Structural Calculations:
Detailed Seismic Assessment

Assets Building

46 High Street, Marton
Rangitikei District Council

12 November 2021
Ref.: 5-P1538.02

WSP
Palmerston North
49 Victoria Avenue
PO Box 1472
Palmerston North 4410, New Zealand
+64 6 350 2500
wsp.com/nz

150 YEARS IN AOTEAROA

CALCULATION SHEET:

[insert calculation desciption here]

Project/Task/File no.:	5-P1538.02	Sheet no.	
Project Description:	RDC Asset Building	Office:	Palmerston North
	Detailed Seismic Assessment	Engineer:	AF
		Date:	3/11/2021

All references refer to NZS 1170.5 unless noted otherwise.

Seismic Design Coefficients (Equivalent Static Method)

			reference
Seismic Action Direction:		Both	
Site Parameters			
Site Subsoil Class		D	Cl 3.1.3
Location		Marten	Table 3.3
Fault Distances from Table 3.3 (km)		-	Table 3.3
Distance to Nearest Major Fault (km)	D		Table 3.3
Hazard Factor	Z	0.3	Table 3.3
Building Parameters			
Period (s)	T_1	0.4	
Importance Level		IL 2	Table 3.2 [1170.0]
Design Working Life (years)		50	Table 3.3 [1170.0]
Seismic Weight (kN)	W_t		

Parameter		**ULS**	**SLS**	
Ductility	μ	3.5	1.25	Cl 4.3
Structural Performance Factor override	S_p			Cl 4.4
leave blank to use 1170.5 values		-	-	
Structural Performance Factor used	S_p	0.7	0.7	Cl 4.4
Annual Probability of Exceedence	APE	1/500	1/25	Table 3.3 [1170.0]
Return Period Factor	R_u, R_s	1.00	0.25	Table 3.5
$ZR_u < 0.7$ check	ZR_u	0.30	-	Cl 3.1.1
Near Fault Factor	$N(T,D)$	1.00	1.00	Cl 3.1.6
Spectral Shape Factor	$C_h(T)$	3.00	3.00	Table 3.1; Cl C3.1.2
Elastic Site Spectrum	$C(T)$	0.90	0.23	Eq 3.1(1)
Ductility Factor	k_u	2.43	1.14	Cl 5.2.1.1
$C_d(T)$ check	$C_d(T)_{min}$	0.04	0.01	Eq 5.2(2)
Design Action Coefficient				
Design Action Coefficient	$C_d(T)$	**0.259**	**0.138**	Cl 5.2.1
Horizontal Seismic Shear (kN)	V	**0.00**	**0.00**	

CALCULATION SHEET:

[insert calculation desciption here]

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Design Response Coefficients for Parts

For all structural and non-structural elements not part of the primary load resisiting system.

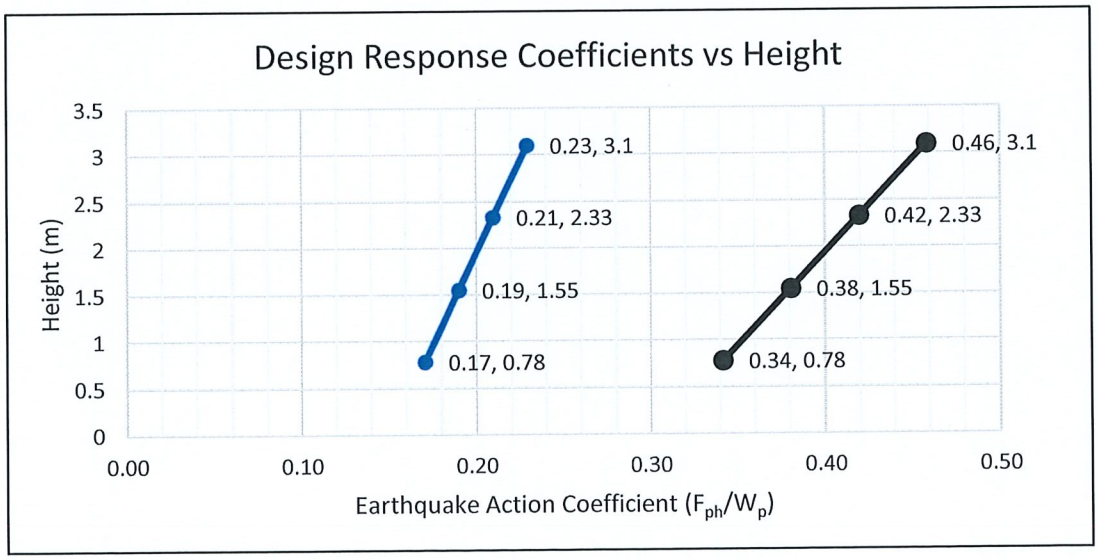
Part Parameters

(Parameters for Marten and Class D Soil. Change parameters on Sheet 1)

		ULS	SLS	reference
Period of Part (s)	T_p	0.4		
Site Hazard Coefficient	$C(0)$	0.34	0.08	Cl 3.1
Part Spectral Shape Coefficient	$C_i(T_p)$	2		Cl 8.4
Part Risk Factor	R_p	1	2	Cl 8.1.2
Ductility of the Part	μ_p	3 or greate	or greater	Cl 8.6
Part Horizontal Response Factor	C_{ph}	0.45	0.45	Table 8.2
Height of uppermost seismic mass (m)	h_n	3.1		Cl 8.3

Part Design Action Coefficient

							reference
Height of attachment of the Part (m)		h_i	3.1	2.33	1.55	0.78	
Floor Height Coefficient		C_{Hi}	1.52	1.39	1.26	1.13	Cl 8.3
Horizontal Design Coefficient (ULS)		$C_p(T_p)$	1.02	0.93	0.85	0.76	Cl 8.2
Earthquake Action Coefficent	**ULS**	F_{ph}/W_p	**0.46**	**0.42**	**0.38**	**0.34**	Cl 8.5.1
Earthquake Action Coefficent	**SLS**	F_{ph}/W_p	**0.23**	**0.21**	**0.19**	**0.17**	Cl 8.5.1



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General Weights

G Roof

Sheeting	0.6 mm	0.1 kPa.
Purlins	@ 600 crs	0.04 kPa
Trusses	@ 1200 crs	0.1 kPa.
Pink batts		0.03 kPa.
M&E (wiring)		0.02 kPa.
Ceiling battens		0.04 kPa.
Ceiling lining		0.07 kPa.
		0.4 kPa.

G walls : external

Masonry veneer	1.75 kPa.
Stud wall (90x45 @ 600)	0.04 kPa
GIB lining	0.07 kPa.
M&E	0.04 kPa
	1.90 kPa.

G walls : internal

Partitions (90x45 @ 600 + GIB x2) 0.2 kPa.

G floor :

20mm T&G Flooring	0.14 kPa
190x45 @ 400 crs	0.12 kPa
M&E	0.04 kPa
	0.3 kPa.

Q floor : 2 kPa.

wsp

CALCULATION SHEET

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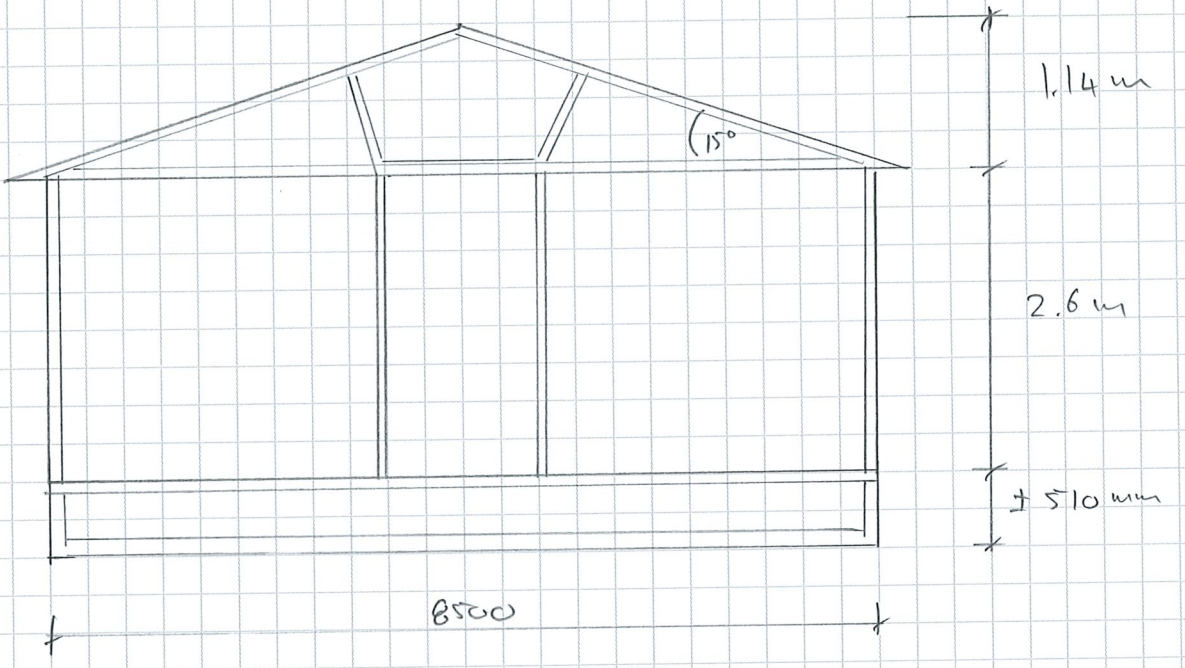
Roof height = $\tan 15° = \frac{y}{8.5 \div 2}$

$y = 1.14\,m$.



Building Areas for Seismic load demand calculation in GIB EasyBrace Schedule:

Area (A) = (12 + 1.9) x (8.5 - 2.75)
= 13.9 x 5.75
= 79.93 m^2

Area (B) = 24.4 m x 8.5 m
= 207.4 m^2

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From GIB EzyBrace:

Area (A) demand = 1018 BU's
Area (B) demand = 2634 BU's

} Seismic load demand from GIB EzyBrace Schedule

$\therefore \frac{1018 \text{ BU's}}{80 \text{ m}^2} = 12.73 \text{ BU's/m}^2$

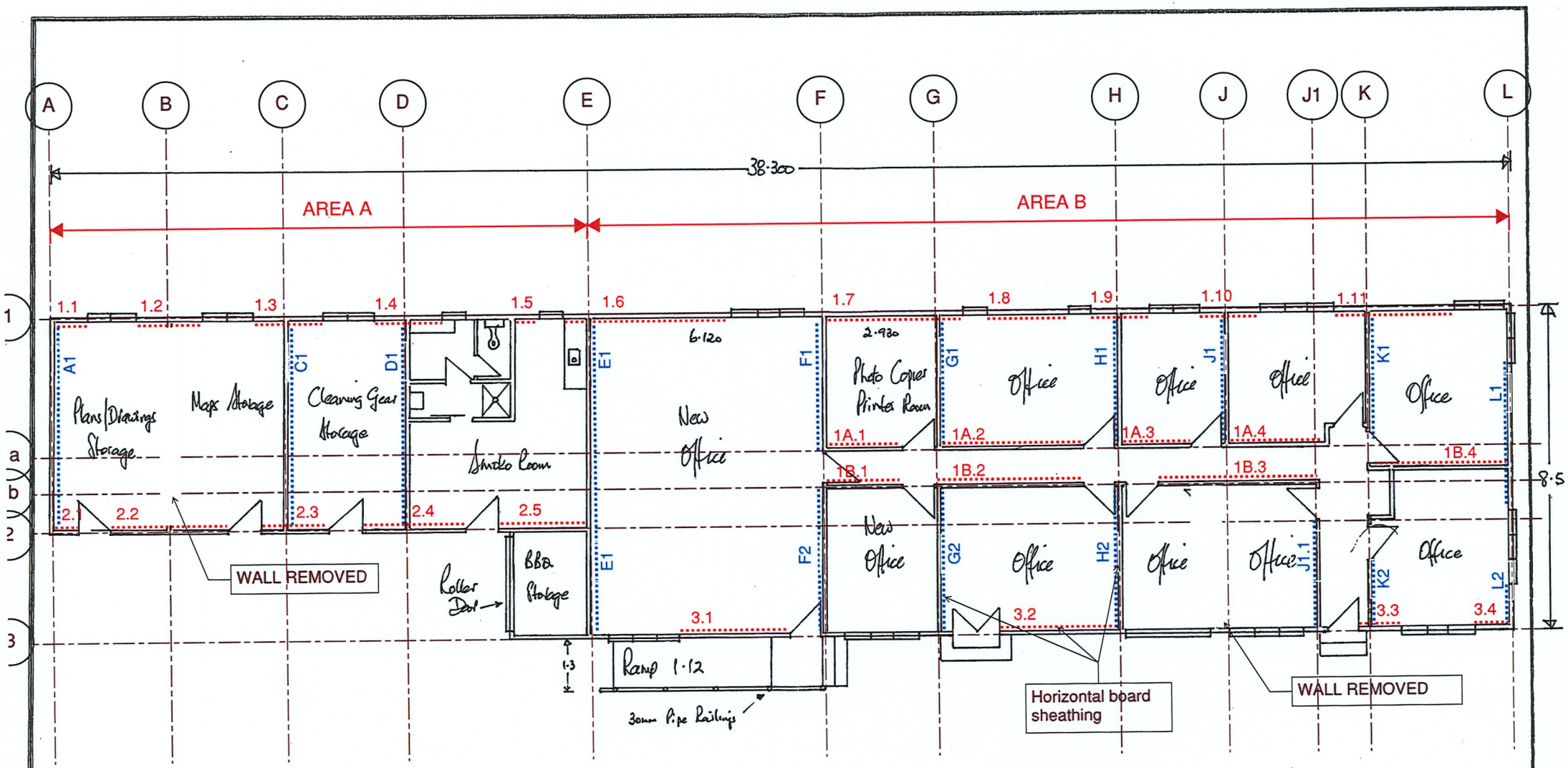
$\frac{2634}{208 \text{ m}^2} = 12.66 \text{ BU's/m}^2$

From NZS 3604 Ts.10: Single storey on slab
2kPa Floor load
Soil type D/E
Eq zone 3

Heavy Roof: 400 kg/m²
Heavy Cladding: 200 kg/m²
Roof pitch: 0–25° (15°)

∴ for single storey walls → 13 BU's/m²

Therefore BU's from EzyBrace are in line with tabulated values from NZS 3604. — okay.



5-P1538.02
Bracing Layout (Rev 1)
2021-11-09

DRAWN BY gv.	291·67 m²	DRAWING No. 5	Kargitiki District Council High Street MARTON
DATE 21·6·06	SCALE 1:100		Internal Alterations Floor Plan.

	EXCEL.	V. GOOD	GOOD	FAIR	POOR
LINE QUALITY					
INTERPRETATION					
ACCURACY					
LAYOUT					

WARWICK

GIB EzyBrace® Bracing Software

Demand Calculation Sheet

Job Details

Name:	RDC Assets Building - AREA A
Street and Number:	4-6 High Street
Lot and DP Number:	
City/Town/District:	Marton
Designer:	A. Ferreira
Company:	WSP NZ Ltd
Date:	Tuesday, 9 November 2021

Building Specification

Number of Storeys	1
Floor Loading	2 kPa
Foundation Type	Slab
	Single
Cladding Weight	Heavy
Roof Weight	Heavy
Room in Roof Space	No
Roof Pitch (degrees)	15
Roof Height above Eaves (m)	1.14
Building Height to Apex (m)	4.25
Ground to Lower Floor (m)	0.51
Average Stud Height (m)	2.6
Building Length (m)	13.9
Building Width (m)	5.75
Building Plan Area (m²)	80

Building Location

Wind Zone = High

Earthquake Zone 3

Soil Type D & E (Deep to Very Soft)

Annual Prob. of Exceedance: 1 in 500 (Default)

Bracing Units required for Wind

	Along	Across
Single Level	**240**	**484**

Bracing Units required for Earthquake

	Along & Across
Single Level	**1018**

GIB EzyBrace® Bracing Software

Single Level Along Resistance Sheet

Job Name: RDC Assets Building - AREA A

									Wind	EQ
									Demand	
									240	1018
									Achieved	
Line	Element	Length (m)	Angle (degrees)	Stud Ht. (m)	Type	Supplier	Wind (BUs)	EQ (BUs)	849 354%	849 Check
1	1	0.98		2.6	GS1-Hist	Gib	45	45		
	2	1.74		2.6	GS1-Hist	Gib	80	80		
	3	1.85		2.6	GS1-Hist	Gib	85	85		
	4	1.74		2.6	GS1-Hist	Gib	80	80		
	5	1.30		2.6	GS1-Hist	Gib	60	60		
									351 OK	351 OK
2	1	0.76		2.6	GS1-Hist	Gib	35	35		
	2	3.16		2.6	GS1-Hist	Gib	146	146		
	3	1.74		2.6	GS1-Hist	Gib	80	80		
	4	2.73		2.6	GS1-Hist	Gib	126	126		
	5	2.40		2.6	GS1-Hist	Gib	111	111		
									498 OK	498 OK

$\frac{849}{1018} \times 100 = 83\%$ NBS

GIB EzyBrace® Bracing Software

Single Level Across Resistance Sheet

Job Name: RDC Assets Building - AREA A

Line	Element	Length (m)	Angle (degrees)	Stud Ht. (m)	Type	Supplier	Wind (BUs)	EQ (BUs)	Wind	EQ
									Demand	
									484	1018
									Achieved	
									1132 234%	1132 111%
A	1	5.75		2.6	GS1-Hist	Gib	265	265		
									265 OK	265 OK
C	1	5.75		2.6	GS2-Hist	Gib	318	318		
									318 OK	318 OK
D	1	5.75		2.6	GS2-Hist	Gib	318	318		
									318 OK	318 OK
E	1	4.15		2.6	GS2-Hist	Gib	230	230		
									230 OK	230 OK

100% NRS

Custom Wall Elements

Supplier	System	Min. Length m	Wind BUs/m	EQ BUs/m
Ecoply	EP1	0.6	95	105
Aqualine	Aqua	0.6	60	60
Ecoply	EPG	1.2	150	150
Ecoply	EPG (0.4m)	0.4	100	115
Gib	GS1-Hist	0.6	50	50
Horizontal Board	140x10 HB	0.6	21	21
Gib	GS2-Hist	0.6	60	60

GIB EzyBrace® Bracing Software

Demand Calculation Sheet

Job Details

Name:	RDC Asset Building - AREA B
Street and Number:	4-6 High Street
Lot and DP Number:	
City/Town/District:	Marton
Designer:	A. Ferreira
Company:	WSP NZ Ltd
Date:	Tuesday, 9 November 2021

Building Specification

Number of Storeys	1
Floor Loading	2 kPa
Foundation Type	Slab
	Single
Cladding Weight	Heavy
Roof Weight	Heavy
Room in Roof Space	No
Roof Pitch (degrees)	15
Roof Height above Eaves (m)	1.14
Building Height to Apex (m)	4.25
Ground to Lower Floor (m)	0.51
Average Stud Height (m)	2.6
Building Length (m)	24.4
Building Width (m)	8.5
Building Plan Area (m²)	207

Building Location

Wind Zone = High

Earthquake Zone 3

Soil Type D & E (Deep to Very Soft)

Annual Prob. of Exceedance: 1 in 500 (Default)

Bracing Units required for Wind

	Along	Across
Single Level	**355**	**850**

Bracing Units required for Earthquake

	Along & Across
Single Level	**2634**

GIB EzyBrace® Bracing Software

Single Level Along Resistance Sheet

Job Name: RDC Asset Building - AREA B

									Wind	EQ
									Demand	
									355	2634
									Achieved	
Line	Element	Length (m)	Angle (degrees)	Stud Ht. (m)	Type	Supplier	Wind (BUs)	EQ (BUs)	2336 658%	2336 Check
1	6	3.70		2.6	GS1-Hist	Gib	171	171		
	7	3.60		2.6	GS1-Hist	Gib	166	166		
	8	2.10		2.6	GS1-Hist	Gib	97	97		
	9	1.50		2.6	GS1-Hist	Gib	69	69		
	10	1.60		2.6	GS1-Hist	Gib	74	74		
	11	3.10		2.6	GS1-Hist	Gib	143	143		
									720 OK	720 OK
1A	1	1.96		2.6	GS2-Hist	Gib	109	109		
	2	3.80		2.6	GS2-Hist	Gib	210	210		
	3	1.96		2.6	GS2-Hist	Gib	109	109		
	4	2.60		2.6	GS2-Hist	Gib	144	144		
									572 OK	572 OK
1B	1	1.96		2.6	GS2-Hist	Gib	109	109		
	2	3.80		2.6	GS2-Hist	Gib	210	210		
	3	4.14		2.6	GS2-Hist	Gib	229	229		
	4	3.80		2.6	GS2-Hist	Gib	210	210		
									759 OK	759 OK
3	1	2.83		2.6	GS1-Hist	Gib	131	131		
	2	3.00		2.6	140x10 HB	Custom	58	58		
	3	1.10		2.6	GS1-Hist	Gib	51	51		
	4	1.00		2.6	GS1-Hist	Gib	46	46		
									286 OK	286 Check

$\frac{2336}{2634} \times 100 = 87\%$ NBS

GIB EzyBrace® Bracing Software

Single Level Across Resistance Sheet

Job Name: RDC Asset Building - AREA B

									Wind	EQ
									Demand	
									850	2634
									Achieved	
Line	Element	Length (m)	Angle (degrees)	Stud Ht. (m)	Type	Supplier	Wind (BUs)	EQ (BUs)	1993 235%	1993 Check
E	1	4.15		2.6	GS2-Hist	Gib	230	230		
									230 OK	230 OK
F	1	3.50		2.6	GS2-Hist	Gib	194	194		
	2	3.50		2.6	GS2-Hist	Gib	194	194		
									388 OK	388 OK
G	1	3.50		2.6	GS2-Hist	Gib	194	194		
	2	3.80		2.6	140x10 HB	Custom	74	74		
									268 OK	268 OK
H	1	3.50		2.6	GS2-Hist	Gib	194	194		
	2	3.80		2.6	140x10 HB	Custom	74	74		
									268 OK	268 OK
J	1	3.50		2.6	GS2-Hist	Gib	194	194		
									194 OK	194 OK
J1	1	2.80		2.6	GS2-Hist	Gib	155	155		
									155 OK	155 Check
K	1	3.10		2.6	GS2-Hist	Gib	172	172		
	2	1.70		2.6	GS2-Hist	Gib	94	94		
									266 OK	266 OK
L	1	3.80		2.6	GS1-Hist	Gib	175	175		
	2	1.10		2.6	GS1-Hist	Gib	51	51		
									226 OK	226 OK

$\frac{1993}{2634} \times 100 = 76\%$ NBS

Custom Wall Elements

Supplier	System	Min. Length m	Wind BUs/m	EQ BUs/m
Ecoply	EP1	0.6	95	105
Aqualine	Aqua	0.6	60	60
Ecoply	EPG	1.2	150	150
Ecoply	EPG (0.4m)	0.4	100	115
Gib	GS1-Hist	0.6	50	50
Custom	140x10 HB	0.6	21	21
Gib	GS2-Hist	0.6	60	60

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Investigate Base Shear to bottom plate from NZS1170.5:

Area A

$G_{\text{Roof Area (A)}}$: $80\ m^2 \times 0.4\ kPa = 32\ kN$

G_{floor} : $0.3\ kPa \times 80\ m^2 = 24\ kN$

Q_{floor} : $2\ kPa \times 0.3 \times 80\ m^2 = 48\ kN$

$G_{\text{walls external Area (A)}}$:

Grid 1 = $14.2m \times 2.6m \times 1.9\ kPa \times 0.5 = 35\ kN$
Grid 2 = $14.2m \times 2.6m \times 1.9\ kPa \times 0.5 = 35\ kN$
Grid A = $5.75m \times 2.6m \times 1.9\ kPa \times 0.5 = 14.2\ kN$

$G_{\text{wall internal Area (A)}}$:

Grid B = $5.75m \times 2.6m \times 0.2\ kPa \times 0.5 = 1.5\ kN$
C = $5.75m \times 2.6 \times 0.2\ kPa \times 0.5 = 1.5\ kN$
D = $5.75m \times 2.6 \times 0.2\ kPa \times 0.5 = 1.5\ kN$
E = $\frac{8.5}{2} = 4.25m \times 2.6 \times 0.2\ kPa \times 0.5 = 1.1\ kN$

Misc = $9.7m \times 2.6m \times 0.2\ kPa \times 0.5 = 2.5\ kN$

$92.3\ kN$

Seismic weight to Area (A): $32 + 24 + 48 + 92.3 = 196.3\ kN$

Seismic parameters:

T = 0.45
Z = 0.3 (Marton)
N = 1.0
Soil = D
I.L. = 2
Design life = 50 years
P.o.E. = 1/500 (ULS)

$\therefore Cd(T) = 0.259$ ULS

Seismic Base Shear (Area A): $(32\ kN + 24\ kN + 48\ kN + 92.3\ kN)0.259$
$= 50\ kN$ (1016 BU's) $\therefore$ okay

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Area A

Transverse Shear acting on trib width:
(consider floor as flexible diaphragm)

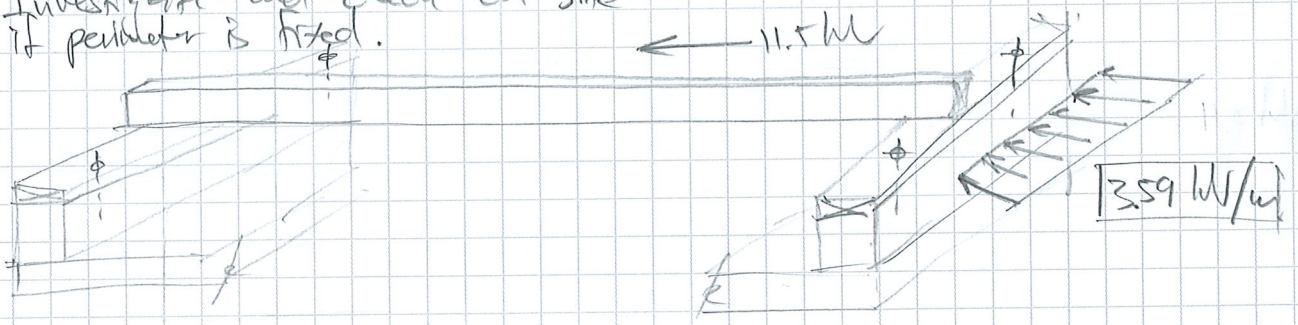
Along Gridline (C): trib width = 3.2 m.

∴ Tributary load = $\frac{50\ kN}{80\ m^2} \times 3.2\ m$

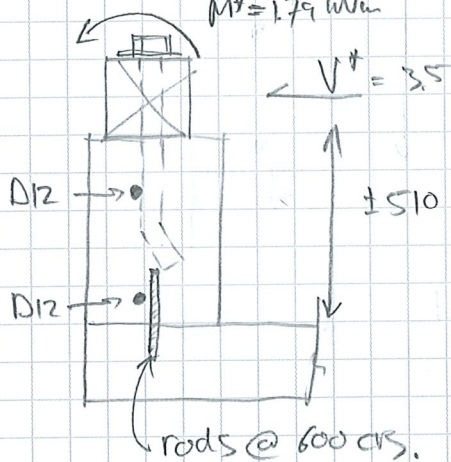
= 2 kN/m × 5.75 m

= 11.5 kN → (11.5 ÷ 3.2 = 3.59 kN/m)

(*) Investigate and check on site if perimeter is fixed.



Consider shear capacity of 100 × 100 bearer beam



Single shear capacity: (load ⊥ grain)

f_{i1} = 14.9

$f_{i\perp}$ = 12.4 MPa.

d_a = 12 mm

b_e = 100 mm

ϕ = 1.0 (DSA)

∴ Q_{bp} = 2.31 kN per anchor

Capacity of anchors @ 600 crs

= 2.31 × $\frac{1}{0.6}$ = 3.85 kN.

∴ $\frac{3.85\ kN/m}{3.59\ kN/m} \times 100$ = 107% NBS

wsp

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Area B

$G_{Roof\ area\ (B)}$: $208\ m^2 \times 0.4\ kPa$ = 83.2 kN.

$G_{Floor\ (B)}$: $24.4\ m \times 8.5\ m \times 0.3\ kPa$ = 62.2 kN

$Q_{Floor\ (B)}$: $24.4\ m \times 8.5\ m \times (0.3 \times 2\ kPa)$ = 124.44 kN

$G_{Walls\ external\ (B)}$:

Grid 1	= $24.4 \times 2.6 \times 1.9 \times 0.5$	= 60.27 kN
Grid 3	= $24.4\ m \times 2.6\ m \times 1.9\ kPa \times \frac{1}{2}$	= 60.27 kN.
Grid L	= $8.5\ m \times 2.6\ m \times 1.9\ kPa \times \frac{1}{2}$	= 21 kN

$G_{walls\ internal\ (B)}$:

Grid E	= $\frac{8.5}{2} \times 2.6\ m \times 0.2\ kPa \times 0.5$	= 1.11 kN
F	= $(3.5 + 3.8) \times 2.6 \times 0.2 \times 0.5$	= 1.9 kN
G	= $(3.5 + 3.8) \times 2.6 \times 0.2 \times 0.5$	= 1.9 kN
H	= $(3.5 + 3.8) \times 2.6 \times 0.2 \times 0.5$	= 1.9 kN
J	= $(3.5 + 3.8) \times 2.6 \times 0.2 \times 0.5$	= 1.9 kN
J_1	= $(2.8) \times 2.6 \times 0.2 \times 0.5$	= 0.99 kN
K	= $(2.1 + 1.74) \times 2.6 \times 0.2 \times 0.5$	= 1.28 kN
1A	= $14.4 \times 0.2 \times 2.6 \times 0.5$	= 3.74 kN
1B	= $17.9 \times 0.2 \times 2.6 \times 0.5$	= 4.65 kN
		19.35 kN

Seismic Weight to Area (B) : 83.2 + 62.2 + 124.44 + 60.27 + 60.27 + 21 kN + 19.35

= 430.73 kN

Seismic Base Shear, V^*_{Base} = 0.259 × 430.73 kN

= 111.6 kN (2231 BUs)

Bracing Schedule demand = 2634 BUs.

∴ Use demand from EzyBrace.

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Transverse Shear acting on this width:

$$\frac{2634}{20} = \frac{131.7\ kN}{207\ m^2} \times 1m = 0.636\ kN/m$$

length = 8.5 m

Face = $0.636\ kN/m \times 8.5\ m$ = 5.4 kN/m.

Capacity of anchors @ 600 crs (from previous)

= 3.85 kN/m.

$\therefore \frac{3.85}{5.4} \times 100$ = 71% NBS

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Check Overturning moment due to V^*:

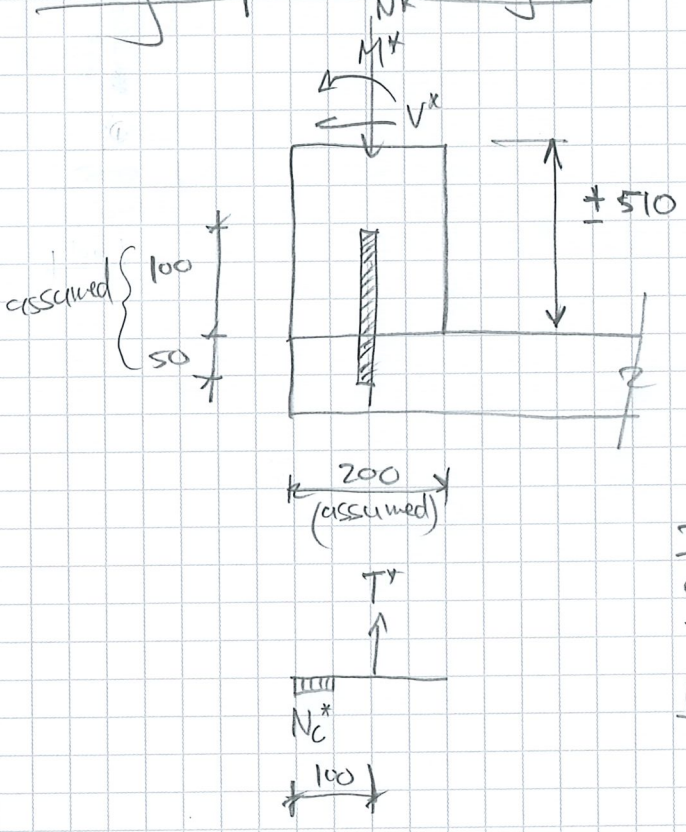
$M^* = 3.59\ kN/m \times 0.51 = 1.79\ kNm$

No flexural capacity of nib, hence tension pull-out failure mechanism will develop.

Analyze as per base plate methodology:

Using "plastic analysis":

$M^* = 1.79\ kNm$
$V^* = 3.59\ kN/m$
$N^* = 6.64\ kN$



It follows then, distance from centre line to tension bolt = 0 mm.

$$\frac{M^* \times 10^3 - N^* \times 0.5 \times d}{t + [0.5 \times (d)}$$

$$= \frac{1.79 \times 10^3 - (6.64 \times 0.5 \times 200)}{0 + (0.5 \times 200)}$$

$N^*_t = 11.26\ kN/m$.

rods @ 600 crs

$\therefore N^*t = 11.26 \times 0.6 = 6.75\ kN$.

by inspection okay — pull out resistance of steel rod is sufficient.

100% NBS

CALCULATION SHEET

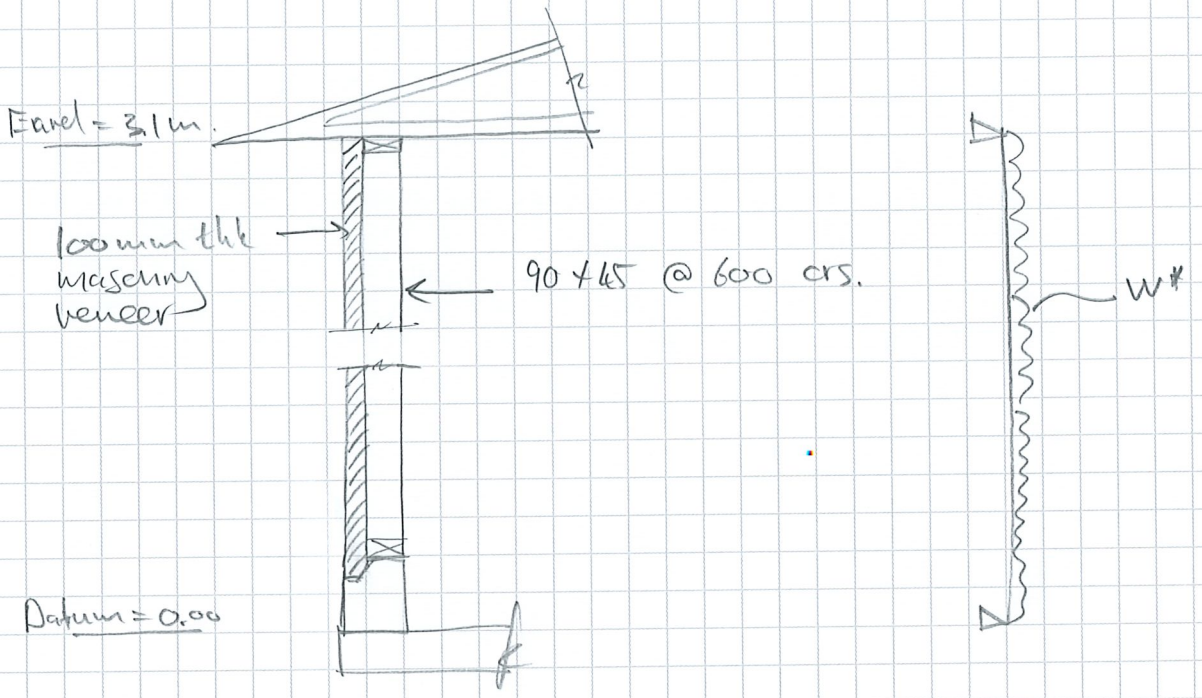
Project/Task/File No: S-P1538.02 | Sheet No | of

Project Description: | Office:

Computed: 3 / 11 / 2021

Check: / /

Out-of-plane loading on veneer clad stud wall:



External wall weight = 1.9 kPa.

@ $\frac{3.1\,m}{2} = 1.55\,m$ → $F_{ph}/W_p = \boxed{0.38}$

Demand:

∴ Seismic load using Panels & Partitions $W^* = 1.9\,kPa \times 0.38 = 0.72\,kPa$.

$$M^* = \frac{wl^2}{8} = \frac{0.72 \times 2.6^2}{8}\,m = 0.608\,kNm/m.$$

(blocking provides FLR to stud) per stud = $0.608 \times 0.6\,m = 0.365\,kNm$

Capacity:

90 x 45 SG8 stud → $\phi M = 1.0 \times 1.0 \times 14\,MPa \times 60.75 \times 10^3 = 0.85\,kNm$.

∴ **100% NBS**

CALCULATION SHEET

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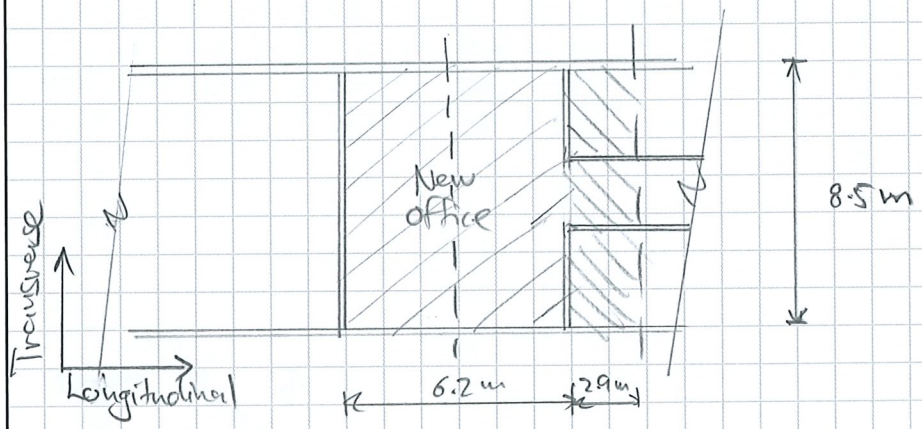
Check: / /

Ceiling Diaphragm - Block B

Investigate worst-case ceiling area:

New office area has walls spaced @ 6.2 m in longitudinal direction and 8.5 m in transverse direction.



Longitudinal:

Bracing lines in longitudinal direction provided by internal walls leading to corridor; roof loads transfered to internal walls therefore ceiling diaphragm is okay.

Transverse:

According to NZS 3604:2011, max distance between bracing lines is 6 m.

Table C9.3: Gypsum plasterboard ceiling - loading parallel to rafters

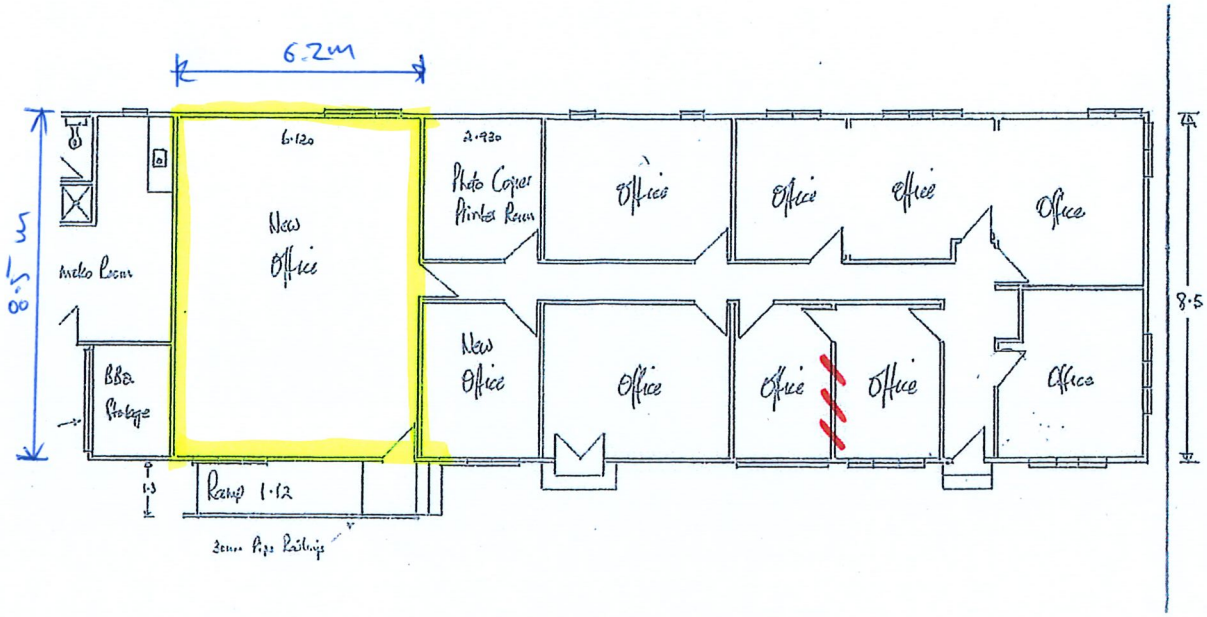
Probable Strength value = 6 kN/m.

$$\text{Demand} = \frac{2634}{207\,m^2} = 12.7\ BU's/m^2 = 0.64\ kN/m^2$$

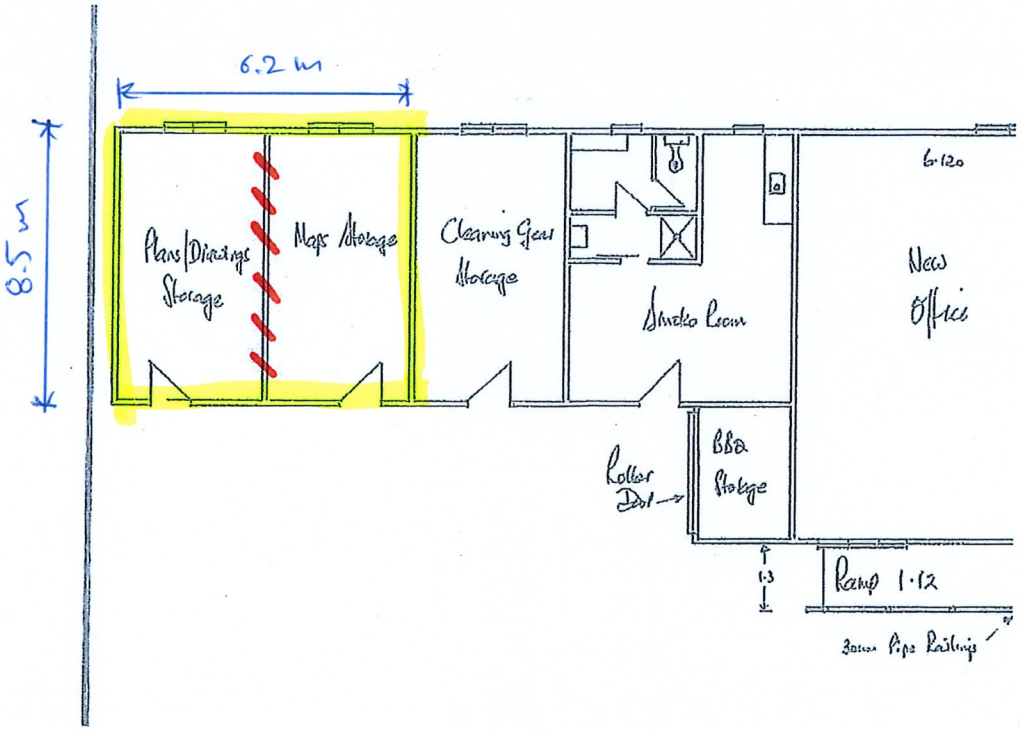
$$\text{Shear demand} = 0.64\ kN/m^2 \times \left(\frac{6.2}{2} + 2.9\right) = 3.84\ kN/m$$

$$\frac{6\ kN/m}{3.84\ kN/m} \times 100 = \boxed{156\%\ NBS}$$

Investigation of ceiling diaphragms



Block B Layout



Block A Layout

CALCULATION SHEET

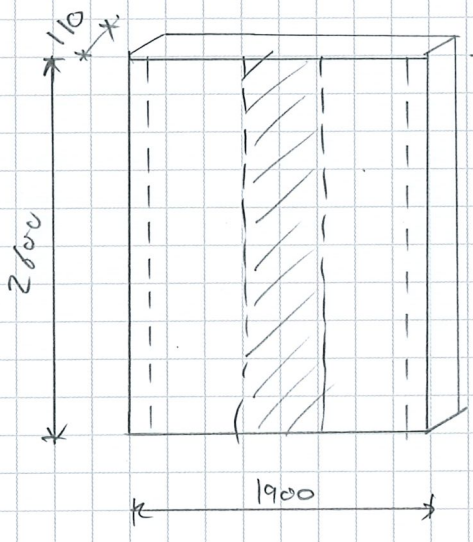
Project/Task/File No: 5- P1538.02 | Sheet No of

Project Description: | Office:

Computed: 9 / 11 / 2021

Check: / /

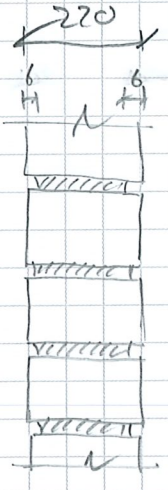
Out-of-plane behaviour of (URM) masonry wall: (BBQ storage)



C8.8.5.2

following criteria to be met:

- Capacity to be halved ($\mu = 1.0$)
- no signs of cracking
- no cracking expected in-plane



$\therefore n = 2$

$p = 16$

f'_t = 3.1 MPa. T C8.5

p = 10 mm

t_{gross} = 220 mm

n = 2

$P = 0.3\ kPa \times \frac{2.75}{2} = 0.41\ kN/m$

$A_n = 220 \times 1000 = 220\,000\ mm^2$

$t_{nom} = 220 - 2 \times 6$ ~ ignore, use $t_{nom} = 220$ mm.

$\therefore M_{cap} = \frac{t_{nom}^2}{6}\left(f'_t + \frac{P}{A_n}\right)$ ignoring SW of masonry.

$= \frac{220^2}{6}\left(3.1 + \frac{0.41 \times 10^3}{110\,000}\right)$

$= 8067\ (3.1037) \times 10^{-6}$

$= 0.025\ kNm/m$

$M^* = \frac{(1.98\ kPa \times 0.38) \times 2.6^2}{8}$

$= 0.6358\ kNm/m$

$\frac{0.025}{0.6358} \times 100 =$ **4% NBS**

Typical as 15% NBS.

T A8.1