CAP DESIGN

CAP DESIGN

Code: AASHTO STANDARD (17th Edition 2002) - Ultimate Strength Design

Units: US

Pier View: Upstation.

DESIGN PARAMETERS

f'c = 3500.0 psi	
Fy flex = 60000.0 psi	Fy shear = 60000.0 psi
phi flex = 0.90	phi shear = 0.85
Ec = 3586.6 ksi	Es = 29000.0 ksi
crack control factor z = 170.00 kips / in	
Concrete Type : Normal Weight.	
Design of cap at face of column.	

CAP GEOMETRY

Variable Cap : Length(X) = 39.25 ft Depth(Z) = 72.00 in

Cap Section Properties

Sec.	Area ft ^2	Ixx in ^4	Izz in ^4
1	24.00	1492992.00	663552.00
2	60.00	3732480.00	10368000.00
3	60.00	3732480.00	10368000.00
4	24.00	1492992.00	663552.00

MAIN REINFORCEMENT

	Bar size	Quantity	Bar dist. in	As total in^2	From ft	To ft	Hook
TOP							
	# 11	17	3.45	26.520	0.00	39.25	Both
	# 11	17	6.98	26.520	0.00	39.25	Both
BOTTOM							
	# 11	4	3.45	6.240	0.00	21.11	Left
	# 11	4	3.45	6.240	15.83	30.92	None
	# 11	4	3.45	6.240	25.64	39.25	Right

STIRRUPS

From ft	To ft	Stirrup Size	n legs	Spacing in	Aprv/s in^2 / ft

From ft	To ft	Stirrup Size	n legs	Spacing in	Aprv/s in^2 / ft
0.00	9.80	# 6	4	18.00	14.08
9.80	20.63	# 6	4	6.00	42.24
20.63	22.90	# 6	4	24.00	10.56
22.90	24.63	# 6	4	12.00	21.12
24.63	28.63	# 6	4	24.00	10.56
28.63	29.45	# 6	4	18.00	14.08
29.45	36.00	# 6	4	24.00	10.56
36.00	39.25	# 6	4	18.00	14.08

Clear Cover on Sides = 2.00 in

FLEXURE DESIGN

Span 1: From 0.00 ft To 25.12 ft

Loc ft	AbsLoc ft	H in	Mmax Mmin kips-ft	pMn kips-ft	Comb	Asb-req in^2	Asb-prv in^2	Asb-eff in^2	Ast-req in^2	Ast-prv in^2	Ast-eff in^2
3.3	3.3	60	5.3	1639.8	1436	0.03	6.24	6.24	0.00	53.04	53.04
			-60.8	-11495.6	1427	0.00	6.24	6.24	0.33	53.04	53.04
9.8	9.8	83	0.0	2297.8	0	0.00	6.24	6.24	0.00	53.04	53.04
			-4259.4	-17088.7	1414	0.00	6.24	6.24	12.44	53.04	53.04
16.3	16.3	106	0.0	2955.8	0	0.00	12.48	6.24	0.00	53.04	53.04
			-12968.5	-22737.3	1416	0.00	12.48	7.60	29.67	53.04	53.04
20.1	20.1	120	0.0	3335.1	0	0.00	12.48	6.24	0.00	53.04	53.04
			-20643.6	-26008.6	1416	0.00	12.48	8.81	42.13	53.04	53.04
20.6	20.6	120	0.0	3335.1	0	0.00	12.48	6.24	0.00	53.04	53.04
			-21672.0	-25957.4	1416	0.00	12.48	7.51	44.36	53.04	53.04

Span 2: From 25.12 ft To 39.25 ft

Loc ft	AbsLoc ft	H in	Mmax Mmin kips-ft	pMn kips-ft	Comb	Asb-req in^2	Asb-prv in^2	Asb-eff in^2	Ast-req in^2	Ast-prv in^2	Ast-eff in^2
4.5	29.6	120	0.0	3335.1	0	0.00	12.48	6.24	0.00	53.04	53.04
			-4210.9	-26040.4	1413	0.00	12.48	9.64	10.99	53.04	53.04
5.0	30.1	120	0.0	3335.1	0	0.00	12.48	6.24	0.00	53.04	53.04
			-3869.0	-25989.4	1413	0.00	12.48	8.32	10.09	53.04	53.04
10.9	36.0	74	1.7	2033.4	1427	0.01	6.24	6.24	0.00	53.04	53.04
			-64.4	-14841.1	1436	0.00	6.24	6.24	0.28	53.04	53.04

SHEAR AND TORSION DESIGN

Span 1: From 0.00 ft To 25.12 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vc kips	T-lim kips-ft	Avs/s in^2/ft	2Ats/s in^2/ft	Av/s in^2/ft	Aprv/s in^2/ft	Alt in^2
3.25	3.25	L	17.1	1399	0.0	0	394.0	293.4	0.00	0.00	0.00	14.08	0.00
		R	623.3	1415	69.3	2142	394.0	293.4	0.99	0.00	0.99	14.08	0.00
9.80	9.80	L	668.8	1415	69.3	2142	563.7	483.3	0.72	0.00	0.72	14.08	0.00
		R	1299.4	1416	140.3	2142	563.7	483.3	2.22	0.00	2.22	42.24	0.00
16.35	16.35	L	1359.9	1416	140.3	2142	733.4	690.1	1.46	0.00	1.46	42.24	0.00
		R	2012.3	1416	213.3	2142	733.4	690.1	2.97	0.00	2.97	42.24	0.00
20.13	20.13	L	2054.0	1416	465.9	2677	831.2	814.6	2.51	0.00	2.51	42.24	0.00
		R	2054.0	1416	465.9	2677	831.2	814.6	2.51	0.00	2.51	42.24	0.00
20.62	20.62	L	2059.8	1416	465.9	2677	831.2	814.6	2.52	0.00	2.52	42.24	0.00

Span 2: From 25.12 ft To 39.25 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vc kips	T-lim kips-ft	Avs/s in^2/ft	2Ats/s in^2/ft	Av/s in^2/ft	Aprv/s in^2/ft	Alt in^2
4.50	29.62	R	686.8	1420	69.3	2146	831.2	814.6	0.72	0.00	0.72	10.56	0.00
5.01	30.13	L	681.0	1420	69.3	2146	831.2	814.6	0.72	0.00	0.72	10.56	0.00
		R	681.0	1420	69.3	2146	831.2	814.6	0.72	0.00	0.72	10.56	0.00
10.88	36.00	L	625.5	1420	69.3	2146	495.5	404.5	0.72	0.00	0.72	10.56	0.00
		R	19.3	1399	0.0	0	495.5	404.5	0.00	0.00	0.00	14.08	0.00

Shear and Torsion Design : Notes

- Pos is the design position. L suggests the calculation is done at immediate left of "Loc" and R suggests at immediate right of it.
- T-lim is the limiting value of torsion for the concrete section. If actual torsion is higher than this value, torsional steel has to be provided.
- Avs/s is the required area of steel per unit length for shear force.
- 2Ats/s is the required area of steel per unit length for two legs of torsional reinforcement.
- Av/s is the total required area of steel per unit length due to shear plus torsion.
- Aprvs/s is the total provided area of steel per unit length due to shear (stirrups).
- Alt is the total longitudinal steel required due to torsion in addition to the REQUIRED flexural steel.

CRACKING/FATIGUE CHECK

Span 1: From 0.00 ft To 25.12 ft

Loc ft	AbsLoc ft	H in	Cracking fs-t fs-b ksi	Cracking ratio fs-t ratio fs-b	Cracking Comb	Fatigue fs-t fs-b ksi	Fatigue ratio fs-t ratio fs-b

Loc ft	AbsLoc ft	H in	Cracking fs-t fs-b ksi	Cracking ratio fs-t ratio fs-b	Cracking Comb	Fatigue fs-t fs-b ksi	Fatigue ratio fs-t ratio fs-b
3.25	3.3	59.6	0.2	0.01	29	0.0	0.00
			0.1	0.01	38	0.0	0.00
9.80	9.8	83.1	10.2	0.28	16	1.6	0.07
			0.0	0.00	0	0.0	0.00
16.35	16.3	106.5	23.7	0.66	18	3.7	0.20
			0.0	0.00	0	0.0	0.00
20.13	20.1	120.0	33.0	0.92	18	5.3	0.32
			0.0	0.00	0	0.0	0.00
20.62	20.6	120.0	34.7	0.96	18	5.6	0.34
			0.0	0.00	0	0.0	0.00

Span 2: From 25.12 ft To 39.25 ft

Loc ft	AbsLoc ft	H in	Cracking fs-t fs-b ksi	Cracking ratio fs-t ratio fs-b	Cracking Comb	Fatigue fs-t fs-b ksi	Fatigue ratio fs-t ratio fs-b
4.50	29.6	120.0	6.7	0.19	15	1.0	0.05
			0.0	0.00	0	0.0	0.00
5.01	30.1	120.0	6.2	0.17	15	1.0	0.04
			0.0	0.00	0	0.0	0.00
10.88	36.0	73.6	0.2	0.01	38	0.0	0.00
			0.0	0.00	29	0.0	0.00

* Cracking / fatigue checking failed.

Column Design

COLUMN DESIGN - Column: 1

Code: AASHTO STANDARD (17th Edition 2002) - Factored Load Design
Units: US
Pier View: Upstation.
Design/Analysis Method: Moment Magnification - Unbraced Column.

Column Type: Rectangular 108.00 x 72.00 in

Column Section Properties

Sec.	Area ft^2	Ixx in^4	Izz in^4
1	54.00	3359232.00	7558272.00

DESIGN PARAMETERS

f'c = 3500.0 psi	fy = 60000.0 psi
phi flex = 0.90	phi axial = 0.70
Ec = 3586.6 ksi	Es = 29000 ksi
Concrete Type : Normal Weight.	

Reinforcement

Rebar Pattern: Rectangular
Rebar Orientation: Face Parallel

Reinforcement Schedule

Layer	Dir	Size	No. bars	Bar Dist. in
1	X	11	26	3.20
1	Z	11	17	3.20
2	X	11	13	7.00
2	Z	11	9	7.00

Reinforcement summary

Main bars summary:

122 # 11 bars

Total number of bars in the column: 122

Ties size: # 3

Moment Magnification calculation - Mx (global)

Loc ft	Comb	K	Cm	Beta	Delta B	Delta S	pPc kips
60.00	35C	3.4219	1.0000	0.7826	----	2.0251	7671.15
98.00	35C	3.4219	1.0000	0.7634	----	1.8519	7754.88

Moment Magnification calculation - Mz (global)

Loc ft	Comb	K	Cm	Beta	Delta B	Delta S	pPc kips
60.00	35C	3.4219	1.0000	0.5735	----	1.2478	19553.80
98.00	35C	3.4219	1.0000	0.5735	----	1.2231	19553.80

Design values used after Moment Magnification (e-min effect included).

Loc ft	Comb	Fx kips	Fy kips	Fz kips	Mx kips-ft	My kips-ft	Mz kips-ft
60.00	35C	-0.0	3883.2	0.0	1808.7	-0.0	-31764.6
98.00	35C	-0.0	3567.3	0.0	-1519.4	-0.0	31136.9

COLUMN DESIGN

Bot/Top Elev. ft	Comb	Pu kips	Mux kips-ft	Muz kips-ft	pMn kips-ft	Incl deg	pPn/Pu	pMn/Mu
60.00	35C	3883.2	1808.7	31764.6	36056.7	86.74	1.00	1.13329
98.00	35C	3567.3	1519.4	31136.9	35782.3	87.21	1.00	1.14783

COLUMN DESIGN

Bot/Top Elev. ft	Comb	As_min in^2	As_max in^2	As_req in^2
60.00	35C	77.76	622.08	190.32
98.00	35C	77.76	622.08	190.32

K values for all columns used in unbraced moment magnification

Column	Kx	Kz
1	3.42	3.42

Column Design : Notes

Min reinforcement = 1.0000 % of Ag = 77.76 in^2.

For layer 1, direction X: Minimum bar distance is: 1.41 in. Effective bar distance is: 2.65 in.

For layer 2, direction X: Minimum bar distance is: 1.41 in. Effective bar distance is: 6.42 in.

For layer 1, direction Z: Minimum bar distance is: 1.41 in. Effective bar distance is: 2.69 in.

---- Values do not exist at that location as computation is done at the top and bottom of clear length of column.

ISOLATED FOOTING DESIGN

ISOLATED FOOTING DESIGN

Code: AASHTO STANDARD (17th Edition 2002) - Ultimate Strength Design
Units: US
Pier View: Upstation.

GEOMETRY

Name : FTG03
Shape : Rectangular, Type : Pile/Shaft Cap
Bf(X) = 22.00 ft, Hf(Z) = 22.00 ft, Thickness(Y) = 78.00 in
Ag = 484.00 ft^2, Ix = 1128.13 ft^2, Iz = 1128.13 ft^2
Footing eccentric: Start at X = -14.00 ft from centerline of column.
Footing eccentric: Start at Z = -10.00 ft from centerline of column.
Columns located on the footing:
Column No. 1 at x = 0.00 ft, Rectangular 108.00 in x 72.00 in
Surcharge = 0.30 ksf
Piles: Chamfer Size: W = 13.83 in, D = 14.69 in, T1 = 0.62 in, T2 = 0.00 in
Service Capacity: 234.00 kips Factored Capacity: 328.00 kips
Piles Section Properties: Area = 0.18 ft^2 Ix = 904.00 in^4 Iz = 326.00 in^4

DESIGN PARAMETERS

f'c = 3500.00 psi	fy = 60000.00 psi
phi flex = 0.90	phi shear = 0.85
Ec = 3586.6 ksi	Es = 29000.0 ksi
Crack control factor z = 130.00 kips/in	
Concrete Type : Normal Weight.	

Pile Reactions, Service (Without the reduction of overstress allowance)

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
1	-12.50	-0.50	18.00	-114.0	720	1.400	-2588.20	-4830.71	16091.49	217.22
					523	1.400	-2337.80	4685.87	8003.82	67.39
2	-7.75	-0.50	75.00	-114.0	732	1.400	-2588.20	-5003.52	15793.41	182.36
					524	1.400	-2337.80	5096.54	8560.56	62.11
3	-3.00	-0.50	132.00	-114.0	740	1.400	-2675.84	-5373.33	13841.58	154.43
					517	1.400	-2337.80	5422.02	12713.47	52.85
4	1.75	-0.50	189.00	-114.0	880	1.400	-2588.20	-5003.52	9263.23	142.24
					503	1.400	-2216.12	3720.90	15381.91	26.56
5	6.50	-0.50	246.00	-114.0	916	1.400	-2624.70	-4392.43	8540.57	138.95
					503	1.400	-2216.12	3720.90	15381.91	-10.21

Bentley	Tampa	Sheet #	DS-2
		Job #	100010194
Program: LEAP® RC-PIER® V8i (SELECTseries1)		By	DRB
Version: Version: 09.00.01	Copyright © Bentley Systems, Inc. 1984 - 2009.	Date	Nov/5/2009
	www.bentley.com Phone: 1-800-778-4277	Checked	
File Name: **I-75 PPI**		Date	

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
6	-12.50	-5.25	18.00	-57.0	696	1.400	-2551.69	-4392.42	16516.08	209.12
					521	1.400	-2459.47	3720.89	7079.97	94.53
7	-7.75	-5.25	75.00	-57.0	720	1.400	-2588.20	-4830.71	16091.49	172.71
					523	1.400	-2337.80	4685.87	8003.82	92.79
8	-3.00	-5.25	132.00	-57.0	740	1.400	-2675.84	-5373.33	13841.58	143.08
					517	1.400	-2337.80	5422.02	12713.47	85.52
9	1.75	-5.25	189.00	-57.0	916	1.400	-2624.70	-4392.43	8540.57	134.31
					503	1.400	-2216.12	3720.90	15381.91	51.56
10	6.50	-5.25	246.00	-57.0	916	1.400	-2624.70	-4392.43	8540.57	131.50
					503	1.400	-2216.12	3720.90	15381.91	14.79
11	-12.50	-10.00	18.00	0.0	18	1.500	-2838.60	-104.12	17672.48	215.34
					38	1.250	-2459.47	-0.10	7079.97	120.55
12	-7.75	-10.00	75.00	0.0	18	1.500	-2838.60	-104.12	17672.48	176.78
					38	1.250	-2459.47	-0.10	7079.97	121.81
13	-3.00	-10.00	132.00	0.0	13	1.500	-3013.88	140.27	16402.95	145.24
					29	1.250	-2216.12	-0.09	15381.91	113.33
14	1.75	-10.00	189.00	0.0	15	1.500	-2838.60	103.88	9978.94	132.07
					29	1.250	-2216.12	-0.09	15381.91	76.56
15	6.50	-10.00	246.00	0.0	15	1.500	-2838.60	103.88	9978.94	125.91
					29	1.250	-2216.12	-0.09	15381.91	39.78
16	-12.50	-14.75	18.00	57.0	1021	1.400	-2551.69	4392.21	16516.08	230.61
					530	1.400	-2459.47	-3721.09	7079.97	115.24
17	-7.75	-14.75	75.00	57.0	991	1.400	-2675.84	5065.46	15456.72	195.59
					528	1.400	-2337.80	-4686.05	8003.82	112.48
18	-3.00	-14.75	132.00	57.0	1279	1.400	-2675.84	5373.11	13093.69	165.61
					508	1.400	-2337.80	-5422.20	9748.40	105.21
19	1.75	-14.75	189.00	57.0	1233	1.400	-2624.70	4392.21	8540.57	156.41
					512	1.400	-2216.12	-3721.08	15381.91	70.22
20	6.50	-14.75	246.00	57.0	1233	1.400	-2624.70	4392.21	8540.57	153.60
					512	1.400	-2216.12	-3721.08	15381.91	33.45
21	-12.50	-19.50	18.00	114.0	997	1.400	-2588.20	4830.50	16091.49	**260.81***
					528	1.400	-2337.80	-4686.05	8003.82	106.76
22	-7.75	-19.50	75.00	114.0	979	1.400	-2675.84	5238.27	15158.65	228.39
					527	1.400	-2337.80	-5096.73	8560.56	101.48
23	-3.00	-19.50	132.00	114.0	1279	1.400	-2675.84	5373.11	13093.69	199.50
					508	1.400	-2337.80	-5422.20	9748.40	92.22
24	1.75	-19.50	189.00	114.0	1238	1.400	-2712.34	4627.17	10011.67	187.09
					512	1.400	-2216.12	-3721.08	15381.91	63.88
25	6.50	-19.50	246.00	114.0	1233	1.400	-2624.70	4392.21	8540.57	183.15
					512	1.400	-2216.12	-3721.08	15381.91	27.11

Pile Reactions, Factored

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
1	-12.50	-0.50	18.0	-114.0	2118	---	-3235.24	-6038.39	20114.36	271.52
					1921	---	-2922.24	5857.33	10004.77	84.24
2	-7.75	-0.50	75.0	-114.0	2130	---	-3235.24	-6254.40	19741.77	227.95
					1922	---	-2922.24	6370.68	10700.69	77.63
3	-3.00	-0.50	132.0	-114.0	2138	---	-3344.79	-6716.66	17301.97	193.04
					1915	---	-2922.24	6777.52	15891.84	66.06
4	1.75	-0.50	189.0	-114.0	2278	---	-3235.24	-6254.40	11579.04	177.80
					1901	---	-2770.15	4651.13	19227.38	33.20
5	6.50	-0.50	246.0	-114.0	2314	---	-3280.87	-5490.53	10675.71	173.68

Bentley	Tampa	Sheet #	DS-3
		Job #	100010194
Program: LEAP® RC-PIER® V8i (SELECTseries1)		By	DRB
Version: Version: 09.00.01	Copyright © Bentley Systems, Inc. 1984 - 2009.	Date	Nov/5/2009
	www.bentley.com Phone: 1-800-778-4277	Checked	
File Name: **I-75 PPI**		Date	

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
					1901	---	-2770.15	4651.13	19227.38	-12.77
6	-12.50	-5.25	18.0	-57.0	1416	---	-3755.28	-148.88	23811.62	272.76
					1919	---	-3074.34	4651.11	8849.96	118.16
7	-7.75	-5.25	75.0	-57.0	1416	---	-3755.28	-148.88	23811.62	219.94
					1921	---	-2922.24	5857.33	10004.77	115.99
8	-3.00	-5.25	132.0	-57.0	2138	---	-3344.79	-6716.66	17301.97	178.84
					1915	---	-2922.24	6777.52	15891.84	106.90
9	1.75	-5.25	189.0	-57.0	2314	---	-3280.87	-5490.53	10675.71	167.89
					1901	---	-2770.15	4651.13	19227.38	64.45
10	6.50	-5.25	246.0	-57.0	2314	---	-3280.87	-5490.53	10675.71	164.38
					1901	---	-2770.15	4651.13	19227.38	18.48
11	-12.50	-10.00	18.0	0.0	1416	---	-3755.28	-148.88	23811.62	287.95
					1919	---	-3074.34	4651.11	8849.96	150.69
12	-7.75	-10.00	75.0	0.0	1416	---	-3755.28	-148.88	23811.62	235.12
					1919	---	-3074.34	4651.11	8849.96	152.26
13	-3.00	-10.00	132.0	0.0	1411	---	-4005.93	200.60	21996.19	192.33
					1901	---	-2770.15	4651.13	19227.38	141.66
14	1.75	-10.00	189.0	0.0	1413	---	-3755.28	148.56	12809.86	175.80
					1901	---	-2770.15	4651.13	19227.38	95.70
15	6.50	-10.00	246.0	0.0	1413	---	-3755.28	148.56	12809.86	169.30
					1901	---	-2770.15	4651.13	19227.38	49.73
16	-12.50	-14.75	18.0	57.0	1417	---	-3755.28	148.56	23811.62	304.39
					1928	---	-3074.34	-4651.36	8849.96	144.05
17	-7.75	-14.75	75.0	57.0	1411	---	-4005.93	200.60	21996.19	252.05
					1926	---	-2922.24	-5857.57	10004.77	140.60
18	-3.00	-14.75	132.0	57.0	1411	---	-4005.93	200.60	21996.19	210.04
					1906	---	-2922.24	-6777.75	12185.50	131.51
19	1.75	-14.75	189.0	57.0	2631	---	-3280.87	5490.26	10675.71	195.51
					1910	---	-2770.15	-4651.34	19227.38	87.77
20	6.50	-14.75	246.0	57.0	2631	---	-3280.87	5490.26	10675.71	192.01
					1910	---	-2770.15	-4651.34	19227.38	41.81
21	-12.50	-19.50	18.0	114.0	2395	---	-3235.24	6038.13	20114.36	326.01
					1926	---	-2922.24	-5857.57	10004.77	133.45
22	-7.75	-19.50	75.0	114.0	2377	---	-3344.79	6547.83	18948.31	285.49
					1925	---	-2922.24	-6370.91	10700.69	126.85
23	-3.00	-19.50	132.0	114.0	2677	---	-3344.79	6716.38	16367.12	249.37
					1906	---	-2922.24	-6777.75	12185.50	115.28
24	1.75	-19.50	189.0	114.0	2636	---	-3390.42	5783.96	12514.58	233.86
					1910	---	-2770.15	-4651.34	19227.38	79.85
25	6.50	-19.50	246.0	114.0	2631	---	-3280.87	5490.26	10675.71	228.94
					1910	---	-2770.15	-4651.34	19227.38	33.89

Pile Reactions, Service (After the reduction of overstress allowance)

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
1	-12.50	-0.50	18.00	-114.0	6	1.000	-2588.20	-52.11	14451.71	163.17
					523	1.400	-2337.80	4685.87	8003.82	48.14
2	-7.75	-0.50	75.00	-114.0	6	1.000	-2588.20	-52.11	14451.71	135.01
					524	1.400	-2337.80	5096.54	8560.56	44.36
3	-3.00	-0.50	132.00	-114.0	488	1.250	-2675.84	-3791.30	13118.33	112.89
					517	1.400	-2337.80	5422.02	12713.47	37.75
4	1.75	-0.50	189.00	-114.0	880	1.400	-2588.20	-5003.52	9263.23	101.60
					503	1.400	-2216.12	3720.90	15381.91	18.97

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
5	6.50	-0.50	246.00	-114.0	916	1.400	-2624.70	-4392.43	8540.57	99.25
					503	1.400	-2216.12	3720.90	15381.91	-7.29
6	-12.50	-5.25	18.00	-57.0	6	1.000	-2588.20	-52.11	14451.71	173.85
					521	1.400	-2459.47	3720.89	7079.97	67.52
7	-7.75	-5.25	75.00	-57.0	6	1.000	-2588.20	-52.11	14451.71	145.69
					523	1.400	-2337.80	4685.87	8003.82	66.28
8	-3.00	-5.25	132.00	-57.0	2	1.000	-2675.84	-70.31	13118.33	120.75
					517	1.400	-2337.80	5422.02	12713.47	61.09
9	1.75	-5.25	189.00	-57.0	10	1.000	-2588.20	-52.11	10604.94	105.57
					503	1.400	-2216.12	3720.90	15381.91	36.83
10	6.50	-5.25	246.00	-57.0	916	1.400	-2624.70	-4392.43	8540.57	93.93
					503	1.400	-2216.12	3720.90	15381.91	10.56
11	-12.50	-10.00	18.00	0.0	6	1.000	-2588.20	-52.11	14451.71	184.52
					521	1.400	-2459.47	3720.89	7079.97	86.11
12	-7.75	-10.00	75.00	0.0	6	1.000	-2588.20	-52.11	14451.71	156.37
					521	1.400	-2459.47	3720.89	7079.97	87.00
13	-3.00	-10.00	132.00	0.0	1	1.000	-2675.84	70.09	13816.94	131.72
					503	1.400	-2216.12	3720.90	15381.91	80.95
14	1.75	-10.00	189.00	0.0	3	1.000	-2588.20	51.89	10604.94	116.25
					503	1.400	-2216.12	3720.90	15381.91	54.68
15	6.50	-10.00	246.00	0.0	3	1.000	-2588.20	51.89	10604.94	104.29
					503	1.400	-2216.12	3720.90	15381.91	28.42
16	-12.50	-14.75	18.00	57.0	7	1.000	-2588.20	51.89	14451.71	195.64
					530	1.400	-2459.47	-3721.09	7079.97	82.31
17	-7.75	-14.75	75.00	57.0	1	1.000	-2675.84	70.09	13816.94	167.66
					528	1.400	-2337.80	-4686.05	8003.82	80.34
18	-3.00	-14.75	132.00	57.0	1	1.000	-2675.84	70.09	13816.94	143.28
					508	1.400	-2337.80	-5422.20	9748.40	75.15
19	1.75	-14.75	189.00	57.0	3	1.000	-2588.20	51.89	10604.94	127.37
					512	1.400	-2216.12	-3721.08	15381.91	50.16
20	6.50	-14.75	246.00	57.0	3	1.000	-2588.20	51.89	10604.94	115.41
					512	1.400	-2216.12	-3721.08	15381.91	23.89
21	-12.50	-19.50	18.00	114.0	7	1.000	-2588.20	51.89	14451.71	206.76
					528	1.400	-2337.80	-4686.05	8003.82	76.26
22	-7.75	-19.50	75.00	114.0	1	1.000	-2675.84	70.09	13816.94	179.22
					527	1.400	-2337.80	-5096.73	8560.56	72.48
23	-3.00	-19.50	132.00	114.0	1	1.000	-2675.84	70.09	13816.94	154.84
					508	1.400	-2337.80	-5422.20	9748.40	65.87
24	1.75	-19.50	189.00	114.0	3	1.000	-2588.20	51.89	10604.94	138.48
					512	1.400	-2216.12	-3721.08	15381.91	45.63
25	6.50	-19.50	246.00	114.0	1233	1.400	-2624.70	4392.21	8540.57	130.82
					512	1.400	-2216.12	-3721.08	15381.91	19.36

Footing Design : Notes

* Service Force in pile is greater than service pile capacity.
Only max. force in piles is considered for design.
Pile coordinates X and Z are from the most left edge of the footing.
Plong= Lateral load in longitudinal direction at the top of pile, Kips.
Php= Available resisting horizontal component due to batter= batter * Vertical pile reaction, Kips.
Plong-Php= Remaining lateral force required to resist by pile.

Max. Pile Reaction Used in Design: (without selfweight and surcharge)

Factored pile reaction	295.15 kips
Service pile reaction	236.12 kips
Fatigue pile reaction	33.36 kips

Reinforcement Schedule

Dir	Quantity	Size	Bar dist. in	As total in^2	Spacing in	Hook
X	44	# 11	15.50	68.64	5.97	None
Z	44	# 11	17.50	68.64	5.97	None

Flexure

Dir	Loc ft	d in	Mmax kft	Comb	Asb_req in^2	Asb_prv in^2	Asb_eff in^2	Ast_req in^2	Ast_prv in^2	Ast_eff in^2
X	-4.50	62.50	16602.4	2395	61.33	68.64	68.64	0.00	0.00	0.00
X	4.50	62.50	2951.5	2395	14.08	68.64	45.55	0.00	0.00	0.00
Z	-3.00	60.50	15126.6	2395	57.66	68.64	68.64	0.00	0.00	0.00
Z	3.00	60.50	9223.5	2395	44.90	68.64	68.64	0.00	0.00	0.00

One Way Shear

Col	Dir	Dist ft	Comb	d in	Vu kips	phi*Vc kips
1	X	-9.71	2395	62.50	1475.8	1659.5
	X	9.71	Outside of Footing	---	---	---
	Z	-9.04	2395	60.50	1475.8	1606.4
	Z	7.04	2395	60.50	1400.1	1606.4

Two Way Shear

#	Bo ft	Ao ft^2	Comb	Avg. d in	Vu kips	phi*Vc kips
Columns						
1	50.50	157.14	2395	61.50	5607.9	7496.5
Piles - max						
7	25.11	39.41	2395	61.50	295.2	3727.5
Piles - min						

#	Bo ft	Ao ft^2	Comb	Avg. d in	Vu kips	phi*Vc kips
1	9.28	21.52	2395	61.50	295.2	1377.2

Two Way Shear Note

TWO WAY SHEAR IN FOOTING IS NOT DESIGNED AND STIRRUPS ARE NOT CONSIDERED.