



APPENDIX



Wind and Seismic Calculations

Table A.1: Wind Load Calculation using ASCE 7-02	
Basic Wind Speed, $V = 90$ mph	Figure 6-1
Wind Directionality Factor, $K_d = 0.85$	Table 6-4
Importance Factor, $I = 1.0$	Table 6-1
Exposure Category: B	Section 6.5.6.3
Total Building Height: 281.9 feet	
Velocity Pressure Exposure Coefficient, K_z	Table 6-3
Topographic Factor, $K_{zt} = 1.0$	Section 6.5.7
Gust Effect Factor, $G = 0.82$	Section 6.5.8
Enclosure Classification: Enclosed	Section 6.5.9
Internal Pressure Coefficient, $G_{Cpi} = +/- 0.18$	Figure 6-5
External Pressure Coefficient, C_p	Figure 6-6
See Calculations on Next Page	
Velocity Pressure, q_z	Section 6.5.10
Design Wind Load, p	Section 6.5.12

Table A.2: Design Wind Pressure								
Height (ft)	Kz	qz (psf)	N-S Wind, p (psf)		Total MWFRS (psf)	E-W Wind, p (psf)		Total MWFRS (psf)
			Windward	Leeward		Windward	Leeward	
0-15	0.57	10.047	6.591	-8.39	14.981	6.591	-9.32	15.911
20	0.62	10.928	7.169	-8.39	15.559	7.169	-9.32	16.489
25	0.66	11.633	7.631	-8.39	16.021	7.631	-9.32	16.951
30	0.7	12.338	8.094	-8.39	16.484	8.094	-9.32	17.414
40	0.76	13.395	8.787	-8.39	17.177	8.787	-9.32	18.107
50	0.81	14.277	9.366	-8.39	17.756	9.366	-9.32	18.686
60	0.85	14.982	9.828	-8.39	18.218	9.828	-9.32	19.148
70	0.89	15.687	10.291	-8.39	18.681	10.291	-9.32	19.611
80	0.93	16.392	10.753	-8.39	19.143	10.753	-9.32	20.073
90	0.96	16.921	11.100	-8.39	19.490	11.100	-9.32	20.420
100	0.99	17.449	11.447	-8.39	19.837	11.447	-9.32	20.767
120	1.04	18.331	12.025	-8.39	20.415	12.025	-9.32	21.345
140	1.09	19.212	12.603	-8.39	20.993	12.603	-9.32	21.923
160	1.13	19.917	13.066	-8.39	21.456	13.066	-9.32	22.386
180	1.17	20.622	13.528	-8.39	21.918	13.528	-9.32	22.848
200	1.2	21.151	13.875	-8.39	22.265	13.875	-9.32	23.195
250	1.28	22.561	14.800	-8.39	23.190	14.800	-9.32	24.120
281.9	1.32	23.266	15.262	-8.39	23.652	15.262	-9.32	24.582

-Internal Building Pressure, $p = q_i * G_{cpi} = +/- 4.09$ psf

Table A.3: North-South Wind Story Shear Forces

North- South Wind Story Shear Forces														
Level	Tributary Height (ft)	Total Height (ft)	P1 (psf)	H1 (ft)	P2 (psf)	H2 (ft)	P3 (psf)	H3 (ft)	P3 (psf)	H4 (ft)	Story Dist. Load (plf)	Cum. Dist. Load (plf)	Story Shear (kips)	Cum. Shear (kips)
Roof	5.8167	281.9175	23.652	5.8167							137.577	5822.808	24.420	24.420
25	11.55	276.1008	23.652	11.55							273.181	5685.231	48.490	72.909
24	11.45	264.5508	23.652	11.45							270.815	5412.051	48.070	120.979
23	12.5167	253.1008	23.19	9.4159	23.652	3.101					291.695	5141.235	51.776	172.755
22	11.7709	240.5841	23.19	11.7709							272.967	4849.540	48.452	221.207
21	9.9417	228.8132	23.19	9.9417							230.548	4576.573	40.922	262.129
20	9.9417	218.8715	23.19	9.9417							230.548	4346.025	40.922	303.051
19	9.9417	208.9298	22.265	1.0119	23.19	8.9298					229.612	4115.477	40.756	343.807
18	9.9417	198.9881	22.265	9.9417							221.352	3885.865	39.290	383.097
17	9.9417	189.0464	21.918	0.8953	22.265	9.0464					221.041	3664.513	39.235	422.332
16	9.9417	179.1047	21.918	9.9417							217.902	3443.472	38.678	461.010
15	9.9417	169.163	21.456	0.7787	21.918	9.163					217.542	3225.570	38.614	499.624
14	9.9417	159.2213	21.456	9.9417							213.309	3008.027	37.862	537.486
13	9.9417	149.2796	20.993	0.6621	21.456	9.2796					213.003	2794.718	37.808	575.294
12	9.9417	139.3379	20.993	9.9417							208.706	2581.716	37.045	612.339
11	9.9417	129.3962	20.415	0.5455	20.993	9.3962					208.391	2373.009	36.989	649.329
10	9.9417	119.4545	20.415	9.9417							202.960	2164.619	36.025	685.354
9	9.9417	109.5128	19.837	0.4289	20.415	9.5128					202.712	1961.659	35.981	721.335
8	9.9417	99.5711	19.49	0.3706	19.837	9.5711					197.085	1758.947	34.983	756.318
7	10.9459	89.6294	19.143	1.3165	19.49	9.6294					212.879	1561.862	37.786	794.104
6	11.95	78.6835	18.681	3.2665	19.143	8.6835					227.250	1348.983	40.337	834.441
5	11.6167	66.7335	18.218	4.8832	18.681	6.7335					214.751	1121.734	38.118	872.559
4	11.2833	55.1168	17.756	6.1665	18.218	5.1168					202.710	906.983	35.981	908.540
3	14.8667	43.8335	16.484	1.0332	17.117	10	17.756	3.8335			256.269	704.273	45.488	954.028
2	19.0959	28.9668	14.981	5.1291	15.559	5	16.021	5	16.484	3.9668	300.128	448.004	53.273	1007.300
1	9.8709	9.8709	14.981	9.8709							147.876	147.876	26.248	1033.548

Building Tributary Width = 177.5'

Table A.4: East-West Wind Story Shear Forces

East-West Wind Story Shear Forces														
Level	Tributary	Total	P1	H1	P2	H2	P3	H3	P3	H4	Story Dist.	Cum. Dist.	Story Shear	Cum. Shear
	Height (ft)	Height (ft)	(psf)	(ft)	(psf)	(ft)	(psf)	(ft)	(psf)	(ft)	Load (plf)	Load (plf)	(kips)	(kips)
Roof	5.8167	281.9175	24.582	5.8167							142.986	6085.591	31.857	31.857
25	11.55	276.1008	24.582	11.55							283.922	5942.605	63.258	95.115
24	11.45	264.5508	24.582	11.45							281.464	5658.683	62.710	157.825
23	12.5167	253.1008	24.12	9.4159	24.582	3.101					303.335	5377.219	67.583	225.408
22	11.7709	240.5841	24.12	11.771							283.914	5073.883	63.256	288.664
21	9.9417	228.8132	24.12	9.9417							239.794	4789.969	53.426	342.091
20	9.9417	218.8715	24.12	9.9417							239.794	4550.176	53.426	395.517
19	9.9417	208.9298	23.195	1.0119	24.12	8.9298					238.858	4310.382	53.218	448.734
18	9.9417	198.9881	23.195	9.9417							230.598	4071.524	51.377	500.111
17	9.9417	189.0464	22.848	0.8953	23.195	9.0464					230.287	3840.926	51.308	551.419
16	9.9417	179.1047	22.848	9.9417							227.148	3610.639	50.609	602.028
15	9.9417	169.163	22.386	0.7787	22.848	9.163					226.788	3383.491	50.528	652.556
14	9.9417	159.2213	22.386	9.9417							222.555	3156.703	49.585	702.141
13	9.9417	149.2796	21.923	0.6621	22.386	9.2796					222.248	2934.148	49.517	751.658
12	9.9417	139.3379	21.923	9.9417							217.952	2711.900	48.560	800.218
11	9.9417	129.3962	21.345	0.5455	21.923	9.3962					217.637	2493.948	48.489	848.708
10	9.9417	119.4545	21.345	9.9417							212.206	2276.311	47.279	895.987
9	9.9417	109.5128	20.767	0.4289	21.345	9.5128					211.958	2064.106	47.224	943.211
8	9.9417	99.5711	20.42	0.3706	20.767	9.5711					206.331	1852.148	45.970	989.182
7	10.9459	89.6294	20.073	1.3165	20.42	9.6294					223.058	1645.817	49.697	1038.879
6	11.95	78.6835	19.611	3.2665	20.073	8.6835					238.363	1422.759	53.107	1091.986
5	11.6167	66.7335	19.148	4.8832	19.611	6.7335					225.554	1184.396	50.253	1142.240
4	11.2833	55.1168	18.686	6.1665	19.148	5.1168					213.204	958.841	47.502	1189.742
3	14.8667	43.8335	17.414	1.0332	18.107	10	18.686	3.8335			270.695	745.638	60.311	1250.052
2	19.0959	28.9668	15.911	5.1291	16.489	5	16.951	5	17.414	3.97	317.887	474.943	70.825	1320.878
1	9.8709	9.8709	15.911	9.8709							157.056	157.056	34.992	1355.870

Building Tributary Width = 222.8'

Table A.5: Seismic Load Calculation using ASCE 7-02	
Occupancy Category, II	Table 1-1
Seismic Use Group, I	Table 9.1.3
Site Classification: Assume Site Class D	
Acceleration:	
$S_s = 0.180$	Map 9.4.1.1a
$S_1 = 0.062$	Map 9.4.1.1b
Site Coefficient, $F_a = 1.6$	Table 9.4.1.2.4a
Site Coefficient, $F_v = 2.4$	Table 9.4.1.2.4b
$S_{ms} = F_a * S_s = 0.288$	
$S_{m1} = F_v * S_1 = 0.149$	
Design Spectral Response:	
$S_{ds} = 2/3 S_{ms} = 0.192$	
$S_{d1} = 2/3 S_{m1} = 0.0992$	
Seismic Design Category:	
B	Table 9.4.2.1a
B	Table 9.4.2.1b
Response Modification Coefficient, $R = 4$	Table 9.5.2.2
System Overstrength Factor, $W_o = 2.5$	
Deflection Amplification Factor, $C_d = 3$	
(for dual system with moment frames and braced frames.)	
Use Equivalent Lateral Force Analysis, Section 9.5.5	Table 9.5.2.5.1
Seismic Response Coefficient, $C_s = 0.0275$	Section 9.5.5.2.1
Occupancy Importance Factor, $I = 1.0$	Table 9.1.4
Approximate Period Paramters, $C_t = 0.02$	Table 9.5.5.3.2
$\alpha = 0.75$	

Table A.6: Seismic Force Distribution							
Level	Total DL (psf)	Floor Area (ft ²)	W _x (kips)	h _x (ft.)	W _x *h _x ^k	C _v x (k)	F _x (k)
Roof	115	15600	278.52	281.92	302380.93	0.07	19.32
25	115	17300	308.87	262.18	306486.18	0.07	19.59
24	115	18700	333.86	243.73	302650.28	0.07	19.34
23	115	19800	353.50	232.44	302175.06	0.07	19.31
22	115	19800	353.50	221.16	284107.79	0.07	18.16
21	115	19800	353.50	209.21	265212.00	0.06	16.95
20	115	19800	353.50	197.26	246572.55	0.06	15.76
19	115	19800	353.50	187.32	231269.35	0.05	14.78
18	115	19800	353.50	177.38	216159.13	0.05	13.81
17	115	19800	353.50	167.43	201250.05	0.05	12.86
16	115	19800	353.50	157.49	186551.17	0.04	11.92
15	115	19800	353.50	147.55	172072.52	0.04	11.00
14	115	19800	353.50	137.61	157825.30	0.04	10.09
13	115	19800	353.50	127.67	143822.16	0.03	9.19
12	115	19800	353.50	117.73	130077.46	0.03	8.31
11	115	19800	353.50	107.78	116607.68	0.03	7.45
10	115	19800	353.50	97.84	103431.94	0.02	6.61
9	115	19800	353.50	87.90	90572.80	0.02	5.79
8	115	19800	353.50	77.96	78057.24	0.02	4.99
7	115	32300	576.68	68.02	107533.35	0.03	6.87
6	115	32300	576.68	58.08	88412.82	0.02	5.65
5	115	32300	576.68	48.13	70062.07	0.02	4.48
4	115	32300	576.68	34.53	46431.24	0.01	2.97
3	115	48100	858.76	23.10	42013.56	0.01	2.68
2	127.5	48100	858.76	11.63	17958.92	0.00	1.15
	Totals:	593800	33960.50	3483.03	4209693.55	1.00	269.01

Seismic Calculations:

Seismic Base Shear:

$$V = C_s W$$

New Building Weight, $W = 10601.55$ kips

$$C_s = S_{ds}/(R/I) = 0.192/(4/1.0) = 0.048$$

$$C_{s,max} = S_{d1}/[T(R/I)]$$

$$T_a = C_t * h_n^{0.75} = 0.02 * 281.9^{0.75} = 1.376$$

$$T_{max} = T_a * C_u = 1.376 * 1.7 = 2.339$$

$$C_u = 1.7$$

$$\text{Use } T = 0.977$$

$$C_{s,max} = 0.0992/[0.977(4/1.0)] = 0.0254$$

$$C_{s,min} = 0.044 S_{ds} * I = 0.044 * 0.192 * 1.0 = 0.00845$$

Therefore, use $C_s = 0.0254$

$$V = C_s W = 0.0254 * 10601.55 = 269.28 \text{ kips}$$

Vertical Distribution of Seismic Forces:

$$F_x = C_{vx} V$$

$$C_{vx} = w_x * h_x^k / (\sum w_i * h_i^k)$$

$k = 1.239$ (linear interpolation between 1 and 2 for a period of $T = 0.977$ s.)

See Table # for the complete Seismic Force Distribution.

Foundation Calculations

Table A.7: Foundation Resize Calculations

New Foundation Sizes				
Allow. Bearing Pressure (ksf):	30			
Column:	TA-T12			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	2.30	2.5	4.15	124.6
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			2.5	2.5
Column:	TA-T11			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	2.37	2.5	4.40	131.9
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			2.5	2.5
Column:	TA-T10			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	0.99	2.5	0.78	23.3
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			2.5	2.5
Column:	TA-T9			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	2.85	2.5	6.39	191.7
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			3	2.5
Column:	TA-T8			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	0.99	2.5	0.78	23.3
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			2.5	2.5

Column:	TA-T7			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	2.67	2.5	5.60	167.9
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			3	2.5
Column:	TA-T6			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	0.99	2.5	0.78	23.3
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			2.5	2.5
Column:	TA-T5			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	2.73	2.5	5.86	175.7
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			3	2.5
Column:	TA-T3			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	2.75	2.5	5.93	177.8
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			3	2.5
Column:	TA-T2			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	1.01	2.5	0.79	23.8
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			2.5	2.5

Column:	TA-T1			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	2.42	2.5	4.59	137.8
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			2.5	2.5
Column:	TB-T12			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9	3.5	63.62	
New Design:	5.70	3.5	25.51	765.4
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			6	3.5
Column:	TB-T11			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9.5	3.5	70.88	
New Design:	5.38	3.5	22.76	682.9
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5.5	3.5
Column:	TB-T10			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9.5	3.5	70.88	
New Design:	5.43	3.5	23.17	695
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5.5	3.5
Column:	TB-T9			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	15.5	6	188.69	
New Design:	5.40	6	22.86	685.9
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			6	6

Column:	TB-T8			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9.5	3.5	70.88	
New Design:	5.40	3.5	22.87	686.2
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5.5	3.5
Column:	TB-T7			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	12	4.5	113.10	
New Design:	5.40	4.5	22.87	686.2
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5.5	4.5
Column:	TB-T6			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9.5	3.5	70.88	
New Design:	5.40	3.5	22.87	686.2
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5.5	3.5
Column:	TB-T5			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	12	4.5	113.10	
New Design:	5.40	4.5	22.87	686.2
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5.5	4.5
Column:	TB-T4			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9.5	3.5	70.88	
New Design:	5.28	3.5	21.92	657.5
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5.5	3.5

Column:	TB-T3			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	12	4.5	113.10	
New Design:	5.22	4.5	21.41	642.4
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5.5	4.5
Column:	TB-T2			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9.5	3.5	70.88	
New Design:	5.28	3.5	21.89	656.7
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5.5	3.5
Column:	TB-T1			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9.5	3.5	70.88	
New Design:	4.74	3.5	17.61	528.4
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5	3.5
Column:	TB.2-T14			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	8.5	3	56.74	
New Design:	2.74	3	5.89	176.8
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			3	3
Column:	TC-T14			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	8.5	3	56.74	
New Design:	6.28	3	30.99	929.8
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			6.5	3

Column:	TC-T3.5			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	11	4	95.03	
New Design:	6.76	4	35.90	1077.1
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			7	4
Column:	TC-T2			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9.5	3.5	70.88	
New Design:	5.90	3.5	27.31	819.4
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			6	3.5
Column:	TC-T1			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9.5	3.5	70.88	
New Design:	5.31	3.5	22.17	665.2
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5.5	3.5
Column:	TC.1-T12			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	11.5	4.5	103.87	
New Design:	6.96	4.5	38.00	1139.9
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			7	4.5
Column:	TC.1-T10.5			
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	11.5	4.5	103.87	
New Design:	7.08	4.5	39.34	1180.1
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			7.5	4.5

Column: TN-T2.3				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	15	5.5	176.71	
New Design:	6.68	5.5	35.01	1050.3
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			7	5.5
			Final Design:	
Column: TN-T1				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	15	5.5	176.71	
New Design:	5.63	5.5	24.91	747.2
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			6	5.5
			Final Design:	
Column: TN-5-T7				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	7.5	2.5	44.18	
New Design:	3.11	2.5	7.61	228.3
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			3.5	2.5
			Final Design:	
Column: TN-5-T5				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	7	2.5	38.48	
New Design:	3.37	2.5	8.94	268.3
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			3.5	2.5
			Final Design:	
Column: TP-T3.6				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9	4	63.62	
New Design:	4.71	4	17.46	523.8
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			5	4
			Final Design:	

Column: TP-T1				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9	4	63.62	
New Design:	4.42	4	15.33	460
			Bell Dia. (ft.)	Shaft Dia. (ft.)
			4.5	4
			Final Design:	
Column: TP-5-T2.3				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9	4	63.62	
New Design:	6.12	4	29.44	883.2
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			6.5	4
			Final Design:	
Column: TQ-T7				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	3.11	2.5	7.61	228.3
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			3.5	2.5
			Final Design:	
Column: TQ-T5				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	6	2.5	28.27	
New Design:	3.37	2.5	8.94	268.3
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			3.5	2.5
			Final Design:	
Column: TQ-T3.6				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9	4	63.62	
New Design:	4.53	4	16.15	484.4
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			5	4
			Final Design:	

Column: TQ-T1				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9	4	63.62	
New Design:	4.34	4	14.81	444.2
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			4.5	4
			Final Design:	
Column: TR-T3.6				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9	3.5	63.62	
New Design:	4.76	3.5	17.80	534
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			5	3.5
			Final Design:	
Column: TR-T2.3				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9	3.5	63.62	
New Design:	5.73	3.5	25.82	774.6
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			6	3.5
			Final Design:	
Column: TR-T1				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	9	3.5	63.62	
New Design:	4.61	3.5	16.66	499.8
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			5	3.5
			Final Design:	
Column: TR-3-T7				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	7.5	2.5	44.18	
New Design:	3.13	2.5	7.67	230.1
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			3.5	2.5
			Final Design:	

Column: TR-3-T5				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	7	2.5	38.48	
New Design:	3.39	2.5	9.02	270.5
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			3.5	2.5
			Final Design:	
Column: TS-T7				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	7.5	2.5	44.18	
New Design:	2.75	2.5	5.95	178.6
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			3	2.5
			Final Design:	
Column: TS-T5				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	7.5	3	44.18	
New Design:	3.13	3	7.67	230.2
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			3.5	3
			Final Design:	
Column: TS-T3.6				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	7.5	3	44.18	
New Design:	3.03	3	7.22	216.6
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			3.5	3
			Final Design:	
Column: TS-T2.3				
	Bell Dia. (ft.)	Shaft Dia. (ft.)	Bell Area (sq.ft.)	Col. Load (kips)
Original Design:	7.5	3	44.18	
New Design:	2.89	3	6.58	197.3
			Bell Dia. (ft.) <td>Shaft Dia. (ft.)</td>	Shaft Dia. (ft.)
			3	3
			Final Design:	

Construction Management: R.S. Means

05200 Metal Joists									
05210 Steel Joists				UNIT	2006 BARE COSTS				TOTAL INCL O&P
CREW	DAILY OUTPUT	LABOR-HOURS	MAT.		LABOR	EQUIP.	TOTAL		
6200	For shop prime paint other than mfrs. standard, add				20%				
6300	For bottom chord extensions, add per chord			Ea.	28.50			28.50	31.50
7000	Joist girders, minimum			Ton	1,200	210	101	1,511	1,825
7020	Average				1,325	243	117	1,685	2,025
7040	Maximum				1,375	287	138	1,800	2,200
8000	Trusses, factory fabricated WT chords, average				4,325	287	138	4,750	5,425

5 METALS

05300 Metal Deck													
05310 Steel Deck				UNIT	2006 BARE COSTS				TOTAL INCL O&P				
CREW	DAILY OUTPUT	LABOR-HOURS	MAT.		LABOR	EQUIP.	TOTAL						
0010	METAL DECKING Steel decking												
0200	Cellular units, galv, 2" deep, 20/20 gauge, over 15 squares			R053100 -10	E-4	1460	.022	S.F.	5.85	.89	.06	6.80	8.20
0250	18-20 gauge					1420	.023		6.65	.91	.06	7.62	9.05
0300	18-18 gauge					1390	.023		6.85	.93	.06	7.84	9.30
0320	16-18 gauge					1360	.024		8.15	.95	.07	9.17	10.80
0340	16-16 gauge					1330	.024		9.05	.97	.07	10.09	11.85
0400	3" deep, galvanized, 20/20 gauge					1375	.023		6.45	.94	.06	7.45	8.95
0500	18-20 gauge					1350	.024		7.80	.96	.07	8.83	10.40
0600	18-18 gauge					1290	.025		7.75	1	.07	8.82	10.50
0700	16-18 gauge					1230	.026		8.75	1.05	.07	9.87	11.65
0800	16-16 gauge					1150	.028		9.55	1.13	.08	10.76	12.70
1000	4-1/2" deep, galvanized, 20/18 gauge					1100	.029		9	1.18	.08	10.26	12.20
1100	18-18 gauge					1040	.031		8.95	1.24	.09	10.28	12.25
1200	16-18 gauge					980	.033		10.05	1.32	.09	11.46	13.60
1300	16-16 gauge					935	.034		10.95	1.38	.10	12.43	14.75
1500	For acoustical deck, add								15%				
1700	For cells used for ventilation, add								15%				
1900	For multi-story or congested site, add								50%				
2100	Open type, galv., 1-1/2" deep wide rib, 22 gauge, under 50 squares				E-4	4500	.007	S.F.	1.47	.29	.02	1.78	2.17
2400	Over 500 squares					5100	.006		1.06	.25	.02	1.33	1.65
2600	20 gauge, under 50 squares					3865	.008		1.73	.33	.02	2.08	2.56
2700	Over 500 squares					4300	.007		1.24	.30	.02	1.56	1.95
2900	18 gauge, under 50 squares					3800	.008		2.24	.34	.02	2.60	3.13
3000	Over 500 squares					4300	.007		1.61	.30	.02	1.93	2.35
3050	16 gauge, under 50 squares					3700	.009		3.01	.35	.02	3.38	3.99
3100	Over 500 squares					4200	.008		2.17	.31	.02	2.50	2.99
3200	3" deep, 22 gauge, under 50 squares					3600	.009		2.02	.36	.02	2.40	2.92
3300	20 gauge, under 50 squares					3400	.009		2.36	.38	.03	2.77	3.33
3400	18 gauge, under 50 squares					3200	.010		3.05	.40	.03	3.48	4.15
3500	16 gauge, under 50 squares					3000	.011		4.02	.43	.03	4.48	5.25
3700	4-1/2" deep, long span roof, over 50 squares, 20 gauge					2700	.012		3.78	.48	.03	4.29	5.10
3800	18 gauge					2460	.013		4.88	.53	.04	5.45	6.35
3900	16 gauge					2350	.014		3.64	.55	.04	4.23	5.05
4100	6" deep, long span, 18 gauge					2000	.016		7	.65	.04	7.69	8.95
4200	16 gauge					1930	.017		5.20	.67	.05	5.92	7
4300	14 gauge					1860	.017		6.70	.70	.05	7.45	8.70
4500	7-1/2" deep, long span, 18 gauge					1690	.019		7.65	.77	.05	8.47	9.95
4600	16 gauge					1590	.020		5.70	.81	.06	6.57	7.90
4700	14 gauge					1490	.021		7.35	.87	.06	8.28	9.80
4800	For painted instead of galvanized, deduct								2%				

210 Important: See the Reference Section for supporting data - Crews, Rental Equipment, City Cost Indexes and Reference Data

05100 Structural Metal Framing											
05120 Structural Steel		CREW	DAILY OUTPUT	LABOR HOURS	UNIT	2006 BARE COSTS			TOTAL INCL O&P		
						MAT.	LABOR	EQUIP.		TOTAL	
560	0050	1/8" thick (5.1 Lb./S.F.)			S.F.	4.85			4.85	5.35	
	0100	1/4" thick (10.2 Lb./S.F.)				9.70			9.70	10.65	
	0300	3/8" thick (15.3 Lb./S.F.)				14.55			14.55	16	
	0400	1/2" thick (20.4 Lb./S.F.)				19.40			19.40	21.50	
	0450	3/4" thick (30.6 Lb./S.F.)				29			29	32	
	0500	1" thick (40.8 Lb./S.F.)				39			39	42.50	
600	0010	STRESSED SKIN ROOF & CEILING SYSTEM									
	0020	Double panel flat roof, spans to 100'	E-2	1150	.049	S.F.	7.60	1.89	1.24	10.73	13.10
	0100	Double panel convex roof, spans to 200'		960	.058		12.35	2.27	1.49	16.11	19.30
	0200	Double panel arched roof, spans to 300'		760	.074		19	2.87	1.88	23.75	28
640	0010	STRUCTURAL STEEL MEMBERS									
	0020	Shop fab'd for 100-ton, 1-2 story project, bolted conn's.									
	0102	W 6 x 9	E-2	600	.093	L.F.	9.40	3.63	2.38	15.41	19.45
	0302	W 8 x 10		600	.093		10.45	3.63	2.38	16.46	20.50
	0502	x 31		550	.102		32.50	3.96	2.59	39.05	45.50
	0702	W 10 x 22		600	.093		23	3.63	2.38	29.01	34.50
	0902	x 49		550	.102		51	3.96	2.59	57.55	66.50
	1102	W 12 x 14		880	.064		14.65	2.48	1.62	18.75	22.50
	1302	x 22		880	.064		23	2.48	1.62	27.10	31.50
	1502	x 26		880	.064		27	2.48	1.62	31.10	36
	1702	x 72		640	.088		75	3.40	2.23	80.63	91.50
	1902	W 14 x 26		990	.057		27	2.20	1.44	30.64	35.50
	2102	x 30		900	.062		31.50	2.42	1.59	35.51	40.50
	2302	x 34		810	.069		35.50	2.69	1.76	39.95	46
	2502	x 120		720	.078		125	3.03	1.98	130.01	146
	2702	W 16 x 26		1000	.056		27	2.18	1.43	30.61	35.50
	2902	x 31		900	.062		32.50	2.42	1.59	36.51	41.50
	3102	x 40		800	.070		42	2.72	1.78	46.50	53
	3302	W 18 x 35	E-5	960	.083		36.50	3.28	1.58	41.36	47.50
	3502	x 40		960	.083		42	3.28	1.58	46.86	53.50
	3702	x 50		912	.088		52.50	3.46	1.66	57.62	65.50
	3902	x 55		912	.088		57.50	3.46	1.66	62.62	71
	4102	W 21 x 44		1064	.075		46	2.96	1.42	50.38	57.50
	4302	x 50		1064	.075		52.50	2.96	1.42	56.88	64.50
	4502	x 62		1036	.077		65	3.04	1.46	69.50	78.50
	4702	x 68		1036	.077		71	3.04	1.46	75.50	85
	4902	W 24 x 55		1110	.072		57.50	2.84	1.37	61.71	69.50
	5102	x 62		1110	.072		65	2.84	1.37	69.21	78
	5302	x 68		1110	.072		71	2.84	1.37	75.21	84.50
	5502	x 76		1110	.072		79.50	2.84	1.37	83.71	94
	5702	x 84		1080	.074		88	2.92	1.40	92.32	103
	5902	W 27 x 94		1190	.067		98	2.65	1.27	101.92	114
	6102	W 30 x 99		1200	.067		103	2.63	1.26	106.89	120
	6302	x 108		1200	.067		113	2.63	1.26	116.89	130
	6502	x 116		1160	.069		121	2.72	1.31	125.03	139
	6702	W 33 x 118		1176	.068		123	2.68	1.29	126.97	142
	6902	x 130		1134	.071		136	2.78	1.34	140.12	156
	7102	x 141		1134	.071		147	2.78	1.34	151.12	169
	7302	W 36 x 135		1170	.068		141	2.70	1.30	145	161
	7502	x 150		1170	.068		157	2.70	1.30	161	178
	7702	x 194		1125	.071		203	2.80	1.35	207.15	230
	7902	x 230		1125	.071		240	2.80	1.35	244.15	271
	8102	x 300		1035	.077		315	3.05	1.46	319.51	350
	8490	For projects 75 to 99 tons, add					10%				
	8492	50 to 74 tons, add					20%				
	8494	25 to 49 tons, add					30%	10%			

204 Important: See the Reference Section for supporting data - Crews, Rental Equipment, City Cost Indexes and Reference Data

05100 Structural Metal Framing											
QTY	L O&P	DESCRIPTION	CREW	DAILY OUTPUT	LABOR HOURS	UNIT	2006 BARE COSTS				TOTAL INCL O&P
							MAT.	LABOR	EQUIP.	TOTAL	
220	1250	Two coats primer paint instead of galv.	E-4	267	.120	L.F.	11.25	4.85	.33	16.43	22
	1400	Monitor support, ceiling hung, expansion bolted		4	8	Ea.	300	325	22.50	647.50	960
	1450	Hung from pre-set inserts		6	5.333		325	216	14.90	555.90	775
	1600	Motor supports for overhead doors		4	8	↓	153	325	22.50	500.50	800
	1700	Partition support for heavy folding partitions, without pocket		24	1.333	L.F.	43	54	3.72	100.72	153
	1750	Supports at pocket only		12	2.667	↓	86.50	108	7.45	201.95	305
	2000	Rolling grilles & fire door supports		34	.941	↓	37	38	2.63	77.63	115
	2100	Spider-leg light supports, expansion bolted to ceiling slab		8	4	Ea.	124	162	11.15	297.15	455
	2150	Hung from pre-set inserts		12	2.667	*	133	108	7.45	248.45	355
	2400	Toilet partition support		36	.889	L.F.	43	36	2.48	81.48	117
	2500	Xray travel gantry support	↓	12	2.667	*	148	108	7.45	263.45	375
250	0010	COLUMNS, LIGHTWEIGHT	E-2	780	.072	L.F.	2.99	2.79	1.83	7.61	10.30
	1000	Lightweight units (lally), 3-1/2" diameter		900	.062	*	4.40	2.42	1.69	8.41	10.90
	1050	4" diameter				Ea.	32			32	35
	5800	Adjustable jack post, 8' maximum height, 2-3/4" diameter				*	51			51	56
	5850	4" diameter				*					
260	0010	COLUMNS, STRUCTURAL	R051223 -20								
	0020	Shop fab'd for 100-ton, 1-2 story project, bolted conn's.									
	0800	Steel, concrete filled, extra strong pipe, 3-1/2" diameter	E-2	660	.085	L.F.	31.50	3.30	2.16	36.96	43
	0830	4" diameter		780	.072	↓	35	2.79	1.83	39.62	45.50
	0890	5" diameter		1020	.055	↓	41.50	2.14	1.40	45.04	51.50
	0930	6" diameter		1200	.047	↓	55	1.82	1.19	58.01	65
	0940	8" diameter	↓	1100	.051	↓	55	1.98	1.30	58.28	65.50
	1100	For galvanizing, add				Lb.	.22			.22	25
	1300	For web ties, angles, etc., add per added lb.	1 Sswk	945	.008		.95	.34		1.29	1.68
	1500	Steel pipe, extra strong, no concrete, 3" to 5" diameter	E-2	16000	.004	↓	.95	.14	.09	1.18	1.39
	1600	6" to 12" diameter		14000	.004	↓	.95	.16	.10	1.21	1.44
	1700	Steel pipe, extra strong, no concrete, 3" diameter x 12'-0"		60	.933	Ea.	117	36.50	24	177.50	220
	1750	4" diameter x 12'-0"		58	.966	↓	171	37.50	24.50	233	283
	1800	6" diameter x 12'-0"		54	1.037	↓	325	40.50	26.50	392	460
	1850	8" diameter x 14'-0"		50	1.120	↓	575	43.50	28.50	647	745
	1900	10" diameter x 16'-0"		48	1.167	↓	830	45.50	29.50	905	1,025
	1950	12" diameter x 18'-0"		45	1.244	↓	1,125	48.50	31.50	1,205	1,350
	3300	Structural tubing, square, A500GrB, 4" to 6" square, light section		11270	.005	Lb.	.95	.19	.13	1.27	1.54
	3600	Heavy section	↓	32000	.002	*	.95	.07	.04	1.06	1.22
	4000	Concrete filled, add				L.F.	3.47			3.47	3.81
	4500	Structural tubing, sq, 4" x 4" x 1/4" x 12'-0"	E-2	58	.966	Ea.	157	37.50	24.50	219	267
	4550	6" x 6" x 1/4" x 12'-0"		54	1.037	↓	257	40.50	26.50	324	385
	4600	8" x 8" x 3/8" x 14'-0"		50	1.120	↓	555	43.50	28.50	627	720
	4650	10" x 10" x 1/2" x 16'-0"		48	1.167	↓	1,025	45.50	29.50	1,100	1,250
	5100	Structural tubing, rect, 5" to 6" wide, light section		8000	.007	Lb.	.95	.27	.18	1.40	1.74
	5200	Heavy section		12000	.005	↓	.95	.18	.12	1.25	1.51
	5300	7" to 10" wide, light section		15000	.004	↓	.95	.15	.10	1.20	1.41
	5400	Heavy section		18000	.003	↓	.95	.12	.08	1.15	1.36
	5500	Structural tubing, rect, 5" x 3" x 1/4" x 12'-0"		58	.966	Ea.	152	37.50	24.50	214	262
	5550	6" x 4" x 5/16" x 12'-0"		54	1.037	↓	238	40.50	26.50	305	365
	5600	8" x 4" x 3/8" x 12'-0"		54	1.037	↓	345	40.50	26.50	412	480
	5650	10" x 6" x 3/8" x 14'-0"		50	1.120	↓	555	43.50	28.50	627	720
	5700	12" x 8" x 1/2" x 16'-0"		48	1.167	↓	1,025	45.50	29.50	1,100	1,250
	6800	W Shape, A992 steel, 2 tier, W8 x 24		1080	.052	L.F.	25	2.02	1.32	28.34	32.50
	6850	W8 x 31		1080	.052	↓	32.50	2.02	1.32	35.84	40.50
	6900	W8 x 48		1032	.054	↓	50	2.11	1.38	53.49	60.50
	6950	W8 x 67		984	.057	↓	70	2.21	1.45	73.66	82.50
	7000	W10 x 45		1032	.054	↓	47	2.11	1.38	50.49	57

5 METALS

05100 Structural Metal Framing												
05120 Structural Steel				CREW	DAILY OUTPUT	LABOR HOURS	UNIT	2006 BARE COSTS				TOTAL INCL O&P
								MAT.	LABOR	EQUIP.	TOTAL	
260	7050	W10 x 68		E-2	984	.057	L.F.	71	2.21	1.45	74.66	83.50
	7100	W10 x 112	R051223 -20		960	.058		117	2.27	1.49	120.76	135
	7150	W12 x 50			1032	.054		52.50	2.11	1.38	55.99	63
	7200	W12 x 87			984	.057		91	2.21	1.45	94.66	106
	7250	W12 x 120			960	.058		125	2.27	1.49	128.76	144
	7300	W12 x 190			912	.061		199	2.39	1.56	202.95	224
	7350	W14 x 74			984	.057		77.50	2.21	1.45	81.16	90.50
	7400	W14 x 120			960	.058		125	2.27	1.49	128.76	144
	7450	W14 x 176			912	.061		184	2.39	1.56	187.95	208
	8090	For projects 75 to 99 tons, add					All	10%				
	8092	50 to 74 tons, add						20%				
	8094	25 to 49 tons, add						30%	10%			
	8096	10 to 24 tons, add						50%	25%			
	8098	2 to 9 tons, add						75%	50%			
	8099	Less than 2 tons, add						100%	100%			
	9000	Minimum labor/equipment charge		1 Sskw	1	8	Job		320		320	600
300	0010	CURB EDGING										
	0020	Steel angle w/anchors, on forms, 1" x 1", 0.8#/L.F.		E-4	350	.091	L.F.	1.61	3.70	.26	5.57	8.95
	0100	2" x 2" angles, 3.92#/L.F.			330	.097		5.15	3.92	.27	9.34	13.35
	0200	3" x 3" angles, 6.1#/L.F.			300	.107		8.15	4.31	.30	12.76	17.40
	0300	4" x 4" angles, 8.2#/L.F.			275	.116		10.55	4.71	.32	15.58	21
	1000	6" x 4" angles, 12.3#/L.F.			250	.128		15.25	5.20	.36	20.81	27
	1050	Steel channels with anchors, on forms, 3" channel, 5#/L.F.			290	.110		6.40	4.46	.31	11.17	15.75
	1100	4" channel, 5.4#/L.F.			270	.119		6.85	4.79	.33	11.97	16.85
	1200	6" channel, 8.2#/L.F.			255	.125		10.55	5.10	.35	16	21.50
	1300	8" channel, 11.5#/L.F.			225	.142		14.35	5.75	.40	20.50	27
	1400	10" channel, 15.3#/L.F.			180	.178		18.65	7.20	.50	26.35	34.50
	1500	12" channel, 20.7#/L.F.			140	.229		25	9.25	.64	34.89	45.50
	2000	For curved edging, add						35%	10%			
	9000	Minimum labor/equipment charge		E-4	4	8	Job		325	22.50	347.50	630
440	0010	LIGHTWEIGHT FRAMING										
	0200	For load-bearing steel studs see Division 05410-400	R051223 -35									
	0400	Angle framing, field fabricated, 4" and larger		E-3	440	.065	Lb.	.55	2.22	.20	2.97	4.97
	0450	Less than 4" angles	R051223 -45		265	.091	"	.57	3.68	.34	4.59	7.90
	0460	1/2" x 1/2" x 1/8"			200	.120	L.F.	.11	4.87	.45	5.43	9.70
	0462	3/4" x 3/4" x 1/8"			160	.150		.32	6.10	.56	6.98	12.35
	0464	1" x 1" x 1/8"			135	.178		.46	7.20	.66	8.32	14.75
	0466	1-1/4" x 1-1/4" x 3/16"			115	.209		.84	8.50	.78	10.12	17.65
	0468	1-1/2" x 1-1/2" x 3/16"			100	.240		1.03	9.75	.89	11.67	20.50
	0470	2" x 2" x 1/4"			90	.267		1.82	10.85	.99	13.66	23.50
	0472	2-1/2" x 2-1/2" x 1/4"			72	.333		2.34	13.55	1.24	17.13	29.50
	0474	3" x 2" x 3/8"			65	.369		3.36	15	1.37	19.73	33
	0476	3" x 3" x 3/8"			57	.421		4.10	17.10	1.57	22.77	38
	0600	Chanel framing, field fabricated, 8" and larger			500	.048	Lb.	.57	1.95	.18	2.70	4.48
	0650	Less than 8" channels			335	.072	"	.57	2.91	.27	3.75	6.35
	0660	C2 x 1.78			115	.209	L.F.	1.01	8.50	.78	10.29	17.80
	0662	C3 x 4.1			80	.300		2.34	12.20	1.12	15.66	27
	0664	C4 x 5.4			66	.364		3.08	14.75	1.35	19.18	32.50
	0666	C5 x 6.7			57	.421		3.82	17.10	1.57	22.49	38
	0668	C6 x 8.2			55	.436		4.52	17.70	1.62	23.84	40
	0670	C7 x 9.8			40	.600		5.60	24.50	2.23	32.33	54
	0672	C8 x 11.5			36	.667		6.55	27	2.48	36.03	60.50
	0710	Structural bar tee, field fabricated, 3/4" x 3/4" x 1/8"			160	.150		.32	6.10	.56	6.98	12.35
	0712	1" x 1" x 1/8"			135	.178		.46	7.20	.66	8.32	14.75
	0714	1-1/2" x 1-1/2" x 1/4"			114	.211		1.33	8.55	.78	10.66	18.35
	0716	2" x 2" x 1/4"			89	.270		1.82	10.95	1	13.77	23.50

202 Important: See the Reference Section for supporting data - Crews, Rental Equipment, City Cost Indexes and Reference Data

05050 Basic Metal Materials & Methods											
05090 Metal Fastenings		CREW	DAILY OUTPUT	LABOR HOURS	UNIT	2006 BARE COSTS				TOTAL INCL O&P	
						MAT.	LABOR	EQUIP.	TOTAL		
540	0300		E-16	35	.457	Ea.	64	18.70	2.55	85.25	108
	0500			30	.533		74	22	2.98	98.98	126
	0600			25	.640		81	26	3.57	110.57	142
	0800			20	.800		85	33	4.46	122.46	160
	0900			15	1.067		113	43.50	5.95	162.45	212
POWDER ACTUATED TOOLS & FASTENERS											
580	0020					Ea.	340			340	370
	0100					"	545			545	600
	0300					C	17.40			17.40	19.15
	0400						25			25	27.50
	0600	1 Carp		4.80	1.667		13.05	59.50		72.55	112
	0700			4	2		51	71		122	174
	0800					Ea.	2,350			2,350	2,600
	0900	1 Carp		1	8	M	540	284		824	1,075
RIVETS											
600	0100	1 Carp		4.80	1.667	C	5.25	59.50		64.75	104
	0200			4	2		8.10	71		79.10	127
	0300			4.80	1.667		8.05	59.50		67.55	107
	0400			4	2		7.35	71		78.35	126
	0500			4.80	1.667		7.30	59.50		66.80	106
	0600			4.80	1.667		26	59.50		85.50	127
	0700			4	2		75	71		146	201
	0800			4.80	1.667		13.05	59.50		72.55	112
	0900			4	2		24.50	71		95.50	145
	1000			4.80	1.667		10.20	59.50		69.70	109
	1100			4	2		18.45	71		89.45	139
	1200			4.80	1.667		6.30	59.50		65.80	105
	1300			4	2		9.50	71		80.50	128
	1400					Ea.	122			122	134
	1500						233			233	257
	1600						880			880	970
	1700						2,225			2,225	2,450
VIBRATION PADS											
820	0300	2 Sswk		24	.667	S.F.	59	26.50		85.50	115
	0400			20	.800		119	32		151	191
	0600			24	.667		22.50	26.50		49	74.50
	0700			20	.800		45.50	32		77.50	110
	0900			24	.667		10	26.50		36.50	61
	1000			20	.800		20	32		52	82
	1200			24	.667		26	26.50		52.50	78.50
	1300			20	.800		47	32		79	112
	1500			24	.667		46.50	26.50		73	101
	1600			24	.667		69.50	26.50		96	127
	1800			24	.667		82.50	26.50		109	141
	1900			24	.667		107	26.50		133.50	168
	2100					Kip	6.75			6.75	7.40
WELD SHEAR CONNECTORS											
840	0020	E-10		960	.017	Ea.	.41	.68	.28	1.37	2.03
	0030			950	.017		.43	.69	.28	1.40	2.07
	0200			945	.017		.46	.69	.28	1.43	2.12
	0300			935	.017		.48	.70	.28	1.46	2.15
	0500			930	.017		.54	.70	.29	1.53	2.22
	0600			920	.017		.56	.71	.29	1.56	2.27
	0800			910	.018		.57	.72	.29	1.58	2.29

02450 | Foundation & Load Bearing Elements

02465 Bored Piles	CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2006 BARE COSTS				TOTAL INCL O&P
					MAT.	LABOR	EQUIP.	TOTAL	
0400 36" diameter, 0.262 C.Y./L.F.	B-43	125	.384	V.L.F.	28.50	11.65	27	67.15	79.50
0500 48" diameter, 0.465 C.Y./L.F.		100	.480		50.50	14.55	34	99.05	116
0600 60" diameter, 0.727 C.Y./L.F.		90	.533		79	16.20	37.50	132.70	155
0700 72" diameter, 1.05 C.Y./L.F.		80	.600		114	18.20	42	174.20	201
0800 84" diameter, 1.43 C.Y./L.F.		75	.640		155	19.45	45	219.45	252
1000 For bell excavation and concrete, add									
1020 4' bell diameter, 24" shaft, 0.444 C.Y.	B-43	20	2.400	Ea.	38.50	73	169	280.50	350
1040 6' bell diameter, 30" shaft, 1.57 C.Y.		5.70	8.421		137	256	595	988	1,225
1060 8' bell diameter, 36" shaft, 3.72 C.Y.		2.40	20		325	605	1,400	2,330	2,900
1080 9' bell diameter, 48" shaft, 4.48 C.Y.		2	24		390	730	1,700	2,820	3,450
1100 10' bell diameter, 60" shaft, 5.24 C.Y.		1.70	28.235		455	855	2,000	3,310	4,075
1120 12' bell diameter, 72" shaft, 8.74 C.Y.		1	48		760	1,450	3,375	5,585	6,925
1140 14' bell diameter, 84" shaft, 13.6 C.Y.		.70	68.571		1,175	2,075	4,825	8,075	9,975
1200 Open style, machine drilled, to 50' deep, in wet ground, pulled casing and pumping, 18" diameter, 0.065 C.Y./L.F.	B-48	160	.350	V.L.F.	7	10.85	22.50	40.35	50.50
1400 24" diameter, 0.116 C.Y./L.F.		125	.448		12.55	13.90	29	55.45	68.50
1500 30" diameter, 0.182 C.Y./L.F.		85	.659		19.70	20.50	43	83.20	102
1600 36" diameter, 0.262 C.Y./L.F.		60	.933		28.50	29	60.50	118	145
1700 48" diameter, 0.465 C.Y./L.F.	B-49	55	1.600		50.50	52	78	180.50	225
1800 60" diameter, 0.727 C.Y./L.F.		35	2.514		79	81.50	123	283.50	355
1900 72" diameter, 1.05 C.Y./L.F.		30	2.933		114	95.50	143	352.50	435
2000 84" diameter, 1.43 C.Y./L.F.		25	3.520		155	114	172	441	545
2100 For bell excavation and concrete, add									
2120 4' bell diameter, 24" shaft, 0.444 C.Y.	B-48	19.80	2.828	Ea.	38.50	88	184	310.50	385
2140 6' bell diameter, 30" shaft, 1.57 C.Y.		5.70	9.825		137	305	640	1,082	1,350
2160 8' bell diameter, 36" shaft, 3.72 C.Y.		2.40	23.333		325	725	1,525	2,575	3,200
2180 9' bell diameter, 48" shaft, 4.48 C.Y.	B-49	3.30	26.667		390	865	1,300	2,555	3,250
2200 10' bell diameter, 60" shaft, 5.24 C.Y.		2.80	31.429		455	1,025	1,525	3,005	3,825
2220 12' bell diameter, 72" shaft, 8.74 C.Y.		1.60	55		760	1,775	2,675	5,210	6,675
2240 14' bell diameter, 84" shaft, 13.6 C.Y.		1	88		1,175	2,850	4,300	8,325	10,700
2300 Open style, machine drilled, to 50' deep, in soft rocks and medium hard shales, 18" diameter, 0.065 C.Y./L.F.	B-49	50	1.760	V.L.F.	7	57	86	150	195
2500 24" diameter, 0.116 C.Y./L.F.		30	2.933		12.55	95.50	143	251.05	325
2600 30" diameter, 0.182 C.Y./L.F.		20	4.400		19.70	143	214	376.70	490
2700 36" diameter, 0.262 C.Y./L.F.		15	5.867		28.50	191	286	505.50	655
2800 48" diameter, 0.465 C.Y./L.F.		10	8.800		50.50	286	430	766.50	990
2900 60" diameter, 0.727 C.Y./L.F.		7	12.571		79	410	615	1,104	1,425
3000 72" diameter, 1.05 C.Y./L.F.		6	14.667		114	475	715	1,304	1,675
3100 84" diameter, 1.43 C.Y./L.F.		5	17.600		155	570	860	1,585	2,050
3200 For bell excavation and concrete, add									
3220 4' bell diameter, 24" shaft, 0.444 C.Y.	B-49	10.90	8.073	Ea.	38.50	262	395	695.50	905
3240 6' bell diameter, 30" shaft, 1.57 C.Y.		3.10	28.387		137	920	1,375	2,432	3,175
3260 8' bell diameter, 36" shaft, 3.72 C.Y.		1.30	67.692		325	2,200	3,300	5,825	7,550
3280 9' bell diameter, 48" shaft, 4.48 C.Y.		1.10	80		390	2,600	3,900	6,890	8,950
3300 10' bell diameter, 60" shaft, 5.24 C.Y.		.90	97.778		455	3,175	4,775	8,405	10,900
3320 12' bell diameter, 72" shaft, 8.74 C.Y.		.60	146		760	4,775	7,150	12,685	16,500
3340 14' bell diameter, 84" shaft, 13.6 C.Y.		.40	220		1,175	7,150	10,700	19,025	24,700
3600 For rock excavation, sockets, add, minimum		120	.733	C.F.		24	35.50	59.50	78
3650 Average		95	.926			30	45	75	98.50
3700 Maximum		48	1.833			59.50	89.50	149	196
3900 For 50' to 100' deep, add				V.L.F.				7%	7%
4000 For 100' to 150' deep, add								25%	25%
4100 For 150' to 200' deep, add								30%	30%
4200 For casings left in place, add				Lb.	.72			.72	.79
4300 For other than 50 lb. reinf. per C.Y., add or deduct					.77			.77	.85
4400 For steel "I" beam cores, add	B-49	8.30	10.602	Ton	1.525	345	515	2,385	2,800

For expanded coverage of these items see Means Site Work & Landscape Cost Data 2006

03200 | Concrete Reinforcement

03230 Stressing Tendons		CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2006 BARE COSTS				TOTAL INCL O&P	
						MAT.	LABOR	EQUIP.	TOTAL		
600	0150 300 kip	R034136-90	C-3	2700	.024	Lb.	.71	.86	.04	1.61	2.28
	0300 100' span, 100 kip			1700	.038		1.44	1.36	.06	2.86	3.95
	0350 300 kip			3200	.020		1.26	.72	.03	2.01	2.65
	0500 200' span, 100 kip			2700	.024		1.43	.86	.04	2.33	3.07
	0550 300 kip			3500	.018		1.26	.66	.03	1.95	2.53
	0800 Grouted bars, 50' span, 42 kip			2600	.025		.70	.89	.04	1.63	2.32
	0850 143 kip			3200	.020		.68	.72	.03	1.43	2
	1000 75' span, 42 kip			3200	.020		.70	.72	.03	1.45	2.03
	1050 143 kip			4200	.015		.62	.55	.03	1.20	1.64
	1200 UngROUTED strand, 50' span, 100 kip		C-4	1275	.025		.47	1	.02	1.49	2.27
	1250 300 kip			1475	.022		.47	.87	.02	1.36	2.03
	1400 100' span, 100 kip			1500	.021		.47	.85	.02	1.34	2
	1450 300 kip			1650	.019		.47	.78	.02	1.27	1.87
	1600 200' span, 100 kip			1500	.021		.47	.85	.02	1.34	2
	1650 300 kip			1700	.019		.47	.75	.02	1.24	1.83
	1800 UngROUTED bars, 50' span, 42 kip			1400	.023		.43	.91	.02	1.36	2.06
	1850 143 kip			1700	.019		.43	.75	.02	1.20	1.78
	2000 75' span, 42 kip			1800	.018		.43	.71	.02	1.16	1.71
	2050 143 kip			2200	.015		.43	.58	.01	1.02	1.49
	2220 UngROUTED single strand, 100' slab, 25 kip			1200	.027		.47	1.07	.03	1.57	2.38
	2250 35 kip			1475	.022		.47	.87	.02	1.36	2.03

03240 | Fibrous Reinforcing

03240 Fibrous Reinforcing										
300	0010 FIBROUS REINFORCING									300
	0100 Synthetic fibers, add to concrete					Lb.	3.97		3.97	4.37
	0110 1-1/2 lb. per C.Y.					C.Y.	6.15		6.15	6.75
	0150 Steel fibers, add to concrete					Lb.	.46		.46	.51
	0155 25 lb. per C.Y.					C.Y.	11.50		11.50	12.65
	0160 50 lb. per C.Y.						23		23	25.50
	0170 75 lb. per C.Y.						35.50		35.50	39
	0180 100 lb. per C.Y.						46		46	50.50

$\frac{923}{3} \times 3$

03300 | Cast-In-Place Concrete

03310 Structural Concrete		CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2006 BARE COSTS				TOTAL INCL O&P
						MAT.	LABOR	EQUIP.	TOTAL	
200	0010 CONCRETE, FIELD MIX									200
	0015 FOB forms 2250 psi	R033105-65			C.Y.	78			78	85.50
	0020 3000 psi					81			81	89
220	0010 CONCRETE, READY MIX Normal weight									220
	0012 Includes local aggregate, sand, portland cement, and water	R033105-10								
	0015 Excludes all additives and treatments	R033105-20								
	0020 2000 psi				C.Y.	83.50			83.50	92
	0100 2500 psi	R033105-30				85			85	93.50
	0150 3000 psi					87			87	95.50
	0200 3500 psi	R033105-40				89			89	98
	0300 4000 psi					91			91	100
	0350 4500 psi	R033105-50				93			93	102
	0400 5000 psi					96			96	106

Data For expanded coverage of these items see Means Concrete & Masonry Cost Data 2006

3 CONCRETE

03300 Cast-In-Place Concrete			CREW	DAILY OUTPUT	LABOR HOURS	UNIT	2006 BARE COSTS				TOTAL INCL O&P
03310 Structural Concrete							MAT.	LABOR	EQUIP.	TOTAL	
220	0411	6000 psi				C.Y.	109			109	120
	0412	8000 psi					179			179	196
	0413	10,000 psi					253			253	279
	0414	12,000 psi					305			305	335
	0700	Lightweight, 110#/CF				C.Y.	10%				
	1000	For high early strength cement, add									
	1010	For structural lightweight with regular sand, add					25%				
	2000	For all lightweight aggregate, add					45%				
	3000	For integral colors, 2500 psi (5 bag mix)									
	3100	Red, yellow or brown, 1.8 lb. per bag, add				C.Y.	21			21	23
	3200	9.4 lb. per bag, add					109			109	120
	3400	Black, 1.8 lb. per bag, add					28			28	31
	3500	7.5 lb. per bag, add					117			117	129
	3700	Green, 1.8 lb. per bag, add					35.50			35.50	39
	3800	7.5 lb. per bag, add					148			148	163
	4000	Flowable fill: ash, cement, aggregate, water									
	4100	40 - 80 psi				C.Y.	69			69	76
	4150	Structural: ash, cement, aggregate, water & sand									
	4200	50 psi				C.Y.	73.50			73.50	80.50
	4250	140 psi					76.50			76.50	84
	4300	500 psi					79.50			79.50	87.50
	4350	1000 psi					84			84	92.50
240	0010	CONCRETE IN PLACE									
	0020	Including forms (4 uses), concrete, placement, reinforcing steel and finishing unless otherwise indicated									
	0300	Beams, 5 kip per L.F., 10' span				C.Y.	287	455	46	788	1,125
	0350	25' span	C-14A	15.62	12.804		298	385	39	722	1,000
	0500	Chimney foundations, industrial, minimum				C-14C	129	118	.66	247.66	340
	0510	Maximum					152	160	.90	312.90	435
	0700	Columns, square, 12" x 12", minimum reinforcing				C-14A	305	595	60.50	960.50	1,400
	0720	Average reinforcing					10.13	19.743		485	705
	0740	Maximum reinforcing					9.03	22.148		725	790
	0800	16" x 16", minimum reinforcing					16.22	12.330		243	440
	0820	Average reinforcing					12.57	15.911		410	565
	0840	Maximum reinforcing					10.25	19.512		640	695
	0900	24" x 24", minimum reinforcing					23.66	8.453		207	300
	0920	Average reinforcing					17.71	11.293		370	400
	0940	Maximum reinforcing					14.15	14.134		585	505
	1000	36" x 36", minimum reinforcing					33.69	5.936		182	211
	1020	Average reinforcing					23.32	8.576		325	305
	1040	Maximum reinforcing					17.82	11.223		545	400
	1200	16" diameter, minimum reinforcing					31.49	6.351		236	226
	1220	Average reinforcing					19.12	10.460		415	370
	1240	Maximum reinforcing					13.77	14.524		630	515
	1300	20" diameter, minimum reinforcing					41.04	4.873		238	174
	1320	Average reinforcing					24.05	8.316		400	296
	1340	Maximum reinforcing					17.01	11.758		630	420
	1400	24" diameter, minimum reinforcing					51.85	3.857		223	137
	1420	Average reinforcing					27.06	7.391		400	263
	1440	Maximum reinforcing					18.29	10.935		620	390
	1500	36" diameter, minimum reinforcing					75.04	2.665		224	95
	1520	Average reinforcing					37.49	5.335		380	190
	1540	Maximum reinforcing					22.84	8.757		600	310
	1900	Elevated slabs, flat slab with drops, 125 psf Sup. Load, 20' span				C-14B	38.45	5.410		242	192
	1950	30' span					50.99	4.079		250	145
	2100	Flat plate, 125 psf Sup. Load, 15' span					30.24	6.878		220	245

154 Important: See the Reference Section for supporting data - Crews, Rental Equipment, City Cost Indexes and Reference Data

03300 Cast-In-Place Concrete										
03310 Structural Concrete		CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2006 BARE COSTS				TOTAL INCL O&P
						MAT.	LABOR	EQUIP.	TOTAL	
240	2150									510
	2300									240
	2350									
	2500									
	2550									
	2700									
	2750									
	2900									
	2950									
	3100									
	3110									
	3150									
	3200									
	3250									
	3300									
	3400									
	3450									
	3500									
	3520									
	3800									
	3850									
	3900									
	3920									
	3925									
	3930									
	3935									
	3940									
	3945									
	3950									
	4000									
	4050									
	4200									
	4250									
	4260									
	4270									
	4300									
	4350									
	4500									
	4520									
	4525									
	4530									
	4535									
	4650									
	4700									
	4751									
	4760									
	4820									
	4840									
	4900									
	4950									
	5000									
	5001									
	5010									
	5020									
	5200									
	5210									

CONCRETE 3

For expanded coverage of these items see Means Concrete & Masonry Cost Data 2006

3 CONCRETE

03300 Cast-In-Place Concrete												
03310 Structural Concrete				CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2006 BARE COSTS			TOTAL INCL. O&P	
			MAT.					LABOR	EQUIP.	TOTAL		
240	5250	Average	R033053-10	C-14B	1650	.126	S.F.	5.80	4.48	.44	10.72	14.30
	5300	Maximum			1500	.139		6.25	4.93	.48	11.66	15.65
	5500	Lightweight, ready mix, including screed finish only, not including forms or reinforcing	R033053-50									
	5510	1:4 for structural roof decks	R033053-60	C-14B	260	.800	C.Y.	122	28.50	2.78	153.28	184
	5600	1:6 for ground slab with radiant heat		C-14F	92	.783		123	25.50	.23	148.73	176
	5650	1:3:2 with sand aggregate, roof deck	R033105-90	C-14B	260	.800		120	28.50	2.78	151.28	182
	5700	Ground slab		C-14F	107	.673		120	21.50	.20	141.70	167
	5900	Pile caps, incl. forms and reinf., sq. or rect., under 5 C.Y.	R033105-85	C-14C	54.14	2.069		151	70	.39	221.39	282
	5950	Over 10 C.Y.			75	1.493		139	50.50	.28	189.78	237
	6000	Triangular or hexagonal, under 5 C.Y.			53	2.113		107	71.50	.40	178.90	236
	6050	Over 10 C.Y.			.85	1.318		120	44.50	.25	164.75	206
	6200	Retaining walls, gravity, 4' high see division 02830-100		C-14D	66.20	3.021		125	107	10.90	242.90	325
	6250	10' high			125	1.600		117	56.50	5.80	179.30	229
	6300	Cantilever, level backfill loading, 8' high			70	2.857		136	101	10.30	247.30	330
	6350	16' high			91	2.198		130	77.50	7.95	215.45	280
	6800	Stairs, not including safety treads, free standing, 3'-6" wide		C-14H	83	.578	L.F. Nose	5.30	20	.26	25.56	39.50
	6850	Cast on ground			125	.384	*	4.03	13.45	.17	17.65	26.50
	7000	Stair landings, free standing			200	.240	S.F.	4.36	8.40	.11	12.87	18.80
	7050	Cast on ground			475	.101	*	3.05	3.54	.05	6.64	9.25
	9000	Minimum labor/equipment charge		2 Carp	1	16	Job		570		570	940
450	0010	INSULATING CONCRETE See division 03520-250										450
700	0010	PLACING CONCRETE										700
	0020	Includes labor and equipment to place and vibrate	R033105-70									
	0050	Beams, elevated, small beams, pumped		C-20	60	1.067	C.Y.		31.50	12.40	43.90	65
	0100	With crane and bucket		C-7	45	1.600			48	22.50	70.50	103
	0200	Large beams, pumped		C-20	90	.711			21	8.25	29.25	43.50
	0250	With crane and bucket		C-7	65	1.108			33	15.55	48.55	71
	0400	Columns, square or round, 12" thick, pumped		C-20	60	1.067			31.50	12.40	43.90	65
	0450	With crane and bucket		C-7	40	1.800			54	25.50	79.50	116
	0600	18" thick, pumped		C-20	90	.711			21	8.25	29.25	43.50
	0650	With crane and bucket		C-7	55	1.309			39.50	18.40	57.90	84
	0800	24" thick, pumped		C-20	92	.696			20.50	8.10	28.60	42.50
	0850	With crane and bucket		C-7	70	1.029			31	14.45	45.45	66
	1000	36" thick, pumped		C-20	140	.457			13.55	5.30	18.85	28
	1050	With crane and bucket		C-7	100	.720			21.50	10.10	31.60	46
	1400	Elevated slabs, less than 6" thick, pumped		C-20	140	.457			13.55	5.30	18.85	28
	1450	With crane and bucket		C-7	95	.758			22.50	10.65	33.15	48.50
	1500	6" to 10" thick, pumped		C-20	160	.400			11.90	4.65	16.55	24.50
	1550	With crane and bucket		C-7	110	.655			19.65	9.20	28.85	42
	1600	Slabs over 10" thick, pumped		C-20	180	.356			10.55	4.13	14.68	22
	1650	With crane and bucket		C-7	130	.554			16.60	7.80	24.40	35.50
	1900	Footings, continuous, shallow, direct chute		C-6	120	.400			11.55	.36	11.91	19.35
	1950	Pumped		C-20	150	.427			12.65	4.96	17.61	26
	2000	With crane and bucket		C-7	90	.800			24	11.25	35.25	51.50
	2100	Footings, continuous, deep, direct chute		C-6	140	.343			9.90	.31	10.21	16.60
	2150	Pumped		C-20	160	.400			11.90	4.65	16.55	24.50
	2200	With crane and bucket		C-7	110	.655			19.65	9.20	28.85	42
	2400	Footings, spread, under 1 C.Y., direct chute		C-6	55	.873			25	.78	25.78	42.50
	2450	Pumped		C-20	65	.985			29	11.45	40.45	60
	2500	With crane and bucket		C-7	45	1.600			48	22.50	70.50	103
	2600	Over 5 C.Y., direct chute		C-6	120	.400			11.55	.36	11.91	19.35
	2650	Pumped		C-20	150	.427			12.65	4.96	17.61	26
	2700	With crane and bucket		C-7	100	.720			21.50	10.10	31.60	46

156 Important: See the Reference Section for supporting data - Crews, Rental Equipment, City Cost Indexes and Reference Data

03300 Cast-In-Place Concrete											
03310 Structural Concrete											
TOTAL % O&P	CREW	DAILY OUTPUT	LABOR- HOURS	UNIT	2006 BARE COSTS				TOTAL INCL O&P		
					MAT.	LABOR	EQUIP.	TOTAL			
14.30				C-6	350	.137	C.Y.	3.96	.12	4.08	6.65
15.65				C-20	400	.160		4.75	1.86	6.61	9.80
184				C-7	300	.240		7.20	3.37	10.57	15.40
176				C-6	150	.320		9.25	.28	9.53	15.45
182				C-20	180	.356		10.55	4.13	14.68	22
167				C-7	120	.600		18	8.40	26.40	39
282				C-20	2100	.030		.91	.35	1.26	1.87
237				C-7	2100	.034		1.03	.48	1.51	2.20
136				C-6	90	.533		15.40	.47	15.87	26
106				C-20	110	.582		17.25	6.75	24	35.50
25				C-7	80	.900		27	12.65	39.65	58
29				C-6	175	.274		7.95	.24	8.19	13.25
30				C-20	200	.320		9.50	3.72	13.22	19.60
39.50				C-7	150	.480		14.40	6.75	21.15	31
16.50				C-6	215	.223		6.45	.20	6.65	10.80
8.80				C-20	240	.267		7.90	3.10	11	16.35
9.25				C-7	185	.389		11.65	5.45	17.10	25
0				C-6	110	.436		12.60	.39	12.99	21
46				C-20	130	.492		14.60	5.70	20.30	30.50
70				C-7	110	.655		19.65	9.20	28.85	42
50				C-6	165	.291		8.40	.26	8.66	14.10
50				C-20	185	.346		10.25	4.02	14.27	21
10				C-7	145	.497		14.90	6.95	21.85	31.50
30				C-6	90	.533		15.40	.47	15.87	26
30				C-20	100	.640		19	7.45	26.45	39
50				C-7	80	.900		27	12.65	39.65	58
50				C-6	100	.480		13.85	.43	14.28	23.50
50				C-20	110	.582		17.25	6.75	24	35.50
50				C-7	90	.800		24	11.25	35.25	51.50
30				C-6	105	.457		13.20	.41	13.61	22
30				C-20	120	.533		15.85	6.20	22.05	33
30				C-7	95	.758		22.50	10.65	33.15	48.50
30											
30				C-18	32	.281	C.Y.	7.75	1.63	9.38	14.65
30					24	.375		10.35	2.18	12.53	19.55
30					18	.500		13.80	2.90	16.70	26
30				C-19	80	.113		3.11	.93	4.04	6.15
30					60	.150		4.14	1.24	5.38	8.20
30					45	.200		5.50	1.65	7.15	10.95
30				C-6	2	.24	Job	695	21.50	716.50	1,175
03350 Concrete Finishing											
300 FINISHING FLOORS											
				1 Ceff	900	.009	S.F.	.31		.31	.48
					725	.011		.38		.38	.60
					630	.013		.44		.44	.69
					600	.013		.46		.46	.72
					550	.015		.50		.50	.79
					4	.2	Job	69		69	108
				C-10B	1000	.040	S.F.	.06	1.21	1.45	2.22
					950	.042		.17	1.27	1.63	2.45
					850	.047		.26	1.42	1.89	2.82
					750	.053		.35	1.61	2.19	3.25
					590	.068		.19	2.05	2.54	3.86
					580	.069		.29	2.08	2.67	4.02
					575	.070		.39	2.10	2.80	4.17

For expanded coverage of these items see Means Concrete & Masonry Cost Data 2006

Construction Management: Cost Estimate and Takeoffs

Table A.8: Steel Structural System Cost Estimate						
Steel Beams						
Size	Length (ft.)	Cost per Lin. Foot			Total	Total Cost
		Material	Labor	Equip.		
W8x10	16511.09	10.45	3.63	2.38	16.46	271772.5414
W10x12	34707.9	14.65	3.63	2.38	20.66	717065.214
W12x14	9095.67	14.65	2.48	1.62	18.75	170543.8125
W12x16	4326.33	23	2.48	1.62	27.1	117243.543
W12x19	9358.81	23	2.48	1.62	27.1	253623.751
W14x22	5384.31	27	2.2	1.44	30.64	164975.2584
W14x26	420	27	2.2	1.44	30.64	12868.8
W16x26	3259.31	27	2.18	1.43	30.61	99767.4791
W12x30	441	31.5	2.48	1.62	35.6	15699.6
W14x30	901.46	31.5	2.42	1.59	35.51	32010.8446
W16x31	2153.27	32.5	2.42	1.59	36.51	78615.8877
W14x34	28	35.5	2.69	1.76	39.95	1118.6
W12x35	21	35.5	2.48	1.62	39.6	831.6
W18x35	299.75	36.5	3.28	1.58	41.36	12397.66
W14x38	56	35.5	2.69	1.76	39.95	2237.2
W18x40	180	42	3.28	1.58	46.86	8434.8
W14x43	28	42	2.69	1.76	46.45	1300.6
W21x44	66.42	46	2.96	1.42	50.38	3346.2396
W14x48	122.75	52.5	3.46	1.66	57.62	7072.855
W16x50	32.92	52.5	2.72	1.78	57	1876.44
W21x50	135	52.5	2.96	1.42	56.88	7678.8
W14x74	1584.87	79.5	3.03	1.98	84.51	133937.3637
W24x76	21	79.5	2.84	1.37	83.71	1757.91
W14x82	7200	88	3.03	1.98	93.01	669672
W16x89	3426.83	88	2.72	1.78	92.5	316981.775
W24x103	42	113	2.92	1.4	117.32	4927.44
W24x131	42	136	2.92	1.4	140.32	5893.44
					Total =	3113651.455

Steel Columns						
		Cost per Lin. Foot				
Size	Length (ft.)	Mat.	Labor	Equip.	Total	Total Cost
W10x33	1662.1	47	2.11	1.38	50.49	83919.429
W10x39	168.3	47	2.11	1.38	50.49	8497.467
W12x40	78	47	2.11	1.38	50.49	3938.22
W14x43	2324.7	47	2.11	1.38	50.49	117374.103
W12x45	9.9	47	2.11	1.38	50.49	499.851
W10x45	84.7	47	2.11	1.38	50.49	4276.503
W14x48	496.3	50	2.11	1.38	53.49	26547.087
W10x49	296.9	50	2.11	1.38	53.49	15881.181
W12x50	9.9	52.5	2.11	1.38	55.99	554.301
W12x53	19.9	56	2.21	1.45	59.66	1187.234
W14x53	368.6	56	2.21	1.45	59.66	21990.676
W10x54	346.3	56	2.21	1.45	59.66	20660.258
W12x58	9.9	61	2.21	1.45	64.66	640.134
W10x60	99	63	2.21	1.45	66.66	6599.34
W14x61	951.7	64	2.21	1.45	67.66	64392.022
W12x65	29.8	71	2.21	1.45	74.66	2224.868
W10x68	395.8	71	2.21	1.45	74.66	29550.428
W14x68	449.5	71	2.21	1.45	74.66	33559.67
W12x72	19.9	75.5	2.21	1.45	79.16	1575.284
W14x74	333.5	77.5	2.21	1.45	81.16	27066.86
W12x79	19.9	82.5	2.21	1.45	86.16	1714.584
W14x82	340.7	85.5	2.21	1.45	89.16	30376.812
W12x87	12	91	2.27	1.49	94.76	1137.12
W14x90	1294.7	94	2.27	1.49	97.76	126569.872
W12x96	23.2	100	2.27	1.49	103.76	2407.232
W14x99	492.3	103	2.27	1.49	106.76	52557.948
W14x109	289.8	113.5	2.27	1.49	117.26	33981.948
W14x120	301	124.5	2.27	1.49	128.26	38606.26
W14x132	1054.1	137	2.39	1.56	140.95	148575.395
W12x136	49.5	141	2.39	1.56	144.95	7175.025
W14x145	402.8	150.5	2.39	1.56	154.45	62212.46
W14x159	49.5	165	2.39	1.56	168.95	8363.025
W14x176	346.4	182	2.39	1.56	185.95	64413.08
W14x193	99	199.5	2.39	1.56	203.45	20141.55
W14x211	529.3	218	2.47	1.62	222.09	117552.237
W14x233	518	241	2.47	1.62	245.09	126956.62
W14x257	9038.3	265.5	2.47	1.62	269.59	2436635.297
					Total =	3750311.381

Lateral Bracing						
Cost per Lin. Foot						
Size	Length (ft.)	Mat.	Labor	Equip.	Total	Total Cost
2L8x8x3/4	25884.8	20.55	5.81	0.47	26.83	694489.184
					Total =	694489.184

Shear Studs						
Cost per Stud						
Size	No. Studs	Mat.	Labor	Equip.	Total	Total Cost
3"x3/4"	67681	0.41	0.68	0.28	1.37	92722.97
					Total =	92722.97

Metal Deck						
Cost per Square Foot						
Size	Sq. Feet	Mat.	Labor	Equip.	Total	Total Cost
1.5", 18 GA	593800	1.61	0.3	0.02	1.93	1146034
					Total =	1146034

Concrete Slab						
Cost per Cubic Yard						
Size	Cu. Yards	Mat.	Labor	Equip.	Total	Total Cost
3" thick	5500	87	11.9	4.65	103.55	569525
					Total =	569525

Foundations								
Cost per Cubic Yard								
No. Caissons	Shaft Dia. (ft.)	Bell Dia. (ft.)	Cu. Yards	Mat.	Labor	Equip.	Total	Total Cost
19	2.5	3	784.22	38.5	73	169	280.5	219973.2
19	2.5	3.5	1067.41	38.5	73	169	280.5	299408.0
4	3.5	6	186.76	137	256	595	988	184520.1
27	4.5	5.5	1059.29	137	256	595	988	1046574.7
12	4.5	6.5	277.52	325	605	1400	2330	646613.4
15	4.5	7.5	461.84	325	605	1400	2330	1076094.9
							Total =	3473184.2

Ext. Cladding	Perimeter (ft.)	Height (ft.)	Sq. Feet	Cost per Square Foot			Total	Total Cost
				Mat.	Labor	Equip.		
25	609.91	11.6333	7095.27	12.4	5.5	3.01	20.91	148362.0121
24	665.89	11.4667	7635.56	12.4	5.5	3.01	20.91	159659.5776
23	721.06	11.4334	8244.17	12.4	5.5	3.01	20.91	172385.5404
22	749.82	13.6	10197.55	12.4	5.5	3.01	20.91	213230.8123
21	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
20	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
19	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
18	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
17	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
16	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
15	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
14	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
13	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
12	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
11	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
10	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
9	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
8	749.82	9.9417	7454.49	12.4	5.5	3.01	20.91	155873.2917
7	838.92	9.9417	8340.29	12.4	5.5	3.01	20.91	174395.4841
6	872.83	11.95	10430.32	12.4	5.5	3.01	20.91	218097.9598
5	885.21	11.95	10578.26	12.4	5.5	3.01	20.91	221191.4061
4	885.21	11.2833	9988.09	12.4	5.5	3.01	20.91	208850.9618
3	885.21	11.2833	9988.09	12.4	5.5	3.01	20.91	208850.9618
2	885.21	18.45	16332.12	12.4	5.5	3.01	20.91	341504.7233
1	885.21	19.7417	17475.55	12.4	5.5	3.01	20.91	365413.7559
							Total =	4614169.3

Total Cost Steel System =	17454087.5
----------------------------------	-------------------

Table A.9: Reinforced Cast-in-Place Concrete System Cost Estimate

Table A.9: Reinforced Cast-in-Place Concrete System Cost Estimate									
Concrete Columns	Floor	Area (sq. ft.)	Height (ft.)	Cu. Yards	Cost per Cubic Yards			Total	Total Cost
					Mat.	Labor	Equip.		
	25	106.43	10.8333	42.703	410	565	57.5	1032.5	44091.11974
	24	106.43	10.6667	42.047	410	565	57.5	1032.5	43413.06406
	23	106.43	10.6667	42.047	410	565	57.5	1032.5	43413.06406
	22	253.5	12	112.667	410	565	57.5	1032.5	116328.3333
	21	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	20	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	19	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	18	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	17	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	16	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	15	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	14	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	13	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	12	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	11	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	10	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	9	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	8	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	7	253.5	9.1667	86.065	410	565	57.5	1032.5	88862.24443
	6	611.7	11	249.211	370	400	41	811	202110.2111
	5	611.7	11	249.211	370	400	41	811	202110.2111
	4	611.7	10.3333	234.107	370	400	41	811	189860.495
	3	611.7	10.3333	234.107	370	400	41	811	189860.495
	2	611.7	17.5	396.472	370	400	41	811	321538.9722
	1	611.7	18.6667	422.904	370	400	41	811	342975.5162
								Total =	3028635.148

Concrete Slab	Size	Cu. Yards	Mat.	Cost per Cubic Yard			Total	Total Cost
				Labor	Equip.	Total		
	8" thick	14662	220	245	24	489	7169718	
						Total =	7169718	

Shear Walls									
					Cost per Cubic Yards				
Floor	Thick. (in.)	Length (ft.)	Height (ft.)	Cu. Yards	Material	Labor	Equip.	Total	Total Cost
25	12	185.5	10.8333	74.429	144	17.25	6.75	168	12504.0356
24	12	185.5	10.6667	73.284	144	17.25	6.75	168	12311.74218
23	12	185.5	10.6667	73.284	144	17.25	6.75	168	12311.74218
22	12	185.5	12	82.444	144	17.25	6.75	168	13850.66667
21	12	185.5	9.1667	62.979	144	17.25	6.75	168	10580.40884
20	12	185.5	9.1667	62.979	144	17.25	6.75	168	10580.40884
19	12	185.5	9.1667	62.979	144	17.25	6.75	168	10580.40884
18	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
17	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
16	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
15	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
14	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
13	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
12	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
11	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
10	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
9	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
8	15	185.5	9.1667	78.723	144	15.85	6.2	166.05	13072.00066
7	18	185.5	9.1667	94.468	144	15.85	6.2	166.05	15686.40079
6	18	185.5	11	113.361	144	15.85	6.2	166.05	18823.6125
5	18	185.5	11	113.361	144	15.85	6.2	166.05	18823.6125
4	18	185.5	10.3333	106.490	144	15.85	6.2	166.05	17682.73046
3	18	185.5	10.3333	106.490	144	15.85	6.2	166.05	17682.73046
2	18	185.5	17.5	180.347	144	15.85	6.2	166.05	29946.65625
1	18	185.5	18.6667	192.371	144	15.85	6.2	166.05	31943.15704
								Total =	377100.3204

Foundations								
Cost per Cubic Yard								
No. Caissons	Shaft Dia. (ft.)	Bell Dia. (ft.)	Cu. Yards	Mat.	Labor	Equip.	Total	Total Cost
18	2.5	6	840.43	137	256	595	988	830340.2
5	2.5	7	134.11	325	605	1400	2330	312466.1
6	2.5	7.5	184.74	325	605	1400	2330	430437.9
1	3	7.5	30.79	325	605	1400	2330	71739.7
11	3	8.5	435.02	325	605	1400	2330	1013601.6
1	3.5	8.5	331.34	325	605	1400	2330	772030.7
2	3.5	9	73.63	390	730	1700	2820	207639.5
5	3.5	9.5	205.10	390	730	1700	2820	578378.4
5	4	9	184.08	390	730	1700	2820	519098.7
3	4	10	116.58	455	855	2000	3310	385870.7
3	4	10.5	128.53	455	855	2000	3310	425422.4
1	4	11	47.02	455	855	2000	3310	155634.5
10	4.5	11.5	308.11	760	1450	3375	5585	1720803.2
6	4.5	12	201.29	760	1450	3375	5585	1124214.7
1	5	12.5	36.40	760	1450	3375	5585	203308.5
2	5	13.5	54.57	1175	2075	4825	8075	440681.6
2	5	14	58.69	1175	2075	4825	8075	473929.2
1	5.5	15	33.69	1175	2075	4825	8075	272025.7
1	6	15	33.69	1175	2075	4825	8075	272025.7
2	6	15.5	71.94	1175	2075	4825	8075	580926.0
							Total =	10790575.1

Ext. Cladding	Perimeter (ft.)	Height (ft.)	Sq. Feet	Cost per Square Foot			Total	Total Cost
				Mat.	Labor	Equip.		
25	609.91	10.8333	6607.34	12.4	5.5	3.01	20.91	138159.438
24	665.89	10.6667	7102.85	12.4	5.5	3.01	20.91	148520.57
23	721.06	10.6667	7691.33	12.4	5.5	3.01	20.91	160825.725
22	749.82	12	8997.84	12.4	5.5	3.01	20.91	188144.834
21	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
20	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
19	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
18	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
17	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
16	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
15	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
14	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
13	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
12	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
11	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
10	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
9	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
8	749.82	9.1667	6873.37	12.4	5.5	3.01	20.91	143722.271
7	838.92	9.1667	7690.13	12.4	5.5	3.01	20.91	160800.576
6	872.83	11	9601.13	12.4	5.5	3.01	20.91	200759.628
5	885.21	11	9737.31	12.4	5.5	3.01	20.91	203607.152
4	885.21	10.3333	9147.14	12.4	5.5	3.01	20.91	191266.708
3	885.21	10.3333	9147.14	12.4	5.5	3.01	20.91	191266.708
2	885.21	17.5	15491.18	12.4	5.5	3.01	20.91	323920.469
1	885.21	18.6667	16523.95	12.4	5.5	3.01	20.91	345515.784
							Total =	4264899.4

Total Cost Concrete System =	25630928.0
-------------------------------------	-------------------

Construction Management: Schedule Estimate

Table A.10: Steel Structural System Schedule Estimate					
Steel Beams					
Size	Length (ft.)	Crew	Daily Output	Labor Hours	Total Days
W8x10	16511.09	E2	600	0.093	27.5184833
W10x12	34707.9	E2	600	0.093	57.8465
W12x14	9095.67	E2	880	0.064	10.3359886
W12x16	4326.33	E2	600	0.093	7.21055
W12x19	9358.81	E2	600	0.093	15.5980167
W14x22	5384.31	E2	990	0.057	5.43869697
W14x26	420	E2	990	0.057	0.42424242
W16x26	3259.31	E2	1000	0.056	3.25931
W12x30	441	E2	990	0.057	0.44545455
W14x30	901.46	E2	900	0.062	1.00162222
W16x31	2153.27	E2	900	0.062	2.39252222
W14x34	28	E2	810	0.069	0.0345679
W12x35	21	E2	990	0.057	0.02121212
W18x35	299.75	E2	960	0.083	0.31223958
W14x38	56	E5	960	0.083	0.05833333
W18x40	180	E5	960	0.083	0.1875
W14x43	28	E5	960	0.083	0.02916667
W21x44	66.42	E5	1064	0.075	0.06242481
W14x48	122.75	E5	960	0.083	0.12786458
W16x50	32.92	E5	912	0.088	0.03609649
W21x50	135	E5	1064	0.075	0.1268797
W14x74	1584.87	E5	1110	0.072	1.42781081
W24x76	21	E5	1110	0.072	0.01891892
W14x82	7200	E5	1080	0.074	6.66666667
W16x89	3426.83	E5	1080	0.074	3.17299074
W24x103	42	E5	1200	0.067	0.035
W24x131	42	E5	1134	0.071	0.03703704
				Total =	143.826096

Steel Columns					
Size	Length (ft.)	Crew	Daily Output	Labor Hours	Total Days
W10x33	1662.1	E2	1032	0.054	1.61056202
W10x39	168.3	E2	1032	0.054	0.1630814
W12x40	78	E2	1032	0.054	0.0755814
W14x43	2324.7	E2	1032	0.054	2.25261628
W12x45	9.9	E2	1032	0.054	0.00959302
W10x45	84.7	E2	1032	0.054	0.08207364
W14x48	496.3	E2	1032	0.054	0.48091085
W10x49	296.9	E2	1032	0.054	0.2876938
W12x50	9.9	E2	1032	0.054	0.00959302
W12x53	19.9	E2	1032	0.054	0.01928295
W14x53	368.6	E2	1032	0.054	0.35717054
W10x54	346.3	E2	1032	0.054	0.33556202
W12x58	9.9	E2	984	0.057	0.01006098
W10x60	99	E2	984	0.057	0.10060976
W14x61	951.7	E2	984	0.057	0.9671748
W12x65	29.8	E2	984	0.057	0.03028455
W10x68	395.8	E2	984	0.057	0.40223577
W14x68	449.5	E2	984	0.057	0.45680894
W12x72	19.9	E2	984	0.057	0.02022358
W14x74	333.5	E2	984	0.057	0.33892276
W12x79	19.9	E2	984	0.057	0.02022358
W14x82	340.7	E2	984	0.057	0.34623984
W12x87	12	E2	984	0.057	0.01219512
W14x90	1294.7	E2	960	0.058	1.34864583
W12x96	23.2	E2	960	0.058	0.02416667
W14x99	492.3	E2	960	0.058	0.5128125
W14x109	289.8	E2	960	0.058	0.301875
W14x120	301	E2	960	0.058	0.31354167
W14x132	1054.1	E2	960	0.058	1.09802083
W12x136	49.5	E2	960	0.058	0.0515625
W14x145	402.8	E2	960	0.058	0.41958333
W14x159	49.5	E2	912	0.061	0.05427632
W14x176	346.4	E2	912	0.061	0.37982456
W14x193	99	E2	912	0.061	0.10855263
W14x211	529.3	E2	912	0.061	0.58037281
W14x233	518	E2	912	0.061	0.56798246
W14x257	9038.3	E2	912	0.061	9.91041667
				Total =	24.0603344

Lateral Bracing					
Size	Length (ft.)	Crew	Daily Output	Labor Hours	Total Days
2L8x8x3/4	25884.8	E4	225	0.134	115.043556
				Total =	115.043556

Shear Studs					
Size	No. Studs	Crew	Daily Output	Labor Hours	Total Days
3"x3/4"	67681	E10	960	0.017	70.5010417
				Total =	70.5010417

Metal Deck					
Size	Sq. Feet	Crew	Daily Output	Labor Hours	Total Days
1.5", 18 GA	593800	E4	4300	0.007	138.093023
				Total =	138.093023

Concrete Slab					
Size	Cu. Yards	Crew	Daily Output	Labor Hours	Total Days
3" thick	5500	C20	160	0.4	34.375
				Total =	34.375

Foundations					
Bell Dia. (ft.)	Cu. Yards	Crew	Daily Output	Labor Hours	Total Days
3	784.22	B-43	20	2.4	39.2
3.5	1067.41	B-43	20	2.4	53.4
6	186.76	B-43	5.7	8.421	32.8
5.5	1059.29	B-43	5.7	8.421	185.8
6.5	277.52	B-43	2.4	20	115.6
7.5	461.84	B-43	2.4	20	192.4
				Total =	619.3
Total No. Days Steel System =					1145.2

Table A.11: Reinforced Cast-in-Place Concrete System Schedule Estimate								
Concrete Columns								
	Floor	Area (sq. ft.)	Height (ft.)	Cu. Yards	Crew	Daily Output	Labor Hours	Total Days
	25	106.4	10.8333	42.703	C-14A	12.57	15.911	3.40
	24	106.4	10.6667	42.047	C-14A	12.57	15.911	3.34
	23	106.4	10.6667	42.047	C-14A	12.57	15.911	3.34
	22	253.5	12	112.667	C-14A	12.57	15.911	8.96
	21	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	20	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	19	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	18	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	17	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	16	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	15	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	14	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	13	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	12	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	11	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	10	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	9	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	8	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	7	253.5	9.1667	86.065	C-14A	12.57	15.911	6.85
	6	611.7	11	249.211	C-14A	17.71	11.293	14.07
	5	611.7	11	249.211	C-14A	17.71	11.293	14.07
	4	611.7	10.3333	234.107	C-14A	17.71	11.293	13.22
	3	611.7	10.3333	234.107	C-14A	17.71	11.293	13.22
	2	611.7	17.5	396.472	C-14A	17.71	11.293	22.39
	1	611.7	18.6667	422.904	C-14A	17.71	11.293	23.88
							Total =	222.60

Concrete Slab					
Size	Cu. Yards	Crew	Daily Output	Labor Hours	Total Days
8" thick	14662	C-14B	30.24	6.878	484.85
				Total =	484.85

Shear Walls								
Floor	Thick. (in.)	Length (ft.)	Height (ft.)	Cu. Yards	Crew	Daily Output	Labor Hours	Total Days
25	12	185.5	10.8333	74.429	C-14D	64.32	3.109	1.157
24	12	185.5	10.6667	73.284	C-14D	64.32	3.109	1.139
23	12	185.5	10.6667	73.284	C-14D	64.32	3.109	1.139
22	12	185.5	12	82.444	C-14D	64.32	3.109	1.282
21	12	185.5	9.1667	62.979	C-14D	64.32	3.109	0.979
20	12	185.5	9.1667	62.979	C-14D	64.32	3.109	0.979
19	12	185.5	9.1667	62.979	C-14D	64.32	3.109	0.979
18	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
17	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
16	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
15	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
14	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
13	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
12	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
11	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
10	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
9	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
8	15	185.5	9.1667	78.723	C-14D	80.02	2.499	0.984
7	18	185.5	9.1667	94.468	C-14D	80.02	2.499	1.181
6	18	185.5	11	113.361	C-14D	80.02	2.499	1.417
5	18	185.5	11	113.361	C-14D	80.02	2.499	1.417
4	18	185.5	10.3333	106.490	C-14D	80.02	2.499	1.331
3	18	185.5	10.3333	106.490	C-14D	80.02	2.499	1.331
2	18	185.5	17.5	180.347	C-14D	80.02	2.499	2.254
1	18	185.5	18.6667	192.371	C-14D	80.02	2.499	2.404
							Total =	29.810

Foundations									
	No. Caissons	Shaft Dia. (ft.)	Bell Dia. (ft.)	Cu. Yards	Crew	Daily Output	Labor Hours	Total Days	
	18	2.5	6	840.43	B-43	5.7	8.421	147.4	
	5	2.5	7	134.11	B-43	2.4	20	55.9	
	6	2.5	7.5	184.74	B-43	2.4	20	77.0	
	1	3	7.5	30.79	B-43	2.4	20	12.8	
	11	3	8.5	435.02	B-43	2.4	20	181.3	
	1	3.5	8.5	331.34	B-43	2.4	20	138.1	
	2	3.5	9	73.63	B-43	2	24	36.8	
	5	3.5	9.5	205.10	B-43	2	24	102.5	
	5	4	9	184.08	B-43	2	24	92.0	
	3	4	10	116.58	B-43	1.7	28.235	68.6	
	3	4	10.5	128.53	B-43	1.7	28.235	75.6	
	1	4	11	47.02	B-43	1.7	28.235	27.7	
	10	4.5	11.5	308.11	B-43	1	48	308.1	
	6	4.5	12	201.29	B-43	1	48	201.3	
	1	5	12.5	36.40	B-43	1	48	36.4	
	2	5	13.5	54.57	B-43	0.7	68.571	78.0	
	2	5	14	58.69	B-43	0.7	68.571	83.8	
	1	5.5	15	33.69	B-43	0.7	68.571	48.1	
	1	6	15	33.69	B-43	0.7	68.571	48.1	
	2	6	15.5	71.94	B-43	0.7	68.571	102.8	
							Total =	1922.3	
			Total No. Days Concrete System =						2659.58