EASTERN CONSULTING LIMITED

CONSULTING CIVIL & STRUCTURAL ENGINEERS

Producer Statement – PS1 – Design

Issued by: Eastern Consulting Limited
To: Gibraltar Built, Te Puke

In respect of: Flare by Gibraltar Built, outdoor fire place.

Dr Peter Davenport, of Eastern Consulting Limited, has been engaged by Gibraltar Built to provide structural design of the outdoor fire place. These items are not covered by NZS 3604 or other building standards and it is needed to verify compliance with the requirements of clause B1 of the Building Regulations 1992 for these items.

I have carried out calculations for these components in accordance with NZBC verification method B1/VM1 of the approved documents issued by the Department of Building and Housing and the work is described on drawings titled Flare by Gibraltar Built – Metro/Tuscany, dwg # PS1-1, PS1-2, PS1-3 and PS1-4, dated 19/02/2010, the assembly instructions and the calculations to support this.

On behalf of the Design Firm, and subject to:

(i) Site verification of suitable ground as defined in NZS3604
(ii) Construction in accordance with the assembly instructions

I believe on reasonable grounds that the fire place, if constructed in accordance with the drawings, specifications and other documents provided, will comply with the relevant provisions of the building code.

I, Peter Davenport am a CPEng, I am a member of IPENZ and hold the qualifications listed below.

The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance to a minimum value of $200,000.

This producer statement was issued on 18 March 2010.
It will be valid for 13 months until 18 April 2011.

Signed by Peter Davenport on behalf of Eastern Consulting Limited

P Davenport

Dr Peter Davenport
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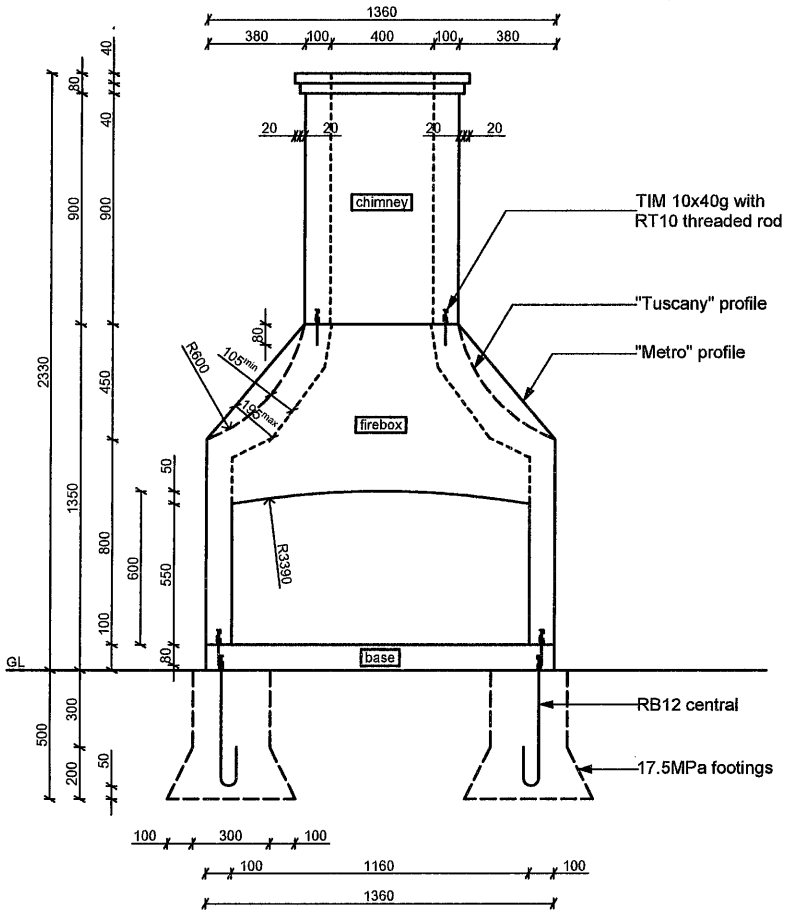
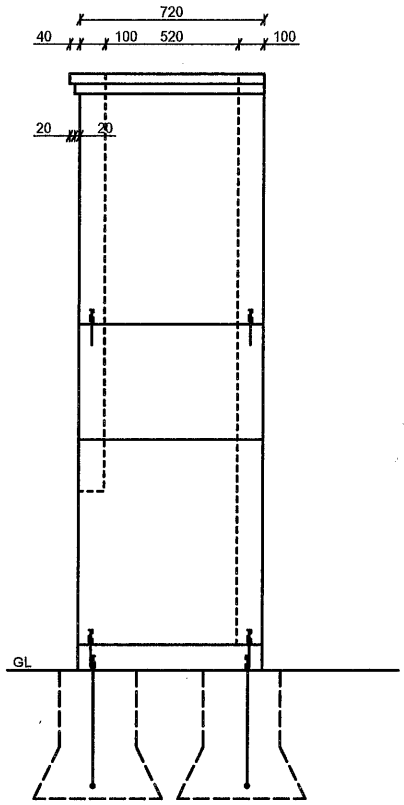
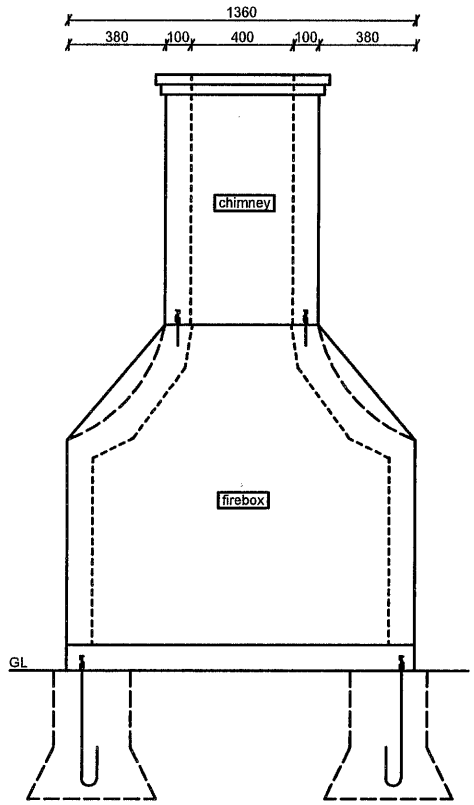


Front Elevation



Side Elevation



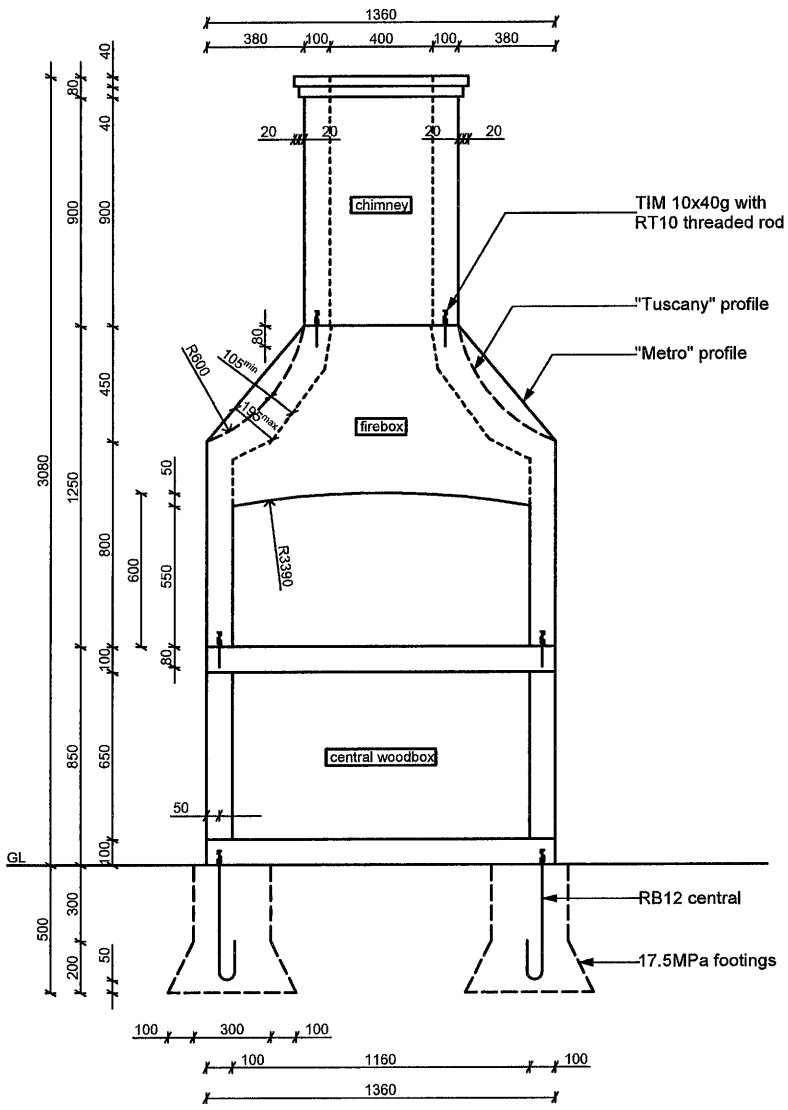
Rear Elevation

Flare by Gibraltar Built - METRO/TUSCANY 1

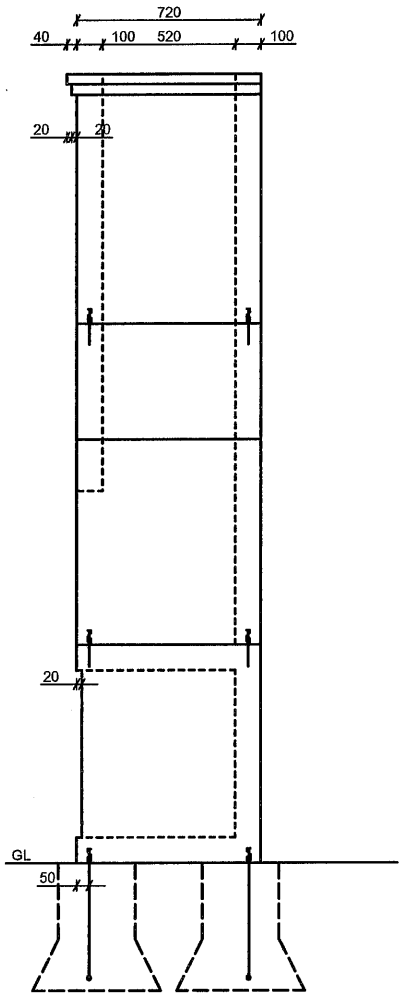
dwg # PS1-1 19/02/2010 1:20 @ A3

Notes:

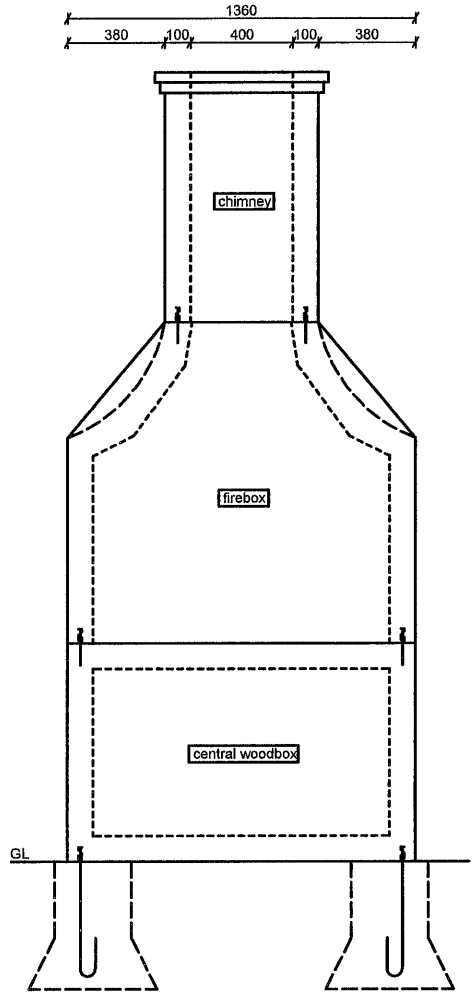
1. All concrete work shall comply with the requirements of NZS3109:1997.
2. Concrete panels shall be 25MPa concrete and footings shall be 17.5MPa concrete.
3. Maximum slump shall be 100mm unless noted otherwise.
4. All panels shall be 100mm thick unless noted otherwise.
5. All panels shall have 668 mesh central and 30mm minimum cover from edges.
6. All inserts shall be TIM10x40g with RT10 galvanised threaded rod unless noted otherwise.
7. All steelwork shall be hot dip galvanised after fabrication.



Front Elevation



Side Elevation



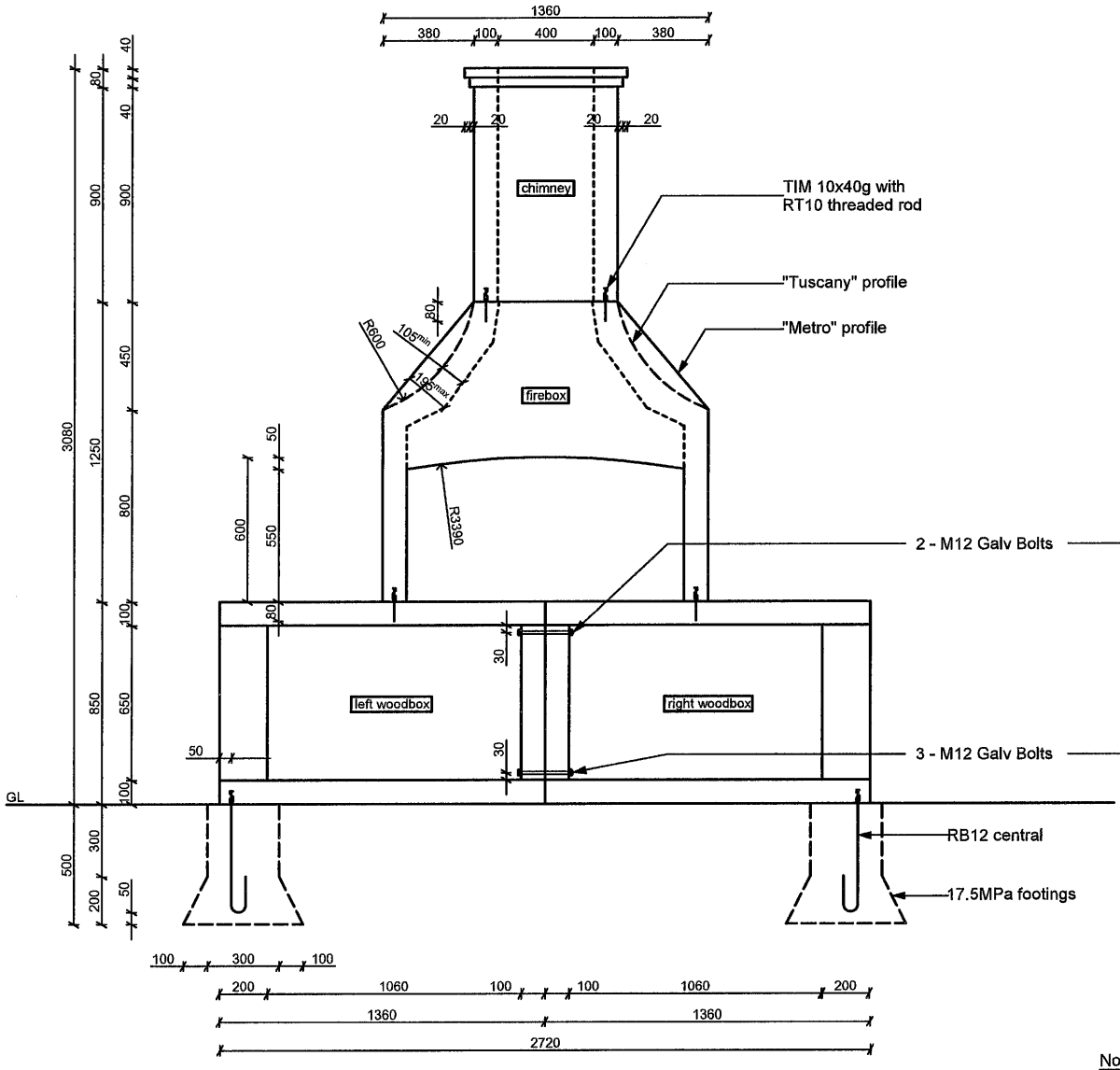
Rear Elevation

Flare by Gibraltar Built - METRO/TUSCANY 2

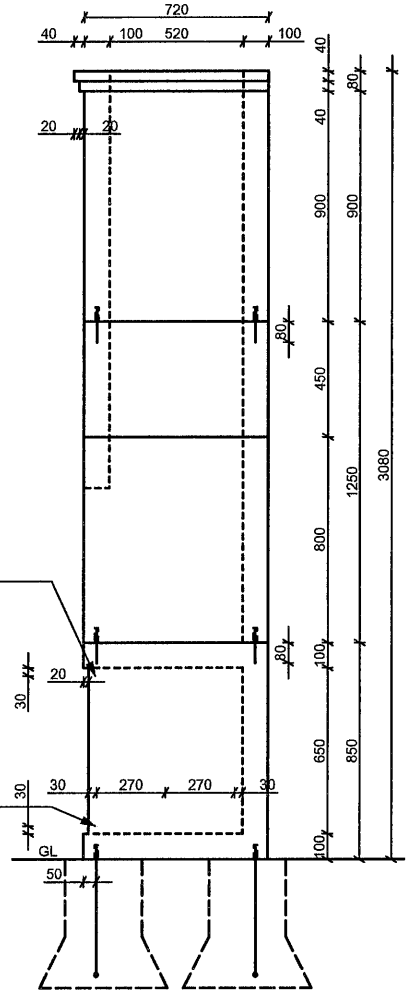
dwg # PS1-2 19/02/2010 1:20 @ A3

Notes:

1. All concrete work shall comply with the requirements of NZS3109:1997.
2. Concrete panels shall be 25MPa concrete and footings shall be 17.5MPa concrete.
3. Maximum slump shall be 100mm unless noted otherwise.
4. All panels shall be 100mm thick unless noted otherwise.
5. All panels shall have 668 mesh central and 30mm minimum cover from edges.
6. All inserts shall be TIM10x40g with RT10 galvanised threaded rod unless noted otherwise.
7. All steelwork shall be hot dip galvanised after fabrication.



Front Elevation



Side Elevation

Flare by Gibraltar Built - METRO/TUSCANY 3

dwg # PS1-3 19/02/2010 1:20 @ A3

Notes:

1. All concrete work shall comply with the requirements of NZS3109:1997.
2. Concrete panels shall be 25MPa concrete and footings shall be 17.5MPa concrete.
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4. All panels shall be 100mm thick unless noted otherwise.
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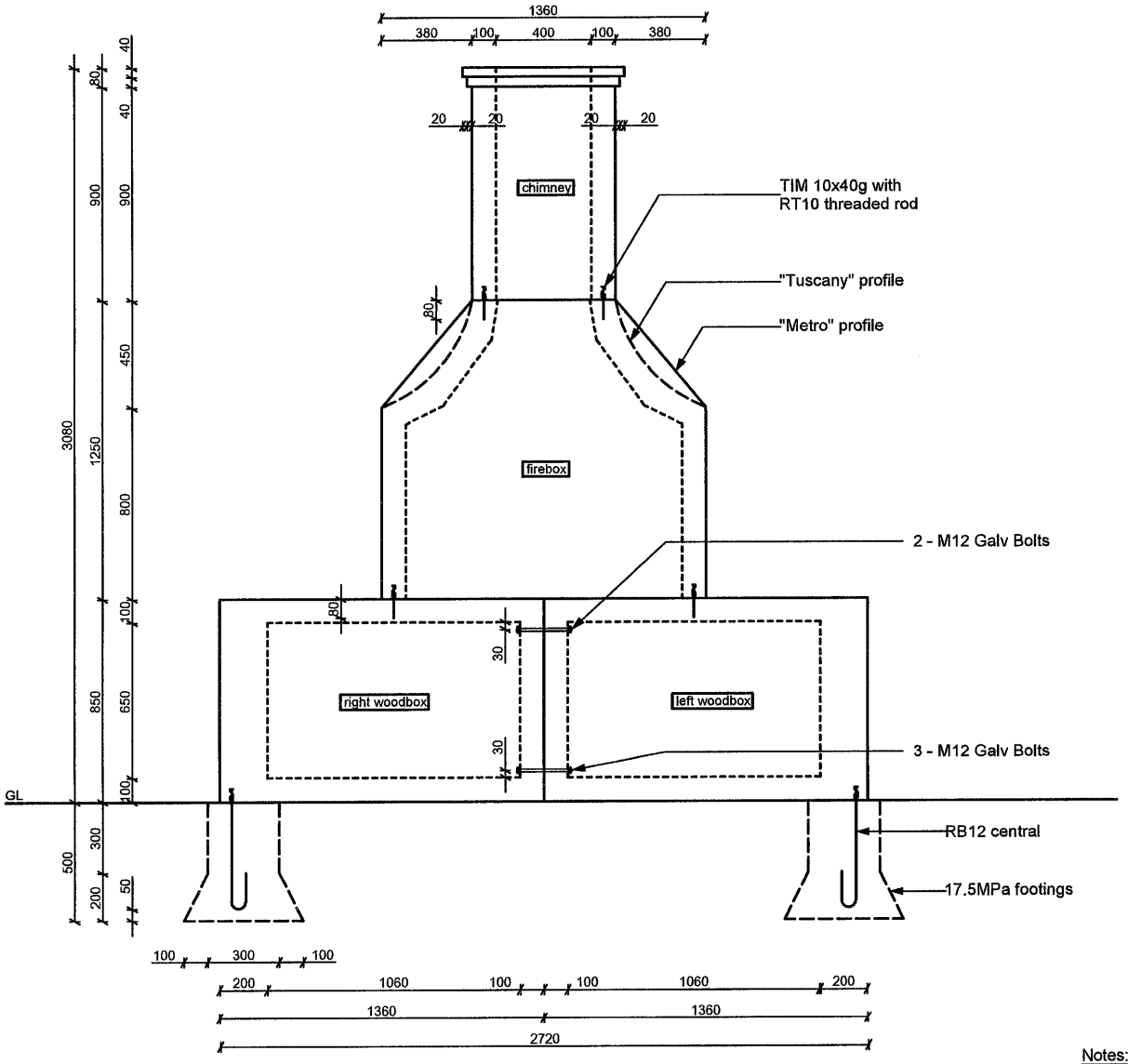
7. All steelwork shall be hot dip galvanised after fabrication.



Rear Elevation

Flare by Gibraltar Built - METRO/TUSCANY 3

dwg # PS1-4 19/02/2010 1:20 @ A3

Notes:

1. All concrete work shall comply with the requirements of NZS3109:1997.
2. Concrete panels shall be 25MPa concrete and footings shall be 17.5MPa concrete.
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4. All panels shall be 100mm thick unless noted otherwise.
5. All panels shall have 668 mesh central and 30mm minimum cover from edges.
6. All inserts shall be TIM10x40g with RT10 galvanised threaded rod unless noted otherwise.
7. All steelwork shall be hot dip galvanised after fabrication.

EASTERN CONSULTING LIMITED

Job: Gibraltar Built fireplaces

Job No.: U090036

Page: 1

Date: Mar 2010

Calc: PD

Chkd:

Structural check on fireplace
Loading to NZS 1170.
Precast concrete "pitset". Heavy weight indicates that seismic load is most critical
Refer to drawings for sizes of component.

Wind Load NZS/AS 1170.2

$V_{sit,\beta} = V_R M_d (M_{z,cat}\ M_s\ M_t)$

Not a specific location, but choose an exposed site to cover worst case.

$V_R = 47$ m/s { Importance level 1 → design life 50y, R = 100 years, region A7, A6 or W

$M_d = 1.0$ - any direction

$M_{z,cat} = 0.91$ Terrain 2, ht < 5m

$M_s = 1.0$ no shielding

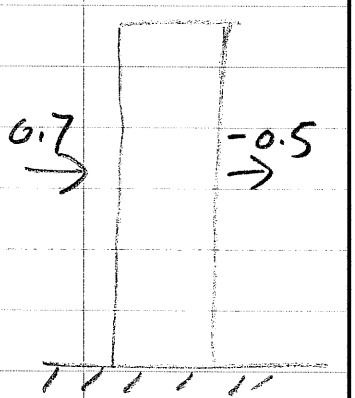
$M_t = 1.0$ no terrain effect

$V_{sit,\beta} = 47 * 0.91 = 42.8$ m/s

pressure on force

$= 1/2 * 1.2 * (42.8)^2 * (0.7 + 0.5)$

$= 1.32$ kPa



force area $= (0.6 * 0.98) + \left(\frac{0.6 + 1.36}{2} * 0.45, + 1.36 * 0.8\right)$

$+ (2 * 1.36 * 0.85) = 1.58 + 1.53 + 2.31 = 5.42\ m^2$

Force $= 1.32 * 5.42 = 7.2$ kN

EASTERN CONSULTING LIMITED

Job: Gibraltar Built fireplaces

Job No.: U0900036

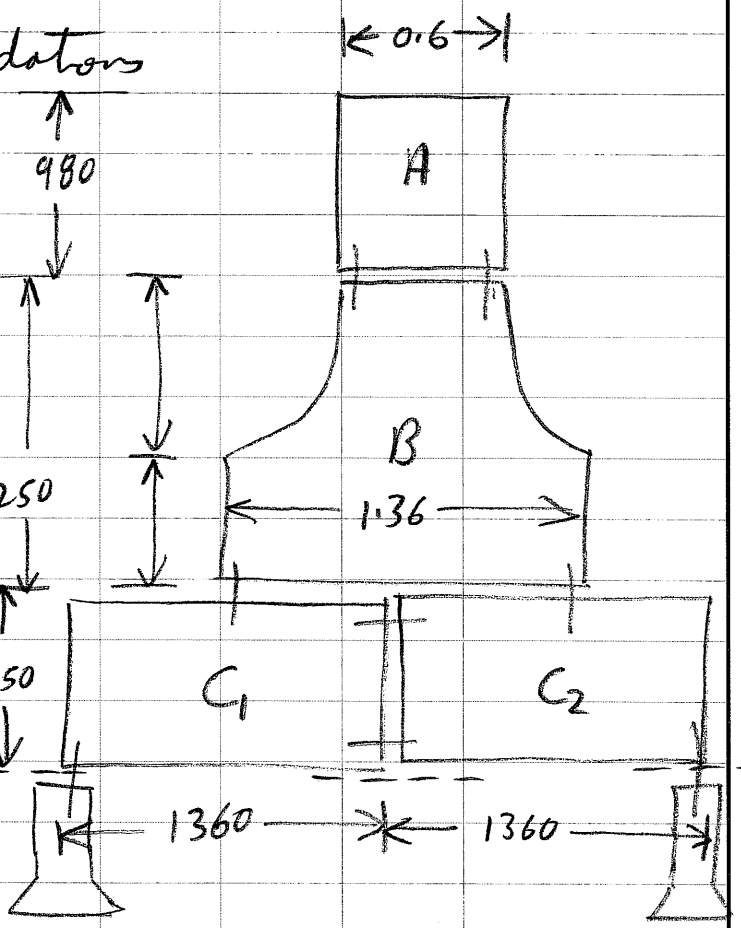
Page: 2

Date: Mar 2010

Calc: PD Chkd:

3 basic precast parts + foundations

Piece	Vol (m^3)	Wgt (kN)	centroid $\bar{x}$ (mm)	$W\bar{x}$
A	0.20	4.80	2590	12.43
B	0.37	8.88	1550	13.76
C_1	0.36	8.64	425	3.67
C_2	0.36	8.64	425	3.67
		30.96		33.53



overall $\bar{x} = \frac{\Sigma W\bar{x}}{\Sigma W} = \frac{33.53}{30.96}$

$= 1.08$ m above base

for top 2 items (A & B)

$\bar{x} = 26.18 / 13.68 = 1.91$ m above base of B

EASTERN CONSULTING LIMITED

Job: Gibraltar Built fire places.

Job No.: 4090036

Page: 3

Date: Mar 2010

Calc: PD Chkd:

Seismic load NZS 1170.5

This is essentially a very stiff structure & will respond as a rigid body - ie very short period & as an elastic / non-ductile mode, so $\mu = 1.25$

The site subsoil C - shallow soil.

$C_h(T) = 2.26$ - soil C, short period

$Z = 0.42$ - worst case for NZ populated areas

$R = 0.5$ - 100 year return period
- no fault effects as short period.

$C(T) = 2.26 \times 0.42 \times 0.5 = 0.47$

$S_p = 1.3 - 0.3 \times 1.25 = 0.92$

$k_u = \frac{(1.25-1)\ 0.4}{0.7} + 1 = 1.14$

$C_d(T_1) = 0.47 \times 0.92 / 1.14 = 0.38$

total weight = 31 kN

lateral force = $0.38 \times 31 = 11.8$ kN

This is greater than wind, as expected.

c of g is 1.08 m above base

overturning moment = $11.8 \times 1.08 = 12.7$ kNm

EASTERN CONSULTING LIMITED	Job: Gibraltar Built fire places	Job No.: U090036	Page: 4
Date: Mar 2010		Calc: PD	Chkd:

Check fixings

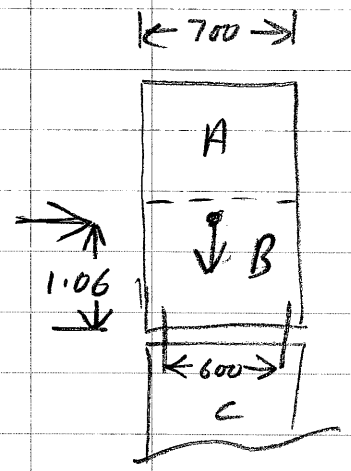
base of units A & B (to lower unit C)

weight of A & B = 13.7 kN

ht of c of g = 1.06

lateral load = 0.38 * 13.7 = 5.2 kN

moment = 5.2 * 1.06 = 5.5 kNm



force in fixings = $\left(\pm\frac{5.5}{0.6\text{m}} + \frac{13.7}{2}\right) * \frac{1}{2} = (\pm 9.2 + 6.8)/2$

(0.6m: separation; 2: 2 fixings; 1/2: 2 rows)

ie 8.0 kN compression

or 1.2 kN tension

capacity of 10 mm fixings Reid TIM 10 * 40 insert

characteristic load 17 kN
material factor 0.6
→ 10.2 kN (tension)

capacity of Sika Anchor Fix-1 adhesive

M10 threaded rod, 90 deep.

characteristic tensile load = 24.6 kN

recommended tensile load 8.2 kN

This is more than adequate

fixings between A & B have lower loads & thus also OK.

Check connections to pile

Total weight 31 kN

seismic load = 0.38 * 31 = 11.8 kN

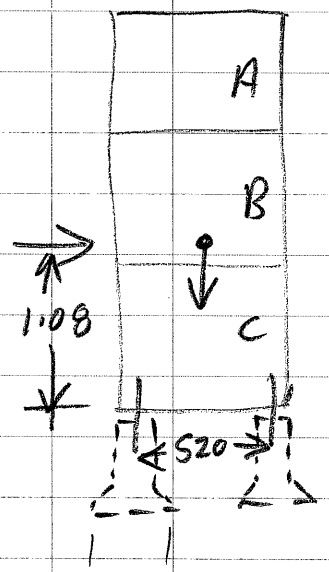
height of cofg = 1.08m

overturning moment = 11.8 * 1.08 = 12.7 kNm

Tension forces on piles

$= \frac{1}{2}\left(\pm\frac{12.7}{0.52} + \frac{31}{2}\right) = \pm 12.2 + 7.8$

(2 rows; 2 piles in each row)



= + 20.0 kN (compression)

or − 4.4 (tension)

pressure on pile at base (500 diam)

$= 20. / \left(\frac{\pi \cdot (0.5)^2}{4}\right) = \frac{20}{0.196} = 102$ kPa

OK under seismic ultimate load

tension on pile

- weight $0.5 * \pi * (0.3)^2/4 * 24$ = 0.8 kN
- side friction (@ 10 kPa) = $0.3 * \pi * 0.5 * 10$ = 4.7 kN

Total 5.5 kN.

OK

fixings adequate for tension force.

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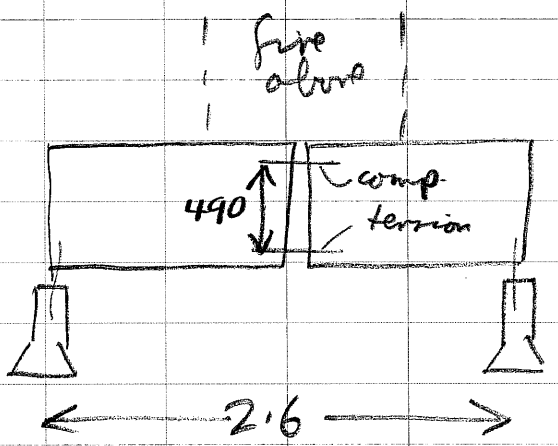
Date: Mar 2010		Calc: PD	Chkd:

Check fixings of base units.

Assume soil settles in middle & span across between pile - not expect it to be this severe



total weight of concrete components = 31 kN.

Live load of fire wood & people sitting on it - say 5 kPa over area of $0.7m * 2.6m = 9kN$.

$1.2G \& 1.5Q = 1.2*31 + 1.5*9 = 51kN$.

assume as UDL

Moment at "centre of beam" $= \frac{wl^2}{8} = \frac{(51/2.6)*(2.6)^2}{8} = 16.6 kNm/m$

check joint at centre

tension at bottom $= \frac{16.6}{0.49} = 33.8 kN$.

have 3 - M12 bolts at bottom

capacity $= 3 * \pi * \frac{(0.012)^2}{4} * 300 MPa * 0.7 = 71kN$

OK.