ARIANNA PRIETO, P.E.
P.E. No. 90741

3911 N.W. 1st. Street.
Miami, Florida, 33126
tel: 786-991-3288

2-Story Addition.

FOR:

Eva Vaccaro

12940 SW 63rd Avenue
Pinecrest, Florida, 33156

Structural CALCULATIONS

Arianna Prieto, P.E.
P.E. No 90741
Pages

ARIANNA PRIETO, P.E. P.E. No. 90741

3911 N.W. 1st. Street.
Miami, Florida, 33126 tel: 786-991-3288

Project: 2-Story Addition.

Process No.:

Design Criteria

1. Florida Building Code: 2020, Seven Edition.
2. Wind (New Addition)
    - ASCE 7-16
    - Wind Velocity 175 MPH
    - Category II
    - Exposure C
    - Kd 1.0

3. Concrete Strength at 28 days - 3000 PSI
4. Reinforcing - 60,000 PSI
5. Structural Steel, ASTM A36 – 36,000 PSI
6. Wood – No2, Fb 1,200 PSI
7. Masonry – F'm 1,500 PSI (F'c=1900PSI)
8. Light Gauge Metal Framing ASTM A653, Grade 33 having a G60 galvanize meeting the requirements of ASTM A654 and C955
9. Open web steel Joists, fabrication and erection, shall conform to the requirements set forth by the Steel Joist Institute.
10. Metal Decking shall be 1-1/2 inch deep, 22 gauge, galvanized (G-90) and shall conform the requirements set forth by the American Iron and Steel Institute, and shall have a minimum yield strength of 33,000 PSI.

11. Design Loads
    - Roof Loads
        - Live Load 30 PSF (20 PSF for roof slopes greater than 1-1/2:12)
        - Dead Load 20 PSF
        - System Load 5 PSF
    - Floor Loads
        - Live Load 40 PSF
        - Dead Load 20 PSF
        - System Load – See Plans

- Soil Bearing Capacity – 2000 PSF

WIND02 v2-04

Detailed Wind Load Design (Method 2) per ASCE 7-16

Description: 2-Story Addition
Analysis by: L.A.H

User Input Data		
Structure Type	Building	
Basic Wind Speed (V)	175	mph
Struc Category (I, II, III, or IV)	II	
Exposure (B, C, or D)	C	
Struc Nat Frequency (n1)	1	Hz
Slope of Roof	5.0	:12
Slope of Roof (Theta)	22.6	Deg
Type of Roof	Hipped	
Kd (Directonality Factor)	0.8	
Eave Height (Eht)	20.67	ft
Ridge Height (RHt)	25.16	ft
Mean Roof Height (Ht)	22.92	ft
Width Perp. To Wind Dir (B)	54.00	ft
Width Paral. To Wind Dir (L)	149.00	ft

Calculated Parameters	
Type of Structure	
Height/Least Horizontal Dim	0.42
Flexible Structure	No

Calculated Parameters		
Importance Factor	1	
Hurricane Prone Region (V>100 mph)		
Table 6-2 Values		
Alpha =	9.500	
zg =	900.000	
At =	0.105	
Bt =	1.000	
Bm =	0.650	
Cc =	0.200	
l =	500.00	ft
Epsilon =	0.200	
Zmin =	15.00	ft

Gust Factor Category I: Rigid Structures - Simplified Method			
Gust1	For rigid structures (Nat Freq > 1 Hz) use 0.85	0.85	
Gust Factor Category II: Rigid Structures - Complete Analysis			
Zm	Zmin	15.00	ft
Izm	Cc * (33/z)^0.167	0.2281	
Lzm	l*(zm/33)^Epsilon	427.06	ft
Q	(1/(1+0.63*((Min(B,L)+Ht)/Lzm)^0.63))^0.5	0.9076	
Gust2	0.925*((1+1.7*Izm*3.4*Q)/(1+1.7*3.4*Izm))	0.8764	
Gust Factor Summary			
G	Since this is not a flexible structure the lessor of Gust1 or Gust2 are used	0.85	

WIND02 v2-04

Detailed Wind Load Design (Method 2) per ASCE 7-16

Fig 6-5 Internal Pressure Coefficients for Buildings, Gcpi

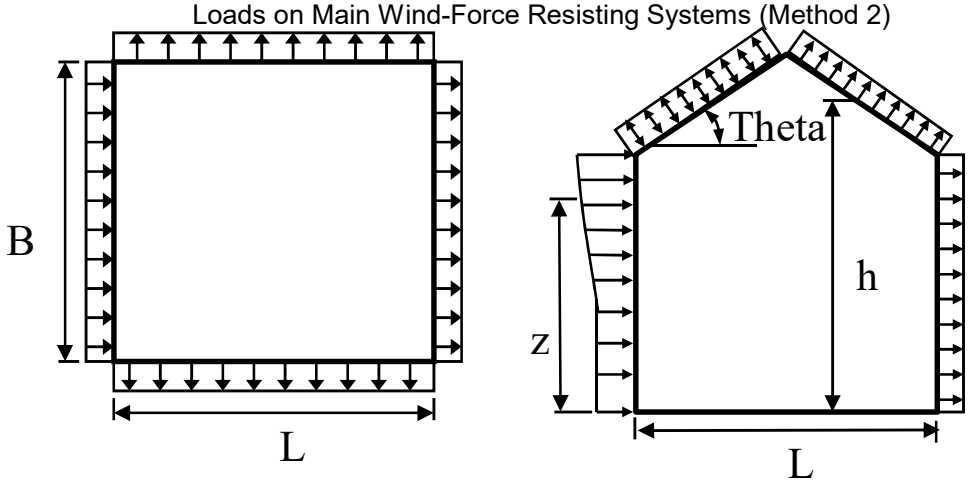
Condition	Gcpi	
	Max +	Max -
Open Buildings	0.00	0.00
Partially Enclosed Buildings	0.55	-0.55
Enclosed Buildings	0.18	-0.18
Enclosed Buildings	**0.18**	**-0.18**

6.5.12.2.1 Design Wind Pressure - Buildings of All Heights

Elev	Kz	Kzt	qz	Pressure (lb/ft^2)	
				Windward Wall*	
0			lb/ft^2	+GCpi	-GCpi
25.16	0.95	1.00	59.37	29.89	50.85
22.92	0.93	1.00	58.21	29.11	50.06
20.67	0.91	1.00	56.96	28.25	49.21
20	0.90	1.00	56.57	27.99	48.94
15	0.85	1.00	53.24	25.73	46.68

Figure 6-6 - External Pressure Coefficients, Cp

Loads on Main Wind-Force Resisting Systems (Method 2)



Variable	Formula	Value	Units
Kh	2.01*(Ht/zg)^(2/Alpha)	0.93	
Kht	Topographic factor (Fig 6-4)	1.00	
Qh	.00256*(V)^2*I*Kh*Kht*Kd	58.21	psf
Khcc	Comp & Clad: Table 6-3 Case 1	0.93	
Qhcc	.00256*V^2*I*Khcc*Kht*Kd	58.21	psf

Wall Pressure Coefficients, Cp	
Surface	**Cp**
Windward Wall (See Figure 6.5.12.2.1 for Pressures)	0.8

WIND02 v2-04

Detailed Wind Load Design (Method 2) per ASCE 7-16

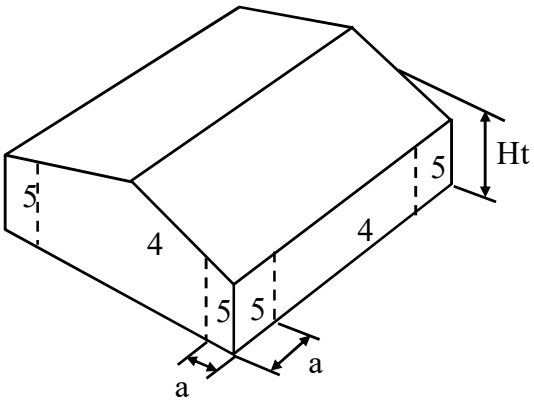
Roof Pressure Coefficients, Cp	
Roof Area (sq. ft.)	-
Reduction Factor	1.00

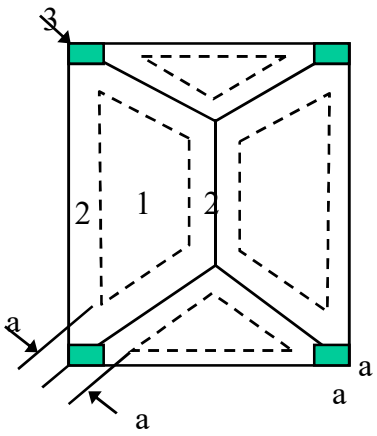
Calculations for Wind Normal to 54 ft Face *Additional Runs may be req'd for other wind directions*	Cp	Pressure (psf) +GCpi	 -GCpi
Leeward Walls (Wind Dir Normal to 54 ft wall)	-0.26	-23.44	-2.49
Leeward Walls (Wind Dir Normal to 149 ft wall)	-0.50	-35.22	-14.26
Side Walls	-0.70	-45.11	-24.16
Roof - Wind Normal to Ridge (Theta>=10) - for Wind Normal to 54 ft face			
Windward - Min Cp	-0.25	-22.73	-1.77
Windward - Max Cp	0.25	2.01	22.97
Leeward Normal to Ridge	-0.60	-40.17	-19.21
Overhang Top (Windward)	-0.25	-12.25	-12.25
Overhang Top (Leeward)	-0.60	-29.69	-29.69
Overhang Bottom (Applicable on Windward only)	0.80	38.73	38.73
Roof - Wind Parallel to Ridge (All Theta) - for Wind Normal to 149 ft face			
Dist from Windward Edge: 0 ft to 45.84 ft - Max Cp	-0.18	-19.38	1.57
Dist from Windward Edge: 0 ft to 11.46 ft - Min Cp	-0.90	-55.01	-34.05
Dist from Windward Edge: 11.46 ft to 22.92 ft - Min C	-0.90	-55.01	-34.05
Dist from Windward Edge: 22.92 ft to 45.84 ft - Min C	-0.50	-35.22	-14.26
Dist from Windward Edge: > 45.84 ft	-0.30	-25.32	-4.37

* Horizontal distance from windward edge

Figure 6-11 - External Pressure Coefficients, GCp

Loads on Components and Cladding for Buildings w/ Ht <= 60 ft





Hipped Roof
7 < Theta <= 27

WIND02 v2-04

Detailed Wind Load Design (Method 2) per ASCE 7-16

a = 5.4 ==> 5.40 ft

Double Click on any data entry line to receive a help Screen

Component	Width (ft)	Span (ft)	Area (ft^2)	Zone	GCp		Wind Press (lb/ft^2)	
					Max	Min	Max	Min
Truss 1	26	2	52.00	1	0.36	-0.83	31.25	-58.70
Truss 1	26	2	52.00	2	0.36	-1.34	31.25	-88.60
Truss 2	23	2	46.00	1	0.37	-0.83	31.87	-59.01
Truss 2	23	2	46.00	2	0.37	-1.37	31.87	-90.15
Truss 3	7	2	14.00	1	0.47	-0.89	37.88	-62.02
Truss 3	7	2	14.00	2	0.47	-1.63	37.88	-105.19
Truss 4	6	2	12.00	1	0.48	-0.89	38.66	-62.41
Truss 4	6	2	12.00	2	0.48	-1.66	38.66	-107.14
GT-1	26	4	104.00	1	0.30	-0.80	27.94	-57.05
GT-1	26	4	104.00	2	0.30	-1.20	27.94	-80.33
GT-2	13	13	169.00	1	0.30	-0.80	27.94	-57.05
GT-2	13	13	169.00	2	0.30	-1.20	27.94	-80.33
GT-3	23	3.5	80.50	1	0.32	-0.81	29.04	-57.60
GT-3	23	3.5	80.50	2	0.32	-1.25	29.04	-83.08
JKT-1	10	3.5	35.00	1	0.39	-0.85	33.25	-59.70
JKT-1	10	3.5	35.00	2	0.39	-1.43	33.25	-93.60
JKT-2	8	3	24.00	1	0.42	-0.86	35.16	-60.66
JKT-2	8	3	24.00	2	0.42	-1.51	35.16	-98.37
Wall	1	10	33.33	5	0.91	-1.22	63.32	-81.23
Wall	1	10	33.33	4	0.91	-1.01	63.32	-69.14
Ex. Truss	2	12	48.00	1	0.36	-0.83	31.65	-58.90
Ex. Truss	2	12	48.00	2	0.36	-1.36	31.65	-89.61

Note: * Enter Zone 1 through 5, or 1H through 3H for overhangs.

Note: ****** Calculations have been adjusted to comply with ASCE-7

WIND02 v2-04

Detailed Wind Load Design (Method 2) per ASCE 7-16

Component	PRESURE AVERAGE	W.UPLIFT (Lbs)	GRAVITY LOAD (psf)	GRAVITY REACT. (lbs)	D.L (psf)	0.6D.L+W.L REACT. (lbs)
Truss 1	73.65	**1914.92**	**55.00**	**1430.00**	8.00	**1790.12**
Truss 2	74.58	**1715.35**	**55.00**	**1265.00**	8.00	**1604.95**
Truss 3	83.60	**585.22**	**55.00**	**385.00**	8.00	**551.62**
Truss 4	84.77	**508.63**	**55.00**	**330.00**	8.00	**479.83**
Girder 1	68.69	**3571.93**	**55.00**	**2860.00**	8.00	**3072.73**
Girder 2	68.69	**5804.38**	**55.00**	**4647.50**	8.00	**4993.18**
Girder 3	70.34	**2831.04**	**55.00**	**2213.75**	8.00	**2444.64**
Jack Truss 1	76.65	**1341.43**	**55.00**	**962.50**	8.00	**1173.43**
Jack Truss 2	79.51	**954.18**	**55.00**	**660.00**	8.00	**838.98**
Ex. Truss	74.26	**891.09**	**55.00**	**660.00**	8.00	**775.89**

WIND02 v2-04

Detailed Wind Load Design (Method 2) per ASCE 7-16

LATERAL WIND LOAD

L= 149.00 ft B= 54.00 ft *(Perp. to Wind Direction)* **H2=** 4.50 ft *(Dist. From Eave to Ridge)*

WALLS	WIND PRESSURE	HEIGHT (ft)	MOMENT (Kips-ft/ft)	FORCE lbs/ft	@	Reactlion L2	L1
WALL	**0.00 Cladding**	**8.00**	**0.00**				
TRUSS 1	**25.73 MWFRS**	***(Windward)***		**160.79**	1.00	**160.79**	
-	**46.68 MWFRS**	***(Leward Side Walls)***		**186.73**			**33.84**

USING: **Nu-Vue**

Component	Anchor Capacity			ANCHOR TYPE	CHECK COMBINATION	
	Uplift	L1	L2			
Truss 1	2338	1181	1631	NVHTA-16H (18-10d Fasteners)	0.892897552	**CONNECTION OK**
Truss 2	2078	1050	1450	NVHTA-16H (16-10d Fasteners)	0.861462909	**CONNECTION OK**
Truss 3	1308	700	1049	NVSTA-16H (11-10d Fasteners)	0.623345566	**CONNECTION OK**
Ttruss 4	1308	700	1049	NVSTA-16H (11-10d Fasteners)	0.568461726	**CONNECTION OK**
Girder 1	3367	2942	2758	NV358-16 (24-10d Fasteners)	0.982401678	**CONNECTION OK**
Girder 2	9600	4250	4900	NVUCB-2	0.560899001	**CONNECTION OK**
Girder 3	3367	2942	2758	NV358-16 (24-10d Fasteners)	0.726057527	**CONNECTION OK**
Jack Truss 1	1545	823	1239	NVSTA-16H (13-10d Fasteners)	0.930392382	**CONNECTION OK**
Jack Truss 2	1308	700	1049	NVSTA-16H (11-10d Fasteners)	0.843038976	**CONNECTION OK**
Ex. Truss	821	-	-	NVJH26 (16-10d Fasteners)	0.94505979	**CONNECTION OK**

ARIANNA PRIETO, P.E. P.E. No. 90741

3911 N.W. 1st. Street.
Miami, Florida, 33126 tel: 786-991-3288

STRUCTURAL CALCULATION

1. Floor System (Second floor):

For: 6"Conc. Slab

Load		span	W	ϕ	ϕW
Live	40.00 psf	1.00 ft	40.00 Lbs-ft	1.6	64.00 Lbs-ft
Dead	30.00 psf	1.00 ft	30.00 Lbs-ft	1.2	36.00 Lbs-ft
Total Load			**70.00 Lbs-ft**		**100.00 Lbs-ft**

a) Combination:

1.2 D.L + 1.6 L.L = **100.00 Lbs-Ft**

For: 6" conc. slab 1 use #5 at 6" O/C., #5 at 12" O/C. temp. as shown on plan and for conc. slab 2 use #5 at 12" O/C., #5 at 12" O/C. temp. as shown on plan.

2. Concrete Beam (B-1):

Load at Total span = 16 ft

Load		span	W	ϕ	ϕW
Live	40.00 psf	2.50 ft	100.00 Lbs-ft	1.6	160.00 Lbs-ft
6" conc. slab	75.00 psf	2.50 ft	187.50 Lbs-ft	1.2	225.00 Lbs-ft
Dead	30.00 psf	2.50 ft	75.00 Lbs-ft	1.2	90.00 Lbs-ft
Total Live Load			100.00 Lbs-ft		160.00 Lbs-ft
Total Dead Load			262.50 Lbs-ft		315.00 Lbs-ft
Total Load			**362.50 Lbs-ft**		**475.00 Lbs-ft**

a) Combination:

1.2 D.L + 1.6 L.L = **760.00 Lbs-Ft**

Note: See computer calculation attached
Summary: Use 8x30 conc. beam with 2# 5 top and bottom reinforce cont. Stirrup: #3 at 12" o/c.

ARIANNA PRIETO, P.E. P.E. No. 90741

3911 N.W. 1st. Street.
Miami, Florida, 33126 tel: 786-991-3288

Concrete Beam (B-2):

Load at Total span = 21 ft.

Load		tributary With	w	ϕ	Φw
Live Load (roof)	30.00 psf	7.00 ft	210.00 Lbs-ft	1.6	336.00 Lbs-ft
Live Load (2nd floor)	40.00 psf	7.00 ft	280.00 Lbs-ft	1.6	448.00 Lbs-ft
Dead Load (roof)	25.00 psf	7.00 ft	175.00 Lbs-ft	1.2	210.00 Lbs-ft
Dead Load (2nd floor)	30.00 psf	7.00 ft	210.00 Lbs-ft	1.2	252.00 Lbs-ft
6" Conc. Slab	75.00 psf	7.00 ft	525.00 Lbs-ft	1.2	630.00 Lbs-ft
8" CMU wall	60.00 psf	10.00 ft	600.00 Lbs-ft	1.2	720.00 Lbs-ft
Total Live Load			490.00 Lbs-ft		784.00 Lbs-ft
Total Dead Load			1510.00 Lbs-ft		1812.00 Lbs-ft
Total Load			**2000.00 Lbs-ft**		**2596.00 Lbs**

a) Combination:

W 1(21 ft) = D.L + L.L = **2596.00 Lbs/Ft**

See: Computer calculation attached.
Note: Use: 10x24 Concrete Beam with 3 #6 Bottom, 2# 6 “B” bars and 2 # 5 top , stirrup #3 at 10” O/C. as shown on plan.

4. **Concrete Beam (B-3):**

Load at Total span = 9 ft.

Load		tributary With	w	ϕ	Φw
Live Load (2nd floor)	40.00 psf	12.00 ft	480.00 Lbs-ft	1.6	768.00 Lbs-ft
Dead Load (2nd floor)	30.00 psf	12.00 ft	360.00 Lbs-ft	1.2	432.00 Lbs-ft
6" Conc. Slab	75.00 psf	12.00 ft	900.00 Lbs-ft	1.2	1080.00 Lbs-ft
Total Live Load			480.00 Lbs-ft		768.00 Lbs-ft
Total Dead Load			1260.00 Lbs-ft		1512.00 Lbs-ft
Total Load			**1740.00 Lbs-ft**		**2280.00 Lbs**

a) Combination:
W 1(9 ft)= D.L + L.L = **2280.00 Lbs/Ft**

See: Computer calculation attached.
Note: Use: 2x12 Concrete Beam with 2 #5 top and Bottom , stirrup 8 #3 at 4” O/C., balance #3 at 12” O/C. as shown on plan.

ARIANNA PRIETO, P.E. P.E. No. 90741

3911 N.W. 1st. Street.
Miami, Florida, 33126 tel: 786-991-3288

5. Concrete Beam (B-4):

Load at Total span = 8.5 ft.

Load		tributary With	w	ϕ	Φw
Live Load (2nd floor)	40.00 psf	2.50 ft	100.00 Lbs-ft	1.6	160.00 Lbs-ft
Live Load (stair)	40.00 psf	4.00 ft	160.00 Lbs-ft	1.6	256.00 Lbs-ft
Dead Load (2nd floor)	30.00 psf	2.50 ft	75.00 Lbs-ft	1.2	90.00 Lbs-ft
Dead Load (stair)	75.00 psf	4.00 ft	300.00 Lbs-ft	1.2	360.00 Lbs-ft
6" Conc. Slab	75.00 psf	2.50 ft	187.50 Lbs-ft	1.2	225.00 Lbs-ft
Total Live Load			260.00 Lbs-ft		416.00 Lbs-ft
Total Dead Load			562.50 Lbs-ft		675.00 Lbs-ft
Total Load w1			**822.50 Lbs-ft**		**1091.00 Lbs**
Total Load w2			**362.50 Lbs-ft**		**475.00 Lbs**

a) Combination:

W 1(3.5 ft) = D.L + L.L = **1091.00 Lbs/Ft**
W 2(5 ft) = D.L + L.L = **475.00 Lbs/Ft**
R1 (From Beam B-4) = **8.324 Kips**

See: Computer calculation attached.
Note: Use: 8x12 Concrete Beam with 2 #5 top and 2 #5 “C” Bars. Stirrup #3 at 5” O/C. as shown on plan.

6. Concrete Beam (B-5):

Load at Total span = 18 ft.

Load		tributary With	w	ϕ	Φw
Live Load (roof)	30.00 psf	12.00 ft	360.00 Lbs-ft	1.6	576.00 Lbs-ft
Live Load (2nd floor)	40.00 psf	5.00 ft	200.00 Lbs-ft	1.6	320.00 Lbs-ft
Dead Load (roof)	25.00 psf	12.00 ft	300.00 Lbs-ft	1.2	360.00 Lbs-ft
Dead Load (2nd floor)	30.00 psf	5.00 ft	150.00 Lbs-ft	1.2	180.00 Lbs-ft
6" Conc. Slab	75.00 psf	5.00 ft	375.00 Lbs-ft	1.2	450.00 Lbs-ft
8" CMU wall	60.00 psf	10.00 ft	600.00 Lbs-ft	1.2	720.00 Lbs-ft
Total Live Load			560.00 Lbs-ft		896.00 Lbs-ft
Total Dead Load			1425.00 Lbs-ft		1710.00 Lbs-ft
Total Load			**1985.00 Lbs-ft**		**2606.00 Lbs**

a) Combination:

W 1(18 ft) = D.L + L.L = **2606.00 Lbs/Ft**

See: Computer calculation attached.
Note: Use: 8x16 Concrete Beam with2 #6 Bottom, 2#6 “B” bars and 2 # 5 top , stirrup #3 at 6” O/C. as shown on plan.

ARIANNA PRIETO, P.E. P.E. No. 90741

3911 N.W. 1st. Street.
Miami, Florida, 33126 tel: 786-991-3288

7. Wood Ledger:

Load		span	W	ϕ	ϕW
Live	30.00 psf	7.00 ft	210.00 Lbs-ft	1.6	336.00 Lbs-ft
Dead	25.00 psf	7.00 ft	175.00 Lbs-ft	1.2	210.00 Lbs-ft
Total Load			**385.00 Lbs-ft**		**546.00 Lbs-ft**

a) Combination:

1.2 D.L + 1.6 L.L = **546.00 Lbs-Ft**

Note: See computer calculation attached
Summary: Use (2)2x8 Wood Ledger with 5/8" Ø exp. Bolts staggered at 18' O/C. 4 ½" min. embedment into conc. filled cells.

8. Steel Columns:

a) Load at Top of Columns: (From beam 5)

Live load = 3,765.00 Lbs
Dead Load = 8,564.00 Lbs

b) Combination:
1.2 D.L + 1.6 L.L = **16,300.80 Lbs**

Note: See computer calculation attached
Summary: Use 4x4x1/4" Steel Columns, as shown on plan.

9. Steel Bottom Plate:

Live load = 3,765.00 Lbs
Dead Load = 8,564.00 Lbs
Column weight = 108.78 Lbs

Combination:
1.2 D.L + 1.6 L.L = **16,409.58 Lbs**

Note: See computer calculation attached
Summary: Use 10x10x 1/2" Steel Plate, as shown on plan.

ARIANNA PRIETO, P.E. P.E. No. 90741

3911 N.W. 1st. Street.
Miami, Florida, 33126 tel: 786-991-3288

10. Steel Columns Top Plate:

Live load = 3,765.00 Lbs
Dead Load = 8,564.00 Lbs

a) Combination:
b) 1.2 D.L + 1.6 L.L = **16,300.80 Lbs**

Note: See computer calculation attached
Summary: Use 8x10x 1/2" Steel Plate, as shown on plan.

11. Combine Concrete Footing (CF-3080):

b) Reaction from Columns:

Live load = 3,765.00 Lbs
Dead Load = 8,564.00 Lbs
Column weight = 108.78 Lbs

Combination: (Two Columns)

1.2 D.L + 1.6 L.L = **32,819.16 Lbs**

Note: See computer calculation attached
Summary: Use Concrete Footing CF-3080 (36"x36"x12") with 4#5 bottom, each way , as shown on plan.

12. Concrete Footing (CF-40):

Load		tributary With	w	ϕ	Φw
Live Load (roof)	30.00 psf	9.50 ft	285.00 Lbs-ft	1.6	456.00 Lbs-ft
Live Load (2nd floor)	40.00 psf	14.00 ft	560.00 Lbs-ft	1.6	896.00 Lbs-ft
Dead Load (roof)	25.00 psf	9.50 ft	237.50 Lbs-ft	1.2	285.00 Lbs-ft
Dead Load (2nd floor)	30.00 psf	14.00 ft	420.00 Lbs-ft	1.2	504.00 Lbs-ft
Floor System (Hambro)	37.50 psf	14.00 ft	525.00 Lbs-ft	1.2	630.00 Lbs-ft
6" Conc. Slab	75.00 psf	5.00 ft	375.00 Lbs-ft	1.2	450.00 Lbs-ft
14x28 Conc. Beam	350.00 psf	1.17 ft	409.50 Lbs-ft	1.2	491.40 Lbs-ft
8" CMU wall	60.00 psf	10.00 ft	600.00 Lbs-ft	1.2	720.00 Lbs-ft
Total Live Load			845.00 Lbs-ft		1352.00 Lbs-ft
Total Dead Load			2567.00 Lbs-ft		3080.40 Lbs-ft
Total Load			**3412.00 Lbs-ft**		**4432.40 Lbs**

ARIANNA PRIETO, P.E. P.E. No. 90741

3911 N.W. 1st. Street.
Miami, Florida, 33126 tel: 786-991-3288

c) Load at Top of Columns: (C-2) Reaction From beam 2)

Live load = **5,145.00 Lbs**
Dead Load = **15,855.00 Lbs**
Column weight = **1,005.00 Lbs**

c) Combination:
1.2 D.L + 1.6 L.L = **28,464.00 Lbs**

Note: See computer calculation attached
Summary: Use Concrete Footing CF-40 (48”x48”x12”) with 5# 5 bottom each way, as shown on plan.

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580001
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Timber Ledger Design

Description WOOD LEDGER

General Information

Code Ref: 2015 NDS, 2015 IBC, 2015 NFPA 5000. Base allowables are user defined.

Ledger Width	4.000 in	Uniform Load...		Point Load...	
Ledger Depth	8.000 in	Dead Load	175.00 #/ft	Dead Load	0.00 lbs
Ledger is Bolted to Concrete		Live Load	210.00 #/ft	Live Load	0.00 lbs
Bolt Diameter	5/8"			Spacing	0.00 ft
Bolt Spacing	18.000 in	Horizontal Shear	0.00 #/ft	Offset	0.00 in
Load Duration Factors...		Southern Pine, No.2 2 -4 Thick, 8 Wide			
Live Load	1.250	Fb Allowable	1,200.0 psi		
Short Term	1.330	Fv Allowable	175.0 psi		

Ledger Stresses

Load Combination :	DL + LL	DL + ST	DL + LL + ST
Maximum Moment	866.25 in-#	393.75 in-#	866.25 in-#
Bending Stress	20.30 psi	9.23 psi	20.30 psi
Stress Ratio	**0.014**	**0.006**	**0.013**
MaximumShear	401.04 lbs	182.29 lbs	401.04 lbs
Shear Stress	12.53 psi	5.70 psi	12.53 psi
Stress Ratio	**0.057**	**0.024**	**0.054**

Bolt Loading

Note: Bolt Design Value from NDS 8.2 / UBC 23 **Using : Southern Pine**

Stress Summary	DL + LL	DL + ST	DL+LL+ST
Max. Vertical Load	577.50 lbs	262.50 lbs	577.50 lbs
Allow Vertical Load	4,062.50 lbs	4,322.50 lbs	4,322.50 lbs
Max. Horizontal Load	0.00 lbs	0.00 lbs	0.00 lbs
Allow Horizontal Load	7,687.50 lbs	8,179.50 lbs	8,179.50 lbs
Angle of Resultant	90.0 degrees	90.0 degrees	90.0 degrees
Diagonal Component	577.50 lbs	262.50 lbs	577.50 lbs
Allow Diagonal Force	762.33 lbs	786.35 lbs	786.35 lbs
Final Stress Ratio	**0.758 : 1.00**	**0.334 : 1.00**	**0.734 : 1.00**

Summary

Wood Stress & Bolts OK

Stress Summary	DL + LL	DL + ST	DL+LL+ST
Wood Bending Stress Ratio	0.014 **: 1.00**	0.006 **: 1.00**	0.013 **: 1.00**
Wood Shear Stress Ratio	0.057 **: 1.00**	0.024 **: 1.00**	0.054 **: 1.00**
Bolt Stress Ratio	0.758 **: 1.00**	0.334 **: 1.00**	0.734 **: 1.00**

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC SLAB 1

General Information

Code Ref: ACI 318-14, 2015 IBC, 2015 NFPA 5000

Span	20.00 ft	f'c	3,000 psi
Depth	6.000 in	Fy	60,000 psi
Width	12.000 in	Concrete Wt.	145.0 pcf
		Seismic Zone	0
		End Fixity	Fixed-Fixed
Beam Weight Added Internally		Live Load acts 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	1	5	4.50 in	#1	2	5	2.00 in	#1	2	5	2.00 in

Load Factoring

Note: Load factoring supports 2015 IBC and 2015 NFPA 5000 by virtue of their references to ACI 318-14 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-14 C.2

Uniform Loads

	Dead Load	Live Load	Short Term	Start	End
#1	0.030 k	0.040 k	k	0.000 ft	20.000 ft

Summary

Beam Design OK

Span = 20.00ft, Width= 12.00in Depth = 6.00in

Maximum Moment : Mu	-7.05 k-ft	Maximum Deflection	-0.4519 in
Allowable Moment : Mn*phi	9.46 k-ft		
Maximum Shear : Vu	2.05 k	Max Reaction @ Left	1.42 k
Allowable Shear : Vn*phi	4.47 k	Max Reaction @ Right	1.42 k

Shear Stirrups...
Stirrup Area @ Section 0.440 in2

Region	0.000	3.333	6.667	10.000	13.333	16.667	20.000 ft
Max. Spacing	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd in
Max Vu	2.047	1.421	0.711	0.694	0.694	1.404	2.030 k

Bending & Shear Force Summary

Bending...	Mn*Phi	Mu, Eq. C-1	Mu, Eq. C-2	Mu, Eq. C-3
@ Center	5.85 k-ft	3.52 k-ft	2.64 k-ft	1.54 k-ft
@ Left End	9.46 k-ft	-7.05 k-ft	-5.29 k-ft	-3.07 k-ft
@ Right End	9.46 k-ft	-7.05 k-ft	-5.29 k-ft	-3.07 k-ft
Shear...	**Vn*Phi**	**Vu, Eq. C-1**	**Vu, Eq. C-2**	**Vu, Eq. C-3**
@ Left End	4.47 k	2.05 k	1.54 k	0.89 k
@ Right End	4.47 k	2.03 k	1.52 k	0.89 k

Deflection

Deflections...	Upward			Downward		
DL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.2111 in	at	10.0000 ft
DL + LL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.4519 in	at	10.0000 ft
DL + LL + ST + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.4519 in	at	10.0000 ft

Reactions...	@ Left	@ Right
DL + [Bm Wt]]	1.025 k	1.025 k
DL + LL + [Bm Wt]	1.425 k	1.425 k
DL + LL + ST + [Bm Wt]	1.425 k	1.425 k

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC SLAB 1

Section Analysis

Evaluate Moment Capacity...	Center	Left End	Right End
X : Neutral Axis	0.715 in	1.430 in	1.430 in
a = beta * Xneutral	0.608 in	1.215 in	1.215 in
Compression in Concrete	18.597 k	37.194 k	37.194 k
Sum [Steel comp. forces]	0.000 k	0.000 k	0.000 k
Tension in Reinforcing	-18.600 k	-37.200 k	-37.200 k
Find Max As for Ductile Failure...			
X-Balanced	2.663 in	2.367 in	2.3673 in
Xmax = Xbal * 0.75	1.997 in	1.776 in	1.776 in
a-max = beta * Xbal	2.264 in	2.012 in	2.012 in
Compression in Concrete	51.954 k	46.181 k	46.181 k
Sum [Steel Comp Forces]	0.000 k	0.000 k	0.000 k
Total Compressive Force	51.954 k	46.181 k	46.181 k
AS Max = Tot Force / Fy	0.866 in2	0.770 in2	0.770 in2
Actual Tension As	0.310 **OK**	0.620 **OK**	0.620 **OK**

Additional Deflection Calcs

Neutral Axis	1.250 in	Mcr	2.46 k-ft
Igross	216.00 in4	Ms:Max DL + LL	4.75 k-ft
Icracked	49.46 in4	R1 = (Ms:DL+LL)/Mcr	0.519
Elastic Modulus	3,122.0 ksi	Ms:Max DL+LL+ST	4.75 k-ft
Fr = 7.5 * f'c^.5	410.792 psi	R2 = (Ms:DL+LL+ST)/Mcr	0.519
Z:Cracking	213.843 k/in	I:eff... Ms(DL+LL)	72.729 in4
Z:cracking > 175 : No Good!		I:eff... Ms(DL+LL+ST)	72.729 in4
Eff. Flange Width	12.00 in		

ACI Factors (per ACI 318-14, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC SLAB 2

General Information

Code Ref: ACI 318-14, 2015 IBC, 2015NFPA 5000

Span	10.50 ft	f'c	3,000 psi
Depth	6.000 in	Fy	60,000 psi
Width	12.000 in	Concrete Wt.	145.0 pcf
		Seismic Zone	0
		End Fixity	Fixed-Fixed
Beam Weight Added Internally		Live Load acts 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	1	5	4.50 in	1	5	2.00 in	1	5	2.00 in

Load Factoring

Note: Load factoring supports 2015 IBC and 2015 NFPA 5000 by virtue of their references to ACI 318-14 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-14 C.2

Uniform Loads

	Dead Load	Live Load	Short Term	Start	End
#1	0.030 k	0.040 k	k	0.000 ft	10.500 ft

Summary

Beam Design OK

Span = 10.50ft, Width= 12.00in Depth = 6.00in

Maximum Moment : Mu	-1.94 k-ft	Maximum Deflection	-0.0116 in
Allowable Moment : Mn*phi	5.16 k-ft		
Maximum Shear : Vu	1.05 k	Max Reaction @ Left	0.75 k
Allowable Shear : Vn*phi	4.47 k	Max Reaction @ Right	0.75 k

Shear Stirrups...

Stirrup Area @ Section 0.440 in2

Region	0.000	1.750	3.500	5.250	7.000	8.750	10.500 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	1.048	0.746	0.373	0.364	0.364	0.737	1.039 k

Bending & Shear Force Summary

Bending...	**Mn*Phi**	**Mu, Eq. C-1**	**Mu, Eq. C-2**	**Mu, Eq. C-3**
@ Center	5.85 k-ft	0.97 k-ft	0.73 k-ft	0.42 k-ft
@ Left End	5.16 k-ft	-1.94 k-ft	-1.46 k-ft	-0.85 k-ft
@ Right End	5.16 k-ft	-1.94 k-ft	-1.46 k-ft	-0.85 k-ft
Shear...	**Vn*Phi**	**Vu, Eq. C-1**	**Vu, Eq. C-2**	**Vu, Eq. C-3**
@ Left End	4.47 k	1.05 k	0.79 k	0.46 k
@ Right End	4.47 k	1.04 k	0.78 k	0.45 k

Deflection

Deflections...	Upward			Downward		
DL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.0083 in	at	5.2500 ft
DL + LL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.0116 in	at	5.2500 ft
DL + LL + ST + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.0116 in	at	5.2500 ft

Reactions...	@ Left	@ Right
DL + [Bm Wt]]	0.538 k	0.538 k
DL + LL + [Bm Wt]	0.748 k	0.748 k
DL + LL + ST + [Bm Wt]	0.748 k	0.748 k

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC SLAB 2

Section Analysis

Evaluate Moment Capacity...	Center	Left End	Right End
X : Neutral Axis	0.715 in	0.715 in	0.715 in
a = beta * Xneutral	0.608 in	0.608 in	0.608 in
Compression in Concrete	18.597 k	18.597 k	18.597 k
Sum [Steel comp. forces]	0.000 k	0.000 k	0.000 k
Tension in Reinforcing	-18.600 k	-18.600 k	-18.600 k
Find Max As for Ductile Failure...			
X-Balanced	2.663 in	2.367 in	2.3673 in
Xmax = Xbal * 0.75	1.997 in	1.776 in	1.776 in
a-max = beta * Xbal	2.264 in	2.012 in	2.012 in
Compression in Concrete	51.954 k	46.181 k	46.181 k
Sum [Steel Comp Forces]	0.000 k	0.000 k	0.000 k
Total Compressive Force	51.954 k	46.181 k	46.181 k
AS Max = Tot Force / Fy	0.866 in2	0.770 in2	0.770 in2
Actual Tension As	0.310 **OK**	0.310 **OK**	0.310 **OK**

Additional Deflection Calcs

Neutral Axis	1.250 in	Mcr	2.46 k-ft
Igross	216.00 in4	Ms:Max DL + LL	1.31 k-ft
Icracked	38.23 in4	R1 = (Ms:DL+LL)/Mcr	1.883
Elastic Modulus	3,122.0 ksi	Ms:Max DL+LL+ST	1.31 k-ft
Fr = 7.5 * f'c^.5	410.792 psi	R2 = (Ms:DL+LL+ST)/Mcr	1.883
Z:Cracking	58.940 k/in	I:eff... Ms(DL+LL)	216.000 in4
		I:eff... Ms(DL+LL+ST)	216.000 in4
Eff. Flange Width	12.00 in		

ACI Factors (per ACI 318-14, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CANTILEVEL SLAB

General Information

Code Ref: ACI 318-14, 2015 IBC, 2015 NFPA 5000

Span	5.50 ft	f'c	3,000 psi
Depth	6.000 in	Fy	60,000 psi
Width	12.000 in	Concrete Wt.	145.0 pcf
		Seismic Zone	0
		End Fixity	Fixed-Free
Beam Weight Added Internally		Live Load acts 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	1	5	2.00 in	1	5	2.00 in	1	5	2.00 in

Load Factoring

Note: Load factoring supports 2015 IBC and 2015 NFPA 5000 by virtue of their references to ACI 318-14 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-14 C.2

Uniform Loads

	Dead Load	Live Load	Short Term	Start	End
#1	0.030 k	0.100 k	k	0.000 ft	5.500 ft

Summary

Beam Design OK

Span = 5.50ft, Width= 12.00in Depth = 6.00in

Maximum Moment : Mu	-4.74 k-ft	Maximum Deflection	-0.1012 in
Allowable Moment : Mn*phi	5.16 k-ft		
Maximum Shear : Vu	1.62 k	Max Reaction @ Left	1.11 k
Allowable Shear : Vn*phi	20.11 k	Max Reaction @ Right	0.00 k

Shear Stirrups...

Stirrup Area @ Section 0.440 in2

Region	0.000	0.917	1.833	2.750	3.667	4.583	5.500 ft
Max. Spacing	1.000	1.000	1.000	1.000	Not Req'd	Not Req'd	Not Req'd in
Max Vu	1.621	1.441	1.152	0.579	0.579	0.290	0.110 k

Bending & Shear Force Summary

Bending...	Mn*Phi	Mu, Eq. C-1	Mu, Eq. C-2	Mu, Eq. C-3
@ Center	2.37 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
@ Left End	5.16 k-ft	-4.74 k-ft	-3.56 k-ft	-1.40 k-ft
@ Right End	5.16 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
Shear...	**Vn*Phi**	**Vu, Eq. C-1**	**Vu, Eq. C-2**	**Vu, Eq. C-3**
@ Left End	20.11 k	1.62 k	1.22 k	0.48 k
@ Right End	4.47 k	0.00 k	0.00 k	0.00 k

Deflection

Deflections...	Upward			Downward		
DL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.0300 in	at	5.5000 ft
DL + LL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.1012 in	at	5.5000 ft
DL + LL + ST + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.1012 in	at	5.5000 ft

Reactions...	@ Left	@ Right
DL + [Bm Wt]]	0.564 k	0.000 k
DL + LL + [Bm Wt]	1.114 k	0.000 k
DL + LL + ST + [Bm Wt]	1.114 k	0.000 k

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CANTILEVEL SLAB

Section Analysis

Evaluate Moment Capacity...	Center	Left End	Right End
X : Neutral Axis	0.715 in	0.715 in	0.715 in
a = beta * Xneutral	0.608 in	0.608 in	0.608 in
Compression in Concrete	18.597 k	18.597 k	18.597 k
Sum [Steel comp. forces]	0.000 k	0.000 k	0.000 k
Tension in Reinforcing	-18.600 k	-18.600 k	-18.600 k
Find Max As for Ductile Failure...			
X-Balanced	1.184 in	2.367 in	2.3673 in
Xmax = Xbal * 0.75	0.888 in	1.776 in	1.776 in
a-max = beta * Xbal	1.006 in	2.012 in	2.012 in
Compression in Concrete	23.091 k	46.181 k	46.181 k
Sum [Steel Comp Forces]	0.000 k	0.000 k	0.000 k
Total Compressive Force	23.091 k	46.181 k	46.181 k
AS Max = Tot Force / Fy	0.385 in2	0.770 in2	0.770 in2
Actual Tension As	0.310 **OK**	0.310 **OK**	0.000 **OK**

Additional Deflection Calcs

Neutral Axis	0.770 in	Mcr	2.46 k-ft
Igross	216.00 in4	Ms:Max DL + LL	3.06 k-ft
Icracked	29.47 in4	R1 = (Ms:DL+LL)/Mcr	0.805
Elastic Modulus	3,122.0 ksi	Ms:Max DL+LL+ST	3.06 k-ft
Fr = 7.5 * f'c^.5	410.792 psi	R2 = (Ms:DL+LL+ST)/Mcr	0.805
Z:Cracking	0.000 k/in	I:eff... Ms(DL+LL)	126.678 in4
Z:cracking > 175 : No Good!		I:eff... Ms(DL+LL+ST)	126.678 in4
Eff. Flange Width	12.00 in		

ACI Factors (per ACI 318-14, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC BEAM B-1

General Information

Code Ref: ACI 318-14, 2015 IBC, 2015 NFPA 5000

Span	16.00 ft	f'c	3,000 psi
Depth	30.000 in	Fy	60,000 psi
Width	8.000 in	Concrete Wt.	150.0 pcf
		Seismic Zone	0
		End Fixity	Pinned-Pinned
Beam Weight Added Internally		Live Load acts 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	2	5	2.00 in	#1	2	5	2.00 in	#1	2	5	2.00 in
#2	2	5	27.81 in	#2	2	5	27.81 in	#2	2	5	27.81 in

Load Factoring

Note: Load factoring supports 2015 IBC and 2015 NFPA 5000 by virtue of their references to ACI 318-14 for concrete design. Factoring of entered loads to ultimate loads within this program is according to ACI 318-14 C.2

Uniform Loads

	Dead Load	Live Load	Short Term	Start	End
#1	0.262 k	0.100 k	k	0.000 ft	16.000 ft

Summary

Beam Design OK

Span = 16.00ft, Width= 8.00in Depth = 30.00in

Maximum Moment : Mu	24.78 k-ft	Maximum Deflection	-0.0161 in
Allowable Moment : Mn*phi	75.03 k-ft		
Maximum Shear : Vu	4.41 k	Max Reaction @ Left	4.90 k
Allowable Shear : Vn*phi	20.86 k	Max Reaction @ Right	4.90 k

Shear Stirrups...

Stirrup Area @ Section 0.220 in2

Region	0.000	2.667	5.333	8.000	10.667	13.333	16.000 ft
Max. Spacing	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd in
Max Vu	4.411	4.163	2.082	2.032	2.032	4.114	4.361 k

Bending & Shear Force Summary

Bending...	**Mn*Phi**	**Mu, Eq. C-1**	**Mu, Eq. C-2**	**Mu, Eq. C-3**
@ Center	75.03 k-ft	24.78 k-ft	18.59 k-ft	14.75 k-ft
@ Left End	75.03 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
@ Right End	75.03 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
Shear...	**Vn*Phi**	**Vu, Eq. C-1**	**Vu, Eq. C-2**	**Vu, Eq. C-3**
@ Left End	20.86 k	4.41 k	3.31 k	2.62 k
@ Right End	20.86 k	4.36 k	3.27 k	2.60 k

Deflection

Deflections...	Upward			Downward		
DL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.0134 in	at	8.0000 ft
DL + LL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.0161 in	at	8.0000 ft
DL + LL + ST + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.0161 in	at	8.0000 ft

Reactions...	@ Left	@ Right
DL + [Bm Wt]]	4.096 k	4.096 k
DL + LL + [Bm Wt]	4.896 k	4.896 k
DL + LL + ST + [Bm Wt]	4.896 k	4.896 k

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC BEAM B-1

Section Analysis

Evaluate Moment Capacity...	Center	Left End	Right End
X : Neutral Axis	2.095 in	2.095 in	2.095 in
a = beta * Xneutral	1.781 in	1.781 in	1.781 in
Compression in Concrete	36.327 k	36.327 k	36.327 k
Sum [Steel comp. forces]	0.865 k	0.865 k	0.865 k
Tension in Reinforcing	-37.200 k	-37.200 k	-37.200 k
Find Max As for Ductile Failure...			
X-Balanced	16.459 in	16.459 in	16.4590 in
Xmax = Xbal * 0.75	12.344 in	12.344 in	12.344 in
a-max = beta * Xbal	13.990 in	13.990 in	13.990 in
Compression in Concrete	214.049 k	214.049 k	214.049 k
Sum [Steel Comp Forces]	35.619 k	35.619 k	35.619 k
Total Compressive Force	249.668 k	249.668 k	249.668 k
AS Max = Tot Force / Fy	4.161 in2	4.161 in2	4.161 in2
Actual Tension As	0.620 **OK**	0.000 **OK**	0.000 **OK**

Additional Deflection Calcs

Neutral Axis	5.270 in	Mcr	41.08 k-ft
Igross	18,000.00 in4	Ms:Max DL + LL	19.58 k-ft
Icracked	3,377.80 in4	R1 = (Ms:DL+LL)/Mcr	2.098
Elastic Modulus	3,122.0 ksi	Ms:Max DL+LL+ST	19.58 k-ft
Fr = 7.5 * f'c^.5	410.792 psi	R2 = (Ms:DL+LL+ST)/Mcr	2.098
Z:Cracking	56.719 k/in	I:eff... Ms(DL+LL)	18,000.000 in4
		I:eff... Ms(DL+LL+ST)	18,000.000 in4
Eff. Flange Width	8.00 in		

ACI Factors (per ACI 318-14, applied internally to entered loads)

ACI C-1 & C-2 DL	1.200	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.600	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.600	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC BEAM B-2

General Information

Code Ref: ACI 318-14, 2015 IBC, 2015 NFPA 5000

Span	21.00 ft	f'c	3,000 psi
Depth	16.000 in	Fy	60,000 psi
Width	12.000 in	Concrete Wt.	150.0 pcf
Flange @ Both Sides		Seismic Zone	0
Flange Thickness	6.000 in	End Fixity	Pinned-Pinned
Web Spacing	6.000 ft	Live Load acts with Short Term	

Tee beam weight calc'd using Depth * Width

Reinforcing

Rebar @ Center of Beam...	Count	Size	'd' from Top	Rebar @ Left End of Beam...	Count	Size	'd' from Top	Rebar @ Right End of Beam...	Count	Size	'd' from Top
#1	2	5	2.00 in	#1	2	5	2.00 in	#1	2	5	2.00 in
#2	3	7	13.69 in	#2	2	7	13.69 in	#2	2	7	13.69 in
#3	2	7	12.81 in	#3			in	#3			in

Load Factoring

Note: Load factoring supports 2015 IBC and 2015 NFPA 5000 by virtue of their references to ACI 318-14 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-14 C.2

Uniform Loads

	Dead Load	Live Load	Short Term	Start	End
#1	1.510 k	0.490 k	k	0.000 ft	21.000 ft

Summary

Beam Design OK

Span = 21.00ft, Width= 12.00in Depth = 16.00in 'T' Beam with Flange= 6.00in thick @ Both Sides, Web spac= 6.00ft

Maximum Moment : Mu	156.33 k-ft	Maximum Deflection	-0.8582 in
Allowable Moment : Mn*phi	173.42 k-ft		
Maximum Shear : Vu	26.68 k	Max Reaction @ Left	23.10 k
Allowable Shear : Vn*phi	38.25 k	Max Reaction @ Right	23.10 k

Shear Stirrups...
Stirrup Area @ Section 0.220 in2

Region	0.000	3.500	7.000	10.500	14.000	17.500	21.000 ft
Max. Spacing	6.844	6.844	6.844	6.844	6.844	6.844	6.844 in
Max Vu	26.681	20.011	10.005	9.767	9.767	19.773	26.443 k

Bending & Shear Force Summary

Bending...	Mn*Phi	Mu, Eq. C-1	Mu, Eq. C-2	Mu, Eq. C-3
@ Center	173.42 k-ft	156.33 k-ft	117.25 k-ft	84.84 k-ft
@ Left End	67.72 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
@ Right End	67.72 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
Shear...	**Vn*Phi**	**Vu, Eq. C-1**	**Vu, Eq. C-2**	**Vu, Eq. C-3**
@ Left End	38.25 k	26.68 k	20.01 k	14.48 k
@ Right End	38.25 k	26.44 k	19.83 k	14.35 k

Deflection

Deflections...	Upward			Downward		
DL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.6594 in	at	10.5000 ft
DL + LL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.8582 in	at	10.5000 ft
DL + LL + ST + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.8582 in	at	10.5000 ft

Reactions...	@ Left	@ Right
DL + [Bm Wt]]	17.955 k	17.955 k
DL + LL + [Bm Wt]	23.100 k	23.100 k
DL + LL + ST + [Bm Wt]	23.100 k	23.100 k

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC BEAM B-2

Section Analysis

Evaluate Moment Capacity...	Center	Left End	Right End
X : Neutral Axis	1.460 in	2.450 in	2.450 in
a = beta * Xneutral	1.241 in	2.082 in	2.082 in
Compression in Concrete	37.975 k	63.724 k	63.724 k
Sum [Steel comp. forces]	0.000 k	8.326 k	8.326 k
Tension in Reinforcing	-199.950 k	-72.000 k	-72.000 k
Find Max As for Ductile Failure...			
X-Balanced	8.101 in	8.101 in	8.1011 in
Xmax = Xbal * 0.75	6.076 in	6.076 in	6.076 in
a-max = beta * Xbal	6.886 in	6.886 in	6.886 in
Compression in Concrete	829.665 k	158.031 k	158.031 k
Sum [Steel Comp Forces]	34.603 k	34.603 k	34.603 k
Total Compressive Force	864.268 k	192.635 k	192.635 k
AS Max = Tot Force / Fy	14.404 in2	3.211 in2	3.211 in2
Actual Tension As	3.620 **OK**	0.000 **OK**	0.000 **OK**

Additional Deflection Calcs

Neutral Axis	2.995 in	Mcr	24.62 k-ft
Igross	7,963.40 in4	Ms:Max DL + LL	121.27 k-ft
Icracked	3,555.87 in4	R1 = (Ms:DL+LL)/Mcr	0.203
Elastic Modulus	3,122.0 ksi	Ms:Max DL+LL+ST	121.27 k-ft
Fr = 7.5 * f'c^.5	410.792 psi	R2 = (Ms:DL+LL+ST)/Mcr	0.203
Z:Cracking	151.984 k/in	I:eff... Ms(DL+LL)	3,592.754 in4
Z:cracking > 145 : Interior Only !		I:eff... Ms(DL+LL+ST)	3,592.754 in4
Eff. Flange Width	63.00 in		

ACI Factors (per ACI 318-14, applied internally to entered loads)

ACI C-1 & C-2 DL	1.200	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.600	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.600	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC BEAM B-3

General Information

Code Ref: ACI 318-14, 2015 IBC, 2015 NFPA 5000

Span	9.00 ft	f'c	3,000 psi
Depth	12.000 in	Fy	60,000 psi
Width	8.000 in	Concrete Wt.	150.0 pcf
		Seismic Zone	0
		End Fixity	Pinned-Pinned
Beam Weight Added Internally		Live Load acts 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	2	5	2.00 in	#1	2	5	2.00 in	#1	2	5	2.00 in
#2	2	5	9.81 in	#2	2	5	9.81 in	#2	2	5	9.81 in

Load Factoring

Note: Load factoring supports 2015 IBC and 2015 NFPA 5000 by virtue of their references to ACI 318-14 for concrete design. Factoring of entered loads to ultimate loads within this program is according to ACI 318-14 C.2

Uniform Loads

	Dead Load	Live Load	Short Term	Start	End
#1	1.260 k	0.490 k	k	0.000 ft	9.000 ft

Summary

Beam Design OK

Span = 9.00ft, Width= 8.00in Depth = 12.00in

Maximum Moment : Mu	24.46 k-ft	Maximum Deflection	-0.2305 in
Allowable Moment : Mn*phi	24.81 k-ft		
Maximum Shear : Vu	8.96 k	Max Reaction @ Left	8.32 k
Allowable Shear : Vn*phi	30.18 k	Max Reaction @ Right	8.32 k

Shear Stirrups...

Stirrup Area @ Section 0.220 in2

Region	0.000	1.500	3.000	4.500	6.000	7.500	9.000 ft
Max. Spacing	4.905	4.905	Not Req'd	Not Req'd	Not Req'd	4.905	4.905 in
Max Vu	8.959	7.306	3.653	3.566	3.566	7.219	8.872 k

Bending & Shear Force Summary

Bending...	Mn*Phi	Mu, Eq. C-1	Mu, Eq. C-2	Mu, Eq. C-3
@ Center	24.81 k-ft	24.46 k-ft	18.35 k-ft	12.39 k-ft
@ Left End	24.81 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
@ Right End	24.81 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
Shear...	**Vn*Phi**	**Vu, Eq. C-1**	**Vu, Eq. C-2**	**Vu, Eq. C-3**
@ Left End	30.18 k	8.96 k	6.72 k	4.54 k
@ Right End	30.18 k	8.87 k	6.65 k	4.49 k

Deflection

Deflections...	Upward			Downward		
DL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.1487 in	at	4.5000 ft
DL + LL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.2305 in	at	4.5000 ft
DL + LL + ST + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.2305 in	at	4.5000 ft

Reactions...	@ Left	@ Right
DL + [Bm Wt]]	6.120 k	6.120 k
DL + LL + [Bm Wt]	8.325 k	8.325 k
DL + LL + ST + [Bm Wt]	8.325 k	8.325 k

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC BEAM B-3

Section Analysis

Evaluate Moment Capacity...	Center	Left End	Right End
X : Neutral Axis	2.095 in	2.095 in	2.095 in
a = beta * Xneutral	1.781 in	1.781 in	1.781 in
Compression in Concrete	36.327 k	36.327 k	36.327 k
Sum [Steel comp. forces]	0.865 k	0.865 k	0.865 k
Tension in Reinforcing	-37.200 k	-37.200 k	-37.200 k
Find Max As for Ductile Failure...			
X-Balanced	5.806 in	5.806 in	5.8059 in
Xmax = Xbal * 0.75	4.354 in	4.354 in	4.354 in
a-max = beta * Xbal	4.935 in	4.935 in	4.935 in
Compression in Concrete	75.506 k	75.506 k	75.506 k
Sum [Steel Comp Forces]	27.584 k	27.584 k	27.584 k
Total Compressive Force	103.090 k	103.090 k	103.090 k
AS Max = Tot Force / Fy	1.718 in2	1.718 in2	1.718 in2
Actual Tension As	0.620 **OK**	0.000 **OK**	0.000 **OK**

Additional Deflection Calcs

Neutral Axis	2.930 in	Mcr	6.57 k-ft
Igross	1,152.00 in4	Ms:Max DL + LL	18.73 k-ft
Icracked	344.66 in4	R1 = (Ms:DL+LL)/Mcr	0.351
Elastic Modulus	3,122.0 ksi	Ms:Max DL+LL+ST	18.73 k-ft
Fr = 7.5 * f'c^.5	410.792 psi	R2 = (Ms:DL+LL+ST)/Mcr	0.351
Z:Cracking	177.730 k/in	I:eff... Ms(DL+LL)	379.541 in4
Z:cracking > 175 : No Good!		I:eff... Ms(DL+LL+ST)	379.541 in4
Eff. Flange Width	8.00 in		

ACI Factors (per ACI 318-14, applied internally to entered loads)

ACI C-1 & C-2 DL	1.200	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.600	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.600	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580000
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Multi-Span Concrete Beam

Description CONC BEAM 4

General Information

Code Ref: ACI 318-14, 2015 IBC, 2003 NFPA 5000

Fy	60,000.0 psi	Spans Considered Continuous Over Supports		ACI Dead Load Factor	1.20
f'c	3,000.0 psi	Stirrup Fy	40,000.0 psi	ACI Live Load Factor	1.60

Concrete Member Information

Description			SPAN 1	SPAN 2
Span		ft	3.50	5.00
Beam Width		in	8.00	8.00
Beam Depth		in	12.00	12.00
End Fixity			Free-Fix	Fix-Pin
Reinforcing	Center	Area	0.62in2	0.62in2
		Bar Depth	9.81in	9.81in
	Left	Area	0.62in2	1.24in2
		Bar Depth	2.00in	2.00in
	Right	Area	1.24in2	0.62in2
		Bar Depth	2.00in	2.00in

Loads

Using Live Load This Span ??		Yes	Yes
Dead Load	k/ft	0.562	0.262
Live Load	k/ft	0.260	0.100
Point #1 DL	k	5.780	
LL	k	2.544	
@ X	ft	0.000	0.000

Results

		Beam OK	Beam OK
Mmax @ Cntr	k-ft	0.00	0.83
@ X =	ft	0.00	3.13
Mn * Phi	k-ft	24.82	24.82
Max @ Left End	k-ft	0.00	-1.48
Mn * Phi	k-ft	25.35	45.62
Max @ Right End	k-ft	-45.20	0.00
Mn * Phi	k-ft	45.62	25.35
		Bending OK	Bending OK
Shear @ Left	k	0.00	1.48
Shear @ Right	k	14.82	0.89

Reactions & Deflections

DL @ Left	k	0.00	0.82
LL @ Left	k	0.00	0.31
Total @ Left	k	0.00	1.13
DL @ Right	k	7.75	0.49
LL @ Right	k	3.45	0.19
Total @ Right	k	11.20	0.68
Max. Deflection	in	-0.216	-0.001
@ X =	ft	0.00	2.90
Inertia : Effective	in4	344.53	1,152.00

Shear Stirrups

Stirrup Rebar Area	in2	0.220	0.220
Spacing @ Left	in	5.00	Not Req'd
Spacing @ .2*L	in	5.00	Not Req'd
Spacing @ .4*L	in	5.00	Not Req'd
Spacing @ .6*L	in	5.00	Not Req'd
Spacing @ .8*L	in	5.00	Not Req'd
Spacing @ Right	in	5.00	Not Req'd

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580000
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Multi-Span Concrete Beam

Description CONC BEAM 4

Query Values

Location	ft	0.00	0.00
Moment	k-ft	0.0	-1.5
Shear	k	-11.0	1.5
Deflection	in	-0.2159	0.0000

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC BEAM B-5

General Information

Code Ref: ACI 318-14, 2015 IBC, 2015 NFPA 5000

Span	18.00 ft	f'c	3,000 psi
Depth	24.000 in	Fy	60,000 psi
Width	8.000 in	Concrete Wt.	150.0 pcf
		Seismic Zone	0
		End Fixity	Pinned-Pinned
Beam Weight Added Internally		Live Load acts 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	2	5	2.00 in	#1	2	5	2.00 in	#1	2	5	2.00 in
#2	2	6	21.75 in	#2	2	6	21.75 in	#2	2	6	21.75 in
#3	2	6	21.00 in	#3			in	#3			in

Load Factoring

Note: Load factoring supports 2015 IBC and 2015 NFPA 5000 by virtue of their references to ACI 318-14 for concrete design. Factoring of entered loads to ultimate loads within this program is according to ACI 318-14 C.2

Uniform Loads

	Dead Load	Live Load	Short Term	Start	End
#1	1.425 k	0.560 k	k	0.000 ft	18.000 ft

Summary

Beam Design OK

Span = 18.00ft, Width= 8.00in Depth = 24.00in

Maximum Moment : Mu	115.26 k-ft	Maximum Deflection	-0.3623 in
Allowable Moment : Mn*phi	154.06 k-ft		
Maximum Shear : Vu	20.49 k	Max Reaction @ Left	19.66 k
Allowable Shear : Vn*phi	38.90 k	Max Reaction @ Right	19.66 k

Shear Stirrups...

Stirrup Area @ Section 0.220 in2

Region	0.000	3.000	6.000	9.000	12.000	15.000	18.000 ft
Max. Spacing	10.875	10.875	10.875	10.875	10.875	10.875	10.875 in
Max Vu	20.491	17.213	8.606	8.401	8.401	17.008	20.286 k

Bending & Shear Force Summary

Bending...	Mn*Phi	Mu, Eq. C-1	Mu, Eq. C-2	Mu, Eq. C-3
@ Center	154.06 k-ft	115.26 k-ft	86.45 k-ft	59.23 k-ft
@ Left End	81.20 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
@ Right End	81.20 k-ft	0.00 k-ft	0.00 k-ft	0.00 k-ft
Shear...	**Vn*Phi**	**Vu, Eq. C-1**	**Vu, Eq. C-2**	**Vu, Eq. C-3**
@ Left End	38.90 k	20.49 k	15.37 k	10.53 k
@ Right End	38.90 k	20.29 k	15.21 k	10.42 k

Deflection

Deflections...	Upward			Downward		
DL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.2592 in	at	9.0000 ft
DL + LL + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.3623 in	at	9.0000 ft
DL + LL + ST + [Bm Wt]	0.0000 in	at	0.0000 ft	-0.3623 in	at	9.0000 ft

Reactions...	@ Left	@ Right
DL + [Bm Wt]]	14.625 k	14.625 k
DL + LL + [Bm Wt]	19.665 k	19.665 k
DL + LL + ST + [Bm Wt]	19.665 k	19.665 k

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580008
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Concrete Rectangular & Tee Beam Design

Description CONC BEAM B-5

Section Analysis

Evaluate Moment Capacity...	Center	Left End	Right End
X : Neutral Axis	4.465 in	2.505 in	2.505 in
a = beta * Xneutral	3.795 in	2.129 in	2.129 in
Compression in Concrete	77.423 k	43.437 k	43.437 k
Sum [Steel comp. forces]	28.198 k	9.293 k	9.293 k
Tension in Reinforcing	-105.600 k	-52.800 k	-52.800 k
Find Max As for Ductile Failure...			
X-Balanced	12.872 in	12.872 in	12.8724 in
Xmax = Xbal * 0.75	9.654 in	9.654 in	9.654 in
a-max = beta * Xbal	10.942 in	10.942 in	10.942 in
Compression in Concrete	167.406 k	167.406 k	167.406 k
Sum [Steel Comp Forces]	35.619 k	35.619 k	35.619 k
Total Compressive Force	203.025 k	203.025 k	203.025 k
AS Max = Tot Force / Fy	3.384 in2	3.384 in2	3.384 in2
Actual Tension As	1.760 **OK**	0.000 **OK**	0.000 **OK**

Additional Deflection Calcs

Neutral Axis	7.130 in	Mcr	26.29 k-ft
Igross	9,216.00 in4	Ms:Max DL + LL	88.49 k-ft
Icracked	4,437.86 in4	R1 = (Ms:DL+LL)/Mcr	0.297
Elastic Modulus	3,122.0 ksi	Ms:Max DL+LL+ST	88.49 k-ft
Fr = 7.5 * f'c^.5	410.792 psi	R2 = (Ms:DL+LL+ST)/Mcr	0.297
Z:Cracking	127.944 k/in	I:eff... Ms(DL+LL)	4,563.155 in4
		I:eff... Ms(DL+LL+ST)	4,563.155 in4
Eff. Flange Width	8.00 in		

ACI Factors (per ACI 318-14, applied internally to entered loads)

ACI C-1 & C-2 DL	1.200	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.600	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.600	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580007
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Steel Column

Description STEEL COLUMNS

General Information

Code Ref: AISC 14th ASD, 2015 IBC, 2015 NFPA 5000

Steel Section	**HSS4X4X1/4**	Fy	36.00 ksi	X-X Sidesway :	Restrained
		Duration Factor	1.330	Y-Y Sidesway :	Restrained
Column Height	9.500 ft	Elastic Modulus	29,000.00 ksi		
End Fixity	Pin-Pin	X-X Unbraced	9.500 ft	Kxx	1.000
Live & Short Term Loads Combined		Y-Y Unbraced	9.500 ft	Kyy	1.000

Loads

Axial Load...

Dead Load	10.27 k	Ecc. for X-X Axis Moments	0.000 in
Live Load	6.02 k	Ecc. for Y-Y Axis Moments	0.000 in
Short Term Load	k		

Summary

Column Design OK

Section : HSS4X4X1/4, Height = 9.50ft, Axial Loads: DL = 10.27, LL = 6.02, ST = 0.00k, Ecc. = 0.000in

Unbraced Lengths: X-X = 9.50ft, Y-Y = 9.50ft

Combined Stress Ratios	Dead	Live	DL + LL	DL + ST + (LL if Chosen)
AISC Formula H1 - 1	0.1916		0.3039	0.2285
AISC Formula H1 - 2	0.1411		0.2238	0.1683
AISC Formula H1 - 3		0.1124		

XX Axis : Fa calc'd per Eq. E2-1, K*L/r < Cc
YY Axis : Fa calc'd per Eq. E2-1, K*L/r < Cc

Stresses

Allowable & Actual Stresses	Dead	Live	DL + LL	DL + Short
Fa : Allowable	15.91 ksi	15.91 ksi	15.91 ksi	21.16 ksi
fa : Actual	3.05 ksi	1.79 ksi	4.84 ksi	4.84 ksi
Fb:xx : Allow [F3.1]	21.60 ksi	21.60 ksi	21.60 ksi	28.73 ksi
fb : xx Actual	0.00 ksi	0.00 ksi	0.00 ksi	0.00 ksi
Fb:yy : Allow [F3.1]	21.60 ksi	21.60 ksi	21.60 ksi	28.73 ksi
fb : yy Actual	0.00 ksi	0.00 ksi	0.00 ksi	0.00 ksi

Analysis Values

F'ex : DL+LL	26,595 psi	Cm:x DL+LL	0.60	Cb:x DL+LL	1.00
F'ey : DL+LL	26,595 psi	Cm:y DL+LL	0.60	Cb:y DL+LL	1.00
F'ex : DL+LL+ST	35,372 psi	Cm:x DL+LL+ST	0.60	Cb:x DL+LL+ST	1.00
F'ey : DL+LL+ST	35,372 psi	Cm:y DL+LL+ST	0.60	Cb:y DL+LL+ST	1.00

Max X-X Axis Deflection 0.000 in at 0.000 ft Max Y-Y Axis Deflection 0.000 in at 0.000 ft

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580007
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Steel Column

Description STEEL COLUMNS

Section Properties HSS4X4X1/4

Depth	4.000 in	Weight	11.45 #/ft	Values for LRFD Design....	
Web Thick	0.233 in	Ixx	7.800 in4	J	12.800 in4
Width	4.000 in	Iyy	7.800 in4	Cw	6.56 in6
Flange Thick	0.233 in	Sxx	3.900 in3	Zx	4.690 in3
Area	3.37 in2	Syy	3.900 in3	Zy	4.690 in3
Rt	0.000 in	Rxx	1.520 in		0.000
		Ryy	1.520 in		

Section Type = HSS-Square

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580000
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Steel Column Base Plate

Description TOP PLATE

General Information

Code Ref : AISC 14th Ed ASD, 2015 IBC, 2015 NFPA 5000

Loads

Axial Load	16.30 k
X-X Axis Moment	0.00 k-ft

Plate Dimensions

Plate Length	10.000 in
Plate Width	8.000 in
Plate Thickness	**0.500** in

Support Pier Size

Pier Length	12.000 in
Pier Width	8.000 in

Steel Section **HSS4x4x1/4**

Section Length	4.000 in
Section Width	4.000 in
Flange Thickness	0.233 in
Web Thickness	4.000 in

Allowable Stresses

Concrete f'c	3,000.0 psi
Base Plate Fy	36.00 ksi
Load Duration Factor	1.330

Anchor Bolt Data

Dist. from Plate Edge	1.000 in
Bolt Count per Side	2
Tension Capacity	5.500 k
Bolt Area	0.442 in2

Summary

Baseplate OK

Concrete Bearing Stress **Bearing Stress OK**

Actual Bearing Stress	203.8	psi
Allow per ACI318-95, A3.1 = 0.3 * f'c * Sqrt(A2/A1) * LDF	1,197.0	psi
Allow per AISC J9	1,396.5	psi

Full Bearing : No Bolt Tension

Plate Bending Stress **Thickness OK**

Actual fb	23,497.9	psi
Max Allow Plate Fb	35,910.0	psi

Tension Bolt Force **Bolt Tension OK**

Actual Tension	0.000	k
Allowable	5.500	k

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580000
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Steel Column Base Plate

Description BASE PLATE

General Information

Code Ref : AISC 14th Ed ASD, 2015 IBC, 2015 NFPA 5000

Loads

Axial Load	16.41 k
X-X Axis Moment	0.00 k-ft

Plate Dimensions

Plate Length	10.000 in
Plate Width	10.000 in
Plate Thickness	**0.500** in

Support Pier Size

Pier Length	36.000 in
Pier Width	36.000 in

Steel Section **HSS4x4x1/4**

Section Length	4.000 in
Section Width	4.000 in
Flange Thickness	0.233 in
Web Thickness	4.000 in

Allowable Stresses

Concrete f'c	3,000.0 psi
Base Plate Fy	36.00 ksi
Load Duration Factor	1.330

Anchor Bolt Data

Dist. from Plate Edge	1.000 in
Bolt Count per Side	2
Tension Capacity	5.500 k
Bolt Area	0.442 in2

Summary

Baseplate OK

Concrete Bearing Stress **Bearing Stress OK**

Actual Bearing Stress	164.1	psi
Allow per ACI318-95, A3.1 = 0.3 * f'c * Sqrt(A2/A1) * LDF	2,394.0	psi
Allow per AISC J9	2,793.0	psi

Full Bearing : No Bolt Tension

Plate Bending Stress **Thickness OK**

Actual fb	22,764.0	psi
Max Allow Plate Fb	35,910.0	psi

Tension Bolt Force **Bolt Tension OK**

Actual Tension	0.000	k
Allowable	5.500	k

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580000
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Square Footing Design

Description CONC FOOTING CF-30

General Information

Code Ref: ACI 318-14, 2015 IBC, 2015 NFPA 5000

Dead Load	8.670 k	Footing Dimension	3.000 ft
Live Load	3.760 k	Thickness	12.00 in
Short Term Load	0.000 k	# of Bars	4
Seismic Zone	0	Bar Size	5
Overburden Weight	0.000 psf	Rebar Cover	3.250
Concrete Weight	150.00 pcf	f'c	2,000.0 psi
LL & ST Loads Combine		Fy	40,000.0 psi
Load Duration Factor	1.330		
Column Dimension	0.00 in	Allowable Soil Bearing	2,000.00 psf

Note: Load factoring supports 2015 IBC and 2015 NFPA 5000 by virtue of their references to ACI 318-14 for concrete design. Factoring of entered loads to ultimate loads within this program is according to ACI 318-14 C.2

Reinforcing

Rebar Requirement

Actual Rebar "d" depth used	8.438 in	As to USE per foot of Width	0.259 in2
200/Fy	0.0050	Total As Req'd	0.778 in2
As Req'd by Analysis	0.0009 in2	Min Allow % Reinf	0.0014
Min. Reinf % to Req'd	0.0014 %		

Summary

Footing OK

3.00ft square x 12.0in thick with 4- #5 bars

Max. Static Soil Pressure	1,531.11 psf	Vu : Actual One-Way	15.78 psi
Allow Static Soil Pressure	2,000.00 psf	Vn*Phi : Allow One-Way	76.03 psi
Max. Short Term Soil Pressure	1,531.11 psf	Vu : Actual Two-Way	59.87 psi
Allow Short Term Soil Pressure	2,660.00 psf	Vn*Phi : Allow Two-Way	152.05 psi
Mu : Actual	2.25 k-ft / ft		
Mn * Phi : Capacity	9.96 k-ft / ft		

Alternate Rebar Selections...

4	# 4's	3	# 5's	2	# 6's		
2	# 7's	1	# 8's	1	# 9's	1	# 10's

Title : Job #
Dsgnr: Date:
Description :

Scope :

Rev: 580000
User: KW-0605358, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Square Footing Design

Description CONC FOOTING CF-40

General Information

Code Ref: ACI 318-14, 2015 IBC, 2015 NFPA 5000

Dead Load	16.860 k	Footing Dimension	4.000 ft
Live Load	5.150 k	Thickness	12.00 in
Short Term Load	0.000 k	# of Bars	4
Seismic Zone	0	Bar Size	5
Overburden Weight	0.000 psf	Rebar Cover	3.250
Concrete Weight	150.00 pcf	f'c	2,000.0 psi
LL & ST Loads Combine		Fy	40,000.0 psi
Load Duration Factor	1.330		
Column Dimension	0.00 in	Allowable Soil Bearing	2,000.00 psf

Note: Load factoring supports 2015 IBC and 2015 NFPA 5000 by virtue of their references to ACI 318-14 for concrete design. Factoring of entered loads to ultimate loads within this program is according to ACI 318-14 C.2

Reinforcing

Rebar Requirement

Actual Rebar "d" depth used	8.438 in	As to USE per foot of Width	0.259 in2
200/Fy	0.0050	Total As Req'd	1.037 in2
As Req'd by Analysis	0.0016 in2	Min Allow % Reinf	0.0014
Min. Reinf % to Req'd	0.0021 %		

Summary

Footing OK

4.00ft square x 12.0in thick with 4- #5 bars

Max. Static Soil Pressure	1,525.62 psf	Vu : Actual One-Way	25.10 psi
Allow Static Soil Pressure	2,000.00 psf	Vn*Phi : Allow One-Way	76.03 psi
Max. Short Term Soil Pressure	1,525.62 psf	Vu : Actual Two-Way	106.70 psi
Allow Short Term Soil Pressure	2,660.00 psf	Vn*Phi : Allow Two-Way	152.05 psi
Mu : Actual	3.92 k-ft / ft		
Mn * Phi : Capacity	7.56 k-ft / ft		

Alternate Rebar Selections...

6	# 4's	4	# 5's	3	# 6's		
2	# 7's	2	# 8's	2	# 9's	1	# 10's

Project :
Location: By:

TIME:
DATE:

DESIGN METHOD : IBC 2000: Working Stress Design
MASONRY MATERIAL : Hollow Core Concrete Masonry Units
MORTAR TYPE : Type S
MORTAR MATERIAL : Portland Cement Lime Mortar
BLOCK PLACEMENT : Running Bond

MASONRY WALL DATA:

Wall Height	=	10.00 ft.
Nominal Wall Thickness	=	8.00 in.
Depth to c.g. Steel, Wall	=	3.81 in.
Parapet Height	=	0.00 ft.
Nominal Parapet Thickness	=	0.00 in.
Depth to c.g. Steel, Parapet	=	0.00 in.
Design Strip Width	=	12.00 in.

Main Wall Reinf. Layers = One Layer
Wall Grout Spacing = Partially Grouted

Support Type at Base = Pinned Support
Span Type = Supported Top and Bottom

WALL LOADS:

Wall Weight	=	60.00 psf.
Floor or Roof Load: Dead	=	250.0 Lb
Live	=	300.0 Lb
Eccentricity	=	0.00 in.
Additional Vertical Load: Dead	=	0.0 Lb
Live	=	0.0 Lb
Eccentricity	=	0.00 in.
Vertical Distance (y)	=	0.00 ft.
Equivalent Fluid Pressure	=	0.00 pcf.
Vertical Distance (x)	=	0.00 ft.

SEISMIC LOADS:

Site Class (A to F)	=	Class A
Seismic Use Group	=	I
Short Period Spectral Acceleration, Ss	=	0.00 %
One Second Spectral Acceleration, S1	=	< 0.75 g
(Computed) Design Category,	=	Category A
Parapet Component Importance Factor, Ip	=	1
Parapet Height/Roof Height Ratio z/h	=	0
Veneer Weight	=	0.00 psf.
Seismic Load on Main Wall*	=	6.00 psf.

* Minimum Code Required Value

Seismic Load on Parapet Wall	=	0.00 psf.

Project :
Location: By:

TIME:
DATE:

WIND LOADS:

	Load W or H	Magnitude (plf, lb)	Distance From Base of Wall (ft) Start	End
1	W	75.18	0.00	10.00
2				
3				
4				
5				

Notes: 1. "W" designates a uniform distributed wind load.
"H" designates a concentrated horizontal wind load.
2. Horizontal loads are positive to the right.

MASONRY DATA:

Masonry Unit Strength = 1900.00 psi.

Masonry Compressive Strength, f'm = 1500.00 psi.
Allowable Flexural Stress, Fb = 500.00 psi.
Allowable Shear Stress, Fv = 38.73 psi.
Allowable Tension: No Grout, Ft = 25.00 psi.
Solid Grout, Ft = 68.00 psi.

Modulus of Elasticity, Em = 1,350 ksi.
Modular Ratio, Es/Em = n = 21.48

Single Grouted Cell + Web Width = 8.00 in.
Nominal Length of Masonry Unit = 16.00 in.
Block Face Shell Thickness = 1.25 in.
Nominal Minus Actual Thickness = 0.38 in.

MATERIAL DATA:

Steel Yield Strength, Fy = 60.00 ksi.
Allowable Steel Stress, Fs = 24.00 ksi.
Modulus of Elasticity, Es = 29,000 ksi.

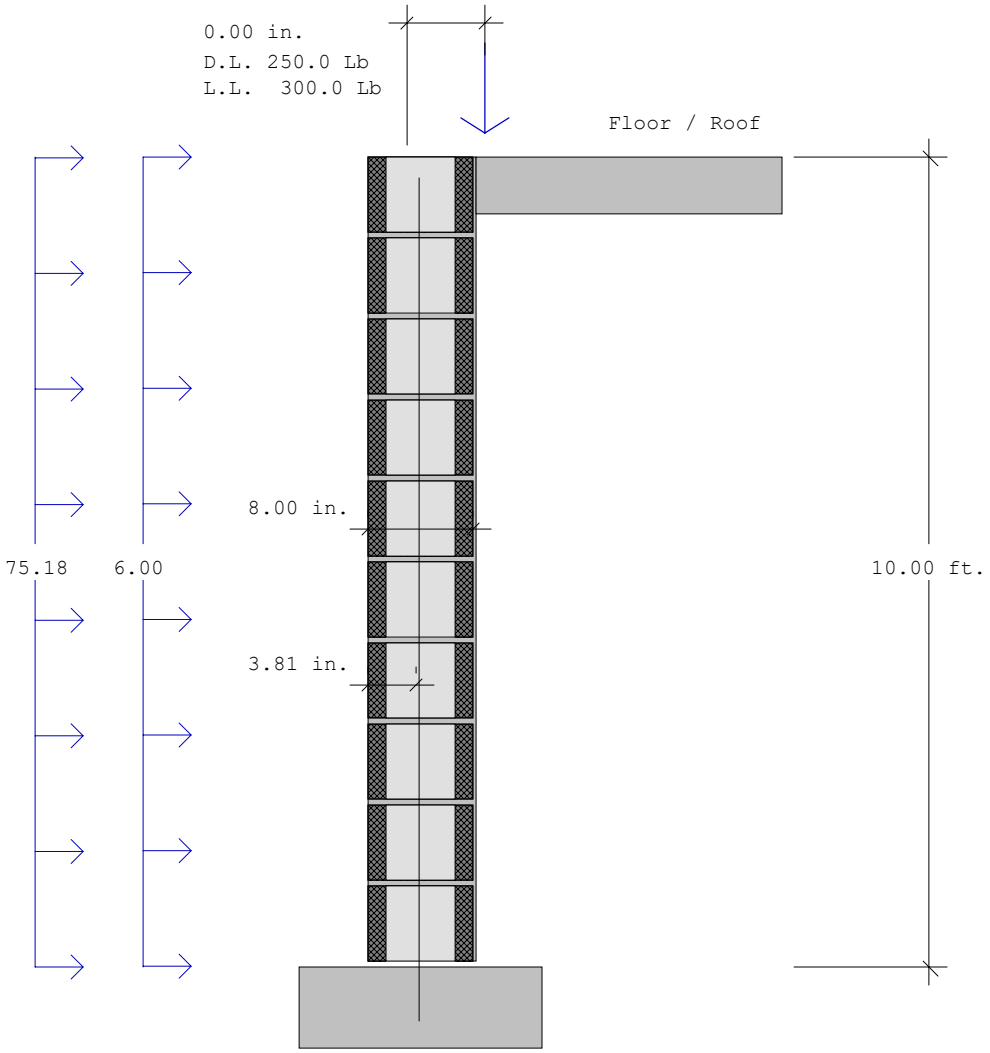
REINFORCED WALL DATA:

Minimum Steel Ratio, As/bt = 0.0007

Project :
Location: By:

TIME:
DATE:

GRAPHIC SUMMARY OF MASONRY WALL DATA



Project :
Location: By:

TIME:
DATE:

****
S U M M A R Y O F R E S U L T S
F O R M A I N W A L L
****

DESIGN LOADS:

Moment, Ms = 939.7 ft-lb / 12.00 in.
Axial Load, Ps = 330.0 Lb / 12.00 in.
Load Combination = 0.6*DL+1*WL
Eccentricity at Moment, e = M/P = 34.17 in.

NOTE: Max. moment is located in Zone C, (e > 2d/3)
Wall is cracked, steel is stressed in tension.

Max. Shear, Vs = 375.9 Lb / 12.00 in.
Load Combination = 0.6*DL+1*WL

ANALYSIS RESULTS:

Design Strip Width = 12.00 in.
Actual Wall Thickness, t = 7.63 in.
Effective Height, h' = 10.00 ft.
Seismic Force, (IBC 2000 1620.1.7) Fp = 6.00 plf. / 12.00 in.

Minimum Area of Steel, Vertical Reinf. = 0.064 in.^2 / 12.00 in.
Minimum Area of Steel, Horiz. Reinf. = Not Required

Ref. ACI 99 1.11/IBC 2000 2109.6.5

DESIGN RESULTS:

Bar Size	Fa, psi (4/3*.25*f'm*R)	fv, psi (V/b'd)	All. Moment @ Axial Load (P=330.0 lb)	Bar Spa. (in. o.c.)
#3	424.18	8.22	1,433.1	8.00
#4	447.53	24.65	1,019.1	24.00
#5	453.70	41.08	957.0	40.00
#6	455.35	49.29	1,107.3	48.00
#7	455.35	49.29	1,386.9	48.00
#8	455.35	49.29	1,518.8	48.00
#9	455.35	49.29	1,627.0	48.00

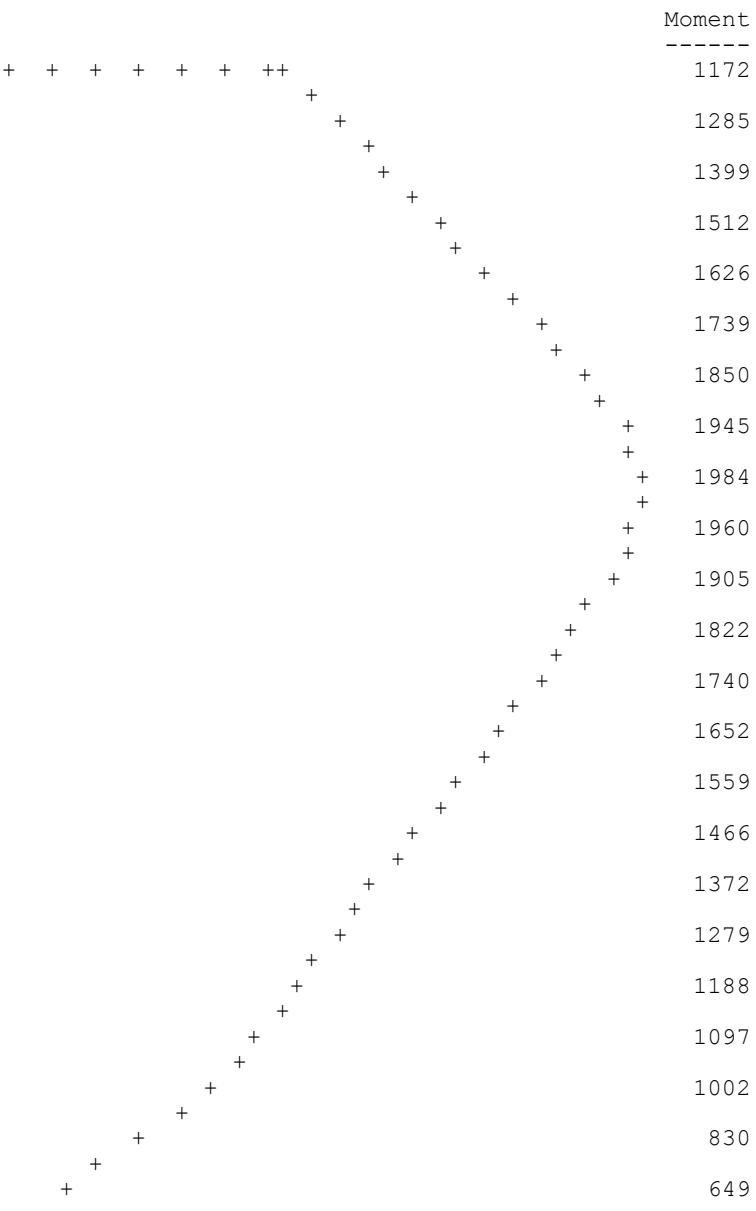
Max. vertical bar spacing is 72 inch per ACI 99 2.3.3.3 (commentary)
Per IBC 2000 2107.2.4, bar size is limited to #8

Project :
Location: By:

TIME:
DATE:

MASONRY WALL INTERACTION DIAGRAM: (DEAD + LIVE LOAD ONLY)

Effective Wall Height = 10.00 ft. Solid Masonry Area, Ae = 42.30 in^2
Actual Wall Thickness = 7.63 in. All. Axial Stress, Fa = 340.28 psi.
Depth to c.g. Steel = 3.81 in. All. Bending Stress, Fb = 500.00 psi.
Design Width = 12.00 in. All. Steel Stress, Fs = 24.00 ksi.
Reinforcing Design = #5 @ 40 in. o.c.



NOTES: Axial Load = Lb, Moment = ft-lb
+ = Moment Capacity
o = Applied Moment

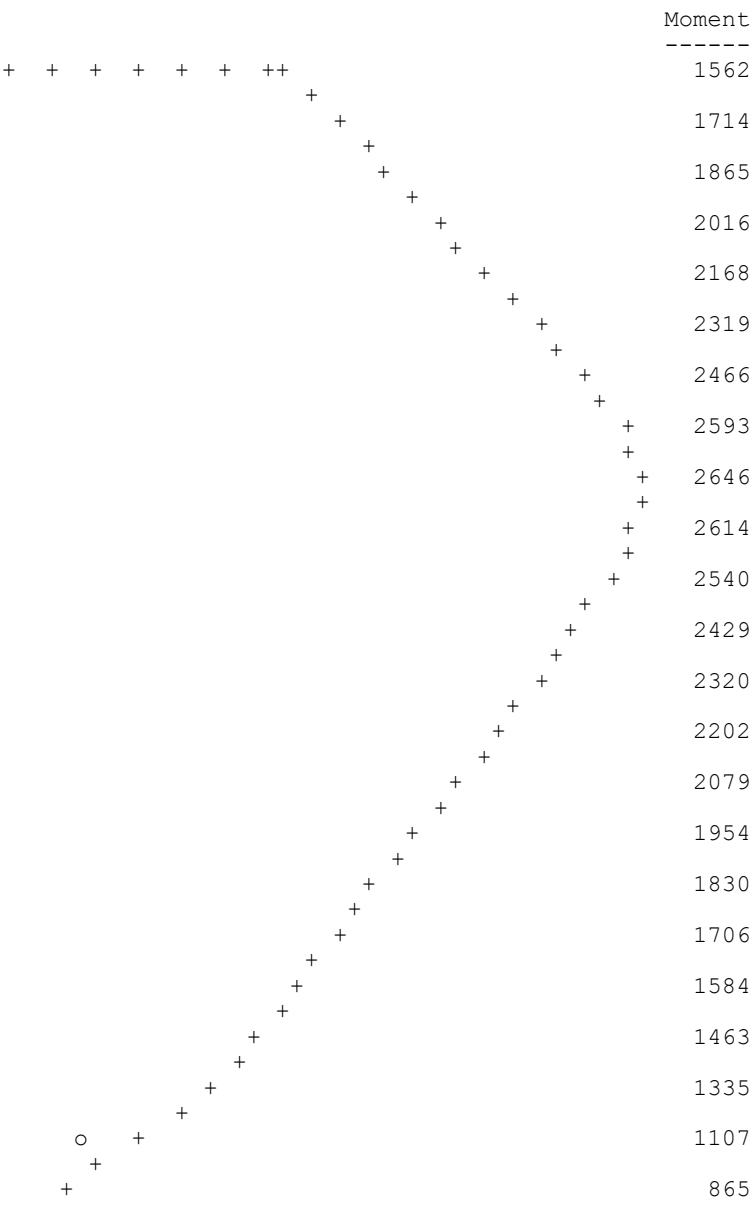
Positive moment is defined as moment which causes compression on the outside face of wall.

Project :
Location: By:

TIME:
DATE:

MASONRY WALL INTERACTION DIAGRAM: (WIND / SEISMIC LOADS)

Effective Wall Height = 10.00 ft. Solid Masonry Area, Ae = 42.30 in^2
Actual Wall Thickness = 7.63 in. All. Axial Stress, Fa = 453.70 psi.
Depth to c.g. Steel = 3.81 in. All. Bending Stress, Fb = 666.67 psi.
Design Width = 12.00 in. All. Steel Stress, Fs = 32.00 ksi.
Reinforcing Design = #5 @ 40 in. o.c.



NOTES: Axial Load = Lb, Moment = ft-lb
+ = Moment Capacity
o = Applied Moment

Positive moment is defined as moment which causes compression on the outside face of wall.