

Structural Calculations For:

**MOH Villas – Villa 250 M2
Riyadh - KSA
Saudi Arabia**

Arizona Structural Group Job No. 16130
Client: OMNI Block

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Revised: 1 / 3 / 2017



EXPIRES 9/30/2017

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Principal
Arizona Structural Group

DESIGN CRITERIA

Project Name: MOH Villas – Villa 250 M2 (Saudi Arabia – OMNI Block)
Job Number: 16130

Code

Compliance with the 1997 UBC.

Loadings

Live Loads

Roof:		psf
	Flat to less than 4/12 pitch, reducible for area	20
Floor:		psf
	Residential	40

Wind Loads 1997 UBC

$$P = C_e \cdot C_q \cdot q_s \cdot I$$

Basic wind speed 103 mph (Design Based on 110 mph)
Exposure B (Design Based on Exposure C)

Seismic Loads 1997 UBC

$$V = ((C_v \cdot I) / (R \cdot T)) \cdot W$$

Zone 1,
 $C_a = 0.09$
 $C_v = 0.13$
Soil Profile S_c

Soil Loads

Soil Weight 110 pcf

Dead Loads

Hambro Deck w/ Concrete Roof:	psf
Built up roofing	4.4
4 in. concrete slab	50.0
Hambro System	15.0
Mechanical, electrical, and plumbing	5.0
Miscellaneous allowance	5.1

Total Floor Dead Load	80.0

Hambro Deck w/ Concrete Floor:	psf
4 in. concrete slab	50.0
Hambro System	15.0
Mechanical, electrical, and plumbing	5.0
Miscellaneous allowance	5.0

Total Floor Dead Load	75.0

Walls: Masonry	Total Wall Dead Load
8 in. masonry concrete block (Medium Weight)	psf
Solid Grouted	78.0
Partial Grouted at:	
16" o/c	63.0
24" o/c	58.0
32" o/c	55.0
40" o/c	53.0
48" o/c	51.0

Walls: OMNI Block Masonry	Total Wall Dead Load
8 in. OMNI Block	psf
Solid Grouted	52.0
Partial Grouted at:	
16" o/c	41.0
24" o/c	37.0
32" o/c	35.0
40" o/c	34.0
48" o/c	34.0

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Material Strengths

Concrete:	fc' psi
Foundations, slabs	2500
Structural	3000 (Design Based on 2500)

Masonry:	
Net Area Compressive Strength (f'm)	1500 psi
Hollow concrete block units:	ASTM C90, Grade N
Mortar:	Type S

Steel:		Fy psi
Rebar:		
#4 and Smaller:	ASTM A615, Gr. 40	40,000
#5 and Larger:	ASTM A615, Gr. 60	60,000
Bolts and Anchors:	A307 or A36	36,000
Anchor Rods:	F1554 Gr. 36	36,000
(Bent, Headed, & Threaded)		
Structural (W Shapes)	A992	50,000
Structural (Angles & Channels)	A36	36,000
Tube Steel (HSS)	A500 Grade B	42,000
Pipe (Columns)	A53 Grade B	35,000
Bars & Plates	A36	36,000

Soil:	
Foundation Pressure	psf
(1'-6" Minimum foundation bearing below grade)	
General Case w/o Soils Report	
1'-6" deep (Minimum Depth)	1500
Lateral Bearing (Passive Pressure)	150 psf/ft
Coefficient of Friction (Applied to Dead Load)	0.25

Floor loads for Mas. Partition walls - Non BRG

Partition wall ht = 10' max

Partition wt = 51 psf (8" CMU w/ grouted cells @ 48' c/c)

Max line load = 51 (10) = 510 #/l

floor joists @ 4'-6" o/c Max

$$M = \frac{PL}{4} = \frac{w_{eq} L^2}{8} \Rightarrow w_{eq} = \frac{8}{L^2} \left(\frac{PL}{4} \right) = \frac{2P}{L}$$

$$\Rightarrow w_{eq} = \frac{2(510)}{4.5} = 227 \text{ psf}$$

∴ Use 227 psf Partition load @ Hambro

Floor System for 10'-0" Max Masonry

Partition walls on Floor Framing

∴ Use 510 #/l Load @ Floor Bearing

Lintels & walls where Mas. Partition

walls are used

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Metric To Imperial Conversion Table

(Block Modular Dimensions)

Conversion Factors:

1 m = 3.277777.... ft

200 mm = 8 in = 06.7777... ft

mm	ft
200	0.667
400	1.333
600	2.000
800	2.667
1000	3.333
1200	4.000
1400	4.667
1600	5.333
1800	6.000
2000	6.667
2200	7.333
2400	8.000
2600	8.667
2800	9.333
3000	10.000
3200	10.667
3400	11.333
3600	12.000
3800	12.667
4000	13.333
4200	14.000
4400	14.667
4600	15.333
4800	16.000
5000	16.667
5200	17.333
5400	18.000
5600	18.667
5800	19.333
6000	20.000
6200	20.667
6400	21.333
6600	22.000
6800	22.667
7000	23.333
7200	24.000
7400	24.667
7600	25.333
7800	26.000
8000	26.667
8200	27.333
8400	28.000
8600	28.667
8800	29.333
9000	30.000

mm	ft
9200	30.667
9400	31.333
9600	32.000
9800	32.667
10000	33.333
10200	34.000
10400	34.667
10600	35.333
10800	36.000
11000	36.667
11200	37.333
11400	38.000
11600	38.667
11800	39.333
12000	40.000
12200	40.667
12400	41.333
12600	42.000
12800	42.667
13000	43.333
13200	44.000
13400	44.667
13600	45.333
13800	46.000
14000	46.667
14200	47.333
14400	48.000
14600	48.667
14800	49.333
15000	50.000
15200	50.667
15400	51.333
15600	52.000
15800	52.667
16000	53.333
16200	54.000
16400	54.667
16600	55.333
16800	56.000
17000	56.667
17200	57.333
17400	58.000
17600	58.667
17800	59.333
18000	60.000

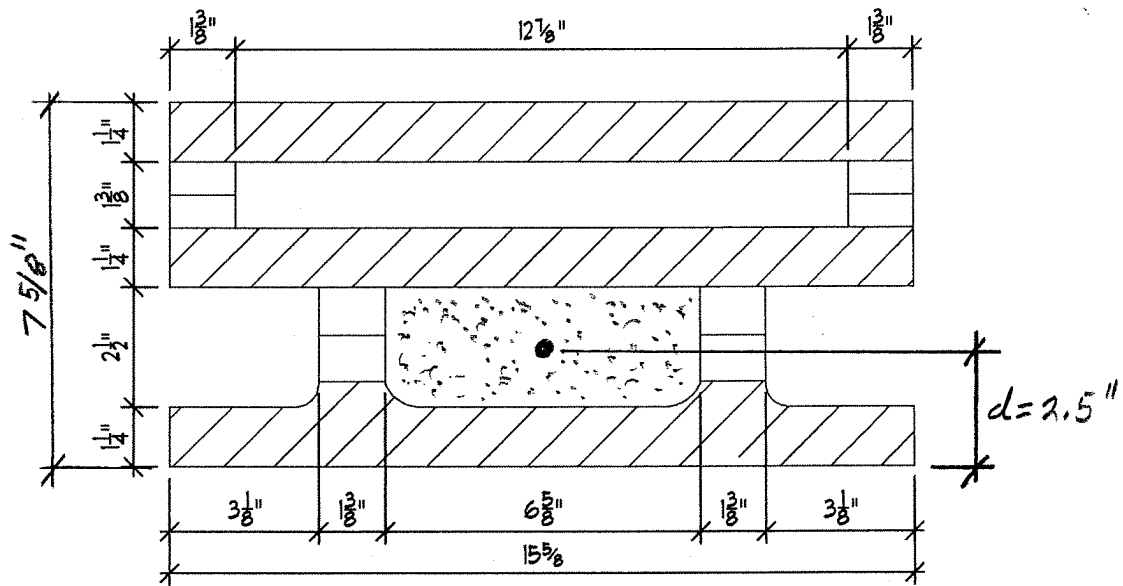
mm	ft
18200	60.667
18400	61.333
18600	62.000
18800	62.667
19000	63.333
19200	64.000
19400	64.667
19600	65.333
19800	66.000
20000	66.667
20200	67.333
20400	68.000
20600	68.667
20800	69.333
21000	70.000
21200	70.667
21400	71.333
21600	72.000
21800	72.667
22000	73.333
22200	74.000
22400	74.667
22600	75.333
22800	76.000
23000	76.667
23200	77.333
23400	78.000
23600	78.667
23800	79.333
24000	80.000
24200	80.667
24400	81.333
24600	82.000
24800	82.667
25000	83.333
25200	84.000
25400	84.667
25600	85.333
25800	86.000
26000	86.667
26200	87.333
26400	88.000
26600	88.667
26800	89.333
27000	90.000

Design Properties of 8" OMNI Block

Vert. Cores Grouted at	Reinf. On One Face	
	Weight (pcf)	Equiv. Solid Thickness (in)
8" o/c (Solid Grouted)	52	5.0
16" o/c	41	4.1
24" o/c	37	3.8
32" o/c	35	3.6
40" o/c	34	3.5
48" o/c	34	3.4
No Grout	30	3.1

Medium Wt CMU (pcf) = 115
Grout (pcf) = 140

May be designed as
6" Conventional Masonry
w/ d = 2.5"



8" OMNI STRETCHER BLOCK

Note: Block is 7 5/8" tall

Wall Components Wind loads - '97 UBC

Wind speed 103 mph \rightarrow use 110 mph

Exposure B \rightarrow use Exp. C

$$q_s = 31.0 \text{ psf}$$

$$P_w = C_e C_g q_s I$$

$$I_w = 1.0$$

$$C_g = 1.2 \text{ (wall elements)}$$

h (ft)	C _e	C _g	q _s psf	I _w	P _w psf
0-15	1.06	1.2	31.0	1.0	34.1
15-20	1.13	"	"	"	36.4
20-25	1.19	"	"	"	38.3
25-30	1.23	"	"	"	39.6

\therefore By comparison to similar

Projects, wind loads will

govern over seismic loads

at wall components.

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Standard CMU or IMSI wall

	Wall ID	W1	(Max BRG @ Roof)	
Block Type (imsi or cmu)	CMU			Moment CSI
Soil brg allowable (psf)	1500			CSI roof 0.49 <1.0 OK
Wall height (ft)	26.00			CSI roof w/SSI no SSI Req'd
Parapet height (ft)	4.00			CSI floor 0.49 <1.0 OK
Ceiling height roof (ft)	11.00			CSI floor w/SSI no SSI Req'd
Ceiling height floor (ft)	11.00			
Eccentricity roof (in)				DL + Wind CSI
Eccentricity floor (in)				qs 31
Width of block type (in)	7.625			Ce 1.19
f'm	1500			Cq 1.2
fs (psi)	24000			l 1
Ae (in^2)	41			P inward 44.3
Weight of wall (lb)	34			P outward 39.6
Weight of parapet (lb)	34			Moment @ roof 383
d (in)	2.5			Moment @ floor 383
Fa	329			Calc'd fb TL 448
1/2 Fa	165			Calc'd fa TL 67
Fb	500			CSI SSI Req'd
1/2 Fb	250			CSI w/SSI 1.10 <1.33 OK
Braced wall roof lu (ft)	8.80			
Braced wall floor lu (ft)	8.80			DL + Wind CSI Governs

	Rebar size	Spacing (in)		
Vert. Rebar Try	5	48		Vertical Steel Check
Area of bar (in)	0.31			Calc'd fs TL (psi) 2202
np	0.067	25.8	=n	Calc'd fs/fs <1 ok 0.09 <1.0 OK
2/jk	7.31			
k	0.3044			Horizontal Steel Check
j	0.8985			Minimum horz. steel req'd .002*Ag-Asv or .0007 Ag
Roof DL above (plf)	1440			Rebar size Spacing (in)
Roof TL above (plf)	1800			Horz. Rebar Try 5 96
Floor DL above (plf)	300			Area of bar (in) 0.31
Floor TL above (plf)	460			Min. hor. stl check (lf > .0007 ok) 0.000423
Min footing width (in)	26.24			Asv 0.000847
Calc'd fa TL	80.00			Hor. Steel Req'd (.002- Asv)*Ag 0.001153 *Ag
Ledger Moment roof (lb in/ft)				Ag (in^2) 2379.00
Ledger Moment floor (lb in/ft)				Req'd in^2 2.7430
Calc'd fb TL @ roof				Min. # of bars req'd 8.8
Calc'd fb TL @ floor				

Use 8 inch OMNI Block Wall w/ # 5 Verticals @ 48 inches O.C.

w/ STD DuroWire @ 16 inches O.C. w/ # 5 Horizontal @ 96 inches O.C.

W/ 30 Inch Wide x 12 inch Thick Footing w/ 3 # 5 Continuous

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Standard CMU or IMSI wall

	Wall ID	W2	(Max BRG @ Floor)	
Block Type (imsi or cmu)	CMU			Moment CSI
Soil brg allowable (psf)	1500			CSI roof 0.55 <1.0 OK
Wall height (ft)	26.00			CSI roof w/SSI no SSI Req'd
Parapet height (ft)	4.00			CSI floor 0.55 <1.0 OK
Ceiling height roof (ft)	11.00			CSI floor w/SSI no SSI Req'd
Ceiling height floor (ft)	11.00			
Eccentricity roof (in)				DL + Wind CSI
Eccentricity floor (in)				qs 31
Width of block type (in)	7.625			Ce 1.19
f _m	1500			Cq 1.2
f _s (psi)	24000			l 1
A _e (in ²)	41			P inward 44.3
Weight of wall (lb)	34			P outward 39.6
Weight of parapet (lb)	34			Moment @ roof 383
d (in)	2.5			Moment @ floor 383
F _a	329			Calc'd fb TL 448
1/2 F _a	165			Calc'd fa TL 70
F _b	500			CSI SSI Req'd
1/2 F _b	250			CSI w/SSI 1.11 <1.33 OK
Braced wall roof lu (ft)	8.80			
Braced wall floor lu (ft)	8.80			DL + Wind CSI Governs

	Rebar size	Spacing (in)		
Vert. Rebar Try	5	48		Vertical Steel Check
Area of bar (in)	0.31			Calc'd f _s TL (psi) 2202
np	0.067	25.8	=n	Calc'd f _s /f _s <1 ok 0.09 <1.0 OK
2/jk	7.31			
k	0.3044			Horizontal Steel Check
j	0.8985			Minimum horz: steel req'd .002*Ag-Asv or .0007 Ag
Roof DL above (plf)	120			Rebar size Spacing (in)
Roof TL above (plf)	400			Horz. Rebar Try 5 96
Floor DL above (plf)	1745			Area of bar (in) 0.31
Floor TL above (plf)	2261			Min. hor. stl check (If > .0007 ok) 0.000423
Min footing width (in)	29.45			Asv 0.000847
Calc'd fa TL	89.78			Hor. Steel Req'd (.002- Asv)*Ag 0.001153 *Ag
Ledger Moment roof (lb in/ft)				Ag (in ²) 2379.00
Ledger Moment floor (lb in/ft)				Req'd in ² 2.7430
Calc'd fb TL @ roof				Min. # of bars req'd 8.8
Calc'd fb TL @ floor				

Use 8 inch OMNI Block Wall w/ # 5 Verticals @ 48 inches O.C.

w/ STD DuroWire @ 16 inches O.C. w/ # 5 Horizontal @ 96 inches O.C.

W/ 30 Inch Wide x 12 inch Thick Footing w/ 3 # 5 Continuous

Partition load check
controls - see next sheet

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Standard CMU or IMSI wall

	Wall ID	W2	(Max BRG @ Floor)	
Block Type (imsi or cmu)	CMU		(Check w/ Masonry	Moment CSI
Soil brg allowable (psf)	1500		Partition Loads)	CSI roof 0.62 <1.0 OK
Wall height (ft)	26.00			CSI roof w/SSI no SSI Req'd
Parapet height (ft)	4.00			CSI floor 0.62 <1.0 OK
Ceiling height roof (ft)	11.00			CSI floor w/SSI no SSI Req'd
Ceiling height floor (ft)	11.00			
Eccentricity roof (in)				DL + Wind CSI
Eccentricity floor (in)				qs 31
Width of block type (in)	7.625			Ce 1.19
fm	1500			Cq 1.2
fs (psi)	24000			I 1
Ae (in^2)	41			P inward 44.3
Weight of wall (lb)	34			P outward 39.6
Weight of parapet (lb)	34			Moment @ roof 383
d (in)	2.5			Moment @ floor 383
Fa	329			Calc'd fb TL 448
1/2 Fa	165			Calc'd fa TL 70
Fb	500			CSI SSI Req'd
1/2 Fb	250			CSI w/SSI 1.11 <1.33 OK
Braced wall roof lu (ft)	8.80			
Braced wall floor lu (ft)	8.80			DL + Wind CSI Governs

	Rebar size	Spacing (in)		
Vert. Rebar Try	5	48		Vertical Steel Check
Area of bar (in)	0.31			Calc'd fs TL (psi) 2202
np	0.067	25.8	=n	Calc'd fs/fs <1 ok 0.09 <1.0 OK
2/jk	7.31			
k	0.3044			Horizontal Steel Check
j	0.8985			Minimum horz. steel req'd .002*Ag-Asv or .0007 Ag
Roof DL above (plf)	120			Rebar size Spacing (in)
Roof TL above (plf)	400			Horz. Rebar Try 5 96
Floor DL above (plf)	1745			Area of bar (in) 0.31
Floor TL above (plf)	2771			Min. hor. stl check (If > .0007 ok) 0.000423
Min footing width (in)	33.53			Asv 0.000847
Calc'd fa TL	102.22			Hor. Steel Req'd (.002- Asv)*Ag 0.001153 *Ag
Ledger Moment roof (lb in/ft)				Ag (in^2) 2379.00
Ledger Moment floor (lb in/ft)				Req'd in^2 2.7430
Calc'd fb TL @ roof				Min. # of bars req'd 8.8
Calc'd fb TL @ floor				

Use 8 inch OMNI Block Wall w/ # 5 Verticals @ 48 inches O.C.

w/ STD DuroWire @ 16 inches O.C. w/ # 5 Horizontal @ 96 inches O.C.

W/ 36 Inch Wide x 12 inch Thick Footing w/ 3 # 5 Continuous

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Standard CMU or IMSI wall

	Wall ID	W3	(Interior BRG Wall @ Floor Only)		
Block Type (imsi or cmu)	CMU			Moment CSI	
Soil brg allowable (psf)	1500			CSI roof 0.33	<1.0 OK
Wall height (ft)	11.00			CSI roof w/SSI no SSI Req'd	
Parapet height (ft)				CSI floor 0.33	<1.0 OK
Ceiling height roof (ft)				CSI floor w/SSI no SSI Req'd	
Ceiling height floor (ft)	11.00				
Eccentricity roof (in)					
Eccentricity floor (in)				DL + Wind CSI	
Width of block type (in)	7.625			qs 31	
f _m	1500			Ce 1.19	
f _s (psi)	24000			Cq 1.2	
A _e (in ²)	41			l 1	
Weight of wall (lb)	34			P inward 44.3	
Weight of parapet (lb)				P outward 39.6	
d (in)	2.5			Moment @ roof	
F _a	329			Moment @ floor 599	
1/2 F _a	165			Calc'd fb TL	
F _b	500			Calc'd fa TL 38	
1/2 F _b	250			CSI 0.23	<1.33 OK
Braced wall roof lu (ft)				CSI w/SSI no SSI Req'd	
Braced wall floor lu (ft)	11.00				

DL + Wind CSI Governs

		Rebar size	Spacing (in)		
Vert. Rebar Try		5	48	Vertical Steel Check	
Area of bar (in)		0.31		Calc'd f _s TL (psi)	3440
np		0.067	25.8 =n	Calc'd f _s /f _s <1 ok	0.14 <1.0 OK
2/jk		7.31			
k		0.3044		Horizontal Steel Check	
j		0.8985		Minimum horz. steel req'd	.002*Ag-Asv or .0007 Ag
Roof DL above (plf)				Rebar size	5
Roof TL above (plf)				Spacing (in)	96
Floor DL above (plf)		1200		Horz. Rebar Try	5
Floor TL above (plf)		1840		Area of bar (in)	0.31
Min footing width (in)		17.71		Min. hor. stl check (If > .0007 ok)	0.000423
Calc'd fa TL		54.00		Asv	0.000847
Ledger Moment roof (lb in/ft)				Hor. Steel Req'd (.002-Asv)*Ag	0.001153 *Ag
Ledger Moment floor (lb in/ft)				Ag (in ²)	1006.50
Calc'd fb TL @ roof				Req'd in ²	1.1605
Calc'd fb TL @ floor				Min. # of bars req'd	3.7

Use 8 inch OMNI Block Wall w/ # 5 Verticals @ 48 inches O.C.

w/ STD DuroWire @ 16 inches O.C. w/ # 5 Horizontal @ 96 inches O.C.

W/ 24 Inch Wide x 12 inch Thick Footing w/ 2 # 5 Continuous

Hembro Floor System

Note: Joist Design by others

Slab: DL = self wt - LL = 40 psf

check 4" slab w/ 4x4 - W2.9 x W2.9 WWF

Reinf. is 1" from slab face

$$A_s = 0.09 \text{ in}^2 / \text{ft} \leftarrow \text{WWF}$$

$$\text{Eq } A_s \text{ w/ \#3 bars} \rightarrow 0.11 \text{ in}^2 / \text{bar}$$

$$A_{\text{bar}} \left(\frac{s}{12} \right) = A_s$$

$$0.11 \left(\frac{s}{12} \right) = 0.09 \rightarrow s = 9.82 \text{ " } \approx 10 \text{ "}$$

⇒ Analyze a 9.82" wide strip w/ 1#3 bar

span = 4.5' max ~ see Attached calc.

∴ USE 4" THICK SLAB W/

4x4 - W2.9 x W2.9 WWF

Score :

Rev: 506001

Concrete Rectangular & Tee Beam Design

Page 1

Description One Way Slab @ Hambro Joist System

General Information

Span	4.50 ft	f _c	2,500 psi
Depth	4.000 in	F _y	60,000 psi
Width	9.820 in	Concrete Wt.	145.0 pcf
		Seismic Zone	0
		End Fixity	Pinned-Pinned
		Live Load	not acting with Short Term

Beam Weight Added Internally

Reinforcing

Rebar @ Center of Beam...				Rebar @ Left End of Beam...				Rebar @ Right End of Beam...			
Count	Size	'd' from Top		Count	Size	'd' from Top		Count	Size	'd' from Top	
#1	1	3	3.00in	#1	1	3	3.00 in	#1	1	3	3.00 in

Uniform Loads

#1	Dead Load	Live Load	Short Term	Start	End
	k	0.040 k	k	0.000 ft	4.500 ft

Summary

Beam Design OK

Span = 4.50ft, Width= 9.82in Depth = 4.00in

Maximum Moment : Mu	0.31 k-ft	Maximum Deflection	-0.0049 in
Allowable Moment : Mn/phi	1.40 k-ft		
Maximum Shear : Vu	0.25 k	Max Reaction @ Left	0.18 k
Allowable Shear : Vn*phi	2.51 k	Max Reaction @ Right	0.18 k

Shear Stirrups...

Stirrup Area @ Section	0.220 in ²						
Region	0.000	0.750	1.500	2.250	3.000	3.750	4.500 ft
Max. Spacing	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd in
Max Vu	0.249	0.187	0.093	0.091	0.091	0.184	0.247 k

Deflection

Deflections...	Upward		Downward	
DL + [Bm Wt]	0.0000 in	at 0.0000 ft	-0.0024 in	at 2.2500 ft
DL + LL + [Bm Wt]	0.0000 in	at 0.0000 ft	-0.0049 in	at 2.2500 ft
DL + LL + ST + [Bm Wt]	0.0000 in	at 0.0000 ft	-0.0024 in	at 2.2500 ft
Reactions...	@ Left		@ Right	
DL + [Bm Wt]	0.089 k		0.089 k	
DL + LL + [Bm Wt]	0.179 k		0.179 k	
DL + LL + ST + [Bm Wt]	0.089 k		0.089 k	

8

Concrete Beam

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 Licensee : Arizona Structural Group

Lic. # : KW-06010212

Description : One Way Slab @ Hambro Joist System : With Masonry Partition Wall Load

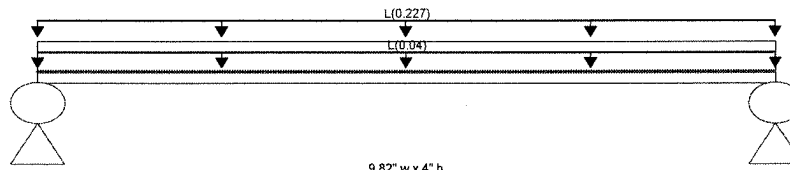
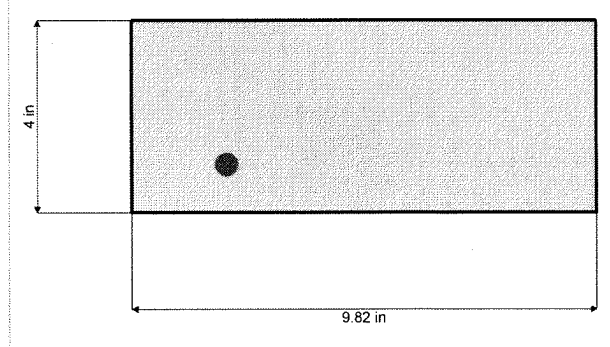
CODE REFERENCES

Calculations per ACI 318-11, IBC 2012, ASCE 7-10
 Load Combination Set : IBC 2015

In compliance w/ 1997 UBC

Material Properties

f_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
Ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	2



Span=4.50 ft

Cross Section & Reinforcing Details

Rectangular Section, Width = 9.820 in, Height = 4.0 in
 Span #1 Reinforcing...
 1-#4 at 1.0 in from Bottom, from 0.0 to 4.50 ft in this span

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : L = 0.040 k/ft, Tributary Width = 1.0 ft
 Uniform Load : L = 0.2270 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.492 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.015 in Ratio = 3585 >= 36
Mu : Applied	1.201 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 < 360
Mn * Phi : Allowable	2.441 k-ft	Max Downward Total Deflection	0.017 in Ratio = 3122 >= 18
Location of maximum on span	2.246 ft	Max Upward Total Deflection	0.000 in Ratio = 999 >= 18
Span # where maximum occurs	Span # 1		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	0.690	0.690
Overall MINimum	0.089	0.089
+D+L+H	0.690	0.690
D Only	0.089	0.089
L Only	0.601	0.601

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.0173	2.250		0.0000	0.000

9.1

Bearing Plates @ Hambro Joists

Max Reactions @ Hambro Joists

Roof

$$R = 80/20 \left(\frac{36.67}{2} \right) \left(\frac{4.5}{2} + \frac{4.5}{2} \right)$$

$$R \approx 8250 \#_{TL}$$

@ Roof

Floor

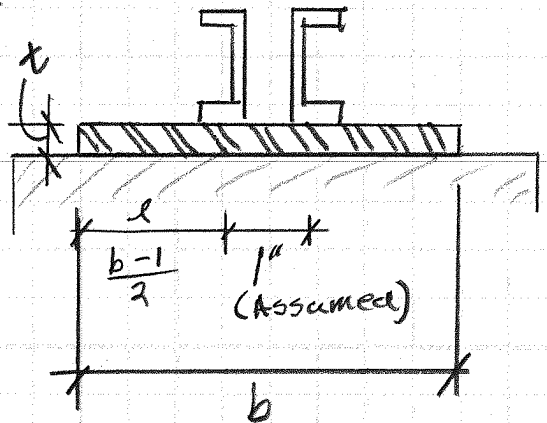
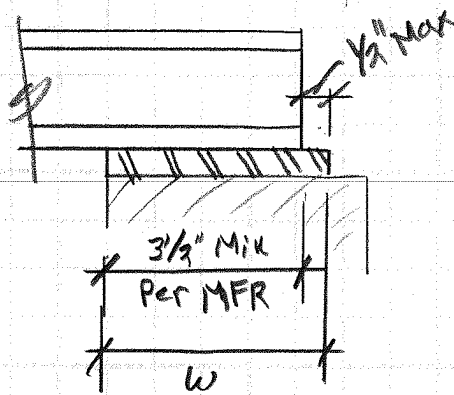
$$R = 75/40 \left(\frac{40}{2} \right) \left(\frac{4.5}{2} + \frac{4.5}{2} \right) =$$

$$R = 12650 \#_{TL}$$

@ Floor

← Controls BRG Plate Design

Note:
 BRG Plates
 May be omitted
 IF Joist MFR
 Designs Joist
 Shoe to Bear
 on Mas. Wall



$$P = 12650 \#_{TL} = 12.65 K$$

$$A_{mix} = \frac{P}{.25 f'_m} = \frac{12.65}{.25 (1.5)} \approx 34 \text{ in}^2$$

.375 ksi

$$\text{if } w = 5'' \rightarrow b_{min} = \frac{34}{5} = 6.8'' \rightarrow \text{use } 7'' \text{ MIN}$$

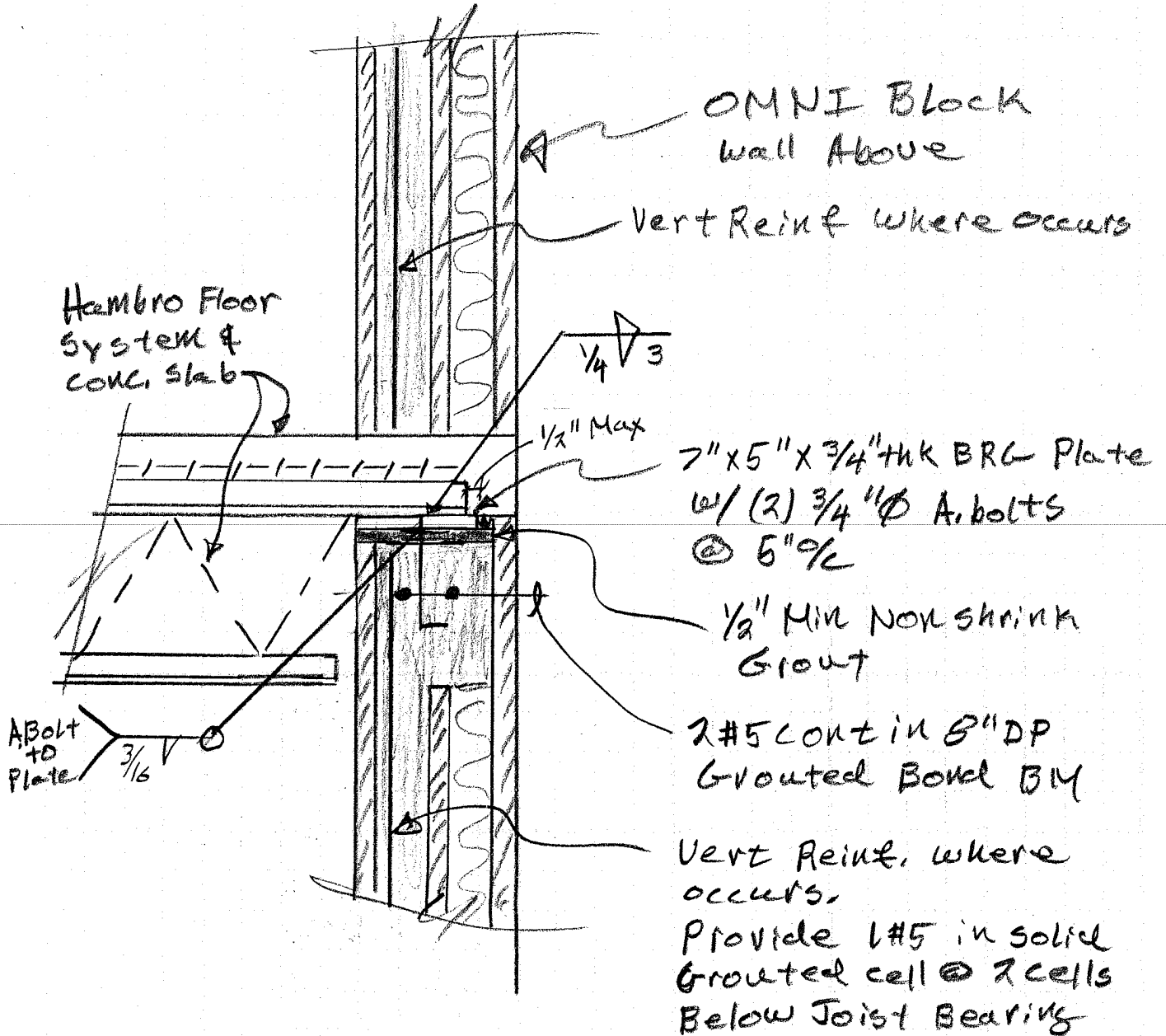
$$A_1 = 5(7) = 35 \text{ in}^2$$

$$l = \frac{b-1}{2} = \frac{7-1}{2} = 3''$$

$$f_p = \frac{12.65}{35} \approx 0.36 \text{ ksi} < .375 \text{ OK}$$

$$t_{min} = 2l \sqrt{\frac{f_p}{F_y}} = 2(3) \sqrt{\frac{.36}{36}} = .6'' \rightarrow \text{use } 3/4''$$

∴ Use 7" x 5" x 3/4" thick BRG Plate @ Hambro Joists



○ Hambro Joist @ OMNI Wall

Arizona Structural Group

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OMNI Block Masonry Lintel Schedule

A36 Steel (36 ksi)

Mark	Steel Lintel	Minimum Solid Grout Depth	Metric Designations	
			Steel Lintel	Minimum Solid Grout Depth
ML1	OL8-16 w/#5	16 in	OL20-40 w/#5	40 cm
ML2	OL8-24 w/#5	24 in	OL20-60 w/#5	60 cm
ML3	OL8-32 w/#5	32 in	OL20-80 w/#5	80 cm
ML4	OL8-40 w/#5	40 in	OL20-100 w/#5	100 cm
ML5	OL8-48 w/#5	48 in	OL20-120 w/#5	120 cm

Masonry Lintels @ Roof

Non BRG Lintel → 4' max span

$$w = \frac{89}{20} \left(\frac{4}{2} \right) + 78(4) + 34(4) = 648 \#/TL$$

200 312 136

∴ Use OLS-16 w/#5 ⇒ MLI

Allow = 1920 @ 4'

BRG Lintels

Max Reaction @ Roof Hambro Joist = 8250#

4'-8" Max span w/ Joist @ Midspan

$$w = 648 \# + \frac{2(8250)}{4.67} = 4181 \#/TL \quad \text{OLS-40 w/#5}$$

3533

$$V = \frac{648}{2} + \frac{8250}{2} = 4449 \# \quad \text{OK}$$

324 4125

∴ Use OLS-40 w/#5 ⇒ ML4

(Allow = 4683#)

4'-8" Max span w/ Joist @ one/both ends

$$w = 648 \#/TL$$

$$V = 324 \# + 8250 = 8574 \# \quad \leftarrow \text{controls}$$

$\leftarrow 8564 \# \rightarrow 7.625(32)(38) = 9272 \#$
 OK w/ Actual OK
 Lintel Depth

∴ use OLS-32 w/#5 ⇒ ML3

Mas Lintels @ Roof-cont

BRG Lintels - cont

2'-0" Max Span w/ Joist @ Any Location Above

Mas. Below Roof to bott. of lintel = 4'-0"

Min depth for Arching Action of Masonry

$$\frac{2'}{2} + 0.5' = 1.5' < 4' \text{ OK}$$

⇒ Arching Action APPLIES

$$w = 78(4) = 312 \#/\text{ft}$$

∴ use OLG-16 w/#5 ⇒ MLI

$$\text{Allow} = 3839$$

7'-4" span w/ Roof overhang & Parapet

$$w = \frac{80}{200} \left(\frac{4}{2} \right) + \frac{78}{156} (2) + \frac{34}{181} (5.33) = 537 \#/\text{ft}$$

∴ Use OLG-16 w/#5 ⇒ MLI

$$\text{Allow} = 1047$$

Max Lintels @ Floor

Non BRG Floor Lintels

5'-4" Max span - typ load

$$w = \frac{80}{20} \left(\frac{35.67}{2} \right) + \frac{75}{40} \left(\frac{4}{2} \right) + 78(4) + 34(15)$$

1833 230 312 510

$$w = 2885 \#/TL$$

\therefore Use OLB-32 w/#5 \Rightarrow ML3

$$\text{Allow} = 3212$$

3'-4" Max span - typ load + stoop roof

$$w = 2885 \#/TL + \frac{80}{20} \left(\frac{4}{2} \right) = 3085$$

300

\therefore Use OLB-24 w/#5 \Rightarrow ML2

$$\text{Allow} = 3721$$

2'-4" Max span @ stoop roof (20" Max depth)

$$w = \frac{80}{20} \left(\frac{4}{2} \right) + 78(2) = 356 \#/TL$$

200 156

\therefore Use OLB-16 w/#5 \Rightarrow ML1

$$\text{Allow} = 1047$$

Mas. Lintels @ Floor - cont

BRG Floor Lintels

Max Reaction of Floor Hambro Joist = $12650 \frac{\#}{TL}$

4'-8" Max span w/ Hambro Joist @ Midspan

$$w = \frac{80}{20} \left(\frac{4}{2} \right) + 78(4) + 34(15) \approx 1022 \frac{\#}{TL} + 510 \frac{\#}{TL} \text{ Mas Partitions.}$$

200 312 510

$$\frac{1073 \frac{\#}{TL}}$$

$P = 12650 \frac{\#}{TL} \rightarrow$ Mas. Above will distribute Point load as uniform load

$$w_p = \frac{12650}{4} = 3163 \frac{\#}{TL}$$

$$w_{eq} = 1073 + 3163 = 4236 \frac{\#}{TL}$$

\therefore Use OL 8-40 w/#5 \Rightarrow ML4

$$\text{Allow} = 4683$$

3'-4" Max span w/ Joist BRG Near end Above

$$w_{eq} = 4236 \frac{\#}{TL}$$

\therefore Use OL 8-32 w/#5 \Rightarrow ML3

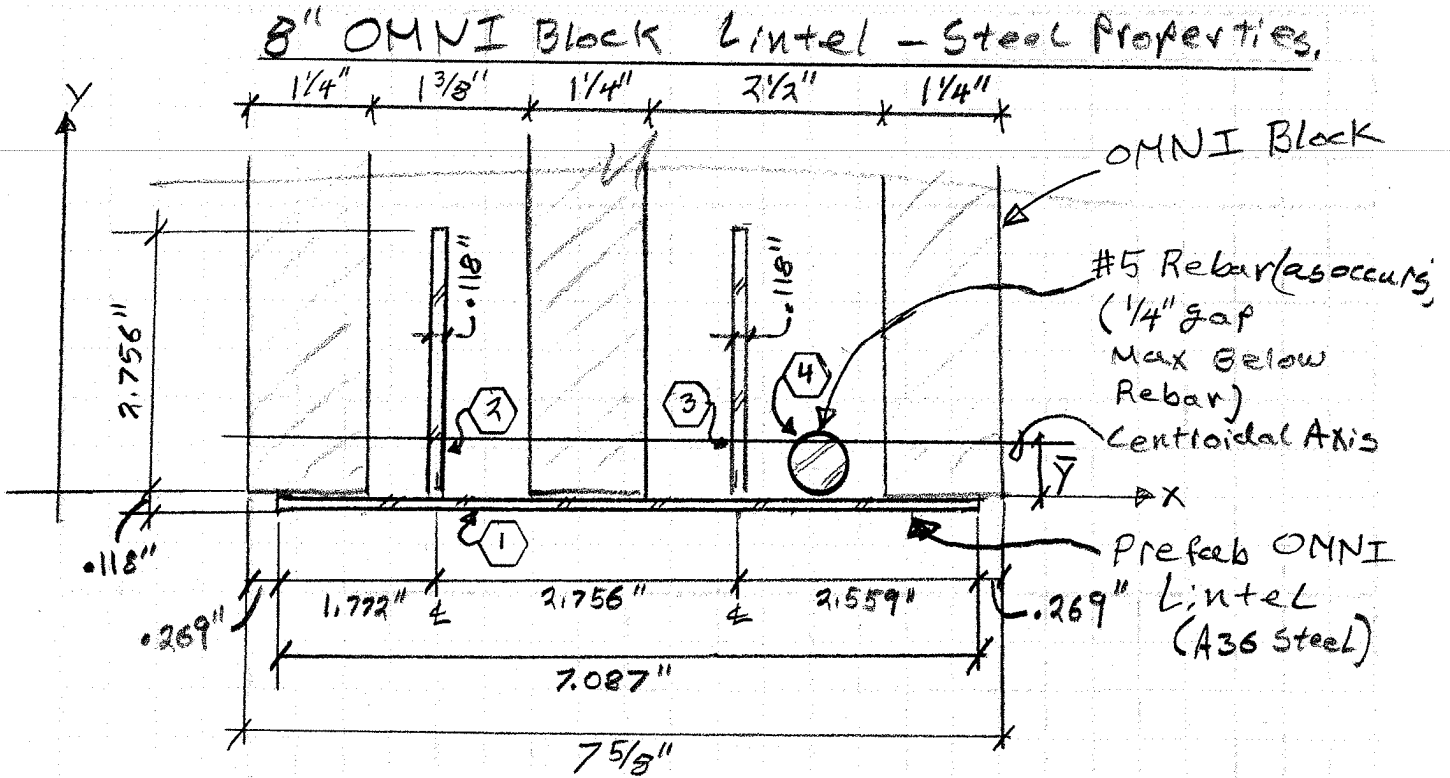
$$\text{Allow} = 5138$$

2'-0" Max span w/ Joist @ Any location above

$$w_{eq} = 4236 \frac{\#}{TL}$$

\therefore Use OL 8-24 w/#5 \Rightarrow ML2

$$\text{Allow} = 6202$$



Mark	Y_i (in)	A_i (in ²)	$Y_i A_i$ (in ³)
①	-0.059	0.836	-0.049
②	1.378	0.325	0.448
③	1.378	0.325	0.448
(#5 Bar) ④	0.563	0.31	0.175
$\Sigma w/\#5 =$		1.796	1.022
$\Sigma w/\#5 =$		1.486	0.847

A_s ↗

$$\bar{Y} = \frac{\sum Y_i A_i}{\sum A_i} \quad \text{(For simplicity use larger } \bar{Y} \text{ for Design)}$$

$$\Rightarrow \bar{Y}_{(w/\#5)} = \frac{1.022}{1.796} \approx 0.569''$$

$$\Rightarrow \bar{Y}_{(w/\#6)} = \frac{0.847}{1.486} \approx 0.570''$$

∴ For Lintel Designs

$d = \text{Grout Depth} - 0.570''$

$A_s = 1.796 \text{ in}^2 \text{ (w/\#5)}$

$A_s = 1.486 \text{ in}^2 \text{ (w/\#6)}$

∴ For simplicity use

$d = \text{Grout Depth} - 3''$
(conservative)

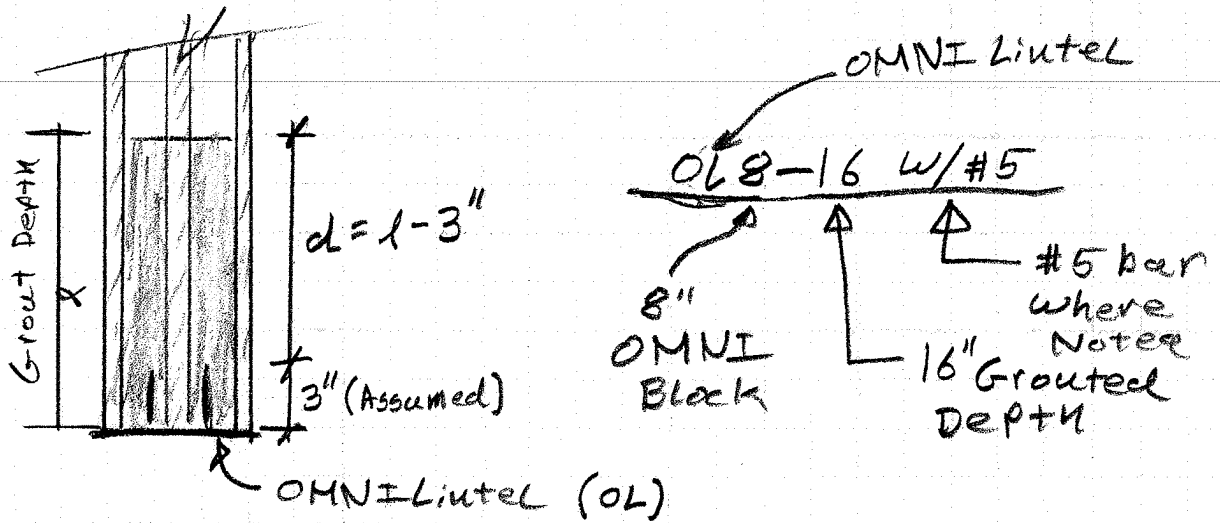
Arizona Structural Group

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 telephone: (602) 287-8720 fax: (602) 287-8737

Job Name: _____

Job No.: _____

By: JLK Date: _____



for: OL 8-16 w/#5

$$L = 16'' \rightarrow d = 16 - 3 = 13$$

$$b = 7.625''$$

$$A_s = 1.796 \text{ in}^2$$

$$\rho = \frac{A_s}{bd} = \frac{1.796}{7.625(13)} = 0.0181$$

$$\rho_n \approx 0.3895$$

$$k = \sqrt{2\rho_n - (\rho_n)^2} - \rho_n = 0.403$$

$$j = 1 - \frac{k}{3} \approx 0.866$$

$$M_{cap_m} = \frac{F_m b d^2 j k}{2(12)} = \frac{500 \text{ psi} (7.625 \text{ in}) (13 \text{ in})^2 (0.866)(0.403)}{2(12)} = 9369 \text{ #-ft} = 9.37 \text{ K-ft}$$

$$M_{cap_s} = \frac{A_s f_s j d}{12} = \frac{1.796 \text{ in}^2 (18 \text{ Kpsi}) (0.866)(13 \text{ in})}{12} \approx 30.3 \text{ K-ft}$$

↑
control

$$V_{cap} = F_v b d = (38.7 \text{ Kpsi}) (7.625 \text{ in}) (13 \text{ in}) = 3836 \text{ #}$$

$$\phi L \text{ Lintel} = 36 \text{ Kpsi}$$

$$\rightarrow F_b = \frac{36}{2} = 18 \text{ Kpsi}$$

$$F_b = \frac{f'_m}{3} = \frac{1500}{3} = 500 \text{ Psi}$$

$$n = 21.5$$

$$F_v = \sqrt{f'_m} = \sqrt{1500} = 38.7 \text{ Psi}$$

Allowable EQ Load (6'-0" span)

Moment

$$M = \frac{wL^2}{8} \Rightarrow w = \frac{8M}{L^2}$$

$$M_{cap} \approx 9.37 \text{ K-ft}$$

$$\Rightarrow w_{eq} = \frac{8(9.37)}{6^2} = 2.08 \text{ K/ft} \\ = 2080 \#/\text{ft}$$

$$V = \frac{wL}{2} \Rightarrow w = \frac{2V}{L}$$

$$V_{cap} = 3836 \#$$

$$w_{eq} = \frac{2(3836)}{6} \approx 1278 \#/\text{ft} \quad \triangle \text{ controls}$$

∴ OL 8-16 w/ #5 Lintel capacity = 1278 #/ft (EQ Tot. load)

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OMNI Block Lintels - OL8 Lintels

Lintel Capacities - Total Load

Metric Designation =	OL8-16 w/#5 OL20-40 w/#5	OL8-16 OL20-40	OL8-24 w/#5 OL20-60 w/#5	OL8-24 OL20-60	OL8-32 w/#5 OL20-80 w/#5	OL8-32 OL20-80	OL8-40 w/#5 OL20-100 w/#5	OL8-40 OL20-100	OL8-48 w/#5 OL20-120 w/#5	OL8-48 OL20-120
f _m (psi) =	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
F _y (ksi) =	36	36	36	36	36	36	36	36	36	36
Grout Depth (in) =	16	16	24	24	32	32	40	40	48	48
d (in) =	13	13	21	21	29	29	37	37	45	45
b (in) =	7.625	7.625	7.625	7.625	7.625	7.625	7.625	7.625	7.625	7.625
A _s (in ²) =	1.796	1.486	1.796	1.486	1.796	1.486	1.796	1.486	1.796	1.486
ρ =	0.0181	0.0150	0.0112	0.0093	0.0081	0.0067	0.0064	0.0053	0.0052	0.0043
n =	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5
ρ _m *n =	0.3895	0.3223	0.2411	0.1995	0.1746	0.1445	0.1369	0.1132	0.1125	0.0931
k =	0.403	0.413	0.410	0.400	0.390	0.373	0.368	0.349	0.348	0.328
j =	0.866	0.862	0.863	0.867	0.870	0.876	0.877	0.884	0.884	0.891
F _s (ksi) =	18	18	18	18	18	18	18	18	18	18
F _m (psi) =	500	500	500	500	500	500	500	500	500	500
F _v (psi) =	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7
M _{cap} Mas (#-ft) =	9356	9562	24803	24277	45325	43665	70231	67067	99043	94040
M _{cap} Sll (#-ft) =	30323	24987	48840	40570	67971	56598	87447	72879	107154	89330
V _{cap} (#) =	3839	3839	6202	6202	8564	8564	10927	10927	13289	13289
Max Span w/o Deflection Check Per Code (ft) =	8.67	8.67	14.00	14.00	19.33	19.33	24.67	24.67	30.00	30.00

OMNI Block Lintels - OL8 Lintels

Lintel Load Table (in pounds per linear foot)

Metric Designation = Span (ft)	OL8-16 w/#5 OL20-40 w/#5		OL8-24 w/#5 OL20-60 w/#5		OL8-32 w/#5 OL20-80 w/#5		OL8-40 w/#5 OL20-100 w/#5		OL8-48 w/#5 OL20-120 w/#5	
	OL8-16 OL20-40	OL8-24 OL20-60	OL8-32 OL20-80	OL8-40 OL20-100	OL8-48 OL20-120	OL8-16 OL20-40	OL8-24 OL20-60	OL8-32 OL20-80	OL8-40 OL20-100	OL8-48 OL20-120
2.00	3839	6202	8564	10927	13289	3839	6202	8564	10927	13289
2.67	2879	4651	6423	8195	9967	2879	4651	6423	8195	9967
3.33	2303	3721	5138	6556	7974	2303	3721	5138	6556	7974
4.00	1920	3101	4282	5463	6645	1920	3101	4282	5463	6645
4.67	1645	2658	3670	4683	5695	1645	2658	3670	4683	5695
5.33	1440	2326	3212	4097	4983	1440	2326	3212	4097	4983
6.00	1280	2067	2855	3642	4430	1280	2067	2855	3642	4430
6.67	1152	1860	2569	3278	3987	1152	1860	2569	3278	3987
7.33	1047	1691	2336	2980	3624	1047	1691	2336	2980	3624
8.00	960	1550	2141	2732	3322	960	1550	2141	2732	3322
8.67	886	1431	1976	2522	3067	886	1431	1976	2522	3067
9.33	823	1329	1835	2341	2848	823	1329	1835	2341	2848
10.00	748	1240	1713	2185	2658	748	1240	1713	2185	2658
10.67	658	1163	1606	2049	2492	658	1163	1606	2049	2492
11.33	583	1094	1511	1928	2345	583	1094	1511	1928	2345
12.00	520	1034	1427	1821	2215	520	1034	1427	1821	2215
12.67	467	979	1352	1725	2098	467	979	1352	1725	2098
13.33	421	930	1285	1639	1993	421	930	1285	1639	1993
14.00	382	886	1223	1561	1898	382	886	1223	1561	1898
14.67	348	846	1168	1490	1812	348	846	1168	1490	1812
15.33	318	809	1117	1425	1733	318	809	1117	1425	1733
16.00	292	775	1071	1366	1661	292	775	1071	1366	1661
16.67	269	744	1028	1311	1595	269	744	1028	1311	1595
17.33	249	714	988	1261	1533	249	714	988	1261	1533
18.00	231	686	952	1214	1477	231	686	952	1214	1477
18.67	215	660	918	1171	1424	215	660	918	1171	1424
19.33	200	636	886	1130	1375	200	636	886	1130	1375
20.00	187	616	856	1093	1329	187	616	856	1093	1329
20.67	175	595	829	1057	1286	175	595	829	1057	1286
21.33	164	576	804	1024	1246	164	576	804	1024	1246
22.00	155	560	782	993	1208	155	560	782	993	1208
22.67	146	544	762	964	1173	146	544	762	964	1173
23.33	137	530	744	937	1139	137	530	744	937	1139
24.00	130	518	728	911	1107	130	518	728	911	1107
24.67	123	508	714	886	1078	123	508	714	886	1078
25.33	117	499	702	863	1049	117	499	702	863	1049
26.00	111	492	692	841	1022	111	492	692	841	1022
26.67	105	486	683	820	997	105	486	683	820	997
27.33	100	481	675	801	972	100	481	675	801	972
28.00	95	476	668	783	949	95	476	668	783	949
28.67	91	471	662	766	927	91	471	662	766	927
29.33	87	467	657	750	906	87	467	657	750	906
30.00	83	463	653	735	880	83	463	653	735	880

Shading Denotes Lintel Span Longer than 8'd. Thus, Deflection Check Required by Code

Primary Systems Wind Loads - '97 UBC

Wind speed 103 mph \rightarrow use 110 mph

Exposure B \rightarrow Use Exp. C

$$q_s = 31.0 \text{ psf}$$

$$P_w = C_e C_g q_s I$$

$$I_w = 1.0$$

$$C_g = 1.3 \text{ (Primary Systems)}$$

h (ft)	C_e	C_g	q_s psf	I_w	P_w (psf)
0-15	1.06	1.3	31.0	1.0	42.7
15-20	1.13	"	"	"	45.5
20-25	1.19	"	"	"	48.0
25-30	1.23	"	"	"	49.6

Primary Systems Seismic Loads - 97 UBL

Seismic zone 1 $\rightarrow Z = 0.075$

Soil $\rightarrow S_c$ $C_a = 0.09$ $C_v = 0.13$

$R = 4.5$ (Masonry Bearing / shear walls)

$C_t = 0.020$ $I = 1.0$

$$T = C_t h_n^{(3/4)} = 0.02(22.67)^{(3/4)} \approx 0.208$$

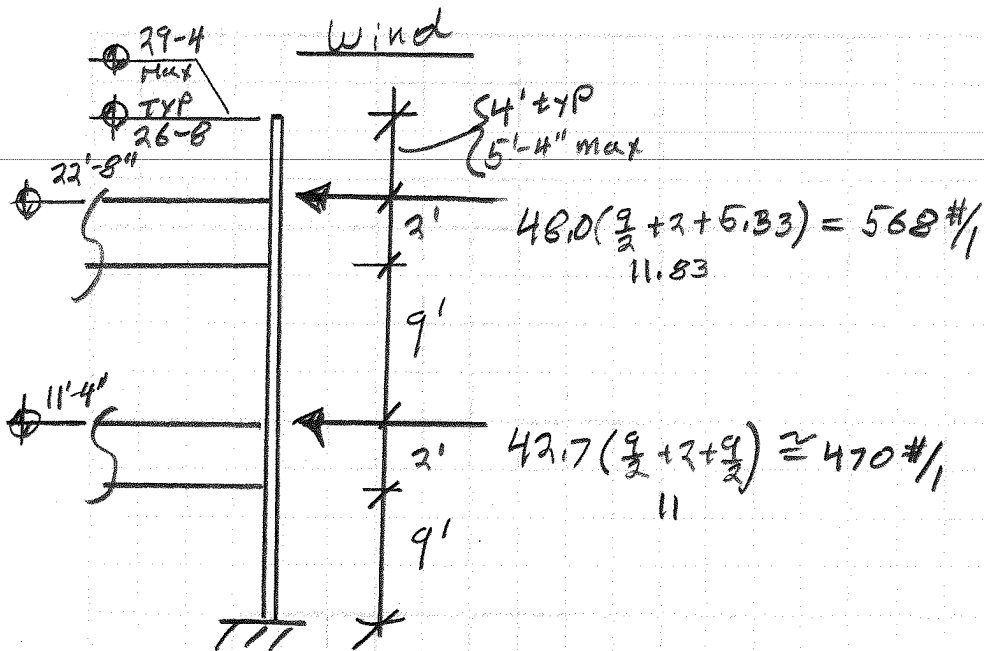
$$\hookrightarrow h_n = 22.67$$

$$V = \frac{C_v I W}{R T} = \frac{0.13(1)W}{4.5(0.208)} = \underline{\underline{0.138 W}} = V$$

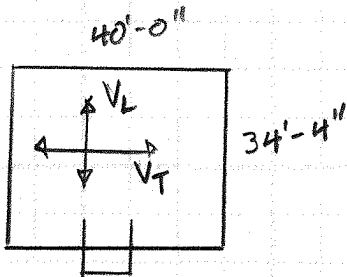
$$V_{max} = \frac{2.5 C_a I W}{R} = \frac{2.5(0.09)(1)W}{4.5} = 0.05 \text{ OK}$$

$$V_{min} = 0.11 C_a I W = 0.11(0.09)(1)W = 0.0099 \text{ OK}$$

$$\therefore \underline{\underline{V = 0.138 W}}$$



Seismic



Worst case:

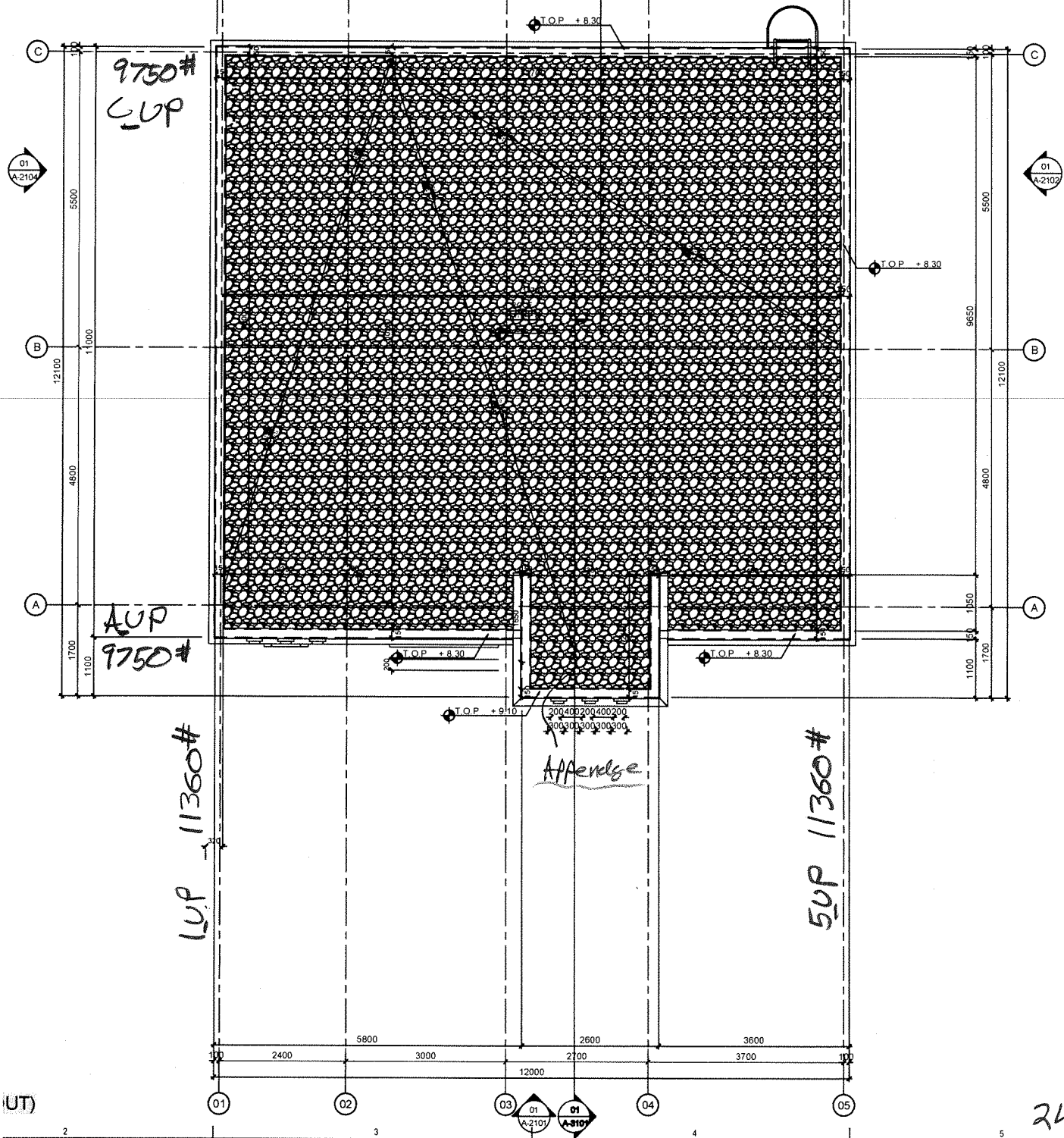
$$V_{L \text{ ROOF}} = .138 \left[\frac{2(34)(11.83)}{804} + \frac{75(40)}{3000} \right] \cong 525 \# / 1.4 \cong 375 \# / < 568 \text{ wind}$$

$$V_{L \text{ FLOOR}} = .138 \left[\frac{2(34)(11)}{748} + \frac{75(40)}{3000} \right] \cong 517 \# / 1.4 \cong 369 \# / < 470 \text{ wind}$$

$$V_{T \text{ FLOOR}} = .138 [748 + 75(34.33)] \cong 459 \# /$$

∴ Wind Governs in All Directions

OMNI
16130



(UT)

Arizona Structural Group

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Allowable Shear in Masonry Walls

(Complies With 1997 IBC/IRC)

$f_m = 1500$ (psi)
 $F_v = 38.7$ (psi)
 $F_y = 40$ (psi) #4 Bars
 $F_y = 60$ (psi) #5 Bars & Larger

6" CMU Walls			
Grout Spacing (in o/c)	EQ. Solid Thickness (in)	Wall Length (1ft = 12")	Allowable Shear (plf)
48	3.7	12	1720
40	3.8	12	1766
32	4.0	12	1859
24	4.1	12	1906
16	4.0	12	1859
8	5.6	12	2603

← 8" OMNI
 Block wall
 Allow shear

8" CMU Walls			
Grout Spacing (in o/c)	EQ. Solid Thickness (in)	Wall Length (1ft = 12")	Allowable Shear (plf)
48	4.6	12	2138
40	4.7	12	2184
32	4.9	12	2277
24	5.2	12	2417
16	5.8	12	2696
8	7.6	12	3532

12" CMU Walls			
Grout Spacing (in o/c)	EQ. Solid Thickness (in)	Wall Length (1ft = 12")	Allowable Shear (plf)
48	6.5	12	3021
40	6.7	12	3114
32	7.0	12	3253
24	7.5	12	3486
16	8.5	12	3950
8	11.6	12	5391

Tension Capacity of Reinforcing			
Rebar Used	As (in ²)	Fs (ksi)	Allowable Tension (Kips)
1 # 4	0.20	20	4.0
2 # 4	0.40	20	8.0
1 # 5	0.31	24	7.4
2 # 5	0.62	24	14.9
1 # 6	0.44	24	10.6
2 # 6	0.88	24	21.1

Arizona Structural Group

706 E. Bell Road, Suite 105, Phoenix, AZ 85022
 telephone: (602) 287-8720 fax: (602) 287-8737

Job No: 16130

Wall 1_UP

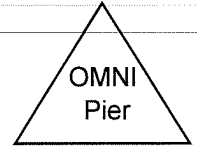
Total force at wall (lbs): 11360
 Total wall length (ft): 36.67
 Height of wall (ft): 11.00
 Total effective shear wall length (ft): 33.33
 Unit shear (plf): 341
 Weight of wall (psf): 34
 Weight of load above (plf):
 Concentrated load left of wall (lb):
 Concentrated load right of wall (lb):
 First interior concentrated load (lb):
 First int. conc. load distance from left (ft):
 Second interior concentrated load (lb):
 Sec. int. conc. load distance from left (ft):
 Resisting moment adjustment: 0.60

Perforated Shear Wall

Length of shear wall segment 1 (ft): 36.67
 Total force in wall segment: 11360
 Jamb Force (Mot): 3408
 Total resisting jamb force right: 4114
 Total resisting jamb force left: 4114

Provide for net uplift of -706
 Use Simpson *N/A*

Provide for net uplift of -706
 Use Simpson *N/A*



(lb) on right side
or equivalent

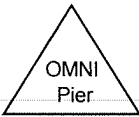
(lb) on left side
or equivalent

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Job No: 16130

Wall 1

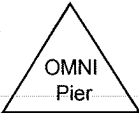
Total force at wall (lbs): 20760 Total wall length (ft): 36.67 Height of pier (ft): 11.00 Total effective shear wall length (ft): 31.33 Unit shear (plf): 663 Weight of wall (psf): 34 Weight of load above (plf): 374 Concentrated load left of wall (lb): Concentrated load right of wall (lb): First interior concentrated load (lb): First int. conc. load distance from left (ft): Second interior concentrated load (lb): Sec. int. conc. load distance from left (ft): Resisting moment adjustment: 0.60	<p><u>Perforated Shear Wall</u></p> Length of shear wall segment 1 (ft): 36.67 Total force in wall segment: 20760 Jamb Force (Mot): 6228 Total resisting jamb force right: 8228 Total resisting jamb force left: 8228 Provide for net uplift of -2000 (lb) on right side Use Simpson <i>N/A</i> Provide for net uplift of -2000 (lb) on left side Use Simpson <i>N/A</i>		Footing depth: 0.8333 Footing width: 1.3333 Left extension: 1.5000 Right extension: 1.5000 Stem height: 0.8333 Stem width: 0.5000 Wt. of Concrete: 150.00 Total dead load of segment: 36329.01 Mr 720525.46 Mot 262962.38 7.24 Toe pressure: 1495.19 Allowable soil pressure: 1500.00
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Job No: 16130

Wall 5

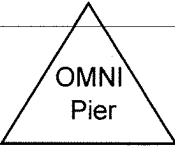
Total force at wall (lbs): 20760 Total wall length (ft): 36.67 Height of pier (ft): 11.00 Total effective shear wall length (ft): 30.67 Unit shear (plf): 677 Weight of wall (psf): 34 Weight of load above (plf): 374 Concentrated load left of wall (lb): Concentrated load right of wall (lb): First interior concentrated load (lb): First int. conc. load distance from left (ft): Second interior concentrated load (lb): Sec. int. conc. load distance from left (ft): Resisting moment adjustment: 0.60	<p align="center"><u>Perforated Shear Wall</u></p> Length of shear wall segment 1 (ft): 36.67 Total force in wall segment: 20760 Jamb Force (Mot): 6228 Total resisting jamb force right: 8228 Total resisting jamb force left: 8228 Provide for net uplift of -2000 (lb) on right side Use Simpson <i>N/A</i> Provide for net uplift of -2000 (lb) on left side Use Simpson <i>N/A</i>		Footing depth 0.8333 Footing width 1.3333 Left extension 1.5000 Right extension 1.5000 Stem height 0.8333 Stem width 0.5000 Wt. of Concrete 150.00 Total dead load of segment 36329.01 Mr 720525.46 Mot 262959.28 7.24 Toe pressure 1495.19 Allowable soil pressure 1500.00
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Job No: 16130

Wall 5_UP

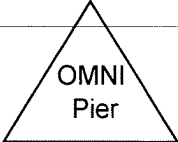
<p>Total force at wall (lbs): 11360</p> <p>Total wall length (ft): 36.67</p> <p>Height of wall (ft): 11.00</p> <p>Total effective shear wall length (ft): 30.67</p> <p>Unit shear (plf): 370</p> <p>Weight of wall (psf): 34</p> <p>Weight of load above (plf):</p> <p>Concentrated load left of wall (lb):</p> <p>Concentrated load right of wall (lb):</p> <p>First interior concentrated load (lb):</p> <p>First int. conc. load distance from left (ft):</p> <p>Second interior concentrated load (lb):</p> <p>Sec. int. conc. load distance from left (ft):</p> <p>Resisting moment adjustment: 0.60</p>	<p style="text-align: center;"><u>Perforated Shear Wall</u></p> <p>Length of shear wall segment 1 (ft): 36.67</p> <p>Total force in wall segment: 11360</p> <p>Jamb Force (Mot): 3408</p> <p>Total resisting jamb force right: 4114</p> <p>Total resisting jamb force left: 4114</p> <p>Provide for net uplift of -706 (lb) on right side or equivalent</p> <p style="padding-left: 40px;">Use Simpson <i>N/A</i></p> <p>Provide for net uplift of -706 (lb) on left side or equivalent</p> <p style="padding-left: 40px;">Use Simpson <i>N/A</i></p>	
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Job No: 16130

Wall A_UP

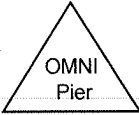
<p>Total force at wall (lbs): 9750</p> <p>Total wall length (ft): 40.00</p> <p>Height of wall (ft): 11.00</p> <p>Total effective shear wall length (ft): 28.67</p> <p>Unit shear (plf): 340</p> <p>Weight of wall (psf): 34</p> <p>Weight of load above (plf):</p> <p>Concentrated load left of wall (lb):</p> <p>Concentrated load right of wall (lb):</p> <p>First interior concentrated load (lb):</p> <p>First int. conc. load distance from left (ft):</p> <p>Second interior concentrated load (lb):</p> <p>Sec. int. conc. load distance from left (ft):</p> <p>Resisting moment adjustment: 0.60</p>	<p style="text-align: center;"><u>Perforated Shear Wall</u></p> <p>Length of shear wall segment 1 (ft): 40.00</p> <p>Total force in wall segment: 9750</p> <p>Jamb Force (Mot): 2681</p> <p>Total resisting jamb force right: 4488</p> <p>Total resisting jamb force left: 4488</p> <p>Provide for net uplift of -1807 (lb) on right side Use Simpson <i>N/A</i> or equivalent</p> <p>Provide for net uplift of -1807 (lb) on left side Use Simpson <i>N/A</i> or equivalent</p>	
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 telephone: (602) 287-8720 fax: (602) 287-8737

Job No: 16130

Wall A

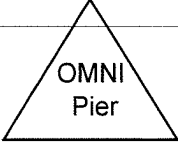
Total force at wall (lbs): 17820 Total wall length (ft): 40.00 Height of pier (ft): 11.00 Total effective shear wall length (ft): 28.67 Unit shear (plf): 622 Weight of wall (psf): 34 Weight of load above (plf): 374 Concentrated load left of wall (lb): Concentrated load right of wall (lb): First interior concentrated load (lb): First int. conc. load distance from left (ft): Second interior concentrated load (lb): Sec. int. conc. load distance from left (ft): Resisting moment adjustment: 0.60	<p><u>Perforated Shear Wall</u></p> Length of shear wall segment 1 (ft): 40.00 Total force in wall segment: 17822 Jamb Force (Mot): 4901 Total resisting jamb force right: 8976 Total resisting jamb force left: 8976 Provide for net uplift of -4075 (lb) on right side Use Simpson <i>N/A</i> Provide for net uplift of -4075 (lb) on left side Use Simpson <i>N/A</i>		Footing depth 0.8333 Footing width 1.3333 Left extension 0.5000 Right extension 0.5000 Stem height 0.8333 Stem width 0.5000 Wt. of Concrete 150.00 Total dead load of segment 39252.89 Mr 804684.23 Mot 225745.39 5.75 Toe pressure 1340.34 Allowable soil pressure 1500.00
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Job No: 16130

Wall C_UP

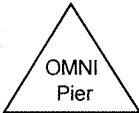
<p>Total force at wall (lbs): 9750</p> <p>Total wall length (ft): 40.00</p> <p>Height of wall (ft): 11.00</p> <p>Total effective shear wall length (ft): 28.00</p> <p>Unit shear (plf): 348</p> <p>Weight of wall (psf): 34</p> <p>Weight of load above (plf):</p> <p>Concentrated load left of wall (lb):</p> <p>Concentrated load right of wall (lb):</p> <p>First interior concentrated load (lb):</p> <p>First int. conc. load distance from left (ft):</p> <p>Second interior concentrated load (lb):</p> <p>Sec. int. conc. load distance from left (ft):</p> <p>Resisting moment adjustment: 0.60</p>	<p style="text-align: center;"><u>Perforated Shear Wall</u></p> <p>Length of shear wall segment 1 (ft): 40.00</p> <p>Total force in wall segment: 9750</p> <p>Jamb Force (Mot): 2681</p> <p>Total resisting jamb force right: 4488</p> <p>Total resisting jamb force left: 4488</p> <p>Provide for net uplift of -1807 (lb) on right side Use Simpson <i>N/A</i> or equivalent</p> <p>Provide for net uplift of -1807 (lb) on left side Use Simpson <i>N/A</i> or equivalent</p>	
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Arizona Structural Group

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 telephone: (602) 287-8720 fax: (602) 287-8737

Job No: 16130

Wall C

Total force at wall (lbs): 17820 Total wall length (ft): 40.00 Height of pier (ft): 11.00 Total effective shear wall length (ft): 28.00 Unit shear (plf): 636 Weight of wall (psf): 34 Weight of load above (plf): 374 Concentrated load left of wall (lb): Concentrated load right of wall (lb): First interior concentrated load (lb): First int. conc. load distance from left (ft): Second interior concentrated load (lb): Sec. int. conc. load distance from left (ft): Resisting moment adjustment: 0.60	<p><u>Perforated Shear Wall</u></p> Length of shear wall segment 1 (ft): 40.00 Total force in wall segment: 17820 Jamb Force (Mot): 4901 Total resisting jamb force right: 8976 Total resisting jamb force left: 8976 Provide for net uplift of -4076 (lb) on right side Use Simpson <i>N/A</i> or equivalent Provide for net uplift of -4076 (lb) on left side Use Simpson <i>N/A</i> or equivalent		Footing depth 0.8333 Footing width 1.3333 Left extension 0.5000 Right extension 0.5000 Stem height 0.8333 Stem width 0.5000 Wt. of Concrete 150.00 Total dead load of segment 39252.89 Mr 804684.23 Mot 225719.41 5.75 Toe pressure 1340.27 Allowable soil pressure 1500.00
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Score :

Rev: 506001

Concrete Rectangular & Tee Beam Design

Page 1

Description Stair Landing Support Beam

General Information

Span	8.00 ft	fc	2,500 psi
Depth	8.000 in	Fy	60,000 psi
Width	8.000 in	Concrete Wt.	145.0 pcf
		Seismic Zone	0
		End Fixity	Pinned-Pinned
		Live Load	not acting with Short Term

Beam Weight Added Internally

Reinforcing

Rebar @ Center of Beam...				Rebar @ Left End of Beam...				Rebar @ Right End of Beam...			
	Count	Size	'd' from Top		Count	Size	'd' from Top		Count	Size	'd' from Top
#1	2	5	6.00in	#1	2	5	6.00 in	#1	2	5	6.00 in

Uniform Loads

	Dead Load	Live Load	Short Term	Start	End
#1	1.155 k	0.280 k	k	0.000 ft	4.500 ft

Summary

Beam Design OK

Span = 8.00ft, Width= 8.00in Depth = 8.00in

Maximum Moment : Mu	11.64 k-ft	Maximum Deflection	-0.2366 in
Allowable Moment : Mn/phi	13.67 k-ft		
Maximum Shear : Vu	6.08 k	Max Reaction @ Left	4.90 k
Allowable Shear : Vn*phi	20.40 k	Max Reaction @ Right	2.07 k

Shear Stirrups...

Stirrup Area @ Section	0.220 in2						
Region	0.000	1.333	2.667	4.000	5.333	6.667	8.000 ft
Max. Spacing	3.000	3.000	Not Req'd	3.000	3.000	3.000	3.000 in
Max Vu	6.082	4.266	1.332	1.332	2.767	2.889	2.964 k

Bending & Shear Force Summary

Bending...	Mn*Phi	Mu, Eq. 9-1	Mu, Eq. 9-2	Mu, Eq. 9-3
@ Center	13.67 k-ft	11.64 k-ft	6.87 k-ft	5.89 k-ft
@ Left End	13.67 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
@ Right End	13.67 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
Shear...	Vn*Phi	Vu, Eq. 9-1	Vu, Eq. 9-2	Vu, Eq. 9-3
@ Left End	20.40 k	6.08 k	3.58 k	3.07 k
@ Right End	20.40 k	2.96 k	1.77 k	1.52 k

Deflection

Deflections...	Upward		Downward	
DL + [Bm Wt]	0.0000 in	at 0.0000 ft	-0.1837 in	at 3.7760 ft
DL + LL + [Bm Wt]	0.0000 in	at 0.0000 ft	-0.2366 in	at 3.7760 ft
DL + LL + ST + [Bm Wt]	0.0000 in	at 0.0000 ft	-0.1837 in	at 3.7760 ft
Reactions...	@ Left		@ Right	
DL + [Bm Wt]	3.993 k		1.720 k	
DL + LL + [Bm Wt]	4.899 k		2.074 k	
DL + LL + ST + [Bm Wt]	3.993 k		1.720 k	

use 8" x 8" BM w/ 2#5 bott.

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Scope :

Rev: 506001

Concrete Rectangular & Tee Beam Design

Page 1

Description Stair Tread Sloped Beam

General Information

Span	11.00 ft	fc	2,500 psi
Depth	5.000 in	Fy	60,000 psi
Width	48.000 in	Concrete Wt.	145.0 pcf
		Seismic Zone	0
		End Fixity	Pinned-Pinned
Beam Weight Added Internally		Live Load not acting with Short Term	

Reinforcing

Rebar @ Center of Beam...				Rebar @ Left End of Beam...				Rebar @ Right End of Beam...			
Count	Size	'd' from Top		Count	Size	'd' from Top		Count	Size	'd' from Top	
#1	5	5	4.00 in	#1	5	5	4.00 in	#1	5	5	4.00 in

Uniform Loads

	Dead Load	Live Load	Short Term	Start	End
#1	0.660 k	0.160 k	k	0.000 ft	11.000 ft

Summary

Beam Design OK

Span = 11.00ft, Width= 48.00in Depth = 5.00in

Maximum Moment : Mu	23.21 k-ft	Maximum Deflection	-0.7188 in
Allowable Moment : Mn/phi	24.67 k-ft		
Maximum Shear : Vu	7.97 k	Max Reaction @ Left	5.84 k
Allowable Shear : Vn*phi	16.33 k	Max Reaction @ Right	5.84 k

Shear Stirrups...

Stirrup Area @ Section	0.220 in ²							
Region	0.000	1.833	3.667	5.500	7.333	9.167	11.000 ft	
Max. Spacing	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd in
Max Vu	7.966	5.671	2.835	2.768	2.768	5.603	7.899 k	

Bending & Shear Force Summary

Bending...	Mn*Phi	Mu, Eq. 9-1	Mu, Eq. 9-2	Mu, Eq. 9-3
@ Center	24.67 k-ft	23.21 k-ft	14.32 k-ft	12.27 k-ft
@ Left End	24.67 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
@ Right End	24.67 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
Shear...	Vn*Phi	Vu, Eq. 9-1	Vu, Eq. 9-2	Vu, Eq. 9-3
@ Left End	16.33 k	7.97 k	4.92 k	4.21 k
@ Right End	16.33 k	7.90 k	4.87 k	4.18 k

Deflection

Deflections...	Upward		Downward	
DL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.5671 in at 5.5000 ft
DL + LL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.7188 in at 5.5000 ft
DL + LL + ST + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.5671 in at 5.5000 ft
Reactions...	@ Left		@ Right	
DL + [Bm Wt]	4.959 k		4.959 k	
DL + LL + [Bm Wt]	5.839 k		5.839 k	
DL + LL + ST + [Bm Wt]	4.959 k		4.959 k	

*use #5 @ 12" o/c Main Reinf.
 @ stairs*

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