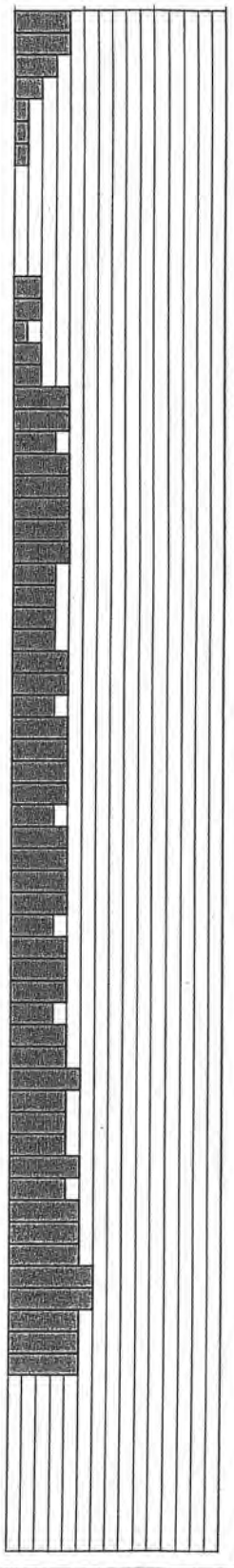
3500	0



Probe Number 3

Front

Depth	No.
50	4
100	4
150	3
200	2
250	1
300	1
350	1
400	0
450	0
500	0
550	0
600	0
650	2
700	2
750	1
800	2
850	2
900	4
950	4
1000	3
1050	4
1100	4
1150	4
1200	4
1250	4
1300	3
1350	3
1400	3
1450	3
1500	4
1550	4
1600	3
1650	4
1700	4
1750	4
1800	4
1850	3
1900	4
1950	4
2000	4
2050	4
2100	3
2150	4
2200	4
2250	4
2300	3
2350	4
2400	4
2450	5
2500	4
2550	4
2600	4
2650	5
2700	4
2750	5
2800	5
2850	5
2900	6
2950	6
3000	5
3050	5
3100	5
3150	0
3200	0
3250	0
3300	0
3350	0
3400	0
3450	0
3500	0

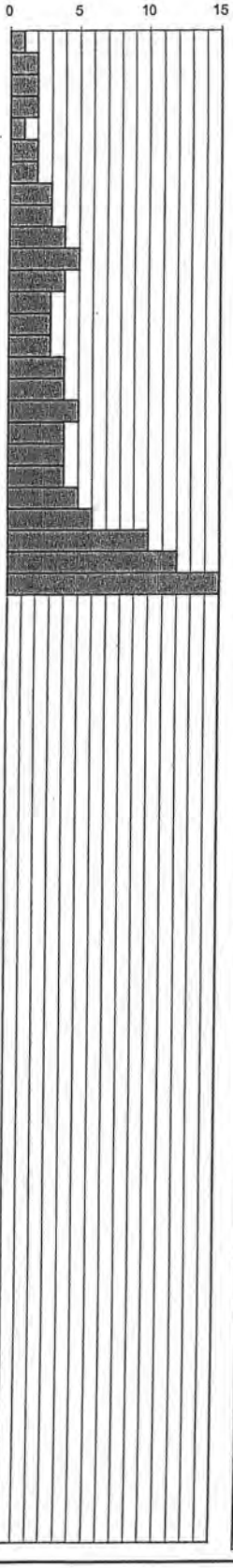


Job Number	23040		ISP Consulting Engineers Ltd
Date	6-Mar-09	Signed	Scala Penetrometer Results Sheet
Location	125 Nikau Palm Road		ISP Centre, 14 Laings Road
	Paraparaumu		P O Box 30535, Lower Hutt
Client			Tel (04) 566 8004 Fax (04) 566 8037

Notes

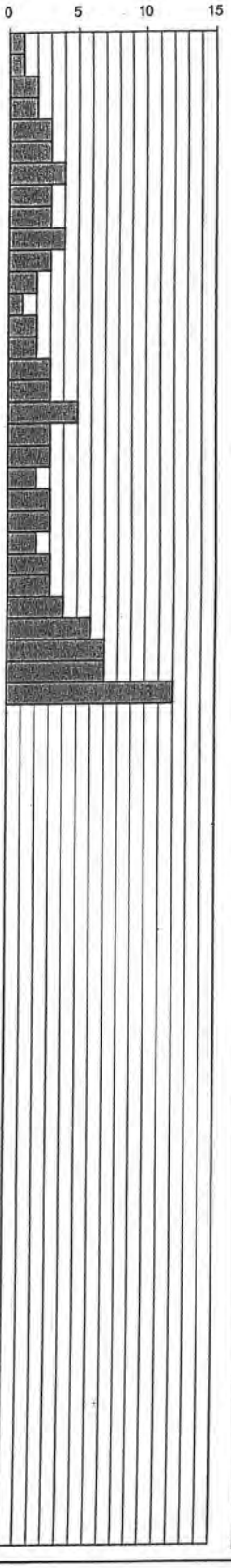
Probe Number 4

Depth	No.
50	1
100	2
150	2
200	2
250	1
300	2
350	2
400	3
450	3
500	4
550	5
600	4
650	3
700	3
750	3
800	4
850	4
900	5
950	4
1000	4
1050	4
1100	5
1150	6
1200	10
1250	12
1300	15
1350	0
1400	0
1450	0
1500	0
1550	0
1600	0
1650	0
1700	0
1750	0
1800	0
1850	0
1900	0
1950	0
2000	0
2050	0
2100	0
2150	0
2200	0
2250	0
2300	0
2350	0
2400	0
2450	0
2500	0
2550	0
2600	0
2650	0
2700	0
2750	0
2800	0
2850	0
2900	0
2950	0
3000	0
3050	0
3100	0
3150	0
3200	0
3250	0
3300	0
3350	0
3400	0
3450	0
3500	0



Probe Number 5

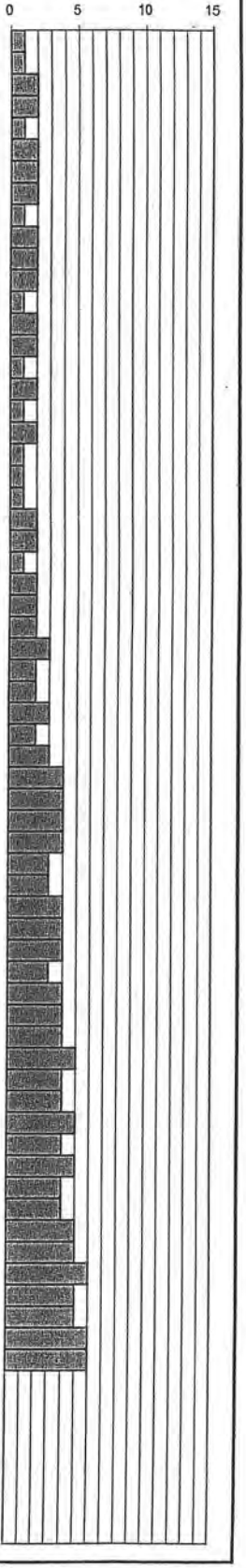
Depth	No.
50	1
100	1
150	2
200	2
250	3
300	3
350	4
400	3
450	3
500	4
550	3
600	2
650	1
700	2
750	2
800	3
850	3
900	5
950	3
1000	3
1050	2
1100	3
1150	3
1200	2
1250	3
1300	3
1350	4
1400	6
1450	7
1500	7
1550	12
1600	0
1650	0
1700	0
1750	0
1800	0
1850	0
1900	0
1950	0
2000	0
2050	0
2100	0
2150	0
2200	0
2250	0
2300	0
2350	0
2400	0
2450	0
2500	0
2550	0
2600	0
2650	0
2700	0
2750	0
2800	0
2850	0
2900	0
2950	0
3000	0
3050	0
3100	0
3150	0
3200	0
3250	0
3300	0
3350	0
3400	0
3450	0
3500	0



Probe Number 6

Front

Depth	No.
50	1
100	1
150	2
200	2
250	1
300	2
350	2
400	2
450	1
500	2
550	2
600	2
650	1
700	2
750	2
800	1
850	2
900	1
950	2
1000	1
1050	1
1100	1
1150	2
1200	2
1250	1
1300	2
1350	2
1400	2
1450	3
1500	2
1550	2
1600	3
1650	2
1700	3
1750	4
1800	4
1850	4
1900	4
1950	3
2000	3
2050	4
2100	4
2150	4
2200	3
2250	4
2300	4
2350	4
2400	5
2450	4
2500	4
2550	5
2600	4
2650	5
2700	4
2750	4
2800	5
2850	5
2900	6
2950	5
3000	5
3050	6
3100	6
3150	0
3200	0
3250	0
3300	0
3350	0
3400	0
3450	0
3500	0



Gould
TANK SYSTEMS
A division of Wright Tanks Ltd.
Water Tanks • Sewage Systems • Water Pumps • Filtered Septic Tanks • Septic Filters

8th September 2008

Kapiti Coast District Council
Private Bag 601
PARAPARAUMU
Attention: **Barry McLennon**

Dear Barry,

Re: **PS 1**
Roulston Property
125 Nikau Palm Road
Nikau Valley
PARAPARAUMU

I write to confirm that the enclosed plans for the above named property and reports and all specifications to do with the sewage disposal system for the proposed installation complies with the relevant provisions of the building code and is installed and constructed as per AS/NZS1546.1 and AS/NZS1547:2000 as well as TP58. Gould Tank Systems is a member of the New Zealand Concrete Tank Manufacturers Association.

All plans and drawings have been drawn up and assessed by a suitably qualified professional and as an independent suitably qualified professional to complete this work (and covered by a current policy of professional indemnity insurance to a minimum value of $250,000) I hereby declare that all of the work to be completed by Gould Tank Systems specifications will be signed off by the writer.

A Producer Statement will also be issued after the installation of the above work has been completed.

Regards

Andrew Wright
Director
Registration Number: 23958

FREEPHONE 0800 253 273
TEL 06 353·6157 • FAX 06 353·3020 • MOBILE 021 505·198
email: gouldtanks@xtra.co.nz • website: gouldtanks.com
PO BOX 4777 • PALMERSTON NORTH 4442

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Proposed Sewage System Installation

Date:	08/09/2008
Client:	Roulston Property
Site Address:	125 Nikau Palm Road Nikau valley PARAPARAUMU
District Authority:	Kapiti Coast District Council
Regional Authority:	Greater Wellington Regional Council

A review of onsite wastewater treatment requirements and system design of land application field for 125 Nikau Palm Road.

Site Inspection Report – to be read in conjunction with enclosed site plan.

We have carried out our assessment of the above reference site for the purpose of determining the requirement for the onsite treatment and land application of domestic wastewater (effluent) generated from the proposed three bedroom dwelling. The purpose of this report therefore is to determine the suitability and satisfactory position and location of a new sewage system and specially designed land application area.

After a site visit of the Roulston property on Thursday the 4th of September 2008 inspection of the soil structure within the proposed land application area, revealed that there was a silty topsoil ranging in depth between 125mm – 140mm and this was overlaying a silty clay structure to a depth of 700mm. At this point there was no ground water encountered. However this is an elevated site.

These results place the property in category 4 - 5, indicating that the area has imperfectly to poorly drained soils, also indicating that an evapotranspiration sewage land application system is required, in order to obtain a suitable evapotranspiration rate and a low hydraulic loading rate to have a nil environmental impact.

Good evaporation will occur within the upper soils present and also an average amount of soakage will occur within the silty clay structure present beneath, suggesting that the effluent land application area would have an LTAR of 5 - 6 litres of secondary treated effluent per square metre per day. However, the proposed sewage treatment plant will have a DLR of 3 litres per square metre per day.

The three bedroom dwelling will provide accommodation for no more than six people. 6 people @ 180 litres per person per day

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= 1080 litres per day
* 1080 litres divided by 360 square metres
= 3 litres per square metre per day

The proposed sewage system is a five stage Gould GT10,000 Series Wastewater Treatment Plant, with a total capacity of 10,000 litres. A Gould GT500 disc-filter is used within the system in the final stage of filtration, producing a high effluent quality. The plant will be located approximately 7 metres on the South Western side of the dwelling, as indicated on the enclosed site plan. There will be 15 rows of drip irrigation line each ranging in length between 10 – 30m and 1 metre apart. These drip irrigation lines will be on the South- South Western side of the dwelling, as indicated on the enclosed site plan.

The drip irrigation lines will be buried to a depth of 200mm in a specially designed terrace raised beds and planted up as a feature garden. The drip irrigation lines will have emitters at 600mm centres and will release effluent at 2.2 litres per hour per each emitter. This will create our effluent land application area of 360 square metres resulting in our DLR rate of 3 litres per square metre per day.

The land application area will be more than 20 metres away from any open waterway, open water drain and neighbouring land application area. The drip irrigation line at its closest point will be approximately 8 metres from the Southern side boundary, as indicated on the enclosed site plan.

We strongly advise clients to plant small trees and shrubs over the land application area in order to increase the volume of discharged treated effluent that is transpirated as this greatly assists the treatment of released effluent and a list of suitable plants will be supplied to the client. Planting is advised with a soil category over 3 or in an environmentally sensitive area. This area has been designated as an effluent land application area and no stock or vehicle access is allowed on the land application area itself.

This effluent site plan and the Gould GT10,000 Sewage System is in general accordance with AS/NZS 1547.2000. Gould Tank Systems also comply with AS/NZS 1546.1 and is a member of the New Zealand Concrete Tank Manufacturers Association. Gould Tank Systems have installed a number of tanks in this area for the last 11 years from LPED systems to treatment plants utilizing drip irrigation lines and ETS beds, and all systems to date are working well with service and maintenance contracts.

The installation of a Gould GT10,000 Series Wastewater Treatment Plant includes a three year service contract and thereafter the owner enters into a maintenance contract with Gould Tank Systems that allows for bi-annual services at an approximate cost of $90.00 plus GST per visit (subject to change). These services are to be conducted only by Gould Tank Systems employees or approved installers. This sewage system will be installed by Gould Tank Systems or their nominated installers.

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The following practices are strongly recommended to assist in the continual smooth operation of the treatment plant:

1: Minimal sanitary products and no nappies should be introduced into the tank
2: Water should be conserved
3: No strong chemicals or cleaners should be introduced into the tank, and we recommend the use of environmentally friendly products
4: The tank should be pumped out regularly; the average period between emptying is three to five years however this may vary depending on the use of the particular system.

All fixtures, vent pipes and fittings required by the building code are to be supplied and fitted by the owners' drainlayer. The concrete treatment plant is guaranteed for a period of fifteen years and all pumps and electrical fittings are guaranteed for 2 years.

Regards

Andrew Wright
Director
Registration Number: 23958

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WASTEWATER TECHNOLOGY

FREEPHONE: 0800 253 273

This Gould Sewage Treatment Plant carries a three-year service contract.

Contract: Roulston Property
Location: 125 Nikau Palm Road
Nikau Valley
PARAPARAUMU

Date Drawn: 8th September 2008

The 3 bedroom dwelling will support 6 people producing 180 litres of wastewater per person per day = 1080 litres of wastewater per day disposed over 360 square metres = 3 litres per square metre per day

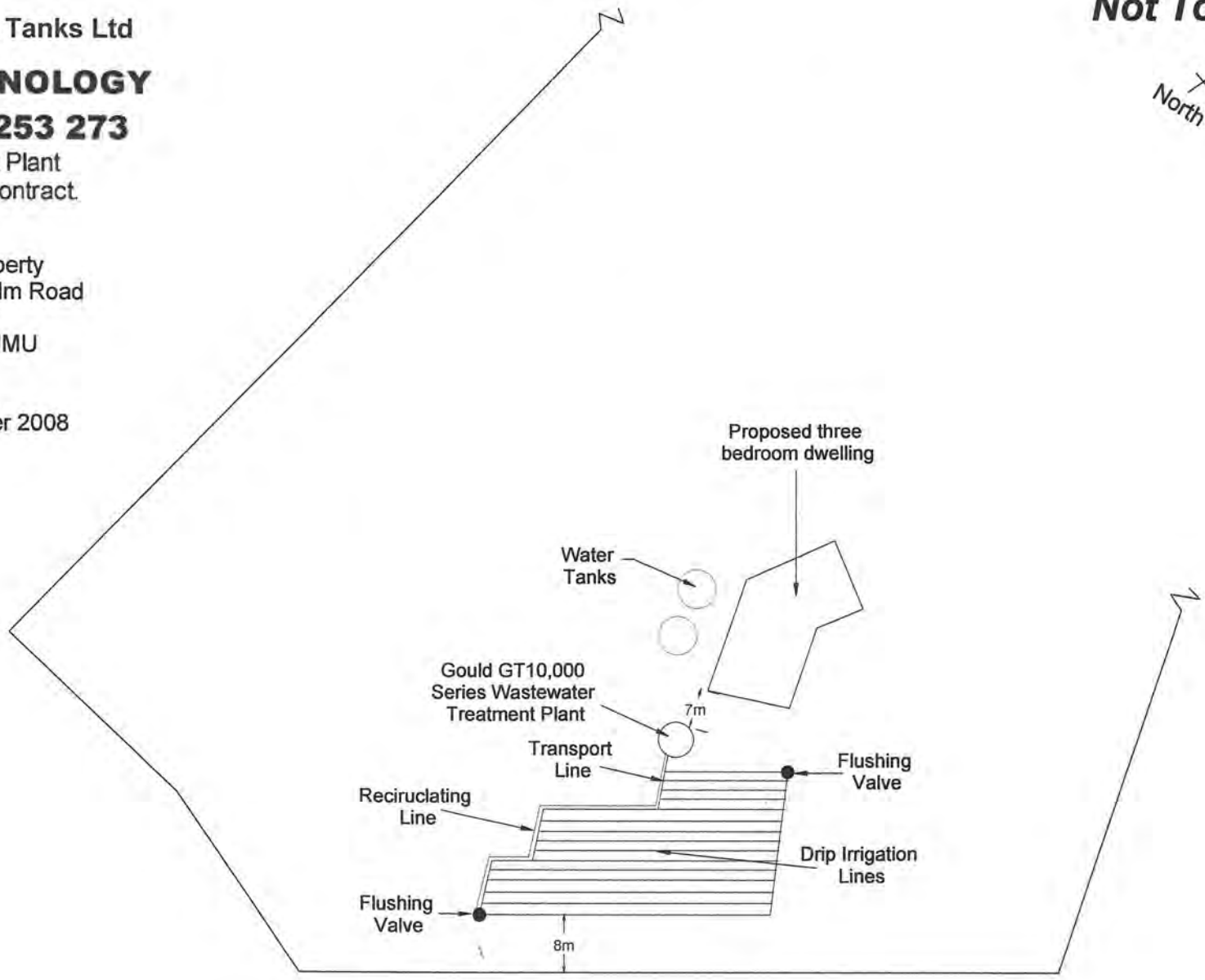
15 rows of drip irrigation lines, ranging in length from 10-30m buried to a depth of 200mm in a specially designed raised bed and planted up as a feature.

The drip irrigation lines will have emitters at 600mm centres and will release effluent at 2.2 litres per hour.

Effluent land application area will be located more than 20 metres from any open waterway or open water drain.

Site plan to be read in conjunction with enclosed site inspection report

Not To Scale

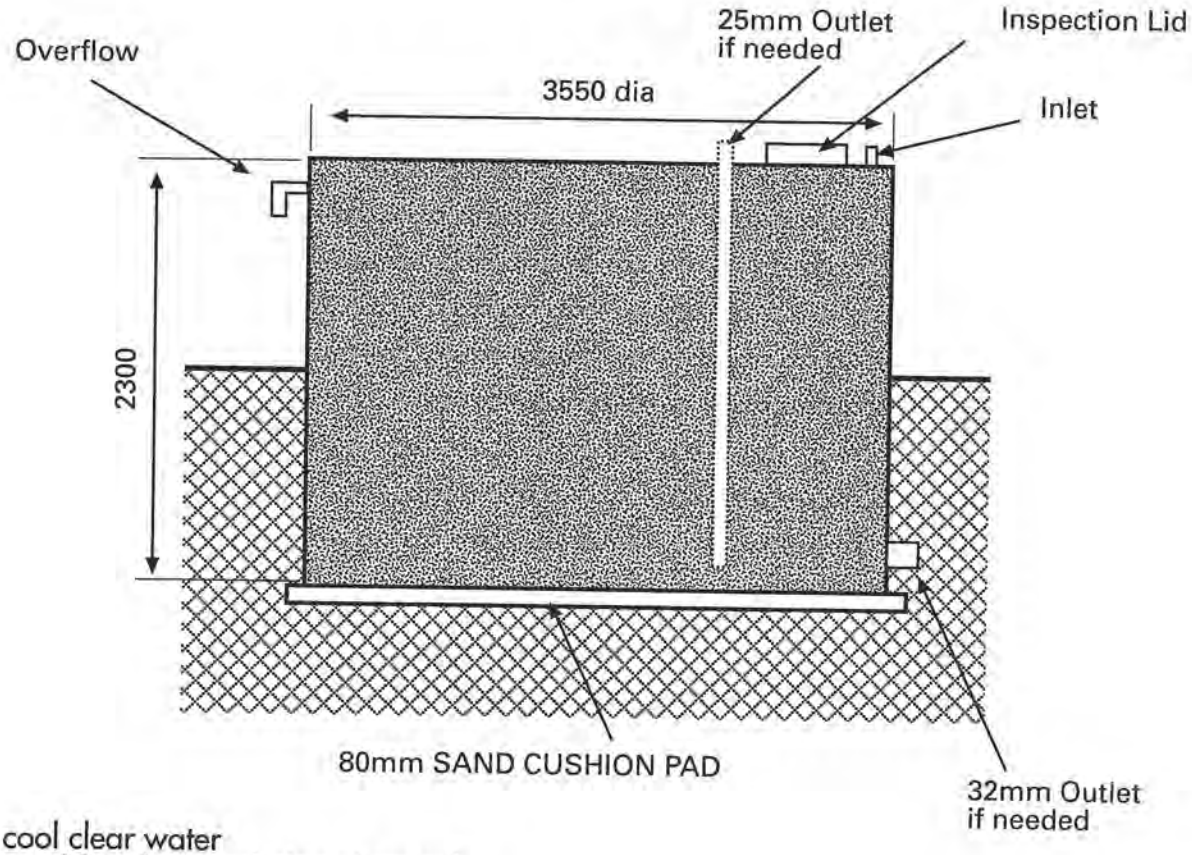


GTS

GOULD TANK SYSTEMS

Water Tanks • Sewage Systems • Water Pumps • Filtered Septic Tanks • Septic Filters

GOULD WATER TANKS CAN BE COMPLETELY OR PARTIALLY BURIED SAFELY



- For cool clear water
- No need for algae reducing chemicals
- Individually handcrafted with pride
- Engineer designed
- Heavy duty reinforcing for strength and reliability
- 32mm outlet standard to match new generation performance pumps
- Installed by truck mounted crane

Sizes from 5,000 litres to 20,000 litres

Litres	Price
5,000	$ 1900 + GST
10,000	$ 2400 + GST
15,000	$ N/A
20,000	$ 3300 + GST

$3600 + GST without septic

GOULD WATER TANKS STAND THE TEST OF TIME

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TEL 64 6 353-6157 • FAX 64 6 353-3020 • MOBILE 021 505-198

PO BOX 4196 • PALMERSTON NORTH

email: gouldtanks@xtra.co.nz

website: gouldtanks.com

HJ COOPER

MADE TO LAST. END OF STORY

Water Heating ▸ Electric Water Heating ▸ Mains Pressure

The H J Copper range of Mains Pressure storage cylinders are manufactured from a high grade corrosion resistant stainless steel Known as duplex.

For the water heating industry stainless steel offers the benefits of excellent corrosion resistance, tolerance of high flow rates, strength, and excellent durability The material's excellent resistance to corrosion compared to mild steels eliminates the need for a protective coating and sacrificial anode. Stainless steel is also environmentally friendly; and 100 per cent recyclable.

"When compared to other materials that could be used in the production of storage cylinders the benefits of stainless steel become increasingly apparent. Mild steel is utilised on large and small unvented systems manufactured in Europe and the USA. Mild steel requires corrosion protection, usually comprising a glass lining and a sacrificial anode. The anode must be inspected every year for erosion and replaced if necessary, making mild steel storage cylinders high maintenance. Mild steel glass lined cylinders are very heavy – a stainless steel unit is less than half the weight of an equivalent glass-lined unit and is therefore far easier to transport and handle."

There are four sizes available:

135L

180L

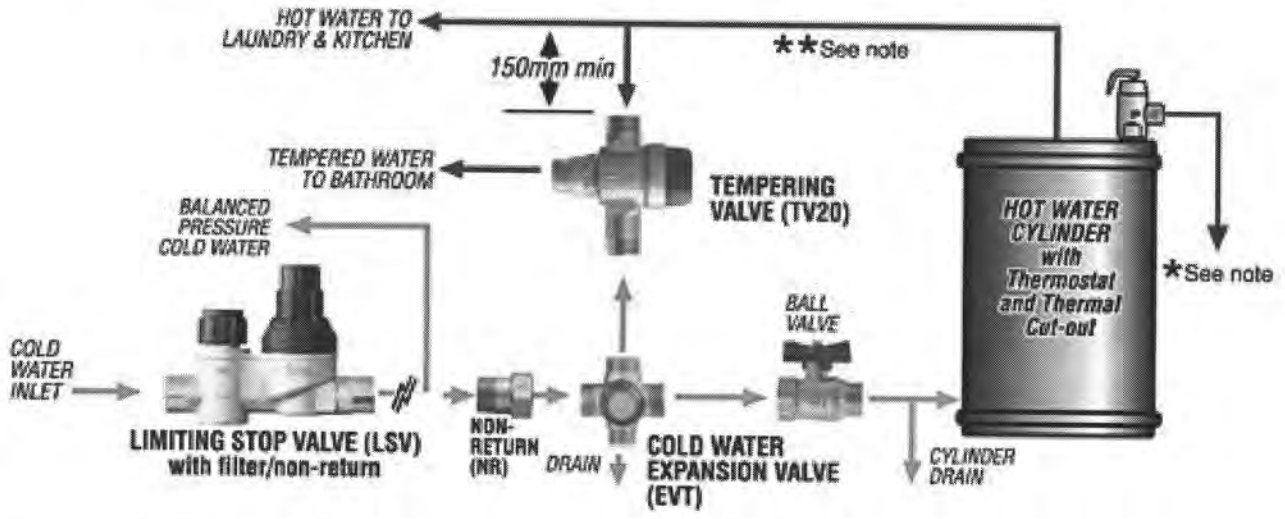
250L

300L

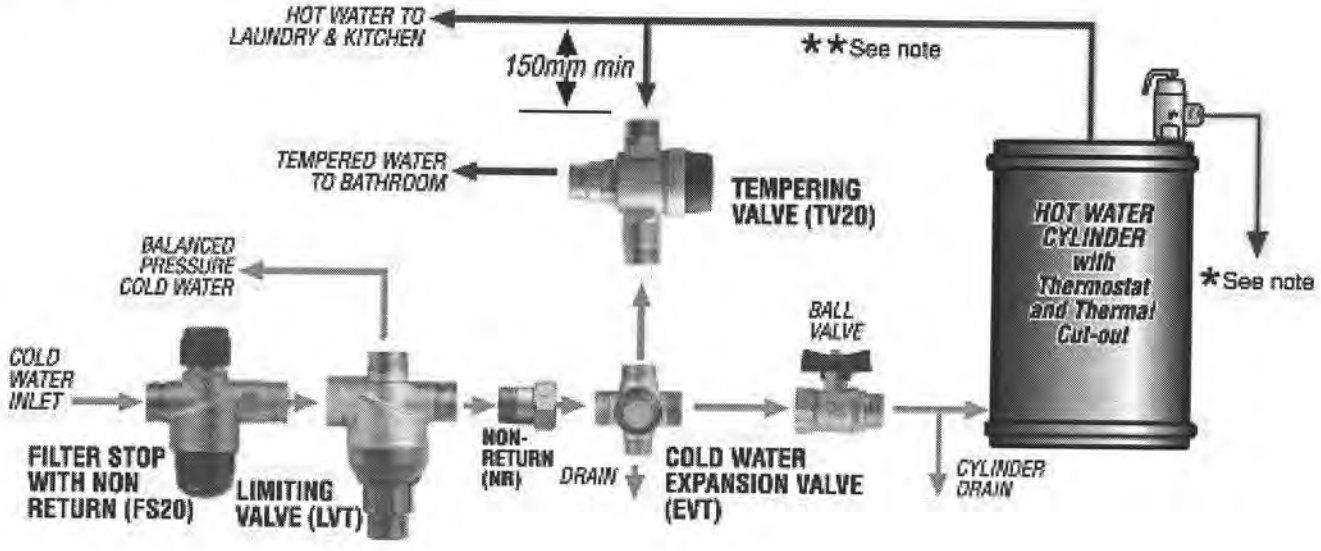
All of these cylinders come in a convenient 550ml diameter

High (Mains) Pressure - Valve Vented

High Mains Pressure Valve Vented - incorporating Limiting Stop Valve



High Mains Pressure Valve Vented - Alternative



Notes:

* If the drain exceeds a factor of 12 as a combination of length in meters and number of bends (e.g.. 7 metres & 5 bends) we recommend the installation of an **SVB vacuum break.**

** 1.0m minimum copper pipe length from cylinder to Tempering Valve

SKYSTREAM 3.7™ 33.5 ft (10.2 m) Monopole Tower

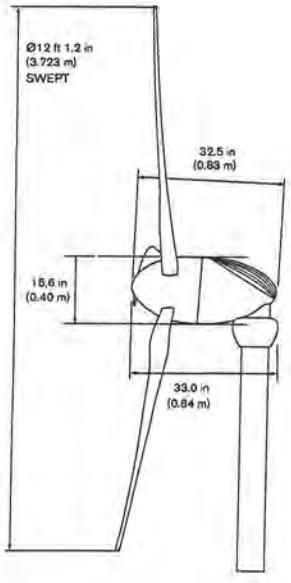
Technical Specifications

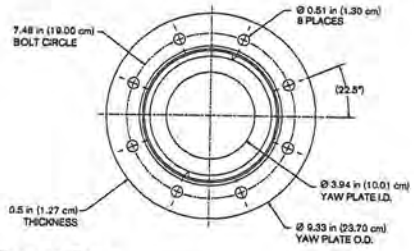
Tower:	Freestanding Tapered Tubular Steel / Galvanized Finish
Tower Weight:	550 lb (249.5 kg)

Top of Tower Loads at 146 mph (65.3 m/s) wind speed

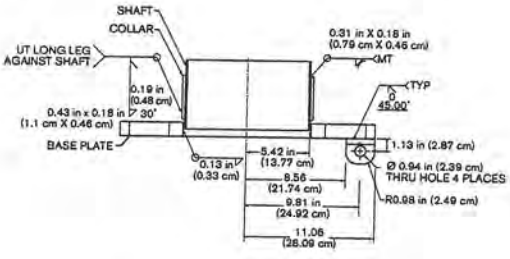
Thrust Force:	630 lb (2802 N)*
Peak Bending Moment:	1130 ft-lb (top of tower) (1532 N-m)*
Downward Axial Force:	230 lb (1023 N)*

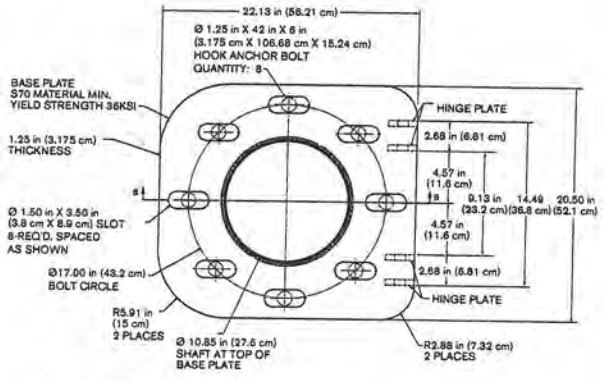
*Loads do not include safety factor. SWWP recommends minimum safety factor of 1.5.





1. Tower Top





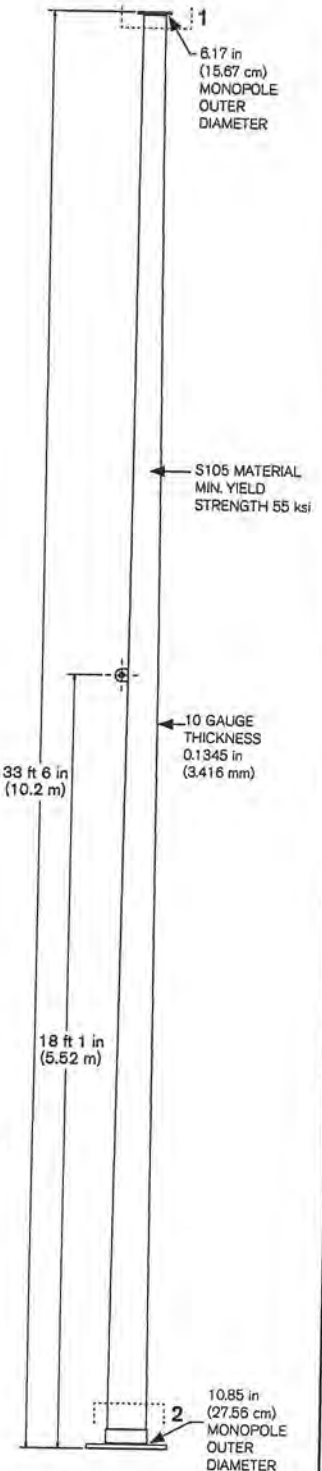
2. Tower Base

Dimensions

Prop Tip to Center of Tower:
31 in (79 cm)

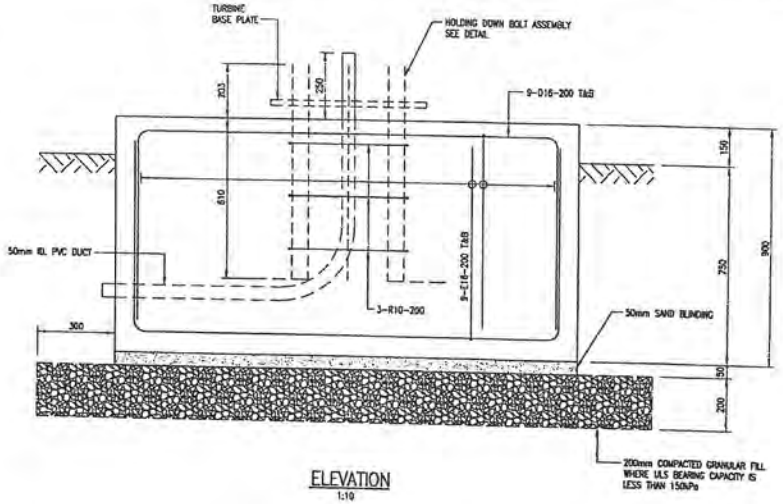
Minimum Tip Clearance:
27 in (69 cm)

Max Tower Diameter at Tip:
8 in (20 cm)

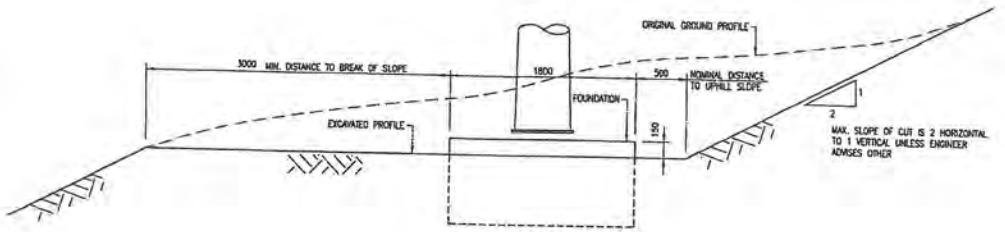


Tower

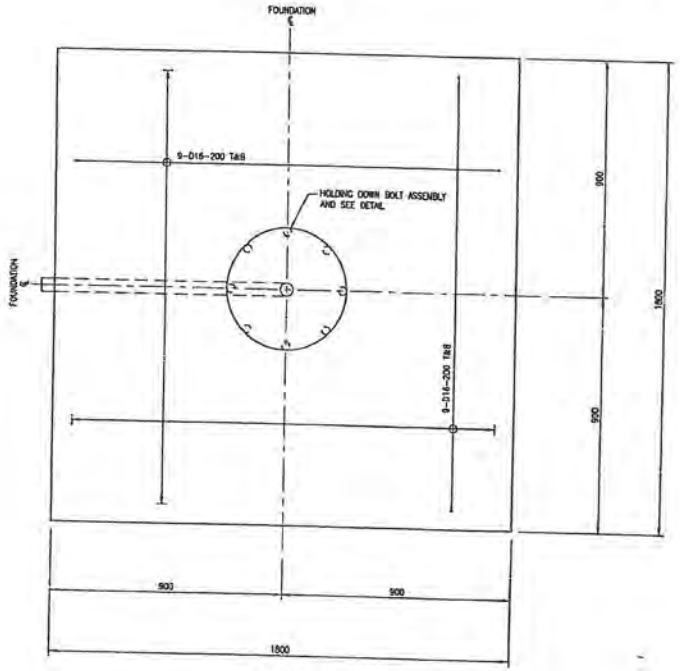
Southwest Windpower
1801 W. Route 66 • Flagstaff, AZ 86001
Tel 928.779.9463 • Fax 928.779.1485
www.skystreamenergy.com



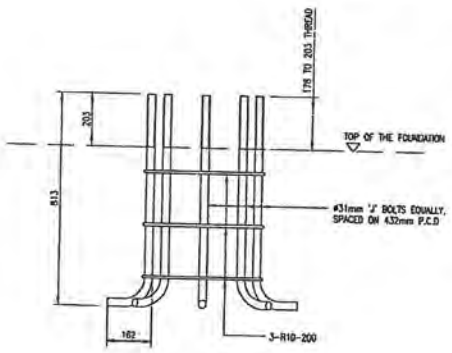
ELEVATION
1:10

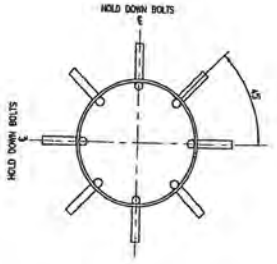


FOUNDATION PLATFORM DETAIL
1:25



PLAN
1:10





HOLDING DOWN BOLT ASSEMBLY
1:10
SEE NOTE 5

NOTES

1. THIS STANDARD FOUNDATION APPLIES TO THE SKYSTREAM 3.7 (1.8kW), 10m HIGH DOMESTIC WIND TURBINE.
2. ALL REINFORCEMENT SHALL BE GRADE 500E DEFORMED BARS
3. COVER TO REINFORCEMENT – BOTTOM AND SIDES 75mm
   – TOP 50mm
4. CONCRETE STRENGTH 25MPa
5. ENSURE HOLDING DOWN 'J' BOLTS HAVE BETWEEN 178mm AND 203mm OF THREAD EXTENDING ABOVE THE TOP OF THE CONCRETE PAD.
6. ULS FORCES AT TOWER BASE UNDER THE DESIGN WIND SPEED OF 73m/s (TO NZS 1170.2:2002)

   ARE MOMENT = 35.6kNm
   SHEAR = 3.8kN
   WEIGHT = 3.4kN
7. FOR ERECTION OF TOWER, REFER TO MANUFACTURER'S INSTRUCTION.
8. BEARING CAPACITY TO BE DETERMINED FOR EACH SITE BY SITE SPECIFIC GEOTECHNICAL INVESTIGATION.

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			05/07
DRAWN	A KATONA	I.R.TAYLOR	05/07
APPROVED			

Meridian Energy

OPUS
Wellington Office
PO Box 12-003
Wellington, New Zealand
Tel: +64 4 471 7000
Fax: +64 4 471 1291

TITLE: MERIDIAN ENERGY LIMITED
STANDARD WIND TURBINE FOUNDATION
SKYSTREAM 3.7, 10m HIGH, DOMESTIC TURBINE

FOUNDATION SLAB DETAILS

STATUS	FILE
DRAFT FOR COMMENT	5C1235.00

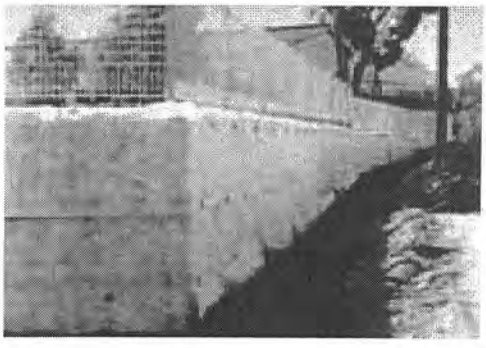
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
1:10, 1:25 (A1)	31/05/07 @ 16:31	5/1946/1	7504	1	R0

GRAPHIC SCALES
1:10 0 100 200 300 400 500 600 700 800 900 1000 mm
1:25 0 400 800 1200 1600 2000 2400 mm

p:\energy\meridian\dwgs\domestic wind turbine fdns\5_1946_1_7504_1_1.dwg ORIGINAL SHEET SIZE A1 [840x594]

nylex
Films & Fabrics

Nylex Drainage Solutions

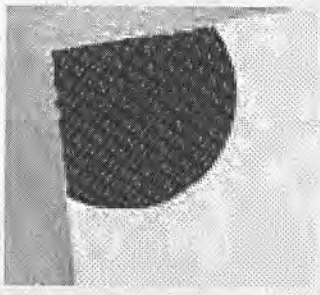


We have the solutions because we have the systems

Nylex pioneered the use of geocomposite sub-surface drainage systems in Australia.

Today the Nylex range of fully filtered, pre fabricated products including root control, are the first choice of specifiers who demand top quality, ease of use and value for money.

Vertical Drainage Solutions



Cordrain™

Cordrain™ is lightweight, easy to install and has been specifically designed to reduce hydrostatic pressure behind structures, reducing the likelihood of structural damage caused by foundation movements in expansive soils.

Application

Basements, retaining walls, bridge abutments, culverts, tunnel lining.

Description

Cordrain™ is a geocomposite vertical drainage blanket, which consists of a plastic cuspated inner core (cuspation on both sides), fitted with a heat bonded, non woven geotextile filter fabric, (bonded on one side only).

Benefits

- Effectively reduces hydrostatic pressure behind walls
- Provides an airlock between drainage layer and wall
- Assists in the waterproofing of structures
- Reduces the likelihood of structural damage caused by foundation movements in expansive soils
- Cordrain™ typically eliminates the need for aggregate or sand backfill
- Easy to handle, quick to install
- Lightweight and flexible

How it works

Cordrain™ is fitted with a heat bonded non woven geotextile and in the vast majority of soils, the geotextile ensures stable filtration of the adjacent soil.

A soil filter develops within the first few millimetres of soil against the geo textile. As water passes from the original soil into the drain, it washes a few small particles with it for a short period of time after installation.

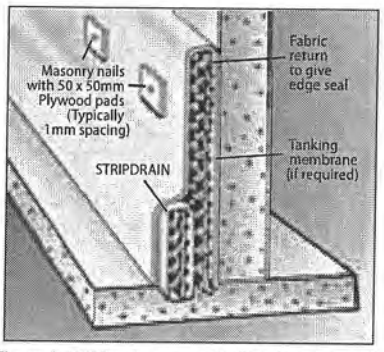


Figure 1. Building basements/cellars (not to scale)

As the particles are washed through, a bridging network of slightly larger particles builds up against the geotextile.

This network prevents further small particles from being washed through, stabilising the soil and allowing only water to pass through the system. (see Fig 2)

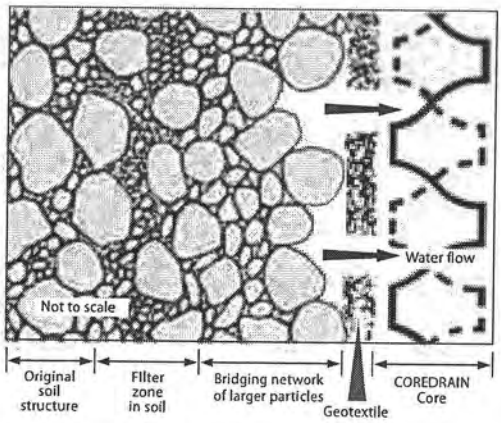


Figure 2. Magnified cross section of Cordrain and soil filter

Product Range

The Cordrain™ range consists of products which will be suitable for most vertical drainage blanket applications.

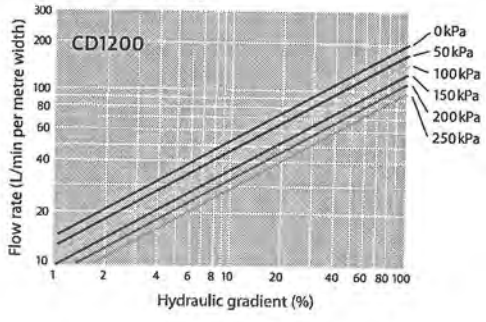
Product	Thickness	Crush strength	Rec. max soil depth
Cordrain/1150	12mm	100kPa	0-10 metres
Cordrain/1200	18mm	250kPa	0-2/2.5 metres

Note:

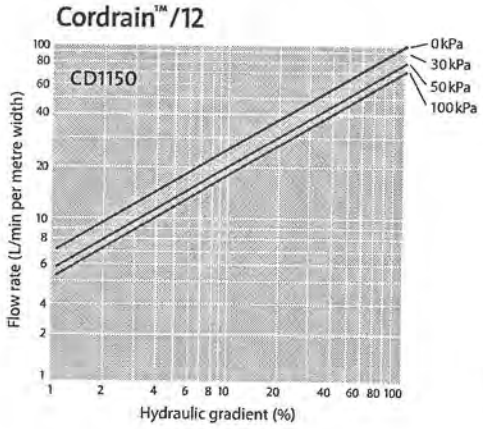
- The crush strength stated above for lateral soil pressures in most soils for each given depth when installed vertically.
- An approximate factor of safety of 2:1 has been used to determine the recommended maximum soil depth.
- The above values are a guideline only. It is up to the designer to calculate the insitu backfill properties.
- If required, a product of higher crush strength is available upon request.

Flow rates Vs Hydraulic Gradient
(at various pressures)

Cordrain™/18



Cordrain™/12



Application photo: Copyright Maccaferri (Aust) Pty Ltd

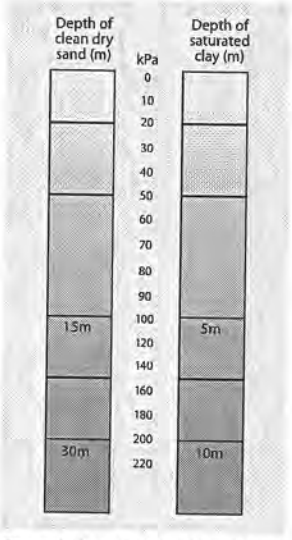


Figure 3. Relationship of lateral earth pressure to depth in soils. (indicative only)

Product Specifications

Geotextile	CD1200MF	CD1150MF
Non woven heat bonded PET geotextile	Yes	Yes
Core wrap	One side only	One side only
Flow rate - 275 litres/m²/sec @10cm head	Yes	Yes
Plastic Core		
Material	HDPE	HDPE
Core Profile	Raised cusps on both sides (square shaped)	Raised cusps on both sides (square shaped)
Mass (gsm) nominal	900	720
Fungus Resistance	Excellent	Excellent
Colour	Black	Black
Crush Strength (kPa)	250	100
Core Thickness (mm)	18	12
In-plane flow rate/m-width (nominal)	110 litres/min/m	75 litres/min/m
@ Slope	100%	100%
@ Pressure	250kPa	250kPa
Geocomposite		
Roll Length (m)	25	30
Packaging	PE bag	PE bag
Width	1200mm	1150mm

nylex Films & Fabrics

nylex

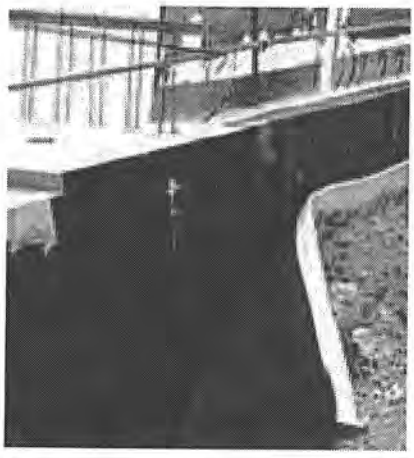
Nylex Stripdrain™, Stripdrain XS™, Cordrain™, Plazadeck™ Drain and Root Barrier are all manufactured to Nylex Corporation Pty Ltd specifications.

For further information about these Nylex Drainage products, please contact your nearest Nylex State branch.

Head Office:
PO Box 68,
Mentone 3194
Victoria, Australia

Tel: 1800 650 081
Fax: (03) 9581 0401

Email: customerservice@nylex.com.au
Website: **www.nylex.com.au**



Nylex Stripdrain™, Stripdrain XS™, Cordrain™ and Plazadeck™ Drain are distributed by:

MACCAFERRI
Environmental Solutions

Maccaferri Pty Ltd

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ABN 21 084 725 002

DRN 8PP 05-06

nylex Films & Fabrics

MACCAFERRI

TECHNICAL DATA SHEET
Rev: 00, Issue Date 18.2.09

CORDRAIN CD1150
VERTICAL SHEET DRAINAGE

PRODUCT DESCRIPTION

Cordrain is a geocomposite vertical drainage blanket which consists of a plastic cuspated sheet (cuspations on both sides) with a heat bonded non woven geotextile filter fabric bonded on one side only. The filter fabric has been designed to meet NSW RTA R63, QLD MRD MRS 11.27 and Transit NZ F/7 strength class A and filtration class 1. The filter fabric extends approximately 100mm beyond the edge of the drainage core to achieve a continuous filter overlapped joint.

PRODUCT FUNCTION

Cordrain is designed to reduce hydrostatic pressure behind structure walls by providing a drainage path for rapid transportation of water to the base drain or weepholes. **Cordrain** assists waterproofing and provides an airlock between the drainage layer and wall. **Cordrain** eliminates the need for aggregate backfills in most soils.

PRODUCT APPLICATION

Cordrain is suitable as a vertical drainage blanket for the following applications:

- Building Basements
- Bridge Abutments
- Concrete Retaining Walls
- Timber Retaining Walls
- Tunnel Linings
- Shotcreting
- Culverts
- Bored Pile Walls

Geotextile Filter	
Trapezoidal Tear AS3706.3	≥ 180N (Q value)
Grab Tensile AS2001.2.3 (b)	≥ 500N (Q value)
G Rating Austroads	≥ 900 (Q value)
Permittivity AS3706.9	≥ 50 ℓ/m²/s
Pore Size AS3706.7	≤ 120µm

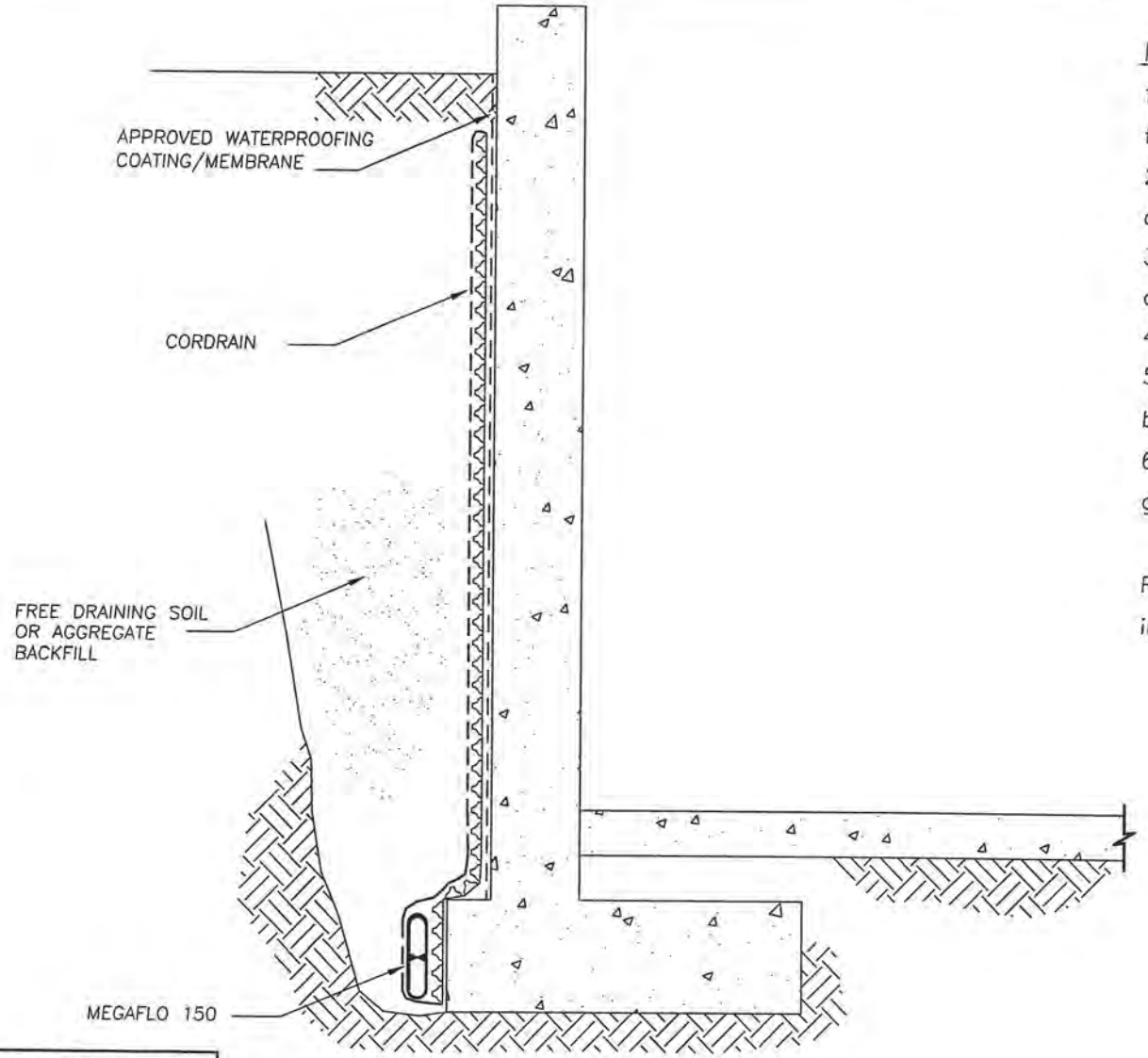
CORE Properties (Raised cusps on both sides)	
Mass	720g/m²
Colour	Black
Material	HDPE
Crush Strength	100kPa
Core Thickness	12 mm

Please see the **Cordrain** brochure for core flow capacity.

Geocomposite (Double cuspated core with geotextile filters one side only)	
Widths	1150mm
Roll Lengths	30m
Gross Roll Weight	25Kg
Packaging	White P.E. bag

NOTE: that Q value (or characteristic value) is calculated in accordance with NSW RTA R63, QLD MRD MRS 11.27 and Transit NZ F7, that being Q = Mean - 0.83 x standard deviation.

Maccaferri NZ Ltd.
14 Goodman Place, P.O. BOX 12536, Penrose, Auckland, New Zealand
Tel. (+64) 9 6346495 - Fax (+64) 9 6346492, FREEPHONE 0800 60 60 20
E-mail: sales@maccaferri.co.nz - Web site: www.maccaferri.co.nz
Quality System AS/NZS ISO 9001:2000



Installation

1. Fix CORDRAIN to wall having geotextile filter fabric to soil backfill side.
2. Fixing is carried out using building adhesive or masonary nails with plywood pads.
3. Join sheets horizontally or vertically by overlapping core by 75mm–100mm.
4. Tape all joints to prevent soil entry.
5. Form CORDRAIN over footing and butt to base drain (MEGAFLO 150).
6. Backfill with suitable excavated material or granular drainage fill.

Refer to "Designing with Cordrain" for full installation details.

- CONCEPT ONLY -
NOT FOR CONSTRUCTION

MACCAFERRI
Engineered Environmental Solutions

Auckland
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F: 09 634 6492

Christchurch
P: 09 349 5600
F: 09 349 5004

Email: technical@maccaferri .com.nz

Rev:	Issue / Revision:	Prepared By:	Checked By:	Date:
0	Concept Layout Proposal	MNZ		01/02/09

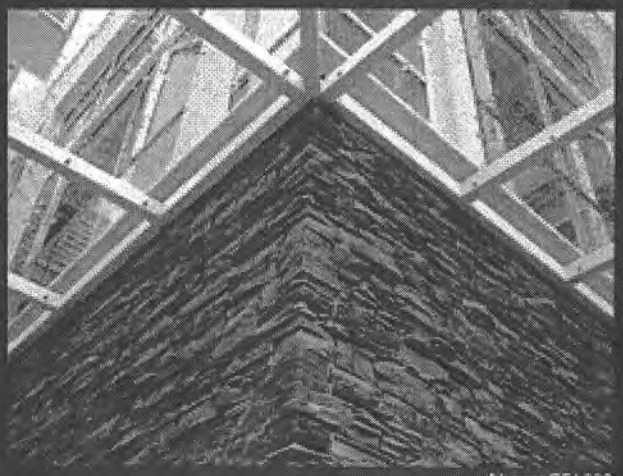
Project Title: BASEMENT OR RETAINING WALL DRAINAGE LAYOUT	Project No:
Client: BUILDING CONTRACTOR	Drawing No: coredrain09.dwg
	Rev No: 0
	Scale (A4): NOT TO SCALE

CraftStone®

Artificial Stone Veneer

Cast and mold from chemically improved light weight concrete. CraftStone® is a fine replica of natural stone, capturing even the finest detail that even on close examination, these artificial stone veneers look and feel like the original!

Each range of CraftStone® products is carefully designed and cast from hundreds of different molds, virtually eliminating any repetition.



Above: CSI-032

Above: CSI-022

Advantages:

Light-Weight Features
Typically one-quarter the weight of the full-thickness wall, eliminating the need for additional footings or wall ties.

Versatile
Comes in various textures and colors that will suit any design without worries on color or tonality differentiation.

Feasibility
Suitable for both interior and exterior application, with numerous architectural accessories for the finishing touch.

Economical
About half the installation cost of natural stone.

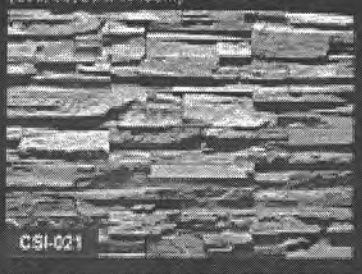
Durability
Colorfast and virtually maintenance free with 25 years limited warranty!

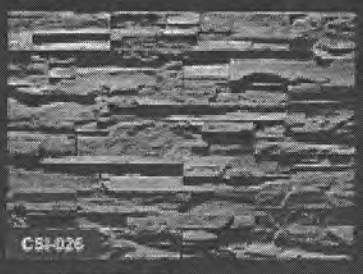
Above: CSI-034

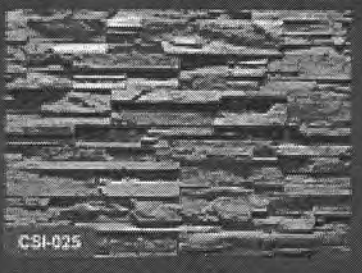
* The product colors in this brochure are as accurate as current photography and printing techniques allow. We suggest you look at actual samples for better idea and selection.

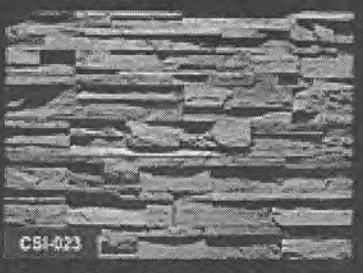
Vintage Ledgestone Collection

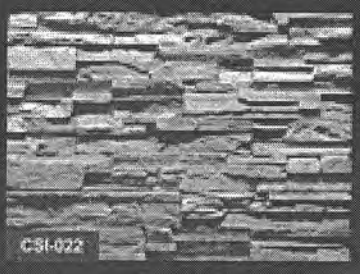
(L50, 30, 20 x W10cm)

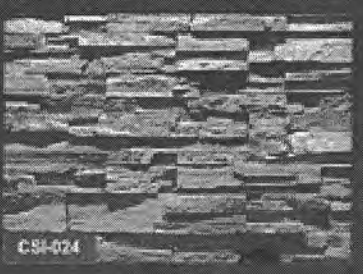








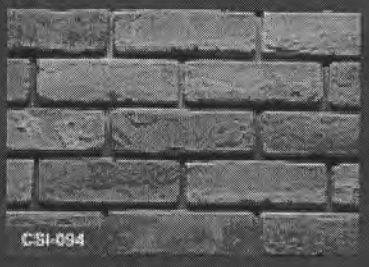


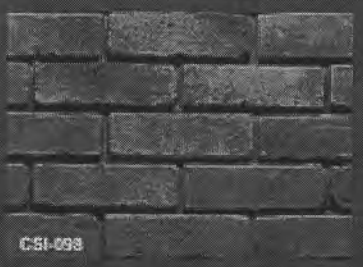


Craft Bricks™ Collection (L20 x W6cm)

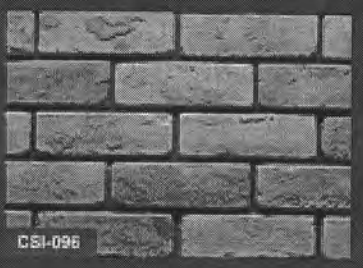

CSI-091


CSI-093


CSI-094


CSI-095

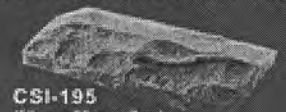

CSI-097


CSI-096

Corner Pieces

CraftStone® veneers come with 90° outside corner components that offer full-thickness apperance.

Architectural Accessories


CSI-195
(50cm x 30cm x 7cm)


CSI-196
(50cm x 30cm x 7cm)


CSI-183
(50cm x 10cm x 7cm)


CSI-184


CSI-185


CSI-186
(50cm x 10cm x 8cm)


CSI-187
(50cm x 10cm x 8cm)


CSI-188


CSI-189


CSI-190
(50cm x 12.5cm x 8cm)

Installation Method

STEP 1 :

STEP 2 :

STEP 3 :

STEP 4 :

STEP 5 :

STEP 6 :

Technical Specification

25-Year Limited Warranty

CraftStone® products carry a 25-year limited warranty when used on structures that conform to local building codes and installed according to the maunfacturer's instruction. Warranty is limited to replacement of defective materials only. Damages resulting from building settlement, wall movement, force contact, contact with chemicals or paint, discoloration due to airborne contamination, staining or oxidation, will not be covered under the warranty.

Warranty is non-transferable and is only limited to the original purchaser.

Water Repellent

CraftStone® products feature the addition of water-based water repellent that greatly enhances the stone's performance in humid climate. Water repellent is mixed with the composite material during manufacturing, thus providing a more lasting effect then spray, brush or paint method.

Non-Combustible

CraftStone® products show zero flame spread and zero smoke development.

General Properties

Material Composition: Portland Cement, Light-Weight Aggregates and Iron Oxide Pigments.

Unit Weight: 35~45kg/m² (varies according to profile)

Thickness: 20~40mm (varies according to profile)

Physical Properties

Water Absorption : <13%

Open Porosity*: <35%

Compressive Strength*: >12.0N/mm²

Flexural Strength*: >5.0N/mm²

*Test reference to NBN EN 1926 (1999), NBN EN 12372 (1999)

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BRANZ APPRAISED

SPECIFY WITH CONFIDENCE

BRANZ Appraisals

Technical Assessments of products for building and construction

BRANZ APPRAISAL CERTIFICATE No. 460 (2004)

POLYCLAD® BARRICADE

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WFTAO

Product

1.1 PolyClad® Barricade is a cavity-based Exterior Insulation and Finishing System (EIFS) wall cladding. It is designed to be used as an external wall cladding system for residential and light commercial type buildings where domestic construction techniques are used.

1.2 The system consists of expanded polystyrene (EPS) sheets fixed over polystyrene battens to form the cavity. The coating system consists of 5-6 mm thickness of reinforced polymer-modified cement-based plaster applied in two coats to the EPS sheets which are 40 or 60 mm thick. The plaster is reinforced between coats with fibreglass mesh, and finished with a 100% acrylic coating. The second plaster coat can be textured to give different appearances such as sponge or adobe.

1.3 The system incorporates a primary and secondary means of weather resistance (first and second line of defence) against water penetration by separating the cladding from the external wall framing with a nominal 20 mm cavity. The cavity allows for any occassional ingress of water that may get past the external skin to drain to the exterior of the building, and any remaining moisture to dry by evaporation.

Scope

2.1 PolyClad® Barricade has been appraised as an external wall cladding system for buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1 (Third Edition June 2004), Paragraph 1.1; and,
- constructed with timber or steel framing complying with the NZBC; and,
- with a risk score of 0-20, calculated in accordance with NZBC Acceptable Solution E2/AS1 (Third Edition June 2004), Table 2; and,
- situated in NZS 3604 Building Wind Zones up to, and including 'Very High'.

2.2 PolyClad® Barricade must only be installed on vertical surfaces (except for tops of parapets, sills and balustrades, which must have a minimum 15° slope and be waterproofed in accordance with the Technical Literature).

2.3 The system is appraised for use with aluminium window and door joinery that is installed with vertical jambs and horizontal heads and sills. *(The Appraisal of PolyClad® Barricade relies on the joinery meeting the requirements of NZS 4211 for the relevant Building Wind Zone.)*

2.4 The system must be installed in accordance with the details set out in the PolyClad® Barricade Technical Literature, refer to Paragraph 6.1.

2.5 Installation of components and accessories supplied by Sika (NZ) Ltd and approved applicators must be carried out only by Sika (NZ) Ltd approved applicators.

Building Regulations

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, PolyClad® Barricade if designed, used, installed and maintained in accordance with the statements and conditions of this Certificate, will meet or contribute to meeting the following provisions of the NZBC:

Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4. PolyClad® Barricade meets the requirements for loads arising from self-weight, earthquake, wind, human impact and creep [i.e. B1.3.3 (a), (f), (h), (j) and (q)]. See Paragraphs 10.1 - 10.4.

Clause B2 DURABILITY: Performance B2.3.1 (b), 15 years. PolyClad® Barricade meets this requirement. See Paragraph 11.1.

Clause C3 SPREAD OF FIRE: Performance C3.3.5. PolyClad® Barricade meets this requirement. See Paragraphs 14.1-14.3.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2. PolyClad® Barricade meets this requirement. See Paragraphs 16.1 - 16.5.

Clause E3 INTERNAL MOISTURE: Performance E3.3.1. PolyClad® Barricade contributes to meeting this requirement. See Paragraphs 17.1 - 17.3.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. PolyClad® Barricade meets this requirement and will not present a health hazard to people.

Clause H1 ENERGY EFFICIENCY: Performance H1.3.2 (a) and (b). PolyClad® Barricade contributes to meeting this requirement. See Paragraph 18.1.

3.2 This Certificate appraises an Alternative Solution in terms of New Zealand Building Code Compliance.

Technical Specification

4.1 System components and accessories supplied by Sika (NZ) Ltd are as follows:

Polystyrene

- Polystyrene cavity battens are available as either Standard or Peel 'n' Stick. Standard and Peel 'n' Stick battens are manufactured from high density (Class H) EPS with an approximate density of 24 kg/m³. The battens are 20 mm thick by 50 mm wide. Peel 'n' Stick battens are coated on the back face with a red coloured acrylic adhesive, which is protected prior to installation by a removable film.
- EPS sheets are 40 or 60 mm thick Class S with an approximate density of 16 kg/m³ or 40 or 60 mm thick Class H with an approximate density of 24 kg/m³. The sheets are supplied in lengths ranging from 2.4 to 3.6 m x 1.2 m wide and are manufactured to meet the requirements of AS 1366 Part 3.

Plasters and Coatings

- The PolyClad® Barricade plaster and coating systems are as set out in Table 1.
- *PolyClad® Plaster* is a polymer-modified, Portland cement-based plaster supplied in 25 kg bags and mixed on site with clean drinking water. It is trowel applied as a base coat in a minimum 3 mm thick layer followed by the embedment of fibreglass mesh reinforcement in the outer surface, followed by a second coat 2-3 mm thick. PolyClad® Plaster is available in Fine, Medium grey, Medium white, Coarse, Sponge or Polytex grades, and can also be used as a spray applied pre-texture for the Flexiform, Fleximatt and Colorkote Systems.
- *Basecoat No.1* is an acrylic elastomeric coating used to provide a water resistant base coat to the Esterno, Scratchkote, Stonekote and Leatherkote Systems. It is supplied in 20 litre pails.
- *Esterno* is a pre-mixed aggregate filled pigmented acrylic coating supplied in 20 litre pails, used as the finish coat of the Esterno System. It is supplied in fine, medium or coarse profiles and can be spray or trowel applied to achieve a variety of textured finishes.
- *Flexiform* is a pigmented high-build acrylic coating supplied in 20 litre pails, used to provide water resistance and pre-coloured finishing for the Flexiform System. It may be applied directly over a cured PolyClad® Plaster base or over a cured PolyClad® Plaster texture coat.
- *Fleximatt* is a pigmented high-build acrylic coating supplied in 20 litre pails, used to provide water resistance and pre-coloured finishing for the Fleximatt System. It may be applied directly over a cured PolyClad® Plaster base or over a cured PolyClad® Plaster texture coat.
- *Scratchkote* is a pre-mixed, aggregate filled, pigmented acrylic coating supplied in 20 litre pails, used to provide a pre-coloured finish for the Scratchkote System. The coating is trowel applied to achieve a straight or swirl scratch finish.
- *Stonekote* is a pre-mixed, aggregate filled, pigmented acrylic coating supplied in 20 litre pails, used to provide a pre-coloured finish for the Stonekote System. The coating is trowel applied to achieve a natural aggregate finish.
- *Leatherkote* is a pre-mixed, aggregate filled, pigmented acrylic coating supplied in 20 litre pails, used to provide a pre-coloured finish for the Leatherkote System. The coating is trowel applied to achieve a weathered stone finish.
- *Colorkote* is a pigmented acrylic finish, available in gloss, matt and silk versions, used to provide water resistance and pre-coloured finishing for the Colorkote System. It is supplied in 20 litre pails. It may be applied directly over a cured PolyClad® Plaster base or over a cured PolyClad® Plaster texture coat.
- *Multiglaze* is a clear acrylic finish available in either gloss or silk versions, used as an optional glaze coat for the Esterno, Scratchkote and Leatherkote Systems. It is supplied in 20 litre pails.

Table 1: PolyClad® Barricade Plaster and Coating Systems

	Colorkote System	Esterno System	Flexiform System	Fleximatt System	Scratchkote System
Plaster Base	PolyClad® Plaster	PolyClad® Plaster	PolyClad® Plaster	PolyClad® Plaster	PolyClad® Plaster
Base/ Texture Coat	PolyClad® Plaster[2]	Basecoat No.1	PolyClad® Plaster[2]	PolyClad® Plaster[2]	Basecoat No. 1
Finish Coat(s)[1]	Colorkote	Esterno	Flexiform	Fleximatt	Scratchkote
Glaze Coat	N/A	Multiglaze[3]	N/A	N/A	Multiglaze[3]

	Stonekote System	Leatherkote System
Plaster Base	PolyClad® Plaster	PolyClad® Plaster
Base/Texture Coat	Basecoat No. 1	Basecoat No. 1
Finish Coat(s)[1]	Stonekote	Leatherkote
Glaze Coat	Multiglaze	Multiglaze[3]

1. Finish coat colours must have a light reflectance value of 40% minimum regardless of gloss value.
2. PolyClad Plaster Texture coat optional.
3. Glaze coat optional.

Accessories

- Reinforcing mesh - alkali-resistant fibreglass mesh with a nominal mesh size of approximately 4 mm square and a weight of 150 g/m² for use in domestic and light commercial situations.
- uPVC components - sill flashing, jamb flashing and trim flashing, foot flashing, corner beads, vermin guard flashing acting as a ventilated cavity closure and Z-flashing.
- Cavity batten fixings (Standard batten) - 30 x 2.5 mm hot-dipped galvanised flat head nails, Nailbond PB or Spraytak.
- Polystyrene sheet fixings (timber frame) - 90 x 3.55 mm (for 40 mm thick EPS) and 110 x 4.0 mm (for 60 mm thick EPS) hot-dipped galvanised flat head nails with 40 mm diameter PolyClad® washers.
- PolyClad® washers - 40 mm diameter polypropylene washers.
- Flexible sealant – Silaflex MS.
- Adhesive – Sika Nailbond WB and Sika Nailbond PB.

4.2 Accessories used with the system which are supplied by the approved applicator are:

- Fixings (steel frame) for cavity battens and EPS sheets - Self-drilling AS 3566 Corrosion Class 3 6-gauge screws in corrosion zones 1, 2 and 3 and Corrosion Class 4 6-gauge screws in corrosion zones 1, 2, 3 and 4 as defined by NZS 3604, used with 40 mm diameter PolyClad® washers. The screw length must allow a 10 mm minimum penetration through the steel framing.
- Waterproof membrane tapes - tapes covered by a valid BRANZ Appraisal Certificate for use as waterproofing membranes over tops of plastered parapets, balustrades, fixing blocks and the like.

4.3 Accessories used with the system which are supplied by the building contractor are:

- Building wrap - paper or wrap complying with NZBC Acceptable Solution E2/AS1 (Third Edition June 2004), Table 23, or breather-type membranes covered by a valid BRANZ Appraisal Certificate for use as wall wraps.
- Building wrap support - polypropylene strap for securing the building wrap in place and preventing bulging of the bulk insulation into the drainage cavity. (Note: additional vertical battens may also be installed to provide support.)
- Flexible sill and jamb flashing tape - flexible flashing tapes complying with NZBC Acceptable Solution E2/AS1 (Third Edition June 2004), Paragraph 4.3.11, or flexible flashing tapes covered by a valid BRANZ Appraisal Certificate for use around window and door joinery openings.
- Joinery head flashings - as supplied by the joinery manufacturer or contractor.
- Window and door trim cavity airseal – Sika Foamtak® SB.

Handling and Storage

5.1 Handling and storage of all materials supplied by Sika (NZ) Ltd or the approved applicator, whether on or off site, is under the control of Sika (NZ) Ltd approved applicators. Dry storage must be provided on site for the fibreglass mesh and bags of PolyClad® Plaster. EPS sheets and battens, uPVC flashings and profiles must be protected from direct sunlight and physical damage, and should be stored flat and under cover.

5.2 Handling and storage of all materials supplied by the building contractor, whether on or off site, is under the control of the building contractor. Materials must be handled and stored in accordance with the relevant manufacturer's instructions.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the PolyClad® Barricade system. The Technical Literature must be read in conjunction with this Certificate. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Certificate must be followed. The PolyClad® Barricade listing on the BRANZ website excludes specific details. These details are outside the scope of this Certificate.

Design Information

Framing

Timber Treatment

7.1 Timber wall framing behind the PolyClad® Barricade system must be treated as required by NZS 3602.

Timber Framing

7.2 Timber framing must comply with NZS 3604. Studs must be at maximum 600 mm centres, with nogs fitted flush between the studs at maximum 800 mm centres.

7.3 Timber framing must have a maximum moisture content of 24% at the time of the cladding application. *(If sheets are fixed to framing with a moisture content of greater than 24% problems may occur at a later date due to excessive timber shrinkage.)*

Steel Framing

7.4 Steel framing must be to a specific design meeting the requirements of the NZBC.

7.5 The minimum framing specification is 'C' section studs and nogs of overall section size of 75 mm web and 32 mm flange. Steel thickness must be minimum 0.55 mm.

7.6 Studs must be at maximum 600 mm centres, with nogs flush fitted between at maximum 800 mm centres.

EPS Sheet Setout

7.7 All EPS sheet edges must be supported and fixed through the cavity battens to the framing except at the base where they must hang 50 mm below the supporting framing.

7.8 Additional framing will be required at soffits, internal and external corners and window and door openings for the support and fixing of sheet edges.

General

8.1 Punchings in the vermin guard flashing provide a minimum ventilation opening area of 1000 mm² per lineal metre of wall in accordance with NZBC Acceptable Solution E2/AS1 (Third Edition June 2004), Paragraph 9.1.8.3(b).

8.2 At ground level, the bottom edge of the PolyClad® Barricade system must be kept clear of paved surfaces, such as footpaths and mowing strips, by a minimum of 100 mm and unpaved surfaces by 175 mm in accordance with NZBC Acceptable Solution E2/AS1 (Third Edition June 2004), Table 18. The ground clearances to finished floor levels as set out

in NZS 3604 must be adhered to at all times. *(A detail showing PolyClad® Barricade carried closer to the ground is included in the Technical Literature. This detail is outside the scope of this Certificate and approval for its use is by specific design.)*

8.3 At balcony, deck or roof/wall junctions, the bottom edge of the PolyClad® Barricade system must be kept clear of any adjacent surface, or above the top surface of any adjacent roof flashing by a minimum of 35 mm in accordance with NZBC Acceptable Solution E2/AS1 (Third Edition June 2004), Paragraph 9.1.3.6.

8.4 Unlined gables and walls must incorporate a rigid sheathing or an air barrier which meets the requirements of NZBC Acceptable Solution E2/AS1 (Third Edition June 2004), Table 23.

8.5 Where the system abuts other cladding systems, designers must detail the junction to meet their own requirements and the performance requirements of the NZBC. These details are outside the scope of this Certificate.

Electrical Cables

8.6 PVC sheathed electrical cables must be prevented from direct contact with the polystyrene. When cables must penetrate the EPS for exterior electrical connections, the cable must be directly supported by passing through an electrical conduit or a hole drilled in a framing member.

Control Joints

9.1 Control joints must be constructed in accordance with the Technical Literature, and be provided as follows:

- Horizontal control joints - at maximum 6 m centres.
- Vertical control joints - at maximum 20 m centres; aligned with any control joint in the structural framing; where the system abuts different cladding types, or where the system covers different structural materials.

(Note: Horizontal and Vertical Control joints must be located over structural supports. The design of vertical control joints where the system abuts different cladding types is outside the scope of this Certificate and is the responsibility of the designer - see Paragraph 8.5.)

Structure

Mass

10.1 The mass of the PolyClad® Barricade system is approximately 12 kg/m² at equilibrium moisture content, therefore it is considered a light wall cladding in terms of NZS 3604.

Impact Resistance

10.2 The system has adequate resistance to human impact loads likely to be encountered in normal residential use. The likelihood of impact damage to the system when used in light commercial situations should be considered at the design stage, and appropriate protection such as the installation of bollards and barriers should be considered for vulnerable areas. *(Additional coats of reinforced PolyClad® Plaster or a heavier grade of reinforcing mesh can be used to increase impact resistance. This has not been assessed by BRANZ and is outside the scope of this Certificate.)*

Wind Zones

10.3 The system is suitable for use in all Building Wind Zones of NZS 3604, up to, and including, Very High.

Polystyrene Sheet Fixing

10.4 EPS sheets must be fixed through the cavity battens to the wall framing at maximum centres specified in Table 2.

Table 2: EPS Sheet Fixing Centres

NZS 3604 Building Wind Zone	Maximum Fixing Centres (mm)
Low[1]	300
Medium[1]	300
High[1]	300
Very High[2]	200

1. One fixing is also required into each nog at mid-nog length.
2. Fixings are also required into each nog at 200 mm centres.

Durability

Serviceable Life

11.1 PolyClad® Barricade is expected to have a serviceable life of at least 30 years provided the system is maintained in accordance with this Certificate, and the EPS sheets, fixings and plaster are continuously protected by a weathertight coating and remain dry in service.

Maintenance

12.1 Regular maintenance is essential to ensure the performance requirements of the NZBC are continually met and to ensure the maximum serviceability of the system.

12.2 Annual inspections must be made to ensure that all aspects of the cladding system, including the coating system, plaster, flashings and any sealed joints remain in a weatherproof condition. Any cracks, damaged areas or areas showing signs of deterioration which would allow water ingress, must be repaired immediately. Sealant, coatings and the like must be repaired in accordance with the instructions of Sika (NZ) Ltd.

12.3 Regular cleaning (at least annually) of the paint coating is required to remove grime, dirt and organic growth and to maximise the life and appearance of the coating. Grime may be removed by brushing with a soft brush, warm water and detergent. Finish coats must be reapplied at approximately 7-10 yearly intervals in accordance with the instructions of Sika (NZ) Ltd.

12.4 Minimum ground clearances as set out in this Certificate and the Technical Literature must be maintained at all times during the life of the system. *(Failing to adhere to the minimum ground clearances given in this Certificate and the Technical Literature will affect the long term durability of the PolyClad® Barricade system.)*

Control of Internal Fire and Smoke Spread

13.1 Polystyrene used with the system meets the flame propagation criteria of AS 1366. It must also comply with the requirements of NZBC Acceptable Solution C/AS1 Part 6, Paragraphs 6.20.11 and 6.20.12. Where required by NZBC Acceptable Solution C/AS1 Part 6, Table 6.3, flame barriers meeting the requirements of C/AS1 Part 6, Paragraph 6.20.13 and Appendix C, Paragraph C10.1 must be provided. Joints in flame barriers and openings for penetrations must be designed to prevent flame contact with the polystyrene.

Control of External Fire Spread

14.1 The PolyClad® Barricade system, when finished using the Flexiform, Colorkote and Esterno coating systems, has a performance level B in accordance with NZBC Acceptable Solution C/AS1 Table 7.5 and is therefore considered to meet the performance provisions of NZBC C3.3.5 for use as an external wall cladding when restricted to:

- Buildings up to 7 m high, 1 m or more from the boundary, for all purpose groups.
- Buildings up to 10 m high, 1 m or more from the boundary, for all purpose groups other than SC and SD.

14.2 The PolyClad® Barricade system when finished using the Fleximatt, Scratchkote, Leatherkote and Stonekote coating systems is considered to meet the performance provisions of NZBC C3.3.5 for use as an external wall cladding when restricted to:

- Single storey buildings 1 m or more from the boundary for all purpose groups.
- Buildings up to 7 m high, 1 m or more from the boundary, for all purpose groups other than SC and SD.
- Fully sprinklered buildings up to 10 m high, 1 m or more from the boundary for all purpose groups other than SC, SD, SA and SR.
- Buildings containing purpose group SH, with a building height less than 10 m and located 1 m or more from the boundary.

(Note: The scope of this Certificate limits building heights to 10 m in accordance with the limitations of NZBC Acceptable Solution E2/AS1 (Third Edition June 2004), Paragraph 1.1 (a).)

14.3 Where buildings are of the three floor maximum permitted by NZBC Acceptable Solution E2/AS1 (Third Edition June 2004), Paragraph 1.1 (a), and when the cladding system extends to cover the walls of all three floors, the requirements for barriers to vertical fire spread in the EPS as set out in NZBC Acceptable Solution C/AS1 Part 7, Paragraphs 7.9.18 and 7.9.19 must be met. These joints are not covered by the Technical Literature, therefore are outside the scope of this Certificate. Design of the barrier joint must be specifically detailed by the designer to meet the NZBC, including blocking of the cladding cavity and wall framing cavity, and installation of flashing and sealing systems to collect and direct any moisture to the outside of the cladding system at this point.

Outbreak of Fire

15.1 PolyClad® Barricade must be separated from chimneys and flues in accordance with the requirements of NZBC Acceptable Solution C/AS1, Part 9 for the protection of combustible materials.

External Moisture

16.1 PolyClad® Barricade, when installed in accordance with this Certificate and the Technical Literature, prevents the penetration of moisture that could cause undue dampness or damage to building elements.

16.2 The cavity must be sealed off from the roof and sub-floor space to meet code compliance with Clause E2.3.5.

16.3 The PolyClad® Barricade system allows excess moisture present at the completion of construction to be dissipated without permanent damage to building elements to meet code compliance with Clause E2.3.6.

16.4 The details given in the Technical Literature for weather sealing are based on the design principle of having a first and second line of defence against moisture entry for all joints, penetrations and junctions. The ingress of moisture must be excluded by detailing joinery and wall interfaces as shown in the Technical Literature. Weathertightness details that are developed by the designer are outside the scope of this Certificate and are the responsibility of the designer for compliance with the NZBC.

16.5 The use of PolyClad® Barricade where there is a designed cavity drainage path for moisture that penetrates the cladding, does not reduce the requirement for junctions, penetrations, etc to remain weather resistant.

Internal Moisture

17.1 NZBC Acceptable Solution E3/AS1 Paragraph 1.1.1(a) requires a minimum wall R-value of 1.5 for framed cavity wall construction. For buildings other than communal non-residential, commercial, industrial, outbuildings or ancillary buildings, PolyClad® Barricade alone does not meet NZBC Acceptable Solution E3/AS1. Additional wall insulation must be added. Alternatively, a specific thermal design may be carried out.

17.2 The EPS cavity battens will act as a thermal break to steel framing in accordance with NZBC Acceptable Solution E3/AS1.

Water Vapour

17.3 PolyClad® Barricade is not a barrier to the passage of water vapour, and when installed in accordance with this Certificate will not create or increase the risk of moisture damage resulting from condensation.

Energy Efficiency

18.1 The thermal performance of PolyClad® Barricade, or any additional insulation provided within the wall can be calculated in accordance with NZS 4214. However, calculations in accordance with NZS 4214 require that the ventilated air gap and the thermal resistance of each layer between the ventilated air gap and outside air be de-rated by a factor of 0.5. Therefore, in this system, unless better information is available for a specific case, the R-value of the polystyrene layers must be taken as half of the actual value, and are as set out in Table 3.

Table 3: Board R-values (including 0.5 de-rating)

Polystyrene Type	Thickness	
	40 mm	60 mm
EPS Class S[1]	R0.49	R0.73
EPS Class H[2]	R0.52	R0.79

1. Based on a thermal conductivity k value of 0.041 W/m°C.
2. Based on a thermal conductivity k value of 0.038 W/m°C.

Installation Information

Installation Skill Level Requirements

19.1 Installation and finishing of components and accessories supplied by Sika (NZ) Ltd and the approved applicators must be completed by trained applicators, approved by Sika (NZ) Ltd.

19.2 Installation of the accessories supplied by the building contractor must be completed by tradespersons

with an understanding of cavity construction, in accordance with instructions given within the PolyClad® Barricade Technical Literature and this Certificate.

System Installation

Building Wrap and Flexible Sill and Jamb Flashing Tape

19.3 The selected building wrap and flexible sill and jamb tape system must be installed by the building contractor in accordance with the wrap and tape manufacturer's instructions prior to the installation of the cavity battens and the rest of the PolyClad® Barricade system. Particular attention must be paid to the installation of the building wrap and sill and jamb tapes around window and door openings to ensure a continuous seal is achieved and all exposed wall framing in the opening is protected.

Aluminium Joinery Installation

19.4 Aluminium joinery and associated head flashings must be installed by the building contractor in accordance with the Technical Literature. A 7.5-10 mm nominal gap must be left between the joinery reveal and the wall framing so a PEF rod and Foamtak® SB airseal can be installed after the joinery has been secured in place.

PolyClad® Barricade System

19.5 The system must be installed in accordance with the Technical Literature by Sika (NZ) Ltd approved applicators.

Inspections

19.6 The Technical Literature must be referred to during the inspection of PolyClad® Barricade installations by building consent authorities and territorial authorities.

Health and Safety

20.1 Safe use and handling procedures for the components that make up PolyClad® Barricade are provided in the relevant manufacturer's Technical Literature.

Basis of Appraisal

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

Tests

21.1 The following testing has been completed by BRANZ:

- BRANZ expert opinion on NZBC E2 code compliance for PolyClad® Barricade was based on testing and evaluation of all details within the scope and as stated within this Certificate. The PolyClad® Barricade system and EIFS balustrade to wall junction details were tested to AS/NZS 4284 with a BRANZ-designed extension. The testing was completed in three stages; the first being the standard AS/NZS 4284 test, the second being the modified AS/NZS 4284 test with defects introduced in the test panel, and the third being the modified AS/NZS 4284 test with the internal linings and building wrap removed. The testing assessed the performance of the foundation detail, window head, jamb and sill details, vertical and horizontal control joints, internal and external corners and balustrade to wall junction with a plastered cap. In addition to the weathertightness test, the details contained within the Technical Literature have been reviewed, and an opinion has been given by BRANZ technical experts that the system will meet the performance levels of Acceptable Solution E2/AS1 (Third Edition June 2004) for EIFS drained cavity claddings.
- Wind face load and fastener pull through testing for EIFS cladding systems. BRANZ determined design wind suction pressures, and by comparing these pressures with the NZS 3604 design wind speeds and NZS 4203 pressure coefficients, the fixing requirements were determined for timber and steel framed walls.
- Cone Calorimeter testing of the Flexiform, Colorkote and Esterno plaster systems over 40 mm EPS. The testing was carried out in accordance with ISO 5660.

Other Investigations

22.1 Structural and durability opinions have been given by BRANZ technical experts.

22.2 The performance of PolyClad® XL since 1998 and other Exterior Insulation and Finishing Systems in New Zealand has been considered. This includes durability, structural performance, impact resistance, plaster bond, weathertightness and non-hazardous properties.

22.3 Site visits have been carried out by BRANZ to assess the practicability of installation, and to examine completed installations.

22.4 The manufacturer's Technical Literature has been examined by BRANZ and found to be satisfactory.

Quality

23.1 The manufacture of the plasters has been examined by BRANZ, including methods adopted for quality control. Details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory.

23.2 The quality of materials, components and accessories supplied by Sika (NZ) Ltd is the responsibility of Sika (NZ) Ltd. The quality control system of Sika (NZ) Ltd has been assessed and registered as meeting the requirements of AS/NZS ISO 9001:2000 by Telarc Limited, Registration Number 451.

23.3 Quality on site is the responsibility of the Sika (NZ) Ltd approved applicator.

23.4 Designers are responsible for the building design, and building contractors are responsible for the quality of installation of framing systems and joinery, building wraps, flashing tapes, air seals and joinery head flashings in accordance with the instructions of Sika (NZ) Ltd.

23.5 Building owners are responsible for the maintenance of PolyClad® Barricade in accordance with the instructions of Sika (NZ) Ltd.

Sources of Information

- AS 1366.3 - 1992 Rigid cellular plastic sheets for thermal insulation - Rigid cellular polystyrene - Moulded (RC/PS-M)
- AS 3566 - 2002 Self-drilling screws for the building and construction industries.
- AS/NZS 4284: 1995 Testing of building facades.
- NZS 3602: 2003 Timber and wood-based products for use in building.
- NZS 3604: 1999 Timber framed buildings.
- NZS 4203: 1992 General structural design and design loadings for buildings.
- NZS 4211: 1985 Specification for performance of windows.
- NZS 4214: 2002 (INT) Methods of determining the total thermal resistance of parts of buildings.
- ISO 5660 - Fire Tests - Reaction to Fire part 1: Heat Release Rate from Building Products (Cone Calorimeter Method).
- Approved Document for New Zealand Building Code External Moisture Clause E2, Building Industry Authority, Third Edition June 2004.
- New Zealand Building Code Handbook and Approved Documents, Building Industry Authority, 1992.
- The Building Regulations 1992, up to, and including April 2003 Amendment.

BRANZ
BUILDING ON KNOWLEDGE

In the opinion of BRANZ, PolyClad® Barricade is fit for purpose and will comply with the Building Code to the extent specified in this Certificate provided it is used, designed, installed and maintained as set out in this Certificate.

The Appraisal Certificate is issued only to the Certificate Holder, Sika (NZ) Ltd, and is valid until further notice, subject to the Conditions of Certification.

Conditions of Certification

1. This Certificate:
a) relates only to the product as described herein;
b) must be read, considered and used in full together with the technical literature;
c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
d) is copyright of BRANZ.
2. The Certificate Holder:
a) continues to have the product reviewed by BRANZ;
b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
c) abides by the BRANZ Appraisals Services Terms and Conditions.
3. The product and the manufacture are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ.
4. BRANZ makes no representation as to:
a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
c) any guarantee or warranty offered by the Certificate Holder.
5. Any reference in this Certificate to any other publication shall be read as a reference to the version of the publication specified in this Certificate.

For BRANZ

J R Wanden

M E Reed

Date of issue: 29 September 2004

Construction

Product Data Sheet
Version no: 05/07 (replaces 09/02)

BRANZ Appraised
Appraisal No.452 [2007]

Sika Boom®

One component, multi-position, high yield adhesive foam

Positioning

Description
Sika Boom® is a one part, multi position, high yield polyurethane adhesive foam.

Use
Sika Boom® is used for fixing, insulating and filling connection joints around window- and door-frames, pipe entries around air-conditioning vents and roller blind housings, etc. It is also used to insulate against sound, cold and draughts etc.

Advantages
- Multiposition can allows foam to be applied at any angle (360°)
- High yield
- BRANZ appraised (Appraisal No. 452 [2007])
- Easy application with valve nozzle (adapter)
- Suitable for application at lower temperatures (+5°C)
- Fast curing
- Excellent insulation properties
- Effective sound dampening
- Age resistant
- HFC-free

Product Data

Form:
1-part polyurethane, moisture curing

Colour:
Light yellow

Storage & shelf life:
9 months from date of production if stored in undamaged original unopened containers, in dry conditions and protected from direct sunlight at temperatures between +18°C and +20°C. The aerosol cans must be stored in a vertical position! An opened can must be used within ~ 4 weeks.

Packaging:
250 ml can (20 cans per box)
500 ml can (12 cans per box)
750 ml can (12 cans per box)

Technical Data

Specific gravity:	0.024 ±0.003kg/l (= 24 ± 3 kg/m3)	
Skinning time:	10 ± 2 minutes (+23°C / 50% r.h.)	
Curing rate:	A 20 mm bead of expanded foam can be cut after 30 minutes (+23°C / 50% r.h.). Full cure after 12 hours (+23°C / 50% r.h.).	
Service temperature:	-40°C to +80°C (temporary exposure up to +100°C)	
Heat conductivity	~ 0.0389 W/mK	(DIN 52 612)
Compressive strength:	~ 0.04 ± 0.01 N/mm2 with 10% deformation (+23°C / 50% r.h.)	(DIN 53 421)
Shear strength:	~ 0.04 ± 0.02 N/mm2 (+23°C / 50% r.h.)	(DIN 53 427)
Tensile strength:	~ 0.08 ± 0.02 N/mm2 (+23°C / 50% r.h.)	(DIN 53 430)
Elongation at break:	~ 38% ± 2% (+23°C / 50% r.h.)	(DIN 53 430)
Substrate temperature:	+5°C min. / +35°C max. (aerosol can has to be +5°C min.)	
Ambient temperature:	Optimum handling temperature: +20°C Permissible handling temperatures: +5°C min. / +35°C max.	
Relative air humidity	Between 30% and 100%	
Consumption	Consumption can be regulated by the pressure and angle of the valve / adapter.	

Yield:
750 ml can up to 39 litres (+/- 3 litres)
500 ml can up to 26 litres (+/- 3 litres)
250 ml can up to 13 litres (+/- 2 litres)

Construction

Application Conditions

Substrate Quality	Clean and dry, homogeneous, free from oils and grease, dust and loose or friable particles.
Substrate Preparation	Pre-dampen the substrate with clean water, this ensures that the foam cures optimally and also prevents secondary foam expansion later on.
Application Method/ Tools	• Shake the can thoroughly before use (~ 20 times). • Screw the adapter firmly right down into place without pressing the valve. • Holding the valve in any position, regulate foam flow with pressure on the valve / adapter. • Fill deep cavities in several layers. Take care to allow each layer to cure and expand sufficiently by spraying with water between each layer or allowing sufficient waiting time between the layers. • Do not fill up hollow sections completely from the nozzle as the foam expands by 1.5 to 2 times its volume during curing! • All fixings and components, etc must be temporarily supported until the foam has hardened.
Cleaning of Tools	Remove fresh spots of foam immediately using a cleaner such as Sika Boom®-Cleaner. Cured foam can only be removed mechanically.
Notes on application/ limitations	• The aerosol can temperature has to be +5°C min. and +25°C max. • For optimum flow and expansion the aerosol can temperature should be +20°C. • Protect the can from direct sun and temperatures above +50°C (danger of explosion). • For the correct curing of the foam sufficient moisture is necessary. • Do not use on PE, PP, Teflon, silicone, oil, grease and other separating agents. • Foam is not resistant to UV light. • Read the safety and technical recommendations printed on the aerosol can. • All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.
Local Restrictions	Please note that as a result of specific local regulations the performance of this product may vary from country to country. Please consult the local Product Data Sheet for the exact description of the application fields.

Health & Safety Instructions

Protective Measures	• To avoid rare allergic reactions, we recommend the use of protective gloves. Change soiled work clothes and wash hands before breaks and after finishing work. • Local regulations as well as health and safety advice on packaging labels must be observed. • For further information refer to the Sika Material Safety Data Sheet which is available on request. • If in doubt always follow the directions given on the pack or label.
Important Notes	• Residues of material must be removed according to local regulations. Fully cured material can be disposed of as household waste under agreement with the responsible local authorities. • Detailed health and safety information as well as detailed precautionary measures e.g. physical, toxicological and ecological data can be obtained from the safety data sheet.

Legal Notes

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Responsible Care

Certified Quality System ISO 9001/EN 29001 since 1986

3.1 Structural bracing

3.1.1 Description and purpose

The Ecoply® Bracing system provides bracing resistance for walls and subfloor foundations for light timber framed buildings under wind and earthquake loading, to meet the requirements of the New Zealand Building Code Section B1 Structure, and NZS 3604:1999 'Timber Framed Buildings' or specifically designed to NZS 3603:1993 'Timber Structures Standard'.

Ecoply® used for bracing may also be a rigid air barrier and/or interior wall lining. Any Ecoply® structural panel may be used for bracing as long as it is equal to or greater than the minimum thickness shown in Table 8, treated for the specific application in accordance with NZS 3602 (summarised in Table 7) and fixed in accordance with the requirements below.

Shadowclad® exterior cladding, direct-fixed to framing or installed over 20mm cavity battens, may be used for bracing when installed with fasteners spaced as per the wall type codes in Table 8 and in accordance with the Shadowclad® Specification & Installation manual. When used as bracing as well as cladding, Shadowclad® must be:

- coated with an acrylic latex paint system which is maintained through the life of the building and has a light reflectance value of 40% or more
- fixed with stainless steel or silicon bronze annular grooved nails or screws

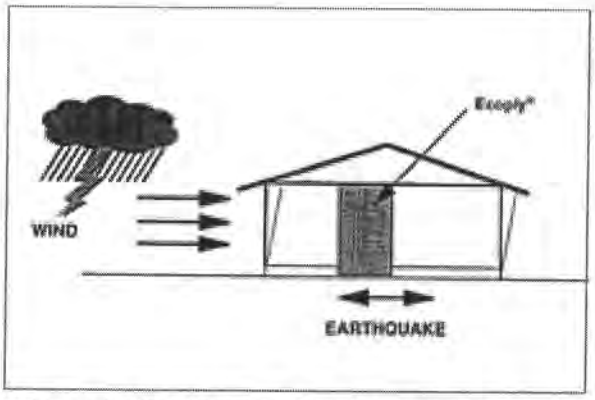
BRANZ Test Report STO593 (dated 20 December 2004) covers the use of Shadowclad® used as bracing when installed on a 20mm drained ventilated cavity. The test report can be downloaded from www.shadowclad.co.nz.

3.1.2 Design to comply with the New Zealand Building Code

Structure

Timber framed buildings to NZS 3604

NZS 3604:1999 'Timber Framed Buildings' is listed as an Acceptable Solution under clause 3.0 Timber in Acceptable Solution B1/AS1 Structure. Bracing unit ratings for an extended range of plywood wall bracing systems have been derived from tests according to clauses 5.5.2 and 8.3.1.2 of NZS 3604:1999 for walls and clauses 5.4.3 and 6.2.3 for subfloor timber framing.



Woodproducts NZ commissioned testing on over 50 different walls to develop a wide range of wall bracing element design options shown in Table 8, tested and analysed using the P21 testing and analysis methods referenced in NZS 3604. These tests included 7mm Ecoply® and Shadowclad® groove (12mm).

BRANZ has subsequently conducted testing to validate the bracing units for Shadowclad® exterior cladding used as bracing when installed onto 20mm cavity battens. Refer to the Shadowclad® Specification & Installation manual for fixing details.

Specific Design

Because Ecoply® is structural plywood manufactured to AS/NZS 2269, it is suitable for design and use in earthquake and wind bracing systems constructed in accordance with NZS 3603:1993 and NZS 4203:1992 or AS/NZS 1170.

Structural plywood to AS/NZS 2269 is the only sheet brace material with properties defined in a published New Zealand engineering design code, NZS 3603:1993 'Timber Structures', and so can be designed in compliance with Verification method B1/VM1 under clause 6.0 Timber, for use in buildings over three storeys in height.

Durability

Ecoply® plywood is manufactured to meet the requirements of NZS 3602 Timber and Wood based products for use in Buildings. If the product is used, handled and installed in accordance with Woodproducts NZ product literature it will meet the durability clauses of the NZ Building Code.

Table 7 summarises the applications in which Ecoply® and Shadowclad® can be used as structural bracing together with the preservative treatment requirement and fastener material for corrosion resistance.

Table 7: Ecoply® and Shadowclad® suitability for bracing applications including treatment type and fastener material

Application	Plywood Type	Fastener Description
Plywood bracing protected from the weather but with a risk of moisture penetration conducive to decay: e.g. plywood bracing and/or rigid underlay (air barrier), fixed to framing with/without building paper/wrap over, with/without cavity battens behind cladding	Ecoply® H3 treated[1], DD surface grade or better	Stainless steel[5] or silicone bronze
Plywood bracing exposed to exterior weather conditions and dampness but not in ground contact: e.g. plywood as both cladding and bracing (direct fixed to framing or over a 20mm drained ventilated cavity system)	Shadowclad®[1,2] Ecoply® H3 treated[1]	Stainless steel[5] or silicone bronze (as per Table 4.3 of NZS 3604:1999[3])
Bracing walls where the timber framing is not required to be treated in accordance with NZS 3602	Ecoply® untreated[4]	Hot dipped galvanised or better
Bracing on framing exposed to ground atmosphere (subfloor)	Ecoply® H3 treated[1]	Stainless steel[5] or silicone bronze
Bracing in wet process buildings	Ecoply® H3 treated[1]	Stainless steel[5] or silicone bronze

[1] Ecoply® H3 is plywood that has been preservative treated to the H3 hazard rating with CCA type preservative. Shadowclad® plywood cladding products are preservative treated to H3 hazard rating with a LOSP azole system. H3 CCA treated plywood in accordance with AS/NZS 1604.3:2004 is comparable to H3.2 and H3 LOSP azole is comparable to H3.1.

[2] Refer to the "Shadowclad® Specification & Installation Manual". Plywood used as both cladding and bracing must have a three coat maintained acrylic exterior paint system with a light reflectance value of 40% or greater for 50 year durability.

[3] Galvanised steel/protected galvanised steel nails are unsuitable for use with Ecoply® H3 CCA treated plywood.

[4] Moisture content in plywood and adjacent timber must be less than 18% in service.

[5] Stainless steel nails must have annular grooves to provide similar withdrawal resistance to hot dipped galvanised nails.

- Detailing near doors and other fittings must avoid the collection of debris which could damage the plywood surface.
- Battens and other items attached to the surface shall have capillary breaks and surfaces that encourage drainage of water and shedding of debris.
- Acceptable Solution E2/AS1 requires plywood claddings to be a minimum of 12mm in thickness and grade CD or better. Woodproducts NZ recommends the use of Shadowclad® rather than Ecoply® for exterior cladding (Refer page 24 and Shadowclad® Specification & Installation Brochure).

Rain wetting and construction bracing

Untreated Ecoply® will withstand rain and exposure during construction for up to 3 months. Rain and exposure can cause thinner plywood panels to buckle. Plywood stability is related to the number of veneers and thickness of the panel. Where panel stability is critical, consider using thicker panels e.g. Ecoply® 9mm 5 ply versus Ecoply® 7mm 3 ply and/or using temporary building wrap/tarpaulins to protect Ecoply® bracing panels from the weather.

Humidity and condensation

In uses where the moisture content may exceed 18% for prolonged periods, Ecoply® must be H3 treated to resist decay or insect hazard.

Subfloor sheet bracing

H3 treated Ecoply® can be used as sheet bracing where dampness does not allow the use of untreated plywood or other sheet materials (clause 5.4.3 of NZS 3604:1999). Where Ecoply® subfloor sheet bracing is exposed to both rain and sun, it must be coated with a three coat maintained acrylic exterior paint system with a light reflectance value of 40% or greater.

Cladding as bracing

H3 treated Ecoply® and Shadowclad® can be used as cladding as well as bracing. To achieve 50 year structural durability, it must be:

- Surface grade CD or better
- A minimum of 5 ply
- A minimum of 12mm thickness
- Coated with a three coat acrylic paint system with a light reflectance value (LRV) of 40% or more
- Fixed with stainless steel or silicone bronze fasteners

Refer to the Shadowclad® Specification & Installation Manual for details. Woodproducts NZ recommend Shadowclad® for exterior cladding. Shadowclad® has a bandsawn face which helps reduce the incidence of face checking (see footnote† on page 5) and is H3 treated with LOSP Azole, a clear preservative which does not leave fillet marks on the face of the panel.

12mm Ecoply® CD H3 CCA will meet the requirements of Acceptable Solution E2/AS1 and perform as a structural, durable and weathertight cladding and bracing element when correctly installed. However, Ecoply® BD H3 LOSP is recommended where a higher appearance grade is desired with a clear finish preservative treatment and no fillet marks. (H3 CCA has a green tinge and the treatment process leaves fillet marks on the face of the sheet).

Fasteners

Use corrosion resistant fasteners appropriate to the expected life cycle exposure for the bracing element.
Refer Table 7. Where H3 CCA Ecoply® is used, it must be fixed with stainless steel or silicone bronze fasteners.

Soil

Ecoply® (untreated or H3 treated) and Shadowclad® must not be allowed to come in contact with soil. The bottom edge of the plywood sheet must be a minimum of 100mm above decks or paved ground and a minimum of 175mm above unprotected ground.

For further information, refer to the Woodproducts NZ Ecoply® Durability Statement (see page 12).

3.1.3 Bracing ratings for Ecoply® & Shadowclad®

Table 8: P21 ratings for 2.4m high Ecoply® and Shadowclad® wall elements

Wall Type Code (Floor type)	Minimum Wall Length (m)	Minimum Ecoply® Thickness (mm)	Nail*** Spacing (mm)	Hold Down Type***	Maximum Stud Spacing (mm)	Bracing Unit/m (20 bracing units = 1KN) Wind	Earthquake
Ratings for Ecoply® component on one side only							
SP4	0.45	7	75	1	450	70	85
SP2* (Timber)	0.6	7	150	1	600	90	80
(Concrete)	0.6	7	150	1	600	90	105
SP1* (Timber)	0.9	7	150	1	450/600	110/100	105/100
(Concrete)	0.9	7	150	1	450/600	100/100	115/100
SP6	0.9	12	150	1	450 or 600	115	110
SP8D	0.9	7	150	2	450	125	135
SP5D	1.2	7	75	2	600	130	135
SP10	1.8	7	75	1	450	135	135
SP12* (Timber)	1.8	7	150	1	600	120	105
(Concrete)	1.8	7	150	1	600	115	105
Ratings for Ecoply® one side and GIB® plasterboard on the other side‡							
SP2G‡	0.6	7	150	1	600	95	95
SP1G‡	0.9	7	150	1	450 or 600	110	105
SP11G‡	1.8	7	150	1	450 or 600	140	120
BLP† (Timber)	0.9	7	150	1	450 or 600	130	100
(Concrete)	0.9	7	150	1	450 or 600	135	140
SP6G	0.9	12	150	1	450 or 600	120	110
SP6GD	0.9	12	150	2	450 or 600	145	135

Wall type codes

SP = Structural Plywood

D = Double hold down strap (i.e. 2 x 6kN hold down straps at each end of the wall bracing element). Where wall type code does not include a 'D', a single 6kN hold down strap is required at each end of the wall bracing element.

G = 10mm GIB® Standard plasterboard or any other GIB® plasterboard, nailed as per GIB® Standard plasterboard.

BLP = Winstone Wallboards bracing element - refer Winstone Wallboards Ltd literature.

* These walls on timber and concrete floors reviewed by BRANZ. Where floor type is not specified, use the lower value.

** Use these nail spacings at all sheet edges. Within the sheet, nail spacings may be double that specified.

*** See Installation section on page 19. '1' denotes a single 6kN hold down strap is required at each end of the wall bracing element and '2' denotes two 6kN hold down straps are required at each end of the wall bracing element. Straps are not required for every Ecoply® bracing panel, only at each end of the wall bracing element.

† BLP denotes Ecoply® on one side in accordance with this literature and 10mm GIB Braceline® in accordance with Winstone Wallboards Ltd instructions.

‡ The GIB® may be 10mm GIB® Standard plasterboard or any other GIB® plasterboard except system BLP where 10mm GIB Braceline® is required. GIB® may be fixed horizontally or vertically (refer to 'GIB® Bracing Systems' manual for installation details and limitations, available at www.gib.co.nz or by calling 0800 100 442).

Fasteners

Use any of the following fasteners with untreated Ecoply® 7mm bracing. For H3 CCA treated Ecoply® bracing required for those applications shown in Table 7, the stainless steel or silicone bronze fastener options must be used. For fixing Shadowclad® used as bracing as well as cladding, refer to the 'Shadowclad® Specification & Installation Manual'.

- 30 x 2.5mm galvanised clouts (flat head)
- 40 x 2.5mm galvanised clouts (flat head)
- Paslode Impulse RounDrive (full round head) 50 x 2.87mm, Hot Dip Galv. ring nail (B20557)
- 40 x 2.8mm stainless steel annular grooved nails (flat head)
- 40 x 2.8mm silicone bronze annular grooved nails (flat head)
- Paslode 55 x 2.8mm Lense Head (Full Round Head) 304 stainless steel ring nails, plastic collated (B20572)

For 9mm Ecoply® use minimum length 40mm nails. For 12mm Ecoply® use minimum 50mm length nails.

Adjustments for wall height

Use clause 8.3.1.4 of NZS 3604:1999 to calculate bracing values:

"Adjustment of bracing capacity of walls of different heights and walls with sloping top plates shall be obtained by the following method:

(a) For wall bracing elements of heights other than 2.4m, the bracing rating determined by test or from Table 8.1 should be multiplied by 2.4 ÷ element height in metres, except that elements less than 1.8m high shall be rated as if they are 1.8m high.

(b) Walls of varying heights, should have their bracing capacity adjusted in accordance with 8.3.1.4(a) using the average height."

Joining panels for walls higher than maximum sheet length

Ecoply® bracing panels must be fixed from top plate to bottom plate. For wall heights over 2.4m, Ecoply® is available in 2.7m sheet lengths. Alternatively, a part sheet can be stacked above a full sheet, butt joined on a single row of nogs with each sheet/part sheet independently nailed off as per the nail spacing in Table 8 (e.g. 2.4m x 1.2m sheet with a 0.3m x 1.2m part sheet above it to give a 2.7m x 1.2m bracing element).

Ecoply® Bracing

3.1.4 Installation

Framing

Framing must be in accordance with NZS 3604. Before placing the frame in position, check the hold-down requirements to enable positioning of any straps required. Refer to Figure 2 for detailing of expansion gaps and framing alignment. Nogging for horizontal joints between sheets should be at least 35mm wide to enable nailing of both sheet edges.

Hold-down details

Hold-down straps are available through builders supply merchants in a range of lengths from 200mm to 600mm. A standard 6kN hold down strap is pre-galvanised 25mm x 0.91mm (nominal 1mm). Straps are also available in 0.91mm stainless steel 304-2B which must be used if the strap will be exposed to the weather or will be in direct contact with H3 CCA treated Ecoply® or other corrosive timber. Fix pre-galvanised hold-down straps with 30 x 3.15mm flat head galvanized nails and stainless steel straps with 30 x 3.15mm flat head stainless steel. Refer to Figure 2. Where strap projects into subfloor space, use additional protection in accordance with NZS 3604:1999 clause 4.4.5.

Type 1 (6kN) hold-down

At each end of the wall, use either:

- A single 25mm x 0.91mm sheet brace strap. Refer to: Figure 2 or,
- The dropped panel detail, requiring no straps. Refer to: Figure 2(a) and 2(c)

Type 2 (12kN) hold-down

- Higher wall ratings are possible with double hold-down and/or double nailing.
- For Type 2 hold-down use two 25mm x 0.91mm straps, one on each side of the end stud.
- On concrete floors, a single strap may fold under the plate and up both sides of the stud.

Nailing and fixing of sheets

Refer Figure 2(a). Nail according to the desired bracing rating in Table 8 and the notes with the table.

- Allow a 2 to 3mm wide expansion gap between sheets (Figure 2(b)).
- Nails must be at least 7mm from the edge of the sheet for square edge sheets and 7mm plus the width of the top lap for Shadowclad® shiplap edges.
- Do not nail through the top laps of Shadowclad® shiplap edges (Figure 2(b)). For more detailed instructions refer to the Shadowclad® Specification & Installation Manual.
- Nail all sheet edges (including those with plastic tongue-in-groove joints) and all ends of the sheets used as bracing to the requirements of Table 8. Sheets with plastic T & G joints will require solid blocking behind joints if use for bracing.
- Do not foul hold-down straps and nails used to fix the plywood. This weakens the strap below specification.
- For power driven nails, use the Paslode Impulse Compact Nailer fitted with a No Mar(k) work contact element. Adjust work contact element to the flush position and drive nail flush with the plywood surface. Hammer any nails flush which are left proud. Do NOT overdrive power driven nails.

Openings in bracing elements

Small openings (e.g. power outlets) of 90 x 90mm or less may be placed no closer than 90mm to the edge of the braced element, or waste pipe outlets of max. 150mm diameter placed at no closer than 150mm to the edge of the braced element.

Figure 2(a): Fixing of Ecoply® bracing sheets

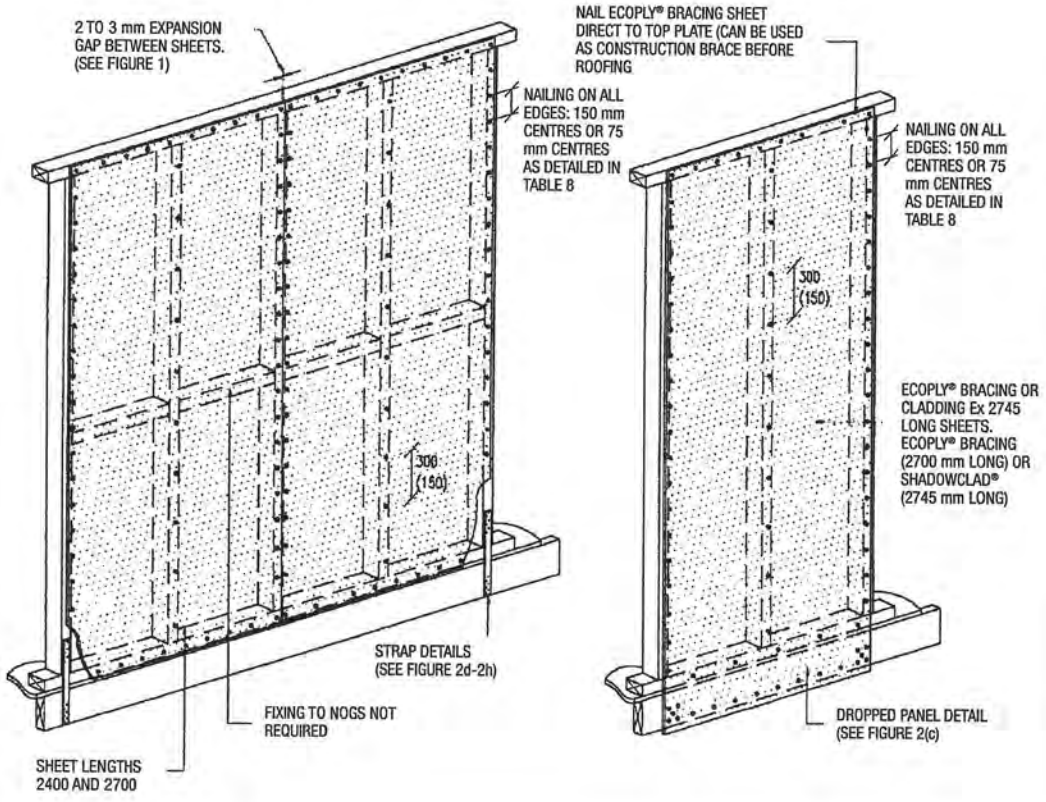
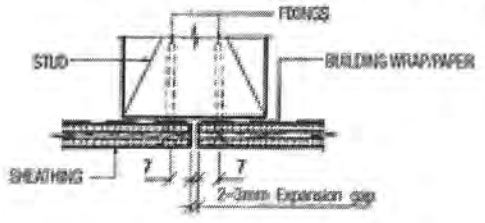
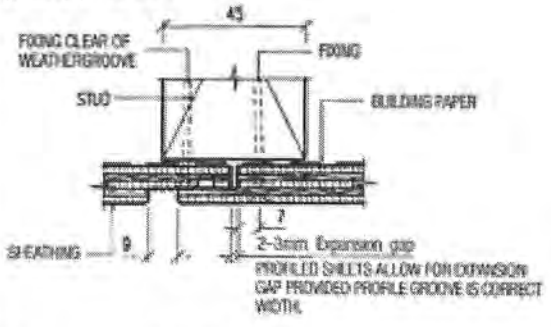


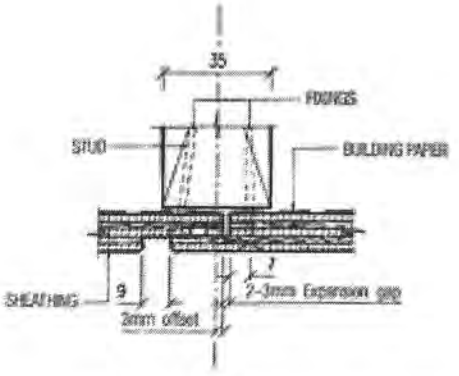
Figure 2(b): Typical detailing for expansion gaps



(i) Ecoply® to stud

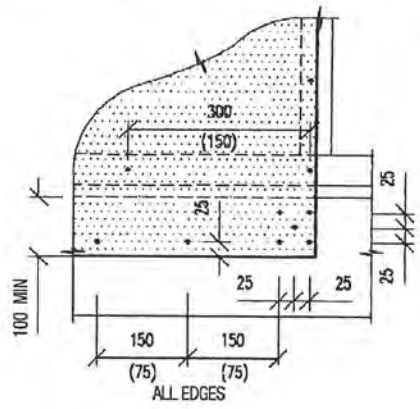


(ii) Shadowclad® to 45 mm stud

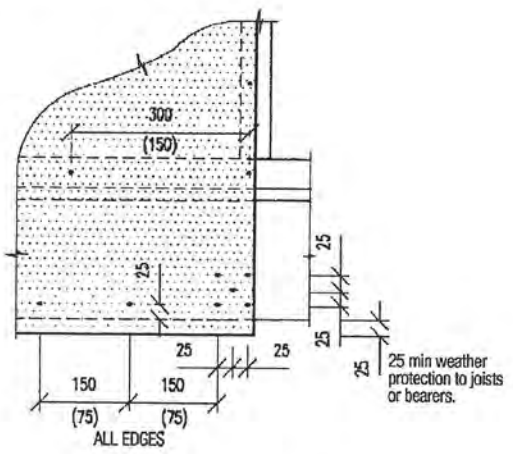


(iii) Shadowclad® to 35 mm stud

Figure 2(c): Type 1 dropped panel fixing for timber frames



(a) Dropped panel for brace under other cladding

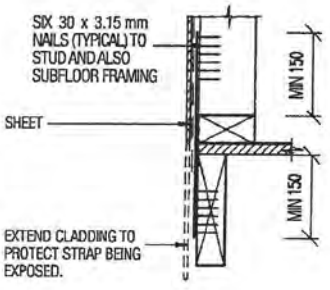


(b) Dropped panel for Shadowclad®/ Ecoply® cladding brace

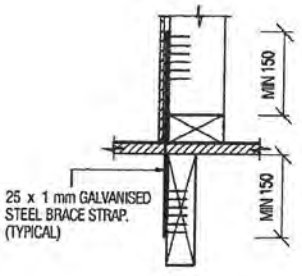
Note

1. Nail centres given for standard nailing, refer Table 8.
2. Extra hold-down nails are same size as for rest of sheet.

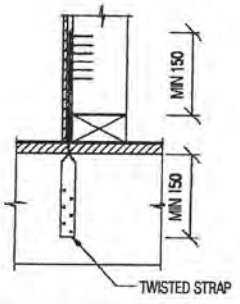
Figure 2(d): Type 1 strap fixings to each end stud of plywood sheet braces for timber ground floor and upper storey



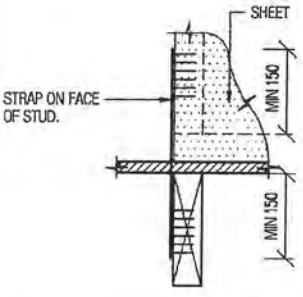
(a) Exterior or edge detail



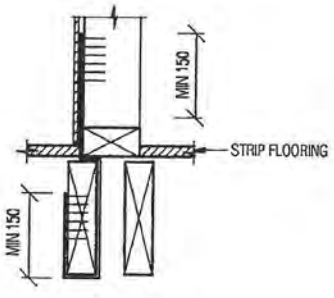
(b) Internal detail over continuous floor – wall parallel to joists



(c) Internal detail over continuous floor – wall across joists



(d) Alternative to detail (c)

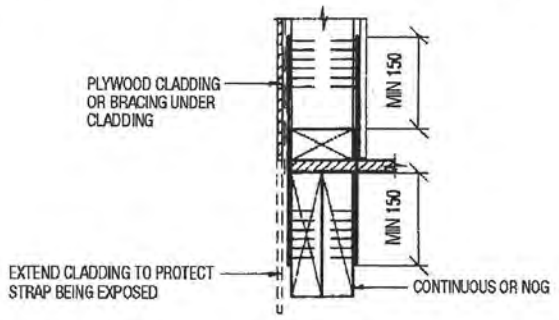


(e) Strip flooring detail

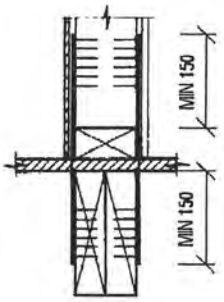
Note:

1. Detail (a) can be replaced by a dropped panel fixing with no straps. See Figure 2(c).

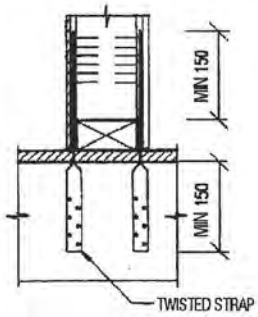
Figure 2(e): Type 2 strap fixings to each stud of plywood sheet braces for timber



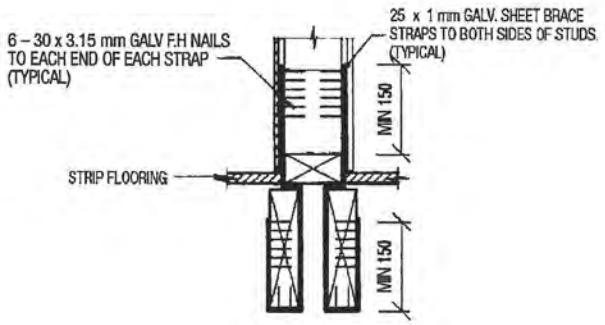
(a) Exterior or edge detail



(b) Internal wall over continuous floor - wall parallel to joists

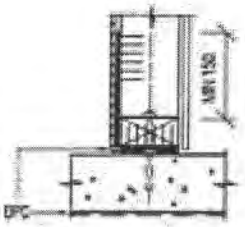


(c) Internal detail over continuous floor - wall across joists

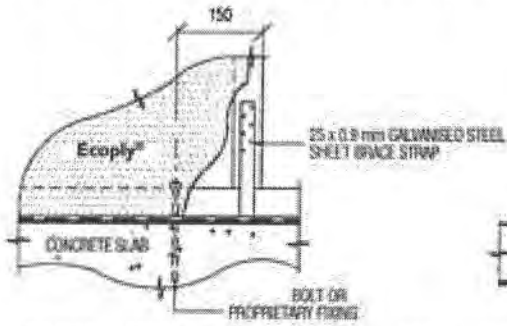


(d) Strip flooring detail

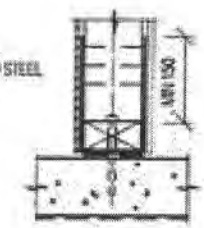
Figure 2(f): Type 1 strap fixings and capacities to each end stud of braced panels on concrete



(a) Type 1 strap one side and under plate 6 – 30 x 3.15mm dia. Galv. F.H. nails each end

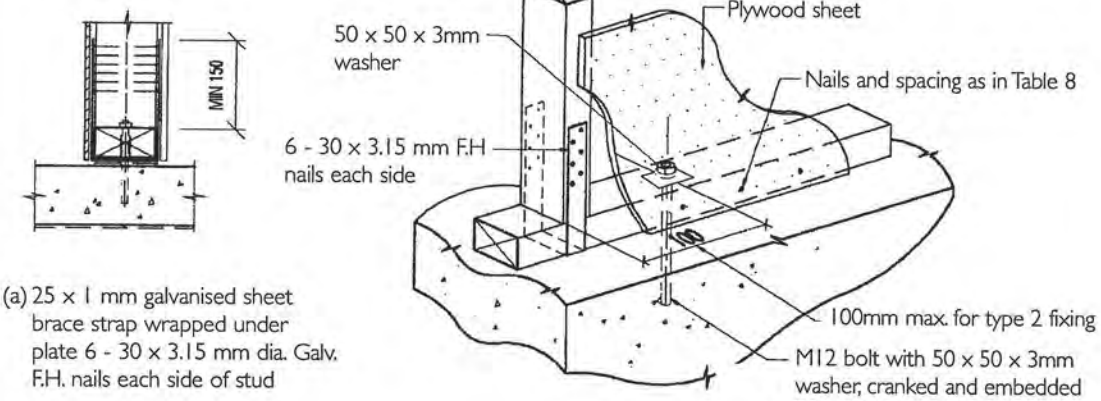


(b) Embed M12 bolt with 50 x 50 x 3mm washer, cranked and embedded 75mm into concrete or proprietary fixing



(c) Type 1 strap wrapped under plate 3 – 30 x 3.15mm dia. Galv. F.H. nails each end of strap

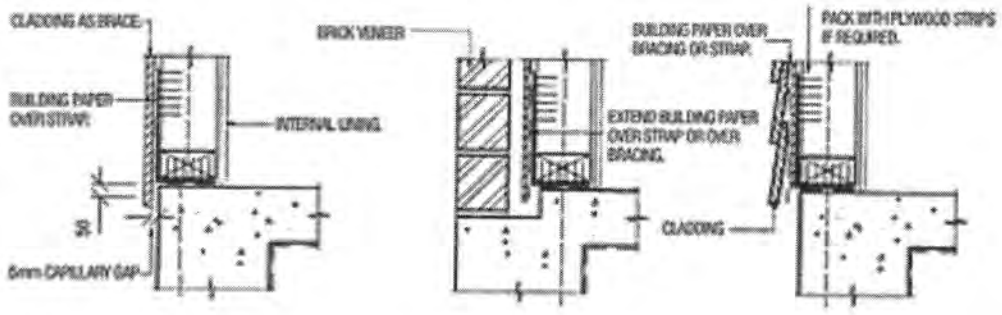
Figure 2(g): Type 2 strap fixings to end studs of plywood sheet braces for concrete floors



(a) 25 x 1 mm galvanised sheet brace strap wrapped under plate 6 - 30 x 3.15 mm dia. Galv. F.H. nails each side of stud

(b) Concrete base

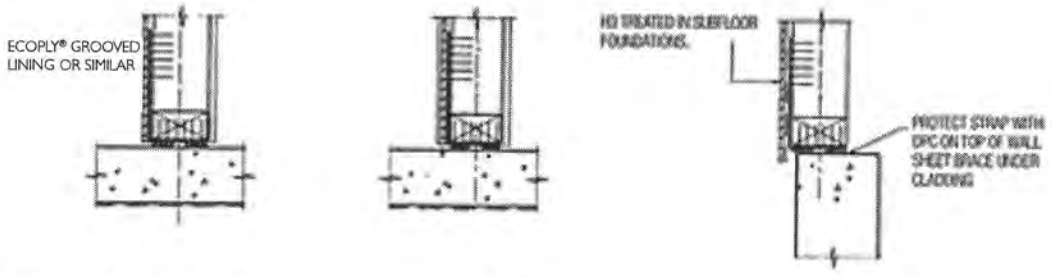
Figure 2(h): Typical detailing for wall and subfloor framing on concrete floor and foundations



(a) Exterior cladding as sheet brace

(b) Sheet brace under brick veneer

(c) Sheet brace under cladding



(d) Plywood internal lining as sheet brace

(e) Plywood sheet under internal lining

(f) Foundation Wall

Note: Modify these details for either Type 1 or Type 2 fixings according to Figure 2(f) or Figure 2(g)

Construction

Product Data Sheet
Version no: 09.06.08

Sika RainTite (au)

Liquid acrylic waterproofing membrane

Positioning

Description

Sika RainTite (au) is a water based elastomeric waterproof liquid membrane for waterproofing external and internal areas in conjunction with the Architextures coatings and claddings.

Use

Sika RainTite (au) is suitable for application to most common building substrates including concrete, masonry, fibre cement, treated plywood, and timber. Has been tested to CSIRO to **AS 3740 - 2004 "Waterproofing of wet areas within residential buildings"**

Sika RainTite (au) can be used as a waterproofing membrane and decorative coating on most building surfaces including:

- Liquid flashings for the Sika Architextures coating / cladding range
- Parapet cappings (concrete and masonry)
- Window reveals and recesses prior to installing windows (concrete and masonry)

Advantages

- Non toxic, water based acrylic, free of solvents.
- Accommodates movement and minor cracking of substrates.
- UV stable.
- One component liquid readily applied.
- Colour – grey only
- Approved in accordance with **AS 4858:2004 "Wet Area Membranes".**

Product Data

Colour:	Grey
Storage & shelf life:	Stored in the original sealed packaging, in dry conditions away from direct sunlight, this product will keep for at least twelve (12) months.
Packaging:	15 litre pails

Technical Data

Specific gravity:	1.2 kg / litre
Solids Content:	51%
Drying times:	Tack free: 1.5 hours
(20°C, 50% RH)	Recoat: 3 – 4 hours
	Fully cured: 7 days
VOC	14.4gms / 1 litre (1.2% by weight)
Application temperatures:	Ambient: 5°C to 40°C
	Substrate: 5°C to 40°C
Consumption:	0.3 to 0.5 litres/m² (per coat)
No. of coats:	3 coats minimum
Elongation at break:	312% (AS4858) Class III (High Extensibility)
Moisture vapour transfer:	~4.2 g/m² /24 hrs
Chemical resistance:	Resistant to a wide range of chemicals and solvents

Application Conditions
Instructions for use

Surface Preparation	Remove dirt, dust, oil, grease and all other contaminants from the surface. Surface irregularities should be ground or sanded to remove protrusions or filled using Sika MonoTop repair mortars or Sikadur epoxy repair mortars. A polyurethane joint sealant (Sikaflex Construction) should be used to form a 10mm fillet at corners, or to fill chased out movement cracks and construction joints. All substrates to receive the Sika Raintite (au) are to be structurally sound and stable and be free from excessive deflection or movement.
Priming	A priming coat must be used on all substrates as part of the surface preparation. Prime timber and plywood using Sika Primer MB. Prime concrete and fibre cement using Primer 2S or Primer 2W. For all other substrates and further information on priming consult Sika (NZ) Ltd Technical Services.
Application	Sika RainTite (au) can be applied by brush, roller or spray. When brushing or rolling, lay the material out onto the surface. Apply 2 to 3 coats of Sika RainTite (au), plus the primer coat. Observe recommended dry times between coats.
Reinforcement	Sika fabric reinforcement is recommended as it provides strong support against substrate or cracking movement and protects the membrane against rupture. Sika fabric reinforcement must be used where the SikaTite (au) membrane is used over joints, junctions or cracks in the substrate or areas subject to flexing or vibration. Approved Sika fabrics include 300gsm chopped strand fiberglass mat, 9oz woven glass cloth or Dekweb Mesh. When using the Sika fabric reinforcement, embed the cloth into the first coat of Sika RainTite (au) whilst it is still wet. Roll the fabric using an approved laminating roller to ensure total "wet out" of the fabric. Apply a second or third coat of Sika RainTite (au) as required. **Overcoating** Sika RainTite (au) can be overcoated using Sika Architextures Basecoats or Glazes.
Cleaning	All tools and equipment can be cleaned with water immediately after use. Hardened material can only be removed mechanically.
Notes	All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.
Local Restrictions	Please note that as a result of specific local regulations the performance of this product may vary from country to country. Please consult the local Product Data Sheet for the exact description of the application fields.

Health & Safety Instructions

Protective Measures

- To avoid rare allergic reactions, we recommend the use of protective gloves. Change soiled work clothes and wash hands before breaks and after finishing work.
- Local regulations as well as health and safety advice on packaging labels must be observed.
- For further information refer to the Sika Material Safety Data Sheet which is available on request.
- If in doubt always follow the directions given on the pack or label.

Important Notes

- Residues of material must be removed according to local regulations. Fully cured material can be disposed of as household waste under agreement with the responsible local authorities.
- Detailed health and safety information as well as detailed precautionary measures e.g. physical, toxicological and ecological data can be obtained from the Safety Data Sheet.

Legal Notes

Construction

Sika (NZ) Ltd
PO Box 19192
Avondale
Auckland 1746
New Zealand

Phone: 0800 SIKA NZ 0800 745 269
Fax: 0800 SIKA FAX 0800 745 232
Email: info@nz.sika.com www.sika.co.nz

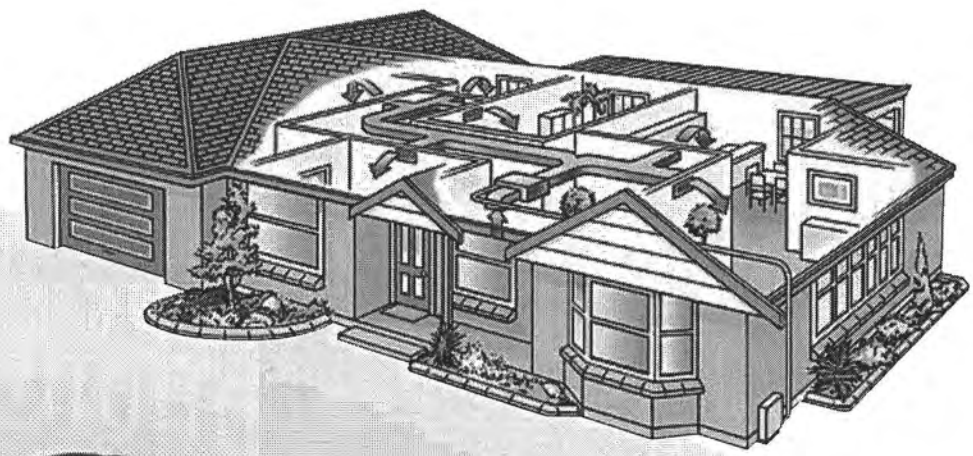
Responsible Care

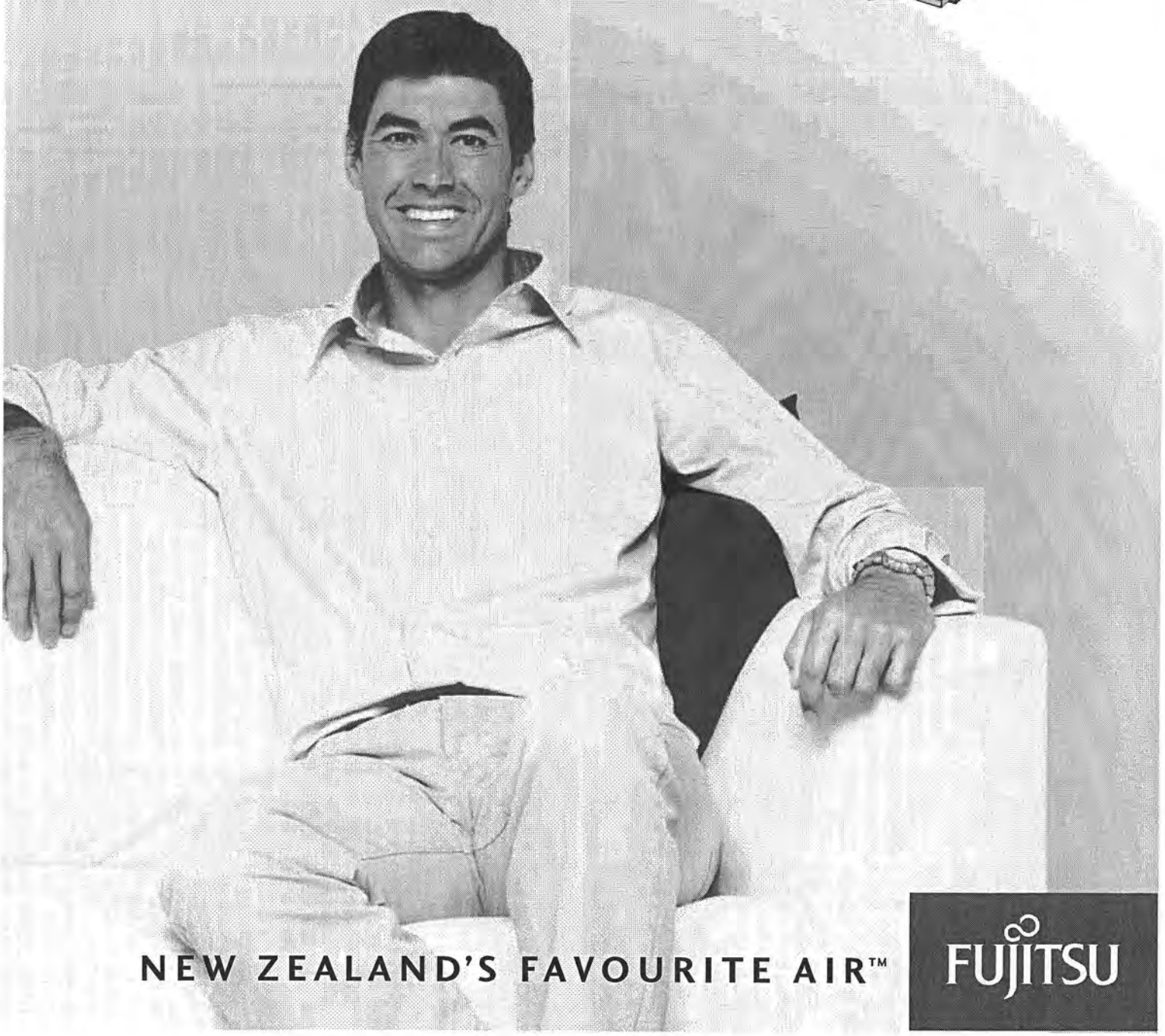
Certified Quality System ISO 9001/EN 29001 since 1986

FUJITSU Ducted

APRIL 2008

INVERTER

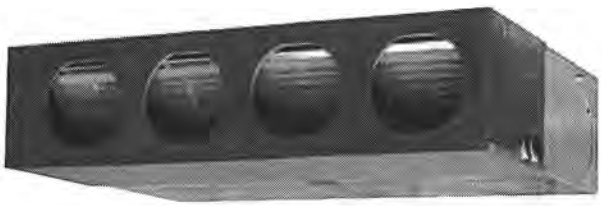




NEW ZEALAND'S FAVOURITE AIR™

FUJITSU

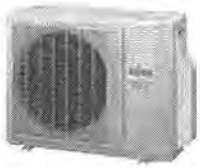
These low-profile models are ideal for narrow ceiling spaces – delivering high efficiency quickly and effectively.



Wired type (with weekly/ setback timer)

Simple Controller (optional)

Remote Temperature sensor (optional)



FOR ARTA24LATU

FOR ARTA 36/45LATU

ARTA24LATU	ARTA36LATU	ARTA45LATU
Hi-COP 3.61	Hi-COP 3.71	Hi-COP 3.71
C 7.10kW / 24,200BTU/h	C 10.00kW / 34,100BTU/h	C 12.50kW / 42,700BTU/h
H 8.00kW / 27,300BTU/h	H 11.20kW / 38,200BTU/h	H 14.00kW / 47,800BTU/h
Quiet mode - just 25dB	**Quiet mode - just 29dB**	**Quiet mode - just 29dB**

Easy installation.

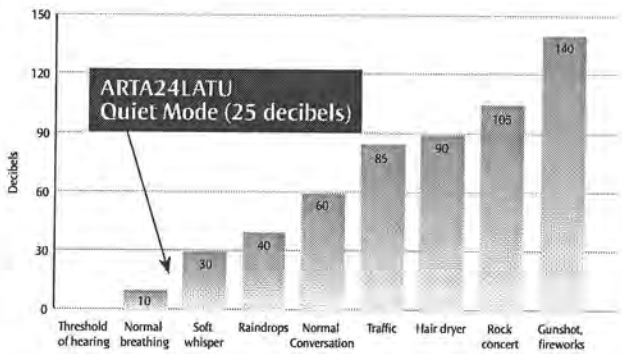
Main work settings can be done easily from the remote controllers at installation, these include:

- Fan mode settings
- Auto restart
- Temperature adjustment when cooling/heating

Heating efficiency or COP.

COP stands for Coefficient Of Performance. This is the relationship of energy used, versus heat delivered. For example 1kW of energy supplied to the ARTA24LATU will produce 3.61kW of heat. Check COP when purchasing a heat pump – you will find it difficult to beat Fujitsu for efficiency.

Quiet Mode.

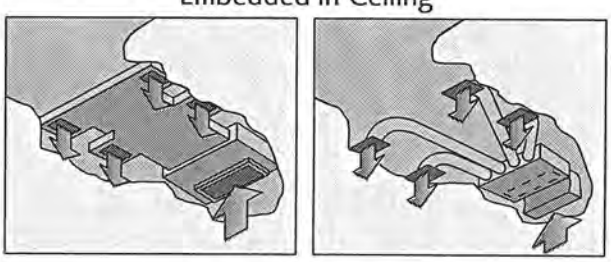


Static pressure mode setting (ARTA24LATU).

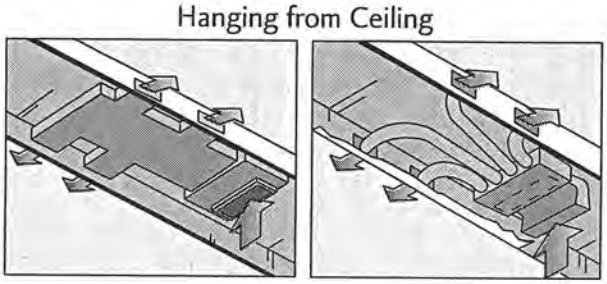
Four settings are available to adjust the static pressure of the indoor unit. This will ensure that the system heats and cools as efficiently and quietly as possible.

Installation styles.

Embedded in Ceiling



Hanging from Ceiling



SPECIFICATIONS

SPECIFICATIONS			Bulkhead	Low Profile	Low Profile	Low Profile	Ducted	Ducted	Ducted	Ducted
Type			Lo Static	Lo Static	Lo Static	Lo Static	Hi Static	Hi Static	Hi Static	Hi Static
MODEL No.	Indoor Unit		ARTA18LALU	ARTA24LATU	ARTA36LATU	ARTA45LATU	ARTC30LUAK	ARTC36LJATU	ARTC45LUAK	ARTC54LJATU
	Outdoor Unit		AOTA18LACL	AOTA24LACL	AOTA36LATL	AOTA45LATL	AOT30LMBDL	AOT36LMADL	AOT45LJBYL	AOT54LJBYL
Reverse Cycle			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cooling Capacities		Watts	5,200	7,100	10,000	12,500	8,800	10,000	12,500	14,500
		BTU/Hr	17,700	24,200	34,100	42,700	30,000	34,100	42,700	49,500
Cooling Range		Watts	900 - 5,900	900 - 8,000	3,800 - 11,200	4,000 - 14,000	2,700 - 9,800	2,700 - 10,500	3,600 - 14,000	3,600 - 15,500
		BTU/Hr	3,100 - 20,100	3,100 - 27,300	13,000 - 38,200	13,700 - 47,800	9,200 - 33,500	9,200 - 36,000	12,300 - 47,800	12,300 - 52,900
Heating Capacities		Watts	6,000	8,000	11,200	14,000	9,200	10,000	14,000	16,000
		BTU/Hr	20,490	27,300	38,200	47,800	31,400	34,100	47,800	54,600
Heating Range		Watts	900 - 7,500	900 - 9,100	4,000 - 14,000	4,200 - 16,200	3,000 - 11,000	3,000 - 12,100	4,700 - 16,000	4,700 - 18,000
		BTU/Hr	3,100 - 25,600	3,100 - 31,000	13,700 - 47,800	14,300 - 55,300	10,200 - 37,600	10,200 - 41,300	47,800 - 54,600	16,000 - 61,500
Energy Star Rating	Cool		5	4.5	5	5	3	2.5	3.5	3
	Heat		5	5	5.5	5.5	5	5	5	4
E.E.R Cool		W/W	3.21	3.11	3.21	3.21	2.67	2.5	2.87	2.69
C.O.P Heat		W/W	3.61	3.61	3.71	3.66	3.54	3.57	3.64	3.33
Running Current	Cool	Amps	6.8	9.3 (11.5 Max)	13 (19 Max)	16.3 (20 Max)	13.8 (15.5 Max)	16.7 (17.6 Max)	18.1 (21.7 Max)	23.5 (25.3 Max)
	Heat	Amps	7	9.3 (12.2 Max)	12.7 (19 Max)	16.1 (20 Max)	10.7 (15.9 Max)	11.7 (17.6 Max)	16 (20.1 Max)	19.8 (25.3 Max)
Input Power	Cool	Watts	1,620	2,280 (2,740 Max)	3,110 (4,540 Max)	3,890 (4,780 Max)	3,300 (1,080 - 4,150)	4,000 (1,080 - 4,200)	4,350 (1,700 - 5,200)	5,570 (1,700 - 6,060)
	Heat	Watts	1,660	2,210 (2,910 Max)	3,020 (4,540 Max)	3,830 (4,780 Max)	2,550 (1,000 - 4,150)	2,800 (1,000 - 4,200)	3,800 (1,500 - 4,800)	4,700 (1,500 - 6,060)
Moisture Removal		L/Hr	2	2.5	3	3.5	3	3	2	3
Fan Speeds			4	4	4	4	3	3	3	3
Air Circulation		l/s	227	305	560	625	700	700	980	980
Indoor Sound Level	Quiet	Dba at 1m	27	25	29	29	N/A	N/A	N/A	N/A
	Low	Dba at 1m	29	27	32	33	36	36	42	42
	Med	Dba at 1m	31	29	37	38	39	39	45	45
	High	Dba at 1m	33	31	42	44	45	45	49	49
Outdoor Sound Level		Dba at 1m	50	53	55	56	54	54	53	53
Outdoor Sound Power Level		Dba	65	68	69	70	65	65	65	69
Dimensions and Weights	I.U Height	mm	217	270	270	270	400	400	400	400
	I.U Width	mm	953	1135	1135	1135	1050	1050	1050	1050
	I.U Depth	mm	595	700	700	700	500	500	500	500
	I.U Net Weight	kg	23	38	41	41	45	45	50	50
	O.U Height	mm	578	578	1290	1290	900	900	1290	1290
	O.U Width	mm	790	790	900	900	900	900	900	900
	O.U Depth	mm	300	315	330	330	350	350	330	330
	O.U Net Weight	kg	40	44	98	98	70	70	105	105
Compressor Type			DC Twin Rotary	DC Twin Rotary	DC Twin Rotary	DC Twin Rotary	DC Twin Rotary	DC Twin Rotary	DC Scroll	DC Scroll
Ductwork Plenum size	Supply	mm	600 X 150	4 X 205 dia	4 X 205 dia	4 X 205 dia	850 X 295	850 X 295	850 X 295	850 X 295
	Return	mm	811 X 177	1015 X240	1015 X 240	1015 X 240	865 X 325	865 X 325	865 X 325	865 X 325
Ex Static Pressure		Pa	0 to 90	30 to 150	30 to 150	30 to 150	200	200	100 - 250	100 - 250
Interconnect cables - size		Qty - mm2	4 - 1.5	4 - 1.5	4 - 1.5	4 - 1.5	4 - 1.5	4 - 1.5	4 - 1.5	4 - 1.5
Recommended Min. Power Cable		mm2	4	4	6	6	4	6	6	6
Phase - Frequency		Ph - Hz	1 - 50	1 - 50	1 - 50	1 - 50	1 - 50	1 - 50	1 - 50	1 - 50
Power Supply Attachment			Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
Power Supply		Volts	230	230	230	230	230	230	230	230
Refrigerant Type			R410a	R410a	R410a	R410a	R410a	R410a	R410a	R410a
Connection Pipe Sizes	Gas	mm	12.7	15.88	15.88	15.88	15.88	15.88	15.88	15.88
	Liquid	mm	6.35	6.35	9.52	9.52	9.52	9.52	9.52	9.52
Minimum Pipe Length		Metre	5	5	5	5	5	5	5	5
Maximum Pipe Length		Metre	25	30	50	50	30	30	70	70
Maximum Pipe Height		Metre	15	20	30	30	20	20	30	30
Pre Charged Length		Meter	15	15	20	20	10	10	20	20
Pipe Connection Method			Flare	Flare	Flare	Flare	Flare	Flare	Flare	Flare
Outdoor Operating Temperature	Cool	Degree C	-10 to 46	-10 to 46	-15 to 46	-15 to 46	0 to 43	0 to 43	-15 to 43	-15 to 43
	Heat	Degree C	-15 to 24	-15 to 24	-15 to 24	-15 to 24	-10 to 21	-10 to 21	-15 to 24	-15 to 24

Explanation of Terms

COP: Stands for coefficient of performance or (more simply!), the relationship between energy used and heat delivered. For example with a heating COP of 4.11 – you will get 4.11kW of heat for every 1kW of energy used.

Energy Star rating: your quick guide to energy efficiency – more stars means more efficient.

Indoor sound – measured in decibels, this is the sound level of your indoor unit at selected fan speeds. For example 20-30 decibels is less than the sound of a human whisper.

Heating range – with our Kiwi winter, your heat pump needs to be able to supply heat indoors, even when its -15˚C outside!

Products depicted in this brochure contain high operating pressure R410a refrigerant. It is illegal to vent that refrigerant to the atmosphere.

Only persons qualified and experienced in the installation, service and repair of these products are authorised to undertake such work.

Fujitsu General Accredited Installers have shown they have the necessary equipment and have accepted responsibility for their installations and the requirements of any statutes or laws.

Due to ongoing Research and Development specifications and designs are subject to improvement without notice therefore relevant manuals must be consulted before any action is taken to install or service these products.

Heating/Cooling capacities and run current tests are based on the requirements of AS/NZS3283, that standard tests at the temperature below.

COOLING: Indoor Temp: 27°C DB / 19°C WB
Outdoor Temp: 35°C DB

HEATING: Indoor Temp: 20°C DB
Outdoor Temp: 7°C DB / 6°C WB

As actual temperature ranges in New Zealand vary considerably only competent people should provide advice as to size and placement of units.

Recommended cable sizes are based in AS/NZS3000 and AS/NZS3008.

Fujitsu General New Zealand Ltd warrants the equipment against any defects in materials and factory workmanship for a period of five years from the date of installation, or for 6 years if installed by an Accredited Installer.

This warranty does not cover defects or failures which are attributable to; incorrect or improper installation; environmental damage; airflow restriction; inadequate electrical supply; getting access to the product.

FUJITSU HEAT PUMPS

NEW ZEALAND'S FAVOURITE AIR™

Fujitsu General New Zealand Limited
www.fujitsugeneral.co.nz

JAS-ANZ

OAS is Accredited by the Joint Accreditation System of Australia and New Zealand, Acc No. S1250992AS

ISO 9002 Certified number: JQA-2005

ISO 14001 Certified number: EC98J1137

Hamamatsu Fujitsu General Ltd.

All products specified in this brochure comply with the Australian Communications Authority's (ACA) requirements for Electromagnetic Compatibility (EMC). N807

ENERGY STAR THE GLOBAL MARK OF ENERGY EFFICIENCY

5 YEARS FULL PARTS & LABOUR WARRANTY

6 YEARS FULL PARTS & LABOUR EXTENDED WARRANTY

FUJITSU ACCREDITED INSTALLER COMFORT WARRANTY

5 Year full parts and labour warranty. 6 years (an extra full year's warranty) when you use a Fujitsu Accredited installer.

FG9048 APRIL_08

Metro Wee Curve

- Radiant design and heat with a large cooktop
- Designed to heat large open areas up to 150m2
- Big on performance, offering over 14kW's of output
- Wetback option, capable of heating your water needs*
- Designed to last - 6mm carbon steel & fire brick lined
- Direct vent option for increased efficiency

Metro Euro Rad

- Radiant design and heat with a large cooktop
- Designed to heat large open areas up to 220m2
- Big on performance, offering over 20kW's of output
- Designed to last - 6mm carbon steel & fire brick lined
- Direct vent option for increased efficiency
- Optional gold, stainless steel or black trim

Metro Xtreme Rad

- Radiant design and heat with a large cooktop
- Designed to heat large open areas up to 220m2
- Big on performance, offering over 20kW's of output
- Wetback option, capable of heating your water needs*
- Designed to last - 6mm carbon steel & fire brick lined
- Direct vent option for increased efficiency (ECO model only)
- Standard in black trim, with upgrade trims available in either gold or stainless steel

Metro Mega Rad

- Radiant design and heat with a mega cooktop
- Designed to heat large open areas up to 280m2
- Massive performance, offering over 23kW's of output
- Wetback and boiler options available up to 7.0kW's, designed to heat underfloor and radiator systems*
- Designed to last - 6mm carbon steel & fire brick lined
- Standard in black trim, with upgrade trims available in either gold or stainless steel

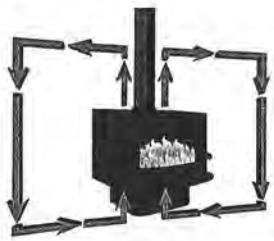
*At time of printing wetback approvals for some regions were pending, please refer to your Metro retailer.

Radiant & Convection Heat – What's the difference

Radiant Heat

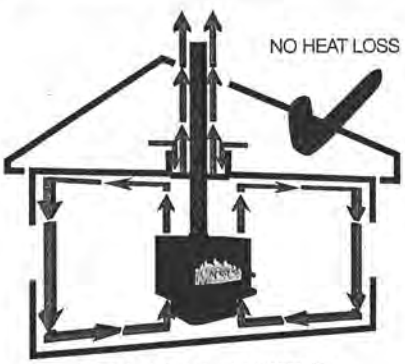
Radiant wood fires release heat into the room by "radiating" a black infrared heat directly from the outer surfaces of the appliance, onto any object in close proximity resulting in more heat being retained lower in the room. Ideal for homes with high ceilings or poor insulation, or for applications when direct radiant heat is preferred, ie people suffering from arthritic or circulatory problems.

Convection Heat

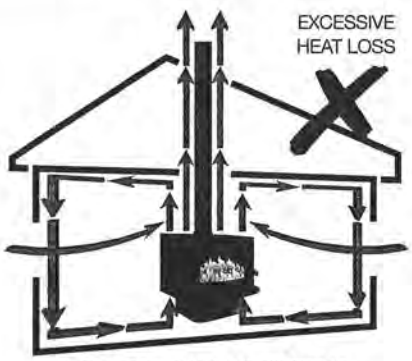


Convection wood fires "convect" hot air vertically from the top of the appliance resulting in the home being heated from the ceiling down. Generally better suited for insulated homes with standard height ceilings, convection woodfires heat more evenly throughout the home by eliminating the localised intensity of a radiant woodfire, and operate with cooler cabinet surfaces.

Metro ECO Flue Systems – The superior flue system



METRO ECO FLUE SYSTEMS



CONVENTIONAL FLUE SYSTEMS

VERTICAL DISCHARGE COWL

Metro ECO Flue Systems

The Metro ECO Flue Systems differ from conventional flue systems in that the cooling air for the system is not taken from inside the home but is drawn in from outside. The energy savings achieved by installing a Metro ECO Flue System are quite dramatic, with independent testing of a conventional flue system resulting in 7.5 litres per second of the warmest air available in the room being drawn out of the home.

ECO Flue Systems are an innovation from Metro based on many years of development and testing to achieve what Metro's engineers believe is the optimum performance and efficiency possible from a flue system.

Shown in the ECO Flue System diagram above, the heat produced by your Metro woodfire stays in your home. The cooling air for the flue is drawn from either the ceiling cavity or outside the home if no ceiling cavity exists. This results in a warmer home with reduced fuel consumption, because with an ECO Flue System the only heat loss from inside the home is what is lost through the ceiling and walls.

ECO flue systems are designed for installation with all Metro LTD, ECO and ECO DV model woodfires, further enhancing the heating efficiency within your home. Metro offer the ECO Flue system with Stainless Steel Liners as an option for customers that live near the coast, or for those wanting a superior looking finish.

Conventional Flue Systems

The conventional flue system illustration shows how the flue draws air from the room to keep itself cool, resulting in the warmest air from your woodfire being drawn out of your home. This discarded warm air is then replaced with cold outside air drawn back into your home. On a cold winter's night this hugely inefficient system will empty an average sized room once every hour of potentially 45°C air. It replaces it with the outside air which in some regions will be below zero, so it's not only the flue that's cooled!

Metro ECO Option Kit

Metro's ECO Option Kit installed in combination with the ECO Flue System provides an external air supply to the ECO Flue System. This enables homes without a vented ceiling cavity such as a sloping ceiling to still enjoy the additional performance and efficiency benefits the ECO Flue System provides.

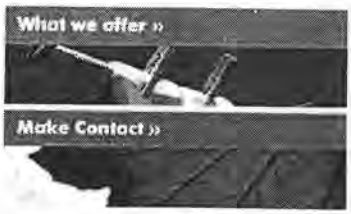
Vertical Discharge Cowl

Metro's ECO Vertical Discharge Cowl comes standard with all ECO Flue Systems, further enhancing the performance of your Metro woodfire. Operating on a vertical discharge principal, the Metro ECO Cowl induces updraft to the flue gases, increasing draw within the fluepipe and enhancing the performance of your Metro wood fire.

Why choose a Solar Advantage Solar Water Heating System?

Solar Water Heating is a smart investment, particularly in today's economic climate and at Solar Advantage we pride ourselves in providing world class products and services. Solar Advantage's customers can remain confident knowing that their Solar Water Heating investment is the right one and that's backed by the additional security of National and International Certification and Compliance second to none! See the Technical Specifications here

The Solar Advantage Evacuated Tube is relatively new to NZ and the technology is quite different to the traditional Solar Water Heating systems of the past. The cylindrical shape of the Solar Advantage Evacuated Tube and unique coatings maximises the absorption of the suns radiation throughout the day, so peak performance is gained well before and beyond the optimum height of the sun is reached without a single drop of sun is being wasted.



0800 69 59 49

Application
New home or retro-fit designed to suit up to 4 people

SAL20S

Application
New home or retro-fit designed to suit up to 6 people.

SAL30S

Application
New home or retro-fit designed to suit up to 8 people.

SAL40S

Application
New home or retro-fit designed to suit up to 9 people or a light commercial application with moderate to high water demand

SAL50S

Application
New home or retro-fit designed to suit up to 9 people or a light commercial application with high water demand.

SAL60S

Application
New home or retro-fit designed to provide hot water for domestic use and additional applications such as wet back, swimming pools, radiators etc. and various commercial applications.

SAL40M

Application
New home or retro-fit designed to provide hot water for domestic use and additional applications such as wet back, swimming pools, radiators etc. and various commercial applications.

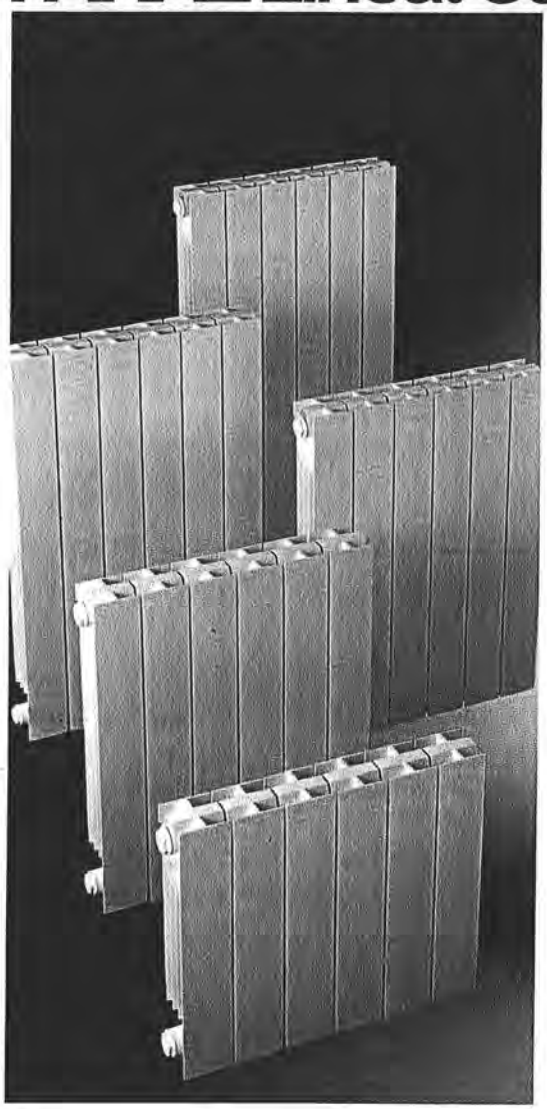
SAL50M

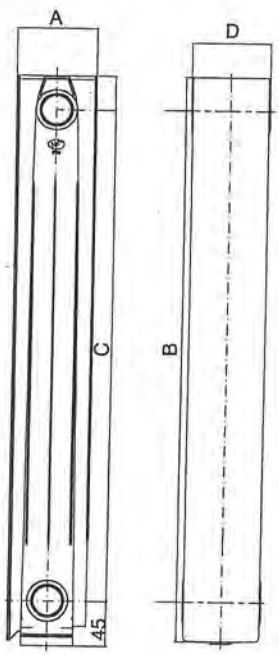
Application
New home or retro-fit designed to provide hot water for domestic use and additional applications such as wet back, swimming pools, radiators etc. and various commercial applications.

SAL60M

The FARAL Lineal 80 radiator is a heating emitter manufactured in die-cast aluminium and consists of individual modular sections assembled by means of steel nipples and special sealing gaskets. It is intended for use in closed circuit central or individual hot water heating systems.
The FARAL Lineal 80 radiator is manufactured by FARAL S.p.A., whose name has been closely associated with vanguard technology in the field of domestic heating systems for more than 30 years.

FARAL *Lineal 80*





PRODUCTION

The raw materials used for the manufacturing of FARAL Lineal 80 radiators are aluminium alloys, specifically developed to enable complex items to be produced. The radiators undergo specific multi-phase treatments before the final coating, making the external and internal surfaces highly resistant to the corrosive action of the water in the system and the surrounding environment. The painting which follows is carried out through a double coating and stoving process. The first coating is created through an anaphoretic immersion of the radiators while the second uses an epoxy resin powder-based finish. Polymerisation in high-temperature kilns guarantees long lasting and glossy coats. The FARAL Lineal 80 radiators undergo to the strictest technological and aesthetic controls before the final leakage test to ensure they comply with the EN 442-1 standard.

ALUMINIUM AND THERMAL CHARACTERISTICS

Aluminium is an excellent heat conductor and this ability has been optimised since the early stages of the designing of FARAL Lineal 80 radiators to guarantee comfort in any environment. Aluminium with its high conductivity reacts swiftly to changes in the temperature of the fluid circulating inside it and its low thermal inertia allows it to respond instantly to thermostatically controlled systems. This ability, combined with a low water content, constitutes a substantial saving of energy.

LIGHT WEIGHT AND EASY TO INSTALL RADIATORS AND ACCESSORIES

Thanks to light weight and easy handling, any installation of FARAL Lineal 80 radiators constitutes a substantial saving of time. FARAL Lineal 80 radiators are supplied in pre-assembled sets, containing from 2 to 15 elements, depending on the customer's requirements. Its wide range of accessories makes the installation of the FARAL Lineal 80 simple and cost effective. Additional sections can be easily added if more are required.

THE PACKING

To protect the radiator during handling before its installation, FARAL Lineal 80 is wrapped in a thick layer of shrink-wrapping polyethylene and then placed in a strong cardboard box. This way the radiator is guaranteed to be transported safely and easily.

THE COLOURS

The standard colour is the pure white RAL 9010 accomplished through anaphoretic immersion and deposition of powder-based pigments polymerised in high-temperature kilns. In addition to the standard colour, FARAL Lineal 80 can be supplied in a selected range of colours, taken from the entire RAL collection.

Model	Depth A mm	Height B mm	Centres C mm	Length D mm	Connection Ø inches	Water content l/sect.	Weight kg/sect.	Heat output EN 442 ΔT= 50 K W/sect.	Exponent n
FARAL *Lineal 80* 800	80	880	800	80	1	0,470	2,040	**164**	1,352
FARAL *Lineal 80* 700	80	780	700	80	1	0,420	1,840	**149**	1,356
FARAL *Lineal 80* 600	80	680	600	80	1	0,380	1,640	**133**	1,332
FARAL *Lineal 80* 500	80	580	500	80	1	0,320	1,440	**118**	1,337
FARAL *Lineal 80* 350	80	430	350	80	1	0,260	1,050	**88,8**	1,302

The maximum operating pressure is 1000 KPa (10 bar)
The above thermal outputs expressed at ΔT=50K comply with the European regulation EN 442-2.
The dimensions are subject to normal manufacturing tolerances, according to the regulation EN 442-1.
The guarantee is valid for ten years provided that the specific conditions of use laid out in the Faral technical literature are adhered to.

DEVHAM SERVICES
COMBUSTION AND HEATING SPECIALISTS

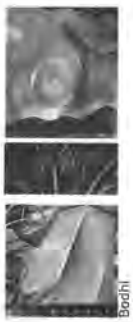
Devham Services Limited
Unit 2, 199 Gracefield Road,
PO Box 45118, Waterloo,
Lower Hutt 5042
Phone: +64-4-9394334
Fax: +64-4-9394335
Email: devham@paradise.net.nz
Web: http://www.devham.co.nz

FARAL S [illegible]
Tel. +39-[illegible]

Kapiti Coast District Council
Private Bag 601
Paraparaumu 5254

Tel. (04) 296 4700
Fax (04) 296 4830

E: kapiti.council@kapiticoast.govt.nz
W: www.kapiticoast.govt.nz



24 April 2009

Architecture DM
17 Gear Street
PETONE

BC090214 Re: Construction of New Dwelling at 125 Nikau Palm Road, Paraparaumu.

I am pleased to advise that the Project Information Memorandum (PIM) component of your Building Consent application, BC090214P, has been completed.

Your proposed building project meets all the requirements of Council's District Plan which means that once you have received your Building Consent you may proceed with construction.

Council's Customer Service group is currently holding the PIM documents so that they can be forwarded to you once your Building Consent is completed however if you require them to be sent earlier please contact our Customer Service staff on 04 2964700.

Yours Sincerely

Colin Bridges
Principal Planner-Land Use

22 April 2009

Architecture DM
17 Gear Street
PETONE

Building Consent: 090214

Dear Sir/Madam

Request for further information

Description: Excavation of site & construction of New Dwelling
Location: 125 Nikau Palm Road, Paraparaumu
Legal Description: LOT 4 DP 82049

Unfortunately, we are unable to process your Building Consent until we receive the information detailed below.

Information Needed:

1. Updated producer statement endorsed by a Cpeng engineer for the Arena balustrade system.
2. Bottom plate hold down details.
3. Cantilever deck joists over spanned. 190 x 45
4. Please provide buildable layout and PS1 for roof framing.
5. Poly head flashing detail not acceptable.
6. Supporting information to enable assessment of wet area membrane, (refer to generic product or system assessment form attached) or branz appraised product. Flexiseal
7. Flue height.
8. Roof penetration and flue details for low pitch roof.
9. Cladding junctions.
10. Roof in wall flashing details.
11. Tanking System

We have suspended your application and will not proceed any further until the above information is received.

Please contact me if you would like to discuss this matter.

Yours sincerely

Stuart Nepia
CONSENTS

Author/generator ID data

Kapiti Coast District Council
Private Bag 601
Paraparaumu 5254

Tel. (04) 296 4700
Fax (04) 296 4830

E: kapiti.council@kapiticoast.govt.nz
W: www.kapiticoast.govt.nz

22 April 2009

ArchitectureDM

Sika Rain Tite

Dear Sir/Madam

Generic Product or System Assessment for Building Code Compliance

Further to your request for the Council to consider your product for acceptance as an alternative solution. The Building Act 2004 requires a Territorial Authority (TA) to be satisfied on reasonable grounds that the alternative solution will meet the requirements of the Building Code.

For a building product or system (Alternative Solution) to be accepted as an alternative solution by a TA, the TA must be satisfied on reasonable grounds the product or system and its intended use will meet the requirements of the code. In the case of a proposed building product or system it is the responsibility of the manufacturer/supplier to verify to the TA how the product or system will achieve this requirement.

There are a number of ways this verification can be undertaken. Some of these are:

- Technical opinion from an approved laboratory or testing facility.
- Comparison to an Acceptable Solution.
- In service history.
- Comparison with other documents.
- Expert opinion from an accepted expert in the field.
- Determination by the Dept Building Housing.
- Certification of the building product or system.
- Combination of the above.

The TA will also need to consider any relevant maintenance data and installation requirements from the manufacturer of the product or system.

When you present your information for review, please ensure the person who has undertaken the assessment of your product/system is a competent independent person, body or organisation. It is important to provide proof as to the independence of the verifier, as well as their suitability as an expert in the field. In this regard, you would need to submit the credentials of the verifier as

part of your application. In some cases due to the complexity of the code and its various clauses, it is possible you may require several "experts" to give specific opinions.

In all cases, the submission has to clearly show the product or system will meet the requirements of the relevant clauses of the code that are pertinent to the assessment. Depending on the proposed use of the product or system, some of the code clauses that may require consideration could include, but not be limited to:

- Clause B2 Durability. (Durability will be considered in all assessments)
- Clause E2 External Moisture.

Yours faithfully

Stuart Nepia
Building Control Officer
04 2964858

copy

20 April 2009

Architecture DM
17 Gear Street
PETONE

Building Consent: 090214

Dear Sir/Madam

Request for further information

Description: Excavation of site & construction of New Dwelling
Location: 125 Nikau Palm Road, Paraparaumu
Legal Description: LOT 4 DP 82049

Unfortunately, we are unable to process your *Building Consent* until we receive the information detailed below.

Information Needed:

Please provide details/schematic on the wetback in relation to the hot water cylinder
The hot water cylinder needs to be above the wet back on all the information I could find and no valves/pump on the flow and return lines.
Show how the pipes will run from the solar panel to the hwc.

The information requested above relates to Plumbing and drainage only.You will be notified of any further requirements of a general nature once your plans have been perused by the Building Control Consents team.

Please contact me if you would like to discuss this matter.

Yours sincerely

Simon Copp

Building Control Officer

Author/generator ID data

BGC Fibre Cement (NZ)

Main Freight Logistics
21 Hobill Avenue
Manukau City
New Zealand
Telephone: (09) 263 5071
Facsimile: (09) 263 5091
Email: bgcnz@xtra.co.nz

Postal Address:
PO Box 76695
Manukau City
New Zealand

BGC FIBRE CEMENT (NZ)
STONESHEET 6.0mm & 7.5mm FIBRE CEMENT BACKING SHEET

DATED 01.06.06

To whom it may concern:

BGC Fibre Cement sheets are manufactured with the latest technology and with our special post manufacturing treatments resulting in a sheet with exceptional inter lamina bond strength and substantial permeability reduction with the Stonesheet Durasheet surface Primal Coating.
Due to this proven technology and treatment BGC Fibre Cement (NZ) have no hesitation in warranting their 6.0mm & 7.5mm DURASHEET product as a substrate for Craftstone stone veneers up to 60kgs/m2.
Over this weight to be specifically designed.

The Primal Coated Stonesheet Durasheet packs are clearly marked STONESHEET.
BGC Durasheet will meet the requirements of NZBC B2 Durability and as such is not susceptible to long term moisture damage and the sheet itself is expected to have a serviceable life of 50 years.

Weathertightness Test:
BGC Fibre Cement (NZ) Cavity system was BRANZ tested on 11 May 2004 and passed all tests confirming its Weathertightness under test certificate number TP1171.

Signed:

Marc Diffey
NZ Manager
BGC FIBRE CEMENT (NZ)

BRANZ APPRAISED
SPECIFY WITH CONFIDENCE

Megamortar Stone and Schist Mortar Adhesive

Characteristics:

- Megamortar Stone and Schist is a premium grade cement based tile and stone adhesive.
- It is designed for bonding all types of ceramic, stone, mosaic tiles, vitrified and porcelain tiles with the exception of light coloured and green marble, onto rigid concrete, render, rendered brickwork and block work surfaces.
- It can be used internally or externally on wall and floor surfaces.
- Megamortar Stone and Schist can be used for fixing low porosity tiles, or tiles in immersed situations like swimming pools, spas, etc, when mixed with Megamortar Binding Additive and Primer.
- Megamortar Stone and Schist when mixed with Megamortar Binding Additive and Primer can be used for facade tiling application.
- Megamortar Stone and Schist can be used to fix tiles over most waterproofing membranes. However it is advisable to contact the manufacturer prior to commencing.

Preparation:

- Ensure all concrete slabs are allowed to cure for at least 6 weeks in accordance with AS 3958.1-1991 and have a wood float finish.
- All rendered surfaces must be allowed to cure for at least 7 days prior to commencing tiling.
- Ensure all surfaces are sound, dry and free from movement, oil, dust, grease, wax, curing compounds, release agents and any other loose contaminating materials.
- Steel trowelled finished concrete surfaces must be mechanically or chemically abraded prior to commencing tiling.
- The maximum variation in the plane of the concrete must not exceed 5mm in 3 meters for floors and 4mm in 2 meters for walls.
- It is recommended that all surfaces must be primed with Megamortar Binding Additive and Primer, especially porous surfaces, to ensure a sound bond of the adhesive to the substrate.
- When applying the Megamortar Binding Additive and Primer to floor surfaces, it is recommended to firstly pour some primer in a section then spread the primer using a broom, brush or roller. Then continue this method of application until the entire area is primed. Note: This method of application ensures a thorough coat of the primer on the surface.
- Allow the primer to dry for approximately 5 minutes at 20°C prior to commencing tiling.

Expansion / Movement Joints

Expansion/movement joints must be provided to allow for movement between adjacent building components. They should be as follows:

- Over existing joints in the substrate.
- Where two different substrates meet. Eg. Timber and concrete.
- Around fixed elements in the floor, Eg. Columns.
- At internal vertical corners.
- Around the perimeter of the floor.
- In internal floors where any dimension exceeds 9m or 5m if subjected to sunlight.
- In external floors where any dimension exceeds 4.5m.
- On wall surfaces at storey heights horizontally and approximately 3m-4.5m apart vertically. Ideally they should be located over movement joints in the structural background and at structural material changes for example, the horizontal joint at the bottom of floor slabs, vertical joints at internal vertical corners, and at junctions with columns. (The above points are in accordance with AS3958.1-1991)
- Movement joints should go right through the tile adhesive bed to the background and kept free from dirt and adhesive droppings. Movement joints must not be less than 5mm and not wider than 10mm. The movement joints must be filled with a flexible sealant like Silicone.

Mixing:

- The mixing ratio of Megamortar Stone and Schist is 20kg powder to 5 Litres of water.

- Pour 5 Litres of clean water into a drum and then gradually add the Megamortar Stone and Schist while mixing continuously until a smooth lump free mix is obtained. Always add powder to liquid.
- Allow the mix to stand for 5 minutes, re-stir and then apply the adhesive onto

Application:

- Once the surface has been appropriately prepared in accordance with the above instructions, then apply the adhesive onto the substrate using an appropriate notched trowel.
- For floor tiling use a 10mm x 10mm square notched trowel for tiles up to 300mm x 300mm. For tiles 300mm x 300mm and larger, use a 12mm x 12mm square notched trowel. For mosaic tiles use a 6mm x 6mm square notched trowel.
- For wall tiling use 6mm x 6mm square notched trowel for tiles up to 200mm x 200mm. For tiles larger than 200mm x 250mm use a 8mm x 8mm or 10mm x 10mm square notched trowel.
- Megamortar Stone and Schist should be applied onto the substrate at a rate of 1m_ at a time. Application rates greater than this can result in the adhesive skinning before the tiles are laid into it.
- Once the adhesive starts to skin, do not lay tiles into it, but remove it and apply fresh adhesives.
- When placing the tiles into the adhesive press them in by using a twisting or sliding action. Ensure no voids occur and full coverage of adhesive is under the tiles.
- For tiles with lugs, groves or uneven backing it may be required to butter the back of the tile with adhesive in addition to trowelling the adhesive onto the substrate.
- The final bed thickness of the adhesive should be at least 2mm for wall tiling and 3mm for floor tiling.
- Once the tiling is completed do not disturb the tiled surface for at least 24 hours at 20°C.

Clean Up:

- Excess adhesive from the face of the tiles can be cleaned up with damp cloth while the adhesive is still wet.
- Adhesive that has oozed out into the grout joint must be raked out with a knife / spatula etc.
- Tools and other equipment can be cleaned up using water while the adhesive is still wet.

Coverage:

- A 20kg bag of Megamortar Stone and Schist will cover approximately 4-5m_ using a 10mm trowel.

Grouting Application:

- Grouting application can commence 24 hours after the completion of tiling.
- Refer to grout data sheets for the technical information.

Packaging / Shelf Life:

- Megamortar Stone and Schist is available in 20kg bags.
- A bag of Megamortar Stone and Schist when stored in a cool, dry environment, and off the ground, will have a shelf life of approximately 12 months.

Handy Tips:

- Do not apply Megamortar Stone and Schist in temperatures above 40°C and below 5°C.
- For fixing tiles in permanently immersed situations like swimming pools or for facade tiling, mix Megamortar Stone and Schist with Megamortar Binding Additive and Primer.
- For applications / situations not mentioned in this data sheet please contact your nearest Flexco (NZ) Ltd
- Megamortar Stone and Schist being cement based is alkaline in nature, and therefore may cause dermatitis. It is recommended that applicators wear PVC Gloves or similar and safety goggles.
- For a full MSDS on this product, please contact Flexco (NZ) ltd

Technical Data:

Properties	**Results**
Appearance	Grey Powder
Bulk Density (Approx.)	1.52 +/- 0.05
Open Time	Approx. 20 minutes at 20°C
Drying Time at 20°C	Approx. 24 Hours
Pot Life	40 Minutes at 20°C

BBRI

CSTC-WTCB

BELGIAN BUILDING RESEARCH INSTITUTE

INSTITUTION RECOGNISED BY APPLICATION OF THE DECREE-LAW OF 30 JANUARY 1947

BELTEST Nr. 054-T

- Test centre : B-1342 Limelette. avenue P. Holoffe, 21 — Tel : (32) 2 655 77 11 — Fax : (32) 2 653 07 29
- Offices : B-1932 Sint-Stevens-Woluwe, Lozenberg I. 7 — Tel : (32) 2 716 42 11 — Fax : (32) 2 725 32 12
- Head office : B-1060 Brussels, bld. Poincaré 79 — Tel : (32) 2 521 81 00 — Fax : (32) 2 521 81 10

VAT n° : BE 407.695.057

LABORATORY : Materials	TEST REPORT	N° DE, DAT. RE : 621xA491 N° Labo : 3963 N° Sample : 21 / 68 / 7

REQUESTED BY : CRAFTSTONE INTERNATIONAL PTE LTD
65 SUNGEI KADUT DRIVE
SINGAPORE 729564
ATTN: MR. BENJAMIN CHNG

Contact persons :	**- Demander -**	**- BBRI -**
	Mr. Su, Chien Chou	Mr. F. de Barquin

Test carried out : Apparent density, open porosity and frost resistance on agglomerated stone, called "Lava Stone" by the demander.

References : NBN B27-009 (1983), NIT 205 (1997) § 3.12 and 4§ .1, NBN EN 1936 (1999).

Date and reference of the request	:	17.04.2001
Date of receipt of the sample(s)	:	06.06.2001
Test date	:	July – August 2001
Drafting date of the report	:	22.08.2001

This report contains **3** pages, numbered from **1/3** to **3/3** ; it may only be reproduced in its entirety.
Each page of the original report has been stamped (in red) by the laboratory and initialled by the head of laboratory.
The results and findings are only valid for the tested samples.

- ☐ No sample
- ☐ Sample(s) submitted to a destructive test
- ☑ Sample(s) to be removed from our laboratories 60 calendar days after sending of the report, unless a written request is received by the demander of the test

In charge of the test: P. Vanherck

The Assistant Head of Division: F. de Barquin

C.S.T.C. W.T.C.B. MA

Technical assistance :

FJB/SDE

1. TEST SPECIMENS

The following samples of an agglomerated stone called "Lava Stone" by the demander were delivered in the test center of the BBRI in Limelette on 6 June 2001:

- samples 1 to 6: cubic samples of 70 mm x 70 mm x 70 mm
- samples 7 to 16: prismatic samples of 190 mm x 90 mm x 35 mm
- samples 17 to 22: cubic samples of 70 mm x 70 mm x 70 mm
- samples 23 to 28: slabs of 200 mm x 200 mm x 35 mm

2. TEST RESULTS

2.1 *Open porosity and apparent density (NBN EN 1936 – 1999)*

The 6 cubic samples numbered from 17 to 22 were dried at 75 °C until constant mass has been reached. They were weighed (md) and water impregnated under vacuum with a barometric depression of 740 mmHg. After 24 h, they were weighed in water (mh) and in the air (ms).

The open porosity Po is given by:

$$Po = \frac{ms - md}{ms - mh} \cdot 100 \quad (vol\ \%)$$

The apparent density is expressed by:

$$\rho_b = \frac{md}{ms - mh} \cdot \rho_{rh}$$

where ρ_{rh} is the density of water at 20°C (998 kg/m³)

Specimen nb	md (g)	ms (g)	mh (g)	Po (vol %)	ρ_b (kg/m³)
17	540.47	655.87	315.62	34	1585,3
18	540.46	657.23	315.15	34.1	1576,8
19	539.8	657.31	314.78	34.3	1572,8
20	533.82	649.87	312.24	34.4	1578
21	528.98	647.85	309.59	35.1	1561
22	535.18	650.38	314.35	34.3	1589,5
average				34.4	1577,1

2.2 *Frost resistance (NBN B27-009 – 1983) (BELTEST)*

The 5 slabs numbered from 23 to 27 were dried at 75°C until constant mass is reached.

After cooling, the slabs were weighed and water impregnated under vacuum with a barometric depression of 650 mm Hg.
So impregnated, the slabs were submitted to the direct frost test according to the standard NBN B27-009, i.e. 25 cycles of free-thaw, comprising 10 cycles with a freezing phase at – 15°C and 15 cycles with a freezing phase at – 5°C.

C.S.T.C. W.T.C.B. MA

At the end of each freezing phase, the samples were thawed under water at + 15°C.

Before and after the cycles, measurements of the dynamic elasticity modulus were made in accordance with the standard NBN B15-230.

Slab nr.	Water content (mass %) before the cycles	Water content (mass %) after the cycles	Variation in dynamic elasticity modulus after the cycles (%)
23	18,72	19,03	+ 12,26
24	19,11	19,54	+ 8,81
25	18,03	17,86	+ 13,35
26	18,97	18,98	+ 12,80
27	18,46	18,72	+ 12,91
average	**18,66**	**18,83**	**+ 12,03**

Visual description of alterations

- No visual alterations on the slabs 23 to 26.
- On the slab 27, the detachment of a small fragment (≤ 10 mm²) has been observed on one of the corner (minor damage which does not compromise the integrity of the specimen).

2.3 *Compressive strength (NBN EN 1926 – 1999) and flexual strength (NBN EN 12372 – 1999)*

See enclosed report 621 x A491 of laboratory Structures (SC).

C.S.T.C. W.T.C.B. M.A.

BBRI

CSTC-WTCB

BELGIAN BUILDING RESEARCH INSTITUTE

INSTITUTION RECOGNISED BY APPLICATION OF THE DECREE-LAW OF 30 JANUARY 1947

- Test centre : B-1342 Limelette, avenue P. Holoffe, 21 — Tel : (32) 2 655 77 11 — Fax : (32) 2 653 07 29
- Offices : B-1932 Sint-Stevens-Woluwe, Lozenberg I, 7 — Tel : (32) 2 716 42 11 — Fax : (32) 2 725 32 12
- Head office : B-1060 Brussels, Boulevard Poincaré, 79 — Tel : (32) 2 502 66 90 — Fax : (32) 2 502 81 80

VAT n° : BE 407.695.057

LABORATORY :	TEST REPORT	N° DE, DAT, RE :	DE 621XA491
Structures (SC)		N° Labo :	MA 3963
		N° Sample :	21 / 68 / 7

REQUESTED BY : CRAFTSTONE INTERNATIONAL PTE LTD
65 SUNGEI KADUT DRIVE
SINGAPORE 729564
ATTN: MR. BENJAMIN CHNG

Q.C.

Contact persons :	**- Demander -**	**- BBRI -**
	Mr Su, Chien Chou	Mr de Barquin

Test carried out : Flexural strength, compressive strength

References : - NBN EN 1926 (1999)
- NBN EN 12372 (1999)

Date and reference of the request	:	04.07.2001
Date of receipt of the sample(s)	:	06.06.2001
Test date	:	24 and 25.07.2001
Drafting date of the report	:	25.07.2001

This report contains **3** pages, numbered from **1/3** to **3/3** ; it may only be reproduced in its entirety.
Each page of the original report has been stamped (in red) by the laboratory and initialled by the head of laboratory.
The results and findings are only valid for the tested samples.

- ☐ No sample
- ☑ Sample(s) submitted to a destructive test
- ☐ Sample(s) to be removed from our laboratories 60 calendar days after sending of the report, unless a written request is received by the demander of the test

In charge of the test

C. Simons

The Head of Laboratory

C.S.T.C. W.T.C.B. SC

ir. V. Pollet

Technical assistance :

CS/WS

1. INTRODUCTION

On request of Hsing Hong Construction Material Co., Ltd, represented by Mr Su, the Laboratory Structures of the BBRI has executed tests to determine the compressive strength and the flexural tensile strength on materials of the Lava Stone type.

2. SAMPLES

The samples have been delivered in the test centre of the BBRI in Limelette on 6 June 2001.
The test samples were registered in the register for test samples under section 21/68/7.

3. TESTS

The different compressive strength tests have been executed according to NBN EN 1926.
The dimensions (length, width, heigth) of the samples, the weight, the apparent density, the maximum load and the compressive strength are listed in the following table :

Sample nr	Length (mm)	Width (mm)	Heigth (mm)	Weight (g)	Apparent density (kg/m³)	Load (N)	Compressive strength (N/mm²)
DE621XA491/001	70.04	70.39	69.94	545	1581	57200	11.60
DE621XA491/002	69.90	71.19	69.28	540	1566	58200	11.70
DE621XA491/003	69.78	71.50	69.54	540	1556	61000	12.23
DE621XA491/004	69.42	71.11	69.61	536	1560	57800	11.71
DE621XA491/005	69.76	72.07	69.37	544	1560	65100	12.95
DE621XA491/006	69.29	70.11	69.60	536	1585	66700	13.73
				Average	**1568**	**Average**	**12.32**
				Standard deviation	**12.1**	***Standard deviation***	**0.86**

Table 1-: Compressive strength

C.S.T.C. W.T.C.B. SC

The different flexural tensile strength have been executed according to NBN EN 12372. The span, the dimensions (length, width, height), the weight, the apparent density, the maximum load and the flexural tensile strength are listed in the following table :

Sample n°	Span (mm)	Length (mm)	Width (mm)	Height (mm)	Weight (g)	Apparent density (kg/m³)	Load (N)	Flexural strength (N/mm²)
DE621XA491/007	150	191.61	92.19	36.31	982	1531	2550	4.72
DE621XA491/008	150	192.71	91.67	35.88	976	1540	2880	5.49
DE621XA491/009	150	192.87	91.7	36.64	986	1522	2990	5.46
DE621XA491/010	150	194.48	92.23	37.27	1056	1580	2930	5.15
DE621XA491/011	150	192.54	91.37	33.46	909	1544	2590	5.70
DE621XA491/012	150	191.88	93.03	34.26	915	1496	2650	5.46
DE621XA491/013	150	190.42	91.93	35.16	954	1550	2980	5.90
DE621XA491/014	150	190.43	92.39	34.97	932	1515	2630	5.24
DE621XA491/015	150	192.64	91.79	36.46	979	1519	2700	4.98
DE621XA491/016	150	190.96	91.97	35.11	951	1542	2630	5.22
					Average	**1534**	**Average**	**5.33**
					Standard deviation	**23.0**	***Standard deviation***	**0.33**

Table 2 - Flexural strength

C.S.T.C. W.T.C.B. SC

GEOLAB (M) SDN. BHD. *(REG. NO: 210351-V)*
Foundation, Soil & Concrete Specialists.
380-380A, Jalan Simbang, Taman Perling, 81200 Johor Bahru, Johor, Malaysia.
Tel: 07-2364932 / 2379814 Fax: 07-2364931
E-mail: tmnetjb@tm.net.my / geolab@tm.net.my
Website: www.geolab1991.com

Our Ref. : GLSB/CV/R0221/05

Date : 13 August 2005
Page 1 of 2

TEST REPORT

(This report is issued subject to the conditions set out overleaf)

Subject Matter : Determination of **Water Absorption for Concrete (1)** on one set of concrete stone veneer sample submitted

Tested For : **MSSR. CRAFTSTONE INTERNATIONAL SDN BHD**
BATU 35, JALN AIR HITAM, BUKIT BATU,
81000 KULAI JOHOR

Client : **MSSR. CRAFTSTONE INTERNATIONAL SDN BHD**

Test Methods :

Test	Reference Methods
Water Absorption Of Concrete	Submitted by client (Refer to Note 1)

Project : **INTERNAL TESTING**

Date Received : 10 August 2005

Sample Description : A) Concrete Stone Veneer

Conditions of Receipts : Ten numbers of concrete stone veneers were received.

Results : Refer to Table 1: Results of analysis

Authorized Signatories

Amelia Md. Som
Chemist, AMIC
M.Eng (Env). B.Sc. App.Chem. (Hons).
Dip. In Microbiology

Adiputera Md. Som
Asst. Engineer
Dip. Eng (Civil)

GEOLAB

Our Ref. : GLSB/CH/R0221/05

Date : 13 August 2005

Table 1 : Water Absorption

SAMPLE REFERENCE	UNIT	1	2	3	4	5	6	7	8	9	10
Condition of sample	GOOD / POOR COMPACTION / HONEYCOMB / ETC	GOOD									
Date tested Note 2 (Placed In Oven)	-	10 August 2005									
Length	m	0.505	0.505	0.503	0.505	0.506	0.505	0.502	0.505	0.502	0.502
Diameter	m	0.097	0.098	0.099	0.098	0.099	0.100	0.098	0.098	0.098	0.099
Dry Mass (A)	kg	1.588	1.794	1.755	1.633	1.804	1.641	1.686	1.568	1.780	1.783
Wet Weight (B)	kg	1.756	1.988	1.919	1.785	1.993	1.841	1.835	1.742	1.974	1.978
Measured Absorption [(B-A) / A] x 100	%	10.6	10.8	9.3	9.3	10.5	12.2	8.8	11.1	10.9	10.9

Note 1

- ☐ *Oven dry samples at 105°C for 24 hours*
- ☐ *Set samples at normal room temperature for one hour*
- ☐ *Take unit weight of each sample*
- ☐ *Completely immersed the samples into room temperature water for half an hour*
- ☐ *Dry samples with cloth and remove excess water on surface of sample*
- ☐ *Take unit weight of each wet sample*

Note 2

The samples are kept at room temperature before commencement of test.

ARCHITECTURE DM

WELLINGTON

SPECIFICATION

of work to be done and materials to be used in carrying out the works shown on the accompanying drawings

ROULSTON RESIDENCE

at

125 Nikau Palm Road

for

Tom Roulston

on

Date: 22nd January 2009

1012 TABLE OF CONTENTS

1220 PROJECT

1. **GENERAL**
This general section describes the project including:
- A description of the work
- Site description, features and restrictions

1.1 READ ALL SECTIONS TOGETHER
Read all general sections together with all other sections.

Description of the work

1.2 SCOPE OF THE WORK
Prepare site and construct new residential dwelling with sevices

Site description

1.3 SITE
The site consists of: Bare rural site
as shown on drawing no. Site Plan

1.4 LEGAL DESCRIPTION
The site of the works, the street address and the legal description are shown on the drawings.

Site features and restrictions

1.5 SITE ACCESS
Access to the site is limited to: Existing access off Nikau Palm Road

1.6 GROUND CONDITIONS
Refer to the soils investigation report included with this specification.

1.7 EXISTING BUILDINGS
Existing buildings consist of: NA
Refer to drawing(s) no(s): NA

1231SA NZS 3910 CONTRACT

1. GENERAL

This general section refers to requirements relating to Standards New Zealand Conditions of Contract NZS3910:2003 under which this work will be constructed.

1.1 THE ENGINEER

The engineer means the person named in the First Schedule of NZS 3910:2003. They are referred to in this specification as the Contract administrator.

1.2 NOMINATED SUBCONTRACTORS

Refer to NZS 3910:2003, First Schedule, and clause 4.2 Nominated Subcontractors.

1.3 SEPARATE CONTRACTORS

Refer to NZS 3910:2003, First Schedule, and clause 5.5 Separate contractors.

1.4 PRINCIPAL SUPPLY ITEMS

Refer to NZS 3910:2003 First Schedule, Exceptions to Contractor's obligation to supply, and clause 5.9 Materials, labour and Plant, subclause 5.9.1.

1.5 MONETARY ALLOWANCES

Refer to NZS 3910:2003, First Schedule, items 12.9.1 and 12.10.1, and to clauses 12.9 Provisional Sums, and 12.10 Prime Cost Sums.

1.6 INCONSISTENCIES IN CONTRACT DOCUMENTS

Refer to NZS 3910:2003, clause 2.8 Documents prepared by the Engineer or Principal, subclause 2.8.4. For the method of handling ambiguities, they will be resolved as follows:

- The specifications take precedence over drawings.
- Figured dimensions on drawings take precedence over scaled dimensions.
- Drawings to a larger scale take precedence over drawings to a smaller scale.
- Drawings showing particular parts of the contract works take precedence over drawings for more general purposes.
- The drawings and specifications take precedence over the schedule of quantities, if any.

1.7 CONTRACTOR DESIGNED ITEMS

Refer to NZS 3910:2003 clause 2.9, Documents prepared by the Contractor, for the method of processing documentation relating to design which is the Contractor's responsibility.

Where specified in work sections, provide contractor design of specified items and submit the design for review.

Submit details of Contractor designed items including any required design producer statement for review to the Engineer, in due time to ensure conformance with the contract programme. Make due allowance in the contract programme for the design work and review, prior to the time required for ordering materials and commencing fabrication.

Review of Contractor designed items does not relieve the contractor of responsibility for the correctness of the design, or for ensuring the work is performed in compliance with the contract documents. Review does not remove the need for the contractor to comply with the stated requirements, details and specifications of the manufacturers and suppliers of individual components, materials and finishes. Review cannot be construed as authorising departures from the contract documents.

1234 DOCUMENTATION

1. GENERAL

This general section relates to documentation required by the Territorial Authority/Building Consent Authority for compliance with the New Zealand Building Code. It also includes documentation relating to:
- Substitutions
- Manufacturers documents

Building Consent Authority documentation

1.1 BUILDING CONSENT

Obtain the original or copies of the building consent forms and documents from the owner and keep them on site. Liaise with the Building Consent Authority for all notices to be given and all inspections required during construction to ensure compliance. Return the consent form and documents to the owner on completion.

1.2 BUILDING CONSENT COMPLIANCE

It is an offence under the Building Act 2004 to carry out any work not in accordance with the building consent.
- The resolution of matters concerning building code compliance to be referred to the contract administrator for a direction in writing and then to the Building Consent Authority for consent.
- Where any alteration is requested by the territorial authority or any other authority, do not undertake such alteration until the matter has been referred to the contract administrator for direction.

1.3 PROJECT PERSONNEL

Provide names and contact detail of the contractor's key personnel and tradespersons who are involved with the project. Provide the names in the form required in the GENERAL section of the specification. Review the list once a month and reissue it if changes have been made.

1.4 KEY PERSONNEL

Provide names and contact detail of key personnel. Provide names, registrations numbers (where appropriate) and contact detail of key personnel that are required by the Building Consent Authority as part of the application for the Code Compliance Certificate.

Include the following as applicable:
- Registered drainlayer
- Registered plumber
- Registered electrician
- Roofer
- Block layer
- External plasterer
- External window manufacturer
- Waterproof membrane applicator

1.5 PRODUCER STATEMENTS

When producer statements verifying construction are required, provide copies to both the Building Consent Authority and the contract administrator. Provide producer statements in the form required by the Building Consent Authority.

1.6 DOCUMENTATION REQUIRED FOR CODE COMPLIANCE

Review the issued Building Consent for details of documents and information that will be required by the Principal for the application for a Code Compliance Certificate. Obtain such required documents from the relevant parties for delivery to the contract administrator after the final inspection has been carried out by the Building Consent Authority

Substitutions

1.7 PROPOSED SUBSTITUTIONS

A substitution may be proposed where specified products are not reasonably available. A substitution may also be proposed by the Contractor where the Contractor considers a proposed substitution to be an alternative to the specified product. Except where a specified product is not available, the Contract administrator is not bound to accept any substitutions. Where branded work sections are included in this specification, substitution of those products or systems will not be allowed.

1.8 NOTIFICATION OF SUBSTITUTIONS

Notify proposed substitution of specified products. Notification to include but not be limited to:

- Product identification
- Manufacturer's name, address, telephone and facsimile numbers, website and email address
- Detailed comparison between the properties and characteristics of the specified product and the proposed substitution
- Statement of NZBC compliance, including durability
- Details of manufacturer warranties

plus an assessment of

- Any changes required to the programme including any extension of time required
- Any consequential effects of the proposed substitution
- Allowance for time and cost for re-design and documentation (if applicable)
- Allowance for time and cost for obtaining an amendment to the Building Consent (if applicable)
- Any change in cost associated with the proposed substitution

and if requested

- All current manufacturer's literature on the product
- Accreditations and appraisals available
- Reference standards
- Product limitations
- Samples
- List of existing installations in the vicinity of the project

1.9 ACCEPTANCE OF SUBSTITUTIONS

The Contract administrator must advise of acceptance of substitutions in writing.

Amendment to issued Building Consent

1.10 CONTRACTOR AMENDMENTS TO BUILDING CONSENT

Where the contactor has sought acceptance of a substitution or a variation which is for the contractor's own convenience and the substitution or variation requires an amendment to the Building Consent, the contractor must apply for and obtain the required amendment.

The contractor must:

- Obtain approval for substitutions from the Contract administrator.
- Prepare and provide to the Building Consent Authority all documentation required for the amendment.
- Pay all fees and other costs associated with this amendment.
- Where the amendment affects other approved plans, also amend those plans.

1.11 PRINCIPALS AMENDMENTS TO BUILDING CONSENT

Where the principal is proposing a substitution or a variation which requires an amendment to the Building Consent, the contractor must provide to the principal information that the contractor has that is required for the amendment.

The principal will:

- Prepare and provide to the Building Consent Authority all documentation required for the amendment.

- Pay all fees and other costs associated with this amendment.
- Where the amendment affects other approved plans, also amend those plans.

Manufacturer's documents

1.12 BRANDED WORK SECTIONS
Branded sections may be included in this specification relating to specific products and systems to be installed as part of the contract works. Where branded sections are included, substitutions to the branded products and systems will not be allowed.

1.13 MANUFACTURER'S AND SUPPLIER'S REQUIREMENTS
Manufacturers and supplier's requirements, instructions, specifications or details mean those issued by them for their particular material, product or component and are the latest edition.

1.14 MANUFACTURER'S AND SUPPLIER'S DOCUMENTS
Refer to individual sections for a detailed list of manufacturer's and supplier's documents relating to work on this project. Retain current copies of the documents listed, and all other relevant manufacturer's technical literature, on site. Make this information available to all personnel and ensure they are familiar with requirements for handling, storing, preparing for, fixing and finishing all products before commencing work. Provide a copy of all listed manufacturer's literature to the Contract administrator.

1.15 ONGOING MAINTENANCE REQUIREMENTS
Refer to individual sections for details of manufacturer's and supplier's requirements for ongoing maintenance necessary to ensure continuing compliance with the durability requirements of the NZBC. Provide a copy of literature detailing ongoing maintenance and inspection requirements to the Contract administrator.

Shop drawings

1.16 PROVIDE SHOP DRAWINGS FOR REVIEW
Unless addressed elsewhere in this specification provide shop drawings for review by the contract administrator. Do not proceed with manufacture of the items until the Contract administrator gives a direction to proceed.

As built drawings

1.17 PROVIDE AS BUILT DRAWINGS
Unless addressed elsewhere in this specification provide as built drawings required as built drawings including those required by the Building Consent Authority.

1270 CONSTRUCTION

1. GENERAL

This GENERAL section relates to common requirements for construction issues including: -

- Quality assurance
- Noise and nuisance
- Set out
- Common execution requirements
- Common materials requirements
- Supply of spare materials
- Common requirements for samples and tests
- Final presentation and cleaning
- Commissioning

Quality control and assurance

1.1 QUALITY ASSURANCE

Carry out and record regular checks of material quality and accuracy, including:

- Concrete quality and finish.
- Dimensional accuracy of structural column locations (following completion of foundations).
- All perimeter columns and frames for plumb.
- Levels of all floors relative to the site datum.
- Framing timber moisture content.

Where any material, quality or dimension falls outside specified or required tolerances, obtain written direction from the contract administrator. Where building consent approval is affected, confirm remedial action with the Building Consent Authority.

Provide all materials, plant, attendances, supervision, inspections and programming to ensure the required quality standards are met by all project personnel.

Noise and nuisance

1.2 LIMIT CONSTRUCTION NOISE

Minimise the effects of noise generation by including in the planning of the work such factors as placing of plant, programming the sequence of operations and other management functions. Limit construction noise to comply with the requirements of NZS 6803, the requirements of the Resource Management Act sections 326, 327 and 328 and the Health and Safety in Employment Regulations clause 11.

1.3 ACCEPTABLE NOISE LEVELS

Refer to NZS 6803 Tables 2 and 3 for the upper limits of construction work noise in residential and industrial areas over the various time periods, particularly 0730 to 1800 hours. Note also the allowed adjustments and exemptions in Section 6. Do not exceed these limits.

1.4 PROVIDE INFORMATION TO NEIGHBOURS

Provide information to neighbours of any noise generation from the site liable to constitute a problem. Explain to them the means being used to minimise excessive noise and establish with them the timings most suitable for the noise generating work to be carried on.

Discuss with any complainant the measures being used to minimise noise. Where possible modify these measures to accommodate particular circumstances. Finally, determine the sound level at the location under discussion using methods and observation reporting as laid down in NZS 6803. If the noise level is above the upper limits of tables 2 and 3, cease the noise generating operation and remedy the problem.

1.5 INCONVENIENCE TO OTHERS
When the works are to be carried out in or around occupied premises, ascertain the nature and times of occupation and use. Carry out the works in a manner to minimise inconvenience, nuisance and danger to occupants and users.

1.6 DIRT AND DROPPINGS
Remove dirt and droppings deposited on public or private thoroughfares from vehicles servicing the site to the satisfaction of the appropriate authorities and the contract administrator.

1.7 DAMAGE AND NUISANCE
Take all precautions to prevent damage and nuisance from water, fire, smoke, dust, rubbish and all other causes resulting from the construction works.

Set-out and tolerances

1.8 SURVEY INFORMATION
Locate and verify survey marks and datum points required to set out the works. Record and maintain their position. Re-establish and replace disturbed or obliterated marks.

1.9 SET-OUT AND DATUM
Set out the work to conform with the drawings. Establish a permanent site datum to confirm the proposed building ground floor level and its relationship to all other existing and new building levels.

1.10 SET-OUT BY LICENSED CADASTRAL SURVEYOR
Before commencing construction provide the contract administrator with a certificate prepared by a licensed cadastral surveyor that the set-out is complete and that the building is accurately placed on the site.

During construction provide the contract administrator with a certificate, prepared by the same licensed cadastral surveyor confirming the set-out of the foundations and grid lines. Necessary adjustments are to be determined and agreed to by the contract administrator before proceeding further.

1.11 CONFIRM HEIGHT IN RELATION TO BOUNDARY
Provide a certificate prepared by a licensed cadastral surveyor that the building has been constructed within the allowed height in relation to boundary. Provide the certificate to the local authority. Provide a copy of the certificate to the contract administrator

1.12 USE OF SET-OUT INSTRUMENTS
Permit without charge, the use of instruments already on site for checking, setting out and levels.

1.13 CHECK DIMENSIONS
Check all dimensions both on drawings and site, particularly the correlation between components and work in place. Take all dimensions on drawings to be between structural elements before linings or finishes, unless clearly stated otherwise.

1.14 TOLERANCES
All work to be level, plumb, and true to line and face. Unless otherwise specified in specific work sections of this specification, tolerances for structural work shall comply with the following:

Concrete construction:	To NZS 3109 Concrete construction Clause 3.9 Tolerances for reinforcement Table 5.1 Tolerance for precast components Table 5.2 Tolerance for in situ construction To NZS 3114 Concrete surface finishes
Masonry construction:	To NZS 4210 Masonry construction: Materials and workmanship Clause 2.6.5 Tolerances Table 2.2 Maximum tolerances

Structural steelwork:	To NZS 3404 Part 1 Steel structures standard Section 14.4 Tolerances (after fabrication) Section 15.3 Tolerances (erection)
Timber framing:	To NZS 3604 Timber framed buildings Clause 2.2 Tolerances Table 2.1 Timber framing tolerances

Refer to work sections for tolerance requirements for finishes

Execution

1.15 EXAMINE PREVIOUS WORK
Before commencing any part of the work carefully examine the previous work on which it may depend. Report in writing to the contract administrator defects that may affect the quality of the proposed work and obtain instructions. Commencing work on any part means that previous work is accepted as being satisfactory for work of the required standard.

1.16 WORKER QUALIFICATIONS
All work to be level, plumb, and true to line and face. Employ only experienced workers familiar with the materials and techniques specified.

1.17 MINIMISE DELAYS DUE TO WEATHER
Use appropriate techniques and methods to prevent damage and minimise delays due to weather.

Materials

1.18 NEW PRODUCTS AND MATERIALS
Materials and products to be new unless stated otherwise, of the specified, and complying with all cited documents.

1.19 COMPATIBILITY OF MATERIALS AND FINISHES
Ensure all parts of a construction or finish are compatible and their individual use approved by the manufacturers and suppliers of other parts of the system. Source all parts of a system from a single manufacturer or supplier.

1.20 STORING PRODUCTS AND MATERIALS
Take delivery of and store products, materials and components in accordance with codes of practice and the product manufacturer's or supplier's stated requirements. Maintain the proper condition of any protective packaging, wrappings or supports during delivery, unloading and storage.

1.21 HANDLING PRODUCTS AND MATERIALS
Handle products, materials and components in accordance with codes of practice and the manufacturer's or supplier's stated guidelines. Avoid distortion and any contact with potentially damaging surfaces or conditions.

1.22 SUBSTRATE CONDITIONS
Ensure substrate conditions are within the manufacturer's or supplier's stated guidelines both before and during the installation of any material, product or system. Obtain written instructions on the necessary action to rectify unsatisfactory conditions.

1.23 INSTALLING PRODUCTS AND MATERIALS
Install in accordance with the manufacturer's or supplier's technical literature. Ensure that all installers are familiar with the required substrate conditions and the manufacturer's or supplier's specified preparation, fixing and finishing techniques.

1.24 COMPLY WITH STANDARDS
Comply with the relevant and/or cited Standard for any material or component. Obtain certificates of compliance when requested by the contract administrator.

1.25 CONDITION OF MATERIALS AND COMPONENTS
To be in perfect condition when incorporated into the work.

1.26 INCOMPATIBLE MATERIALS AND METALS
Separate incompatible materials and metals with separation layers, sleeves or gaskets of plastic film, bituminous felt or mastic or paint coatings, installed so that none are visible on exposed surfaces.

Samples and tests

1.27 SAMPLES AND PROTOTYPES
Where specified in the work sections, submit samples, prepare sample panels, and construct prototypes for review as to appearance, form and conformance with the drawings and specifications. Submit all information required to assist the review process, including technical data, manufacturer's literature, independent appraisals and producer statements.

Timing for the provision and review of samples, sample panels and prototypes to be included in the contract programme. Allow a minimum of 10 working days for each review. Proceed only after instructions to proceed have been issued in writing by the contract administrator.

In situ work may be incorporated in the finished work if so confirmed, otherwise allow to remove completely and replace.

1.28 CONTROL STANDARD
Obtain the contract administrator's confirmation of material, component and work samples which then become the quality control standard. Remove from the site any rejected samples. Retain confirmed samples with care on site for comparison throughout the contract. Remove from the site when no longer required.

Spares

1.29 SPARES
Collect, protect and store safely all spare materials required under the contract. Give the contract administrator an inventory of all spares.

Final presentation and cleaning

1.30 REMOVE TEMPORARY PROTECTION
Remove all temporary markings, coverings, labels and protective wrappings unless instructed otherwise.

1.31 REPLACE DAMAGED MATERIALS
Replace all materials or component damaged during the works to the standard of and integral with the original.

1.32 COMPLETE ALL SERVICES
Ensure all services are complete and operational, with all temporary labelling removed, required labelling fixed and service instructions provided.

1.33 CLEANING BY CONTRACTOR
Clear the contract works of all construction materials, waste, dirt and debris. Clean the contract works including:

- Wipe all surfaces to remove construction dust
- Clean out service ducts and accessible concealed spaces
- Clean out all gutters and rainwater heads
- Wipe dust from both sides of glass. Take particular care when removing paint or cementitious materials to not damage the glass.
- Remove adhesive residue left by labels and other temporary protection/markings
- Clean out the interior of all cabinetry

- Wash down external concrete including driveways and concrete masonry. Take care when waterblasting to not cause damage to the surface or allow water to enter the building.
- Remove rubbish and building material from the area immediately adjacent to the contract works

1.34 CLEANING BY COMMERCIAL CLEANER

Use a commercial cleaning firm to clean the whole of the interior of the building, including all appliances, equipment, fittings, surfaces and finishes to leave it without any blemish. Cleaning to include:

- Clean and wash down all external surfaces to remove dirt, debris and marking.
- Clean all interior surfaces including cabinetwork, joinery, sanitary and hardware items.
- Vacuum or polish all floor finishes.
- Clean and polish all glass, both sides.

Commissioning

1.35 MOVING PARTS

Adjust, ease and lubricate all doors, windows, drawers, hardware, appliances, controls and all moving parts to give easy and efficient operation.

1.36 SECURITY AT COMPLETION

Remove any temporary lock cylinders and complete final keying prior to handing over keys to the principal on completion of the works. Leave the works secure with all accesses locked. Account for all keys/cards/codes and hand to the principal along with an itemised schedule, retaining a duplicate schedule signed by the principal as a receipt.

2241 EXCAVATION

1. GENERAL

This section relates to the excavating required for the building works, removing surface soils and the disposal of excavated material.

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZS 4402	Methods of testing soils for civil engineering purposes
OSH	Approved code of practice for safety in excavation and shafts for foundations

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

Performance

1.2 GROUND CONDITIONS

Foundation investigations and drilling have been carried out. Place your own interpretation on this information as no warranty is implied that the information is truly representative or complete. Make such extra investigations as considered necessary.

Copies of bore logs are ~.

1.3 PROOF DRILLING

Site bores already carried out indicate underlying layers of unsuitable material in certain areas. For the foundations designated on the plan, hand augered proof holes may be required to determine the extent of such material. Include for this work in programming and adjust against provisional quantities scheduled.

1.4 ACCESS FOR MACHINES

Determine working conditions and access for machines. Take into account the time of year, the nature of the ground and subsoil to be excavated, the ground water table and all matters influencing the carrying out of the work.

1.5 SAFE WORKING CONDITIONS

Provide safe working conditions and adequate support to excavations at all times. Cover holes and fence off trenches and banks.

1.6 FOUNDATION BEARING

Request written instructions if a natural bearing is:

- reached at a lesser depth or
- not reached at the depth shown on the drawings.

In made-up ground excavate down to a natural bearing. Remove unsuitable material that is exposed and replace with compacted backfill.

1.7 INSPECTION

Arrange for inspections and before placing any new work. If bearing becomes inadequate due to any cause then stop work and request further instructions.

1.8 SITE MEASUREMENT, ROCK

Where rock is shown to be part of the site condition by the bore logs, all rock removed to be solid measured and the quantity recorded and agreed to in writing as the excavation proceeds.

1.9 SITE MEASUREMENT, OTHER FORMATIONS
If for any reason the excavations have to vary from the drawings, those affected to be solid measured and the quantity recorded and agreed to in writing as the excavation proceeds.

2. PRODUCTS

Materials

2.1 TOPSOIL
Weathered soil, with organic inclusions capable of supporting the growth of vegetation.

2.2 CUT MATERIAL
Consisting of sands, gravels, sedimentary materials, clays, scoria and similar deposits.

2.3 ROCK
Defined as material encountered in excavations which because of its size or position can be removed only by breaking up by explosives or mechanical plant such as jack hammers or percussion drills.

2.4 UNCONTROLLED FILL
Variable fill material placed with little or no compaction control.

2.5 EXCAVATED FILL
Material from other formations in the excavation which may be selected and approved as suitable for filling and complying with NZS 4402 by having grading and moisture content properties that will allow compaction to 95% of maximum density.

3. EXECUTION

Conditions

3.1 REPORT
Report any survey pegs, bench marks, and the like on any features, leaving them undisturbed until approval is given for removal.

3.2 RETAINED FEATURES
Refer to SELECTIONS/drawings for those features to be retained. Mark out those features to be retained with 1 metre high 50 mm x 50 mm timber stakes with yellow plastic tape between, to eliminate accidental damage.

3.3 COMPLY
Comply with the requirements of the OSH publication: Approved code of practice for safety in excavation and shafts for foundations.

3.4 WORK BY OTHERS
Before taking over work done on the site by others check all levels and conditions and report any discrepancies affecting further work.

3.5 EXISTING SERVICES AND FOUNDATIONS
Locate underground services and foundations before work is started. Any information provided regarding the location of these services and foundations is given from available records but with no guarantee of accuracy as regards alignment or depth. Furthermore no guarantee is given or implied that the information provided covers all existing services and foundations. Make good at no extra cost damage to existing services to the satisfaction of the appropriate network utility operator. Protect existing roads, footpaths, gutters, crossings etc from damage during work.

3.6 EXCAVATION NEAR TREES
Do not excavate or remove topsoil within the drip line of retained trees unless specifically directed. If excavation is directed, use hand methods, taking care to avoid damage to roots. Do not cut roots greater than 50 mm diameter. Do not stockpile spoil against tree

trunks or beneath the drip line of retained trees. Report any damage to tree boles or branches, with necessary remedial work by an approved tree surgeon.

3.7 KEEP FREE OF WATER
Keep excavations free from water and keep water from excavations clear of other construction work.

3.8 TERRITORIAL AUTHORITY REQUIREMENTS
Obtain from the territorial authority requirements for the method of discharging water from the site.

3.9 FORM SUMPS
Form sumps outside the line of foundations and deep enough to drain excavations. Pump from sumps without disturbing excavations or any material in place.

3.10 SILT CONTROL
Undertake silt control measures required by territorial authorities and network utility operators in relation to design, location and discharge into the drainage system.

Application

3.11 STRIP TOPSOIL
Strip topsoil carefully over the whole site and stockpile where directed on the site, on the prepared subgrade, for re-spreading at the completion of the contract.

3.12 STRIP TO SUBGRADE
Strip the soil over the whole site to form a subgrade generally, but at a minimum of 200 mm below the original ground level. Leave the subgrade level, clear of all loose material and with no impediment for the excavation work.

3.13 DIVERT WATERWAYS
Temporarily divert as necessary all ditches, field drains and other waterways encountered during the excavations and reinstate to approval on completion.

3.14 DIVERT DRAINS AND SERVICE LINES
Divert services, drains and field drains encountered in the excavations to new routes clear of the building and reconnect to the requirements of the network utility operator.

3.15 BREAK OUT
Break out and remove old foundations, floor slabs, drains, manholes and septic tanks, seal up connections and remove contaminated soil. Grub out roots in excess of 75 mm diameter to a minimum of 500 mm below the bottom level of footings or paving. Backfill with selected excavated material, well rammed in layers.

Take special care when working close to retained trees and shrubs.

3.16 EXCAVATION GENERALLY
Excavate for pads, strip foundations and tie beams to the profiles and levels shown on the drawings. Allow clearance for working space and formwork as necessary. Trim to required profiles, falls and levels. If pouring against natural ground excavate an extra 25 mm that side to provide 75 mm minimum cover to reinforcement horizontally. Bench surface of sloping ground to receive filling.

3.17 OVER EXCAVATION
Make good with well compacted backfill.

3.18 EXCAVATED BACKFILL
Stockpile selected excavated backfill on site where directed so that it does not impede continuing works until it is required.

Finishing

3.19 BATTERS, TEMPORARY PROTECTION

Protect batters with a change of level between crest and toe of more than 1.5 metres from weather erosion with a waterproof covering of either hessian and tar, or heavy duty black polythene sheet. Seal at joints and securely fix down at crest and toe. Maintain coverings in good condition until the ground is secured by permanent construction.

Completion

3.20 LEAVE

Leave work to the standard required by following procedures.

3.21 SURPLUS TOPSOIL

Remove unwanted stripped soil from the site continually as the work proceeds. Clean up continually any soil if dropped on footpaths or roads.

3.22 SURPLUS MATERIAL

Remove surplus excavated material from the site continually as the excavation proceeds. Clean up continually any excavated material dropped on footpaths or roads.

3100 CONCRETE GENERAL

1. GENERAL

This section deals general matters relating to all aspects of concrete work.

Related work

1.1 RELATED SECTIONS

Refer to FORMWORK FOR CONCRETE for formwork
Refer to REINFORCEMENT FOR CONCRETE for reinforcement

Documents

1.2 DOCUMENTS REFERRED TO

Documents referred to in the above sections are:

AS 1366.3	Rigid cellular plastics for thermal insulation - Rigid cellular polystyrene - Moulded (RC/PS - M)
AS 1397	Steel sheet and strip - Hot-dipped zinc-coated or aluminium/zinc-coated
AS/NZS 1554.3	Structural steel welding - Welding of reinforcing steel
AS/NZS 1860.1	Particleboard flooring - Specifications
AS/NZS 2269	Plywood - Structural - Specifications
NZS 3101.1	Concrete structures standard - The design of concrete structures
NZS 3104	Specification for concrete production
NZS 3109	Concrete construction *
NZS 3112.1	Methods of test for concrete - Tests relating to fresh concrete
NZS 3113	Chemical admixtures for concrete
NZS 3114	Specification for concrete surface finishes
NZS 3121	Specification for water and aggregate for concrete
NZS 3122	Specification for Portland and blended cements (General and special purpose)
NZS 3125	Specification for Portland-limestone filler cement
NZS 3404.1 and 2	Steel Structures Standard
NZS 3604	Timber framed buildings
NZS 3631	New Zealand timber grading rules
AS/NZS 4357	Structural laminated veneer lumber
AS/NZS 4671	Steel reinforcing materials
AS/NZS 4586	Slip resistance classification of pedestrian surface materials
AS/NZS ISO 9001	Quality management systems - Requirements
BS EN 10250-3	Open steel die forgings for general engineering purposes – Alloy special steels

Alkali aggregate reaction (Cement and Concrete Association)
*** A copy of NZS 3109 Concrete construction, must be held on site.**

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

1.3 MANUFACTURER'S DOCUMENTS

Manufacturer's and supplier's documents relating to work in this section are:
~

Copies of the above literature are available by phoning ~.

Requirements

1.4 QUALIFICATIONS

Workers to be experienced, competent and familiar in the fabrication and erection of formwork and with the materials and the techniques specified.

1.5 INSPECTIONS

Refer to SELECTIONS for type of inspection.

Requirements

1.6 RECORDS
Make and keep record of mix, time, date and location of each pour and make available on request together with delivery dockets. Cross reference delivery dockets in pour records.

1.7 PRODUCER STATEMENTS
Provide Producer Statements where required by the Building Consent Authority and where required by this specification.

Performance

1.8 TESTING, ON SITE
Carry out sampling and concrete acceptance tests during construction to NZS 3109: section 9, Concrete acceptance tests during construction, noting that concrete may be rejected for:
- Non-compliance with this specification.
- Non-compliance with NZS 3109, section 9, Concrete acceptance tests during construction.
- Showing by appearance when in place that it does not comply with this specification, especially in respect of surface finish, segregation, or low density and which cannot acceptably be made good.

Conduct 7 day strength tests. After a 7 day test result of less than 60% of the specified strength, concrete placement to stop until it is shown the suspect concrete complies with the specification. Make all test records available.

1.9 CONFIRM STEEL REINFORCING COMPLIANCE
Provide a Producer Statement confirming that the steel reinforcing supplied complies with the grades specified on the drawings by producing test results to AS/NZS 4671.

1.10 CONTROL TESTS
Carry out slump tests, yield tests and air content tests to NZS 3112.1, sections 4, 5, and 9 respectively and evaluate to NZS 3104: section 2.15, Control tests and their evaluation, keeping a record of all tests at the plant and making them available on request.

1.11 STRENGTH TESTS
Carry out to NZS 3112.2, section 10 and evaluate to NZS 3104: section 2.15, Control tests and their evaluation, keeping a record of all tests at the plant and making them available on request.

1.12 QUALITY ASSURANCE
Carry out the whole of this work to the requirements of NZS 3109 and under the regime of a quality systems model for quality assurance in production and erection to AS/NZS ISO 9001.

Quality assurance procedures to include all aspects of concrete construction including:
- Formwork quality
- Reinforcing steel placing
- Cast in items
- Concrete quality
- Concrete finishes
- Construction tolerances

Advise name of the suitably experienced and qualified representative who is responsible for quality control of the concrete work. The representative is to sign a written quality control checklist for each on site concrete pour. Provide a copy to the construction reviewer in sufficient time for a pre pour inspection.

3111 FORMWORK FOR CONCRETE

1. GENERAL

This section relates to the design and construction of formwork necessary to support and confine the concrete and shape it to the required dimensions.

Related work

1.1 RELATED SECTIONS
Refer to CONCRETE GENERAL for general matters
Refer to REINFORCEMENT FOR CONCRETE for reinforcement

Documents

1.2 DOCUMENTS REFERRED TO
Documents referred to in this section are listed in CONCRETE GENERAL.

Requirements

1.3 FORMWORK DRAWINGS
Provide details of formwork showing but not limited to:
- position and type of construction joints
- layout of panel joints where exposed to view
- layout of form tie holes where exposed to view
- means of sealing panel joints, tie holes and construction joints
- form surfaces for each finish specified.

2. PRODUCTS

Materials

2.1 TIMBER FALSEWORK
No. 2 framing radiata pine to NZS 3631 or as required to construct the required formwork.

2.2 TIMBER BOARDS
Dressing or merchantable grade radiata pine to NZS 3631 for shutter face, to obtain the concrete finish specified.

2.3 LAMINATED VENEER LUMBER FORMWORK BEAMS
Laminated veneer lumber to AS/NZS 4357, sizes and spacing as recommended in span tables in the manufacturer's literature.

2.4 PROPRIETARY STEEL
An approved proprietary steel formwork and shutter system.

2.5 DAMP-PROOF MEMBRANE
0.25 mm Minimum polyethylene to NZS 3604: clause 7.5.4, Damp-proof membrane.

2.6 SHEET DAMP-PROOFING
Rubberised bitumen membrane specifically produced for waterproofing applications, possessing high resistance to water, water vapour and gas permeability and resistant to the attack of ground bacteria and ageing effects, joined using proprietary techniques and applied by the use of special adhesives. Thickness not less than 1.5 mm.

2.7 BRUSH ON LIQUID-APPLIED MEMBRANE
Fully stable, water-based colloidal bitumen emulsion.

2.8 CELLULAR POLYSTYRENE INSULATION
Proprietary expanded polystyrene (EPS) foam board to AS 1366 part 3.

Finishes

2.9 RELEASE AGENT
A release agent that will not stain or adhere to the concrete, contaminate reinforcing steel or construction joints, or have a detrimental effect on any applied finishes.

2.10 SURFACE RETARDER
A surface retarder that will not have long term detrimental effects on the concrete, or on any applied finishes.

3. EXECUTION

Conditions

3.1 PROVIDE ALL FORMWORK
Provide all formwork necessary to support and confine the concrete and shape it to the required dimensions. Use pre sealed plywood specifically manufactured for use as formwork or seal with 2 coats of polyurethane.

3.2 ACCURACY
Unless stated otherwise on the drawings permissible deviations from established lines, grades, dimensions and cambers to remain within the tolerances laid down in NZS 3109: table 5.1, Tolerances for precast components and table 5.2, Tolerances for in situ construction.

3.3 TOLERANCES OF CONCRETE SURFACE FINISHES
Unless stated otherwise on the drawings, permissible abrupt, offset and gradual deviations for the specified surface finish to remain within the tolerances laid down in NZS 3114: table 3, Tolerances for abrupt deviations or offsets and gradual deviations.

3.4 LOADINGS
Design and construct formwork and falsework in accordance with sound engineering principles to withstand the worst combination of:
- dead loads of formwork, reinforcement, concrete and precast elements such as floor planks
- construction loads including dynamic effects of placing, compacting and construction traffic
- wind and snow loads.

3.5 FALSEWORK
Carry strutting down to a construction sufficiently strong and stable to afford the required support without permissible stress or deflections being exceeded. Prop through to other floors if the construction load on a particular floor exceeds the design load.

3.6 CAMBERS
Cambers shown on the drawings or specified, relate to the concrete immediately before formwork is struck. Unless otherwise shown on drawings, construct forms to achieve the following:
- maximum deflection of face materials between strutting: $^{1}/_{240}{}^{th}$ of span, but not exceeding 6 mm, or within the tolerances specified for surface finish in CONCRETE PLACEMENT
- maximum deflection of beams: $^{1}/_{900}{}^{th}$ of span
- maximum deflection of cantilevers supporting construction loads: $^{1}/_{300}{}^{th}$ of cantilever length.

3.7 INSTALL CONCRETE UNDERLAY
Do not lay until granular hardfill has been formed to a suitable surface to receive the underlay using minimum 25 mm sand blinding. Lay the underlay in true alignment, lapping 150 mm. Carefully scribe fit around all penetrations. Fully seal all laps and penetrations with adhesive tape to the underlay manufacturer's requirements. Refer to details for treatment of sheet at perimeter of concrete.

3.8 INSTALL SHEET DAMP-PROOFING
Protect horizontal surfaces to be damp proofed with a 50 mm layer of 15 MPa site concrete. Ensure surfaces for damp-proofing are free from voids, spalled areas, loose particles and sharp protrusions. Masonry joints struck flush. Apply primer, then install the rubberised bitumen membrane system, strictly in accordance with the damp-proofing manufacturer's requirements. All work by applicators licensed by the damp-proofing manufacturer. Protect vertical surfaces with polystyrene sheets glued to the membrane and taped over joints.

3.9 APPLY LIQUID MEMBRANE
Three coats of water-based bitumen emulsion applied in accordance with the membrane manufacturer's requirements. First coat at the rate of 0.20 litres/m^2, with the second and third coats each at the rate of 0.75 litres/m^2. Protect vertical surfaces with polystyrene sheets before backfilling.

3.10 INSTALL CELLULAR POLYSTYRENE INSULATION
Install EPS insulation system to manufacturer's requirements.

3.11 CONSTRUCTION JOINTS
To NZS 3109: clause, 5.6 Construction joints. Clean face of previously hardened concrete at construction joints.

Use surface retarders to provide a key at construction joints. Use in accordance with the manufacturer's stated requirements. Remove laitance, contamination and cracked or dislodged aggregate before placing the continuing shutters and forms. Keep joints clean and undamaged until placing concrete.

3.12 LOCATION OF CONSTRUCTION JOINTS
Unless otherwise shown on the drawings locate the joints at positions listed in SELECTIONS.

3.13 JOINTS IN FORMS
Construct joints to prevent loss of grout between joints in form linings, as well as between forms and completed work. Column forms to have full height linings so that no horizontal joints occur on exposed faces.

3.14 COLD / HOT CONDITIONS
To NZS 3109: clause 7.2, Unfavourable conditions.

Application

3.15 FABRICATION
Fabricate formwork and falsework in a manner permitting its easy removal without damage to the concrete. Provide positive means of adjustment to ensure the formwork is secured in its correct position.

Provide a 20 mm x 20 mm chamfer to all corners unless detailed or noted otherwise. Protect corners from damage during and after stripping.

3.16 SECURELY FIX
Securely fix and brace to ensure sufficient strength and rigidity to support in safety all loads arising during construction and to maintain the specified dimensional tolerances.

3.17 WORK BELOW GROUND
Provide formwork to vertical faces below ground level.

3.18 WORK BELOW GROUND WITHOUT FORMWORK
Faces may be cast against earth without formwork only if adequate measures are taken to prevent contamination of concrete.

3.19 FORM TIES
Use proprietary form ties and spreaders. Wire ties are not permitted.

3.20 CHASES, HOLES, NIBS, REBATES AND REVEALS
Form chases, fillets, holes upstands and nibs as shown on the drawings. Position accurately at time of casting concrete.

3.21 CAST IN ITEMS, NON STRUCTURAL
Securely fix non-structural cast in items shown on drawings.

3.22 CAST IN ITEMS, STRUCTURAL STEEL
Securely fix structural steel cast in items and hold down bolts shown on drawings. Position accurately at time of casting concrete.

3.23 TRAPS AND WASHOUT PORTS
To NZS 3109: clause 7.3, Preparation for concreting.

Finishing

3.24 RELEASE AGENTS
Use the same type and brand throughout the entire area of any one finish. Apply evenly to form faces using the minimum amount necessary to obtain a clean release. Do not allow the release agent to come in contact with reinforcement, hardened concrete or other materials not part of the form face. Ensure compatibility with subsequent finishes being applied to the concrete.

Thoroughly clean any reinforcement coming in contact with release agent to remove all traces of release agent.

Completion

3.25 STRIKING FORMWORK
Ensure the safe removal of all or any part of the formwork. Remove formwork without shock or vibration or damage to the concrete and in such a manner as to take the imposed stresses gradually to NZS 3109: clause 5.4, Removal of forms and shores. Stripping times to NZS 3109: table 5.3, Minimum formwork stripping times - in situ concrete.

3.26 PARTIAL STRIKING
If this is required, retain supports undisturbed as follows:
- to soffit or beams where side form are struck
- to slabs where soffit forms are struck.

3112 REINFORCEMENT FOR CONCRETE

1. GENERAL

This section relates to the supply, cutting, bending and fixing of steel bar and steel welded reinforcement for concrete.

Related work

1.1 RELATED SECTIONS
Refer to CONCRETE GENERAL for general matters
Refer to FORMWORK FOR CONCRETE for formwork

Documents

1.2 DOCUMENTS REFERRED TO
Documents referred to in this section are listed in CONCRETE GENERAL.

Requirements

1.3 SELECTIONS AND DIAGRAMS
Provide schedules and diagrams of bars and bar bending.

2. PRODUCTS

Materials

2.1 GRADE 300E STEEL
To AS/NZS 4671. Round bars are shown by symbol "R" and deformed bars by symbol "D", followed by the diameter in millimetres.

2.2 WELDED WIRE FABRIC
Hard drawn steel wire spot welded to AS/NZS 4671, smooth or deformed and to the spacings and dimensions either specified or shown on the drawings.

2.3 TYING WIRE
Mild drawn steel wire not less than 1.2 mm diameter.

Components

2.4 SPACERS AND CHAIRS
Precast concrete or purpose made moulded PVC to approval. Where concrete spacer blocks are used in exposed concrete work use blocks matching surrounding concrete.

3. EXECUTION

Conditions

3.1 HANDLE AND STORE
Handle and store all reinforcing steel and accessories without damage or contamination. Store on timber fillets on hard ground in a secure area clear of any building operation. Lay steel fabric flat.

3.2 DELIVER ALL BUNDLES
Deliver all bundles of steel to the site clearly marked or tagged with numbers relating them to the bending schedule and drawings.

3.3 CLEANLINESS
Keep reinforcement clean so that at the time of placing concrete it is free of all loose mill scale, loose rust and any other contamination that may reduce bonding capacity.

3.4 PROJECTING REINFORCEMENT
Protect projecting reinforcement from the weather where rust staining of exposed concrete surfaces may occur.

Protect and/or mark any projecting reinforcement where it provides a potential hazard to site personnel.

Assembly

3.5 CUT AND BEND
Cut and bend bars using proper bending tools to avoid notching and to the requirements of NZS 3109: 3.3 Hooks and bends. Minimum radii of reinforcement bends to NZS 3109: table 3.1, Minimum radii of reinforcement bends. Do not rebend bars. Where rebending is necessary, use a purpose built tool, proper preparation and preheating.

3.6 ADJUSTMENTS
Use a purpose built tool for on site bending and to deal with minor adjustments to steel reinforcement.

3.7 TOLERANCES, BENDING
To NZS 3109: clause, 3.9 Tolerances for reinforcement.

Application

3.8 SECURE REINFORCEMENT
Secure reinforcement adequately with tying wire and place accurately, supported adequately and secured against displacement when concreting. Bend tying wire back well clear of the formwork.

3.9 SPACING
Spacing as dimensioned on the drawings but if not shown then the clear distance between parallel bars in a layer, or the distance between layers, or the spacing of other steel to the minimums laid down in NZS 3109: clause 3.6, Spacing of reinforcement.

3.10 TOLERANCES, SPACING
To NZS 3109: clause 3.9, Tolerances for reinforcement.

3.11 LAPPED SPLICES
Length of laps where not dimensioned on the drawings in accordance with the SELECTIONS. Increase laps for plain round steel by 100%. Provide laps only where indicated on the drawings. Tie all lapping bars to each other.

3.12 WELDED SPLICES
Carry out only if either specified on the drawings or after written approval from the Construction reviewer and then to the requirements of AS/NZS1554 and NZS 3109: clause 3.7.2, Welded splices, in respect of developed strength and location.

3.13 MECHANICAL SPLICES
Use only where shown on drawings. Use the appropriate sleeve size and length, swaged onto the bars using correct die and hydraulic press all to the manufacturer's requirements. Notify when ready for inspection and carry out tests if required.

3.14 STEEL SPACERS
Fix spacers between layers of wall reinforcement at 1.0 metre centres minimum.

3.15 MINIMUM COVER
Unless noted otherwise on the drawings, minimum cover to all reinforcing bars, stirrups, ties and spirals to NZS 3109: clause 3.8, Cover.

3.16 TOLERANCES, COVER
Tolerances on cover relative to the values in NZS 3109: clause 3.9 Tolerances for reinforcement.

3.17 FIX CHAIRS
Fix chairs for top reinforcement in slabs at 1.0 metre centres or to ensure adequate support.

3.18 CONCRETE SPACER BLOCKS
Where required in exposed concrete work, make from same materials and mix as the surrounding concrete.

Completion

3.19 REMOVE
Remove all debris, unused materials and elements from the site.

4. SELECTIONS

4.1 REINFORCEMENT LAPS
Where reinforcement laps are not shown on the drawings, lap as follows:

Bar Diameter	Grade 300E deformed
10 mm	400 mm
12 mm	500 mm
16 mm	650 mm
20 mm	800 mm

3321 CONCRETE MASONRY

1. GENERAL

This section relates to the laying, reinforcing and grouting of hollow concrete masonry for observation type A or B specific design masonry using ready-mix grout.

Related work

1.1 RELATED SECTIONS

Refer to CONCRETE MASONRY VENEER CLADDING for concrete masonry used as a veneer cladding.

Documents

1.2 DOCUMENTS REFERRED TO

Documents referred to in this section are:

AS/NZS 1170.1	Structural design actions - Permanent, imposed and other actions
NZS 1170.5	Structural design actions - Earthquake actions - New Zealand
NZS 3103	Specification for sands for mortars and plasters
NZS 3104	Specification for concrete production
NZS 3109	Concrete construction
NZS 3112.1	Methods of test for concrete - Tests relating to fresh concrete
NZS 4210	Masonry construction: Materials and workmanship
NZS 4230	Design of reinforced concrete masonry structures
AS/NZS 4455.1	Masonry units, pavers, flags, and segmental retaining wall units - Masonry units
AS/NZS 4671	Steel reinforcing materials

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

Requirements

1.3 QUALIFICATIONS

Blocklayers to experienced competent workers familiar with the required type of block laying and be registered with the New Zealand Masonry Trades Registration Board as a Registered Structural Mason.

1.4 CONSTRUCTION OBSERVATION BY ENGINEER

Inspections shall confirm compliance with the design and the required standards of construction.

Obtain from the engineer Producer Statements required relating to the masonry construction.

Where required as a condition of the building consent, advise the engineer when inspections are required.

1.5 QUALITY RECORDS

Keep accurate records relating to strength and quality of materials used in the construction, and make the information available to the Building Consent Authority inspector on request.

1.6 SELECTED MASONRY

Refer to the drawings for areas of masonry, which require select quality blocks to both sides, self-insulating masonry or for weatherproof construction.

Performance - tests

1.7 TESTS
Carry out all required tests to NZS 4210: appendix 2A, Compressive strength tests for mortar and grout.

1.8 TESTING PROCEDURES
Provide advance notice of all or any cell filling work. Maintain on site all equipment necessary for taking and preparing samples for test. Retain records of all test results and supply on request.

1.9 SPREAD OF GROUT
If requested, carry out tests to NZS 3112, part 1, to the requirements of NZS 4210.

1.11 COMPRESSIVE STRENGTH OF GROUT
If requested, carry out tests to NZS 4210: appendix 2.A, Compressive strength tests for mortar and grout, with 3 specimens per test.

1.10 COMPRESSIVE STRENGTH OF MORTAR
If requested, carry out tests to NZS 4210: appendix 2.A, Compressive strength tests for mortar and grout, with 3 specimens per test.

1.11 MASONRY TO MORTAR BOND TEST
If requested, carry out tests to NZS 4210: appendix 2.B, Masonry to mortar bond strength test, with 6 specimens per test.

1.12 EXPANSION OF GROUT
If requested, carry out tests to NZS 4210: appendix 2.C, Test for expansion of grout.

1.13 SPREAD OF GROUT
If requested, carry out on-site tests to NZS 3112.1 to the requirements of NZS 4210.

1.14 RECORDS OF TESTS
To NZS 4210 and kept on site:
- spread of grout tests
- grout supplier's test certificates.

2. PRODUCTS

Materials

2.1 MASONRY
To AS/NZS 4455.1 with true and unblemished surfaces and arrises and from a single manufacturer. Knock-in bond beam masonry not to be used. Use appropriate masonry for intermittently filled construction where vertical reinforcement is placed prior to laying of masonry.

2.2 SELF INSULATING MASONRY
To AS/NZS 4455, 200 mm masonry with a polystyrene insulation insert.

2.3 REINFORCEMENT
To AS/NZS 4671, deformed mild steel except for ties in plain round mild steel.

Accessories

2.4 SAND FOR MORTAR
Sand to comply with NZS 3103. Chloride levels not exceeding 0.04% by dry weight of sand.

2.5 MORTAR
To NZS 4210: 2.2 Mortar.
Mix: 1:0 - 0.25:3 - cement: hydrated lime: sand
Strength: 17.5 MPa

Bond strength: 200 kPa
Pigment: to NZS 3117
Do not rework if not used within 1.5 hours of adding cement.
A plasticiser may be used instead of lime.

2.6 COARSE AGGREGATE GROUT
To NZS 4210: 2.3 Grout.
Mix: 3:8:4 - cement: concreting sand: coarse aggregate
Strength: 17.5 MPa
Aggregate: 4.75 mm to 13.2 mm maximum
Spread value: 450 mm to 530 mm
Ready mix: To NZS 3104 with a copy of the mix design information

2.7 FINE AGGREGATE GROUT
To NZS 4210: 2.3 Grout.
Mix: 2:7 - cement: concreting sand
Strength: 17.5 MPa
Aggregate: 4.75 mm to 6 mm maximum
Spread value: 450 mm to 530 mm
Ready mix: To NZS 3104 with a copy of the mix design information

2.8 EXPANSIVE AGENT
Proprietary admixture based on aluminium powder providing controlled expansion prior to initial set. Use in strict accordance with the manufacturers requirements. Add the required measured dose of agent to the agitator truck on site, immediately prior to grouting. Ensure thorough mixing for 3 to 5 minutes before discharge.

3. EXECUTION

Conditions

3.1 COMPLY
Comply with NZS 4210.

3.2 TOLERANCES
Construct within the tolerances set out in NZS 4210: clause 2.6.5, Tolerances and clause 2.7, Laying the units, unless specified otherwise on the drawings or in this specification. Lay blocks with jointing of consistent thickness throughout.

Lay masonry to an even, plane surface with no deviation exceeding 3 mm in 3 metres on any surface in view in the finished work.

3.3 CHECK BASE
Check that the base concrete on which masonry is being built is true to line and level, to ensure that work can be taken up true and plumb with 10 mm thick bed and perpendicular joints. If more than 20 mm thickness of mortar bed is needed to correct inaccuracies obtain written direction on remedial action.

3.4 CONSTRUCTION JOINTS
Ensure the structural integration of all masonry with adjacent concrete work by providing well roughened, retarded construction joints at all junctions.

All construction joints between grout and concrete and between grout and grout similar to Type B as described in NZS 3109, clause 5.6.3, prepared using an approved retarder, except that the roughness at fine grout surfaces may be ±1.5 mm above and below the average level. Use a "double strength" retarder if necessary to suit the high cement content of the grout.

Vertical joints between masonry and concrete to achieve full structural integration across the joints. Allow to construct concrete work first with prepared vertical construction joints at block junctions the same as for horizontal construction joints. Lay masonry so that all courses have open ends abutting the existing concrete work.

3.5 COVER
Cover to NZS 3109: 3.8 Cover and 3.9 Tolerances for reinforcement. Minimum cover as required for reinforced concrete, with grout and masonry treated as a homogeneous material. Maintain reinforcing bars for retaining walls and bond beams, a minimum of 15 mm, and for other masonry a minimum of 9 mm, from the masonry work face, with the space filled with grout.

3.6 STARTER POSITIONS
Check the location of starter reinforcement before block laying commences, or by a dry trial lay up of the first course. Do not attempt to correct misplacement by cranking bars. Where misplacement exceeds the location tolerance obtain written directions before proceeding further.

3.7 MOISTURE CONTENT
Ensure that blocks are air-dry prior to laying. If necessary to reduce excess absorption of water from the mortar, some dampening of the surface is permissible but no surface water may be present at the time of placing mortar.

3.8 PROTECTION
Keep fair face block walls clean of mortar droppings, grout splashes, or stains of any kind as the work proceeds and before any droppings set.

3.9 WEATHER PRECAUTIONS
When extreme temperatures prevail, either below 4°C or above 27°C, make adjustments to construction as listed in NZS 4210: clause 2.18, Cold weather construction, and clause 2.19, Hot weather construction. Do not use expansive grout for filling in temperatures below 5°C.

Application

3.10 SELECTION
For fair face walls select blocks for consistent colour, texture and lack of imperfections.

3.11 BONDING PATTERN
Unless specifically shown or described otherwise, lay masonry in running bond with full masonry bonding at intersections.

3.12 OPEN-ENDED DEPRESSED WEB MASONRY
Use open-ended depressed web masonry throughout all courses in fully grouted walls.

3.13 CUTTING
Always use a masonry saw to provide clean, accurate cuts.

3.14 BEDDING FOR INTERMITTENTLY FILLED WALLS
Lay blocks on shell bedding, with full bedding of the cross webs at positions of filled cells of intermittently filled walls. Ensure tightly filled perpends.

3.15 SHELL BEDDING
Lay masonry on full mortar beds under face shells only where fully grouted.

3.16 BOTTOM COURSE
For fully grouted walls use inverted open-end depressed web bond beam masonry for the first course, to permit clean-out of grout space at the base.

3.17 INSULATING CONSTRUCTION
Where shown on the drawings or where nominated below, construct walls using self-insulating masonry. Lay with polystyrene insert to the outside and all mortar joints filled to the depth of the face shell and thoroughly compressed by tooling to the block manufacturer's required practice.

3.18 CLEAN OUT HOLES
Use special clean-out masonry or saw off a 100 mm x 200 mm high section of face shell at the base of all cells containing reinforcement, to form clean out and inspection holes.

3.19 GROUT SPACE
Ensure that grouting cells at reinforcement locations are continuously clear by removal of projecting mortar. Ensure tightly filled perpends and beds.

3.20 TIE REINFORCING STEEL
Tie vertical reinforcing steel to starter bars prior to laying blocks. Lay and tie horizontal bars as the work proceeds.

3.21 REINFORCEMENT LAPS
Laps 40 diameters, except as noted otherwise on the drawings.

3.22 BRACING
Provide temporary lateral bracing where necessary to ensure stability and until final supporting construction is in place.

3.23 FLUSH JOINTS
Finish joints which are not visible in the completed work, or in walls to be plastered, by striking off flush with the trowel.

3.24 TOOLED JOINTS
Finish joints on exposed masonry by tooling to produce a neat, slightly concave joint.

3.25 WEATHERPROOF JOINTS
Where weatherproof construction is specified, take extra care to ensure that all joints are tightly filled and tooled to provide an impervious panel between control joints.

3.26 CONTROL JOINTS
To NZS 4210: clause 2.10, Methods of controlling wall movements, generally and to clause 2.10.2, Vertical control joints, for location; not more than 6 metres apart.
Rake out and prime adhesion faces of vertical control joints between masonry and between masonry and concrete as required by the sealant manufacturer. Use masking tape to avoid over-run of sealant onto the block face. Install a backing strip to limit sealant depth to 10 mm, and insert sealant, all to the manufacturer's requirements.
Discontinue grouting of bond beams at control joint locations unless specifically noted otherwise.

3.27 CONTROL JOINTS - HORIZONTAL REINFORCEMENT
To NZS 4210: clause 2.10.5, Horizontal reinforcement.
- Continuous reinforcement: Reinforcement required in lintels and in top course bond beams connecting to floors and roofs shall be continuous through control joints.
- Discontinuous reinforcement: Horizontal reinforcement other than as noted above shall be discontinuous at control joints. Debond reinforcement passing through control joints one side with grease or plastic tape for 400 mm minimum or as specified. Cells within the masonry units either side of the control joints shall be vertically reinforced and grouted.

Application - grouting

3.28 INSPECTION
Inspect clean-out holes prior to grouting. Ensure that cells are clean and reinforcement is correctly placed. Mortar back the clean-out hole shell after verifying the adequacy of grout filling. If holes are covered in the completed work, boxing across the face may replace the shell infill. Brace hole infills to prevent blowouts during grouting.

Notify when work is ready for inspection.

3.29 EXTENT OF GROUTING
Fill only cells where grouting is required. Intermittently fill cell walls that only require the grouting of cells containing reinforcement. Fully grout all reinforced cells and those where fixing devices occur.

3.30 GROUTING, HIGH LIFT WITH EXPANSIVE
Fill masonry walls using the "high lift with expansive admixture method" to NZS 4210 up to a maximum height of 3600 mm in a semi-continuous operation. Consolidate by rodding. Wait for expansion to take place and locally re-compact the top of the wall by trowelling, or place a weighted board on top of the wall to contain the expansion.

3.31 GROUTING, HIGH LIFT WITHOUT EXPANSIVE
Fill masonry walls to NZS 4210: clause 2.12, The high lift without expansive admixture method, up to a maximum height of 3600 mm in maximum lifts of 1200 mm. Consolidate by mechanical vibrator. Wait between each lift until grout settles, but before any set takes place (between 15 and 60 minutes) before pouring the next lift. Consolidate by mechanical vibrator with 300 mm penetration into the previous lift. Wait after the final lift as before and reconsolidate the top 300 mm by mechanical vibrator.

3.32 LIMIT RATE
Limit rate of pour to avoid hydrostatic blowouts.

Application - ancillary work

3.33 HOLES AND CUT MASONRY
Provide all necessary holes, pockets and chases. Cut blocks when non-standard shapes are required. When cut masonry units are used, ensure vertical joints in adjacent courses are no closer than 100 mm. Subsequent cutting away of masonry to form holes is not permitted.

3.34 BUILT IN ELEMENTS
As the work proceeds, mortar in place elements such as sills, copings, lintels, and steps.

3.35 BUILT IN FIXINGS
Build in all necessary plugs, bolts, ties, metal flashings, dowels, fastenings and fixings required by this and other work sections. Co-operate with others to meet this requirement. Fixings only permitted into filled cells.

3.36 ELECTRICAL WORK
Ensure that provision for and fitting of boxes, conduit and pre-wiring are made and done as the work proceeds under the direction of the electrician.

Completion

3.37 PROGRESSIVE CLEANING
Clean off mortar splashes and grout spills as they occur.

3.38 FINAL CLEANING
At completion, clean down block work, remove efflorescence and remove waste materials from adjoining surfaces and floors.

3.39 REPLACE
Replace damaged, cracked or marked elements.

3.40 LEAVE
Leave work to the standard required by following procedures.

3.41 REMOVE
Remove debris, unused materials and elements from the site.

4. SELECTIONS

4.1 MASONRY UNITS
Brand: 20&25 Series

3361 STONEWORK

1. GENERAL

This section relates to the supply, laying and fixing of non-load bearing stone fixed to a rigid structural backing.

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

AS/NZS 2699.1	Built in components for masonry construction - Wall ties
NZS 3103	Sands for mortars and plasters
NZS 4210	Masonry construction: materials and workmanship

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

Requirements

1.2 STONE SAMPLES

Supply 3 samples of each type of stone and surface finish representing the total range of natural variation, marking and finish across the run of quarry. Refer to SELECTIONS for minimum size.

1.3 SAMPLE PANELS

Provide a sample panel, including a corner of each type of stone work. Refer to SELECTIONS for location and size. An approved panel, if suitably located, may be incorporated into the works. Otherwise protect from damage, retain for duration of the work, removing all traces on completion.

1.4 QUALIFICATIONS

Stonemasons to be experienced competent workers, familiar with the materials and the techniques specified.

1.5 SHOP DRAWINGS

Provide shop drawings of set-out of blocks or panels complete with method of bedding and fixing.

Refer to the general section SHOP DRAWINGS for the requirements for submission and review and the provision of final shop drawings.

1.6 REVISED SHOP DRAWINGS

Provide copies of shop drawings revised to include required modifications, before proceeding with any stonework.

2. PRODUCTS

Materials

2.1 STONE

Schist veneer

2.2 FLEXIBLE DAMP-PROOF MEMBRANE

Heavy kraft, strip laminates saturated and coated with bitumen, butyl rubber sheet and adhesive, or equivalent.

2.3 MALLEABLE DAMP-PROOF MEMBRANE

Lead not less than 1.8 mm (20 kg/m²) thick bitumen coated.

Components

2.4 ANCHORS, CRAMPS, DOWELS
Non-corrodible, non-ferrous metal, suitably stamped.

2.5 TIES
Non-corrodible, non-ferrous metal suitably stamped, to AS/NZS 2699.1 for spacing, strength, stiffness and ductility.

Accessories

2.6 SEALANT
Elastomeric joint non-staining sealing compound of approved type and colour. Backing rods closed cell semi-rigid compressible plastic from the type sized to compress 33% in the joint and to the sealant manufacturer's requirements.

2.7 JOINTING MATERIAL
Suitable for the location and type of stone, non-staining, and to the manufacturer's requirements.

2.8 SAND FOR MORTAR
Sand to NZS 3103. Chloride levels to not exceed 0.04% by dry weight of sand.

2.9 MORTAR
Provide details of the proposed mix for approval not less than 7 days before commencing work. Generally the mix to have a strength less than the stone it is bedding and a porosity equal to or greater than the stone.

Finishes

2.10 DAMP-PROOF MEMBRANE, BITUMEN
Water based bitumen emulsion heavy duty sealer.

3. EXECUTION

Conditions

3.1 TOLERANCES
To NZS 4210, table 2.2 Maximum tolerances.

3.2 TOLERANCES AS SHOWN
Construct the stone work within the tolerances shown on the drawings.

3.3 BUILDING IN
Make provision for building into the structure those elements required for the erection and laying of stone.

3.4 BUILT IN ITEMS
Make provision as the work proceeds for elements that need to be built in or keyed to the stone work, including partitions, straps, handrails, beams, trusses and plates.

3.5 TRANSPORT
Transport, unload and handle all stone units to avoid any damage or disfigurement. Stack carefully in the vehicle with packing material to prevent damage.

3.6 STORE
Store stone clear of the ground on its natural bed, protected from the weather and atmospheric pollution on supports that avoid local overstressing and to promote good seasoning without staining, contamination, marking or damage.

Application

3.7 CUTTING
Cut and shape stone to profiles generally as detailed and including all weathering, jointing, chasing, forming mortises, grooves and drilling for handling and fixing. Work the bed, face and back joints of the stone square and true.

3.8 LAY FLEXIBLE DAMP-PROOF MEMBRANE
Apply mortar to a flush even bed and lay the flexible membrane horizontally and to steps in a continuous strip with 150 mm laps and no edges visible at the face.

3.9 MEMBRANES AT OPENINGS
Provide flexible membranes to heads, 150 mm beyond jambs and to jambs and sills, to discharge moisture to the outer face and with no edges visible at the face.

3.10 INSTALL FLASHINGS
Refer to STEEL METALWORK and install flashings provided to the locations as detailed and shown on the drawings.

Application - facing work

3.11 SOLID BEDDING
Adequately support and restrain cladding with durable fixings and continually and solidly fill between backs and supporting structure with mortar.

3.12 SPOT BEDDING
Adequately support and restrain cladding with durable fixings and provide mortar bedding continuously around fixings and in the form of mortar dabs elsewhere.

3.13 JOINTING
Prime surfaces in contact, fit backing rods to ensure correct depths of jointing material and/or sealant, keeping panel surfaces completely clear and unmarked by masking, all to the jointing manufacturer's requirements.

Application - walling work

3.14 BED AND JOINT
Bed and joint stone where possible in one operation on a full bed of mortar. Solidly fill and grout vertical joints, joggles, cramps and the like as the work proceeds and point up joints around flashings.

3.15 SET STONE
Set stone on its natural bed.

3.16 BEDDING SEDIMENTARY STONE
Clean the bed area of dust and impurities and thoroughly damp it down before laying the mortar bed.

3.17 RACKING
Raise advanced work no more than 1 metre above the general level and rack back. Do not tooth stonework unless shown on the drawings or when approved in writing.

3.18 SUPPORT
Provide support to the stone while mortar cures by bracing or joint spacers of non-staining softwood. When curing is complete remove spacers without damage to the stonework and point to match.

Finishing

3.19 PROGRESSIVE CLEANING
Keep the stone faces clean as the work proceeds. Prevent mortar or jointing material from coming into contact with the external face of the stone. Perform the cleaning procedure, including removal of stains as necessary, without damage to the work.

3.20 COMPLETE DAMP-PROOFING
Damp-proof the back and not less than 25 mm on return of bedding faces with two coats of bitumen sealer. Avoid contact of bitumen with the face of the stone.

Completion

3.21 PROTECT
Protect newly erected stonework against inclement weather.

3.22 KEEP FACEWORK CLEAN
Keep facework clean during construction and until completion of the contract works. Clean off, rub down and leave stonework in the specified condition, immediately before handing over.

3.23 REPLACE
Replace damaged, cracked or marked elements.

3.24 LEAVE
Leave work to the standard required by following procedures.

3.25 REMOVE
Remove debris, unused materials and elements from the site.

4. SELECTIONS

4.1 SCHIST
Selected metamorphosed sedimentary stone.
Thickness: 40mm

3411 STRUCTURAL STEELWORK

1. GENERAL

This section relates to the fabrication and erection of structural steel framing and steel framed buildings of a general nature.

Related work

1.1 RELATED SECTIONS

Refer to STEELWORK CORROSION PROTECTION for galvanizing, zinc and aluminium/zinc spray finishes and protective coating of mild steelwork.

Documents

1.2 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZBC F5/AS1	Construction and demolition hazards
AS/NZS 1252	High strength steel bolts with associated nuts and washers for structural engineering
AS/NZS 1554.1	Structural steel welding - Welding of steel structures
AS 1627.2	Metal finishing - Preparation and pretreatment of surfaces - Method selection guide - Power tool cleaning
AS 1627.4	Metal finishing - Preparation and pretreatment of surfaces - Method selection guide - Abrasive blast cleaning
NZS 3404.1	Steel structures standard - Steel structures standard
NZS 4711	Qualification tests for metal-arc welders
NZS 4781	Code of practice for safety in welding and cutting
AS/NZS ISO 9001	Quality systems - Requirements
AS 1111	ISO metric hexagon bolts and screws
AS 1112	ISO metric hexagon nuts
AS 3828	Guidelines for the erection of building steelwork
HERA R4-99	HERA specification for the fabrication, erection and surface treatment of structural steelwork
OSH	Guidelines for the provision of facilities and general safety in the construction industry

1.3 CO-ORDINATION

Refer to architectural, electrical and services drawings to ensure details and fixings required are provided for in the structural steel work.

1.4 VERIFY DIMENSIONS

Verify dimensions against site measurements prior to fabrication. For existing structures, verify grade of steel and dimensions against site measurement.

Requirements

1.5 QUALIFICATIONS

Welding operators to be experienced, competent workers, qualified to NZS 4711, familiar with the materials and techniques specified. Comply with NZS 3404 and AS/NZS 1554.1. Welding operators to have passed the qualifications tests covering those welding positions required to complete the work as set out in NZS 4781. Provide evidence of qualifications on request.

Riggers to be experienced and competent workers, familiar with the materials and techniques required.

1.6 SHOP DRAWINGS

Provide shop drawings to show, but not be limited to:

- Design calculations
- Fully dimensioned elevations of all elements (minimum scale 1:20)
- Complete details of construction, connections and all support systems (minimum scale 1:10)

- Dimensions of all typical elements
- Jointing details and method of fixing between individual elements and between this installation and adjacent work
- Provision for thermal movement
- Provision for seismic movement and movement under prevailing wind loads
- Sequence of installation
- Co-ordination requirements with other work
- A full schedule of materials and finishes.

Refer to the general section SHOP DRAWINGS for the requirements for submission and review and the provision of final shop drawings.

Performance

1.7 QUALITY ASSURANCE
Maintain quality assurance programmes to AS/NZS ISO 9001 for both fabrication and erection as necessary to assure that work is performed in accordance with this specification and the qualifying requirements of the contract documents.

1.8 INSPECTION
Inspect fabrication and construction of the structure to NZS 3404.

1.9 MATERIAL CERTIFICATES
Supply mill test certificates relating to mill sections, bolts and nuts or welding consumables. High strength steel to be marked accordingly by the supplier before delivery.

1.10 TEST WELDING
Non-destructive weld examination with method, extent and standards of acceptance to AS/NZS 1554.1, Section 7 and Table D1 of NZS 3404.1.

2. PRODUCTS

Materials

2.1 STRUCTURAL STEEL
Comply with Australian, British and Japanese Standards for steel as required by NZS 3404, part 1. Test and stress relieve for brittle fracture as required by NZS 3404.1, section 17.

Grade 300, except RHS sections Grade 350, unless noted otherwise on the drawings.

Components

2.2 BOLTS, NUTS AND WASHERS
Grade 4.6 screws and bolts to comply with AS 1111. Grade 4.6 nuts to comply with AS 1112. Grade 8.8 bolts, nuts and washers (high strength structural quality only) to comply with AS/NZS 1252. Hot-dip galvanize to AS/NZS 4680, bolts, nuts and washers forming a permanent part of a structure subject to a protective coating. Alternatively electrogalvanize to AS 1897.

Accessories

2.3 ELECTRODES
To comply with and be selected for grade of steel being welded as required by AS/NZS 1554.1.

2.4 WELDING WIRE
Welding wire as required by the manufacturer for materials to be joined and the welding position.

2.5 FLUX
Welding flux to be dry and from sealed containers.

2.6 STEEL STUDS
Material for arc stud welding to comply with AS/NZS 1554.1.

3. EXECUTION

Conditions

3.1 GENERALLY
Construct to NZS 3404.1, section 14 (fabrication) and section 15 (erection). Identify steel to NZS 3404.

3.2 DEFECTS
Discard any material or fabricated items showing defects affecting its structural integrity.

3.3 SURFACE FINISH
Grind off burrs and sharp arrises.

3.4 TOLERANCES
Comply with the tolerances laid down for holding down bolts, columns, beams and other members in HERA Report R4-99 and NZS 3404. Comply with NZS 3404 for level and alignment of beams and alignment and plumbing of struts.

Structural elements to comply for straightness, length, full contact splices and struts not prepared for full contact with NZS 3404.

3.5 CARRY OUT ERECTION
Carry out the erection of structural steel to the requirements of NZS 3404, section 15 Erection. Comply with NZBC F5/AS1: Construction and demolition hazards, and the OSH publication: Guidelines for the provision of facilities and general safety in the construction industry.

3.6 START ERECTION
Start erection only when the holding down bolts and anchorages have been cast-in-place long enough to achieve sufficient strength.

3.7 SAFETY DURING ERECTION
Erection practices to comply with AS 3828. During erection make structure safe against erection loading including loading due to erection equipment or its operation, and wind.

3.8 TEMPORARY BRACING
Provide temporary bracing and restraint as required to make structure safe. Leave temporary bracing and restraint in place until the erection is sufficiently advanced to allow safe removal of temporary bracing.

Assembly

3.9 CUTTING
Hand cut only where machine cutting is not possible. Cutting to comply with NZS 3404 and HERA Report R4-99, clause 4.6. Site cutting and welding are forbidden.

Application

3.10 WELD FAILURE
Comply with AS/NZS 1554.1 for detailed guidance on welding inspection and quality control.

3.11 WELDING
Carry out welding in accordance with AS/NZS 1554.1 and the additional requirements of NZS 3404. Equipment to comply with AS/NZS 1554.1, clause 1.8.2.

3.12 WELDING SYMBOLS

Welding symbols have not been used on the drawings. Unless denoted otherwise on the drawings, shop weld touching or near-touching steelwork together all round with 6 mm continuous fillet welds.

3.13 HOLING

Comply with NZS 3404 for sizes, alignment, finishing, punching and flame cutting of holes.

3.14 BOLTING

Bolting, including high strength bolting to comply with NZS 3404, section 14.3.6. Ensure that at least one clear thread shows above the nut and at least one thread run out is clear beneath the thread after tightening

3.15 BOLTING NOTATION

Notation of bolting categories:

Bolting category	Bolt standard	Bolt grade	Tension method	Tensioned joint type
4.6/S	AS 1111	4.6	Snug tight	
8.8/S	AS/NZS 1252	8.8	Snug tight	
8.8/TB	AS/NZS 1252	8.8	Full tension	Bearing
8.8/TF	AS/NZS 1252	8.8	Full tension	Friction

In bearing type connections where the thread position relative to the shear plane is to be controlled.
N - threads included in shear plane
X - threads excluded from shear plane
F - friction type joints - prepare faying surfaces

3.16 THREADS EXCLUDED FROM SHEAR PLANE

Select length of bolts such that the threaded portion does not occur within the shear plane between joined parts.

3.17 BASE PLATES

Enlargement or site cutting of holes is not permitted. Bending or displacement of holding down bolts is not permitted.

3.18 INSTALLATION OF COLUMNS

Plumb columns using sawn steel packs and wedges not larger than necessary for the purpose. Obtain written instructions when any column base needs to be raised by more than 25 mm. Fill the space beneath the base plate with cement-sand grout, containing an approved non-shrink additive, having a minimum compressive strength of 30MPa at 28 days, or by the use of a dry pack of 1:2 cement:sand mortar hammered in tight to ensure complete filling of space.

Finishing

3.19 WIRE BRUSHING AND POWER TOOL CLEANING

Remove oil and grease by the use of solvents. Scrape and power wire brush to a minimum class 2 finish to AS 1627.2. Clean to bright metal, but avoid producing a polished surface. Check that no burrs or sharp arrises remain which may prevent the full coating thickness being attained.

3.20 ABRASIVE BLASTING

Remove oil and grease by the use of solvents. Abrasive blast clean to a class $2^{½}$ finish to AS 1627.4. Clean to bright metal, but avoid producing a polished surface. Select grit type and equipment such that the cleaned surface profile between peaks and valleys does not exceed one third of the dry film thickness. Check that no burrs or sharp arrises remain which may prevent the full coating thickness being attained.

3.21 UNPAINTED SURFACES

Do not paint:
- Faying face of friction type joints

- Areas to be site welded, keeping 75 mm clear all round
- Surfaces to be embedded in concrete.

Where steel is only partly encased, then extend priming 30 mm maximum into the concrete encasement area.

4. SELECTIONS

4.1 SHOP DRAWINGS

Shop drawings: Required

3821L LASERFRAME™ TIMBER FRAMING

1. GENERAL

This section relates to the supply and erection of Carter Holt Harvey Timber Laserframe™ kiln-dried, machine graded timber framing as:
- a framed structure
- part of a partitioning system.

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

AS/NZS 1748	Mechanically stress-graded timber
NZS 3603	Timber structures standard
NZS 3604	Timber framed buildings
OSH	Guidelines for the provision of facilities and general safety in the construction industry
BRANZ BU 453	Selection and use of fasteners

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

1.2 MANUFACTURER'S DOCUMENTS

Manufacturer's and supplier's documents relating to work in this section are:
Laser*frame*™ product information:
- **Laser*frame*™** Product Information Sheet
- **Laser*frame*™** Boron H1.2 Product information sheet

Copies of the above literature are available at

Web:	www.laserframe.co.nz
Telephone:	0800 74 63 99

1.3 NO SUBSTITUTIONS

Substitutions are not permitted to any specified system, or associated components and products.

2. PRODUCTS

Materials

2.1 STRUCTURAL TIMBERS, CHEMICAL FREE

Laser*frame*™, kiln dried, machine stress graded to AS/NZS 1748, radiata pine with an average moisture content at supply of 90% within range of 6-21% moisture content.

2.2 STRUCTURAL TIMBERS, TREATED

Laser*frame*™, kiln dried, machine stress graded to AS/NZS 1748, radiata pine with an average moisture content at supply of 90% within range of 13-26% moisture content.

2.3 POLYETHYLENE DPC

Polyethylene film to AS/NZS2904 and embossed on both sides. Thickness 500 microns minimum, manufactured for use as a damp-proof course and concealed flashings to doors and windows.

2.4 BITUMINOUS IMPREGNATED DPC

Heavy Kraft impregnated with high grade bitumen and coated with higher heat resistant bitumen to AS/NZS 2904 and AS/NZS 4347.

Components

2.5 NAILS
Steel, stainless steel and galvanized steel of pattern to suit the location and to BRANZ BU 453.

Type to NZS 3604, section 4 Durability, and of the size and number for each particular type of joint as laid down in the nailing schedules of NZS 3604, sections 6-Foundations and subfloor framing, 7-Floors, 8-Walls, 9-Posts and 10-Roof framing. Except that when hand driving nails into **Laser*frame***™ the nail lengths and diameters should be generally as for power driven nails.

2.6 BOLTS AND SCREWS
Of engineering and/or coach type complete with washers, to the requirements of NZS 3604, section 4: Durability, and of the number and form required for each particular junction to NZS 3604: sections 6-Foundations and subfloor framing, 7-Floors, 8-Walls, 9-Posts and 10-Roof framing.

2.7 THREADED RODS
Use stainless steel threaded rods of the required length, with washers and nuts at both ends, when stainless steel bolts of the required length are not available.

2.8 TIMBER CONNECTORS AND FIXINGS
Supply for each particular joint the connectors and fixings as noted on the drawings. Comply with the requirements of NZS 3604, section 4-Durability, and of the number and form required for each particular junction to NZS 3604: 6-Foundations and subfloor framing, 7-Floors, 8-Walls, 9-Posts and 10-Roof framing.

2.9 BRACING STRAPS
Nail on type to the requirements of NZS 3604, section 4-Durability, and of the number and form required for each particular application to NZS 3604: 6-Foundations and subfloor framing, 7-Floors, 8-Walls, 9-Posts and 10-Roof framing.

2.10 POWDER ACTUATED FASTENERS
To type, size and charge required by the powder actuated tool manufacturer for each particular member and the substrate.

3. EXECUTION

Conditions

3.1 PROTECT TIMBER
Keep **Laser*frame***™ dry and wrapped prior to erection. Protect against damage and from inclement weather and ensure that any variation in moisture content is kept to a minimum, before and after erection and before enclosure.

3.2 PROTECT MID FLOOR BOUNDARY JOISTS
Before flooring is laid, place a 600 mm wide strip of building paper/wrap over mid floor boundary joists and down over the outside face to cover the full depth of the boundary joist to provide temporary protection from potential rain wetting. Staple or nail in place with a minimum number of fasteners to enable air circulation behind the paper during the construction period prior to the cladding being erected.

3.3 EXECUTION
To NZS 3604 and stud design tables. Execution to include those methods, practices and processes contained in the unit standards for the National Certificate in Carpentry and the National Certificate in Joinery (cabinetry, exterior joinery, stairs).

3.4 SEPARATION
Separate all timber framing timbers from concrete, masonry and brick by: -
- a full length bituminous damp-proof membrane overlapping timber by at least 6 mm; or
- a 12 mm minimum free draining air space

3.5 MOISTURE CONTENT
Maximum allowable equilibrium moisture content (EMC) in accordance with the NZBC E2/AS1, clause 11.2 for framing supporting interior linings:
- At lining: 20%

3.6 TOLERANCES
Permissible deviations from established lines, grades and dimensions equal to or less than the following. Multiples of given limits are not cumulative.
- deviation in plan, up to 10 metres, 5 mm
- deviation in plan, over 10 metres, 10 mm
- deviation from horizontal, up to 10 metres, 5 mm
- deviation from horizontal, over 10 metres, 10 mm
- deviation from vertical position more than 1 storey in height, 15 mm
- deviation from vertical position within a storey per 3 metres, 3 mm
- deviation from vertical, in total height, 20 mm
- deviation from horizontal and vertical, within openings, 3 mm
- deviation from level in floors and decks, over 3 metres, 5 mm

3.7 DIMENSIONS
All timber sizes except for battens are actual minimum dried sizes.

Application

3.8 SET OUT
Set-out framing generally in accordance with the requirements of NZS 3604, to carry superimposed loads and as required to support sheet linings and claddings. Set back nogs 12.5 mm from face of studs where required for back-blocking of plasterboard non-tapered ends or edges.

3.9 SET TIMBERS
Set timbers true to the required lines and levels with all mitres, butt joints, laps and housings cut accurately to provide full and even contact over the whole of the bearing surface.

3.10 TIMBER CUTTING
Select and cut spanning members to minimise allowable defects and avoiding knots and short grain on edges in the middle third, and shakes, splits and checks at mid-span and close to ends. Refer to the recommendations appropriate for the treatment type (if any) for the field application of timber preservatives to cut ends.

3.11 HOLES AND NOTCHES
Limit holes and notches, checks and half-housing for the structure to those allowable in NZS 3604. Neatly form holes and notches for services without lessening the structural integrity of the member.

3.12 CUTTING
Cutting for straightening to comply with NZS 3604.

3.13 EXPOSED TIMBER CONNECTORS AND FIXINGS
Do not use on any structural framing exposed to view unless detailed on the drawings.

3.14 POWDER ACTUATED AND MECHANICALLY POWERED FIXING
Comply with the OSH: Guidelines for the provision of facilities and general safety in the construction industry, part 5, section 5.7.

3.15 ADDITIONAL FRAMING
Position and fix all necessary members for the fixing of all services, fittings, fixtures, edges of linings or claddings, and to provide lateral support to load carrying framing.

3.16 FORM NAILED JOINTS
Fully drive nails in all structural joints with the number and location for each joint to the requirements of NZS 3604. Except that 75 mm x 3.15 mm nails may be used in 35 mm timber joints in wall frames and 90 mm x 3.15 mm nails may be used in 45 mm timber

joints in wall frames. 100 mm x 3.75 mm nails should not be used without pre-drilling to 80% of nail diameter.

3.17 FORM BOLTED JOINTS
Drill for and set bolts to ensure full bearing and development of the joint strength, with tension to just set the washers into timber.

3.18 FIT CONNECTORS AND FIXINGS
Fit connectors and fixings to obtain full bearing over all contact surfaces and full development of the required loading capacity for that particular joint.

3.19 FIT BRACING
Fit and fix subfloor, wall and roof bracing elements to the requirement of NZS 3604 and to develop the full number of bracing units required.

3.20 DPC TO LOSP TREATED TIMBER
Lay polyethylene DPC under LOSP treated bottom plate of all external timber framed walls on concrete, in a single layer with 50 mm overlaps at joints to provide a waterproof barrier.

3.21 DPC TO TIMBER
Lay bituminous DPC under the bottom plate of all external timber framed walls on concrete, in a single layer with 50 mm overlaps at joints to provide a waterproof barrier.

Completion

3.22 CLEAN UP
Clean up timber framing as the work proceeds so no offcuts, chips, sawdust or any other matter or items remain behind the claddings or linings.

3.23 LEAVE
Leave work to the standard required by following procedures.

3.24 REMOVE
Remove debris, unused materials and elements from the site.

4. SELECTIONS

4.1 SUB-FLOOR FRAMING

Member	Type	Grade	Treatment
Bearers:	Pinex	MSG8	H3.2
Ground floor joists:	Laserframe	MSG8	H1.2
Piles:		No. 1	H5

4.2 FLOOR FRAMING

Member	Type	Grade	Treatment
Mid floor joists:	Laserframe	MSG8	H1.2 Boron

4.3 EXTERIOR WALL FRAMING

Member	Type	Grade	Treatment
Exterior walls:	Laserframe	MSG8	H1.2
Enclosed decks and balconies:	Laserframe	MSG8	H3.1
Wall battens:	Radiata pine	Framing No1	H3.1

4.4 ROOF FRAMING

Member	Type	Grade	Treatment
Rafters:	Laserframe	MSG8	H1.2
Trusses:	Laserframe	MSG8	H1.2
Purlins:	Laserframe	MSG8	H1.2

4.5 INTERIOR FRAMING

Member	Type	Grade	Treatment
Non structural walls:	Laserframe	MSG8	None
Structural and braced walls:	Laserframe	MSG8	H1.2

4.6 EXTERIOR TIMBER WALL BATTENS

Timber/grade/treatment: Gauged, H3.1 treated radiata pine

4161T THERMAKRAFT WRAPS, UNDERLAYS AND DPC

1. GENERAL

This section relates to the application of **Thermakraft** Industries (NZ) Ltd, DPC, DPM, underfloor foil insulation, wall wraps and roofing underlays.

Related work

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZBC E2/AS1	External moisture
AS 1530	Methods for fire tests on building materials, components and structures
NZS 2295	Pliable, permeable building underlays
AS/NZS 2904	Damp-proof courses and flashings
NZS 3604	Timber framed buildings
NZS 4200	Pliable building membranes and underlays
AS/NZS 4347	Damp-proof courses and flashings - Methods of test
AS/NZS 4389	Safety mesh
AS/NZS 4534	Zinc and zinc/aluminium-alloy coatings on steel wire
BRANZ Appraisal	Certificate No. 356 **Thermakraft Cover-up™** breather-type building membrane
BRANZ Appraisal	Certificate No. 329 **Thermakraft Supercourse 500™** damp-proof course and concealed flashing
BRANZ Appraisal	Certificate No 584 **Thermakraft Watergate** Breather/Absorbent type wall wrap
BRANZ Appraisal	Certificate No. 560 **Thermakraft MirraBlack™** damp proof course
BRANZ Appraisal	Certificate No. 549 **Thermakraft Diflex 130** Building Wrap
BRANZ Appraisal	Certificate No. 614 **Thermakraft Aluband™ /Aluminium** window sealing tape and **Aluband™** corner moulded piece system
NZMRM	NZ Metal Roof and Wall Cladding - Code of Practice

Documents listed above and cited in the clauses that follow are part of this specification. However this specification takes precedence in the event of it being at variance with the cited document.

1.2 MANUFACTURER'S DOCUMENTS

Thermakraft documents relating to work in this section are:
Thermakraft product manual and technical data sheets.
Copies of the above literature are available from:

Web:	www.thermakraft.co.nz
Telephone:	0800 806 595

1.3 MANUFACTURERS WARRANTY

Warrant this work under normal environmental and use conditions against failure of materials and execution. Thermakraft Industries Ltd warrant performance of products if design and installation complies with relevant technical literature, NZBC, and recognised industry Codes of Practice.

1.4 ABBREVIATIONS

The following abbreviations are used in this specification.

NZMRM	New Zealand Metal Roofing Manufacturers Inc.
NASH	National Association of Steel Framed Buildings

1.5 INTERPRETATION

Wall underlay used in this specification has the same meaning as building wraps in NZS 3604 and NZBC E2/AS1.

Requirements

1.6 NO SUBSTITUTIONS
Substitutions are not permitted to any specified materials, or associated products, components or accessories.

1.7 INSTALLATION SKILL LEVELS
Installers to be experienced in the installation of **Thermakraft** products and familiar with **Thermakraft** Industries technical literature and the NZMRM NZ Metal Roof and Wall Cladding - Code of Practice.

2. PRODUCTS

Materials

DPM

2.1 DAMP-PROOF MEMBRANE - MEDIUM DUTY
Thermathene Black™, a minimum of 250 microns polyethylene film, which compiles to NZS 3604 specification for Damp-Proof Membrane, to NZBC Clause E2/AS1.

DPC

2.2 EMBOSSED POLYETHYLENE
Supercourse 500, hi-impact polyethylene film to AS/NZS2904 and embossed on both sides. Thickness 500 microns minimum, manufactured for use as a damp-proof course and concealed flashings around doors and windows and to BRANZ Appraisal Certificate No. 329.

Wall wraps / underlay

2.3 POLYOLEFIN NON-WOVEN BREATHER TYPE MEMBRANE
Thermakraft Diflex 130™, absorbent breathable spun bonded non-woven polyolefin type building membrane. A fire retardant membrane, with Flammability Index of 1, when tested to AS 1530 Part 2. The product has a BRANZ Appraisal, Certificate No. 549.

Roofing underlay

2.4 BITUMINOUS SELF-SUPPORTING ROOFING UNDERLAY
Thermakraft 215™, bituminous self-supporting roofing underlay to NZS 2295.

Accessories

2.5 WINDOW DOOR SEALING SYSTEM
Thermakraft Aluband™/Aluminium system consists of polymeric faced bituminous window sealing tape, **Thermakraft Aluband™** Corner Moulding™ piece, used in conjunction with the **Thermakraft Aluband™** Hand Tool to ensure good adhesion and a tight fit into corners. See **Thermakraft** Data Sheet 312 for installation details and BRANZ Appraisal, Certificate 614.

2.6 STUD STRAPS - POLYOLEFIN
Thermakraft Stud Strap, 25 mm wide woven polyolefin strap in hand held 25 m packs.

2.7 WIRE NETTING
75 mm galvanized hexagonal wire netting to AS/NZS 4534.

2.8 AUSMESH
Ausmesh 300, 2 mm x 150 x 300 mm galvanized safety mesh to AS/NZS 4389.

2.9 GUTTER AND UNDER FLASHINGS
Thermakraft 215™, bituminous breather type building paper cut to width for use under valley, apron flashing and internal gutters.

Soffit liner cut to width from **Thermakraft 210™** bituminous breather type building paper. Refer to SELECTIONS.

2.10 TAPE

Thermakraft tapes to compliment the underlay. Pressure sensitive aluminium foil tapes for joining foil insulation and vapour barriers. **Thermakraft Aluband™ / Aluminium Window Flashing** tape can be used to repair damaged bituminous building papers.

3. EXECUTION

Conditions

3.1 GENERAL REQUIREMENTS

Design application and installation of **Thermakraft** Building products to NZBC E2/AS1, BRANZ Appraisals, **Thermakraft** Technical Literature and Industry Codes of Practice.

3.2 STORAGE

Store building underlays and accessory materials, under conditions that ensure no deterioration or damage. Store rolls in an upright position on a smooth floor and protected from sunlight, UV radiation and moisture.

3.3 INSPECTION

Before starting work, check that the building construction phase will allow work of the required standard. Carry out remedial work identified before laying underlay.

Application DPC / DPM

3.4 DPC TO LOSP/CCA TREATED TIMBER

Lay Supercourse 500 / MirraBlack DPC under LOSP or CCA treated bottom plate of all timber framed walls on concrete, in a single layer with 50 mm overlaps at joints to provide a waterproof barrier.

3.5 DPC TO MASONRY AND BRICK VENEER

Lay DPC along based of cavity and fix top edge to studs with galvanized clouts. Turn DPC out over concrete rebate under bottom course of veneer.

3.6 DPM TO CONCRETE FLOOR

Lay DPM under concrete floor substrate over sand binding, in a single layer with 150 mm overlaps at joints to provide a waterproof barrier. Refer to SELECTIONS for type.

Application - Wraps / wall underlay

3.7 WALL UNDERLAY

Fix horizontally to outside face of framing in true alignment, with succeeding sheets overlapping 150 mm to NZS 3604 Table 4.1 and 4.2 requirement for fastenings. Fix to **Thermakraft** Industries Technical Data specifications. Scribe neatly around penetrations and openings to leave no gaps. Tape all penetrations. Keep clean, undamaged and without visible weather deterioration until closed in.

3.8 METAL CLADDING ON TIMBER CAVITY BATTENS

Fix strip of **Thermakraft** DPC as a separator between the timber and metal cladding.

Application - Roofing underlay

3.9 WIRE NETTING

Lay 75 mm galvanized wire netting at right angles across the purlins and drawn taunt before fixing. Tie edges of netting together with galvanized wire clips.

3.10 SAFETY MESH

Lay **Ausmesh 300** safety mesh over exposed roof areas fixed in accordance with **Thermakraft** Industries technical manual.

3.11 BUILDING PAPER ROOF UNDERLAY

Lay vertically over purlins on wire netting with a 150 mm side lap. Fix securely to purlins with galvanized fixing clips. Lay underlay to avoid excessive dishing between purlins.

When used vertically limit individual runs to 10 metres for bituminous based papers and 7 metres for fire retardant underlays.

Lay horizontally across the rafter/trusses starting at the gutter line with succeeding sheets in true alignment and lapping 150 mm. Scribe around and fit neatly to all penetrations. Avoid prolong exposure by installing the roof immediately.

3.12 GUTTER AND UNDER FLASHINGS

Lay **Thermakraft 215™** bituminous breather type building paper cut to width by manufacturer for use as an underlay to valley, apron flashings, and internal gutters. Lap under flashings with adjoining underlays. Fix **Thermakraft 210™** bituminous breather type building paper soffit liner from top plate down 150 mm past ribbon plate.

Completion

3.13 CLEAN UP

Clean up as the work proceeds.

3.14 LEAVE

Leave work to the standard required by following procedures.

3.15 REMOVE

Remove debris, unused materials and elements from the site.

4311S STEEL AND TUBE PROFILED METAL ROOFING

1. GENERAL

This section relates to the supply and fixing of **Steel and Tube Roofing Products'** profiled metal roofing, complete with accessories.

Related work

1.1 RELATED SECTIONS

Refer to PROFILED PLASTIC ROOFING for plastic sheeting
Refer to STEEL AND TUBE RAINWATER SYSTEMS for rainwater disposal

Documents

1.2 DOCUMENTS REFERRED TO

Documents referred to in this section are:

AS/NZS 1170.2	Structural design actions - Wind actions
AS 1397	Steel sheet and strip – hot-dipped, zinc-coated or aluminium/zinc-coated
NZS 2295	Pliable, permeable building underlays
AS 3566	Self-drilling screws for the building and construction industries
NZS 3604	Timber framed buildings
AS/NZS 4200.1	Pliable building membranes and underlays - Materials
AS/NZS 4200.2	Pliable building membranes and underlays - Installation requirements
AS/NZS 4534	Zinc and zinc/aluminium-alloy coatings on steel wire
AS/NZS 4389	Safety Mesh
NZMRM	NZ Metal roof and wall cladding - Code of practice

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

1.3 MANUFACTURER'S DOCUMENTS

Steel and Tube Roofing Products literature, including:
Product Guide
Selection Guide
Roofing Solutions CD
Copies of the above literature are available from **Steel and Tube Roofing Products**

Web:	www.stroofing.co.nz
Email:	info@stroofing.co.nz
Telephone:	Freephone 0800 333 247

1.4 ABBREVIATIONS

The following abbreviations are used throughout this part of the specification:

BMT	Base metal thickness
MRM	New Zealand Metal Roofing Manufacturers Inc
MS	Modified silyl

Requirements

1.5 NO SUBSTITUTIONS

Substitutions are not permitted to any specified **Steel and Tube Roofing Products** system, or associated components and products.

1.6 QUALIFICATIONS

Roofers to be **Steel and Tube Roofing Products'** Approved Installers. A list of approved installers can be obtained from the **Steel and Tube Roofing Products** website, by telephone or from the local **Steel and Tube Roofing Products** branch.

Web:	www.stroofing.co.nz
Telephone:	Freephone 0800 333 247

Warranties

1.7 WARRANTY - INSTALLER/APPLICATOR
Warrant this work under normal environmental and use conditions against weatherproofing failure.

Period:	5 years from the date of completion of the roof
Form:	Roofing installers standard form

Include a copy of the **Steel and Tube Roofing Products** maintenance requirements with the warranty.

Refer to the general section WARRANTIES - INSTALLER/APPLICATOR for additional requirements.

1.8 WARRANTY - MANUFACTURER/SUPPLIER
Warrant this work under normal environmental and use conditions against materials failure.

15 years	For failure of coating adhesion
15 years	For weatherproofing by material penetration

Provide warranties on **Steel and Tube Roofing Products** standard **Warranty Plus** warranty form.

Performance

1.9 FIXINGS, WIND
Use the fixings appropriate for the design loads of this site as required by NZS 3604 and AS/NZS 1170.2. Allow for specific loadings at corners and the periphery of the roof, where localised pressure factors apply.

1.10 CO-ORDINATE
Co-ordinate to ensure substrate and preparatory work is complete and other work programmed in the order required for access and completion of the roof. Ensure that all necessary members are positioned so that flashings can be fastened at both edges through the roof profile or cladding to the primary structure.

1.11 PERFORMANCE
Install roofing material and associated flashings and accessories to form a weather tight and durable system.

2. PRODUCTS

Materials

2.1 SAFETY MESH
To AS/NZS 4389.

2.2 WIRE NETTING
Galvanized hexagonal 75 mm mesh from 1 mm diameter steel wire to AS/NZS 4534.

2.3 UNDERLAY
Breather type kraft paper laminates to NZS 2295.

2.4 REFLECTIVE FOIL
Reflective foil laminate to AS/NZS 4200.1.

2.5 STEEL ROOFING
Steel sheet to AS 1397, grade G550 except where greater formability is required for curving.

2.6 ALUMINIUM
Aluminium alloy series 5000 temper H16 or H18 to suit application.

2.7 COPPER
Half-hardened commercial finished.

2.8 ZINC
Pure Zinc finished as required , 70 mm BMT.

2.9 FLASHINGS GENERALLY
Formable grade 0.55 BMT for galvanized, aluminium/zinc-coated and pre-painted steel, and 0.90 for aluminium to the same standards as the profiled sheets, notched where across profile or provided with a soft edge. Where flashings are required but are not detailed, design to **Steel and Tube Roofing Products** Design Solutions.

Components

2.10 FASTENERS GENERALLY
Minimum Class 4 and durability not less than the roofing material being fixed. Screw fasteners to be head stamped identifying the manufacturer and class.

2.11 FIXING CLIPS
Galvanized steel (powder coated for aluminium) to suit the material and profile of the rigid sheet and location as required by **Steel and Tube Roofing Products**. Fix to steel with 16 mm x 10 gauge galvanized wafer head self-drilling screws and to timber with 50 mm long x 4.5 mm galvanized spiral rolled flat head nails.

2.12 FIXING SCREWS
To AS 3566. Screws appropriate to the roofing material and the supporting structure, as required by the roofing manufacturer and with a minimum Class 4 durability and not less than the material being fixed.

2.13 RIVETS
Sealed aluminium, minimum diameter 4 mm.

Accessories

2.14 SEALANT
Neutral Curing silicone or MS polymer sealant as required by **Steel and Tube Roofing Products** and used as directed.

2.15 CLOSURE STRIPS
Compressible, closed cell profiled foam strips to fit the sheet profile.

2.16 LAP SEALING TAPE
Closed cell self adhesive nitrile tape.

3. EXECUTION

Conditions

3.1 INSPECTION
Inspect the roof framing and supporting structure to ensure that it is complete and fully braced ready for roofing and free from any misalignments or protrusions that could adversely affect the roofing.

3.2 STORAGE
Take delivery of and accept packs of roofing undamaged on delivery. Reject all damaged material. Store on a level firm base with packs well ventilated and completely protected from weather and damage. Do not allow moisture to build up between sheets. If sheet packs become wet, fillet or cross stack to allow air movement between sheets.

3.3 HANDLING
Avoid distortion and contact with damaging substances, including cement. Do not drag sheets across each other and other materials. Protect edges and surface finishes from damage. Use soft, flat soled shoes when fixing and for all other work on the roof.

3.4 SEPARATION
Place isolators between dissimilar metals and separate roofing from treated timber and cement based materials. Do not use unpainted lead sheet or copper in contact with or allow water run-off onto galvanized or Zincalume® materials.

Application

3.5 SAFETY MESH
Fix safety mesh over exposed roof areas to AS/NZS 4389 and to manufacturer's requirements.

3.6 WIRE NETTING
Fix wire netting where specified, drawn tight and nailed or screwed to purlins with edges butted and twitched together to form a complete net.

3.7 LAY ROOF UNDERLAY
Fit and lap roofing underlay over the netting/mesh. Lay underlay horizontally or vertically with a 150 mm side lap, oversailing the spouting and/or gutters by 10 mm.

3.8 FIX INSULATION
Run and fix insulation blanket as detailed and to the insulation manufacturer's requirements.

3.9 SET-OUT
Carefully set out with consideration of the position of side laps to take account of the line of sight. Ensure all sheets are square and oversailing the gutter true to line. Check during fixing to eliminate creep or spread and string lines along purlin centres to keep fastenings in line.

3.10 END LAPS
End laps are not permitted, except where specifically detailed.

3.11 FIXING GENERALLY
Install and fix in accordance with the NZMRM NZ Metal roof and wall cladding - Code of practice requirements, and to **Steel and Tube Roofing Products** recommendations. Paint colour matched fixings and accessories before installation.

3.12 FIX INSULATION
Run and fix insulation blanket as detailed and to the insulation manufacturer's requirements.

3.13 MARKING AND CUTTING
Cut only by shearing tools. Do not use black lead pencils for marking aluminium/zinc coated products.

3.14 FIX SHEETS
Fix sheets in place using the fastening system required by **Steel and Tube Roofing Products** for specified profiles, making due allowance for dynamic local wind pressures on the building and thermal movement in the sheet.

3.15 STOP ENDS AND DOWNTURNS
Form stop-ends at the upper end of sheets. Form downturns at the gutter line where the roof pitch is less than 8 degrees. Form using purpose made tools.

3.16 FLASHINGS
Flash roof to parapets, walls and penetrations to detail. Where no detail is provided flash to MRM NZ Metal roof and wall cladding - Code of practice recommendations and **Steel and Tube Roofing Products** requirements. Cut accurately and fix using sealant and

rivets to detail and to **Steel and Tube Roofing Products** requirements to form a weatherproof cover. For highly visible flashings, plan joints/junction to take account of the aesthetic requirements.

3.17 USE OF SEALANTS
Select and use sealants only as recommended by **Steel and Tube Roofing Products**. Apply sealant in two narrow beads transversely across flashing intersections, close to the two edges. Avoid exposing sealant on outside surfaces.

3.18 FLASHING PENETRATIONS
Flash all penetrations through the roof. Fit pipe flashings with a proprietary collar flashing to manufacturer's requirements, with other penetrations flashed as detailed and to provide a weathertight installation. Ensure that flashings are set to avoid any ponding of water.

3.19 INSTALL RIDGING
Install ridging by fastening to the purlins through the leading edge of the roofing. Do not fasten transverse flashings to timber with moisture content >18%.

Completion

3.20 REPLACE
Replace damaged or marked elements. Do not attempt to repair coatings by applying colour match paint to pre-finished surfaces.

3.21 LEAVE
Leave this work complete with all necessary flashings, undercloaks, valleys, ridges and hips all properly installed as the work proceeds so the finished roof is completely weathertight.

3.22 REMOVE
Remove trade rubbish and unused materials from the roof and surrounds daily during the work. Sweep down at the end of each day, and clean out spoutings, gutters and rainwater pipes on completion of the roof. Remove debris, unused materials and elements from the site.

4. SELECTIONS

4.1 SAFETY MESH
Brand/Type: Ausmesh® safety mesh

Roofing

4.2 STEEL ROOFING
Brand/profile: Corrugated
BMT: 0.4 mm

Accessories

4.3 CLOSURE STRIPS
Brand: Ecofoam

4.4 PIPE FLASHINGS
Brand/Type: Dektite

4422A ARDEX BUTYNOL MEMBRANE ROOFING

1. GENERAL

This section relates to Butynol as single-layer external waterproof covering bonded to:
- construction plywood, including all underlays and accessories
- concrete, including all underlays and accessories.

Documents

1.1 DOCUMENTS

Documents referred to in this section are:
Ardex waterproofing solutions manual

NZBC E2/AS1	External moisture, 8.5 Membrane roofs and decks
AS/NZS 2269	Plywood - structural - Specifications

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

1.2 MANUFACTURER'S DOCUMENTS

Manufacturer's and supplier's documents relating to work in this section are:
Ardex waterproofing solutions manual

Copies of the above literature are available from Ardex

Web:	www.ardex.com
Telephone:	0-9-580 0005 Auckland
	0-4-568 5949 Wellington
	0-3-384 3029 Christchurch

Requirements

1.3 NO SUBSTITUTIONS

Substitutions are not permitted to any specified Ardex materials, or associated products, components or accessories.

1.4 QUALIFICATIONS

Roofing work to be carried out by an Ardex approved Butynol roofing applicator.
Application to be strictly in accordance with the Ardex waterproofing solutions manual.

1.5 PROJECT REGISTRATION

This project is registered with Systems Ardex for quality assurance. Confirm with Ardex quality assurance co-ordinator any relevant key dates and proposed tenderers.

Warranties

1.6 BUTYNOL WARRANTY

Warrant this work under normal environmental and use conditions against failure.

Warranty period:	Materials up to 20 years
Warranty period:	Execution up to 5 years

Provide separate material and application warranties signed by Ardex and the applicator.

Refer to the general section for the required form of WARRANTY AGREEMENT and details of when completed warranty must be submitted.

Performance

1.7 TEST

Where required a suitable time lapse or water test shall be carried out.

1.8 PERFORMANCE
Accept responsibility for the weather-tight performance of the completed roofing system, including all penetrations through the roof and junctions with walls and parapets. All penetrations to comply with NZBC E2/AS1 and Ardex recommendations.

2. PRODUCTS

Materials

2.1 BUTYNOL RUBBER SHEET
Single ply membrane compounded from butyl.
Thickness: 1 mm

Components

2.2 BUTYNOL SEAM TAPE
Ardex uncured butyl cold gum seam tape.

2.3 BUTYNOL SEALANT
Ardex sealant.

2.4 BUTYNOL FLASHING TAPE
Ardex flashing tape.

2.5 ARDEX DETAIL TAPE
Ardex semi-cured silicone backed detail/finishing tape.

2.6 ARDEX ADHESIVES AND SOLVENTS
Ardex adhesives and solvents.

2.7 EDGE TRIM
Metal or timber to Ardex details to suit the specific location.

Accessories

2.8 ROOFING ACCESSORIES
Ardex substrate ventilators, roof outlets, overflows, scuppers and rainwater heads.

Finishes

2.9 ALUMINIUM PAINT
Ardex compatible aluminium paint system

2.10 PAINT
Ardex compatible paint system.

3. EXECUTION

Conditions

3.1 GENERALLY
All work and materials to the Ardex waterproofing membranes manual.

3.2 STORAGE
Take delivery of Ardex Butynol branded rolls, undamaged and allow for site handling facilities where required. Store membranes and accessory materials under conditions that ensure no deterioration or damage.

3.3 WEATHER
Apply coverings in a dry atmospheric condition and only when the air temperature is 6°C and above.

Application - preparation

3.4 PRELIMINARY WORK
Ensure that preliminary work, including formation of falls, flashing rebates, grooves, ducts, provision of battens and fillets and fixing of vents and outlets to levels, is complete and properly constructed to enable the system to work as intended. This work and the substrate to be smooth, clean and dry.

3.5 ACCEPTANCE OF SUBSTRATE
Confirm that the substrate, including fillets, sumps, outlets and projections, will ensure work of the required standard.

3.6 PLYWOOD SUBSTRATE
Plywood to be a minimum of 17 mm thick and complying with AS/NZS 2269, minimum CD structural grade with the sanded C side upwards. Hazard Class H3 with waterborne CCA treatment and kiln dried after treatment. Lay with staggered joints (brick bond) with all edges of the sheets fully supported or with tongue and groove jointing. Provide 20 mm timber fillets at the base of all upstands and chamfer all external edges with a minimum radius of 5 mm. Fix with 10 gauge x 50 mm stainless steel countersunk head screws, with a 3 mm gap between all sheets. Fix at 150 mm centres on edges and 200 mm in the body of the sheets.

Plywood and the timber substructure to have a maximum moisture content of 20% when the membrane is adhered.

Application - laying Butynol

3.7 GENERAL
Tape plywood joints using 25 mm Ardex approved self-adhesive tape. Run out sheets and allow to relax for 20 minutes before laying. Do not stretch sheets or tapes in laying.

3.8 APPLY ADHESIVE
Apply adhesive to the substrate and the Butynol rubber sheeting by brush, spray, or roller at a spreading rate of not less than 2.5 square metres per litre. Leave to tack dry before bonding the two surfaces together.

3.9 LAY SHEETS
Lay sheets across the roof slope and lap long edges to full width of selvage, 50 mm minimum. Smooth down and roll to remove entrapped air. Adhesive bond and seal to the membrane manufacturer's requirements and roll or rub down as the work proceeds.

3.10 BONDING LAPS
Bond all laps to Ardex requirements. Where the roof slope is less than 5 degrees, where coloured membranes are used, where ponding can occur and in all gutters, use special lap bonding incorporating Ardex seam tape and seam primer.

3.11 MINOR MOVEMENT JOINTS
Lay sheets across joint but leave unbonded on both sides.
Unbonded width: 25 mm minimum
All joints to be taped using Ardex approved self adhesive tape.

3.12 INSPECT
Inspect and test joints on completion.

3.13 PENETRATIONS
Form and finish upstands, downturns, penetrations, sumps and vents to conform with Ardex details and NZBC E2/AS1.

3.14 PENETRATIONS AND JUNCTIONS
Check that adjoining walls and parapets are prepared ready for the installation of the roofing. Confirm that openings have been prepared ready for the installation of skylights and other penetrations through the roof. Required work includes the following:

- roofing installation neatly finished to all sides of openings and to all wall and parapet junctions
- installation of flashings (those required to be installed prior to installation of penetrating elements and/or wall linings).

Finishing

3.15 APPLY PAINT
Apply paint to the paint manufacturer's required system as per Ardex recommendations.

3.16 FOOT TRAFFIC
Foot traffic is to be limited during and after laying.

3.17 ACCESS BOARDS
Provide access boards for later operations and remove when no longer needed.

3.18 ACCEPTANCE
Sign off on completed areas. Protect and maintain roofing until completion of the contract works.

3.19 SUBSEQUENT WORK
Make good any damage by later work. Making good to take the form of inserting a new whole or part infill sheet to maintain the appearance of the covering as originally laid.

Completion

3.20 CLEAN UP
Clean up as the work proceeds.

3.21 LEAVE
Leave work to the standard required by following procedures.

3.22 REMOVE
Remove debris, unused materials and elements from the site.

4. SELECTIONS

4.1 BUTYNOL RUBBER SHEET

Location:	Flat roof
Brand/type:	Ardex Butynol
Thickness:	1 mm
Colour:	Black

4521 ALUMINIUM WINDOWS AND DOORS

1. GENERAL

This section relates to the manufacture, supply, and installation of ~ :
- aluminium windows
- aluminium doors and frames
- hardware and furniture
- flashings

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZBC E2	External moisture
NZBC F4/AS1	Safety from falling
AS/NZS 1170.2	Structural design actions - Wind loads
NZS 1170.5	Structural design actions - Earthquake actions - New Zealand
AS 1734	Aluminium and aluminium alloys - Flat sheet, coiled sheet and plate
AS/NZS 1866	Aluminium and aluminium alloys - Extruded rod, bar, solid and hollow shapes
AAMA 2604.05	Performance requirements and test procedures for high performance organic coatings on aluminium extrusions and panels
AS 3715	Metal finishing - Thermoset powder coatings for architectural applications
BS 3900	Methods of tests for paints, Part C5: Determination of film thickness
NZS 4211	Performance of windows
NZS 4223.3	Code of practice for glazing in buildings - Human impact safety requirements
AS/NZS 4284	Testing of building facades
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles

US Federal Specification

TT-S-001543A	Sealing compound, silicone rubber base (for caulking, sealing and glazing in buildings and other structures)
TT-S-00230C	Sealing compound, elastomeric type, single component (for caulking, sealing and glazing in buildings and other structures)
WANZ	Window installation system - An Alternative Solution for the installation of windows and doors
WANZ	Powder Coating Quality Assurance System (PQAS)
WANZ	SFA 3503-03:2005 Anodising Standard
BRANZ BU 337	Protecting Window Glass from Surface Damage

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

1.2 ABBREVIATIONS AND TERMS

DWP	Design wind pressure
PVF^2	Polyvinylidene Fluoride
SLS	Serviceability limit state
ULS	Ultimate limit state
WANZ	Windows Association of Zealand
PQAS	Powder Coating Quality Assurance System

Requirements

1.3 QUALIFICATIONS

Work to be carried out by tradesmen experienced, competent and familiar with the materials and techniques specified.

1.4 SHOP DRAWINGS AND INSTALLATION DETAILS

Shop drawings to show the general arrangement of the aluminium joining including, but not be limited to:

Construction details (minimum scale 1:5) showing the interface between joinery elements and the building structure including: -

- Jointing details and method of fixing between individual elements and between this installation and adjacent work
- Interaction between claddings and linings
- Flashing details
- Sealants and air seals
- Non standard fixing details including bracketing

And where required the following: -

- Design calculations
- Producer Statement in the form PS1 Producer Statement Design
- Rebate sizes
- Dimensions of all typical elements and of any special sizes and shapes
- Provision for the exclusion and/or drainage of moisture
- Provision for adjustment of fixings to ensure true alignment of windows and doors
- Sealant types and full size sections of all sealants and backing rods
- Provision for thermal movement
- Provision for seismic movement and movement under wind loads
- Sequence of installation
- Glazing specification and details

Where requested provide the following additional information

- Information of Professional Indemnity Insurance held by the person proving the shop drawings

Refer to the general section SHOP DRAWINGS for the requirements for submission and review and the provision of final shop drawings.

Complete shop drawing review before commencing fabrication.

Warranties

1.5 WARRANTY - MANUFACTURER/SUPPLIER

Provide a material manufacturer/supplier warranty:

5 years: For fabrication

Refer to the general section for the required form of WARRANTY AGREEMENT and details of when completed warranty must be submitted.

1.6 WARRANTY - INSTALLER

Provide an installer/applicator warranty:

2 years: For installation

- Provide this warranty in the installer/applicator standard form.

Refer to the general section WARRANTIES for additional requirements.

Performance

1.7 STANDARD OF PERFORMANCE

The windows, doors, their installation and all fixings to comply with NZS 4211.

Refer to SELECTIONS for ULS and SLS

Refer to SELECTIONS for DWP and Air leakage level.

1.8 SEISMIC SUB-FRAMES

Where required units to have seismic sub-frames. Refer to NZS 1170.5. Refer to SELECTIONS for requirements

1.9 RESPONSIBILITY FOR PERFORMANCE
Accept responsibility for the structural and weather-tight performance of the completed window and door installation, the glazing work and all spandrel and infill panel work.

Finishes

1.10 CERTIFY COATINGS
Certify on request compliance with this specification and support with control and sampling records. Test for film thickness to BS 3900, part C5, method No. 4, using method (b) for certifying thickness and method (a) where any dispute arises as to the thickness provided.
The coating should be applied by an applicator who can certify that the coating has been applied in accordance with the specification.

1.11 CERTIFICATION
Provide evidence of a certificate by a laboratory accredited by International Accreditation of New Zealand that the windows and doors offered comply with the requirements of NZS 4211 and the specified design wind pressure and air leakage level.

2. PRODUCTS

Materials

2.1 ALUMINIUM EXTRUSIONS
Alloy designation to comply with AS/NZS 1866. Branded and extruded for anodising or powder coating.

2.2 ALUMINIUM SHEET AND STRIP
Complying with AS 1734 of suitable thickness. Rolled for anodising or powder coating.
Alloy designation: 5251 - H16 or 5005 - H16

2.3 REVEALS - ALUMINIUM
Aluminium reveals fitted to frame via thermal break.

2.4 FLASHINGS GENERALLY
Material, grade and colour of head flashings to match the window frames. Ensure that materials used for head, jamb and sill flashings are compatible with the window frame materials and fixings and cladding materials.

Components - for cavity systems

2.5 WANZ CAVITY CLOSER
Flashing device to close the cavity above the window or door unit to direct water that occasionally penetrates the wall cladding into the cavity spaces adjacent to the window.

2.6 WANZ SUPPORT BAR
Extruded aluminium support bar with built in drainage and ventilation to NZBC E2, to provide continuous support to the window unit.

2.7 WANZ SUPPORT ANGLE
Support angle for use with the sill pan for deeper claddings to transfer the weight of the window back to the frame.

Components

2.8 GLAZING GASKETS
Thermoplastic rubber. Do not stretch glazing gaskets during installation. Measure and cut gaskets 5-10% over length before installation.

2.9 HARDWARE AND FURNITURE
Hinges, stays, catches, fasteners, latches, locks and furniture as offered by the window and door manufacturer. Refer to SELECTIONS for type and finish. Key alike all lockable window hardware able to be keyed alike.

2.10 SAFETY STAYS
Stainless steel non releasable restrictors to limit window opening to NZBC F4/AS1, Table 2, Acceptable opening sizes for barriers.

Structural glazing sealants

2.11 POINTING SEALANT
Building sealant or approved equivalent with not less than a ± 40% movement factor complying with US Federal Specification TT-S-001543A.

Finishes

2.12 POWDER COATED ALUMINIUM
Polyester powder organic coating in accordance with WANZ Powder Coating Quality Assurance System and AS 3715.

3. EXECUTION

Conditions - generally

3.1 DO NOT DELIVER
Do not deliver to site any elements which cannot be unloaded immediately into suitable conditions of storage.

3.2 UNLOAD WINDOW JOINERY
Unload, handle and store elements in accordance with the window manufacturer's requirements.

3.3 AVOID DISTORTION
Avoid distortion of elements during transit, storage and handling.

3.4 PREVENT DAMAGE
Prevent prefinished surfaces rubbing together, and contact with mud, plaster and cement. Keep paper and cardboard wrappings dry.

3.5 PROPRIETARY ELEMENTS
Fix in accordance with the window manufacturer's requirements.

3.6 PROTECTIVE COVERINGS
Retain protective coverings and coatings to BRANZ BU 337 and keep in place during the fixing process. Provide protective coverings and coatings where required to prevent marking of surfaces visible in the completed work and to protect aluminium joinery from following trades. Remove protection on completion.

3.7 ADDITIONAL PROTECTION
Supply and fix additional protection as necessary to prevent marking of surfaces which will be visible on completed work.

Conditions - fixings and fastenings

3.8 SUPPLY OF FIXINGS
Use only fixings and fastenings recommended by the manufacturer of the component being fixed and to comply with the ULS wind pressure stated in SELECTIONS.

3.9 EXPOSED FIXINGS AND FASTENINGS
Ensure fixings and fastenings exposed to the weather are of aluminium, or Type 316 stainless steel.

3.10 PROTECTED FIXINGS AND FASTENINGS
Fixings and fastenings not exposed to the weather may be hot-dip galvanized steel with a coating weight of 610 g/m² complying with AS/NZS 4680.

Assembly

3.11 FABRICATION
Fabricate frames as detailed on shop drawings. Install glazing, hinges, stays and running gear as scheduled. Provide temporary bracing and protection. Temporarily secure all opening elements for transportation.

3.12 HARDWARE GENERALLY
Factory fit all required and scheduled hardware. Account for all keys and deliver separately to the site manager.

3.13 SAFETY STAYS
Factory fit safety stays to all windows scheduled for safety stays and to all windows where safety stays are required to comply with NZBC F4/AS1 4.0, Opening windows.

Application

3.14 CORROSION PROTECTION
Before fixing, apply suitable barriers of bituminous coatings, stops or underlays between dissimilar metals in contact, or between aluminium in contact with concrete.

3.15 CONFIRM PREPARATION OF WALL OPENINGS
Confirm that wall openings have been prepared ready for the installation of all window and door frames. Do not proceed with the window and door installation until required preparatory work has been completed.

Required preparatory work includes the following:
- wall cladding underlay/building wrap to openings finished and dressed off ready for the installation of window and door frames
- claddings neatly finished off to all sides of openings
- interior linings neatly trimmed ready for installation of jamb liners and completion of air seals to all sides of openings
- installation of flashings (those which are required to be installed prior to frames).

3.16 INSTALLATION
Fix to comply with the reviewed shop drawings and installation details including flashings and bedding compounds, pointing sealants and weathering sealants.

3.17 INSTALLATION CAVITY CONSTRUCTION
Install to WANZ Installation System details and drawings including WANZ cavity closers, support bars and support angles

3.18 INSTALL FLASHINGS
Install flashings to heads, jambs and sills of frames as supplied and required by the window manufacturer and as detailed on the drawings. Finish head flashings to match window finish.

Place all flashings so that the head flashing weathers the jamb flashings, which in turn weathers over the upstand of the sill flashing. Ensure that sill flashings drain to the outside air.

Except where window/door frames are recessed, ensure that head flashings over-sail unit by 30 mm minimum at each end.

3.19 COMPLETE AIR SEAL
Form an air-tight seal by means of a proprietary expanding foam or sealants used with backing rods, applied between the window / door reveal and structural framing to a depth of 10 - 20 mm, to provide a continuous air tight seal to the perimeter of the window or door.

3.20 FIX HARDWARE
Fix all sash and door hardware and furniture as scheduled.

Application - jointing and sealing

3.21 SEAL FRAMES ON SITE
Seal frames to each other and to adjoining structure and finishes, all as required by the window manufacturer and to make the installation weathertight. Do not seal the junction between the sill member and the cladding or sill flashing which must remain open.

3.22 PREPARE
Ensure joints are dry. Remove loose material, dust and grease.

3.23 PREPARE JOINTS
Prepare joints in accordance with the sealant manufacturer's requirements, using required solvents and primers where necessary.

3.24 PREPARATION
Mask adjoining surfaces which would be difficult to clean if smeared with sealant.

3.25 BACKING
Insert polyethylene rod or tape back-up behind joints being pointed with sealant.

3.26 BACK UP
When using back-up material do not reduce depth of joint for sealant to less than the minimum required by the manufacturer of the sealant.

3.27 POINTING, BEAD
Tool sealant to form a smooth, flat bead.

3.28 POINTING, FILLET
Tool sealant to form a smooth fillet with a profile and dimensions required by the sealant manufacturer.

3.29 FINISHING
Remove excess sealant from adjoining surfaces, using the cleaning materials nominated by the sealant manufacturer and leave clean.

Completion - cleaning

3.30 REMOVE TRADE DEBRIS
Remove trade debris by appropriate means on a floor by floor basis as each floor is completed and again before any work is covered up by others. Arrange for general removal.

3.31 TRADE CLEAN
Trade clean window frames, operable windows and doors, glass and other related surfaces inside and out at the time of installation to remove marks, dust and dirt, to enable a visual inspection of all surfaces.

3.32 PROTECTIVE COVERINGS
Retain protective coverings and coatings and keep in place during the fixing process. Provide protective coverings and coatings where required to prevent marking of surfaces visible in the completed work and to protect aluminium joinery from following trades. Remove protection on completion.

3.33 SAFETY
Indicate the presence of transparent glasses for the remainder of the contract period, with whiting, tape or signs compatible with the glass type. Indicators other than whiting must not be applied to the glass surface. Masking tape must not be used for this purpose.

Completion

3.34 REPLACE
Replace damaged, cracked or marked elements.

3.35 PROTECTION
Protect finishes against damage from adjacent and following work.

3.36 IN SITU TOUCH-UP TO POWDER COATED ALUMINIUM
In situ touch-up of polyester or fluoropolymer coated aluminium is only permitted only to minor surface scratching. Otherwise replace all damaged material.

3.37 LEAVE
Leave work to the standard required for following procedures.

3.38 REMOVE
Remove safety indicators and protective coverings, and wipe down all joinery thoroughly to leave it perfectly clean. Remove debris, unused materials and elements from the site.

3.39 MANIFESTATIONS
Apply manifestations to comply with NZS 4223.3, 303.1 Manifestations.

4. SELECTIONS

4.1 WIND ZONE - DESIGN TO NZS 3604
Building wind zone: ~ (as determined from table 5.1of NZS 3604)

4.2 STANDARD OF PERFORMANCE
Air leakage level: Level 8 (as determined by section 11 of NZS 4211)

4.3 ORGANIC POWDER COATING FINISH

Type:	Polyester organic powder coating
Thickness:	Average of 80 microns with a minimum of 50 microns

4.4 FLASHINGS

Material/type:	0.55 Steel
Pattern:	Formed to suit details provided

Note: All joinery is to be double glazed

4711 THERMAL INSULATION

1. GENERAL

This section relates to materials installed, laid, hung or fitted as thermal insulation.

Related work

1.1 RELATED SECTIONS

Refer to FORMWORK FOR CONCRETE for insulation under concrete slabs.
Refer to WRAPS, UNDERLAYS AND DPC for building wraps and roofing underlays.
Refer to ROOFING sections for roofing underlays.
Refer to ACOUSTIC INSULATION for acoustic insulation.

Documents

1.2 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZBC H1/AS1	Energy efficiency, 2.0 Building thermal envelope
NZS 4220	Energy conservation in non-residential buildings
NZS 4218	Energy efficiency - Small building envelope
NZS 4243.1	Energy efficiency - Large buildings - Building thermal envelope
NZS 4246	Energy efficiency - Installing insulation in residential buildings
AS/NZS 4534	Zinc and zinc/aluminium-alloy coatings on steel wire
HSE Act	Health and Safety in Employment Act

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

1.3 ABBREVIATIONS

The following abbreviations are used throughout this part of the specification:

BIB	Building Insulation Blanket
NZECP	New Zealand Electrical Code of Practice
EPS	Expanded polystyrene sheets

Requirements

1.4 QUALIFICATIONS

Work to be carried out by tradesmen experienced, competent and familiar with the specified insulation materials and techniques specified.

2. PRODUCTS

Materials

2.1 GLASS FIBRE THERMAL INSULATING PADS

Glass fibres bonded with a thermosetting resin to form a rectangular insulating pad.

2.2 GLASS FIBRE THERMAL BLANKET (BIB)

Glass fibres bonded with a thermosetting resin to form a flexible blanket roll.

2.3 CELLULAR POLYSTYRENE INSULATION

Proprietary expanded polystyrene (EPS) foam board.

2.4 ELECTRIC HOT WATER CYLINDER WRAP

Refer to selections for type.

2.5 WIRE NETTING

Galvanized hexagonal 50 mm mesh from 1 mm diameter steel wire to AS/NZS 4534.

Components

2.6 NAILS, NETTING AND PAPER
Galvanized steel clouts, 25 mm gauge.

2.7 STAPLES
Galvanized steel gauge and length to suit application and to manufacturer's requirements.

2.8 NAILS, SUB-SHEATHING
Galvanized 30 mm x 2.5 mm flat head nails to the board manufacturer's requirements.

2.9 SCREWS, SUB-SHEATHING
30 mm x 6 mm Zinc-plated pan head screws to the board manufacturer's requirements.

2.10 SCREWS, POLYESTER THERMAL BLANKET
Specially coated self drilling screws with embossed or profiled washer system suitable to cover oversize predrilled holes.

2.11 TAPES
Proprietary plastic strapping tape, stapled over framing to retain insulation in unlined wall, ceiling and underfloor locations.

2.12 ADHESIVE TAPE
Pressure sensitive adhesive tape.

3. EXECUTION

Conditions

3.1 DELIVERY
Keep insulation dry in transit. Take delivery of insulation dry and undamaged and store in a location that protects them from the weather and damage. Reject all damaged materials.

3.2 STORAGE
Accept materials undamaged and dry and store in a location that protects them from the weather and damage. Avoid distortion, stretching, puncturing and damage to edges of sheet materials. Do not use damaged sheets.

3.3 HANDLING
Wear protective clothing as necessary and when handling, avoid delamination or distortion of the rectangular form. Maintain full thickness unless compression is an installation system requirement.

3.4 HAZARD MANAGEMENT
Comply with HSE Act and take all safety precautions necessary to reduce potential hazards.

3.5 INSPECTION
Before starting installation of blankets and pads, check that the location and framing are free from moisture, that the cavities are not interconnected and that mesh, building papers and vapour barriers are in place.

Application

3.6 INSTALL INSULATION - GENERAL
Lay, install, fit and fix to NZBC H1/AS1: Energy efficiency, 2.0 Building thermal envelope, and to the insulation manufacturer's requirements. Install in housing to NZS 4218 and NZS 4246. Install in large buildings to NZS 4243.1 and NZS 4220. Allow insulation to re-loft prior to installation.

3.7 WIRE NETTING TO SUBSTRATE
Lay at right angles across the rafters/roof joists. Pull tight and temporarily fix. Tie edges of netting together with galvanized wire clips.

3.8 LAY WIRE NETTING
Lay at right angles across the purlins with enough slack to allow insulation to retain its nominal thickness between. Tie edges of netting together with galvanized wire clips.

3.9 INSTALL WALL UNDERLAY
In retrofit situations install a wall underlay prior to fitting the insulation when wall underlay is not present.

3.10 FIT GLASS FIBRE THERMAL INSULATING PADS
Friction fit insulating pads in place to completely fill the whole of the cavities. Carefully scribe cut insulating pads slightly oversize to maintain friction fit to each other, to smaller spaces and around penetrations. Leave no gaps between, and maintain full thickness of the insulating pads over the whole of the installation. Do not cover vents and leave a 150 mm gap around recessed light fittings and metal flues.

3.11 FIT GLASS FIBRE THERMAL INSULATING BLANKET
BIB application
Lay blanket in the same direction and over the mesh/vapour barrier, firmly butting edges together. Carefully scribe cut blanket to maintain firmly butted edges and ends. Maintain full thickness of the blanket over the whole installation except where detailed otherwise.
Non-BIB application
Lay blanket parallel to ceiling joists to cover battens, tear end for length.

3.12 FIT EPS INSULATION - UNDER CONCRETE FLOORS
Lay EPS on damp proof membrane before pouring the concrete floor slab.

3.13 ELECTRIC HOT WATER CYLINDER WRAP
Install to NZS 4246 and to the wrap manufacturer's instructions.

Application - sub-sheathing

3.14 FIXING SUB-SHEATHING TO TIMBER FRAMING
Provide continuous support to all edges and joints. Allow a 3 mm gap between all sheet edges. Hand nail at 150 mm centres to edges and 200 mm centres elsewhere. Fixings no closer than 10 mm from sheet edges. Flash horizontal joints with polyethylene strip and vertical joints with breather type building paper folded to the manufacturer's requirements.

Completion

3.15 CLEAN UP
Clean up as the work proceeds, so no spare offcuts or any other matter or item remain behind claddings or linings.

3.16 CHECK FOILS
Ensure foils are dry, clean, bright, undamaged and free of debris before being covered.

3.17 CHECK WALL WRAPS AND ROOF UNDERLAYS
Ensure these are dry, clean, undamaged and free of debris before being covered.

3.18 CHECK VAPOUR BARRIERS
Ensure these form one homogeneous sheet vapour barrier and remain as such throughout the ensuing construction process.

3.19 LEAVE
Leave work to the standard required by following procedures.

3.20 REMOVE
Remove debris, unused materials and elements from the site.

4. SELECTIONS

4.1 GLASS FIBRE THERMAL INSULATING PADS

Brand:	Pink Batts
Location:	All exterior walls
R Value	R2.6

4.2 GLASS FIBRE THERMAL BLANKET

Brand:	Pink Batts
Location:	Roof cavity
R Value:	R3.6

4.3 EXPANDED POLYSTYRENE INSULATION (EPS)

Location:	Under habitable concrete floor
R Value:	R1.3
Thickness:	40 mm

5113G GIB® PLASTERBOARD LININGS

1. **GENERAL**

This section relates to the supply, fixing and jointing of GIB® plasterboard linings and accessories to timber and steel framed walls and ceilings to form:
- standard systems
- bracing systems
- wet area systems

Related work

1.1 RELATED SECTIONS

Refer to GIB ULTRALINE® PLUS LINING SYSTEM for GIB Ultraline® PLUS plasterboard linings.

Documents

1.2 DOCUMENTS REFERRED TO

Documents referred to in this section are:

AS/NZS 2588	Gypsum plasterboard
AS/NZS 2589	Gypsum linings - Application and finishing
NZS 3604	Timber framed buildings

BRANZ technical paper P21: A wall bracing test and evaluation procedure

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

1.3 MANUFACTURER'S DOCUMENTS

Manufacturer's and supplier's documents which refer to work in this section are:

General:	GIB® Site Guide (May 2006)
Wet areas:	GIB Aqualine® Wet Area Systems (March 2007)
Bracing:	GIB® Bracing Systems (March 2006)
Ceilings:	GIB-Tone® Suspended Ceiling Tiles
	GIB® Rondo® Metal Ceiling Batten Systems
Accessories:	GIB-Cove®
	GIB® Goldline™ Platinum Tape-on Trims
	GIB® UltraFlex high impact corner mould

Copies of the above literature are available at

Web:	www.gib.co.nz
Telephone:	0800 100 442

Requirements

1.4 NO SUBSTITUTIONS

Substitutions are not permitted to any specified GIB® systems, GIB® system components, GIB® plasterboard, associated GIB® products or GIB® accessories.

1.5 INSTALLER WORK SKILLS AND QUALIFICATIONS

GIB® plasterboard fixers and plasterers to be experienced competent workers, familiar with GIB® plasterboard lining systems installation and finishing techniques. Submit evidence of experience on request. For example:
- National Certificate of Interior Systems; or
- Contractor membership of the Association of Wall and Ceiling Industries New Zealand (AWCINZ)

Performance

1.6 INSPECTIONS AND ACCEPTANCE

Allow for inspection of the finished plasterboard surface:

- before applying sealer and
- before applying finish coatings or decorative papers,
so that after assessment of the type and/or angle of illumination and its effect on the completed decorative treatment, group approval and acceptance of the surface can be given.

1.7 BRACING REQUIREMENTS
Provide braced wall systems using GIB® Bracing Systems to meet the requirements of NZS 3604 when tested to BRANZ technical Paper P21: A wall bracing test and evaluation procedure. Refer to drawings for location and type.

2. PRODUCTS

Materials

2.1 GIB® PLASTERBOARD
Gypsum plaster core encased in a face and backing paper formed for standard and water resistance use to AS/NZS 2588. Refer to SELECTIONS for location, type, thickness and finish.
GIB® Standard plasterboard
GIB Ultraline® high quality surface plasterboard
GIB Braceline® wall bracing plasterboard
GIB Aqualine® wet area plasterboard

2.2 CORNICE
GIB-Cove® plasterboard cornice. Refer to SELECTIONS for profile and size.

Components

2.3 CEILING BATTENS
GIB® Rondo® metal ceiling battens, batten joiners and perimeter channel.

2.4 SCREWS
GIB® Grabber® drywall screws.

2.5 NAILS
GIB® Nails (gold passivated).
Size: 30 mm, 40 mm

2.6 METAL ANGLE TRIMS
GIB® galvanized steel slim angle trims.

2.7 CONTROL JOINTS
GIB® Rondo® P35 control joints.

2.8 TAPE ON TRIMS AND EDGES
GIB® Goldline™ tape-on paper tape and galvanized steel trims and edges or GIB® UltraFlex high impact corner mould.

Accessories

2.9 ADHESIVE

Timber frame:	GIBFix® Wood Bond wallboard adhesive.
Timber frame LOSP treated:	GIBFix® All-Bond wallboard adhesive.
Steel frame:	GIBFix® All-Bond wallboard adhesive.

2.10 JOINTING COMPOUND

Bedding compound:	GIB Tradeset®, GIB Lite Blue®, GIB Promix® All Purpose, GIB® AquaMix, GIB Plus 4®
Finishing compound:	GIB ProMix® All Purpose GIB ProMix® Lite, GIB® All Purpose and GIB Plus 4®, GIB® Topcoat
Cove:	GIB-Cove® Bond

2.11 JOINTING TAPE
GIB® paper jointing tape.

2.12 ACOUSTIC SEALANT
GIB Soundseal® acoustic sealant.

3. EXECUTION

Conditions

3.1 STORAGE
Store GIB® plasterboard sheets and accessories in dry conditions stored indoors out of direct sunlight in neat flat stacks on either an impervious plastic sheet or clear of the floor with no sagging and avoiding damage to ends, edges and surfaces. Reject damaged material. Refer to GIB® Site Guide (May 2006).

3.2 LEVELS OF PLASTERBOARD FINISH
Provide the selected plasterboard surfaces to the pre decorative levels of finish specified in AS/NZS 2589. Refer to GIB® Site Guide (May 2006).

3.3 CONFIRM LEVELS OF PLASTERBOARD FINISH ACCEPTANCE
Before commencing work, agree in writing upon the surface finish assessment procedure necessary to ensure that the levels of finish specified, along with the effect of the type and/or angle of illumination on them, are obtained and are acceptable.

Do not apply decorative treatment until it is agreed in writing by the contractor, subcontractors and decorator that the required plasterboard level of finish has been achieved.

"Levels of plasterboard finish" is a tool for specifying the required quality of finish when installing and flush stopping GIB® plasterboard **prior** to the application of a range of decorative finishes under various lighting conditions. Refer to GIB® Site Guide (May 2006).

3.4 SUBSTRATE
Do not commence work until the substrate is plumb, level and to the standard required by the sheet manufacturer's requirements. Refer to GIB® Site Guide (May 2006).

3.5 TIMBER FRAME MOISTURE CONTENT
Maximum allowable moisture content to AS/NZS 2589 for timber framing at lining: 18% or less for plasterboard linings. Refer to GIB® Site Guide (May 2006).

3.6 PROTECTION
Protect surfaces; cabinetwork, fittings, equipment and finishes already in place from the possibility of water staining and stopping damage. Refer to GIB® Site Guide (May 2006).

Application

3.7 INSTALL CEILING BATTENS
Install to GIB® Rondo™ Ceiling Batten Systems.

3.8 LINING WALLS AND CEILINGS GENERALLY
Form to GIB® Site Guide (May 2006). Ensure bulk insulation thickness shall not exceed that of the wall framing.

3.9 FORM WET AREA SYSTEMS
Form to GIB Aqualine® Wet Area Systems (March 2007).

3.10 FORM BRACING SYSTEMS
Form to GIB® Bracing Systems (March 2006).

3.11 FORM CONTROL JOINTS
Form control joints to GIB Ultraline® PLUS Lining System (February 2006) and GIB® Site Guide (May 2006)

3.12 INSTALL COVES
Install to GIB-Cove® literature using GIB-Cove® Bond.

3.13 INSTALL TAPE-ON TRIMS
Install to GIB® Goldline™ Tape-on trims literature and/or GIB® Ultraflex high impact corner mould literature.

Finishing

3.14 FINISHING GENERALLY
To GIB® Site Guide (May 2006) and AS/NZS 2589.

Completion

3.15 REPLACE
Replace damaged sheets or elements.

3.16 CLEAN DOWN
Clean down completed surfaces to remove irregularities and finally sand down with fine paper to the sheet manufacturer's requirements, to leave completely smooth and clean.

3.17 REMOVE
Remove debris, unused materials and elements from the site.

3.18 LEAVE
Leave work to the standard required by following procedures.

4. SELECTIONS

Plasterboard

4.1 STANDARD SYSTEMS WALLS

Location	Plasterboard type / Lining requirements	Thickness	Finish level
Dry walls	GIB® Standard plasterboard	10 mm	
Wet walls	GIB Aqualine® plasterboard	10 mm	

4.2 STANDARD SYSTEMS CEILINGS

Location	Plasterboard type / Lining requirements	Thickness	Finish level
Dry ceilings	GIB® Standard plasterboard	13 mm	
Wet ceilings	GIB Aqualine® plasterboard	13 mm	
Dry diaphragm celings	GIB Ultraline® PLUS plasterboard	13 mm	

4.3 BRACING SYSTEMS
Refer to GIB Bracing Systems (March 2006). For bracing element location refer to drawn documentation.

Accessories

4.4 CEILING BATTENS
Brand/type: GIB® Rondo® Ceiling battens

6411 VINYL SURFACING

1. GENERAL

This section relates to the supply and installation of:
- PVC sheet
- PVC tiles

including skirtings, nosings, trims and edgings.

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZBC D1/VM1	Access routes
NZBC D1/AS1	Access routes 2.0 Level access routes 3.0 Ramps
NZS/AS 1884	Floor coverings - Resilient sheet and tiles - Laying and maintenance practices
AS/NZS 4586	Slip resistance classification of new pedestrian surface materials
BRANZ BU 330	Thin flooring materials - 2 Preparation and laying

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

Requirements

1.2 QUALIFICATIONS

Vinyl laying to be carried out by competent, experienced layers familiar with the materials and techniques specified.

Warranties

1.3 WARRANTY

Warrant this work under normal environmental and use conditions against failure.

Warrant period - materials:	1 year
Warrant period - execution:	1 year

Refer to the general section for the required form of WARRANTY AGREEMENT and details of when completed warranty must be submitted.

Performance

1.4 SLIP RESISTANCE FOR ACCESS ROUTES

Slip resistance for vinyl to comply with NZBC D1/AS1: 2.1, Level access routes and 3.1: Ramps.
- when in place on a level access route, to have a mean coefficient of friction (μ) not less than 0.4 when tested in accordance with AS/NZS 4586 Slip resistance classification of new pedestrian surface materials.
- when in place on a sloping access route, to have a coefficient of friction (μ) not less than 0.4 x 0.0125S (S = slope of surface expressed as a percentage).

1.5 PROVIDE EVIDENCE

Provide evidence that the vinyl complies with the standard of performance specified.

1.6 CERTIFY

Provide certificates and any other evidence at the time of selection/supply that the vinyl complies with NZBC D1/VM1 and NZBC D1/AS1: Access routes.

2. PRODUCTS

Materials

2.1 VINYL SHEET
High vinyl content homogeneous monolayer flexible PVC sheet flooring.

2.2 VINYL TILES
High vinyl content monolayer flexible PVC tiles.

2.3 COVINGS

Commercial applications:	Pencil cove with butterfly mitres to all external and internal corners. Fillet cove for safety flooring.
Domestic applications:	Pencil or fillet cove method.

2.4 VINYL SHEET WALLCOVERING
High vinyl content homogenous flexible PVC sheet wall covering.

2.5 WALL AND FLOOR VINYL JOINING STRIP
White PVC floor to wall finishing strip.

2.6 TRIMS AND EDGING
PVC as supplied by the sheet manufacturer to complete the work.

Accessories

2.7 ADHESIVE
Standard acrylic adhesive to suit the material and substrate and to the vinyl manufacturer's requirements.

2.8 PRIMER AND SEALER
To the adhesive manufacturer's requirements for the particular substrate.

3. EXECUTION

Conditions

3.1 STORAGE
Maintain rolls of sheet, packages of tiles and accessories undamaged and dry. Store rolls upright with other material on level surfaces in non-traffic, non-work areas that are enclosed, clean and dry.

3.2 HANDLING
Avoid distortion, stretching, marking and damage to edges while shifting, unrolling and handling sheet, tiles and accessories. Inspect for any faulty material. Do not use faulty or damaged material.

3.3 BEFORE COMMENCING WORK
Ensure that the building is enclosed, wet work complete, doors hung and lockable, finishes and trim complete, and good lighting available, before starting work.

3.4 INSPECT
Inspect the substrate to ensure it is of the standard required for work in this section.

3.5 LAYING
Carry out the whole of the work to NZS/AS 1884, BRANZ BU 330 and to the flooring manufacturer's requirements.

3.6 LAYOUT
Before beginning the installation confirm the proposed layout of material, location of seams and other visual considerations of the finished work.

Preparing substrate

3.7 NEW CONCRETE
Clear substrate of debris, clean off surface contamination and carry out surface repairs using a proprietary levelling compound. Carefully feather out at perimeters of repaired areas. Grind level, then vacuum to remove all dust. Check for moisture content by hygrometer to BRANZ BU 330 and do not commence laying vinyl until readings for the whole area show 75% relative humidity or less.

3.8 NEW TIMBER BOARD OR PARTICLEBOARD
Clear substrate of debris, clean off surface contamination and carry out surface repairs using a proprietary levelling compound. Carefully feather out at perimeters of repaired areas. Grind smooth, then vacuum to remove all dust.

Check for moisture content and do not commence final sanding or laying until readings for the whole area show a moisture content of: -
- 8 -12% for air conditioned buildings
- 10 -14% for intermittently heated buildings
- 12 -16% for unheated buildings

3.9 EXISTING CONCRETE
Strip off existing floor coverings, adhesive and surface contaminants. Ensure concrete is dry and if in doubt check for moisture content by hygrometer to BRANZ BU 330. Do not commence laying vinyl until readings for the whole area show 75% relative humidity or less. Carry out minor repairs using a cement-based levelling compound, carefully feathered out at all perimeters of repaired areas. Grind level, then vacuum to remove all dust.

3.10 EXISTING TIMBER BOARD OR PARTICLEBOARD
Strip off existing floor coverings, machine sand to remove adhesive and surface contaminants. Then vacuum to remove all dust prior to installing underlay sheets.

Vinyl floor laying

3.11 PREPARATION
Check that each colour supplied is from the same batch. Follow the vinyl manufacturer's requirements for conditioning of rolls and the working temperatures and conditions before, during and after laying. Protect work from solar heat gain and switch off under-floor heating during and for 48 hours either side, of the work period.

3.12 ADHESIVE APPLICATION
Apply approved adhesive as required by the vinyl manufacturer and without trowel marks after setting. Follow requirements for open time, taking note of substrate porosity, ambient temperature and relative humidity. Remove excess adhesive as the work proceeds using required techniques.

3.13 LAYING VINYL SHEET
Roll out, cut, leave to condition and install sheet vinyl to the vinyl manufacturer's requirements. Ensure there are no air bubbles or twisting, that the seams are kept clear of adhesive, and immediately the sheet is adhered roll with a 68 kg roller.

3.14 THERMO-WELDING VINYL SHEET
Machine groove and thermo-weld all seams in specified areas, heating the sheet and weld rod to a sufficient temperature to melt and fuse them together into a single mass. Trim the weld to leave a smooth, flush surface with the sheet.

3.15 CROSS JOINS
Plan and allow cuts to avoid cross joins. Obtain written approval of the owner before proceeding if cross joins are unavoidable. Cross joins are not acceptable in wet areas.

3.16 COVE VINYL
Pencil cove flooring to the specified height and finish off as detailed.

3.17 MITRES
Perform butterfly method to internal and external mitres. Thermo-weld mitres.

3.18 VINYL TO STAIRCASES
Fit selected nosings to each tread and at the top of each stair flight, in accordance with the nosing manufacturer's requirements. Lay pre-cut vinyl sheets to each tread and riser, pencil coved at the rear of each tread.

3.19 LAYING VINYL TILES
Set out from the centre of the area in two preparatory runs and modify to suit before laying tiles from the centre to the vinyl manufacturer's requirements. Ensure air is expelled and, as each section is completed, immediately roll with a 68 kg roller. Complete sections before scribing the perimeter tiles.

3.20 FIT VINYL SKIRTINGS
Fit skirtings in accordance with the skirting manufacturer's requirements.

3.21 FIT VINYL EDGING
Fit tapered vinyl edging to all borders, except where abutting carpet.

3.22 CLEAN
Leave vinyl flooring surfaces free of adhesive, dirt and debris. Vacuum off, damp mop with a low foam neutral detergent, with a pH level of 7 to 8. Allow to dry and finally buff with a rotary machine using suitable pads at 300 rpm. Polymer polishes to be used only where approved by the vinyl manufacturer and accepted by the owner.

Vinyl sheet to walls

3.23 WALL SURFACES
Clean off surface contamination, carry out minor repairs and bring to a smooth, even surface.

3.24 APPLY PRIMER OR SEALER FOR VINYL SHEET
Prime and/or seal porous plaster, concrete and timber substrates to the adhesive manufacturer's requirements.

3.25 FLOOR TO WALL FINISHING STRIP
Adhere to walls in a true, straight line using contact adhesive. Roll immediately using a seam roller to ensure maximum bond strength is achieved.

3.26 APPLY VINYL WALL SHEET
Apply sheet to walls and heat weld seams under the technical direction of the wall sheet manufacturer's representative for each particular location.

Obtain written approval of the proposed joint layout approach from the owner, then adhesive fix either vertically or the T-method, ensuring all corners are wrapped and joints are no closer than 200 mm to internal or external corners.

Cut vinyl neatly to recess on the floor/wall finishing strip and chemically weld this joint using Werner Mueller, type C welding compound.

3.27 THERMO-WELD VINYL WALL SHEET
Hand groove and thermo-weld all seams, heating the sheet and weld rod to a sufficient temperature to melt and fuse them together into a single mass. Trim the weld to leave a smooth, flush surface with the sheet.

Completion

3.28 REPLACE
Replace damaged or marked elements.

3.29 CLEAN AND POLISH

Vacuum off, damp mop with a low foam neutral detergent, with a pH level of 7 to 8. Allow to dry and finally buff with a rotary machine using suitable pads at 300 rpm. Use polymer polishes only where approved by the manufacturer. Leave vinyl flooring surfaces free of adhesive, dirt and debris and to the standard required by following procedures.

3.30 REMOVE

Remove debris, unused materials and elements from the site.

3.31 PROTECT

Protect completed work from damage for the period between completion of laying and completion of the contract works.

6700R RESENE PAINTING GENERAL

1. GENERAL

This section relates to the general matters related to painting work.

This painting specification is written based on information available at the time of writing.

This painting specification assumes that the applicator has the necessary skill, experience and equipment to undertake the work. The applicator remains responsible for ensuring proper completion of the work.

If in the applicator's own expertise and judgement an amendment to this specification is required, or where a substrate preparation, or required painting system is not covered in this specification, this shall be brought to the attention of the principal and any amendment agreed before work proceeds any further.

Related work

1.1 RELATED SECTIONS
Refer to **RESENE** INTERIOR PAINTING
Refer to **RESENE** EXTERIOR PAINTING

Documents

1.2 DOCUMENTS REFERRED TO
Documents referred to in this section are:
Health and Safety in Employment Act 1992
MPNZA Specification manual

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

1.3 MANUFACTURER'S DOCUMENTS
Manufacturer's and supplier's documents relating to work in this section are:

Resene	One-Line specifications and product data manual (hard copy or at www.resene.co.nz)
Resene	Putting your safety first

Copies of the above literature are available from **Resene**
Telephone: 0800 **RESENE** (0800 737 363)

1.4 ABBREVIATIONS
The following abbreviations are used throughout this part of the specification:
MPNZA Master Painters New Zealand Association Inc.

Requirements

1.5 NO SUBSTITUTIONS
Substitutions are not permitted to any specified **Resene** coating system, or associated components and products.

1.6 QUALIFICATIONS
Painters to be experienced competent workers, familiar with the materials and the techniques specified and with the **Resene** coating systems and be members of the Master Painters New Zealand Association Inc.

1.7 CONTROL SAMPLES
Prepare samples of the finished work, including the specified preparation. Refer to SELECTIONS for location and type. Obtain approval in writing of the appearance before

proceeding. Use the **Resene** Architectural Sample Box as a basis of standard where appropriate.

1.8 SUPERVISED CONTROL SAMPLES
Prepare samples of the finished work including the specified preparation. Refer to SELECTIONS for location and type. Make arrangements for the supervision of the relevant stages. Obtain written approval before proceeding.

Supervised control samples may, after written approval, be used for comparative testing of dry film thicknesses of the complete coating systems.

1.9 HEALTH AND SAFETY
Refer to and comply with the requirements of the Health and Safety in Employment Act 1992 including the obligation to:

- Eliminate hazards and if hazards cannot be eliminated or isolated, then minimise the hazards in this work by using the proper equipment and techniques as required by the MPNZA Painters hazard handbook and **Resene** Putting your safety first handbook.
- Supply protective clothing and equipment.
- Inform the contractor as well as the employees and others on site of those hazards and put in place procedures for dealing with emergencies.

1.10 MATERIAL SAFETY DATA SHEETS
Obtain from **Resene** (phone 0800 **RESENE**, or www.resene.co.nz) the material safety data sheet for each product used and comply with the required safety procedures. Keep sheets on site.

Warranties

1.11 WARRANTY
Warrant this work under normal conditions of use against failure referring to the Resene Promise of Quality in the **Resene** One-Line specifications and product data manual.

Performance

1.12 RESENE INSPECTION
Permit representatives of **Resene** to inspect the work in progress and to take samples of their products from site if requested. **Resene** will take care when inspecting the work, but does not accept any responsibility for the proper completion of the work before or after such inspection.

1.13 INSPECTION OF THE WORK
Inspection of the whole of the work at each of the stages set out in SELECTIONS may be made. Agree on a programme that will facilitate such inspection, including notification when each part and stage of the work is ready for inspection.

2. PRODUCTS

Materials

2.1 MATERIALS GENERALLY
Use only **Resene** products (which are guaranteed for consistency and performance under ISO 9001) prepared, mixed and applied as directed in the **Resene** One-Line specifications and product data manual.

2.2 THINNERS/ADDITIVES
Use only if and when expressly directed by **Resene** for their particular product in a particular application.

Accessories

2.3 ACCESSORIES
Contact your local **Resene ColorShop** for a full range of accessories and usage advice.

3. EXECUTION

Conditions

3.1 EXECUTION
To conform to required trade practice, which shall be deemed to include those methods, practices and techniques contained in the Master Painters New Zealand Association Inc. Specification manual.

3.2 TREATED SURFACES
Where surfaces have been treated with preservatives or fire retardants, check with the treatment manufacturer that coating materials are compatible with the treatment and do not inhibit its performance. If they are not compatible, obtain instructions before proceeding.

3.3 ANCILLARY SURFACES
The descriptions of areas in schedules and elsewhere are of necessity simplified. Coat ancillary exposed surfaces to match similar or adjacent materials or areas, except where a fair-faced natural finish is required or items are completely prefinished. In cases of doubt obtain written instructions before proceeding.

3.4 HARDWARE
Do not paint hinges or hardware that cannot be removed. Before commencing work carefully remove hardware, fixtures and fittings, set aside where they cannot be damaged or misplaced and replace on completion. Refer to SELECTIONS for hardware, fixtures and fittings for removal.

3.5 PROTECTION
Supply, lay and fix dropsheets, coverings and masking necessary to protect adjoining, fixtures, fittings and spaces from paint drops, spots, spray and damage.

Application - preparatory work

3.6 SURFACE PREPARATION
Refer to the **Resene** One-Line specifications and product data manual for surface preparation sheets (or obtain them by phoning 0800 **RESENE**, or at www.resene.co.nz) listed in the materials systems schedule clauses. Carry out the preparatory work required by them for each of the substrates.

3.7 LEAD-BASED PAINT, ASBESTOS
Handle cautiously lead-based paint and asbestos, if present, as outlined in the preamble of the **Resene** One-Line specifications and product data manual and the Putting your safety first brochure.

3.8 SHARP EDGES, CRACKS AND HOLES
Remove and/or repair sharp edges, cracks and holes if present, as outlined in the preamble of the **Resene** One-Line specifications and product data manual.

Elastomeric sealants, if used, should not be painted. The paint film will not match the flexibility of the sealant and may severely limit its effectiveness.

3.9 REMEDIAL WORK
If any substrate or surface, that even with the preparation work called for in this section, cannot be brought up to a standard that will allow painting or clear finishing of the required standard then do not proceed until remedial work is carried out.

3.10 GAP FILLING
Make good cracks, holes, indented and damaged surfaces. Use suitable gap fillers to match the surface being prepared. Any special priming requirements of the fillers must be satisfied. Allow to dry or set before sanding back level with the surface. Prime or seal timber before using putty.

Exterior and wet areas: Use only Portland cement base or water-insoluble organic base gap fillers.

3.11 OFF-SITE WORK

Carry out this work under cover in a suitable environment with suitable lighting. Store items, both before and after coating, in a clean, dry area protected from the weather and mechanical damage, properly stacked and spaced to allow air circulation and to prevent sticking.

3.12 PRIMING JOINERY

Pre-treat any cut surfaces of preservative treated timber before priming. Ensure L.O.S.P. treated joinery has dried sufficiently to lose solvent odour. Pre-treat bare timber with **Resene** TimberLock (see Data Sheet D48) to improve the durability of subsequent coats.

Liberally coat end grain, allow to soak in and then recoat.

3.13 CONCEALED JOINERY SURFACES

Where off-site coatings are specified they must be applied to surfaces including those concealed when incorporated into the building.

3.14 CONCEALED METAL SURFACES

Apply primer to suit the coating system to surfaces which will be concealed when incorporated into the building.

3.15 EXTERNAL DOORS

Prime or seal and paint bottom edges before hanging.

3.16 BEAD GLAZING

Stained, varnished, or painted joinery to have the first two coats, or the primer and one undercoat, applied to rebates and beads before glazing.

3.17 PUTTY FRONTING

According to the putty manufacturer's instructions allow putty to set, then prime with **Resene** Wood Primer (see Data Sheet D40). Fully protect the putty by completing the **Resene** coating system as soon as it is sufficiently firm.

Application - generally

3.18 PAINTING GENERALLY

Comply with the **Resene** One-Line specifications and product data manual data sheets and the additional requirements of this work section.

3.19 MIXING

Although generally supplied ready-mixed, thoroughly mix paints. Lift any settled pigment and ensure the paint is homogenous.

3.20 ENVIRONMENT

Defer painting of exterior surfaces until weather conditions are favourable - warm dry days without frost or heavy dews. Avoid painting in direct sunlight any surfaces that absorb heat excessively. As far as possible apply paint in the temperature range 15°C to 25°C. If temperatures fall outside the range of 10°C and 35°C do not paint unless paints with the necessary temperature tolerance have been specified. Do not apply solventborne paint if moisture is present on the surface.

3.21 SEQUENCE OF OPERATIONS

Painting work to generally follow the following sequences:

- Complete surface preparation before commencing painting.
- Apply primers, sealers, stains, undercoats, paints and clear coatings in the sequences laid down by **Resene**.
- Allow the full drying time between coats laid down by **Resene**.
- Do not expose primers, undercoats and intermediate coats beyond **Resene's** recommendations before applying the next coat.
- Finish broad areas before painting trim.

- Ensure batch numbers of tins are matched for whole areas.
- Internally, paint ceilings before walls and walls before joinery, trim and other items.

3.22 APPLICATION
Select brush, roller, or pad and apply coatings to the requirements of **Resene** to obtain a smooth, even coating of the specified thickness, uniform gloss and colour.

3.23 LIGHTLY SAND
Lightly sand primers, sealers, undercoats and intermediate coats to remove dust pick-up, protruding fibres and coarse particles. Complete by removing dust immediately before applying the next coat.

3.24 DEFECTIVE WORK
Correct defective work immediately and recoat as required, following precisely the **Resene** system being applied.

3.25 EACH COAT
Each coat of paint and the completed paint system to have the following qualities and properties:
- Uniform finish, colour, texture, sheen and hiding power and the proper number of coats applied.
- No blemishes such as runs, sags, crinkling, fat edges, entrained paint skins, hairs, dust, bare or starved patches, cracks, brush marks, ladder marks and blistering.
- Proper covering of corners, crannies, thin edges, cracks, end grain and other difficult places of application.

Completion

3.26 CLEAN
Clean adjoining surfaces, glass and fittings of any paint contamination. Clean off glass indicators at the completion of the building works. Clean glass inside and out to a shining finish.

3.27 LEAVE
Leave the whole of this work uniform in gloss and colour, of correct thickness, free from painting defects, clean and unmarked and to the standard required by following procedures.

3.28 REMOVE
Remove dropsheets, coverings and masking to leave surrounding surfaces and areas clean, tidy and undamaged. Remove debris, unused materials and elements from the site.

3.29 REPLACE
Replace hardware without damage to it or the adjoining surface and leave hardware properly fitted and in working order.

4. SELECTIONS

4.1 SELECTIONS
Refer to **RESENE** PAINTING EXTERIOR and **RESENE** PAINTING INTERIOR for selections.

6711R RESENE PAINTING EXTERIOR

1. GENERAL

This section relates to the surface preparation, painting and clear finishing of new and existing substrates using **Resene** architectural and decorative coating systems.

Related work

1.1 RELATED SECTIONS

Refer to **RESENE** PAINTING GENERAL for general matters related to painting work.
Refer to **RESENE** PAINTING INTERIOR for interior paint systems.

2. PRODUCTS

Materials

2.1 PAINT TYPES GENERALLY/ THINNERS AND ADDITIVES

Refer to **RESENE** PAINTING GENERAL for product clauses.

3. EXECUTION

Conditions

3.1 EXECUTION

Refer to **RESENE** PAINTING GENERAL for execution clauses.

4. SELECTIONS

Resene exterior paint systems

4.1 EXTERIOR CEMENTITIOUS SURFACES

Description:	**Exterior cementitious surfaces, waterborne mineral flat**
System:	**Resene** One-Line Spec. No. 20.e 1.5 SSP
Surface prep:	D83 For thin plaster - **Resene** Limelock D809, waterborne cure/seal
1st coat:	For sound cementitious surfaces - **Resene** Aquapel D65, For powdery surface - **Resene** Sureseal D42, solventborne sealer
2nd coat:	**Resene** Aquashield D601, waterborne mineral flat
3rd coat:	**Resene** Aquashield D601, waterborne mineral flat

4.2 EXTERIOR TIMBERS

Description:	**Exterior timbers, waterborne semi-gloss**
System:	**Resene** One-Line Spec. No. 2e 1.2
Surface prep:	D82; and **Resene** TimberLock D48, solventborne preserver/conditioner
1st coat:	For normal recommended system - **Resene** Quick Dry D45, waterborne primer/undercoat; or For timber that stains - **Resene** Wood Primer D40, solventborne primer; or For hardboard only - **Resene** Sureseal D42, solventborne sealer
2nd coat:	**Resene** Sonyx 101 D30, waterborne semi-gloss
3rd coat:	**Resene** Sonyx 101 D30, waterborne semi-gloss

6721R RESENE PAINTING INTERIOR

1. GENERAL

This section relates to the surface preparation, painting and clear finishing of new and existing substrates using **Resene** architectural and decorative coating systems.

Related work

1.1 RELATED SECTIONS

Refer to **RESENE** PAINTING GENERAL for general matters related to painting work.
Refer to **RESENE** PAINTING EXTERIOR for exterior paint systems.

2. PRODUCTS

Materials

2.1 PAINT TYPES GENERALLY/ THINNERS AND ADDITIVES

Refer to **RESENE** PAINTING GENERAL for product clauses.

3. EXECUTION

Conditions

3.1 EXECUTION

Refer to **RESENE** PAINTING GENERAL for execution clauses.

4. SELECTIONS

Resene interior paint systems

4.1 INTERIOR CEMENTITIOUS SURFACES

Description:	**Interior cementitious surfaces, waterborne semi-gloss**
System:	**Resene** One-Line Spec. No. 1i 1.2
Surface prep:	D83 For thin plaster - **Resene** Limelock D809, waterborne cure/seal
1st coat:	For sound cementitious surfaces - **Resene** Concrete Primer D405, waterborne primer; or For powdery surfaces - **Resene** Sureseal D42, solventborne sealer Self priming - **Resene** Lustacryl D310, waterborne semi-gloss enamel
2nd coat:	**Resene** Lustacryl D310, waterborne semi-gloss enamel
3rd coat:	**Resene** Lustacryl D310, waterborne semi-gloss enamel

4.2 INTERIOR TIMBER

Description:	**Interior timber, waterborne semi-gloss**
System:	**Resene** One-Line Spec. No. 2i 1.2
Surface prep:	D82; and **Resene** TimberLock D48, solventborne preserver/conditioner
1st coat:	For normal recommended system - **Resene** Quick Dry D45, waterborne primer/undercoat; or For timber that stains - **Resene** Wood Primer D40, solventborne primer; or For hardboard only - **Resene** Sureseal D42, solventborne sealer; or For painting over varnish - **Resene** Waterborne Smooth Surface Sealer D47a, waterborne sealer
2nd coat:	**Resene** Lustacryl D310, waterborne semi-gloss enamel; or **Resene** Acrylic Undercoat D404, waterborne undercoat
3rd coat:	**Resene** Lustacryl D310, waterborne semi-gloss enamel

4.3 INTERIOR TIMBER, STAINS AND CLEAR FINISHES

Description:	**Interior timber, stains and clear finishes, waterborne semi-gloss**
System:	**Resene** One-Line Spec. No. 2i 3.2
Surface prep:	D82
1st coat:	Stained finish - **Resene** Waterborne Colorwood D50a, waterborne wood stain; or Clear finish - **Resene** Waterborne Colorwood Reducing Base D50a, waterborne clear (optional)
2nd coat:	**Resene** Aquaclear D59, waterborne semi-gloss urethane
3rd coat:	**Resene** Aquaclear D59, waterborne semi-gloss urethane
4th coat:	**Resene** Aquaclear D59, waterborne semi-gloss urethane
5th coat:	**Resene** Aquaclear D59, waterborne semi-gloss urethane (optional)

4.4 INTERIOR TIMBER JOINERY

Description:	**Interior timber joinery, waterborne semi-gloss**
System:	**Resene** One-Line Spec. No. 3i 1.2
Surface prep:	D82; and **Resene** TimberLock D48, solventborne preserver/conditioner
1st coat:	For normal recommended system - **Resene** Quick Dry D45, waterborne primer/undercoat; or For timber that stains - **Resene** Wood Primer D40, solventborne primer; or For painting over varnish - **Resene** Waterborne Smooth Surface Sealer D47a, waterborne sealer
2nd coat:	**Resene** Lustacryl D310, waterborne semi-gloss enamel
3rd coat:	**Resene** Lustacryl D310, waterborne semi-gloss enamel

4.5 INTERIOR PAPER FACED PLASTER/SOLID PLASTER/FIBROUS PLASTER

Description:	**Interior paperfaced plaster/solid plaster/fibrous plaster, waterborne semi-gloss**
System:	**Resene** One-Line Spec. No. 15i 1.2 Level 5
Surface prep:	D84; D85; D87; **Resene** Broadwall Surface Prep & Seal D807, waterborne prep
1st coat (if reqd):	For wet, area stained, porous or powdery areas - **Resene** Sureseal D42, solventborne sealer For new wet areas - **Resene** Waterborne Smooth Surface Sealer D47a, waterborne sealer
2nd coat:	**Resene** Lustacryl D310, waterborne semi-gloss enamel
3rd coat:	**Resene** Lustacryl D310, waterborne semi-gloss enamel

For Level 5 **Resene** Broadwall 3 in 1 system - **Resene** One-Line Spec. No. 15i 1.21 L 5
Replace **Resene** Broadwall Surface Prep & Seal with **Resene** Broadwall 3 in 1 in the clause above

For Level 4 system - **Resene** One-Line Spec No. 15i 1.2 L 4
Remove **Resene** Broadwall Surface Prep & Seal from Surface prep and add 1st coat: **Resene** Broadwall Waterborne Wallboard Sealer D403, waterborne sealer

7123 HOT AND COLD WATER SYSTEM

1. GENERAL

This section relates to piped water supply systems from the network utility supply authority water main to designated points and appliances, the installation of hot water heating appliances, distributing piped hot water to other appliances, and the installation of valves.

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZBC B2/AS1	Durability
NZBC G12/VM1	Water supplies
NZBC G12/AS1	Water supplies
NZBC H1/AS1	Energy Efficiency
AS/NZS 2492	Cross Linked Polyethylene (PE-X) pipe for pressure applications
AS/NZS 2537	Mechanical joining fittings for use with cross-linked Polyethylene (PE-X) fittings for hot and cold water applications
AS/NZS 2642.2	Polybutylene pipe fittings - Polybutylene (PB) pipe for hot and cold water applications
AS/NZS 2642.3	Polybutylene pipe fittings - Mechanical jointing fittings for use with polybutylene (PB) pipes for hot and cold water applications
AS/NZS 2845.1	Water supply - Backflow prevention devices - Materials, design and performance requirements
AS/NZS 4130	Polyethylene (PE) pipes for pressure applications
NZS 3501	Specification for copper tubes for water, gas and sanitation
NZS 4305	Energy efficiency domestic type hot water systems
NZS 4602	Low pressure copper thermal storage electric water heaters
NZS 4607	Installation of thermal storage electric water heaters: valve vented Systems
NZS 4617	Tempering (3-port mixing) valves
NZS 5261	Installation of gas burning appliances and equipment
DIN 8077	Polypropylene (PP-R) Pipe dimensions
DIN 8078	Polypropylene (PP-R) Pipes Types 1, 2 & 3, General Quality Requirements and Testing.

Plumbers, Gasfitters and Drainlayers Act 2006

Documents listed above and cited in the clauses that follow are part of this specification. However this specification takes precedence in the event of it being at variance with the cited document.

Requirements

1.2 QUALIFICATIONS

Plumbers to be experienced competent workers, familiar with the materials and the techniques specified. Carry out all work under the direct supervision of a plumber registered under the Plumbers, Gasfitters and Drainlayers Act 2006.

1.3 INFORMATION FOR MAINTENANCE MANUAL

Supply maintenance manual information to requirements set out in the GENERAL section.

Warranties

1.4 WARRANTY

Warrant this work under normal environmental and use conditions against failure of materials and execution.

Warranty period: 2 years

Refer to the general section for the required form of WARRANTY AGREEMENT and details of when completed warranty must be submitted.

Performance

1.5 TESTING
Confirm the timing before carrying out any tests. Supply potable water and the apparatus needed.

Slowly fill service pipes with water to exclude air. Apply test pressure of a 90 metre head or a maximum working pressure plus 50%, whichever is the greater. Ensure there is no measurable loss of pressure for a minimum of 30 minutes. Slowly fill distribution pipes with water to exclude air. Ensure that with draw-off taps closed the system must remain water-tight. Ensure that mixers and other fittings that have pressure limits are protected during testing.

2. PRODUCTS

Materials

2.1 COPPER PIPE
To NZS 3501 complete with copper-alloy compression fittings or crox type joints and seal ring compression joints complete with fittings and accessories brand matched to the pipe manufacturer's requirements with durability to NZBC B2/AS1 Durability, Table 1 and NZBC G12/AS1 Water supplies Table 1.

2.2 UPVC PIPE
Complete with fittings and accessories brand matched to the pipe manufacturer's requirements with durability to NZBC B2/AS1 Durability, Table 1 and NZBC G12/AS1 Water supplies Table 1.

2.3 POLYBUTYLENE PIPE
Polybutylene tubing to AS/NZS 2642.1, AS/NZS 2642.2 and AS/NZS 2642.3 complete with fittings and accessories brand-matched with durability to NZBC B2/AS1 Durability, table 1 and NZBC G12/AS1 Water supplies table1.

2.4 POLYETHYLENE PIPE
To AS/NZS 4130 Series 1 complete with fittings and accessories brand matched to the pipe manufacturer's requirements with durability to NZBC B2/AS1 Durability, table 1 and NZBC G12/ AS1 Water supplies table1.

2.5 POLYPROPYLENE RANDOM WATER PIPE
Polypropylene pipes to DIN 8077 and DIN 8078 complete with fusion welded fittings and accessories brand-matched to the pipe manufacturer's requirements with durability to NZBC B2/AS1 Durability, table 1 and NZBC G12/VM1.

2.6 CROSS LINKED POLYETHYLENE PIPE
Cross Linked Polyethylene Pipe to AS/NZS 2492 and fittings to AS 2537 with a minimum pressure capability of 1200 kPa complete with fittings and accessories brand matched to the pipe manufacturer's requirements with durability to NZBC B2/AS1 Durability, table 1 and NZBC G12/VM1.

2.7 WATER METER
To the requirements of the network utility operator.

2.8 VALVES
Pressure reducing or limiting valve, filter, non-return valve, cold water expansion valve, pressure relief or temperature valve, pressure relief valve and isolating valves to NZBC G12/AS1: Water supplies.

2.9 BACKFLOW PREVENTION DEVICES
Provide backflow prevention devices to AS/NZS 2845 where it is possible for water or contaminants to backflow into the potable water supply. Refer to NZBC G12 AS/1 3.4 Backflow protection, and table 2, Selection of Backflow Protection.

2.10 TEMPERING VALVE
Tempering valve to NZS 4617 to NZBC G12/AS1: Water supplies.

2.11 TANKS
Pre-formed black polyethylene or stainless steel tank, complete with access opening and lid and overflow tray.

Materials - hot water heating appliances

2.12 ELECTRIC HOT WATER CYLINDER, MAINS PRESSURE
To NZS 4305, ceramic-coated steel thermal storage cylinder, insulated and complete with required fittings.

Components

2.13 INSULATION
Pre-formed pipe sections complete with bends and fittings, with fixing tape to the manufacturer's requirements and to NZBC H1/AS1.

2.14 PROTECTIVE TAPE
Plasticised PVC tape system with primer, mastic fixing and outer coating.

Accessories

2.15 FIRE RESISTANT SEALER
Gunnable inorganic or silicone elastomer sealant, packed to maintain the specified fire resistance rating of the floor or wall.

2.16 FIRE RESISTANT FOAM SEALER
Two-part silicone foam elastomer sealant, packed to maintain the specified fire resistance rating of the floor or wall.

2.17 FIRE RESISTANT STRIP
Intumescent material mounted on a flexible fire retardant strip used in conjunction with the selected sealer.

2.18 FIRE RESISTANT COLLARS
Corrosion resistant steel collar or canister with intumescent packing to maintain the specified fire resistant rating of the floor or wall.

3. EXECUTION

Conditions

3.1 HANDLE AND STORE
Handle and store pipes, fittings and accessories to avoid damage. Store on site, under cover on a clean level area, stacked to eliminate movement and away from work in progress.

Store tapware in a shelved, dry and securely locked area. Retain tapware in the manufacturer's original packaging, complete with all fixings and installation instructions. Label each unit separately with its space/fixture number to match.

3.2 CORE HOLES AND SLEEVES
Review location and fit core holes and sleeves as needed throughout the structure in conjunction with the boxing, reinforcing and placing of concrete. Strip core holes and make good after installation of pipework.

3.3 CONCEAL
Conceal pipework within the fabric of the building unless detailed otherwise. Satin finish chrome plate exposed work, complete with matching ferrule at the surface penetration.

3.4 CORROSION
Separate all metals subject to electrolytic action from each other and from treated timber, concrete and other lime substances by space, painting of surfaces, taping, or separator strips.

3.5 THERMAL MOVEMENT
Accommodate movement in pipes resulting from temperature change by the layout of the pipe runs, by expansion joints and by sleeving through penetrations.

3.6 PIPE SIZE
Flow rates to each outlet to be no less than those given in NZBC G12/VM1 or G12/AS1: Water supplies, table 3, Acceptable flow rates to sanitary fixtures. Pipe size as determined in table 4, Tempering valve and nominal pipe diameters.

Application - jointing

3.7 JOINTING COPPER PIPE
Braze pipe, fit alloy compression fittings, crox type joints and seal ring compression joints to NZBC G12/AS1: Water supplies.

3.8 JOINTING UPVC PIPE
Solvent welded joints using spigots and sockets, flanged joints and seal ring compression joints to NZBC G12/AS1: Water supplies.

3.9 JOINTING POLYBUTYLENE PIPE
Aluminium clamped, seal ring compression or push fit "O" ring seal jointing to pipe system manufacturer's requirements.

3.10 JOINTING POLYETHYLENE PIPE
Seal ring compression joints and electrofusion to NZBC G12/AS1: Water supplies.

3.11 JOINTING POLYPROPYLENE PIPE
Fusion weld joints to manufacturer's requirements.

Application - pipework installation

3.12 WATER SUPPLY CONNECTION
Arrange with the network utility operator for a connection to the water main and from there through a water meter and gate valve. Provide back flow prevention to NZBC G12/AS1: Water supplies.

3.13 POTABLE WATER SUPPLY PIPEWORK INSTALLATION
From connection point, run pipes complete with all fittings, support and fixing, joins and install to manufacturers specifications. Size the pipes and branches in straight runs to deliver the acceptable flow rate to NZBC G12/VM1 or G12/AS1: Water supplies, table 3, Acceptable flow rates to sanitary fixtures at each outlet. Allow for the expected concurrent use of adjoining fixtures and size the piping layout to eliminate loss of pressure at any point by simultaneous draw-off. Pipework support spacing to be firmly fixed and buffered to eliminate noise and hammer, with preformed tee-connection take-offs and branches, with machine made 3 diameter bends, complete with necessary valves and fittings. Conceal pipework and pressure test before the wall linings are fixed.

3.14 HOT WATER PIPEWORK
Use a take-off spigot to give separate branches to each fitting, lay out pipes with support spacing to NZBC G12/VM1 or G12/AS1: Water supplies, table 7 Water supply pipework support spacing. Fix firmly and buffer to eliminate noise and hammer, with preformed tee-connection take-offs and branches, and preformed 3 diameter bends, complete with all necessary valves and fittings.

Lag all pipes with rigid insulation to the manufacturer's requirements and G12/VM1 or G12/AS1: Water supplies.

3.15 EQUIPOTENTIAL BONDING
Earth metallic water supply pipe and metallic sanitary fixtures to NZBC G12/AS1: Water supplies: 9.0.

3.16 IN LINE FILTER
Install an in line filter immediately adjacent to the main isolating valve at the point of entry to the building, in an accessible position to allow for easy cleaning.

Application - hot water systems

3.17 HOT WATER CYLINDER INSTALLATION GENERALLY
Install hot water cylinders complete to the manufacturer's requirements and with seismic restraint as required to storage cylinders, to NZBC G12/AS1: Water supplies, 6.10, Water heater installation. Valve-vented systems to NZS 4607.

3.18 INSTALL TEMPERING VALVE
Install 1 metre minimum from outlet of hot water cylinder and to manufacturer's instructions. Install copper pipework for 1 metre minimum downstream of tempering valve prior to connection of non-metallic pipework.

Application - fire resistant work

3.19 FIRE RESISTANT SEALER
Thoroughly clean the penetration of the floor or wall. Pack if necessary to support the sealant. Implant the sealant to the manufacturer's requirements to ensure full penetration and to obtain the required fire resistance rating. Tool the surface flush and smooth and allow to cure.

3.20 FIRE RESISTANT FOAM SEALER
Thoroughly clean the opening and box each side with fibreboard to contain the sealer. Mix sealer and inject into the opening to the volume and time limits in the sealer manufacturer's requirements to obtain the required fire resistance rating. Allow to cure, remove boxing and make good any voids with sealer.

3.21 FIRE RESISTANT STRIP
Wrap around the pipe and tape in place in the hole, caulking each side with fire resistant sealer. Tool the surface flush and smooth and allow to cure.

3.22 FIRE RESISTANT COLLARS
Insert circular type collars into the holes provided in the concrete. Supply canister type collars and locate and fix to boxing before the concrete is placed. Comply with the manufacturer's requirement for use of these elements complete with accessories, tapes and sealants.

3.23 FIRE RESISTANT PANELS
Secure steel frames or mullions within the openings to the panel manufacturer's details. Cut panels to suit the opening and the services and fit neatly and flush with required maximum clearances. Seal round panels and services with fire resistant foam sealer to maintain the fire resistance rating of the floor or wall.

Installation - valves

3.24 INSTALLING BELOW GROUND ISOLATING VALVE
Install all below ground items such as main isolating values and water metres in preformed concrete pits or approved equivalent.

3.25 INSTALLING APPLIANCE ISOLATING VALVES - CONCEALED
Install isolating valves for appliances in accessible positions. Locate in adjacent cupboards and position to allow for easy connection and operation.

3.26 INSTALLING BACKFLOW PREVENTION DEVICE
Provide and install backflow prevention device as near as practicable to the potential source of contamination, and in an accessible position for maintenance and testing to AS/NZS 2845.3.

Completion

3.27 LABEL
Label all pipework with permanent adhesive markers at 3 metre minimum intervals.

3.28 CLEAN IN LINE FILTER
Clean all in line filters on completion of works.

3.29 REPLACE
Replace damaged or marked elements.

3.30 LEAVE
Leave work to the standard required by following procedures.

3.31 REMOVE
Remove debris, unused materials and elements from the site.

4. SELECTIONS

Water main

4.1 POLYETHYLENE WATER MAIN
Size: 25 mm outside diameter (i.e. DN 25 in AS/NZS 4130)

Hot water systems

4.2 HOT WATER CYLINDER, MAINS PRESSURE
Brand: Rheem
Model size: 2x300 L

4.3 TEMPERING VALVE
Brand/type: Apex

7141 SANITARY PLUMBING

1. GENERAL

This section relates to above ground gravity flow sanitary plumbing.

Related work

1.1 RELATED SECTIONS

Refer to SANITARY FIXTURES, TAPWARE AND ACCESSORIES for sanitary fixtures.
Refer to HOT AND COLD WATER SYSTEM for potable water systems.

Documents

1.2 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZBC G12/AS1	Water supplies
NZBC G13/AS1	Foul water sanitary plumbing
AS 2887	Plastic waste fittings
AS/NZS 1260	PVC pipes and fittings for drain, waste and vent applications
AS/NZS 2032	Installation of PVC pipe systems
AS/NZS 3500.2	Plumbing and drainage - Sanitary plumbing and drainage
BS EN 12524	Corrosion protection of metals. Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and copper plus nickel plus chromium

Plumbers, Gasfitters and Drainlayers Act 2006

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

Requirements

1.3 QUALIFICATIONS

Plumbers to be experienced competent workers, familiar with the materials and the techniques specified. Carry out all work under the direct supervision of a plumber registered under the Plumbers, Gasfitters and Drainlayers Act 2006.

1.4 INFORMATION FOR MAINTENANCE MANUAL

Supply maintenance manual information to requirements set out in the GENERAL section.

Performance

1.5 TESTING

Confirm timing before carrying out any tests. Supply potable water and apparatus needed. Seal openings below the section being tested and slowly raise the water level to a minimum of 3 metres above the highest point of the section. Do not exceed 6 metres of head above the lowest point. Carry out and record a visual inspection that each joint showed no evidence of leaks.

2. PRODUCTS

Materials

2.1 COPPER PIPES AND TRAPS

Pipes complete with copper-alloy compression fittings and/or crox type joints and seal ring compression joints. Traps complete with screwed access ports. Exposed traps and wastes, complete with matching ferrules at penetration location, satin chrome plated to BS EN 12524.

2.2 UPVC WASTE PIPE
To AS/NZS 1260, complete with fittings and accessories to the pipe manufacturer's requirements, all brand matched.

2.3 UPVC VENT PIPE
To AS/NZS 1260, complete with fittings and accessories to the pipe manufacturer's requirements and all brand matched.

2.4 PLASTIC TRAPS
To AS 2887.

Components

2.5 PROTECTIVE TAPE
Plasticised PVC tape system with primer, mastic fixing and outer coating.

Accessories

2.6 FIRE RESISTANT SEALER
Gunnable inorganic or silicone elastomer sealant packed to maintain the specified fire resistance rating of the floor or wall.

2.7 FIRE RESISTANT FOAM SEALER
Two-part silicone foam elastomer sealant packed to maintain the specified fire resistance rating of the floor or wall.

2.8 FIRE RESISTANT STRIP
Intumescent material mounted on a flexible retardant strip used in conjunction with the selected sealer.

2.9 FIRE RESISTANT COLLARS
Corrosion resistant collar or canister with intumescent packing to maintain the specified fire resistant rating of the floor or wall.

2.10 FIRE RESISTANT PANELS
Moulded mineral fibre refractory panels supported in the opening as necessary by light gauge corrosion-resistant steel frame and mullions.

3. EXECUTION

Conditions

3.1 EXECUTION GENERALLY
Carry out this work and complete all tests to AS/NZS 3500.2.
Carry out this work and complete all tests to NZBC G1/AS1: 2.0, 3.0 and G13/AS1.

3.2 ELECTROLYTIC ACTION
Avoid electrolytic action by eliminating actual contact or continuity of water between dissimilar metals.

3.3 HANDLE AND STORE
Handle and store pipes, fittings and accessories to avoid damage. Store on site under cover on a clean level area, stacked to eliminate movement and away from work in progress.

3.4 SETTING OUT
Set out location of all stacks, discharge pipes, fittings and vent pipes and the completeness of their discharge into the drainage system.

3.5 CORE HOLES AND SLEEVES
Fit core holes and sleeves as needed throughout the structure in conjunction with the boxing, reinforcing and placing of concrete. Sleeve diameter to be 25 mm larger than

outside diameter of pipe accommodated. Strip core holes and make good after installation of pipework.

3.6 PIPE ACCESS
Fit and fix stacks, wastes and pipes in ducts independent of all other services so they are easily replaceable for their full length. Wrap or tape pipes buried in concrete.

3.7 FITTINGS ACCESS
Fit and fix traps and wastes to enable access for cleaning and for maintaining the total system.

3.8 CONFIRM LOCATIONS
Unless the location and height are clearly delineated on the drawings, confirm installation height and plan locations of sanitary fittings before commencing the piping installation.

3.9 TRAPS AND WASTES
Conceal traps and wastes in the fabric of the building unless detailed otherwise. Fit and fix satin chrome plated exposed pipes, traps and wastes unless detailed otherwise.

3.10 CORROSION
Separate metals subject to electrolytic action from each other and from treated timber, concrete and other lime substances by space, painting of surfaces, taping, or separator strips.

Application - jointing

3.11 JOINTING COPPER PIPE
Braze pipe, fit alloy compression fittings, crox type joints and seal ring compression joints to NZBC G12/AS1: Water supplies.

3.12 JOINTING uPVC PIPE
Prime and solvent weld joints using spigots and sockets, flanged joints and seal ring compression joints to AS/NZS 2032.

Application - fixing

3.13 THERMAL MOVEMENT
Accommodate longitudinal movement in pipes resulting from temperature changes. Incorporate expansion joints in copper and uPVC pipes. Install PVC pipes to AS/NZS 2032. Take particular care to allow for movement at horizontal take-off locations from stacks.

3.14 TRAPS AND FIXTURE DISCHARGE PIPES
Size traps and pipes as required for each fixture or appliance. Establish the developed length of waste pipes. Vent and allow access for cleaning as required. Follow the most direct line with the least number of bends to NZBC G13/AS1: Foul water sanitary plumbing, table 4, Discharge unit loading for stacks and graded discharge pipes and table 7, Distance between supports.

3.15 DISCHARGE STACKS AND VENTS
Size stacks and vents to NZBC G13/AS1: Foul water sanitary plumbing, table 2, Fixture discharge pipe sizes and discharge units and table 6, Vent pipe sizes. Extend up past the highest branch to form a discharge stack vent terminating to NZBC G13/AS1: Foul water sanitary plumbing, figure 12 and finishing at the base with a 45 degree bend. Support system to NZBC G13/AS1: Foul water sanitary plumbing, table 7, Distances between supports.

Application - fire resistant penetrations

3.16 FIRE RESISTANT SEALER
Thoroughly clean the penetration of the floor or wall. Pack if necessary to support sealant. Implant sealant to the sealant manufacturer's requirements to ensure full penetration and to obtain the fire resistance rating required. Tool surface flush and

smooth and allow to cure. Inspect for and make good if adhesion and seal are not complete.

3.17 FIRE RESISTANT FOAM SEALER
Thoroughly clean opening and box each side with fibreboard to contain the sealer. Mix sealer and inject into opening to the volume and time limits in the sealer manufacturer's requirements to obtain the fire resistance rating required. Allow to cure, remove boxing and make good voids with sealer.

3.18 FIRE RESISTANT STRIP
Wrap around the pipe and tape in place in the hole, caulking each side with fire resistant sealer. Tool the surface flush and smooth and allow to cure. Inspect for and make good if adhesion and seal are not complete.

3.19 FIRE RESISTANT COLLARS
Insert circular type collars into holes provided in the concrete. Supply canister type collars. Locate and fix to the boxing before concrete is placed. Comply with the collar manufacturer's requirements for use of these elements, complete with accessories, tapes and sealants required for each particular situation.

3.20 FIRE RESISTANT PANELS
Secure steel frames or mullions within the openings to panel manufacturer's details. Cut panels to suit the opening and the services and fit neatly and flush with the required maximum clearances. Seal round panels and services with fire resistant foam sealer, to maintain the fire resistance rating of the floor or wall.

Completion

3.21 REPLACE
Replace damaged or marked elements.

3.22 LEAVE
Leave the whole of this work free of blemishes, undamaged and to the standard of finish required for following procedures.

3.23 REMOVE
Remove debris, unused materials and elements from site.

7400 DRAINAGE GENERAL

1. GENERAL

This section relates to the supply and laying of gravity subsoil, surface water and foul water drains.

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in the above sections are:

NZBC E1/AS1	Surface water, 3.0 Drainage system materials and construction
NZBC E2/AS1	External moisture, 12.3 Drainage
NZBC G13/AS2	Foul water drainage
AS/NZS 1254	PVC Pipes and fittings for Stormwater and Surface Water applications
AS/NZS 1260	PVC pipes and fittings for drain, waste and vent applications
AS/NZS 2032	Installation of PVC pipe systems
AS/NZS 2033	Installation of Polyethylene pipe systems
AS/NZS 2566.1	Buried Flexible Pipelines - Structural Design
AS/NZS 2566.2	Buried Flexible Pipelines - Installation
AS/NZS 4671	Steel reinforcing materials
AS/NZS 5065	Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
NZS 3107	Precast concrete drainage and pressure pipes
NZS 3104	Specification for concrete production
NZS 4442	Welded steel pipes and fittings for water, sewage and pressure gas
OSH	Approved code of practice for safety in excavation and shafts for foundations

Plumbers, Gasfitters and Drainlayers Act 2006
Health and Safety in Employment Act 1992

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

Requirements

1.2 QUALIFICATIONS

Drainage work to be carried out by experienced people and under the direct supervision of a drainlayer registered under the Plumbers, Gasfitters and Drainlayers Act 2006.

1.3 INFORMATION FOR MAINTENANCE MANUAL

Supply maintenance manual information to requirements set out in the general section OPERATION & MAINTENANCE.

1.4 INFORMATION FOR AS-BUILT DRAWINGS

Supply as-built drawings to requirements set out in the general section AS BUILT DOCUMENTATION.

Performance

1.5 SITE MEETING

Meet with the territorial authority drainage inspector to confirm the drainage layout in relation to site conditions. Confirm changes resulting and seek written site instruction before carrying out any work.

1.6 CHECK LOCATION

Check the location of existing on and off-site, private and public services with the network utility operator. Follow their requirements for safety and protection where laying drainage.

1.7 SITE CONDITIONS

Before starting work check on site the drainage layout, dimensions, levels and invert levels and ensure that line, level, falls and cover are correct.

1.8 ADJOINING PROPERTIES

Take precautions to protect adjoining property from damage or risk of damage arising from excavation and drainage work.

1.9 SAFETY

Carry out all safety procedures as required by the OSH publication: Approved code of practice for safety in excavation and shafts for foundations and the Health and Safety in Employment Act 1992, regarding notifiable work and timbering. Prevent material rolling into trenches.

1.10 BLASTING

Do not blast except with the written approval of the territorial authority and the local OSH office of the Department of Labour. If permitted, carry out blasting with experienced workers under a blaster holding a certificate of competence issued by OSH.

1.11 TESTS

Using the method agreed with the territorial authority inspector, test and inspect pipelines before backfilling to ensure required acceptance levels are achieved. Test again after backfilling to confirm acceptance levels and for final acceptance of the works.

1.12 RECORDS

Records to be kept of all tests.

7701 ELECTRICAL BASIC

1. GENERAL

This section relates to the wiring for domestic and small scale commercial installations, including:

- power
- lighting
- electrical automation
- security system
- complete with componentry
- electrically-powered fittings

Documents

1.1 DOCUMENTS

Documents referred to in this section are:

NZBC E2/AS1	External moisture
NZBC F6/AS1	Visibility in escape routes
NZBC F7/AS1	Warning systems, 3.1 Domestic smoke alarms
NZBC G4/AS1	Ventilation
NZBC G9/AS1	Electrical installations within Domestic Dwellings
AS/NZS 1125	Conductors in insulated electric cables and flexible cord
AS/NZS 1768	Lightning protection
AS 1670.6	Fire detection, warning, control and intercom systems - System design, installation and commissioning - Smoke alarms
AS/NZS 2293	Emergency escape lighting for buildings
AS/NZS 3000	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS/NZS 3008.1.2	Electrical installations - Selection of cables - Cables for alternating voltages up to and including 0.6/1 kV - Typical New Zealand installation conditions
AS/NZS 3100	Approval and test specification-general requirements for electrical equipment
AS/NZS 3112	Approval and test specification - Plugs and socket-outlets
AS/NZS 3113	Approval and test specification - Ceiling roses
AS/NZS 3190	Approval and test specification - Residual current devices (current-operated earth-leakage devices)
AS/NZS 3350	Safety of household and similar electrical appliances - General requirements
AS/NZS 3439.3	Low-voltage switchgear and controlgear assemblies - Particular requirements for low-voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access for their use - Distribution boards
AS 3786	Smoke alarms
NZS 4301.1	Intruder alarm systems - systems installed in clients premises
AS/NZS 5000.2	Electric cables - Polymeric insulated - for working voltages up to and including 450/750v
NZECP	NZ Electrical Codes of Practice
NZECP 54	NZ Electrical Codes of Practice for the installation of recessed luminaires and auxiliary equipment (available at www.energysafety.govt.nz)
IEC 61643	Components for low voltage surge protection devices

1.2 ABBREVIATIONS

The following abbreviations are used throughout this part of the specification:

CFL	compact fluorescent lamp
ELV	extra low voltage
GLS	general lighting service
IP	international protection classification
LCD	liquid crystal display
LED	light emitting diode
MCB	miniature circuit breaker

NUO	Network Utility Operator
PCB	printed circuit board
PIR	passive infrared
RCBO	residual current-operated circuit breaker with over current protection
RCCB	residual current-operated circuit breakers
RCD	residual current device
SIA	security integration architecture
TPS	tough plastic sheathed

Requirements

1.3 COMPLY
Comply with the Electricity Regulations 1997, AS/NZS 3000, AS/NZS 3008.1.2 and the New Zealand electrical codes of practice for listed and prescribed work and with the utility network operator's requirements. Apply for the service connection. Arrange for the required inspections of listed work. Pay all fees.

1.4 QUALIFICATIONS
Carry out work under the direct supervision of a holder of a practising licence under the Electricity Regulations 1997.

1.5 QUALIFICATIONS - SECURITY SYSTEM
Installation by an installer licensed under the Private Investigators and Security Guards Act. Installation of all security equipment to comply with NZS 4301 Intruder alarm system - systems installed in client's premises.

1.6 CERTIFICATE OF COMPLIANCE
Supply a certificate of compliance to the owner, as required by the Electricity Regulations 1997 clause 39, within 20 days of completion as required by clause 42. The network utility operator is to inspect before the meter installation, listed work inspection, polarity check and supply becoming live.

Warranties

1.7 WARRANTY
Warrant the complete electrical installation under normal environmental and use conditions against failure of materials and execution.
1 year: Warranty period

Refer to the general section for the required form of WARRANTY AGREEMENT and details of when completed warranty must be submitted.

2. PRODUCTS

2.1 MAINS SUPPLY, SINGLE PHASE
Tough plastic sheathed neutral screened cable to AS/NZS 4961 and AS/NZS 3008.1.2, with a minimum rating of 60 amps per phase. Include pilot cable where required by network utility company.

2.2 CABLES
Tough plastic sheathed copper conductors to AS/NZS 5000.2, stranded above 1.0 mm², and to AS/NZS 3008.1.2. Minimum sizes as below. Increase sizes if the method of installation, thermal insulation, cable length or load will reduce the cable rating below that of the MCB rating, or produce an excessive voltage drop.

Lighting circuits:	Domestic: 1.5 mm² on 10 amp MCBs
Lighting circuits:	Commercial: 1.5 mm² on 16 amp MCBs
Power circuits:	1.5 mm² on 16 amp MCBs for domestic and unenclosed or unfilled cavity construction
	2.5 mm² on 16 amp MCBs for domestic insulated construction, or filled cavity
	2.5 mm² on 20 amp MCBs for unenclosed or unfilled cavity construction

2.5 mm² on 16 amp MCBs for insulated construction, or filled cavity, or lengths over 30 metres

Hot water cylinder circuits: Single phase: 2.5 mm² on 20 amp MCBs

Range/oven/hob circuits: Single phase: 6 mm² on 32 amp MCBs

Heat resistant cable for final connections to all heated appliances, and high temperature cable in ambient conditions that may be above 35°C.

2.3 METER BOX

Proprietary manufactured, zinc plated powder coated metal case, or ABS plastic, with glazed panel door, weatherproof where mounted outdoors, and complete with meter mounting, main switch and fuse.

2.4 DISTRIBUTION BOARD

Flush surface mount boards manufactured to AS/NZS 3439.3 and installed in accordance with AS/NZS 3000. Manufactured from engineering grade resin with a glow wire rating of 850°C, complete with neutral and earth busbars, and insulated comb phase bar. Distribution boards to have 20% spare capacity for future additions and alterations.

2.5 CIRCUIT PROTECTION

General requirements including main switch 63A or 100A. Residual current protection 30mA, ensure RCCBs' meet Type A and comply with AS/NZS 3190. MCBs to 4.5kA or 6kA rated.

2.6 WALL BOXES

Standard grid size or equivalent to be manufactured from plastic or metal, with 2 or more gang size to be metal with steel inserts for accessory securing screws. Screw fixed.

2.7 SWITCH UNITS

Single pole switches to be 16 amp minimum rated, double pole or intermediate to be 16 amp minimum rated. All switches to be 230 volt a.c. polycarbonate flushplate units. Refer to drawings/schedules for number of switches per unit, dimmer units, neon (indicator or toggle) units and 2 way units.

2.8 HOT WATER SYSTEM SWITCH

One way 20 amp switch complete with cable clamp for flexible PVC conduit to element enclosure.

2.9 SWITCHED SOCKET UNITS

10 amp, 230 volt flat 3 pin socket outlets fitted with safety shutters and manufactured to AS/NZS 3100, AS/NZS 3112 and AS/NZS 3113, single or multi gang as detailed.

2.10 SMOKE ALARMS

To AS 3786. A wired 230 volt ionised smoke detector type.

2.11 SURGE PROTECTION

Protection for the homes appliances with IEC 61643 Class II surge protection devices fitted to the switchboard. For variable electronic equipment fit IEC 61643 Class III surge protection to switched socket outlets.

2.12 CEILING ROSES

White plastic mounting base with screwed cover, manufactured to AS/NZS 3113. Terminal type. Cylindrical section TPS for suspended fittings.

2.13 BATTEN HOLDERS

Standard white plastic bayonet cap, with cap angled where wall mounted. Brass liners.

2.14 DOOR BELL SYSTEM

Complete with transformer for mounting on distribution board.

2.15 LIGHT FITTINGS

Fluorescent and High Intensity Discharge fittings with low loss control gear and power factor corrected to 0.95 minimum. Control gear suitable for dimming if this is required. All

fittings complete with lamps; Incandescent GLS lamps pearl, coiled-coil 230v rated, bayonet cap; Fluorescent triphosphor 2700K; CFL; halogen ELV 12v dichroic reflector with cover glass unless detailed otherwise.

2.16 EMERGENCY LIGHT FITTINGS
Emergency escape lighting and exit signs for buildings to AS/NZS 2293. Exit, recessed, ceiling or wall mounted. Refer to SELECTIONS.

2.17 SPACE HEATERS
Fixed wired room heaters radiant or convector, and compliant with AS/NZS 3350. Flush or surface mount, fitted with safety cut-outs.

2.18 EXHAUST FANS
Ceiling, wall or duct mounted exhaust fans for ventilation to NZBC G4/AS1, and compliant with AS/NZS 3350.

2.19 HEATED TOWEL RAILS
Fixed wired heated towel warmers, double insulated, IPX4 splash-proof, compliant with AS/NZS 3350, scratch resistant powdercoated or chrome finish.

2.20 OUTDOOR SWITCHES & SOCKETS
Using materials with superior UV protection, impact strength, and addition chemical resistance when compared with interior polycarbonate fittings. Weather protected, switches to IP56 minimum, and sockets to IP53 minimum. Sockets fitted with safety shutters behind socket pins, and all products able to be padlocked off or on.

Electrical Automation System

2.21 ELECTRICAL AUTOMATION SYSTEM
Electrical automation system designed to enable if required:
- Lighting - automated control and dimming timer control.
- Heating including heated towel rails and ventilation systems.
- Security - programmable to simulate lights and other devices to give appearance home is occupied - ability to interface with security system and smoke detectors to activate lights.
- Energy efficiency - automatically switch circuits off when not required or on during low tariff times.
- Appliances.
- Spa pools.
- Irrigation systems.

Security System

2.22 CONTROL PANEL
Control panel system with a minimum of one installer code, one master code, 6 zones minimum and 6 user codes. The installer to select codes to suit installation.

2.23 DETECTORS
There are two main types of detectors:
- Standard passive infrared sensors: Install in stable environments with no wind flow and no direct bright sunlight.
- Passive infrared/ microwave sensors: Install in area where environmental stability is an issue.

2.24 AUDIBLE DEVICES
Internal sirens can be either a 12V Piezo Siren or a Horn speaker with a sound pressure level of no less than 95dB.

External siren can be either a stainless steel design or have hardened plastic casing. Both designs to be fully weatherproof but not limited to IP66 Rating. The siren box to contain a strobe diffuser in either blue or red. The siren shall contain a horn speaker, 12v speaker or an electronic siren. The external siren box to have both a cover and rear wall tamper mechanism.

2.25 CABLING
Security alarm wiring to NZS 4301.1 for installation.
Security alarm wiring to NZS/AS 1125 for cables.
Security alarm wiring to be multi stranded and not single stranded, minimum 0.5 mm².

2.26 PERIPHERALS
Fit anti-tamper devices to detectors, control panels and equipment housings, programmed to give a tamper indication when the system is unset and a tamper alarm when the system is set.

Standard keypad manufactured of moulded hardened plastic with either a LED or LCD screen, to match the style of the wiring accessories in diameter, colour and aesthetics.

2.27 COMMUNICATIONS
Digital dialler to be built into the PCB of all control panels, with the options for both monitoring and remote dial in windows based software. Digital dialler to comply with all the industry standard communication formats including contact I.D and SIA, and NZ Telepermit certification.

Remote software able to upload / download programming changes and or history events and change status of the security alarm with the ability to be turned off if required.

3. EXECUTION

3.1 MAIN SUPPLY
Lay underground mains to the NUO requirements. Excavate trench, install cable and marker tape and backfill.

3.2 METER BOX
Fit to meter box manufacturer's and Electricity Retailer's requirements. Recess into external wall in sheltered area and flash to weatherproof to NZBC E2/AS1 fig 69. Arrange for meter installation and connection.

3.3 DISTRIBUTION BOARD
Fit to AS/NZS 3000 and board manufacturer's requirements. Recess into wall or surface mount and ensure fire containment properties of the enclosure are maintained.

3.4 CIRCUIT PROTECTION
Install MCBs at distribution board to AS/NZS3000 to protect each final sub circuit.

3.5 EARTH BONDS
Bond together and to earth all plumbing fittings not adequately isolated, to AS/NZS 3000, the Electricity Regulations 1997 and the fitting manufacturer's requirements.

3.6 MAIN EARTH
Provide a plastic toby box to contain and protect the earth electrode. Fix the connecting earth wiring closely and securely against wall surfaces.

3.7 EARTH LEAKAGE PROTECTION
Install RCD protection to AS/NZS 3000.

3.8 DOMESTIC INSTALLATIONS
Install 30mA RCD protection at the distribution board for all final sub circuits to control socket outlets and lighting except for fixed or stationary cooking equipment, to AS/NZS 3000.

3.9 HIGH RISK AREA INSTALLATIONS
Install 30mA RCDs at the distribution board for areas not covered in Domestic installations, or using fixed wired RCD protected socket outlets in areas that may represent increased risk of electric shock to the user:
- Wet areas: bathrooms, laundries, kitchens.
- Near pools and water features.

- Where intended for use with cleaning equipment.
- Hand-held tools subject to movement in use, i.e. work-shops, garages.

3.10 SET-OUT

The position of outlets and equipment shown on drawings is indicative of requirements. Confirm documents and site conditions are not in conflict with other services or features. Resolve conflicts and discrepancies before proceeding with work affected. Confirm on site the exact location, disposition and mounting heights of all outlets, fittings, equipment, penetrations, and use of exposed wiring. Fix outlet items level, plumb and in line.

3.11 CABLING

Install wiring systems to AS/NZS 3000. All cabling run concealed. No TPS cable laid directly in concrete. Locate holes in timber framing for the passage of cables at the centre line of the timber member. Install cable in conduits where required to pass through concrete or underground. In walls run cabling horizontally and vertically in straight lines. In ceilings either run cabling along ceiling framing or attached to catenary wires. Clip cabling to ceiling framing/catenary wires.

3.12 CABLING CIRCUITS

Install all circuits with the appropriately rated cable and circuit protection. Install with a maximum of 8 light switch units or 4 double or single switched socket units on any circuit. Minimum 2 lighting circuits per floor. Separate circuits for all electric heating appliances. Kitchen sockets to be on at least two different circuits.

3.13 WALL BOXES

Mount flush in cavity construction size to fit products selected. Fix vertically mounted wall boxes to studs. Screw fix horizontally mounted switched socket outlet wall boxes to solid blocking or nogs. Fix switch panel wall boxes to solid blocking.

3.14 SWITCH AND SOCKET UNITS

Fit all single and double switch units, all sockets to the following heights (to the centre of the unit) unless shown otherwise on the drawings.

Switch Units: 1000 mm
Socket Units: 150 mm above work benches
400 mm elsewhere

Mount light switches and switch socket outlets vertically and socket units horizontally. Label all switch units that control electrical equipment or special lighting circuits by colour filled engraving on the switch. Use proprietary engraved switch mechanisms where applicable.

3.15 ISOLATING SWITCHES

Locate isolating switches in positions as confirmed by the owner, when not specifically shown on the drawings.

3.16 LIGHT FITTINGS

Install light fittings in locations and at heights specified and confirmed by the owner, in accordance with the fitting manufacturer's requirements. Install recessed fittings to NZECP 54.

3.17 EMERGENCY LIGHTING

Emergency escape lighting and exit signs for buildings to AS/NZS 2293 and NZBC F6/AS1. Fit emergency light fittings to manufacturer's specifications. Refer to plans for position of fittings.

3.18 ELECTRIC HOT WATER SYSTEM

Wire as a separate circuit through a wall-mounted isolating switch, with the cable from switch to element encased in flexible PVC conduit, clamp fixed at each end. Hot water cylinders, thermostats and 3000 watt element supplied and fitted under HOT AND COLD WATER SYSTEM.

3.19 SPACE HEATERS

Install to the heater manufacturer's requirements, and to AS/NZS 3000. Fit neatly and without damage to surrounding finishes. Ensure control switches and thermostats are fitted to appliance, or otherwise connect to a control switch located adjacent to the heater and a remote thermostat.

3.20 SMOKE ALARMS

Install Type 1 domestic smoke alarm system to NZBC F7/AS1 3.1, AS 1670.6 and to the alarm manufacturer's requirements. Fit neatly and without damage to the surrounding finish.

3.21 SURGE PROTECTION

Install surge protection devices to manufacturer's requirements and in accordance with AS/NZS 3000 and AS/NZS 1768. When fitting IEC 61643 Class II protection at the switchboard, protect the device by a dedicated MCB.

3.22 ELECTRIC POWERED FITTINGS AND EQUIPMENT

Install and wire fittings and equipment to individual fittings and equipment manufacturer's requirements. Refer to the drawings for required layouts and locations for equipment. Refer to SELECTIONS for schedules of fittings.

3.23 BATHROOM ELECTRICAL FIXTURES

Install all electrical fixtures. Connect the following bathroom and toilet electrical items:

- Heated towel rails: Install to manufacturers requirements and installed in accordance with AS/NZS 3000 and the NZBC G9/AS1
- Mirror demisters: Locate centrally above the wash hand basin(s). Connect wiring to room lighting unless specified otherwise.
- Exhaust fans: Install exhaust fans to manufacturer requirements. Installed in accordance with AS/NZS 3000 and NZBC G4/AS1.

3.24 OUTDOOR/EXTERIOR SERVICES

Install all wiring systems in accordance with AS/NZS 3000 and in accordance with the manufacturer's recommendations:

Provide circuits and connections for exterior installations, including ELV 12/24 Volt path lighting and electronic irrigation systems. Refer to drawings for connection points. Where underground, ensure appropriate protection, such as thickness of sheathing, conduit, depth of cabling, and proximity to other services.

Use the appropriate rated fittings for power control and power supply. Weather protected switches to IP56, and sockets to IP53 as a minimum. Install to manufacturer's specifications using recommended fittings and sealants to maintain the products integrity.

Earth leakage protection to be provided for in areas where there is increased risk to human safety in the form of either RCD's at the distribution board, or socket outlet. RCDs' are recommended for visible awareness of protection.

3.25 ELECTRICAL AUTOMATION SYSTEM

Fit distribution cabinet in wall, cut-out to finish flush with the wall surface, or surface mounted. Configure installation to manufacturer's instructions. Provide adequate user training and operating manual to the owner.

3.26 LABELLING

Include label under each controller, switch and circuit breaker on distribution boards. Include a warning notice if light dimmers are used in the installation. List the rating of each circuit.

Security System

3.27 SECURITY SYSTEM

Install to the system manufacturer's requirements, control panel, detectors and associated equipment fitted neatly and without damage to surrounding finishes. Installation of security equipment to NZS 4301.3 Intruder alarm system. All 230v mains power connections to the security panel are to be in accordance with AS/NZS 3000. The 230V power is to be switched using a dedicated single gang Isolator switch or similar.

3.28 COMPLETION

Leave installation operating correctly, with equipment clean and operational.

8113 PRECAST CONCRETE RETAINING WALLS

1. GENERAL

This section relates to the supply and erection of crib-type and precast concrete retaining wall systems.

Documents

1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZBC E1/AS1	Surface water, 3.0 Drainage system materials and construction
NZS 3104	Specification for concrete production
NZS 3109	Concrete construction
AS/NZS 4671	Steel reinforcing materials
AS 2439.1	Perforated Plastics Drainage and Effluent Pipes and Fittings

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

Requirements

1.2 QUALIFICATIONS

Retaining wall work to be carried out by competent, experienced workers, familiar with the materials and techniques specified.

2. PRODUCTS

Materials

2.1 CONCRETE

Prescribed mix to NZS 3104, 25 MPa.

2.2 PRECAST CONCRETE UNITS

Reinforcing steel grade 300 to AS/NZS 4671. Minimum 40 mm cover. Concrete to have a minimum 28 day strength of 20 MPa.

2.3 BASE LEVELLING PADS

Well graded compacted crushed stone, or concrete, to the retaining wall manufacturer's requirements.

2.4 PLASTIC PIPING

Plastic piping for field drains perforated and coiled to stiffness requirements of AS 2439.1 Class 200 or equivalent.

Accessories

2.5 FILTER FABRIC

High density polyethylene or polypropylene sheet.

2.6 DRAINAGE MATERIAL

Free draining crushed stone, 7 mm to 20 mm in size.

2.7 BACKFILLING MATERIAL

To NZBC E1/AS1: Surface water, 3.9.5 Acceptable materials. To be 19 mm down, well graded crushed stone.

3. EXECUTION

Conditions

3.1 STORAGE
Take delivery of retaining wall elements in protected pallets, undamaged and dry. Store on level hard standings, protect from damage and keep dry until laid. Do not deliver any materials to the site which cannot be immediately placed in final locations.

Application

3.2 ERECT CONCRETE CRIB WALLS
Excavate, form base for and erect in accordance with the crib wall manufacturer's requirements and standard details.

3.3 ERECT INTERLOCKING CONCRETE BLOCK WALLS
Excavate, form base for and erect in accordance with the block manufacturer's requirements and standard details.

3.4 LAY SUBSOIL DRAINS
Lay perforated coil piping firmly in a granular bed in straight runs to correct gradients, discharging into a cesspit. Carry the granular bed up over the pipes without disturbing them, to a total depth of 300 mm and cover with geotextile fabric; all to the pipe manufacturer's requirements. Carry the high end of all lines up to the surface to allow for flushing out.

3.5 INSTALL BACKFILLING
Compact crushed stone backfilling in 150 mm loose layers, using a suitable vibrating roller, until no further compaction is discernible. Top with 150 mm of clean topsoil.

3.6 CLEAN
Clean and flush out the whole installation and remove silt and debris before handing over.

Completion

3.7 REPLACE
Replace damaged or marked elements.

3.8 LEAVE
Leave work to the standard required by following procedures.

3.9 REMOVE
Remove debris, unused materials and elements from the site.

New Dwelling
125 Nikau Palm Road
PARAPARAUMU

Form 436

PROCESSING CHECKLIST

BC.....

00060

No = Plans , specifications & documentation not complying with the Building Code &/or Bld. Act (The reason specified alongside each prompt)

Yes = Plans , specifications & documentation complying with the Building Code &/or Bld. Act (The reason specified alongside each prompt)

N/A = Not Applicable to this application. (deletion of whole sections as N/A is permitted) For alternatives comment below each section.

Category: 2

Site Plan (*NZS 3604 Sec 3.4, 4,5 Code clB1, B2,E1, E2 F1&F2* Sect. 72, 75 BA04)

Comments

N/A	NO	YES		
☐	☒	☑	Wind zone High V/ High Specific..... *NZS 3604 GIS*	Roof Height
☐	☐	☐	Flooding / ponding .....GIS District plan	
☐	☐	☐	Hazards.....F1 F2 & Sec 71-74 Bld Act GIS	Refer to planning
☐	☐	☑	Corrosion zone .....*B2 & NZS 3604* GIS	
☐	☐	☑	Soil conditions .....B1 *NZS* 3604 Site inspection notes	By Engineer
☐	☐	☑	Distances to boundaries/siting..... District plan	
☐	☐	☑	Floor levels/ contours.....E2/AS1 & *NZS 3604 E1*	
☐	☐	☐	Two or More Allotments.....Sec 75 – 83 Bld Act	

Specific Design (*Verified Online PS2 B1 B2 VM1*)

☐	☐	☑	Design Certificate *PS1 B1 B2 VM1*	ok for ISP
☐	☒	☐	Peer Review..... *PS1 B1 B2 VM1*	
☐	☐	☑	Calculations *VM1*	
☐	☐	☑	CPeng ..... *Verified Online*	

Note :- list all items

Updated Producer statement Arena Balustrade System
Grnd bearing tests, Foundation design, Beam design + connections, retaining walls

Concrete / Foundation Plan (*NZS 3604 NZS 4210 & 4229 E2/AS1*)

Comments

Layout

☐	☐	☑	Layout dimensions..... *NZS 3604.*
☐	☐	☑	Control joints..... *NZS 3604* , cl 7.5
☐	☐	☑	Slab thickening..... *NZS 3604*, cl 7.5
☐	☐	☐	Plumbing layout.....*NZS 3500,G13*
☐	☐	☐	Alternative.....specify reason

Section

☐	☐	☑	Depth & width..... *NZS 3604*
☐	☐	☑	Reinforcement..... *NZS 3604;B2*
☐	☒	☑	Plate fixings..... *NZS 3604:B2 cl 7.5* Bollam plate holddown details
☐	☐	☑	DPM ..... *NZS 3604;B2*
☐	☐	☑	Engineer design and Calcs.....B1;B2
☐	☐	☑	Concrete strength.....B1;B2 cl 4.8.2
☐	☐	☐	Alternative.....specify reason