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Client: DEVON HOMES

Subject: RETAINING WALL FOR REALTY UNIT

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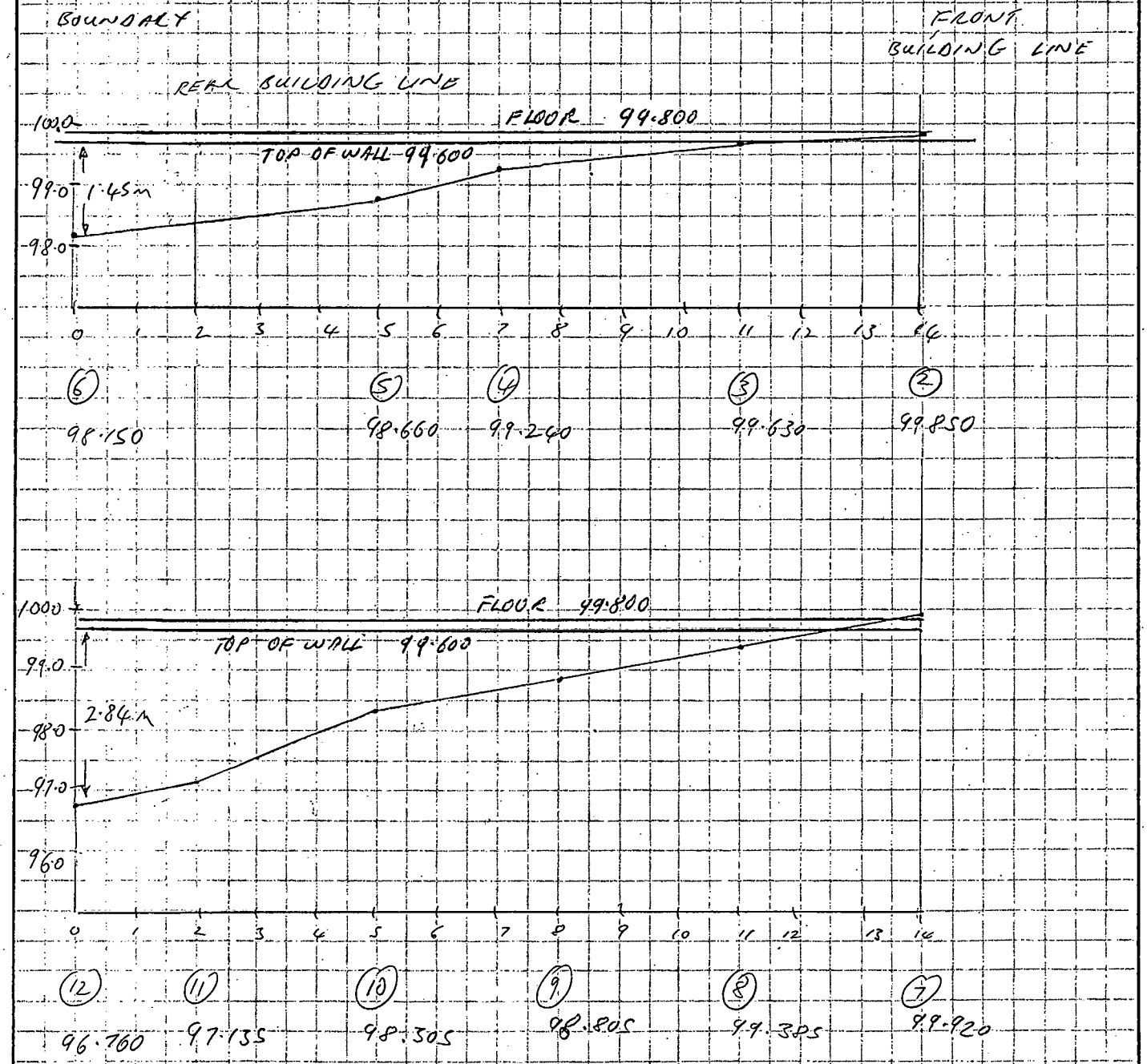
12/5/94	O.C.T

CROSS SECTIONS



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Subject: RETAINING WALL FOR KEELTY UNIT

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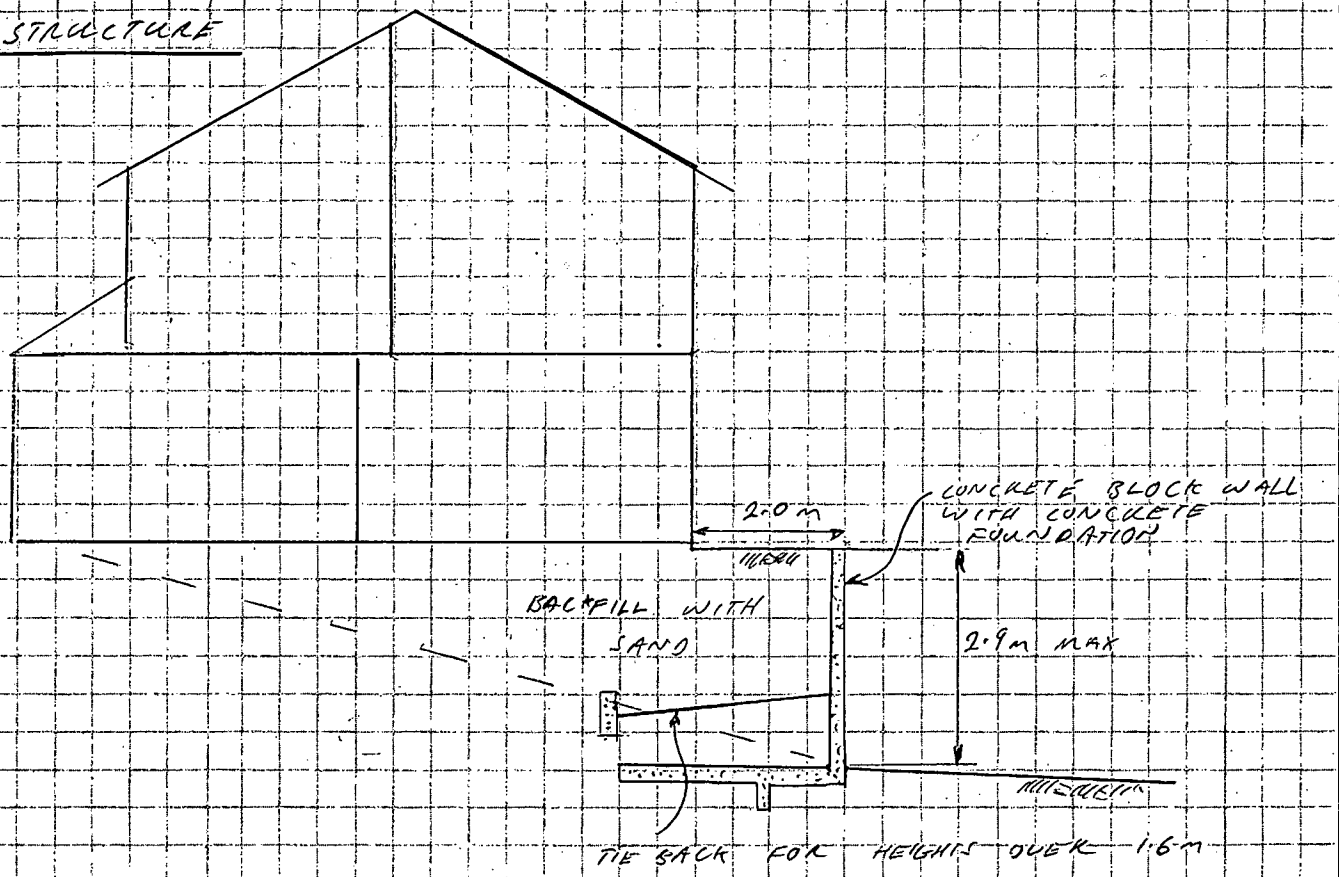
STRUCTURE



LOADS

DEAD:	ROOF (LIGHT)	0·25 kPa.
	FLOOR	0·50 kPa.
	LIGHT TIMBER WALLS	0·40 kPa.
	LIGHT TIMBER WALLS WITH 40mm BRICK VENEER	1·2 kPa.
	100mm FLOOR SLAB	2·5 kPa.
LIVE:	L_u ROOF	0·25 kPa.
	L_u FLOOR	1·5 kPa.

ASSUME AT-REST PRESSURES EXIST IN THE BACKFILL OF SAND HAVING PROPERTIES:

$\gamma = 18\ kN/m^3$

$\phi = 30°$

$k_o = 1 - \sin 30 = 0.5$

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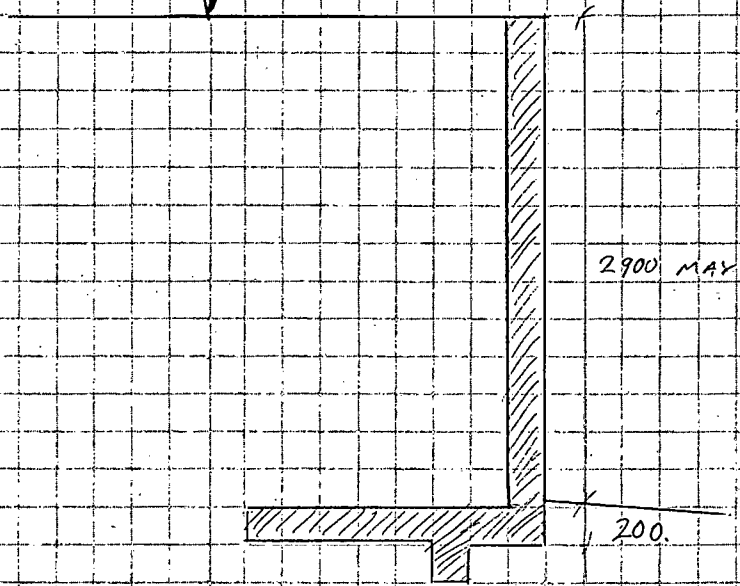
LOAD COMBINATIONS:

$U = 1.4\cancel{D} + 1.7\cancel{L} + 1.7Q$ FOR STRENGTH OF WALL

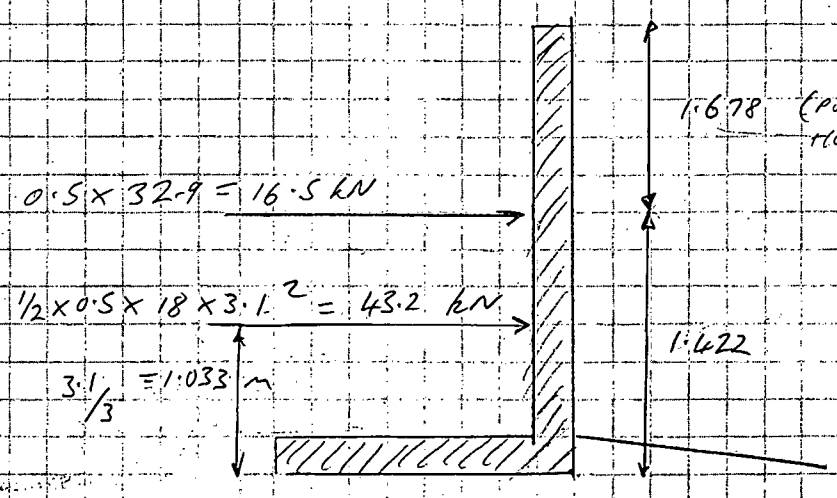
$A = \cancel{D} + \cancel{L} + Q$ FOR STABILITY OF WALL

LOAD MODEL:

$$\frac{7.5}{2} \times (0.25 + 0.25)_{\text{ROOF}} + \frac{7.5}{2} \times (0.5 + 1.5)_{\text{FLOOR}} + 2.4 \times (0.4_{\text{1ST WALL}} + 1.2_{\text{GRD WALL}}) + 9/2 \times (2.5 + 1.5)_{\text{SLAB}}$$
$$+ 0.23 \times 0.3 \times 24_{\text{RING BEAM}} = 32.9 \text{ kN/m}$$



RESULTANT WALL THRUSTS - BY M.W.D RETAINING WALL DESIGN NOTES FIG 31



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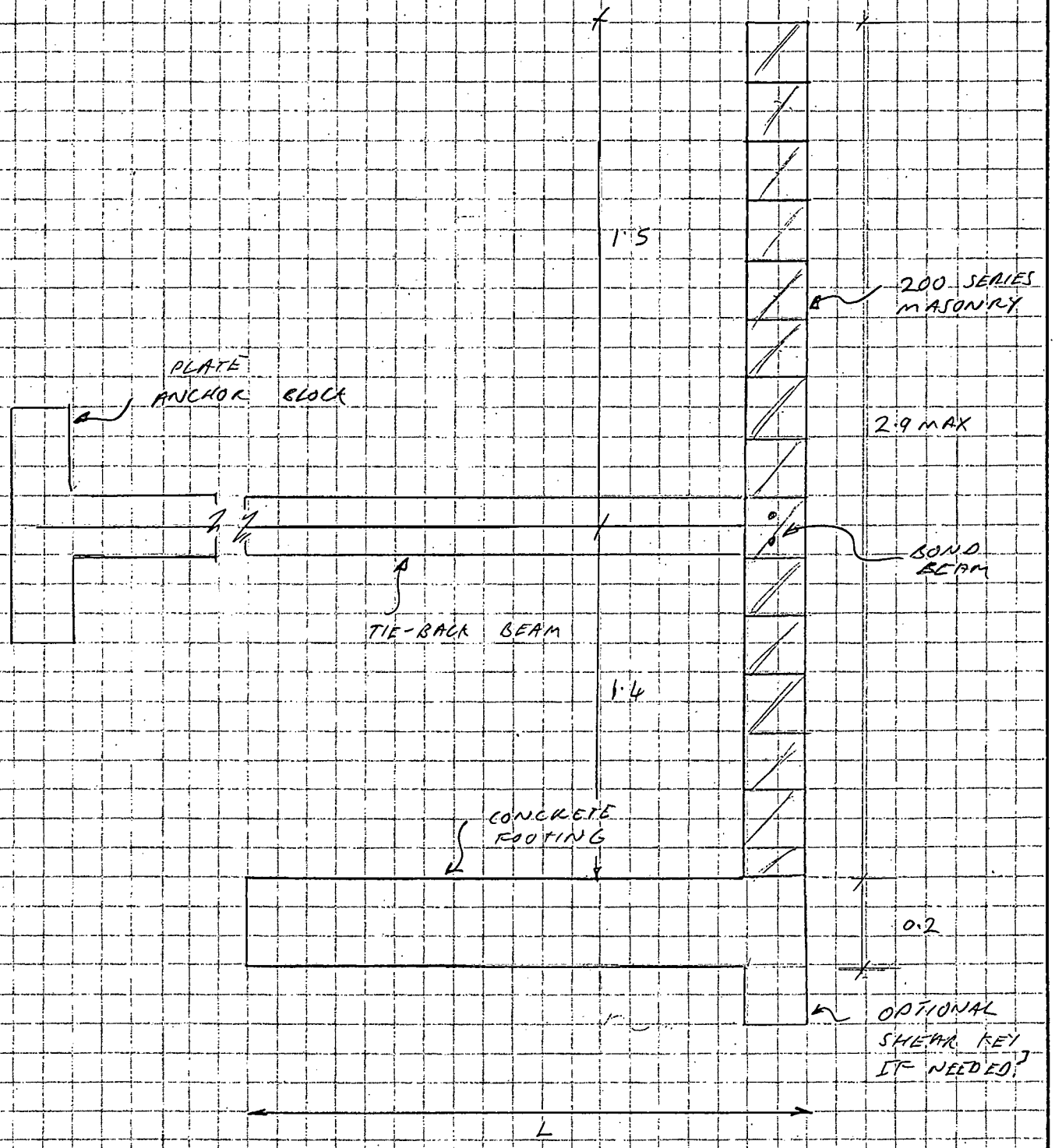
TRY FOLLOWING DESIGN LAYOUT



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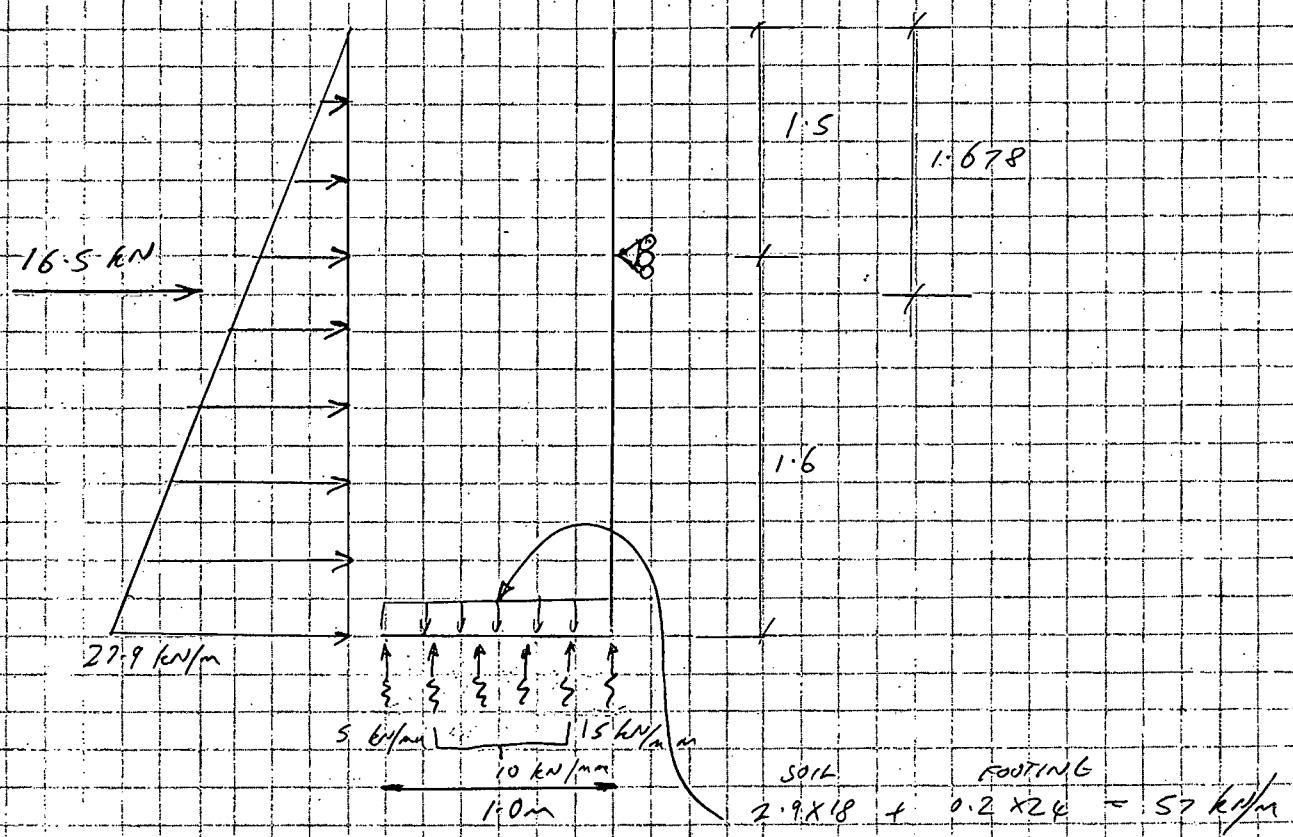
COMPUTER MODEL:



SOIL FOOTING
$2.9 \times 18 + 0.2 \times 24 = 57$ kN/m

COEFFICIENT OF SUBGRADE REACTION, $K_s = 50$ kPa/mm
FOR SANDY SOIL SAY.

CHECK SLIDING STABILITY OF BASE

SOIL FOOTING MAS WALL
$\Sigma F \downarrow = 2.9 \times 18 \times 1.0 + 0.2 \times 24 \times 1.2 + 2.9 \times 0.2 \times 23$

$= 70.36$ kN

$\Rightarrow$ FRICTIONAL RESISTANCE $= 70.36 \times \tan(2/3 \times 30)$

$= 25.60$ kN

FOR 200×200 SHEAR KEY

PASSIVE RESISTANCE $= 1/2 \times 3 \times 18 \times 0.4^2 = 4.32$ kN

$\Rightarrow$ TOTAL RESISTANCE $= 25.6 + 4.32 = 29.92$ kN

$\rightarrow$ $FS = \frac{29.92}{20.19} = 1.48 < 1.5$ BUT CLOSE ENOUGH O.K

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CHECK BEARING PRESSURE

COEFF OF SUBGRADE REACTION

MAX FOUNDATION IMPRESSION = 0.953 mm

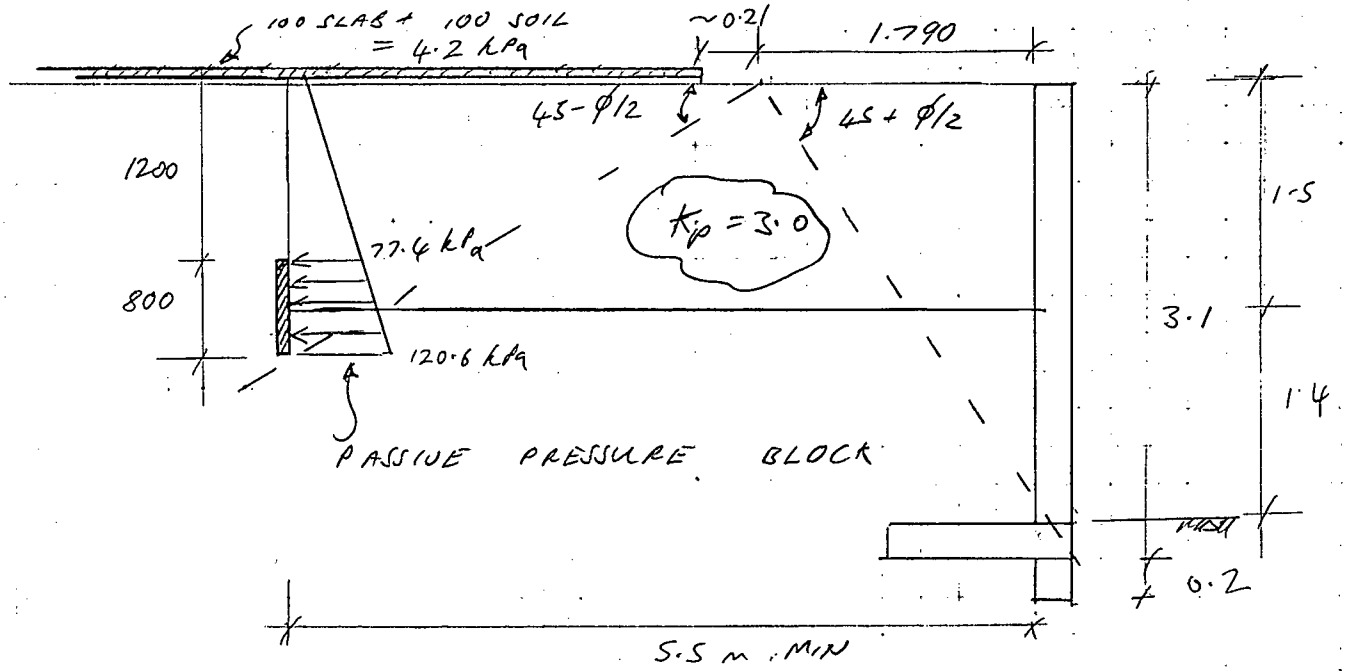
⇒ MAX BEARING PRESSURE = 0.953 × 50 kPa/mm

= 48.0 kPa < 100.0 kPa O.K.

DESIGN TIEBACK

WORKING TIE-BACK FORCE /m = 39.6 kN

⇒ FOR F.S = 2.0 REQUIRE CAPACITY OF 79.2 kN



⇒ PASSIVE RESISTANCE /m = $\left(\frac{77.4 + 120.6}{2}\right) \times 0.8$

= 79.2 kN O.K.

FOR TIES @ 1200 CRS:

ULTIMATE TIE FORCE = 1.7 × 39.6 × 1.2 = 80.8 kN

CAPACITY OF HD 16 = $\frac{\pi}{4} \times 0.016^2 \times 430 \times 10^3$

= 86.5 kN > 80.8 kN O.K

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REVIEW: $a = \frac{603\times10^{-6}\times430\times10^{3}}{0.85\times17.5\times10^{3}\times0.6} = 0.029\,m$

$\Rightarrow M_u = 0.9\times603\times10^{-6}\times430\times10^{3}\times(0.125-0.029/2)$

$= 25.8\ kNm < 25.9\ kNm$ BUT CLOSE ENOUGH

$\Rightarrow$ MOVE VERTICAL BARS INTO CENTRE MORE

$\rightarrow d = 0.125 + 0.016/2 + 0.012/2$

$= 0.139\ m$

$\Rightarrow M_u = 0.9\times377\times10^{-6}\times300\times10^{3}\times(0.139-0.076/2)$

$= 13.8\ kNm > 13.5$ O.K

DESIGN WALL REINFORCEMENT

FROM COMPUTER PRINTOUT — $M_{MAX} = 5.1\ kNm$

$\Rightarrow$ MAX $M_u = 1.7\times5.1 = 8.67\ kNm$

$\Rightarrow$ A_s REQ'D $= \frac{8.67}{0.85\times300\times10^{3}\times0.9\times0.13} = 290\ mm^2$

$\Rightarrow$ 12 ϕ @ 400

REVIEW $a = \frac{283\times10^{-6}\times300\times10^{3}}{0.85\times8\times10^{3}\times1.0} = 0.0125\ m$

$\Rightarrow M_u = 0.85\times283\times10^{-6}\times300\times10^{3}\times(0.13-0.0125/2)$

$= 8.9\ kNm$ O.K

CHECK SHEAR:

V_u MAX $= 1.7\times29.4 = 50.0\ kN$

$\Rightarrow v_u = \frac{0.050}{0.8\times1.0\times0.13} = 0.48\ MPa > 0.30\ MPa$ N.G.

$\Rightarrow$ REANALYSE LINE LOAD AS A DISTRIBUTED LOAD AS A POINT LOAD IS INCORRECTLY REPRESENTING THE SITUATION AND IS CAUSING A HIGH ZONE OF SHEAR.

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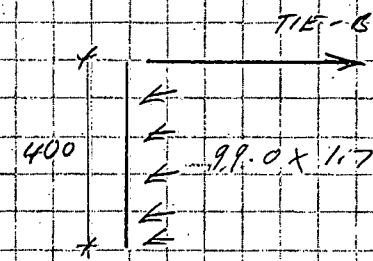
DESIGN ANCHOR BLOCK

FLEXURE ACROSS ANCHOR BLOCK

AVERAGE PRESSURE ACROSS BLOCK = $\frac{77.4 + 120.6}{2} = 99 kPa$



$\Rightarrow M_u$ MAX $= 168.3 \times \frac{0.4^2}{2} = 13.5$ kNm/m

$\Rightarrow$ FOR 250 THICK BLOCK

$A_s = \frac{13.5}{0.9 \times 300 \times 10^3 \times (0.9 \times 0.165)} = 336 mm^2/m$

$\Rightarrow$ D12 @ 300 CRS

REVIEW: $a = \frac{377 \times 10^{-6} \times 300 \times 10^3}{0.85 \times 17.5 \times 10^3 \times 1.0} = 0.0076 m$

$\Rightarrow M_u = 0.9 \times 377 \times 10^{-6} \times 300 \times 10^3 \times (0.165 - \frac{0.0076}{2})$

$= 16.4$ kNm $>$ 13.5 kN/m O.K

FLEXULE ALONG ANCHOR BLOCK BETWEEN TIES

FOR CONTINUOUS ANCHOR BLOCK BEAM

M_u MAX $= 0.107 \times w \times l^2$ STEEL DESIGNER MANUAL

$= 0.107 \times 168.3 \times 1.2^2$

$= 25.9$ kNm

$\Rightarrow A_s = \frac{25.9}{0.9 \times 300 \times 10^3 \times 0.9 \times 0.125}$ STEEL MID-DEPTH

$= 853 mm^2/m$ OR $595 mm^2/m$ FOR HIGH YEILD

$\Rightarrow$ 5-H016

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BY M·W·D "RETAINING WALL DESIGN NOTES".

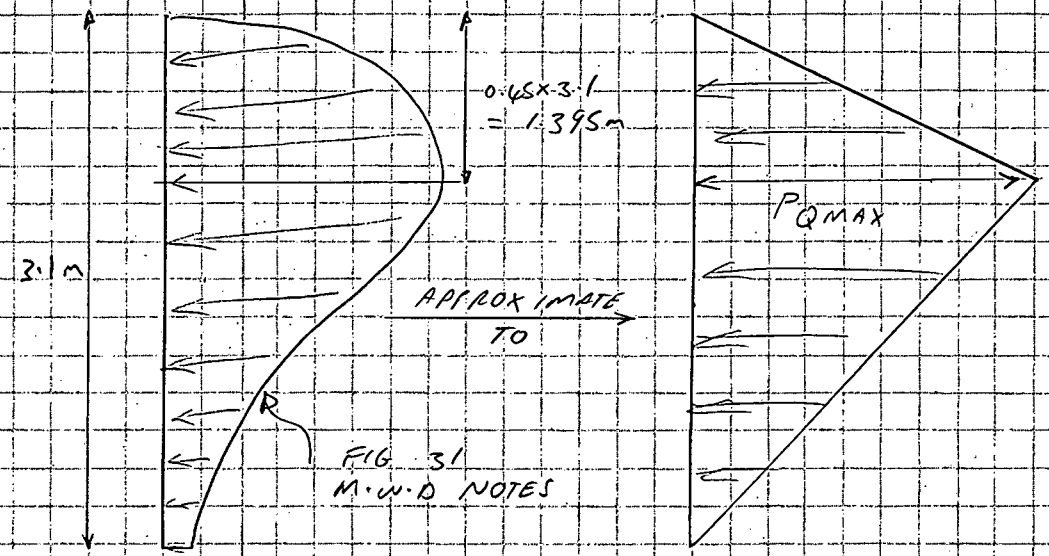

FIG 31
M·W·D NOTES

TOTAL THRUST = 16·5 kN (pg 3)

$\Rightarrow$ $P_{QMAX} = \frac{2 \times 16.5}{3.1} = 10.65$ kN/m

NOW REANALYSE BY COMPUTER:

$M_u = 1.7 \times 9.4 = 15.98$ kNm @ d OUT FROM FACE

$V_u = 1.7 \times 16.1 = 27.37$ kN $\Rightarrow$ $v_c = \frac{0.02737}{0.8 \times 1.0 \times 0.13}$

$= 0.26$ MPa
TOO GREAT FOR GRADE B BUT O·K FOR GRADE A

REDESIGN FLEXURAL STEEL:

A_s REQ'D $= \frac{15.98}{0.85 \times 300 \times 10^3 \times 0.9 \times 0.13} = 536 \text{ mm}^2/\text{m}$

$\Rightarrow$ 016's @ 400 CRS

REVIEW: $a = \frac{503 \times 10^{-6} \times 300 \times 10^3}{0.85 \times 8 \times 10^3 \times 1.0} = 0.022$ m

$\Rightarrow$ $M_u = 0.85 \times 503 \times 10^{-6} \times 300 \times 10^3 \times (0.13 - 0.022/2)$

$= 15.3$ kNm $\Rightarrow$ 4% UNDER CAPACITY

$\Rightarrow$ USE HO 16's @ 400 CRS

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DESIGN BOND BEAM TO TRANSFER TIE-BACK LOADS TO WALL BETWEEN TIE-BACKS

ULTIMATE U.D.L TO BOND BEAM = 1.7×39.6 kN/m
$= 67.32$ kN/m

FOR TIE BACKS @ 1.2m CRS OF CONTINUOUS BEAM

MAX $M_u = 0.107 \times w \times l^2$ BY "STEEL DESIGNERS"

$= 0.107 \times 67.32 \times 1.2^2 = 10.37$ kNm

$\Rightarrow$ A_s REQ $= \dfrac{10.37}{0.85 \times 430 \times 10^3 \times 0.9 \times 0.095}$ ← CENTRAL STEEL

$= 332$ mm² $\rightarrow$ 2/HD16

REVIEW: $a = \dfrac{402 \times 10^{-6} \times 430 \times 10^3}{0.85 \times 8 \times 10^3 \times 0.2} = 0.127$ m $> d$ N.G

$\Rightarrow$ DISTRIBUTE OVER 3 BLOCKS LIKE T-BEAM EFFECT

$\Rightarrow a = 0.2/0.6 \times 0.127 = 0.042$ m

$\Rightarrow M_u = 0.85 \times 402 \times 10^{-6} \times 430 \times 10^3 \times (0.095 - 0.042/2)$

$= 10.85$ kNm $>$ 10.37 kNm O.K

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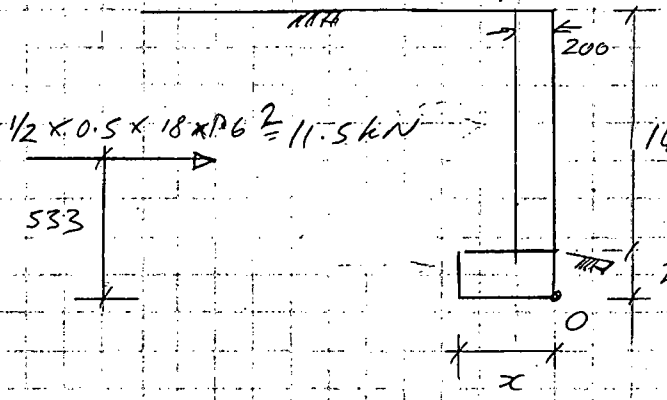
DESIGN WALL SECTION FOR 1.4m MAX RETAINED HEIGHT

THRUST FROM LINE LOAD ACTS TOO LOW TO EFFECT THE WALL
⇒ DISREGARD LINE LOAD.



$M_{OT} = 0.533 \times 11.5$

$= 6.13$ kNm

FOR O/T ABOUT O, FIND x FOR F.S = 2.0

TRY $x = 800$

⇒ O/T RESISTANCE = $1.4 \times 0.2 \times 23$ kN/m³ (MASONRY) $\times \frac{0.2}{2}$

+ 0.2×24 (FOOTING) $\times \frac{0.8^2}{2}$

+ $1.4 \times 0.6 \times 18$ kN/m³ (BACKFILL) $\times 0.5$

= 9.74 kNm ⇒ F.S = 1.6 O.K.

SLIDING : RESISTANCE CHECK

$\Sigma F_H = 25.4$ kN

⇒ BASE FRICTION = $25.4 \times \tan(2/3 \times 30) = 9.2$ kN

PASSIVE RESISTANCE = $1/2 \times 3 \times 18 \times 0.2^2$

$= 1.08$ kN

⇒ TOTAL = $1.08 + 9.2 = 10.3$ kN

⇒ EXTEND FOOTING OUT BACK TO PICK UP MORE SOIL WEIGHT AND THUS INCREASE FRICTION

TRY $x = 1200$ ⇒ $\Sigma F_H = 37.4$ kN

⇒ BASE FRICTION = $37.4 \times \tan(2/3 \times 30) = 13.6$ kN

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TRY 200 x 200 KEY ⇒ PASSIVE RESISTANCE = $\frac{1}{2} \times 3 \times 18 \times 0.4^2$

= 4.32 kN

⇒ TOTAL = 13.61 + 4.32 = 17.93 kN

⇒ F.S = $\frac{17.93}{11.5}$ = 1.56 > 1.5 O.K.

$M_{u\,MAX}$ = 11.5 kN × 0.333 × 1.7 = 6.5 kNm < 8.9 kNm

ϕP_y SC

⇒ D12's @ 400

O.K.

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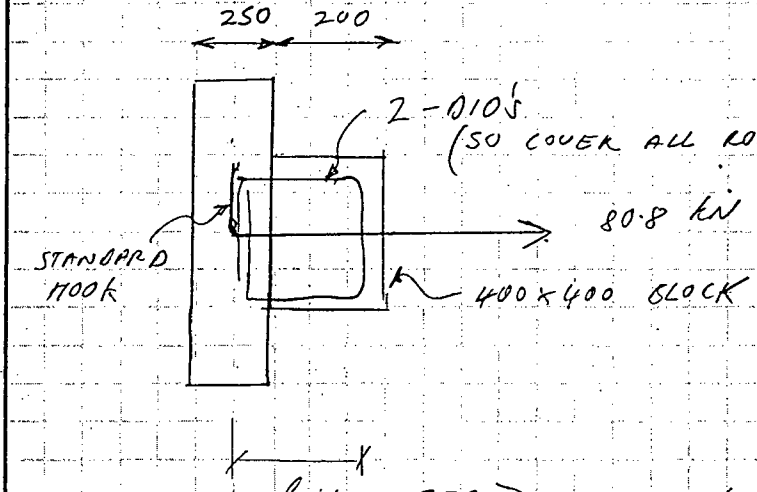
DESIGN ANCHORAGE BLOCKS FOR TIE-BACKS

CONCRETE TO CONCRETE



$$\ell_{Ld} = \frac{66 \times 16}{\sqrt{17.5}} \times \frac{430}{300} \times 0.7$$

$$= 253 \text{ mm}$$

ℓ_{hb} = 275 > 253 O·K.

TENSILE CAPACITY OF A D10 = $78 \times 10^{-6} \times 300 \times 10^{3}$

= 23.4 kN

⇒ 4 N° REQ'D.

FOR A D10, $\ell_{Ld} = \frac{66 \times 10}{\sqrt{17.5}} \times 0.7 = 110$ mm O·K FOR ABOVE

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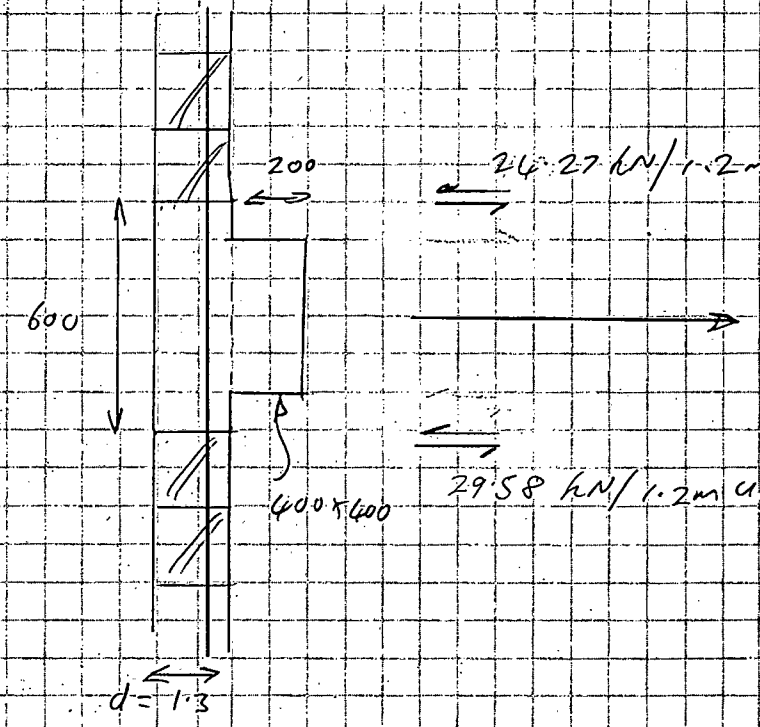
CONCRETE TO MASONRY



CHECK MASONRY / CONC INTERFACE SHEAR

$$\Rightarrow \quad N_c' = \frac{0.02958}{0.8 \times 1.2 \times 0.13} = 0.237 \text{ MPa} \quad < 0.24 \text{ MPa}$$

O K FOR GRADE 8.

CHECK SHEAR ACROSS CONCRETE 400 × 400 ☑

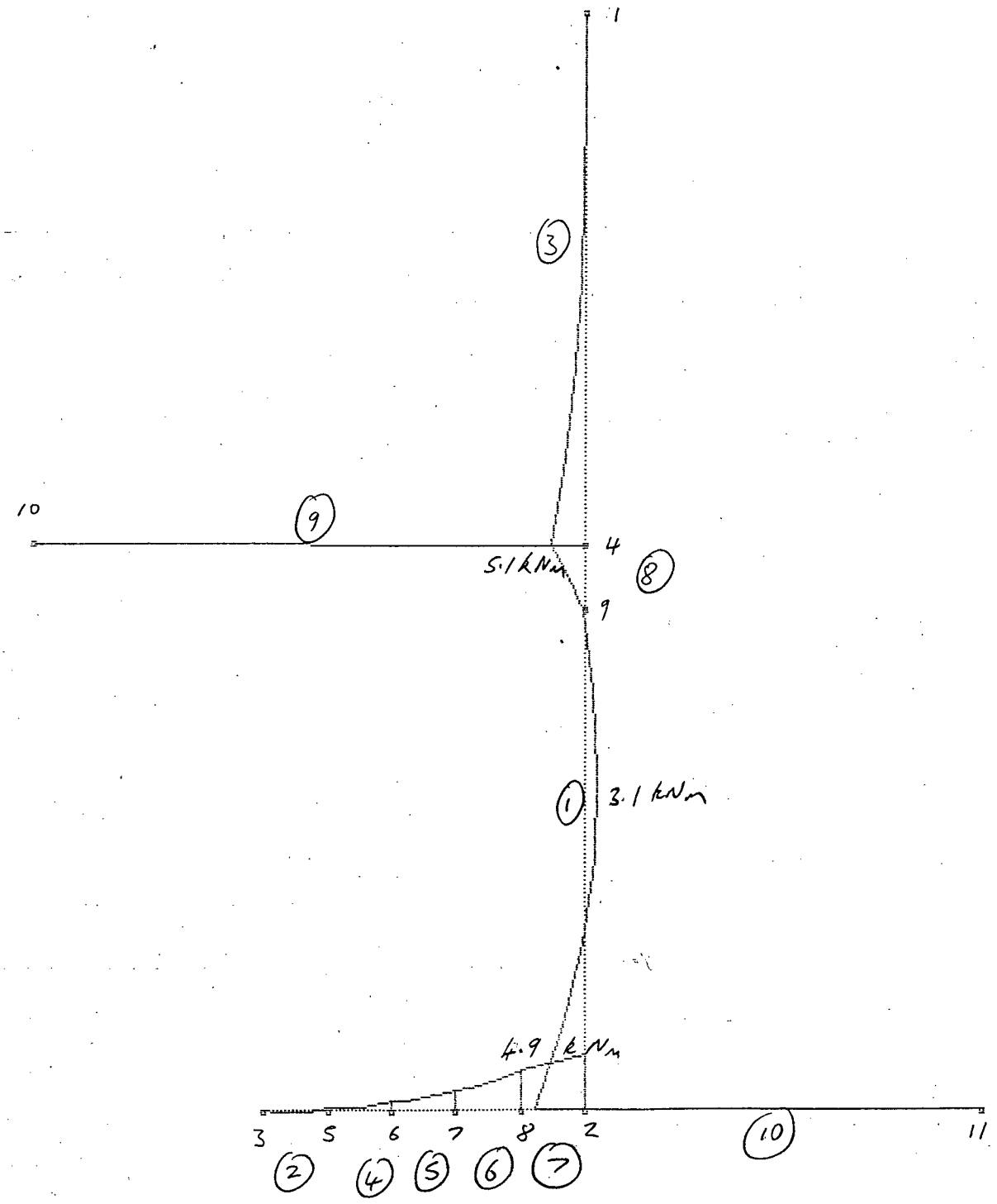
$$N_c' = \frac{0.0808}{0.85 \times 6 \times 0.4 \times 0.13} = 0.46 \text{ MPa}$$

$$N_c = \left(0.07 + \frac{20 \times 201}{400 \times 130}\right)\sqrt{f_c'} = 0.1086\sqrt{f_c'}$$

$$= 0.49 \text{ MPa}$$

O K FOR $f_c' = 20$ MPa

POINT LOAD FROM LINE LOAD



EARTH PRESSURE Moment(kNm)

Joint Coordinates (m)

Joint	x	y
1	0.000	0.000
2	0.000	-3.100
3	-1.000	-3.100
4	0.000	-1.500
5	-0.800	-3.100
6	-0.600	-3.100
7	-0.400	-3.100
8	-0.200	-3.100
9	0.000	-1.678
10	-1.718	-1.495
11	1.235	-3.100

Member Geometry (m,deg.)

Member	Joint 1	Joint 2	Length	Slope
1	2	9	1.422	90.000
2	3	5	0.200	0.000
3	4	1	1.500	90.000
4	5	6	0.200	0.000
5	6	7	0.200	0.000
6	7	8	0.200	0.000
7	8	2	0.200	0.000
8	9	4	0.178	90.000
9	10	4	1.718	-0.179
10	2	11	1.235	0.000

Member Connections and Types

Member	End Types	Group	Name	Orientation
1	Rigid/Rigid	Custom	200 BLOCK	x-x
2	Rigid/Rigid	Custom	300 THK CONC	x-x
3	Rigid/Rigid	Custom	200 BLOCK	x-x
4	Rigid/Rigid	Custom	300 THK CONC	x-x
5	Rigid/Rigid	Custom	300 THK CONC	x-x
6	Rigid/Rigid	Custom	300 THK CONC	x-x
7	Rigid/Rigid	Custom	300 THK CONC	x-x
8	Rigid/Rigid	Custom	200 BLOCK	x-x
9	Rigid/Pinned	UB	760UB244	x-x
10	Pinned/Rigid	UB	760UB220	x-x

Section Properties

Section	Number	Length	A	Ix	Iy	E
			sq. mm	mm^4x10E6	mm^4x10E6	MPa
760UB244	1	1.718	31099.999	3020.000	105.000	2.000e+5
760UB220	1	1.235	27999.999	2700.000	93.100	2.000e+5
200 BLOCK	3	3.100	189999.998	572.000	0.000	2.500e+4
300 THK CONC	5	1.000	300000.012	2250.000	0.000	1.966e+4

Total Mass (kg) 690.754

Joint Restraints and Prescribed Displacements (mm,radE-3)

Joint	x Disp	y Disp	Rotation
10	0.000	0.000	****
11	0.000	0.000	****

Joint Springs (kN/mm,kN/radE-3)

Joint	Kx	Ky	Ktheta
5	0.0	10.000	0.0
6	0.0	10.000	0.0
7	0.0	10.000	0.0
8	0.0	10.000	0.0
3	0.0	5.000	0.0
2	0.0	15.000	0.0

Joint Loads(kN,kNm) EARTH PRESSURE

Joint	Fx	Fy	Mz
9	16.500	0.0	0.0

Member Loads (kN,kNm) EARTH PRESSURE

Member	Load Type	Left Dist	Right Dist	Left Mag	Right Mag
3	Ws	0.000	0.000	-13.500	-0.000
8	Ws	0.000	0.000	-15.100	-13.500
1	Ws	0.000	0.000	-27.900	-15.100
2	Ws	0.000	0.000	-57.000	-57.000
4	Ws	0.000	0.000	-57.000	-57.000
5	Ws	0.000	0.000	-57.000	-57.000
6	Ws	0.000	0.000	-57.000	-57.000
7	Ws	0.000	0.000	-57.000	-57.000

There are no thermal loads in EARTH PRESSURE

Joint Displacements (mm,radE-3)Joint Reactions (kN,kNm)

		Displacements			Reactions		
Joint	Load Case	x Disp	y Disp	Rotation	Rx	Ry	Mz
1	RTH PRESSURE	0.090	-0.953	-0.081	0.000	0.000	0.000
2	RTH PRESSURE	0.004	-0.953	-0.034	-0.000	14.297	0.000
3	RTH PRESSURE	0.004	-0.945	-0.000	-0.000	4.727	0.000
4	RTH PRESSURE	0.008	-0.953	0.052	-0.000	0.000	-0.000
5	RTH PRESSURE	0.004	-0.945	-0.000	0.000	9.454	0.000
6	RTH PRESSURE	0.004	-0.945	-0.001	0.000	9.455	0.000
7	RTH PRESSURE	0.004	-0.946	-0.006	0.000	9.461	0.000
8	RTH PRESSURE	0.004	-0.948	-0.016	0.000	9.483	0.000
9	RTH PRESSURE	0.021	-0.953	0.083	0.000	0.000	-0.000
10	RTH PRESSURE	0.000	0.000	-0.555	-39.557	0.123	-0.000
11	RTH PRESSURE	0.000	0.000	0.772	-20.186	-0.000	0.000

Sum of Reactions (kN,kNm) EARTH PRESSURE

ΣFx	-59.743
ΣFy	57.000
ΣMz	-145.557

Member Actions (kN,kNm)

Member	Load Case	Joint 1 Axial	Joint 1 Shear	Joint 1 Moment	Joint 2 Axial	Joint 2 Shear	Joint 2 Moment
1	RTH PRESSURE	-0.123	20.186	4.856	0.123	10.387	-0.046
2	RTH PRESSURE	-0.000	4.727	0.000	0.000	6.673	-0.195
3	RTH PRESSURE	-0.000	10.125	5.063	0.000	-0.000	0.000
4	RTH PRESSURE	-0.000	2.780	0.195	0.000	8.620	-0.779
5	RTH PRESSURE	-0.000	0.835	0.779	0.000	10.565	-1.752
6	RTH PRESSURE	-0.000	-1.104	1.752	0.000	12.504	-3.112
7	RTH PRESSURE	-0.000	-3.021	3.112	0.000	14.421	-4.856
8	RTH PRESSURE	-0.123	-26.887	0.046	0.123	29.432	-5.063
9	RTH PRESSURE	-39.557	-0.000	-0.000	39.557	0.000	0.000
10	RTH PRESSURE	20.186	0.000	0.000	-20.186	-0.000	0.000

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ENGINEERS · VALUERS · PROPERTY CONSULTANTS
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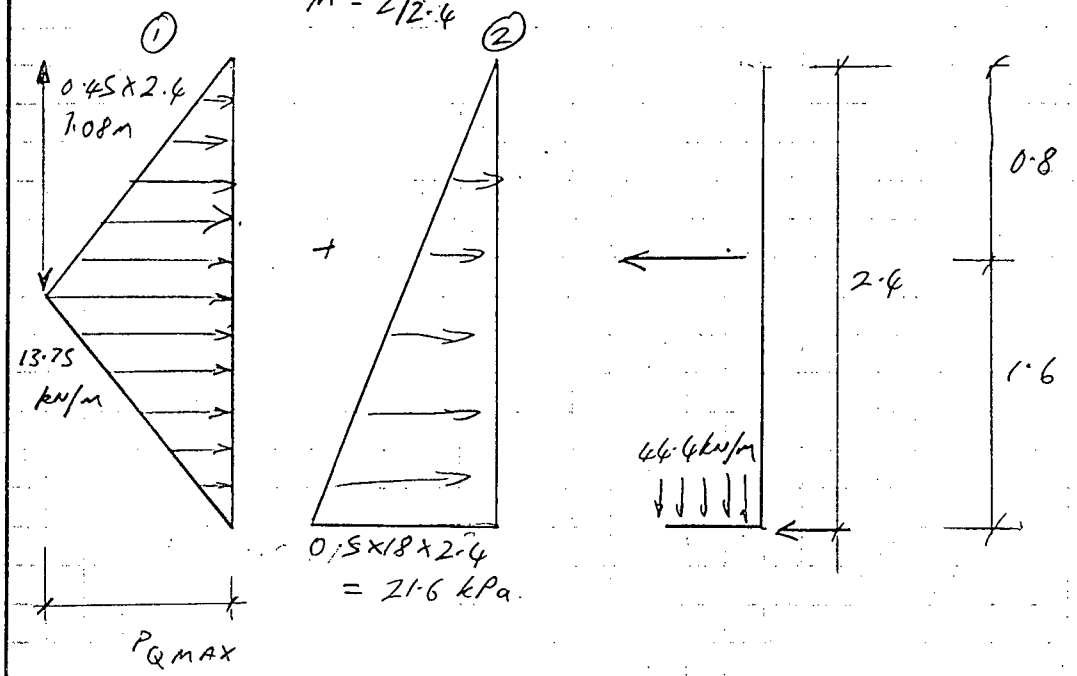
Client:

Subject:

Job No.	Page
3772	10
Date	By

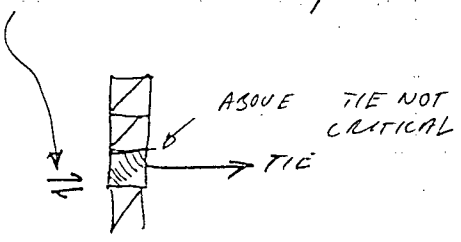
TRY 2200 TOTAL RETAINED HEIGHT:



$$P_{QMAX} = \frac{2 \times 16.5}{2.4} \rightarrow 13.75 \text{ kN/m}$$

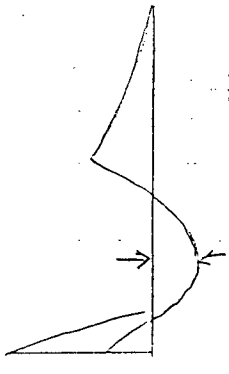
CHECK SHEAR @ CRITICAL REGION ABOVE AND BELOW TIE.

$V_u = 1.7 \times 14.29 = 24.3 \text{ kN/m} \Rightarrow v_i = \frac{0.0243}{0.8 \times 0.13 \times 1.0}$



$= 0.233 \text{ MPa}$

$< 0.29 \text{ MPa}$ O.K FOR GRADE 6



$M_u = 1.7 \times 4.24$
$= 7.2 \text{ kNm} < 8.6 \text{ kNm}$ CAPACITY O.K.

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Client:

Subject:

Job No.	Page
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Date	**By**

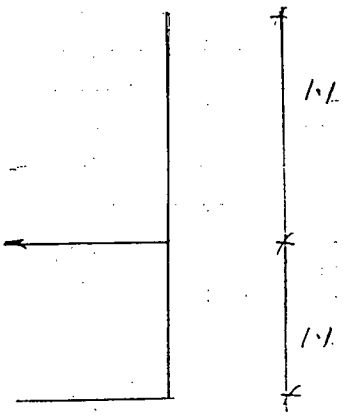
FOR 2.0m HIGH WALL MODELLED SIMILAR TO ABOVE

-VE MOMENT IN LOWER SPAN EXCEEDS CAPACITY

⇒ N.G.

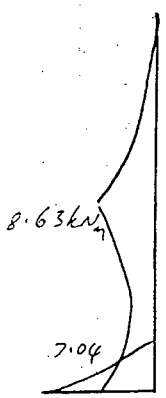
TRY 2.0m HIGH WALL WITH TIE @ 1.1m FROM TOP.

⇒ MODEL AS:

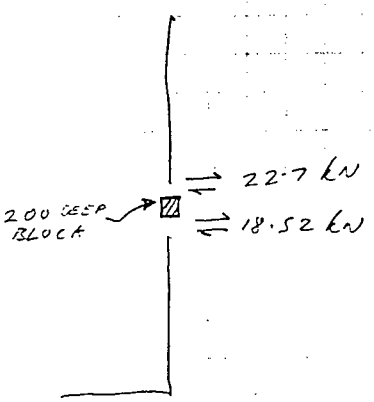


BY COMPUTER ANALYSIS:

M_u:



V_u:



$$a = \frac{503\times10^{-6}\times 430\times10^{3}}{0.85\times8\times10^{3}\times1.0} = 0.032\ m$$

⇒ M_u^{-ve} CAPACITY $= 0.85\times 503\times10^{-6}\times430\times10^{3}\times(0.13 - 0.032/2)$

$= 20.96\ kNm > 8.63\ kNm$ O.K.

$$\text{MAX } v_c' = \frac{0.0227}{0.8\times0.13\times1.0} = 0.22\ MPa < v_m' = 0.24\ MPa$$ O.K.

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ENGINEERS · SURVEYORS · PROPERTY CONSULTANTS
162 Wicksteed Street,
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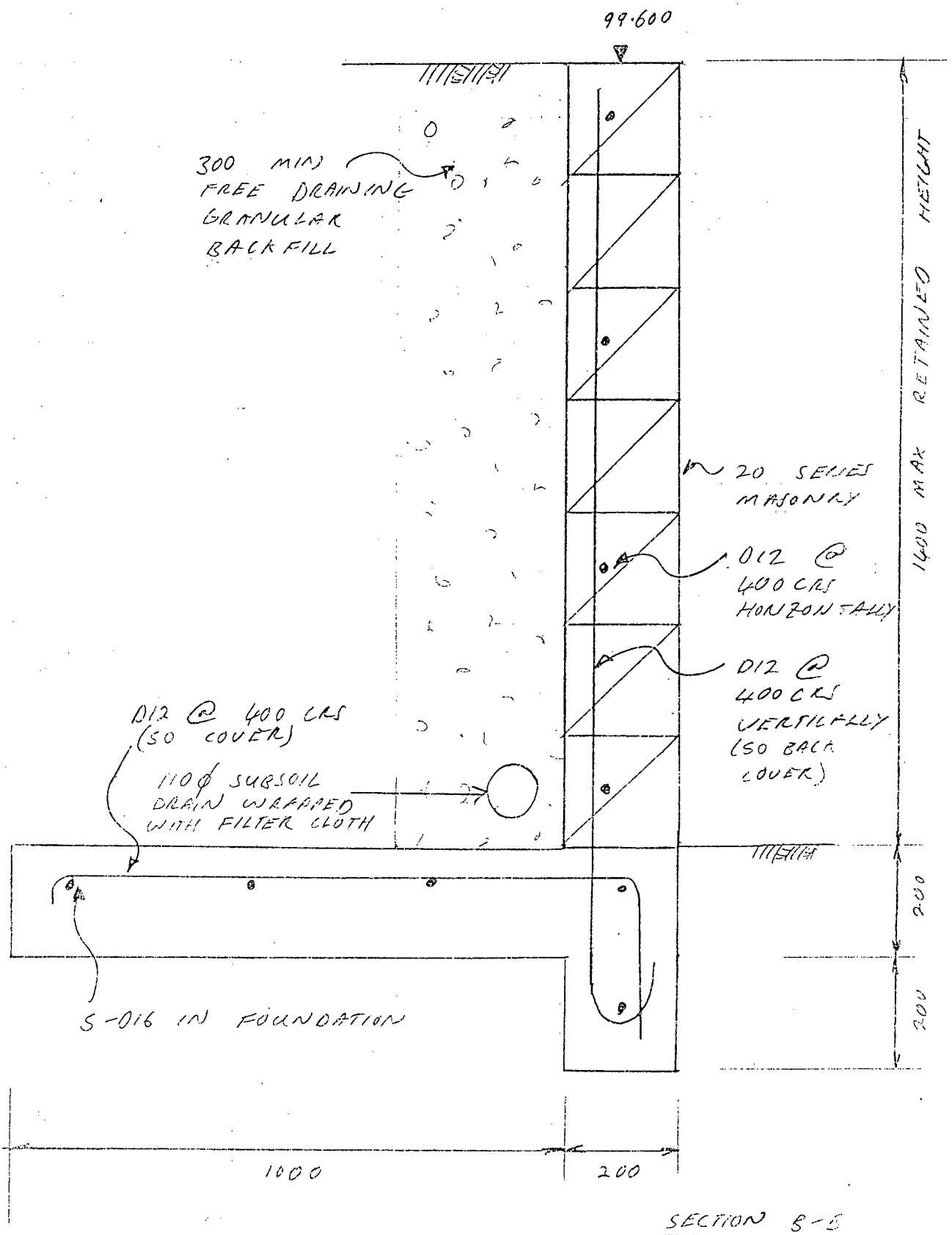
Fax (06) 345 9295

Client: DEVON HOMES

Subject: KEELTY UNITS RETAINING WALL.

Job No.	Page
3772	03
Date	By



SECTION B-B

NOTES :- THIS WALL DESIGN IS TO RETAIN A MAXIMUM HEIGHT OF 1400mm
- SEE NOTES FOR SECTION A-A ALSO

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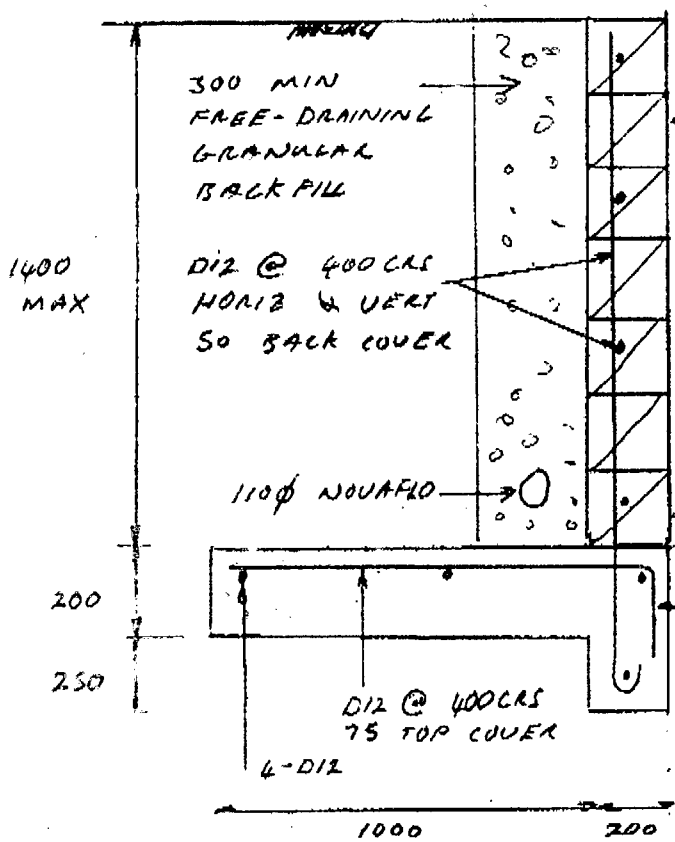
Client:

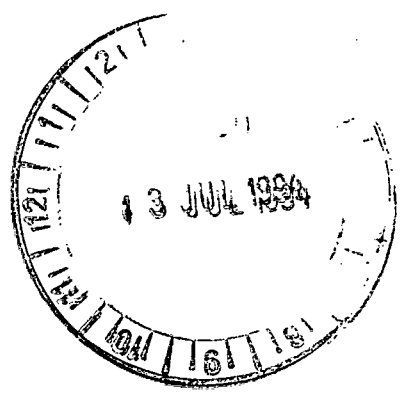
Subject:

Job No.	Page
3772	06.
Date	**By**



TO BE READ IN CONJUNCTION WITH NOTES PAGE 3772/01.

SECTION ON 1400 mm WALL



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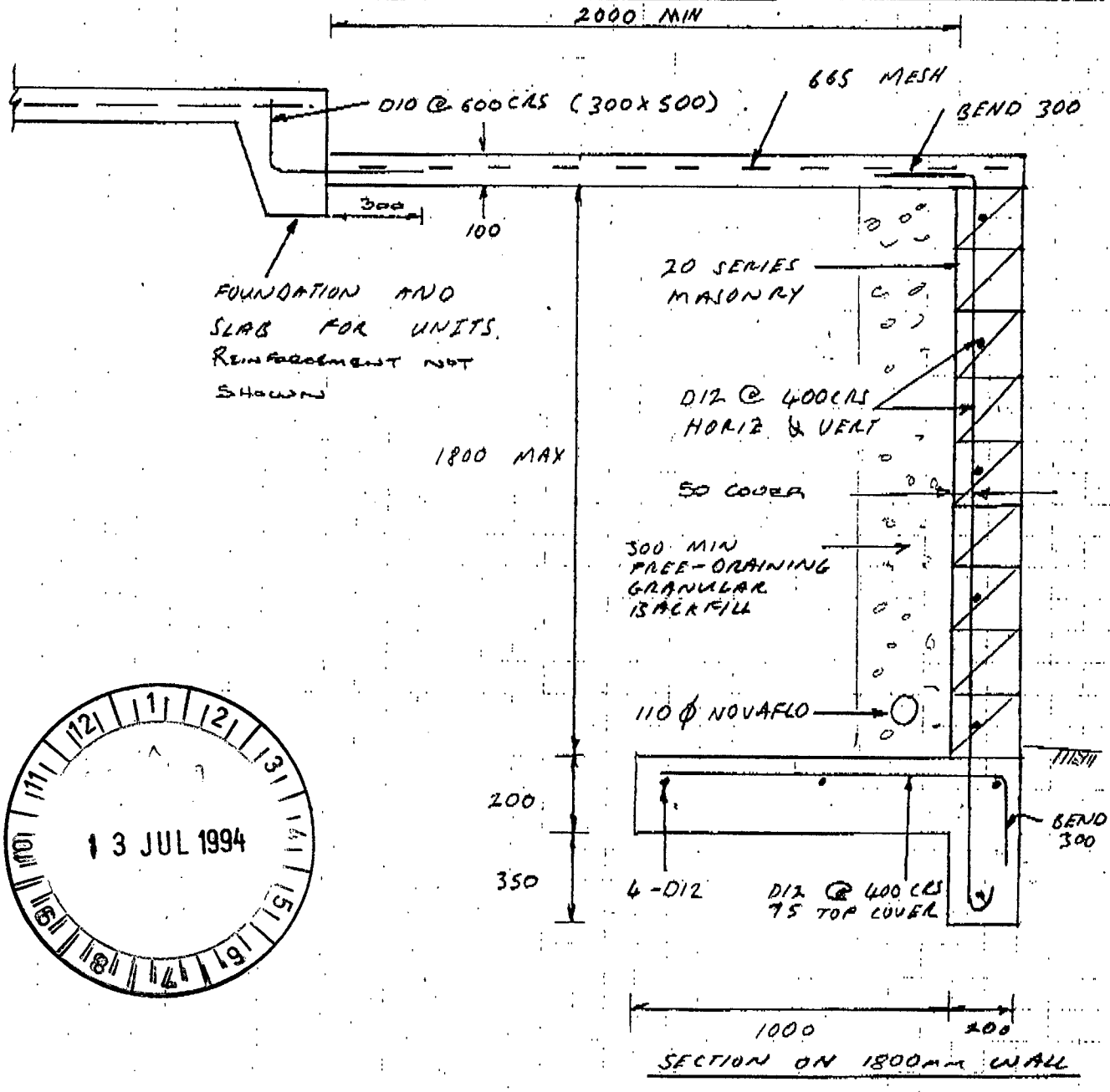
Client: DEVON HOMES		**Job No.** 3772	**Page** D5
Subject: RETAINING WALLS FOR REELTY UNITS		**Date** JULY '94	**By** D.C.T



SECTION ON 1800mm WALL

NOTES:

- ALL MASONRY CONSTRUCTION AND CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE RESPECTIVE NZ STANDARDS.
- ALL MASONRY CELLS SHALL BE FILLED WITH GROUT CONTAINING EXPANSIVE ADMIXTURE
- FOUNDATION CONCRETE SHALL HAVE A MINIMUM CRUSHING STRENGTH OF 20 MPa @ 28 DAYS.
- WALL SHALL BE PROPPED @ TOP UNTIL SLAB IS IN PLACE.
- BACKFILL SHALL BE COMPACTED WITH HAND EQUIPMENT.

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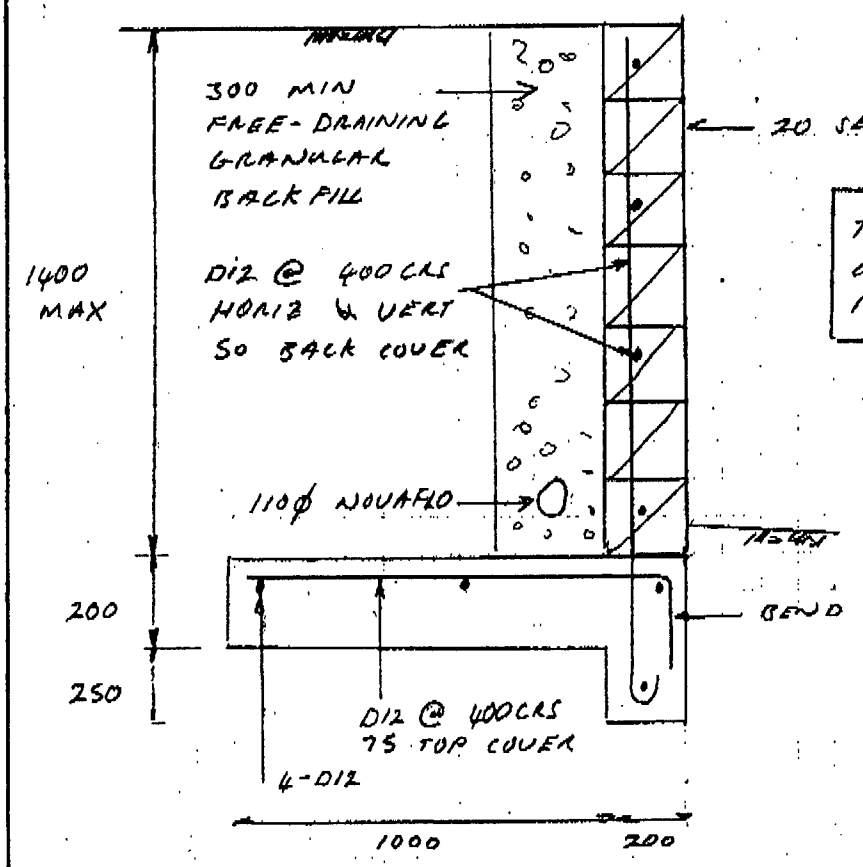
Client:

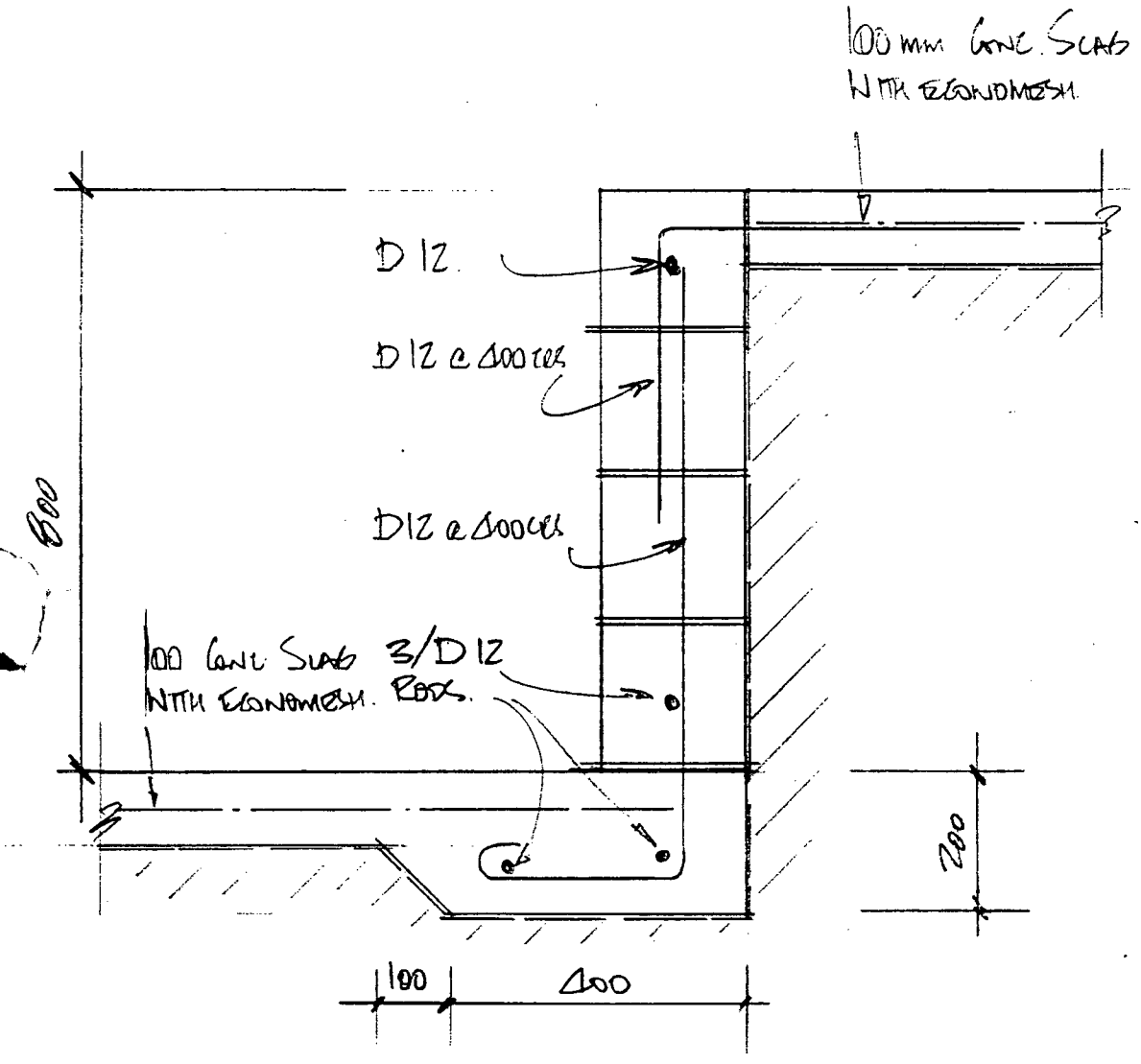
Subject:

Job No.	Page
3772	06
Date	**By**



TO BE READ IN CONJUNCTION WITH NOTES PAGE 3772/01.

SECTION ON 1400mm WALL



Floor to Floor Wall Detail
Scale: 1:10

Association Consulting Engineers of New Zealand

P.I.M. No. 7186

Building Regulation Clause (s)

PRODUCER STATEMENT - DESIGN REVIEW

(Guidance notes on the use of this form are printed on the reverse side)

ISSUED BY: ERNEST GILMORE BYCROFT *(Suitably qualified Design Professional)*

TO: DEVON HOMES *(Owner)*

IN RESPECT OF: RETAINING WALLS *(Description of Building Work)*

AT: GUM TREE RISE, ROTOKAWA *(address)*

LOT 15 **DP** **SO**

BYCROFT PETHERICK LTD *(Review Firm)* has been engaged by DEVON HOMES *(Owner)* to review the design documents for this project in respect of the requirements of Clause(s) B1 of the Building Regulations 1992. The design is for

[X] All [ ] Part only as specified in the building consent

of the building work and has been prepared by BYCROFT PETHERICK LTD *(Design Firm)* in accordance with B1/VM1 *(Verification method)* (respectively) of the approved documents issued by the Building Industry Authority and is described in BYCROFT PETHERICK LTD'S *(Design Firm)* drawings titled KEELTY UNITS RETAINING WALLS and numbered 3772/D1 TO 3772/D3.

As an independent design professional covered by a current policy of Professional Indemnity Insurance to a minimum value of $200,000, I advise that on the basis of the review I have undertaken **I BELIEVE ON REASONABLE GROUNDS** that subject to:

(i) the verification of the following design assumptions :
FOUNDING MATERIAL PROVIDES 100 KPA MINIMUM SAFE BEARING CAPACITY.

and (ii) all proprietary products meeting the requirements of the performance specification.

The drawings, specification and other documents according to which the building is proposed to be constructed comply with the relevant provisions of the building code.

..... Date: 20 MAY 1994

(Signature suitably qualified Design Professional)

BE FIPENZ
(Professional Qualifications)
162 Wicksteed Street, Wanganui

ERB Reg. No. 3418

Member ACENZ [x]

IPENZ [x]

This form to accompany Form 9 of the Building Regulations 1992 for the issue of a Code Compliance Certificate.

GUIDANCE ON USE OF PRODUCER STATEMENTS

This producer statement has been prepared by a combined task committee consisting of members of the New Zealand Institute of Architects, Institution of Professional Engineers New Zealand, Association of Consulting Engineers New Zealand, Building Officials Institute of New Zealand, New Zealand Master Builders Federation and New Zealand Contractors Federation.

Four producer statements are available and brief details on the purpose of each are as follows:

Design: Intended for use by the party responsible for the design when the territorial authority carries out a less rigorous review of the documents.

Design Review: Intended for use by a suitably qualified independent design professional where the territorial authority does not undertake an internal review and relies on the independent design professional's review to issue the building consent.

Construction: Intended for the use by the contractor of the building works where the territorial authority requires a producer statement at the completion of construction.

Construction Review: Intended for use by the design professional required by the building consent to undertake construction monitoring of the building works.

The producer statements system is intended to provide territorial authorities with reasonable grounds for the issuing of a Building Consent or Code Compliance Certificate without having to undertake rigorous design or construction checking using their own resources.

The following criteria are recommended to Territorial Authorities with respect to the use of the producer statements.

Definition of Suitably Qualified Design Professional

A suitably qualified design professional should have recognised qualifications and experience for the work undertaken and should be either:

(i) an active member of the Association of Consulting Engineers of New Zealand (ACENZ) or;
(ii) a corporate member of the Institution of Professional Engineers of New Zealand (IPENZ) having a current policy of Professional Indemnity Insurance for a sum not less than $200,000 or;
(iii) a member of the New Zealand Institute of Architects (NZIA) having a current policy of Professional Indemnity Insurance for a sum of not less than $200,000.

Design Build Contracts

If the design professional is engaged by the contractor, the territorial authority should satisfy itself that it is appropriate for the territorial authority to rely upon a producer statement from the design professional.

Consulting Services during Construction Phase

There are several levels of service which a design professional may provide during the construction phase of a project. The territorial authority is encouraged to require that the service to be provided by the design professional is appropriate for the project concerned.

Requirement to provide Producer Statement

Territorial authorities should ensure that a design professional is aware of any requirement to provide producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the design professional's engagement.

Attached Particulars

Attached particulars referred to in this producer statement refer to supplementary information appended to the producer statement.

Association Consulting Engineers of New Zealand

P.I.M. No.

Building Regulation Clause (s

PRODUCER STATEMENT - DESIGN REVIEW

(Guidance notes on the use of this form are printed on the reverse side)

ISSUED BY: ERNEST GILMORE BYCROFT *(Suitably qualified Design Professional)*

TO: DEVON HOMES *(Owner)*

IN RESPECT OF: RETAINING WALLS *(Description of Building Work)*

AT: GUM TREE RISE, ROTOKAWA *(address)*

LOT 15 **DP** **SO**

BYCROFT PETHERICK LTD *(Review Firm)* has been engaged by DEVON HOMES *(Owner)* to review the design documents for this project in respect of the requirements of Clause(s) B1 of the Building Regulations 1992. The design is for

[X] All [ ] Part only as specified in the building consent

of the building work and has been prepared by BYCROFT PETHERICK LTD *(Design Firm)* in accordance with B1/VM1 *(Verification method)* (respectively) of the approved documents issued by the Building Industry Authority and is described in BYCROFT PETHERICK LTD'S *(Design Firm)* drawings titled KEELTY UNITS RETAINING WALLS and numbered 3772/D1 TO 3772/D4.

As an independent design professional covered by a current policy of Professional Indemnity Insurance to a minimum value of $200,000, I advise that on the basis of the review I have undertaken **I BELIEVE ON REASONABLE GROUNDS** that subject to:

(i) the verification of the following design assumptions :
FOUNDING MATERIAL PROVIDES 100 KPA MINIMUM SAFE BEARING CAPACITY.

and (ii) all proprietary products meeting the requirements of the performance specification.

The drawings, specification and other documents according to which the building is proposed to be constructed comply with the relevant provisions of the building code.

.....
(Signature suitably qualified Design Professional)

Date: 20 MAY 1994

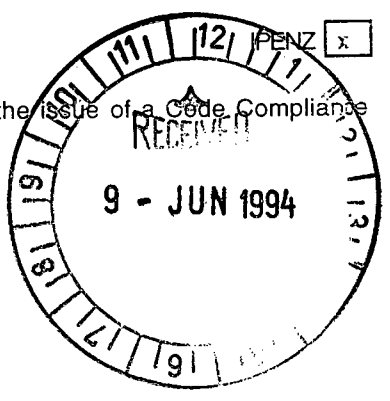
BE FIPENZ
(Professional Qualifications)
162 Wicksteed Street, Wanganui

ERB Reg. No. 3418

Member ACENZ [x]

IPENZ [x]

This form to accompany Form 9 of the Building Regulations 1992 for the issue of a Code Compliance Certificate.



Association Consulting Engineers of New Zealand

P.I.M. No.

Building Regulation Clause (s)

PRODUCER STATEMENT - DESIGN

(Guidance notes on the use of this form are printed on the reverse side)

ISSUED BY: IAN WILLIAM JOHNSON *(Suitably qualified Design Professional)*

TO: DEVON HOMES *(Owner)*

IN RESPECT OF: RETAINING WALLS *(Description of Building Work)*

AT: GUM TREE RISE, ROTOKAWA *(address)*

LOT 15 **DP** **SO**

BYCROFT PETHERICK LTD *(Design Firm)* has been engaged by DEVON HOMES *(Owner)* to provide STRUCTURAL DESIGN *(Extent of Engagement)* services in respect of the requirements of Clause(s) B1 of the Building Regulations 1992 for

[X] All [ ] Part only as specified

of the building work. The design has been prepared in accordance with B1/VM1 *(Verification method)* (respectively) of the approved documents issued by the Building Industry Authority and the work is described on BYCROFT PETHERICK LTD'S *(Design Firm)* drawings titled KEELTY UNITS RETAINING WALLS and numbered 3772/D1 TO 3772/D4.

As an independent design professional covered by a current policy of Professional Indemnity Insurance to a minimum value of $200,000, **I BELIEVE ON REASONABLE GROUNDS** that subject to:

(i) the verification of the following design assumptions :
FOUNDING MATERIAL PROVIDES 100KPA MINIMUM SAFE BEARING CAPACITY.

and (ii) all proprietary products meeting the performance specification requirements.

The drawings, specifications, and other documents according to which the building is proposed to be constructed comply with the relevant provisions of the building code.

.....
(Signature suitably qualified Design Professional)

Date: 20 MAY 1994

(Professional Qualifications)
BE MIPENZ

ERB Reg. No. 9113

Member ACENZ [X]

IPENZ [X]

This form to accompany Form 3 of the Building Regulations 1992 for the application of a Building Consent.

GUIDANCE ON USE OF PRODUCER STATEMENTS

This producer statement has been prepared by a combined task committee consisting of members of the New Zealand Institute of Architects, Institution of Professional Engineers New Zealand, Association of Consulting Engineers New Zealand, Building Officials Institute of New Zealand, New Zealand Master Builders Federation and New Zealand Contractors Federation.

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(iii) a member of the New Zealand Institute of Architects (NZIA) having a current policy of Professional Indemnity Insurance for a sum of not less than $200,000.

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If the design professional is engaged by the contractor, the territorial authority should satisfy itself that it is appropriate for the territorial authority to rely upon a producer statement from the design professional.

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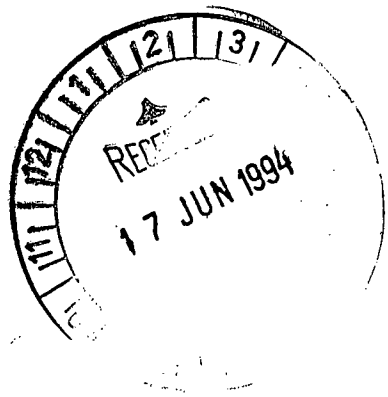
Requirement to provide Producer Statement

Territorial authorities should ensure that a design professional is aware of any requirement to provide producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the design professional's engagement.

Attached Particulars

Attached particulars referred to in this producer statement refer to supplementary information appended to the producer statement.

PLACEMAKERS MANUFACTURING
59A Wilson St., P.O.Box 319, Wanganui.
Ph (06) 3455559, Fax (06) 3455877



**** COUNCIL DETAILS ****

JOB REFERENCE: REU-KEEL
CLIENT: Reuters Construction

JOB: Keelty
ADDRESS: "Keelty / Johnson House"
Gumtree Rise

JOB DETAILS:

Roof Pitch:	28.00 deg	Truss Centres:	900 mm
Roof Load -Live:	0.250 kPa		
Roof Material:	Light	Ceiling Material:	Standard
TC Restraint Centres:	1200 mm	BC Restraint Centres:	600 mm
Wind Area:	High	Design Wind Speed:	36.0 m/s
Ext Pressure Coef:	-0.90	Int Pressure Coef:	0.30

The trusses covered by these job details have been designed using the Gangnail computer program MiTek 2000, to the requirements of Clause B1 of the Building Regulations 1992, inaccordance with NZS 4203, NZS 3604 & TPI 90.

These trusses should be fabricated and erected in accordance with the Gang-Nail nanual. Proper erection bracing must be installed to hold the components true and plumb and in a safe condition until permanent bracing is fixed. All permanent bracing and fixing must be installed before loads are applied.

PLACEMAKERS MANUFACTURING, if awarded this job, confirm that they will manufacture these trusses in accordance with the Building Regulations 1992, inaccordance with NZS 4203, NZS 3604 & TPI 90.

Signed _____

Ross Bennett

FACSIMILE COVER PAGE

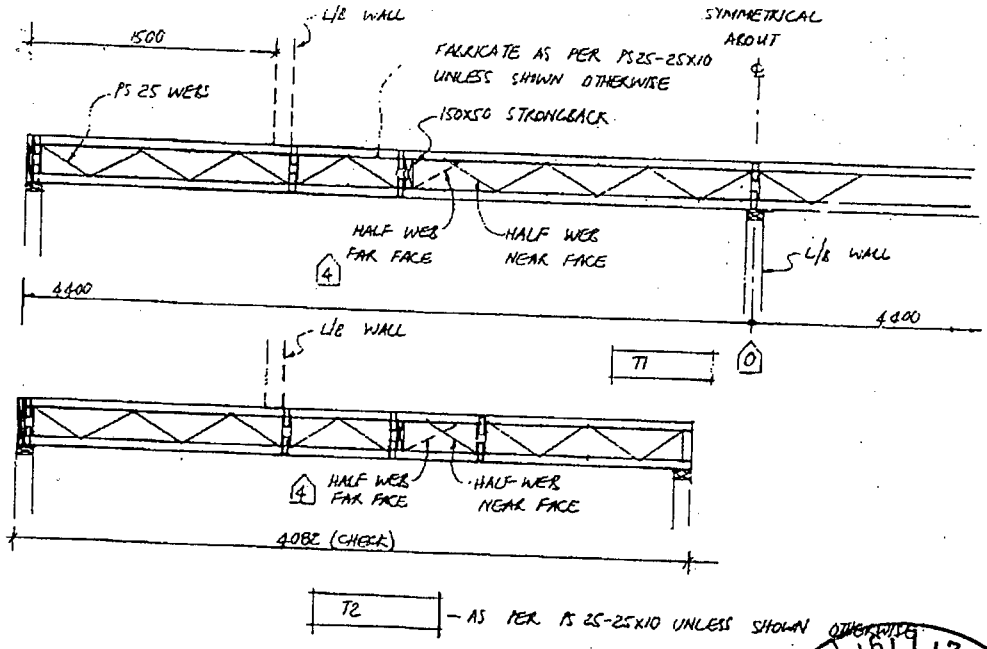
To:
From : Ross Bennett
Pages (including cover): 2

Time: 12:53:04
Date: 17/06/94

Attn: Wanganui District Council

Truss Certificate for the "Keelty / Johnson Residence" , Gumtree Rise.
Builder - Reuters Construction

Regards
Ross Bennett



GANG-NAIL - LUMBERLOK
TIMBER ENGINEERING CONSULTANTS

OWNER DEVON HOMES - KEELTY RESIDENCE
JOB DESCRIPTION 11 GUM TREE RISE
DRAWING TRUSS DETAILS
CLIENT
DRAWN A.V
DATE 17/6/94
CHECKED
DRAWING No. 6288

FACSIMILE COVER PAGE

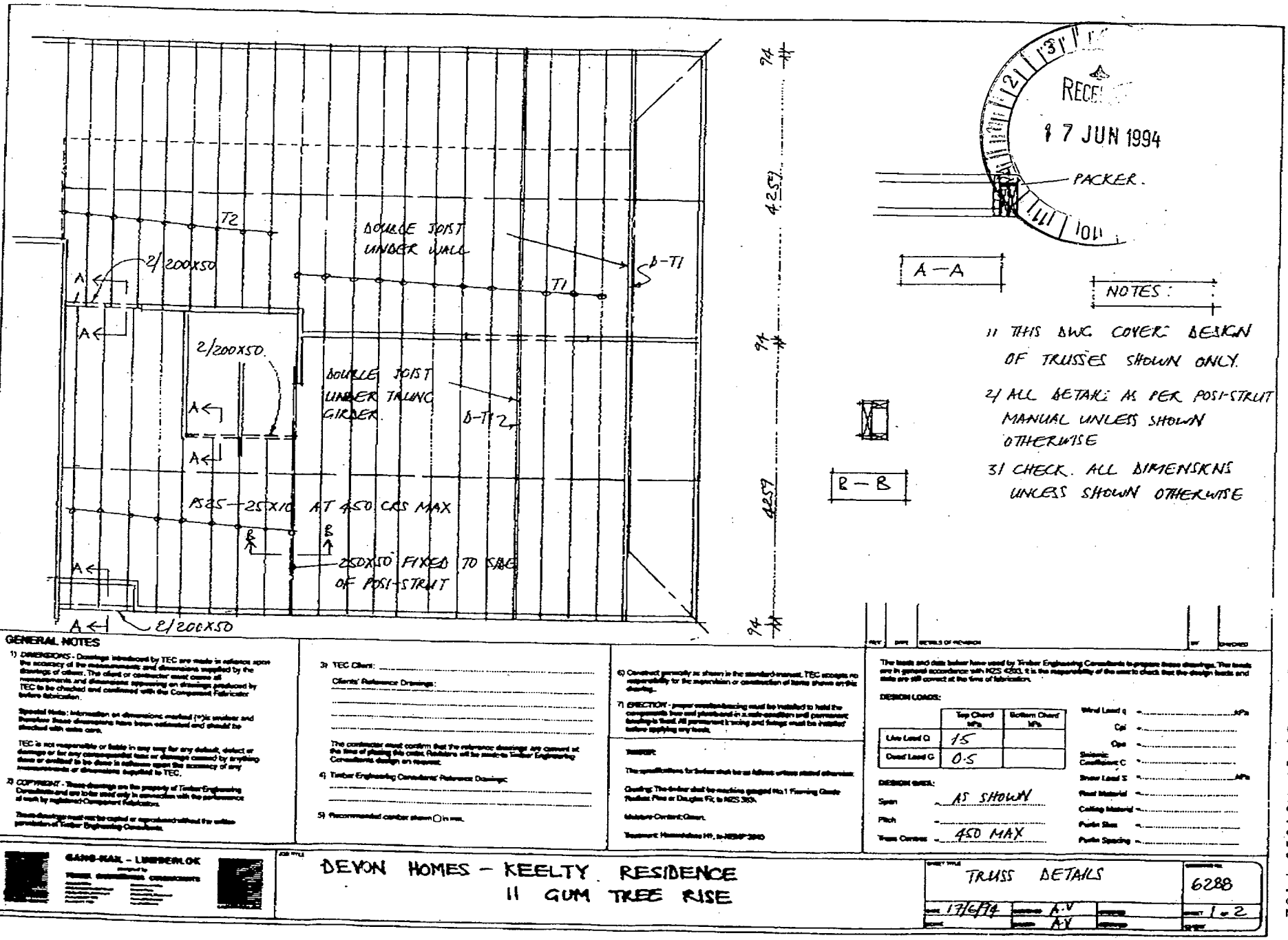
To:
From : Ross Bennett
Pages (including cover): 3

Time: 15:40:46
Date: 17/06/94

Attn: Wanganui District Council
Re.: Floor joist design "Keelty / Johnson House"

These are the preliminary design details as received from Gangnail NZ engineers. Although they have shown the entire floor framed with Posi-strut floor joists, only the area over the Family / Lounge area will use this system. The remainder of the floor structure will be framed conventionally with 250x50 floor joists as detailed on the original plan.
I hope this information is sufficient for your needs. If not please contact myself at 3436338 for discussion.

Regards
Ross Bennett



A—A

B—B

NOTES:

1) THIS DWG COVERS DESIGN OF TRUSSES SHOWN ONLY.

2) ALL BETAKS AS PER POSI-STRUT MANUAL UNLESS SHOWN OTHERWISE

3) CHECK ALL DIMENSIONS UNLESS SHOWN OTHERWISE

GENERAL NOTES

1) DIMENSIONS - Drawings introduced by TEC are made in reliance upon the accuracy of the measurements and dimensions supplied by the drawings of others. The client or constructor must ensure all measurements and dimensions appearing on drawings produced by TEC to be checked and confirmed with the Component Fabricator before fabrication.

Special Note: Information on dimensions marked (*)is unclear and therefore these dimensions have been estimated and should be checked with notes done.

TEC is not responsible or liable in any way for any default, defect or damage or for any consequential loss or damages caused by anything shown or omitted to be done in reliance upon the accuracy of any measurements or dimensions supplied to TEC.

2) COPYRIGHT - These drawings are the property of Timber Engineering Consultants and are to be used only in connection with the performance of work by registered Component Fabricators.

These drawings must not be copied or reproduced without the written permission of Timber Engineering Consultants.

3) TEC Client: .....

Clients' Reference Drawings: .....

The contractor must confirm that the reference drawings are correct at the time of placing this order. Revisions will be made to Timber Engineering Consultants design on request.

4) Timber Engineering Consultants' Reference Drawings: .....

5) Recommended camber shown ○ in mm.

6) Construct generally as shown in the standard manual. TEC accepts no responsibility for the interpretation or construction of items shown on this drawing.

7) ERECTION - proper erection bracing must be installed to hold the components true and plumb and in a safe condition until permanent bracing is fixed. All permanent bracing and fixings must be installed before applying any loads.

TIMBER

The specifications for timber shall be as follows unless stated otherwise:

Grading: The timber shall be machine graded No.1 Framing Grade Radiata Pine or Douglas Fir, to NZS 3631.

Moisture Content: 25mm.

Treatment: Hazard class H1, to NZS 3640

The loads and data below have been used by Timber Engineering Consultants to prepare these drawings. The loads are in general accordance with NZS 4203, it is the responsibility of the user to check that the design loads and data are still correct at the time of fabrication.

DESIGN LOADS:

	Top Chord kPa	Bottom Chord kPa
Live Load Q	1.5	
Dead Load G	0.5	

DESIGN BASIS:

Span AS SHOWN

Pitch .....

Truss Centres 450 MAX

Wind Load q .....kPa

Cpi .....

Cpe .....

Seismic Coefficient C .....

Shear Load S .....kPa

Roof Material .....

Ceiling Material .....

Purlin Size .....

Purlin Spacing .....

GANG-NAIL - LUMBERLOK
supplied by TIMBER ENGINEERING CONSULTANTS

JOB TITLE: DEVON HOMES - KEELTY RESIDENCE
11 GUM TREE RISE

SHEET TITLE: TRUSS DETAILS

JOB NO. 6288

DATE 17/6/94 DRAWN A.V CHECKED A.V

SHEET 1 of 2

amended 13.7.94

Please Photocopy

Wall Bracing Calculation Sheet A

Job Details

box 1

Name Unit 1

Street and Number Gum Tree Rise

Lot and DP Number

City/Town/District Wanganui

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

Building height to apex	7.0 m	Roof weight	light/heavy
Roof height above eaves	2.4 m	Cladding weight	light/heavy
Stud height	2.4 m	Room in roof space	y/n
Average roof pitch	28°		
Building length BL =	7.9 m	Gross Building	
Building width BW =	6.8 m	Plan Area,	GPA 45.1 m2

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

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

Wind Zone

box 2

Region:	Terrain:	Exposure:	Topography:	
R1 0	✓ Inland 0	✓ Sheltered 0	✓ Gentle	0
R2 1	Coastal 1	Exposed 1	Moderate	1 ✓
			Extreme	3

Total points

Wind zone:
- Low (0)
- ✓ Medium (1)
- High (2)
- Very high (3)
- Specific Design (4)

Earthquake zone

box 3

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

BUs required Wind

box 4

From Table W1A/W1B

W along = 86 BUs/m

W across = 86 BUs/m

Total wind load,

W ALONG:

W along x BW = 585 BUs

W ACROSSL

W across x BL = 680 BUs

BUs required Earthquake

box 5

From Table EQ1

E = 4 BUs/m2

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

Total earthquake load,

EQ ALONG and EQ ACROSS:

E x GPA BUs = 1804 BUs

Please Photocopy

Wall Bracing Calculation Sheet A

Job Details

box 1

Name Unit 1

Street and Number Gum Tree Rise

Lot and DP Number

City/Town/District Wonganui

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

Building height to apex	7.0 m	Roof weight	light/~~heavy~~
Roof height above eaves	2.9 m	Cladding weight	~~light~~/heavy
Stud height	2.4 m	Room in roof space	y/n
Average roof pitch	28°		
Building length BL =	16. m	Gross Building	
Building width BW =	12.4 m	Plan Area,	GPA = ~~134~~ m2

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

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

Wind Zone

box 2

Region:	Terrain:	Exposure:	Topography:	
R1 0 ✓	Inland 0 ✓	Sheltered 0 ✓	Gentle	0
R2 1	Coastal 1	Exposed 1	Moderate	1 ✓
			Extreme	3

Total points 1

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

✓ Medium (1) ___ Specific Design (4)

___ High (2)

Earthquake zone

box 3

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

BUs required Wind

box 4

From Table W1A/W1B

W along = 86 BUs/m

W across = 86 BUs/m

Total wind load,

W ALONG:

W along x BW = 1067 BUs

W ACROSSL

W across x BL = 1376 BUs

BUs required Earthquake

box 5

From Table EQ1

E = 8 BUs/m2

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

Total earthquake load,

EQ ALONG and EQ ACROSS:

E x GPA BUs = 1072 BUs

Lower, Unit 1
Gum Tree Rise

Please Photocopy

Wall Bracing Calculation Sheet B

Along

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BUs Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BUs Achieved (BU/m x L) W	Rating BU/m EQ	BUs Achieved (BU/m x L) EQ
A	143	1	1	2.5			42	105
		2	1	2.0			42	84
		8 ✓	GIB2	1.8			60	108
B	70	~~8~~	1	2.41			42	100.8
		3 ✓	GIB2	2.8 ✓			70	196 ✓
		4	1	2.4			42	100.8
C	157	5	GIB2	2.7			70	189
		6	GIB2	2.4			60	144
		7	GIB1	2.2			50	110
D		17	CP4	.6			95	57
		19	CP4	.6			95	57
E								

amended 18.7.94

Totals Achieved		W		EQ	1143.6
From Sheet A	Totals Required	W	1067	EQ	1072
Wreq/EQreq =	.995 *				

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

Across

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BUs Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BUs Achieved (BU/m x L) W	Rating BU/m EQ	BUs Achieved (BU/m x L) EQ
M	87	9	BR4	2.4	91	218.4	85	204
N	87	10	BR4	1.2	91	109.2	85	102
		11	GIB2	2.0	75	150	60	120
		18 ✓	BR4	1.2 ✓	91	109.2	85	102 ✓
O	113	12	GIB2	1.8	75	135	60	108
		13	GIB2	2.0	75	150	60	120
		14	GIB1	3.0	75	225	50	150
P	70	15 ✓	BR4	1.2 ✓	91	109.2	85	102 ✓
Q	100	16	GIB1	3.0	75	225	50	150

Totals Achieved		W	1431	EQ	1158
From Sheet A	Totals Required	W	1376	EQ	1072
Wreq/EQreq =	*				

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Wall Bracing Calculation Sheet A

Job Details Upper Unit 1

box 1

Name

Street and Number Gum Tree Rise

Lot and DP Number

City/Town/District Wongamui

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

Building height to apex	7.0 m	Roof weight	light/~~heavy~~
Roof height above eaves	2.4 m	Cladding weight	light/~~heavy~~
Stud height	2.4 m	Room in roof space	~~y~~/n
Average roof pitch	28°		
Building length BL =	9.9 m	Gross Building	
Building width BW =	7.3 m	Plan Area,	GPA = 65 m2

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

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

Wind Zone

box 2

Region:		Terrain:		Exposure:		Topography:	
R1	0 ✓	Inland	0 ✓	Sheltered	0 ✓	Gentle	0
R2	1	Coastal	1	Exposed	1	Moderate	1 ✓
						Extreme	3

Total points 1

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

✓ Medium (1) ___ Specific Design (4)

___ High (2)

Earthquake zone

box 3

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

BUs required Wind

box 4

From Table W1A/W1B

W along = 86 BUs/m

W across = 86 BUs/m

Total wind load,

W ALONG:
W along x BW = 628 BUs

W ACROSSL
W across x BL = 852 BUs

BUs required Earthquake

box 5

From Table EQ1

E = 4 BUs/m2

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

Total earthquake load,

EQ ALONG and EQ ACROSS:

E x GPA BUs = 260 BUs

upper, unit 1
Gum Tree Rise

Please Photocopy

Wall Bracing Calculation Sheet B

Along

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BUs Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BUs Achieved (BU/m x L) W	Rating BU/m EQ	BUs Achieved (BU/m x L) EQ
A	100	1	GIB1	2.3	55	126.5	50	115
		2	GIB1	2.3	55	126.5	50	115
B	70	3	GIB2	2.4	75	180	60	144
C	84	4	GIB1	2.8	75	210	50	140
D								
E								

Totals Achieved				
	W	643	EQ	514
From Sheet A Totals Required	W	628	EQ	260
Wreq/EQreq = *				

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

Across

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BUs Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BUs Achieved (BU/m x L) W	Rating BU/m EQ	BUs Achieved (BU/m x L) EQ
M	73	5	GIB1	2.5	75	187.5	50	125
N	70	6	BR4	1.2	91	109.2	55	102
O		7	GIB1	3.2	75	240	50	166
		8	GIB1	2.5	75	187.5	50	125
P	70	9	GIB1	2.4	55	132	50	120
Q								

Totals Achieved				
	W	952.2	EQ	632
From Sheet A Totals Required	W	852	EQ	260
Wreq/EQreq = *				

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Wall Bracing Calculation Sheet A

Job Details

box 1

Name: Unit 2

Street and Number: Gum Tree Rise

Lot and DP Number:

City/Town/District: Wanganui

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

Building height to apex	7.0 m	Roof weight	light/~~heavy~~
Roof height above eaves	2.9 m	Cladding weight	~~light~~/heavy
Stud height	2.4 m	Room in roof space	~~y~~/n
Average roof pitch	28°		
Building length BL =	16. m	Gross Building	
Building width BW =	11.2 m	Plan Area,	GPA = 141 m2

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

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

Wind Zone

box 2

Region:	Terrain:	Exposure:	Topography:	
R1 0	✓ Inland 0	✓ Sheltered 0	✓ Gentle	0
R2 1	Coastal 1	Exposed 1	Moderate	1 ✓
			Extreme	3

Total points 1

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

✓ Medium (1) ___ Specific Design (4)

___ High (2)

Earthquake zone

box 3

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

BUs required Wind

box 4

From Table W1A/W1B

W along = 86 BUs/m

W across = 86 BUs/m

Total wind load,

W ALONG:

W along x BW = 964 BUs

W ACROSSL

W across x BL = 1376 BUs

BUs required Earthquake

box 5

From Table EQ1

E = 8 BUs/m2

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

Total earthquake load,

EQ ALONG and EQ ACROSS:

E x GPA BUs = 1128 BUs

Lower, Unit 2
Gum Tree Rise

Please Photocopy

Wall Bracing Calculation Sheet B

Along

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BUs Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BUs Achieved (BU/m x L) W	Rating BU/m EQ	BUs Achieved (BU/m x L) EQ
A	130	18	1	2.4			42	100.8
		19	1	2.2			42	92.4
B	70	17	GIB2	2.8			70	196
		16	GIB1	2.4			50	120
C	160	15	GIB2	2.4			60	144
		14	GIB2	2.4			60	144
		13	GIB2	2.3			60	138
		12	GIB1	2.9			50	145
D	100	10	CP4	.6			95	57
		11	CP4	.6			95	57
E								

Totals Achieved				
	W		EQ	1194.2
From Sheet A Totals Required	W	964	EQ	1128
Wreq/EQreq = 85 *				

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

Across

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BUs Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BUs Achieved (BU/m x L) W	Rating BU/m EQ	BUs Achieved (BU/m x L) EQ
M	100	1	GIB1	3.0	75	225	50	150
N	70	2	1	2.0	42	84	42	84
O	112	3	GIB1	3.0	75	225	50	150
		4	GIB2	2.4	75	180	60	144
		5	BR4	1.2	91	109.2	85	102
P		7	1	2.0	42	84	42	84
		6	BR4	1.2	91	109.2	85	102
		8	BR4	1.2	91	109.2	85	102
Q		9	GIB1	2.5	75	187.5	50	125
		10	BR4	1.1	91	100.1	85	93.5

Totals Achieved				
	W	1413.2	EQ	1154.5
From Sheet A Totals Required	W	1376	EQ	1128
Wreq/EQreq = *				

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Wall Bracing Calculation Sheet A

Job Details

box 1

Name Unit 2

Street and Number Gum tree Rise

Lot and DP Number

City/Town/District Wanganui

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

Building height to apex	7.0 m	Roof weight	light/~~heavy~~
Roof height above eaves	2.4 m	Cladding weight	light/~~heavy~~
Stud height	2.4 m	Room in roof space	~~y~~/n
Average roof pitch	28°		
Building length BL =	8.8 m	Gross Building	
Building width BW =	7.3 m	Plan Area,	GPA = 64 m2

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

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

Wind Zone

box 2

Region:	Terrain:	Exposure:	Topography:	
R1 0 ✓	Inland 0 ✓	Sheltered 0 ✓	Gentle	0
R2 1	Coastal 1	Exposed 1	Moderate	1 ✓
			Extreme	3

Total points 1

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

✓ Medium (1) ___ Specific Design (4)

___ High (2)

Earthquake zone

box 3

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

BUs required Wind

box 4

From Table W1A/W1B

W along = 86 BUs/m

W across = 86 BUs/m

Total wind load,

W ALONG:

W along x BW = 628 BUs

W ACROSSL

W across x BL = 757 BUs

BUs required Earthquake

box 5

From Table EQ1

E = 4 BUs/m2

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

Total earthquake load,

EQ ALONG and EQ ACROSS:

E x GPA BUs = 256 BUs

Amended
13.7.94

upper unit 2
Gum Tree Rise

Please Photocopy

Wall Bracing Calculation Sheet B

Along

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BUs Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BUs Achieved (BU/m x L) W	Rating BU/m EQ	BUs Achieved (BU/m x L) EQ
A	80	1	1	2.3	42	96.6		
		5	BR4	1.0	91	91		
B	70	2	GIB2	1.8	75	135		
		4	GIB3	1.2	65	78		
C	80	3	GIB1	2.3	50	115		
		6	1	2.2	42	92.4		
D								
E								
Totals Achieved					W	608	EQ	
From Sheet A		Totals Required			W	585	EQ	181
Wreq/EQreq =		3.23 *						

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

Across

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BUs Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BUs Achieved (BU/m x L) W	Rating BU/m EQ	BUs Achieved (BU/m x L) EQ
M	70	7	1	2.4	42	100.8		
		8	GIB1	2.0	50	100		
N	70	9	GIB1	2.4	75	180		
		12	BR4	1.2	91	109.2		
O	70	10	BR4	1.2	91	109.2		
		11	BR4	.9	91	81.9		
P								
Q								
Totals Achieved					W	681.1	EQ	
From Sheet A		Totals Required			W	680	EQ	181
Wreq/EQreq =		3.75 *						

GIB BOARD®

Upper, Unit 2
Gum Tree Rise

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Wall Bracing Calculation Sheet B

Along

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BUs Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BUs Achieved (BU/m x L) W	Rating BU/m EQ	BUs Achieved (BU/m x L) EQ
A	88	1	1	2.4	42	100.8		
B	70	2	GIB2	2.3	75	172.5		
		3	GIB1	2.7	75	202.5		
C	88	4	GIB1	1.8	50	90		
		5	GIB1	2.4	50	120		
D								
E								
Totals Achieved					W	685.8	EQ	
From Sheet A Totals Required					W	628	EQ	256
Wreq/EQreq = 2.45 *								

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

Across

Wall or Bracing Line		Bracing Elements Provided			Wind		Earthquake	
1	2	3	4	5	6 W	7 W	6 EQ	7 EQ
Line Label	Minimum BUs Required	Bracing Element No.	Bracing Type	Length Element (m) L	Rating BU/m W	BUs Achieved (BU/m x L) W	Rating BU/m EQ	BUs Achieved (BU/m x L) EQ
M	73	6	GIB1	3.6	75	270		
		7	GIB1	2.0	50	100		
N	70	8	GIB1	2.0	50	100		
		10	BRH	1.2	91	109.2		
O	73	9	GIB1	2.7	75	202.5		
P								
Q								
Totals Achieved					W	781.7	EQ	
From Sheet A Totals Required					W	757	EQ	256
Wreq/EQreq = 2.95 *								