HARTMAN ENGINEERING

BY: RJH DATE: 03-08-2006 SUBJECT _____ SHT. NO.: RAC - 53 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 53

INPUT DATA

Applied Load = 18386 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.071
Radius CL = 24.25 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	477	0.00	0	7	0.00	0	477 to 682	0.00	0
5	477	2.61	33	7	0.99	8	477 to 682	5.35	60
10	477	4.91	125	7	1.87	37	477 to 681	10.07	239
15	477	6.87	263	7	2.64	91	477 to 681	14.11	524
20	477	8.47	434	7	3.24	162	477 to 681	17.38	885
25	477	9.69	640	7	3.68	250	477 to 681	19.84	1322
30	477	10.55	859	7	3.98	346	477 to 682	21.54	1791
35	477	11.04	1075	8	4.08	442	477 to 682	22.40	2258
40	477	11.20	1296	8	4.05	540	477 to 683	22.59	2734
45	477	11.06	1502	8	4.15	636	477 to 683	22.54	3184
50	477	10.63	1688	9	3.84	719	477 to 684	21.43	3587
55	477	9.98	1850	9	3.49	787	477 to 684	19.90	3928
60	477	9.13	1981	9	3.14	838	477 to 685	18.14	4199
65	477	8.15	2072	10	2.87	880	477 to 685	16.30	4397
70	477	7.08	2131	10	2.71	900	477 to 685	14.53	4516
75	477	5.97	2139	10	2.67	900	477 to 685	12.91	4526
80	477	4.86	2104	10	2.80	879	477 to 685	11.57	4442
85	477	5.05	2022	10	3.06	837	477 to 685	12.28	4254
90	477	6.81	1885	10	3.57	774	477 to 685	15.60	3956
95	477	8.66	1699	9	3.66	691	477 to 685	18.36	3554
100	477	10.57	1463	9	4.41	589	477 to 684	22.31	3051
105	477	12.51	1172	9	5.13	470	477 to 684	26.26	2441
110	477	14.48	830	8	5.83	331	477 to 683	30.19	1725
115	477	16.37	440	8	6.53	174	477 to 682	34.02	912
120	477	18.27	0	7	7.17	0	477 to 682	37.78	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-08-2006 SUBJECT _____ SHT. NO.: RAC - 54 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 54

INPUT DATA

Applied Load = 17948 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.073
Radius CL = 24.25 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	467	0.00	0	7	0.00	0	467 to 667	0.00	0
5	467	2.62	33	7	0.99	8	467 to 667	5.36	61
10	467	4.93	125	7	1.87	37	467 to 667	10.09	239
15	467	6.90	264	7	2.64	91	467 to 667	14.15	526
20	467	8.50	436	7	3.24	162	467 to 667	17.42	887
25	467	9.73	642	7	3.68	250	467 to 667	19.89	1326
30	467	10.59	862	7	3.98	346	467 to 667	21.59	1796
35	467	11.09	1079	8	4.08	442	467 to 667	22.46	2264
40	467	11.25	1301	8	4.05	540	467 to 668	22.64	2741
45	467	11.10	1507	8	4.15	636	467 to 668	22.59	3192
50	467	10.67	1694	9	3.84	719	467 to 669	21.48	3596
55	467	10.01	1856	9	3.49	787	467 to 670	19.95	3938
60	467	9.17	1989	9	3.14	838	467 to 670	18.19	4209
65	467	8.18	2080	10	2.87	880	467 to 670	16.35	4408
70	467	7.11	2139	10	2.71	900	467 to 671	14.56	4527
75	467	5.99	2147	10	2.67	900	467 to 671	12.94	4537
80	467	4.88	2112	10	2.80	879	467 to 671	11.60	4452
85	467	5.07	2030	10	3.06	837	467 to 671	12.31	4265
90	467	6.83	1892	10	3.57	774	467 to 670	15.64	3965
95	467	8.69	1705	9	3.66	691	467 to 670	18.40	3563
100	467	10.61	1468	9	4.41	589	467 to 670	22.36	3059
105	467	12.56	1177	9	5.13	470	467 to 669	26.32	2447
110	467	14.53	833	8	5.83	331	467 to 668	30.27	1730
115	467	16.43	441	8	6.53	174	467 to 668	34.10	914
120	467	18.34	0	7	7.17	0	467 to 667	37.88	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-08-2006 SUBJECT _____ SHT. NO.: RAC - 55 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 55

INPUT DATA

Applied Load = 5719 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.309
Radius CL = 29.1 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	217	0.00	0	3	0.00	0	217 to 311	0.00	0
5	217	4.25	64	3	0.42	5	217 to 311	6.67	99
10	217	7.98	244	3	1.06	26	217 to 311	12.99	386
15	217	11.16	513	3	1.38	62	217 to 311	17.99	824
20	217	13.76	847	3	1.83	109	217 to 311	22.38	1372
25	217	15.75	1248	3	1.99	166	217 to 311	25.43	2031
30	217	17.14	1675	4	2.21	227	217 to 311	27.76	2732
35	217	17.95	2096	4	2.20	288	217 to 312	28.88	3425
40	217	18.21	2528	4	2.22	352	217 to 312	29.27	4139
45	217	17.96	2927	4	2.08	411	217 to 312	28.70	4799
50	217	17.28	3291	4	1.98	462	217 to 312	27.56	5394
55	217	16.21	3606	4	1.75	502	217 to 313	25.68	5904
60	217	14.84	3863	4	1.64	534	217 to 313	23.57	6316
65	217	13.24	4040	5	1.56	558	217 to 313	21.20	6605
70	217	11.50	4155	5	1.45	569	217 to 313	18.57	6786
75	217	9.69	4170	5	1.54	567	217 to 313	16.19	6803
80	217	7.89	4103	5	1.55	552	217 to 313	13.69	6684
85	217	8.21	3943	5	1.76	524	217 to 313	14.51	6412
90	217	11.06	3675	5	1.79	484	217 to 313	18.53	5969
95	217	14.08	3313	4	1.92	431	217 to 313	22.99	5372
100	217	17.17	2852	4	2.31	367	217 to 313	27.98	4617
105	217	20.33	2286	4	2.67	291	217 to 312	33.02	3697
110	217	23.52	1618	4	3.02	205	217 to 312	38.07	2615
115	217	26.59	858	4	3.37	107	217 to 312	42.97	1384
120	217	29.69	0	3	3.70	0	217 to 311	47.85	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-08-2006 SUBJECT _____ SHT. NO.: RAC - 56 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 56

INPUT DATA

Applied Load = 7486 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.22
Radius CL = 29.1 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	265	0.00	0	3	0.00	0	265 to 378	0.00	0
5	265	3.96	60	3	0.42	5	265 to 378	6.27	93
10	265	7.44	227	3	1.06	26	265 to 378	12.23	363
15	265	10.40	478	3	1.38	62	265 to 378	16.93	775
20	265	12.82	789	3	1.83	109	265 to 378	21.06	1292
25	265	14.67	1163	3	1.99	166	265 to 378	23.93	1912
30	265	15.97	1561	4	2.21	227	265 to 378	26.13	2573
35	265	16.72	1954	4	2.20	288	265 to 379	27.17	3226
40	265	16.97	2355	4	2.22	352	265 to 379	27.54	3898
45	265	16.74	2728	4	2.08	411	265 to 379	26.99	4520
50	265	16.10	3067	4	1.98	462	265 to 380	25.91	5081
55	265	15.11	3361	4	1.75	502	265 to 380	24.13	5560
60	265	13.83	3600	4	1.64	534	265 to 380	22.15	5948
65	265	12.34	3765	5	1.56	558	265 to 380	19.94	6220
70	265	10.72	3873	5	1.45	569	265 to 380	17.48	6390
75	265	9.03	3886	5	1.54	567	265 to 380	15.27	6406
80	265	7.36	3824	5	1.55	552	265 to 380	12.94	6293
85	265	7.65	3674	5	1.76	524	265 to 380	13.73	6036
90	265	10.31	3425	5	1.79	484	265 to 380	17.48	5619
95	265	13.12	3087	4	1.92	431	265 to 380	21.65	5057
100	265	16.00	2658	4	2.31	367	265 to 380	26.34	4346
105	265	18.95	2130	4	2.67	291	265 to 379	31.08	3479
110	265	21.92	1508	4	3.02	205	265 to 379	35.83	2461
115	265	24.78	799	4	3.37	107	265 to 379	40.43	1302
120	265	27.66	0	3	3.70	0	265 to 378	45.02	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-08-2006 SUBJECT _____ SHT. NO.: RAC - 57 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 57

INPUT DATA

Applied Load = 14626 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.111
Radius CL = 29.1 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	472	0.00	0	13	0.00	0	472 to 684	0.00	0
5	472	3.90	59	13	1.42	16	472 to 684	7.89	111
10	472	7.33	224	13	3.55	87	472 to 684	16.32	462
15	472	10.26	471	13	4.62	207	472 to 684	22.23	1013
20	472	12.64	778	12	6.11	366	472 to 684	28.09	1712
25	472	14.47	1146	13	6.64	557	472 to 684	31.56	2552
30	472	15.74	1539	13	7.39	760	472 to 684	34.62	3448
35	472	16.49	1926	13	7.37	962	472 to 685	35.62	4333
40	472	16.72	2322	14	7.43	1177	472 to 686	36.05	5253
45	472	16.50	2689	15	6.96	1374	472 to 687	34.94	6102
50	472	15.87	3024	15	6.62	1543	472 to 688	33.48	6857
55	472	14.89	3313	16	5.85	1678	472 to 689	30.81	7492
60	472	13.63	3549	16	5.47	1783	472 to 690	28.40	8000
65	472	12.17	3711	17	5.22	1863	472 to 690	25.92	8363
70	472	10.57	3817	17	4.84	1900	472 to 691	23.03	8575
75	472	8.91	3831	17	5.14	1893	472 to 691	21.21	8584
80	472	7.25	3769	17	5.18	1844	472 to 691	18.97	8412
85	472	7.54	3622	17	5.90	1751	472 to 691	20.61	8049
90	472	10.16	3376	16	5.98	1616	472 to 690	24.39	7476
95	472	12.93	3043	16	6.43	1440	472 to 690	29.05	6711
100	472	15.78	2620	16	7.72	1225	472 to 689	35.22	5751
105	472	18.68	2100	15	8.94	974	472 to 688	41.36	4597
110	472	21.61	1487	14	10.10	685	472 to 687	47.42	3247
115	472	24.43	788	14	11.26	360	472 to 685	53.35	1715
120	472	27.27	0	13	12.35	0	472 to 684	59.18	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-08-2006 SUBJECT _____ SHT. NO.: RAC - 58 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 58

INPUT DATA

Applied Load = 16832 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.
Variation Factor = 1.095
Radius CL = 29.1 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	536	0.00	0	13	0.00	0	536 to 773	0.00	0
5	536	3.84	58	13	1.42	16	536 to 773	7.81	110
10	536	7.22	220	13	3.55	87	536 to 773	16.17	457
15	536	10.10	464	13	4.62	207	536 to 773	22.01	1003
20	536	12.45	766	12	6.11	366	536 to 772	27.82	1696
25	536	14.25	1129	13	6.64	557	536 to 773	31.25	2528
30	536	15.51	1515	13	7.39	760	536 to 773	34.29	3415
35	536	16.24	1897	13	7.37	962	536 to 774	35.27	4293
40	536	16.47	2287	14	7.43	1177	536 to 775	35.70	5204
45	536	16.25	2649	15	6.96	1374	536 to 776	34.60	6045
50	536	15.63	2978	15	6.62	1543	536 to 777	33.14	6793
55	536	14.67	3263	16	5.85	1678	536 to 778	30.50	7422
60	536	13.43	3495	16	5.47	1783	536 to 779	28.12	7925
65	536	11.98	3655	17	5.22	1863	536 to 779	25.66	8285
70	536	10.41	3760	17	4.84	1900	536 to 780	22.80	8495
75	536	8.77	3773	17	5.14	1893	536 to 780	21.02	8503
80	536	7.14	3713	17	5.18	1844	536 to 780	18.82	8333
85	536	7.43	3567	17	5.90	1751	536 to 780	20.45	7972
90	536	10.01	3326	16	5.98	1616	536 to 779	24.18	7405
95	536	12.74	2998	16	6.43	1440	536 to 778	28.78	6646
100	536	15.54	2581	16	7.72	1225	536 to 778	34.88	5696
105	536	18.40	2069	15	8.94	974	536 to 777	40.96	4553
110	536	21.28	1464	14	10.10	685	536 to 776	46.97	3216
115	536	24.06	776	14	11.26	360	536 to 774	52.84	1699
120	536	26.86	0	13	12.35	0	536 to 773	58.60	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-08-2006 SUBJECT _____ SHT. NO.: RAC - 59 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 59

INPUT DATA

Applied Load = 18386 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.071
Radius CL = 29.1 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	573	0.00	0	8	0.00	0	573 to 817	0.00	0
5	573	3.14	47	8	0.96	11	573 to 817	6.03	86
10	573	5.90	180	8	2.39	58	573 to 817	12.33	352
15	573	8.25	379	8	3.11	139	573 to 817	16.85	768
20	573	10.16	625	8	4.11	246	573 to 817	21.23	1295
25	573	11.63	921	8	4.47	375	573 to 817	23.90	1928
30	573	12.66	1237	9	4.98	512	573 to 817	26.19	2603
35	573	13.25	1548	9	4.96	648	573 to 818	27.00	3271
40	573	13.45	1867	9	5.00	793	573 to 818	27.34	3963
45	573	13.27	2162	10	4.69	925	573 to 819	26.55	4602
50	573	12.76	2431	10	4.46	1039	573 to 820	25.45	5171
55	573	11.97	2664	10	3.94	1130	573 to 820	23.47	5651
60	573	10.96	2853	11	3.69	1201	573 to 821	21.62	6037
65	573	9.78	2984	11	3.51	1255	573 to 821	19.68	6311
70	573	8.50	3069	11	3.26	1280	573 to 822	17.44	6473
75	573	7.16	3080	11	3.46	1275	573 to 822	15.91	6482
80	573	5.83	3031	11	3.49	1242	573 to 822	14.10	6355
85	573	6.07	2912	11	3.97	1179	573 to 821	15.26	6083
90	573	8.17	2715	11	4.02	1089	573 to 821	18.29	5653
95	573	10.40	2447	11	4.33	970	573 to 821	21.93	5076
100	573	12.68	2107	10	5.20	825	573 to 820	26.60	4353
105	573	15.02	1689	10	6.02	656	573 to 819	31.27	3480
110	573	17.37	1195	9	6.80	461	573 to 819	35.89	2459
115	573	19.64	633	9	7.58	242	573 to 818	40.40	1299
120	573	21.93	0	8	8.32	0	573 to 817	44.84	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-08-2006 SUBJECT _____ SHT. NO.: RAC - 60 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 60

INPUT DATA

Applied Load = 17948 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.073
Radius CL = 29.1 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	560	0.00	0	8	0.00	0	560 to 799	0.00	0
5	560	3.15	48	8	0.96	11	560 to 799	6.04	86
10	560	5.92	180	8	2.39	58	560 to 799	12.36	353
15	560	8.28	380	8	3.11	139	560 to 799	16.89	770
20	560	10.20	628	8	4.11	246	560 to 799	21.28	1298
25	560	11.67	925	8	4.47	375	560 to 799	23.96	1933
30	560	12.70	1242	9	4.98	512	560 to 799	26.26	2610
35	560	13.30	1554	9	4.96	648	560 to 800	27.07	3279
40	560	13.50	1874	9	5.00	793	560 to 801	27.41	3972
45	560	13.32	2170	10	4.69	925	560 to 801	26.62	4613
50	560	12.81	2440	10	4.46	1039	560 to 802	25.51	5184
55	560	12.02	2673	10	3.94	1130	560 to 803	23.53	5665
60	560	11.00	2864	11	3.69	1201	560 to 803	21.68	6052
65	560	9.82	2995	11	3.51	1255	560 to 804	19.73	6327
70	560	8.53	3081	11	3.26	1280	560 to 804	17.48	6489
75	560	7.19	3092	11	3.46	1275	560 to 804	15.95	6497
80	560	5.85	3042	11	3.49	1242	560 to 804	14.13	6371
85	560	6.09	2923	11	3.97	1179	560 to 804	15.29	6098
90	560	8.20	2725	11	4.02	1089	560 to 803	18.33	5667
95	560	10.43	2456	11	4.33	970	560 to 803	21.98	5089
100	560	12.73	2115	10	5.20	825	560 to 802	26.67	4364
105	560	15.07	1695	10	6.02	656	560 to 802	31.35	3489
110	560	17.44	1200	9	6.80	461	560 to 801	35.98	2465
115	560	19.71	636	9	7.58	242	560 to 800	40.50	1303
120	560	22.01	0	8	8.32	0	560 to 799	44.96	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 61 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 61

INPUT DATA

Applied Load = 5719 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.309
Radius CL = 33.95 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	254	0.00	0	4	0.00	0	254 to 363	0.00	0
5	254	4.95	88	4	0.41	7	254 to 363	7.64	135
10	254	9.32	332	4	1.04	38	254 to 363	14.83	529
15	254	13.03	698	4	1.60	87	254 to 363	20.96	1127
20	254	16.05	1153	4	2.01	154	254 to 363	25.90	1878
25	254	18.37	1698	4	2.33	233	254 to 363	29.70	2774
30	254	19.99	2280	4	2.49	315	254 to 363	32.24	3728
35	254	20.94	2853	4	2.58	398	254 to 363	33.70	4672
40	254	21.24	3440	4	2.51	484	254 to 364	34.02	5640
45	254	20.96	3985	5	2.40	561	254 to 364	33.44	6533
50	254	20.16	4480	5	2.23	626	254 to 364	32.02	7337
55	254	18.91	4909	5	2.03	677	254 to 365	29.95	8025
60	254	17.31	5258	5	1.86	718	254 to 365	27.41	8582
65	254	15.45	5499	5	1.73	747	254 to 365	24.59	8969
70	254	13.42	5656	5	1.69	760	254 to 365	21.67	9211
75	254	11.31	5676	5	1.73	756	254 to 365	18.78	9232
80	254	9.21	5585	5	1.83	734	254 to 365	16.01	9068
85	254	9.58	5366	5	2.00	696	254 to 365	16.82	8698
90	254	12.90	5003	5	2.22	642	254 to 365	21.85	8096
95	254	16.42	4509	5	2.32	571	254 to 365	26.94	7285
100	254	20.04	3883	5	2.63	485	254 to 364	32.54	6261
105	254	23.72	3112	5	3.04	384	254 to 364	38.39	5010
110	254	27.44	2203	4	3.43	269	254 to 364	44.25	3543
115	254	31.02	1167	4	3.80	141	254 to 363	49.90	1875
120	254	34.63	0	4	4.16	0	254 to 363	55.56	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 62 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 62

INPUT DATA

Applied Load = 7486 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.22
Radius CL = 33.95 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	310	0.00	0	4	0.00	0	310 to 441	0.00	0
5	310	4.62	82	4	0.41	7	310 to 441	7.17	127
10	310	8.68	309	4	1.04	38	310 to 441	13.94	498
15	310	12.14	651	4	1.60	87	310 to 441	19.72	1060
20	310	14.96	1074	4	2.01	154	310 to 441	24.37	1768
25	310	17.12	1583	4	2.33	233	310 to 441	27.95	2612
30	310	18.63	2125	4	2.49	315	310 to 441	30.33	3510
35	310	19.51	2659	4	2.58	398	310 to 441	31.71	4400
40	310	19.79	3206	4	2.51	484	310 to 442	31.99	5312
45	310	19.53	3714	5	2.40	561	310 to 442	31.44	6153
50	310	18.78	4175	5	2.23	626	310 to 443	30.10	6910
55	310	17.62	4574	5	2.03	677	310 to 443	28.14	7557
60	310	16.14	4900	5	1.86	718	310 to 443	25.76	8081
65	310	14.40	5125	5	1.73	747	310 to 443	23.11	8446
70	310	12.51	5271	5	1.69	760	310 to 443	20.39	8672
75	310	10.54	5290	5	1.73	756	310 to 443	17.70	8692
80	310	8.58	5205	5	1.83	734	310 to 443	15.14	8536
85	310	8.93	5001	5	2.00	696	310 to 443	15.90	8186
90	310	12.02	4662	5	2.22	642	310 to 443	20.62	7619
95	310	15.30	4203	5	2.32	571	310 to 443	25.37	6855
100	310	18.67	3618	5	2.63	485	310 to 443	30.63	5891
105	310	22.11	2900	5	3.04	384	310 to 442	36.13	4714
110	310	25.57	2053	4	3.43	269	310 to 442	41.63	3333
115	310	28.91	1088	4	3.80	141	310 to 441	46.94	1764
120	310	32.28	0	4	4.16	0	310 to 441	52.26	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 63 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 63

INPUT DATA

Applied Load = 14626 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.111
Radius CL = 33.95 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	551	0.00	0	14	0.00	0	551 to 797	0.00	0
5	551	4.55	81	14	1.38	24	551 to 796	8.73	154
10	551	8.56	305	14	3.50	126	551 to 796	17.94	643
15	551	11.97	642	14	5.35	292	551 to 796	25.85	1396
20	551	14.74	1059	14	6.73	517	551 to 796	32.09	2362
25	551	16.88	1560	14	7.80	778	551 to 796	36.90	3507
30	551	18.37	2094	14	8.33	1051	551 to 797	39.89	4721
35	551	19.23	2621	15	8.61	1329	551 to 798	41.57	5930
40	551	19.51	3161	16	8.39	1615	551 to 799	41.60	7172
45	551	19.25	3661	16	8.03	1873	551 to 801	40.62	8310
50	551	18.52	4116	17	7.46	2091	551 to 802	38.61	9317
55	551	17.37	4509	18	6.80	2262	551 to 803	35.90	10160
60	551	15.91	4831	18	6.21	2396	551 to 803	32.84	10838
65	551	14.20	5052	18	5.79	2495	551 to 804	29.72	11315
70	551	12.33	5196	19	5.64	2537	551 to 804	26.86	11589
75	551	10.39	5215	19	5.77	2523	551 to 805	24.37	11591
80	551	8.46	5131	19	6.12	2452	551 to 805	22.25	11352
85	551	8.80	4930	19	6.67	2325	551 to 804	23.68	10855
90	551	11.85	4596	18	7.42	2143	551 to 804	29.22	10078
95	551	15.09	4143	18	7.74	1907	551 to 803	34.29	9043
100	551	18.41	3567	17	8.80	1620	551 to 802	40.73	7748
105	551	21.79	2859	17	10.16	1282	551 to 801	47.79	6183
110	551	25.21	2024	16	11.44	901	551 to 799	54.76	4365
115	551	28.50	1072	15	12.68	472	551 to 798	61.47	2305
120	551	31.82	0	14	13.89	0	551 to 797	68.16	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 64 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 64

INPUT DATA

Applied Load = 16832 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.
Variation Factor = 1.095
Radius CL = 33.95 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	625	0.00	0	14	0.00	0	625 to 900	0.00	0
5	625	4.48	79	14	1.38	24	625 to 900	8.64	153
10	625	8.43	300	14	3.50	126	625 to 900	17.76	636
15	625	11.79	632	14	5.35	292	625 to 900	25.60	1382
20	625	14.52	1043	14	6.73	517	625 to 900	31.78	2340
25	625	16.62	1537	14	7.80	778	625 to 900	36.54	3474
30	625	18.09	2063	14	8.33	1051	625 to 901	39.50	4676
35	625	18.94	2582	15	8.61	1329	625 to 902	41.17	5875
40	625	19.22	3113	16	8.39	1615	625 to 903	41.19	7105
45	625	18.96	3606	16	8.03	1873	625 to 904	40.22	8233
50	625	18.24	4054	17	7.46	2091	625 to 905	38.22	9230
55	625	17.11	4442	18	6.80	2262	625 to 906	35.53	10065
60	625	15.67	4758	18	6.21	2396	625 to 907	32.51	10736
65	625	13.98	4976	18	5.79	2495	625 to 908	29.42	11208
70	625	12.14	5118	19	5.64	2537	625 to 908	26.60	11480
75	625	10.23	5136	19	5.77	2523	625 to 908	24.15	11481
80	625	8.33	5053	19	6.12	2452	625 to 908	22.08	11244
85	625	8.67	4856	19	6.67	2325	625 to 908	23.49	10752
90	625	11.67	4527	18	7.42	2143	625 to 907	28.97	9981
95	625	14.86	4080	18	7.74	1907	625 to 907	33.97	8956
100	625	18.13	3513	17	8.80	1620	625 to 906	40.34	7673
105	625	21.46	2816	17	10.16	1282	625 to 904	47.33	6123
110	625	24.83	1993	16	11.44	901	625 to 903	54.23	4323
115	625	28.07	1056	15	12.68	472	625 to 902	60.87	2283
120	625	31.34	0	14	13.89	0	625 to 900	67.49	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 65 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 65

INPUT DATA

Applied Load = 18386 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.071
Radius CL = 33.95 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	668	0.00	0	9	0.00	0	668 to 952	0.00	0
5	668	3.66	65	9	0.93	16	668 to 952	6.71	119
10	668	6.88	245	9	2.36	85	668 to 952	13.65	488
15	668	9.62	516	9	3.60	197	668 to 952	19.60	1057
20	668	11.85	851	9	4.53	348	668 to 952	24.31	1784
25	668	13.57	1254	9	5.25	524	668 to 952	27.94	2647
30	668	14.77	1684	9	5.61	708	668 to 952	30.23	3562
35	668	15.46	2108	10	5.80	895	668 to 953	31.52	4473
40	668	15.69	2541	10	5.65	1088	668 to 954	31.59	5408
45	668	15.48	2943	11	5.41	1261	668 to 955	30.88	6266
50	668	14.89	3309	11	5.02	1408	668 to 956	29.39	7028
55	668	13.97	3626	12	4.58	1524	668 to 956	27.35	7667
60	668	12.79	3884	12	4.18	1614	668 to 957	25.03	8183
65	668	11.41	4062	12	3.90	1681	668 to 957	22.61	8544
70	668	9.91	4178	12	3.80	1709	668 to 957	20.35	8756
75	668	8.35	4193	12	3.88	1699	668 to 958	18.31	8760
80	668	6.80	4125	12	4.12	1651	668 to 957	16.54	8584
85	668	7.08	3964	12	4.49	1566	668 to 957	17.56	8213
90	668	9.53	3695	12	5.00	1443	668 to 957	21.85	7628
95	668	12.13	3331	12	5.21	1285	668 to 956	25.85	6848
100	668	14.80	2868	11	5.92	1091	668 to 956	30.80	5870
105	668	17.52	2299	11	6.84	864	668 to 955	36.17	4687
110	668	20.27	1627	10	7.71	606	668 to 954	41.49	3310
115	668	22.92	862	10	8.54	318	668 to 953	46.61	1749
120	668	25.58	0	9	9.35	0	668 to 952	51.72	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 66 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 66

INPUT DATA

Applied Load = 17948 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.073
Radius CL = 33.95 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	653	0.00	0	9	0.00	0	653 to 931	0.00	0
5	653	3.67	65	9	0.93	16	653 to 931	6.73	119
10	653	6.91	246	9	2.36	85	653 to 931	13.68	490
15	653	9.66	518	9	3.60	197	653 to 931	19.65	1060
20	653	11.90	855	9	4.53	348	653 to 931	24.37	1789
25	653	13.62	1259	9	5.25	524	653 to 931	28.01	2654
30	653	14.82	1690	9	5.61	708	653 to 932	30.30	3571
35	653	15.52	2115	10	5.80	895	653 to 933	31.60	4484
40	653	15.75	2551	10	5.65	1088	653 to 933	31.67	5422
45	653	15.54	2954	11	5.41	1261	653 to 934	30.96	6281
50	653	14.94	3321	11	5.02	1408	653 to 935	29.47	7045
55	653	14.02	3639	12	4.58	1524	653 to 936	27.43	7686
60	653	12.84	3898	12	4.18	1614	653 to 936	25.09	8203
65	653	11.46	4077	12	3.90	1681	653 to 937	22.67	8565
70	653	9.95	4193	12	3.80	1709	653 to 937	20.40	8777
75	653	8.38	4208	12	3.88	1699	653 to 937	18.35	8782
80	653	6.83	4140	12	4.12	1651	653 to 937	16.57	8605
85	653	7.10	3979	12	4.49	1566	653 to 937	17.59	8233
90	653	9.56	3709	12	5.00	1443	653 to 936	21.90	7647
95	653	12.17	3343	12	5.21	1285	653 to 936	25.92	6865
100	653	14.85	2879	11	5.92	1091	653 to 935	30.88	5885
105	653	17.58	2307	11	6.84	864	653 to 934	36.26	4699
110	653	20.34	1633	10	7.71	606	653 to 933	41.59	3318
115	653	23.00	865	10	8.54	318	653 to 932	46.73	1753
120	653	25.68	0	9	9.35	0	653 to 931	51.86	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 67 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 67

INPUT DATA

Applied Load = 5719 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.309
Radius CL = 38.8 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	290	0.00	0	4	0.00	0	290 to 414	0.00	0
5	290	5.66	115	4	0.69	10	290 to 414	9.11	179
10	290	10.65	433	4	1.28	52	290 to 414	17.09	696
15	290	14.89	912	4	2.05	118	290 to 414	24.34	1478
20	290	18.34	1506	4	2.39	207	290 to 414	29.75	2462
25	290	21.00	2218	4	2.67	309	290 to 414	33.95	3632
30	290	22.85	2978	4	2.91	414	290 to 414	36.95	4875
35	290	23.93	3727	5	2.92	524	290 to 415	38.48	6109
40	290	24.28	4494	5	2.90	632	290 to 415	38.93	7367
45	290	23.95	5205	5	2.69	729	290 to 416	38.12	8527
50	290	23.04	5852	5	2.46	810	290 to 416	36.44	9570
55	290	21.61	6411	5	2.28	873	290 to 416	34.15	10461
60	290	19.79	6868	6	2.06	921	290 to 417	31.21	11182
65	290	17.66	7182	6	1.99	957	290 to 417	28.13	11682
70	290	15.34	7388	6	1.92	971	290 to 417	24.74	11994
75	290	12.93	7414	6	1.91	963	290 to 417	21.35	12019
80	290	10.53	7294	6	2.08	935	290 to 417	18.29	11802
85	290	10.95	7009	6	2.21	885	290 to 417	19.10	11319
90	290	14.75	6534	6	2.40	815	290 to 417	24.74	10534
95	290	18.77	5890	5	2.76	724	290 to 416	30.99	9479
100	290	22.90	5071	5	2.93	615	290 to 416	37.05	8146
105	290	27.11	4065	5	3.38	486	290 to 416	43.71	6518
110	290	31.36	2877	5	3.80	340	290 to 415	50.37	4607
115	290	35.46	1525	4	4.19	178	290 to 415	56.77	2438
120	290	39.58	0	4	4.57	0	290 to 414	63.20	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 68 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 68

INPUT DATA

Applied Load = 7486 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.
Variation Factor = 1.22
Radius CL = 38.8 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	354	0.00	0	4	0.00	0	354 to 504	0.00	0
5	354	5.28	107	4	0.69	10	354 to 504	8.57	168
10	354	9.92	404	4	1.28	52	354 to 503	16.07	654
15	354	13.87	850	4	2.05	118	354 to 503	22.93	1392
20	354	17.10	1403	4	2.39	207	354 to 503	28.01	2318
25	354	19.57	2067	4	2.67	309	354 to 504	31.95	3421
30	354	21.30	2775	4	2.91	414	354 to 504	34.77	4591
35	354	22.30	3473	5	2.92	524	354 to 504	36.20	5754
40	354	22.62	4188	5	2.90	632	354 to 505	36.62	6939
45	354	22.32	4851	5	2.69	729	354 to 505	35.83	8031
50	354	21.47	5453	5	2.46	810	354 to 505	34.25	9013
55	354	20.14	5975	5	2.28	873	354 to 506	32.09	9850
60	354	18.44	6400	6	2.06	921	354 to 506	29.33	10528
65	354	16.46	6693	6	1.99	957	354 to 506	26.44	10998
70	354	14.29	6885	6	1.92	971	354 to 506	23.28	11290
75	354	12.05	6910	6	1.91	963	354 to 506	20.12	11312
80	354	9.81	6798	6	2.08	935	354 to 506	17.29	11107
85	354	10.21	6532	6	2.21	885	354 to 506	18.06	10651
90	354	13.74	6090	6	2.40	815	354 to 506	23.33	9912
95	354	17.49	5489	5	2.76	724	354 to 506	29.20	8917
100	354	21.34	4726	5	2.93	615	354 to 505	34.87	7663
105	354	25.26	3788	5	3.38	486	354 to 505	41.12	6131
110	354	29.23	2682	5	3.80	340	354 to 505	47.38	4333
115	354	33.04	1421	4	4.19	178	354 to 504	53.39	2293
120	354	36.89	0	4	4.57	0	354 to 504	59.43	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 69 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 69

INPUT DATA

Applied Load = 14626 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.111
Radius CL = 38.8 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	630	0.00	0	15	0.00	0	630 to 909	0.00	0
5	630	5.20	105	15	2.30	36	630 to 909	11.21	210
10	630	9.78	398	15	4.27	174	630 to 908	20.97	854
15	630	13.68	838	15	6.87	394	630 to 908	30.83	1844
20	630	16.85	1383	15	7.99	693	630 to 908	37.18	3116
25	630	19.29	2038	15	8.93	1033	630 to 909	42.19	4609
30	630	20.99	2736	16	9.73	1384	630 to 910	45.94	6185
35	630	21.98	3424	16	9.77	1749	630 to 911	47.39	7767
40	630	22.30	4128	17	9.70	2112	630 to 912	47.73	9371
45	630	22.00	4782	18	8.99	2435	630 to 914	46.10	10834
50	630	21.16	5376	19	8.22	2704	630 to 915	43.62	12125
55	630	19.86	5890	19	7.62	2914	630 to 916	40.77	13201
60	630	18.18	6309	20	6.88	3076	630 to 917	37.16	14064
65	630	16.22	6598	20	6.67	3194	630 to 917	34.06	14668
70	630	14.09	6787	20	6.41	3241	630 to 918	30.63	15012
75	630	11.88	6811	20	6.38	3216	630 to 918	27.48	15005
80	630	9.67	6701	20	6.97	3121	630 to 918	25.39	14689
85	630	10.06	6439	20	7.40	2956	630 to 917	26.67	14041
90	630	13.55	6003	20	8.03	2721	630 to 917	32.63	13031
95	630	17.24	5411	19	9.24	2419	630 to 916	39.85	11689
100	630	21.04	4659	19	9.80	2053	630 to 915	46.12	10013
105	630	24.90	3734	18	11.29	1624	630 to 913	54.06	7989
110	630	28.81	2643	17	12.69	1136	630 to 912	61.92	5633
115	630	32.57	1401	16	14.00	594	630 to 910	69.41	2973
120	630	36.36	0	15	15.28	0	630 to 909	76.89	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 70 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 70

INPUT DATA

Applied Load = 16832 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.095
Radius CL = 38.8 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	715	0.00	0	15	0.00	0	715 to 1027	0.00	0
5	715	5.12	104	15	2.30	36	715 to 1027	11.10	208
10	715	9.63	392	15	4.27	174	715 to 1027	20.76	845
15	715	13.47	826	15	6.87	394	715 to 1027	30.54	1827
20	715	16.60	1362	15	7.99	693	715 to 1027	36.83	3087
25	715	19.00	2007	15	8.93	1033	715 to 1027	41.78	4566
30	715	20.68	2695	16	9.73	1384	715 to 1028	45.50	6127
35	715	21.65	3372	16	9.77	1749	715 to 1029	46.93	7695
40	715	21.97	4066	17	9.70	2112	715 to 1031	47.26	9284
45	715	21.67	4710	18	8.99	2435	715 to 1032	45.64	10734
50	715	20.84	5295	19	8.22	2704	715 to 1033	43.17	12011
55	715	19.56	5801	19	7.62	2914	715 to 1035	40.35	13077
60	715	17.91	6214	20	6.88	3076	715 to 1035	36.78	13931
65	715	15.98	6499	20	6.67	3194	715 to 1036	33.72	14529
70	715	13.88	6685	20	6.41	3241	715 to 1036	30.33	14869
75	715	11.70	6709	20	6.38	3216	715 to 1036	27.23	14861
80	715	9.52	6600	20	6.97	3121	715 to 1036	25.19	14548
85	715	9.91	6342	20	7.40	2956	715 to 1036	26.46	13905
90	715	13.34	5913	20	8.03	2721	715 to 1035	32.34	12904
95	715	16.98	5330	19	9.24	2419	715 to 1034	39.49	11575
100	715	20.72	4589	19	9.80	2053	715 to 1033	45.67	9915
105	715	24.53	3678	18	11.29	1624	715 to 1032	53.54	7910
110	715	28.38	2604	17	12.69	1136	715 to 1030	61.31	5577
115	715	32.08	1380	16	14.00	594	715 to 1029	68.72	2943
120	715	35.82	0	15	15.28	0	715 to 1027	76.13	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 71 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 71

INPUT DATA

Applied Load = 18386 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.071
Radius CL = 38.8 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	764	0.00	0	10	0.00	0	764 to 1087	0.00	0
5	764	4.18	85	10	1.55	24	764 to 1087	8.50	161
10	764	7.86	320	10	2.88	117	764 to 1087	15.91	648
15	764	11.00	674	10	4.62	265	764 to 1087	23.26	1395
20	764	13.55	1112	10	5.38	467	764 to 1087	28.13	2352
25	764	15.51	1639	10	6.01	695	764 to 1087	31.94	3477
30	764	16.88	2200	10	6.55	932	764 to 1088	34.78	4666
35	764	17.67	2753	11	6.58	1178	764 to 1088	35.94	5857
40	764	17.93	3319	11	6.53	1422	764 to 1089	36.22	7066
45	764	17.69	3845	12	6.06	1640	764 to 1090	35.07	8171
50	764	17.01	4322	12	5.54	1822	764 to 1091	33.25	9149
55	764	15.97	4736	13	5.13	1963	764 to 1092	31.09	9968
60	764	14.62	5073	13	4.63	2072	764 to 1092	28.35	10626
65	764	13.04	5305	13	4.49	2151	764 to 1093	25.91	11086
70	764	11.33	5457	14	4.31	2183	764 to 1093	23.21	11352
75	764	9.55	5477	14	4.29	2166	764 to 1093	20.68	11351
80	764	7.77	5388	14	4.69	2102	764 to 1093	18.87	11119
85	764	8.09	5178	13	4.98	1991	764 to 1093	19.80	10634
90	764	10.89	4827	13	5.41	1833	764 to 1092	24.45	9874
95	764	13.86	4351	13	6.22	1629	764 to 1092	29.99	8862
100	764	16.91	3746	12	6.60	1382	764 to 1091	34.91	7596
105	764	20.02	3002	12	7.60	1094	764 to 1090	40.97	6064
110	764	23.16	2125	11	8.55	765	764 to 1089	46.97	4277
115	764	26.19	1126	11	9.43	400	764 to 1088	52.70	2258
120	764	29.24	0	10	10.29	0	764 to 1087	58.44	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 72 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 72

INPUT DATA

Applied Load = 17948 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.073
Radius CL = 38.8 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	747	0.00	0	10	0.00	0	747 to 1063	0.00	0
5	747	4.20	85	10	1.55	24	747 to 1063	8.52	161
10	747	7.89	321	10	2.88	117	747 to 1063	15.95	649
15	747	11.04	676	10	4.62	265	747 to 1063	23.32	1399
20	747	13.60	1116	10	5.38	467	747 to 1063	28.19	2358
25	747	15.57	1645	10	6.01	695	747 to 1063	32.02	3486
30	747	16.94	2208	10	6.55	932	747 to 1064	34.87	4677
35	747	17.74	2763	11	6.58	1178	747 to 1065	36.03	5872
40	747	18.00	3332	11	6.53	1422	747 to 1066	36.31	7083
45	747	17.76	3859	12	6.06	1640	747 to 1067	35.16	8191
50	747	17.08	4338	12	5.54	1822	747 to 1068	33.33	9171
55	747	16.02	4753	13	5.13	1963	747 to 1068	31.17	9992
60	747	14.67	5092	13	4.63	2072	747 to 1069	28.43	10652
65	747	13.09	5325	13	4.49	2151	747 to 1069	25.97	11113
70	747	11.37	5477	14	4.31	2183	747 to 1070	23.26	11380
75	747	9.58	5497	14	4.29	2166	747 to 1070	20.73	11380
80	747	7.80	5408	14	4.69	2102	747 to 1070	18.91	11146
85	747	8.12	5197	13	4.98	1991	747 to 1069	19.85	10661
90	747	10.93	4845	13	5.41	1833	747 to 1069	24.51	9899
95	747	13.91	4367	13	6.22	1629	747 to 1068	30.07	8885
100	747	16.98	3760	12	6.60	1382	747 to 1068	34.99	7615
105	747	20.10	3013	12	7.60	1094	747 to 1067	41.07	6079
110	747	23.25	2133	11	8.55	765	747 to 1066	47.09	4288
115	747	26.29	1131	11	9.43	400	747 to 1065	52.84	2264
120	747	29.35	0	10	10.29	0	747 to 1063	58.59	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 73 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 73

INPUT DATA

Applied Load = 5719 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.309
Radius CL = 43.65 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	326	0.00	0	4	0.00	0	326 to 465	0.00	0
5	326	6.37	145	4	0.68	14	326 to 465	10.08	229
10	326	11.98	549	4	1.53	68	326 to 465	19.38	885
15	326	16.75	1155	4	2.27	153	326 to 465	27.32	1879
20	326	20.64	1906	4	2.79	267	326 to 465	33.64	3124
25	326	23.62	2808	4	3.16	395	326 to 465	38.45	4604
30	326	25.71	3769	5	3.17	526	326 to 466	41.38	6172
35	326	26.92	4717	5	3.25	664	326 to 466	43.22	7733
40	326	27.31	5688	5	3.15	797	326 to 467	43.61	9319
45	326	26.95	6587	5	2.95	915	326 to 467	42.76	10779
50	326	25.92	7406	6	2.73	1012	326 to 468	40.93	12090
55	326	24.32	8114	6	2.44	1087	326 to 468	38.20	13209
60	326	22.26	8692	6	2.24	1142	326 to 468	34.98	14112
65	326	19.87	9090	6	2.14	1183	326 to 468	31.47	14739
70	326	17.26	9350	6	2.13	1199	326 to 468	27.78	15129
75	326	14.54	9384	6	2.18	1188	326 to 468	24.08	15158
80	326	11.84	9232	6	2.21	1151	326 to 468	20.35	14883
85	326	12.32	8871	6	2.42	1089	326 to 468	21.37	14272
90	326	16.59	8270	6	2.68	1002	326 to 468	27.80	13282
95	326	21.12	7455	6	3.01	890	326 to 468	34.69	11950
100	326	25.76	6419	6	3.21	754	326 to 467	41.53	10269
105	326	30.50	5144	5	3.69	596	326 to 467	48.98	8217
110	326	35.28	3642	5	4.14	417	326 to 466	56.45	5808
115	326	39.89	1930	5	4.57	217	326 to 466	63.62	3073
120	326	44.53	0	4	4.95	0	326 to 465	70.77	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 74 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 74

INPUT DATA

Applied Load = 7486 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.22
Radius CL = 43.65 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	398	0.00	0	4	0.00	0	398 to 566	0.00	0
5	398	5.94	135	4	0.68	14	398 to 566	9.48	215
10	398	11.16	511	4	1.53	68	398 to 566	18.24	832
15	398	15.61	1076	4	2.27	153	398 to 566	25.72	1769
20	398	19.23	1776	4	2.79	267	398 to 566	31.67	2943
25	398	22.01	2617	4	3.16	395	398 to 566	36.20	4336
30	398	23.96	3513	5	3.17	526	398 to 566	38.94	5813
35	398	25.09	4396	5	3.25	664	398 to 567	40.65	7284
40	398	25.45	5300	5	3.15	797	398 to 567	41.01	8777
45	398	25.11	6139	5	2.95	915	398 to 568	40.19	10151
50	398	24.15	6902	6	2.73	1012	398 to 568	38.46	11384
55	398	22.66	7562	6	2.44	1087	398 to 569	35.88	12436
60	398	20.75	8101	6	2.24	1142	398 to 569	32.86	13284
65	398	18.52	8471	6	2.14	1183	398 to 569	29.58	13873
70	398	16.08	8714	6	2.13	1199	398 to 569	26.14	14238
75	398	13.55	8745	6	2.18	1188	398 to 569	22.70	14264
80	398	11.04	8604	6	2.21	1151	398 to 569	19.22	14004
85	398	11.48	8268	6	2.42	1089	398 to 569	20.19	13427
90	398	15.46	7707	6	2.68	1002	398 to 569	26.22	12494
95	398	19.68	6947	6	3.01	890	398 to 568	32.68	11240
100	398	24.01	5982	6	3.21	754	398 to 568	39.08	9658
105	398	28.42	4794	5	3.69	596	398 to 568	46.08	7727
110	398	32.88	3394	5	4.14	417	398 to 567	53.09	5461
115	398	37.17	1799	5	4.57	217	398 to 567	59.82	2889
120	398	41.50	0	4	4.95	0	398 to 566	66.53	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 75 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 75

INPUT DATA

Applied Load = 14626 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.111
Radius CL = 43.65 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	709	0.00	0	16	0.00	0	709 to 1021	0.00	0
5	709	5.85	133	16	2.28	49	709 to 1020	12.07	271
10	709	11.00	504	16	5.12	228	709 to 1020	24.12	1094
15	709	15.39	1061	16	7.58	513	709 to 1020	34.44	2359
20	709	18.96	1751	16	9.31	894	709 to 1020	42.38	3972
25	709	21.70	2579	16	10.56	1321	709 to 1021	48.34	5857
30	709	23.62	3463	17	10.58	1757	709 to 1022	51.06	7835
35	709	24.73	4334	18	10.85	2217	709 to 1023	53.08	9836
40	709	25.09	5225	19	10.54	2663	709 to 1025	53.06	11843
45	709	24.76	6052	20	9.87	3054	709 to 1027	51.44	13666
50	709	23.81	6804	20	9.11	3378	709 to 1028	48.83	15270
55	709	22.34	7455	21	8.15	3628	709 to 1029	45.14	16605
60	709	20.45	7985	21	7.48	3814	709 to 1030	41.37	17665
65	709	18.25	8351	22	7.17	3951	709 to 1031	37.75	18409
70	709	15.85	8590	22	7.11	4002	709 to 1031	34.29	18830
75	709	13.36	8621	22	7.30	3966	709 to 1031	31.12	18812
80	709	10.88	8481	22	7.40	3844	709 to 1031	27.82	18410
85	709	11.32	8150	22	8.08	3636	709 to 1030	29.59	17592
90	709	15.24	7598	21	8.97	3344	709 to 1030	36.60	16323
95	709	19.40	6848	21	10.06	2971	709 to 1029	44.27	14640
100	709	23.67	5897	20	10.72	2519	709 to 1027	51.38	12539
105	709	28.02	4726	19	12.33	1991	709 to 1026	60.20	10003
110	709	32.41	3346	18	13.84	1393	709 to 1024	68.92	7052
115	709	36.64	1773	17	15.25	727	709 to 1022	77.24	3719
120	709	40.91	0	16	16.54	0	709 to 1021	85.41	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 76 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 76

INPUT DATA

Applied Load = 16832 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.
Variation Factor = 1.095
Radius CL = 43.65 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	804	0.00	0	16	0.00	0	804 to 1154	0.00	0
5	804	5.76	131	16	2.28	49	804 to 1154	11.95	268
10	804	10.84	496	16	5.12	228	804 to 1154	23.88	1083
15	804	15.16	1045	16	7.58	513	804 to 1153	34.12	2337
20	804	18.67	1725	16	9.31	894	804 to 1153	41.98	3935
25	804	21.37	2540	16	10.56	1321	804 to 1154	47.88	5803
30	804	23.26	3410	17	10.58	1757	804 to 1155	50.57	7762
35	804	24.36	4268	18	10.85	2217	804 to 1157	52.55	9745
40	804	24.71	5146	19	10.54	2663	804 to 1158	52.53	11732
45	804	24.38	5961	20	9.87	3054	804 to 1160	50.92	13538
50	804	23.45	6701	20	9.11	3378	804 to 1161	48.33	15126
55	804	22.00	7342	21	8.15	3628	804 to 1162	44.67	16448
60	804	20.14	7865	21	7.48	3814	804 to 1163	40.94	17496
65	804	17.98	8225	22	7.17	3951	804 to 1164	37.37	18233
70	804	15.61	8461	22	7.11	4002	804 to 1164	33.95	18649
75	804	13.16	8491	22	7.30	3966	804 to 1164	30.84	18631
80	804	10.72	8354	22	7.40	3844	804 to 1164	27.59	18231
85	804	11.15	8027	22	8.08	3636	804 to 1164	29.35	17420
90	804	15.01	7483	21	8.97	3344	804 to 1163	36.28	16163
95	804	19.11	6745	21	10.06	2971	804 to 1162	43.86	14495
100	804	23.31	5808	20	10.72	2519	804 to 1161	50.88	12414
105	804	27.60	4655	19	12.33	1991	804 to 1159	59.61	9903
110	804	31.92	3295	18	13.84	1393	804 to 1158	68.24	6982
115	804	36.09	1746	17	15.25	727	804 to 1156	76.47	3682
120	804	40.29	0	16	16.54	0	804 to 1154	84.55	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 77 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 77

INPUT DATA

Applied Load = 18386 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.071
Radius CL = 43.65 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	859	0.00	0	11	0.00	0	859 to 1222	0.00	0
5	859	4.71	107	11	1.53	33	859 to 1222	9.20	207
10	859	8.85	405	10	3.45	153	859 to 1222	18.25	829
15	859	12.37	853	10	5.11	346	859 to 1221	26.01	1783
20	859	15.24	1408	10	6.27	602	859 to 1221	32.01	2995
25	859	17.45	2074	11	7.11	889	859 to 1222	36.53	4417
30	859	18.99	2784	11	7.13	1183	859 to 1223	38.71	5910
35	859	19.88	3484	12	7.31	1493	859 to 1224	40.27	7417
40	859	20.17	4201	12	7.10	1793	859 to 1225	40.32	8932
45	859	19.90	4866	13	6.65	2057	859 to 1226	39.17	10311
50	859	19.14	5471	14	6.14	2276	859 to 1227	37.24	11528
55	859	17.96	5994	14	5.49	2444	859 to 1227	34.49	12547
60	859	16.44	6421	14	5.04	2569	859 to 1228	31.60	13358
65	859	14.68	6715	15	4.83	2661	859 to 1228	28.77	13926
70	859	12.75	6907	15	4.79	2696	859 to 1229	25.99	14253
75	859	10.74	6932	15	4.91	2671	859 to 1229	23.40	14247
80	859	8.75	6820	15	4.98	2589	859 to 1228	20.72	13950
85	859	9.10	6553	14	5.44	2449	859 to 1228	22.00	13339
90	859	12.25	6109	14	6.04	2253	859 to 1228	27.44	12383
95	859	15.60	5507	14	6.78	2001	859 to 1227	33.36	11112
100	859	19.03	4741	13	7.22	1697	859 to 1226	38.93	9523
105	859	22.53	3800	13	8.30	1341	859 to 1225	45.67	7601
110	859	26.06	2690	12	9.32	938	859 to 1224	52.35	5362
115	859	29.46	1426	11	10.27	489	859 to 1223	58.72	2829
120	859	32.89	0	11	11.14	0	859 to 1222	65.00	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 78 OF ____

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 78

INPUT DATA

Applied Load = 17948 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.073
Radius CL = 43.65 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	840	0.00	0	11	0.00	0	840 to 1195	0.00	0
5	840	4.72	108	11	1.53	33	840 to 1195	9.22	207
10	840	8.88	407	10	3.45	153	840 to 1195	18.30	831
15	840	12.42	856	10	5.11	346	840 to 1195	26.07	1787
20	840	15.30	1413	10	6.27	602	840 to 1195	32.09	3003
25	840	17.51	2081	11	7.11	889	840 to 1195	36.62	4427
30	840	19.06	2794	11	7.13	1183	840 to 1196	38.81	5924
35	840	19.96	3497	12	7.31	1493	840 to 1197	40.37	7435
40	840	20.25	4217	12	7.10	1793	840 to 1198	40.42	8953
45	840	19.98	4884	13	6.65	2057	840 to 1199	39.28	10336
50	840	19.21	5491	14	6.14	2276	840 to 1200	37.34	11557
55	840	18.03	6016	14	5.49	2444	840 to 1201	34.58	12578
60	840	16.50	6444	14	5.04	2569	840 to 1202	31.68	13391
65	840	14.73	6739	15	4.83	2661	840 to 1202	28.84	13960
70	840	12.79	6932	15	4.79	2696	840 to 1202	26.06	14289
75	840	10.78	6957	15	4.91	2671	840 to 1202	23.46	14282
80	840	8.78	6845	15	4.98	2589	840 to 1202	20.77	13985
85	840	9.13	6577	14	5.44	2449	840 to 1202	22.04	13372
90	840	12.30	6131	14	6.04	2253	840 to 1201	27.50	12415
95	840	15.65	5527	14	6.78	2001	840 to 1201	33.44	11141
100	840	19.10	4759	13	7.22	1697	840 to 1200	39.03	9547
105	840	22.61	3814	13	8.30	1341	840 to 1199	45.78	7621
110	840	26.16	2700	12	9.32	938	840 to 1198	52.48	5375
115	840	29.57	1431	11	10.27	489	840 to 1197	58.87	2837
120	840	33.01	0	11	11.14	0	840 to 1195	65.17	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 79 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 79

INPUT DATA

Applied Load = 5719 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.309
Radius CL = 48.5 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	363	0.00	0	5	0.00	0	363 to 517	0.00	0
5	363	7.08	180	5	0.95	19	363 to 517	11.54	284
10	363	13.31	678	5	1.78	86	363 to 517	21.67	1096
15	363	18.61	1426	5	2.48	194	363 to 516	30.29	2327
20	363	22.93	2353	5	2.95	335	363 to 516	37.13	3865
25	363	26.25	3466	5	3.47	491	363 to 517	42.65	5689
30	363	28.56	4653	5	3.57	649	363 to 517	46.06	7618
35	363	29.91	5824	5	3.55	817	363 to 518	47.91	9544
40	363	30.35	7022	6	3.39	977	363 to 518	48.26	11493
45	363	29.94	8133	6	3.21	1116	363 to 519	47.38	13284
50	363	28.80	9143	6	2.91	1230	363 to 519	45.27	14893
55	363	27.02	10018	6	2.64	1318	363 to 519	42.33	16266
60	363	24.74	10731	7	2.43	1379	363 to 520	38.77	17368
65	363	22.08	11222	7	2.38	1426	363 to 520	34.96	18136
70	363	19.17	11544	7	2.32	1442	363 to 520	30.79	18613
75	363	16.16	11585	7	2.34	1427	363 to 520	26.61	18646
80	363	13.16	11398	7	2.43	1382	363 to 520	22.57	18307
85	363	13.69	10952	7	2.60	1306	363 to 520	23.61	17554
90	363	18.43	10210	6	2.98	1200	363 to 520	30.88	16336
95	363	23.46	9203	6	3.24	1066	363 to 519	38.36	14697
100	363	28.63	7924	6	3.47	903	363 to 519	45.98	12630
105	363	33.89	6351	6	3.98	713	363 to 518	54.22	10105
110	363	39.20	4496	5	4.46	498	363 to 518	62.48	7143
115	363	44.32	2383	5	4.91	260	363 to 517	70.41	3779
120	363	49.48	0	5	5.33	0	363 to 517	78.33	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 80 OF ____

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 80

INPUT DATA

Applied Load = 7486 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.22
Radius CL = 48.5 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	442	0.00	0	5	0.00	0	442 to 628	0.00	0
5	442	6.60	167	5	0.95	19	442 to 628	10.86	267
10	442	12.40	631	5	1.78	86	442 to 628	20.41	1031
15	442	17.34	1329	5	2.48	194	442 to 628	28.51	2191
20	442	21.37	2193	5	2.95	335	442 to 628	34.95	3640
25	442	24.46	3231	5	3.47	491	442 to 629	40.15	5359
30	442	26.62	4337	5	3.57	649	442 to 629	43.34	7175
35	442	27.88	5427	5	3.55	817	442 to 629	45.06	8989
40	442	28.28	6544	6	3.39	977	442 to 630	45.37	10824
45	442	27.90	7579	6	3.21	1116	442 to 630	44.53	12510
50	442	26.84	8521	6	2.91	1230	442 to 631	42.53	14022
55	442	25.18	9336	6	2.64	1318	442 to 631	39.75	15312
60	442	23.05	10001	7	2.43	1379	442 to 632	36.41	16346
65	442	20.57	10459	7	2.38	1426	442 to 632	32.85	17067
70	442	17.87	10758	7	2.32	1442	442 to 632	28.97	17513
75	442	15.06	10797	7	2.34	1427	442 to 632	25.07	17542
80	442	12.26	10622	7	2.43	1382	442 to 632	21.32	17221
85	442	12.76	10207	7	2.60	1306	442 to 632	22.30	16511
90	442	17.18	9515	6	2.98	1200	442 to 631	29.13	15363
95	442	21.87	8577	6	3.24	1066	442 to 631	36.12	13820
100	442	26.68	7385	6	3.47	903	442 to 631	43.25	11875
105	442	31.58	5919	6	3.98	713	442 to 630	50.99	9500
110	442	36.53	4190	5	4.46	498	442 to 630	58.75	6715
115	442	41.30	2221	5	4.91	260	442 to 629	66.19	3552
120	442	46.11	0	5	5.33	0	442 to 628	73.62	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 81 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 81

INPUT DATA

Applied Load = 14626 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.111
Radius CL = 48.5 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	788	0.00	0	17	0.00	0	788 to 1132	0.00	0
5	788	6.50	165	17	3.18	64	788 to 1132	14.53	341
10	788	12.23	622	17	5.96	288	788 to 1132	27.26	1362
15	788	17.10	1310	16	8.30	648	788 to 1132	38.05	2936
20	788	21.07	2162	17	9.87	1119	788 to 1132	46.28	4929
25	788	24.11	3184	17	11.58	1640	788 to 1133	53.45	7248
30	788	26.24	4275	18	11.92	2166	788 to 1134	57.01	9669
35	788	27.48	5350	19	11.85	2729	788 to 1136	58.62	12131
40	788	27.88	6451	20	11.33	3262	788 to 1137	58.29	14578
45	788	27.51	7472	21	10.72	3726	788 to 1139	56.75	16796
50	788	26.45	8400	22	9.73	4107	788 to 1141	53.59	18743
55	788	24.82	9203	22	8.82	4399	788 to 1142	49.76	20364
60	788	22.73	9859	23	8.11	4602	788 to 1143	45.62	21627
65	788	20.28	10310	23	7.94	4759	788 to 1143	41.91	22526
70	788	17.62	10605	24	7.75	4814	788 to 1144	37.84	23031
75	788	14.85	10643	24	7.81	4765	788 to 1144	34.07	23001
80	788	12.09	10471	23	8.14	4613	788 to 1143	30.77	22503
85	788	12.58	10062	23	8.71	4360	788 to 1143	32.42	21499
90	788	16.94	9380	23	9.95	4007	788 to 1142	40.64	19945
95	788	21.55	8455	22	10.81	3558	788 to 1141	48.57	17886
100	788	26.30	7280	21	11.58	3014	788 to 1140	56.52	15317
105	788	31.13	5835	20	13.30	2382	788 to 1138	66.20	12219
110	788	36.01	4131	19	14.91	1665	788 to 1136	75.78	8614
115	788	40.72	2189	18	16.41	869	788 to 1134	84.91	4543
120	788	45.45	0	17	17.79	0	788 to 1132	93.88	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 82 OF ____

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 82

INPUT DATA

Applied Load = 16832 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.
Variation Factor = 1.095
Radius CL = 48.5 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	893	0.00	0	17	0.00	0	893 to 1280	0.00	0
5	893	6.41	162	17	3.18	64	893 to 1280	14.39	337
10	893	12.04	613	17	5.96	288	893 to 1280	27.00	1349
15	893	16.84	1290	16	8.30	648	893 to 1280	37.69	2908
20	893	20.75	2129	17	9.87	1119	893 to 1280	45.83	4883
25	893	23.75	3137	17	11.58	1640	893 to 1281	52.94	7181
30	893	25.85	4210	18	11.92	2166	893 to 1282	56.45	9578
35	893	27.07	5270	19	11.85	2729	893 to 1284	58.04	12018
40	893	27.46	6354	20	11.33	3262	893 to 1286	57.71	14442
45	893	27.09	7359	21	10.72	3726	893 to 1287	56.17	16639
50	893	26.06	8273	22	9.73	4107	893 to 1289	53.03	18566
55	893	24.45	9065	22	8.82	4399	893 to 1290	49.24	20170
60	893	22.38	9710	23	8.11	4602	893 to 1291	45.14	21420
65	893	19.98	10155	23	7.94	4759	893 to 1291	41.48	22308
70	893	17.35	10445	24	7.75	4814	893 to 1292	37.47	22807
75	893	14.62	10483	24	7.81	4765	893 to 1292	33.76	22777
80	893	11.91	10313	23	8.14	4613	893 to 1291	30.51	22282
85	893	12.39	9910	23	8.71	4360	893 to 1291	32.15	21287
90	893	16.68	9239	23	9.95	4007	893 to 1290	40.29	19748
95	893	21.23	8328	22	10.81	3558	893 to 1289	48.11	17708
100	893	25.90	7170	21	11.58	3014	893 to 1288	55.97	15164
105	893	30.66	5747	20	13.30	2382	893 to 1286	65.55	12096
110	893	35.47	4068	19	14.91	1665	893 to 1284	75.02	8527
115	893	40.10	2156	18	16.41	869	893 to 1283	84.05	4497
120	893	44.77	0	17	17.79	0	893 to 1280	92.92	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 83 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 83

INPUT DATA

Applied Load = 18386 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.071
Radius CL = 48.5 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	955	0.00	0	11	0.00	0	955 to 1356	0.00	0
5	955	5.23	132	11	2.14	43	955 to 1356	10.97	259
10	955	9.83	500	11	4.01	194	955 to 1356	20.60	1031
15	955	13.75	1053	11	5.59	436	955 to 1356	28.75	2217
20	955	16.94	1738	11	6.64	753	955 to 1356	35.02	3715
25	955	19.39	2560	11	7.80	1105	955 to 1357	40.41	5464
30	955	21.10	3437	12	8.03	1459	955 to 1358	43.19	7294
35	955	22.09	4302	13	7.98	1838	955 to 1359	44.51	9149
40	955	22.41	5187	13	7.63	2197	955 to 1360	44.36	10998
45	955	22.12	6008	14	7.22	2510	955 to 1361	43.25	12679
50	955	21.27	6754	14	6.55	2767	955 to 1362	40.93	14160
55	955	19.96	7400	15	5.94	2963	955 to 1363	38.05	15398
60	955	18.27	7927	15	5.46	3100	955 to 1363	34.88	16369
65	955	16.31	8290	16	5.35	3206	955 to 1364	31.93	17057
70	955	14.16	8527	16	5.22	3242	955 to 1364	28.71	17451
75	955	11.94	8558	16	5.26	3209	955 to 1364	25.66	17438
80	955	9.72	8419	16	5.48	3107	955 to 1364	22.93	17071
85	955	10.11	8090	15	5.86	2937	955 to 1363	24.13	16320
90	955	13.62	7542	15	6.70	2699	955 to 1363	30.47	15149
95	955	17.33	6798	15	7.28	2396	955 to 1362	36.65	13592
100	955	21.14	5853	14	7.80	2030	955 to 1361	42.88	11648
105	955	25.03	4691	13	8.96	1604	955 to 1360	50.28	9297
110	955	28.96	3321	13	10.04	1121	955 to 1359	57.62	6557
115	955	32.74	1760	12	11.05	585	955 to 1358	64.63	3460
120	955	36.55	0	11	11.98	0	955 to 1356	71.54	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 84 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 84

INPUT DATA

Applied Load = 17948 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.073
Radius CL = 48.5 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	934	0.00	0	11	0.00	0	934 to 1327	0.00	0
5	934	5.25	133	11	2.14	43	934 to 1327	11.00	260
10	934	9.87	502	11	4.01	194	934 to 1327	20.65	1034
15	934	13.80	1057	11	5.59	436	934 to 1327	28.82	2222
20	934	17.00	1744	11	6.64	753	934 to 1327	35.11	3724
25	934	19.46	2570	11	7.80	1105	934 to 1327	40.51	5477
30	934	21.18	3450	12	8.03	1459	934 to 1328	43.30	7311
35	934	22.18	4318	13	7.98	1838	934 to 1329	44.62	9171
40	934	22.50	5206	13	7.63	2197	934 to 1330	44.47	11025
45	934	22.20	6030	14	7.22	2510	934 to 1332	43.36	12709
50	934	21.35	6779	14	6.55	2767	934 to 1333	41.04	14195
55	934	20.03	7427	15	5.94	2963	934 to 1333	38.16	15436
60	934	18.34	7956	15	5.46	3100	934 to 1334	34.97	16410
65	934	16.37	8320	16	5.35	3206	934 to 1334	32.02	17099
70	934	14.22	8558	16	5.22	3242	934 to 1335	28.78	17495
75	934	11.98	8589	16	5.26	3209	934 to 1335	25.73	17482
80	934	9.76	8450	16	5.48	3107	934 to 1334	22.98	17114
85	934	10.15	8120	15	5.86	2937	934 to 1334	24.19	16362
90	934	13.67	7570	15	6.70	2699	934 to 1334	30.54	15187
95	934	17.39	6823	15	7.28	2396	934 to 1333	36.74	13627
100	934	21.22	5875	14	7.80	2030	934 to 1332	42.98	11678
105	934	25.12	4709	13	8.96	1604	934 to 1331	50.41	9321
110	934	29.06	3333	13	10.04	1121	934 to 1330	57.77	6574
115	934	32.86	1767	12	11.05	585	934 to 1328	64.80	3469
120	934	36.68	0	11	11.98	0	934 to 1327	71.73	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 85 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 85

INPUT DATA

Applied Load = 5719 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.309
Radius CL = 53.35 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	399	0.00	0	5	0.00	0	399 to 568	0.00	0
5	399	7.79	217	5	0.94	24	399 to 568	12.52	346
10	399	14.64	820	5	2.03	106	399 to 568	23.97	1329
15	399	20.47	1725	5	2.69	238	399 to 568	33.25	2822
20	399	25.22	2847	5	3.33	409	399 to 568	40.99	4683
25	399	28.87	4194	5	3.76	596	399 to 568	46.82	6886
30	399	31.42	5631	5	3.80	782	399 to 569	50.46	9213
35	399	32.90	7047	6	3.82	983	399 to 569	52.57	11538
40	399	33.38	8496	6	3.69	1170	399 to 570	53.01	13886
45	399	32.94	9841	6	3.36	1332	399 to 570	51.84	16042
50	399	31.68	11064	7	3.09	1464	399 to 571	49.61	17978
55	399	29.72	12122	7	2.85	1564	399 to 571	46.47	19630
60	399	27.21	12985	7	2.66	1632	399 to 571	42.63	20955
65	399	24.29	13579	7	2.51	1681	399 to 571	38.27	21870
70	399	21.09	13968	7	2.49	1698	399 to 572	33.78	22443
75	399	17.78	14018	7	2.48	1679	399 to 572	29.12	22481
80	399	14.48	13792	7	2.63	1624	399 to 571	24.75	22071
85	399	15.06	13252	7	2.90	1534	399 to 571	26.02	21163
90	399	20.28	12354	7	3.12	1409	399 to 571	33.70	19693
95	399	25.81	11136	7	3.53	1250	399 to 571	42.14	17717
100	399	31.49	9588	6	3.86	1059	399 to 570	50.65	15225
105	399	37.28	7685	6	4.25	836	399 to 570	59.42	12182
110	399	43.12	5441	6	4.76	584	399 to 569	68.47	8611
115	399	48.75	2884	5	5.23	305	399 to 569	77.16	4556
120	399	54.43	0	5	5.67	0	399 to 568	85.85	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 86 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 86

INPUT DATA

Applied Load = 7486 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.22
Radius CL = 53.35 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	487	0.00	0	5	0.00	0	487 to 691	0.00	0
5	487	7.26	203	5	0.94	24	487 to 691	11.78	325
10	487	13.65	764	5	2.03	106	487 to 691	22.57	1251
15	487	19.08	1608	5	2.69	238	487 to 691	31.30	2657
20	487	23.51	2654	5	3.33	409	487 to 691	38.59	4412
25	487	26.91	3909	5	3.76	596	487 to 691	44.07	6487
30	487	29.28	5247	5	3.80	782	487 to 691	47.47	8676
35	487	30.66	6567	6	3.82	983	487 to 692	49.44	10867
40	487	31.11	7918	6	3.69	1170	487 to 693	49.83	13076
45	487	30.69	9171	6	3.36	1332	487 to 693	48.70	15105
50	487	29.52	10311	7	3.09	1464	487 to 694	46.59	16924
55	487	27.70	11297	7	2.85	1564	487 to 694	43.64	18475
60	487	25.36	12101	7	2.66	1632	487 to 694	40.03	19717
65	487	22.63	12655	7	2.51	1681	487 to 694	35.96	20576
70	487	19.66	13017	7	2.49	1698	487 to 695	31.77	21112
75	487	16.57	13064	7	2.48	1679	487 to 695	27.42	21145
80	487	13.49	12853	7	2.63	1624	487 to 694	23.37	20757
85	487	14.04	12351	7	2.90	1534	487 to 694	24.59	19900
90	487	18.90	11514	7	3.12	1409	487 to 694	31.76	18516
95	487	24.05	10378	7	3.53	1250	487 to 694	39.68	16656
100	487	29.35	8936	6	3.86	1059	487 to 693	47.65	14311
105	487	34.74	7162	6	4.25	836	487 to 693	55.87	11450
110	487	40.19	5070	6	4.76	584	487 to 692	64.36	8093
115	487	45.44	2687	5	5.23	305	487 to 692	72.52	4281
120	487	50.72	0	5	5.67	0	487 to 691	80.66	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 87 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 87

INPUT DATA

Applied Load = 14626 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.111
Radius CL = 53.35 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	866	0.00	0	18	0.00	0	866 to 1244	0.00	0
5	866	7.15	200	18	3.16	81	866 to 1244	15.40	419
10	866	13.45	753	17	6.80	355	866 to 1244	30.40	1660
15	866	18.81	1585	17	9.01	796	866 to 1243	41.65	3574
20	866	23.17	2616	17	11.14	1367	866 to 1243	51.39	5987
25	866	26.52	3853	18	12.56	1990	866 to 1245	58.49	8779
30	866	28.87	5173	19	12.69	2611	866 to 1246	62.00	11681
35	866	30.23	6474	20	12.77	3283	866 to 1248	64.03	14646
40	866	30.67	7806	21	12.32	3908	866 to 1250	63.89	17572
45	866	30.26	9041	22	11.24	4446	866 to 1251	61.48	20217
50	866	29.10	10164	23	10.33	4886	866 to 1253	58.32	22537
55	866	27.30	11136	24	9.53	5221	866 to 1254	54.45	24468
60	866	25.00	11929	24	8.89	5449	866 to 1255	50.11	25965
65	866	22.31	12475	25	8.38	5612	866 to 1256	45.49	27006
70	866	19.38	12832	25	8.33	5669	866 to 1256	41.29	27603
75	866	16.33	12878	25	8.30	5606	866 to 1256	36.98	27561
80	866	13.30	12670	25	8.80	5423	866 to 1256	33.58	26959
85	866	13.84	12175	24	9.69	5122	866 to 1255	35.85	25753
90	866	18.63	11350	24	10.41	4705	866 to 1254	43.79	23889
95	866	23.71	10231	23	11.78	4174	866 to 1253	53.23	21421
100	866	28.93	8809	22	12.88	3535	866 to 1252	62.41	18343
105	866	34.25	7060	21	14.19	2792	866 to 1250	72.08	14632
110	866	39.62	4998	20	15.90	1951	866 to 1248	82.50	10315
115	866	44.79	2649	19	17.48	1018	866 to 1246	92.43	5440
120	866	50.00	0	18	18.93	0	866 to 1244	102.20	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 88 OF ____

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 88

INPUT DATA

Applied Load = 16832 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.095
Radius CL = 53.35 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	983	0.00	0	18	0.00	0	983 to 1407	0.00	0
5	983	7.05	197	18	3.16	81	983 to 1407	15.25	414
10	983	13.25	742	17	6.80	355	983 to 1407	30.11	1644
15	983	18.52	1561	17	9.01	796	983 to 1406	41.25	3541
20	983	22.82	2576	17	11.14	1367	983 to 1406	50.90	5932
25	983	26.13	3795	18	12.56	1990	983 to 1407	57.93	8697
30	983	28.43	5095	19	12.69	2611	983 to 1409	61.39	11572
35	983	29.77	6376	20	12.77	3283	983 to 1411	63.40	14509
40	983	30.20	7688	21	12.32	3908	983 to 1413	63.25	17407
45	983	29.80	8905	22	11.24	4446	983 to 1414	60.84	20026
50	983	28.66	10011	23	10.33	4886	983 to 1416	57.70	22323
55	983	26.89	10968	24	9.53	5221	983 to 1417	53.87	24233
60	983	24.62	11750	24	8.89	5449	983 to 1418	49.59	25713
65	983	21.97	12287	25	8.38	5612	983 to 1419	45.02	26743
70	983	19.09	12639	25	8.33	5669	983 to 1419	40.88	27333
75	983	16.09	12684	25	8.30	5606	983 to 1419	36.63	27289
80	983	13.10	12479	25	8.80	5423	983 to 1419	33.30	26691
85	983	13.63	11991	24	9.69	5122	983 to 1418	35.56	25496
90	983	18.35	11179	24	10.41	4705	983 to 1417	43.40	23650
95	983	23.35	10077	23	11.78	4174	983 to 1416	52.73	21205
100	983	28.49	8676	22	12.88	3535	983 to 1415	61.80	18158
105	983	33.73	6954	21	14.19	2792	983 to 1413	71.36	14483
110	983	39.02	4923	20	15.90	1951	983 to 1411	81.66	10210
115	983	44.11	2609	19	17.48	1018	983 to 1409	91.49	5384
120	983	49.25	0	18	18.93	0	983 to 1407	101.14	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 89 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 89

INPUT DATA

Applied Load = 18386 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.071
Radius CL = 53.35 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1050	0.00	0	12	0.00	0	1050 to 1491	0.00	0
5	1050	5.75	160	12	2.13	55	1050 to 1491	11.68	318
10	1050	10.81	606	12	4.58	239	1050 to 1491	22.93	1255
15	1050	15.12	1274	11	6.06	536	1050 to 1491	31.49	2697
20	1050	18.63	2103	11	7.50	921	1050 to 1491	38.85	4511
25	1050	21.33	3098	12	8.46	1340	1050 to 1491	44.24	6617
30	1050	23.21	4159	13	8.55	1758	1050 to 1492	47.04	8813
35	1050	24.30	5205	13	8.60	2211	1050 to 1494	48.65	11048
40	1050	24.66	6276	14	8.30	2632	1050 to 1495	48.64	13262
45	1050	24.33	7269	15	7.57	2995	1050 to 1496	46.94	15270
50	1050	23.40	8173	15	6.96	3291	1050 to 1497	44.60	17038
55	1050	21.95	8954	16	6.42	3517	1050 to 1498	41.66	18516
60	1050	20.10	9592	16	5.98	3670	1050 to 1499	38.32	19669
65	1050	17.94	10031	16	5.64	3780	1050 to 1499	34.72	20470
70	1050	15.58	10318	17	5.61	3819	1050 to 1499	31.35	20938
75	1050	13.13	10355	17	5.59	3776	1050 to 1499	27.89	20917
80	1050	10.69	10188	16	5.92	3653	1050 to 1499	25.05	20474
85	1050	11.12	9789	16	6.52	3450	1050 to 1499	26.68	19571
90	1050	14.98	9126	16	7.01	3169	1050 to 1498	32.90	18165
95	1050	19.06	8226	15	7.94	2812	1050 to 1497	40.19	16298
100	1050	23.26	7083	15	8.68	2381	1050 to 1496	47.33	13965
105	1050	27.54	5677	14	9.56	1881	1050 to 1495	54.81	11146
110	1050	31.85	4019	13	10.71	1314	1050 to 1494	62.81	7861
115	1050	36.01	2130	13	11.77	685	1050 to 1492	70.44	4148
120	1050	40.20	0	12	12.75	0	1050 to 1491	77.97	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 90 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 90

INPUT DATA

Applied Load = 17948 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.
Variation Factor = 1.073
Radius CL = 53.35 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1027	0.00	0	12	0.00	0	1027 to 1459	0.00	0
5	1027	5.77	161	12	2.13	55	1027 to 1459	11.71	319
10	1027	10.85	608	12	4.58	239	1027 to 1458	22.99	1259
15	1027	15.18	1279	11	6.06	536	1027 to 1458	31.57	2704
20	1027	18.70	2111	11	7.50	921	1027 to 1458	38.94	4522
25	1027	21.41	3110	12	8.46	1340	1027 to 1459	44.35	6633
30	1027	23.29	4174	13	8.55	1758	1027 to 1460	47.16	8834
35	1027	24.39	5224	13	8.60	2211	1027 to 1461	48.78	11075
40	1027	24.75	6299	14	8.30	2632	1027 to 1463	48.77	13294
45	1027	24.42	7296	15	7.57	2995	1027 to 1464	47.06	15307
50	1027	23.48	8203	15	6.96	3291	1027 to 1465	44.72	17080
55	1027	22.03	8987	16	6.42	3517	1027 to 1466	41.77	18562
60	1027	20.17	9627	16	5.98	3670	1027 to 1466	38.43	19718
65	1027	18.00	10068	16	5.64	3780	1027 to 1467	34.81	20522
70	1027	15.64	10356	17	5.61	3819	1027 to 1467	31.43	20991
75	1027	13.18	10393	17	5.59	3776	1027 to 1467	27.96	20971
80	1027	10.73	10225	16	5.92	3653	1027 to 1467	25.11	20526
85	1027	11.16	9825	16	6.52	3450	1027 to 1466	26.73	19622
90	1027	15.03	9160	16	7.01	3169	1027 to 1466	32.98	18212
95	1027	19.13	8256	15	7.94	2812	1027 to 1465	40.29	16340
100	1027	23.35	7109	15	8.68	2381	1027 to 1464	47.45	14002
105	1027	27.64	5698	14	9.56	1881	1027 to 1463	54.95	11175
110	1027	31.97	4033	13	10.71	1314	1027 to 1461	62.97	7882
115	1027	36.14	2138	13	11.77	685	1027 to 1460	70.63	4159
120	1027	40.35	0	12	12.75	0	1027 to 1459	78.18	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 91 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 91

INPUT DATA

Applied Load = 5719 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.309
Radius CL = 58.2 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	435	0.00	0	5	0.00	0	435 to 619	0.00	0
5	435	8.50	259	5	1.21	29	435 to 619	13.96	413
10	435	15.97	976	5	2.28	128	435 to 619	26.25	1585
15	435	22.33	2054	5	3.11	288	435 to 619	36.56	3365
20	435	27.52	3389	5	3.70	490	435 to 619	44.82	5579
25	435	31.50	4992	5	4.04	709	435 to 619	50.97	8195
30	435	34.28	6701	6	4.15	925	435 to 620	55.06	10954
35	435	35.90	8386	6	4.08	1161	435 to 620	57.19	13715
40	435	36.42	10112	6	3.89	1376	435 to 621	57.60	16496
45	435	35.93	11711	7	3.58	1561	435 to 622	56.40	19050
50	435	34.56	13167	7	3.26	1711	435 to 622	53.93	21343
55	435	32.42	14426	7	2.98	1824	435 to 622	50.46	23299
60	435	29.69	15453	7	2.82	1901	435 to 623	46.37	24867
65	435	26.49	16160	7	2.70	1948	435 to 623	41.69	25937
70	435	23.01	16623	7	2.65	1966	435 to 623	36.73	26615
75	435	19.39	16683	7	2.69	1942	435 to 623	31.73	26659
80	435	15.79	16413	7	2.83	1878	435 to 623	26.94	26172
85	435	16.43	15772	7	3.07	1772	435 to 623	28.23	25094
90	435	22.12	14703	7	3.38	1627	435 to 622	36.72	23351
95	435	28.16	13253	7	3.74	1443	435 to 622	45.79	21009
100	435	34.35	11411	7	4.03	1222	435 to 622	54.95	18053
105	435	40.67	9146	6	4.50	964	435 to 621	64.59	14445
110	435	47.04	6475	6	5.03	673	435 to 620	74.43	10211
115	435	53.19	3432	6	5.53	351	435 to 620	83.87	5402
120	435	59.38	0	5	5.99	0	435 to 619	93.31	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 92 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 92

INPUT DATA

Applied Load = 7486 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.22
Radius CL = 58.2 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	531	0.00	0	5	0.00	0	531 to 753	0.00	0
5	531	7.92	241	5	1.21	29	531 to 753	13.15	389
10	531	14.89	909	5	2.28	128	531 to 753	24.73	1492
15	531	20.81	1914	5	3.11	288	531 to 753	34.43	3169
20	531	25.65	3158	5	3.70	490	531 to 753	42.20	5256
25	531	29.35	4652	5	4.04	709	531 to 753	47.97	7719
30	531	31.95	6245	6	4.15	925	531 to 754	51.79	10316
35	531	33.45	7816	6	4.08	1161	531 to 755	53.77	12916
40	531	33.94	9423	6	3.89	1376	531 to 755	54.13	15533
45	531	33.48	10915	7	3.58	1561	531 to 756	52.98	17934
50	531	32.20	12271	7	3.26	1711	531 to 756	50.64	20088
55	531	30.22	13444	7	2.98	1824	531 to 757	47.37	21925
60	531	27.66	14402	7	2.82	1901	531 to 757	43.54	23395
65	531	24.69	15061	7	2.70	1948	531 to 757	39.16	24398
70	531	21.44	15492	7	2.65	1966	531 to 757	34.54	25031
75	531	18.07	15547	7	2.69	1942	531 to 757	29.88	25069
80	531	14.72	15296	7	2.83	1878	531 to 757	25.43	24608
85	531	15.31	14698	7	3.07	1772	531 to 757	26.67	23592
90	531	20.62	13702	7	3.38	1627	531 to 757	34.61	21950
95	531	26.24	12351	7	3.74	1443	531 to 756	43.11	19746
100	531	32.01	10635	7	4.03	1222	531 to 756	51.68	16966
105	531	37.90	8523	6	4.50	964	531 to 755	60.71	13573
110	531	43.84	6034	6	5.03	673	531 to 755	69.95	9594
115	531	49.57	3198	6	5.53	351	531 to 754	78.81	5075
120	531	55.33	0	5	5.99	0	531 to 753	87.66	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 93 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 93

INPUT DATA

Applied Load = 14626 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.
Variation Factor = 1.111
Radius CL = 58.2 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	945	0.00	0	18	0.00	0	945 to 1355	0.00	0
5	945	7.81	238	18	4.05	100	945 to 1355	17.83	503
10	945	14.67	897	18	7.63	429	945 to 1355	33.52	1985
15	945	20.52	1886	18	10.39	961	945 to 1355	46.39	4276
20	945	25.28	3113	18	12.36	1637	945 to 1355	56.41	7143
25	945	28.94	4586	19	13.49	2368	945 to 1356	63.46	10447
30	945	31.49	6156	20	13.87	3088	945 to 1358	67.68	13869
35	945	32.98	7704	21	13.61	3875	945 to 1360	69.32	17375
40	945	33.45	9289	22	12.98	4594	945 to 1362	68.92	20816
45	945	33.01	10759	23	11.97	5210	945 to 1364	66.57	23921
50	945	31.75	12096	24	10.89	5711	945 to 1365	62.97	26644
55	945	29.79	13253	25	9.94	6091	945 to 1367	58.62	28910
60	945	27.27	14197	25	9.43	6347	945 to 1368	54.22	30666
65	945	24.34	14846	26	9.01	6503	945 to 1368	49.41	31841
70	945	21.14	15271	26	8.85	6563	945 to 1369	44.65	32537
75	945	17.82	15326	26	8.98	6484	945 to 1369	40.22	32481
80	945	14.51	15079	26	9.47	6268	945 to 1368	36.42	31768
85	945	15.09	14489	25	10.26	5917	945 to 1368	38.58	30344
90	945	20.32	13507	25	11.28	5432	945 to 1366	47.64	28146
95	945	25.87	12175	24	12.51	4818	945 to 1365	57.49	25237
100	945	31.56	10483	23	13.46	4078	945 to 1364	67.07	21611
105	945	37.36	8402	22	15.02	3220	945 to 1362	77.85	17238
110	945	43.22	5948	21	16.81	2249	945 to 1360	89.09	12152
115	945	48.86	3153	20	18.47	1173	945 to 1358	99.82	6409
120	945	54.55	0	18	19.99	0	945 to 1355	110.37	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 94 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 94

INPUT DATA

Applied Load = 16832 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.095
Radius CL = 58.2 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1072	0.00	0	18	0.00	0	1072 to 1533	0.00	0
5	1072	7.69	234	18	4.05	100	1072 to 1533	17.66	498
10	1072	14.45	883	18	7.63	429	1072 to 1533	33.21	1966
15	1072	20.21	1858	18	10.39	961	1072 to 1532	45.96	4237
20	1072	24.90	3066	18	12.36	1637	1072 to 1533	55.88	7078
25	1072	28.50	4517	19	13.49	2368	1072 to 1534	62.85	10350
30	1072	31.02	6063	20	13.87	3088	1072 to 1536	67.02	13739
35	1072	32.48	7588	21	13.61	3875	1072 to 1538	68.63	17212
40	1072	32.95	9150	22	12.98	4594	1072 to 1540	68.21	20620
45	1072	32.51	10597	23	11.97	5210	1072 to 1541	65.87	23695
50	1072	31.27	11914	24	10.89	5711	1072 to 1543	62.30	26389
55	1072	29.34	13054	25	9.94	6091	1072 to 1544	57.99	28630
60	1072	26.86	13983	25	9.43	6347	1072 to 1545	53.65	30366
65	1072	23.97	14623	26	9.01	6503	1072 to 1546	48.89	31528
70	1072	20.82	15041	26	8.85	6563	1072 to 1546	44.21	32215
75	1072	17.55	15095	26	8.98	6484	1072 to 1546	39.84	32158
80	1072	14.29	14852	26	9.47	6268	1072 to 1546	36.12	31450
85	1072	14.87	14271	25	10.26	5917	1072 to 1545	38.27	30039
90	1072	20.02	13304	25	11.28	5432	1072 to 1544	47.22	27861
95	1072	25.48	11992	24	12.51	4818	1072 to 1543	56.94	24980
100	1072	31.08	10325	23	13.46	4078	1072 to 1541	66.41	21390
105	1072	36.80	8276	22	15.02	3220	1072 to 1540	77.06	17061
110	1072	42.57	5859	21	16.81	2249	1072 to 1538	88.18	12027
115	1072	48.12	3105	20	18.47	1173	1072 to 1535	98.79	6342
120	1072	53.73	0	18	19.99	0	1072 to 1533	109.22	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 95 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 95

INPUT DATA

Applied Load = 18386 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.071
Radius CL = 58.2 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1146	0.00	0	12	0.00	0	1146 to 1625	0.00	0
5	1146	6.28	191	12	2.73	67	1146 to 1625	13.43	382
10	1146	11.80	721	12	5.14	289	1146 to 1625	25.26	1501
15	1146	16.50	1517	12	6.99	647	1146 to 1625	35.00	3225
20	1146	20.33	2503	12	8.32	1103	1146 to 1625	42.61	5380
25	1146	23.27	3687	12	9.09	1595	1146 to 1626	48.03	7874
30	1146	25.32	4950	13	9.34	2080	1146 to 1627	51.34	10466
35	1146	26.51	6195	14	9.17	2610	1146 to 1629	52.72	13111
40	1146	26.90	7469	15	8.74	3094	1146 to 1630	52.53	15718
45	1146	26.54	8651	15	8.06	3510	1146 to 1631	50.87	18079
50	1146	25.52	9726	16	7.33	3847	1146 to 1632	48.21	20157
55	1146	23.95	10656	17	6.70	4103	1146 to 1633	44.93	21894
60	1146	21.93	11415	17	6.35	4275	1146 to 1634	41.51	23250
65	1146	19.57	11938	17	6.07	4380	1146 to 1634	37.72	24160
70	1146	17.00	12279	17	5.96	4421	1146 to 1634	33.94	24707
75	1146	14.32	12323	17	6.05	4368	1146 to 1634	30.34	24679
80	1146	11.66	12124	17	6.38	4222	1146 to 1634	27.18	24153
85	1146	12.14	11650	17	6.91	3985	1146 to 1634	28.75	23087
90	1146	16.34	10861	17	7.60	3659	1146 to 1633	35.80	21426
95	1146	20.80	9790	16	8.42	3245	1146 to 1632	43.45	19223
100	1146	25.37	8429	15	9.06	2747	1146 to 1631	50.94	16472
105	1146	30.04	6756	15	10.12	2169	1146 to 1630	59.26	13147
110	1146	34.75	4783	14	11.32	1515	1146 to 1628	67.91	9272
115	1146	39.29	2535	13	12.44	790	1146 to 1627	76.16	4893
120	1146	43.86	0	12	13.47	0	1146 to 1625	84.31	0

HARTMAN ENGINEERING

BY: RJH DATE: 03-09-2006 SUBJECT _____ SHT. NO.: RAC - 96 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 96

INPUT DATA

Applied Load = 17948 lb./ft.
Arc Subtended = 120 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.073
Radius CL = 58.2 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1120	0.00	0	12	0.00	0	1120 to 1590	0.00	0
5	1120	6.30	192	12	2.73	67	1120 to 1590	13.47	383
10	1120	11.84	723	12	5.14	289	1120 to 1590	25.32	1505
15	1120	16.56	1522	12	6.99	647	1120 to 1590	35.08	3233
20	1120	20.40	2512	12	8.32	1103	1120 to 1590	42.72	5393
25	1120	23.35	3701	12	9.09	1595	1120 to 1591	48.15	7893
30	1120	25.41	4968	13	9.34	2080	1120 to 1592	51.47	10492
35	1120	26.61	6218	14	9.17	2610	1120 to 1593	52.85	13143
40	1120	27.00	7497	15	8.74	3094	1120 to 1595	52.67	15757
45	1120	26.64	8683	15	8.06	3510	1120 to 1596	51.01	18123
50	1120	25.62	9762	16	7.33	3847	1120 to 1597	48.34	20207
55	1120	24.04	10695	17	6.70	4103	1120 to 1598	45.05	21949
60	1120	22.01	11457	17	6.35	4275	1120 to 1598	41.62	23308
65	1120	19.64	11981	17	6.07	4380	1120 to 1599	37.83	24221
70	1120	17.06	12324	17	5.96	4421	1120 to 1599	34.03	24770
75	1120	14.38	12369	17	6.05	4368	1120 to 1599	30.42	24742
80	1120	11.71	12169	17	6.38	4222	1120 to 1599	27.24	24215
85	1120	12.18	11693	17	6.91	3985	1120 to 1598	28.81	23147
90	1120	16.40	10901	17	7.60	3659	1120 to 1598	35.89	21482
95	1120	20.87	9826	16	8.42	3245	1120 to 1597	43.55	19274
100	1120	25.47	8460	15	9.06	2747	1120 to 1596	51.07	16515
105	1120	30.15	6781	15	10.12	2169	1120 to 1595	59.42	13181
110	1120	34.88	4800	14	11.32	1515	1120 to 1593	68.09	9297
115	1120	39.43	2544	13	12.44	790	1120 to 1592	76.37	4906
120	1120	44.02	0	12	13.47	0	1120 to 1590	84.53	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 97 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 97

INPUT DATA

Applied Load = 5965 lb./ft.
Arc Subtended = 110 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.309
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	228	0.00	0	4	0.00	0	228 to 327	0.00	0
5	228	4.41	67	4	0.40	5	228 to 327	6.85	103
10	228	8.19	251	4	1.01	25	228 to 327	13.19	395
15	228	11.31	523	4	1.29	59	228 to 327	18.03	833
20	228	13.75	854	4	1.70	103	228 to 327	22.15	1372
25	228	15.51	1251	4	1.81	157	228 to 327	24.80	2019
30	228	16.61	1655	4	2.01	213	228 to 327	26.68	2681
35	228	17.09	2044	4	1.95	269	228 to 327	27.25	3319
40	228	17.00	2443	4	1.94	323	228 to 328	27.11	3971
45	228	16.41	2779	4	1.77	374	228 to 328	25.99	4528
50	228	15.40	3094	5	1.65	416	228 to 328	24.38	5040
55	228	14.04	3322	5	1.53	447	228 to 328	22.27	5411
60	228	12.44	3504	5	1.34	466	228 to 328	19.70	5699
65	228	10.67	3591	5	1.35	476	228 to 329	17.25	5837
70	228	8.84	3591	5	1.31	474	228 to 329	14.60	5835
75	228	7.02	3506	5	1.48	460	228 to 329	12.35	5691
80	228	8.80	3312	5	1.56	431	228 to 329	14.99	5371
85	228	11.80	3019	5	1.69	390	228 to 328	19.39	4891
90	228	14.94	2628	5	1.97	336	228 to 328	24.27	4251
95	228	18.21	2126	4	2.37	269	228 to 328	29.53	3435
100	228	21.54	1518	4	2.75	190	228 to 328	34.84	2449
105	228	24.78	811	4	3.11	100	228 to 327	39.99	1306
110	228	28.09	0	4	3.45	0	228 to 327	45.20	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 98 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 98

INPUT DATA

Applied Load = 7808 lb./ft.
Arc Subtended = 110 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.22
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	278	0.00	0	4	0.00	0	278 to 397	0.00	0
5	278	4.11	63	4	0.40	5	278 to 397	6.43	97
10	278	7.63	234	4	1.01	25	278 to 397	12.41	371
15	278	10.54	487	4	1.29	59	278 to 397	16.95	783
20	278	12.81	796	4	1.70	103	278 to 397	20.84	1290
25	278	14.45	1166	4	1.81	157	278 to 397	23.32	1900
30	278	15.48	1543	4	2.01	213	278 to 397	25.09	2523
35	278	15.93	1905	4	1.95	269	278 to 398	25.62	3125
40	278	15.85	2277	4	1.94	323	278 to 398	25.49	3738
45	278	15.30	2590	4	1.77	374	278 to 398	24.43	4263
50	278	14.35	2884	5	1.65	416	278 to 399	22.91	4746
55	278	13.09	3096	5	1.53	447	278 to 399	20.93	5095
60	278	11.59	3266	5	1.34	466	278 to 399	18.52	5365
65	278	9.94	3346	5	1.35	476	278 to 399	16.23	5495
70	278	8.23	3346	5	1.31	474	278 to 399	13.76	5493
75	278	6.54	3267	5	1.48	460	278 to 399	11.68	5357
80	278	8.20	3086	5	1.56	431	278 to 399	14.15	5056
85	278	10.99	2814	5	1.69	390	278 to 399	18.27	4604
90	278	13.92	2449	5	1.97	336	278 to 399	22.85	4001
95	278	16.97	1981	4	2.37	269	278 to 398	27.79	3233
100	278	20.07	1414	4	2.75	190	278 to 398	32.79	2305
105	278	23.09	755	4	3.11	100	278 to 398	37.63	1229
110	278	26.18	0	4	3.45	0	278 to 397	42.52	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 99 OF ____

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 99

INPUT DATA

Applied Load = 3546 lb./ft.
Arc Subtended = 110 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.619
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	168	0.00	0	4	0.00	0	168 to 242	0.00	0
5	168	5.25	80	4	0.40	5	168 to 242	8.03	121
10	168	9.75	300	4	1.01	25	168 to 242	15.38	462
15	168	13.47	623	4	1.29	59	168 to 242	21.06	973
20	168	16.37	1017	4	1.70	103	168 to 242	25.83	1600
25	168	18.47	1490	4	1.81	157	168 to 242	28.95	2354
30	168	19.78	1971	4	2.01	213	168 to 242	31.12	3124
35	168	20.35	2434	4	1.95	269	168 to 243	31.82	3866
40	168	20.25	2909	4	1.94	323	168 to 243	31.65	4624
45	168	19.55	3309	4	1.77	374	168 to 243	30.38	5270
50	168	18.34	3685	5	1.65	416	168 to 243	28.49	5867
55	168	16.72	3956	5	1.53	447	168 to 244	26.02	6299
60	168	14.81	4173	5	1.34	466	168 to 244	23.03	6636
65	168	12.71	4276	5	1.35	476	168 to 244	20.10	6796
70	168	10.52	4276	5	1.31	474	168 to 244	16.97	6794
75	168	8.36	4175	5	1.48	460	168 to 244	14.22	6627
80	168	10.48	3944	5	1.56	431	168 to 244	17.34	6256
85	168	14.05	3596	5	1.69	390	168 to 244	22.55	5698
90	168	17.79	3130	5	1.97	336	168 to 243	28.27	4954
95	168	21.68	2532	4	2.37	269	168 to 243	34.40	4003
100	168	25.65	1807	4	2.75	190	168 to 243	40.59	2855
105	168	29.51	965	4	3.11	100	168 to 243	46.62	1523
110	168	33.45	0	4	3.45	0	168 to 242	52.70	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 100 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 100

INPUT DATA

Applied Load = 15255 lb./ft.
Arc Subtended = 110 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.111
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	496	0.00	0	14	0.00	0	496 to 719	0.00	0
5	496	4.05	62	14	1.33	17	496 to 719	7.95	117
10	496	7.52	231	14	3.37	83	496 to 719	16.28	466
15	496	10.39	480	14	4.31	198	496 to 718	21.88	1010
20	496	12.63	784	14	5.69	345	496 to 718	27.37	1686
25	496	14.25	1149	14	6.06	524	496 to 719	30.25	2502
30	496	15.26	1521	14	6.71	713	496 to 719	32.78	3343
35	496	15.70	1878	15	6.52	898	496 to 720	33.08	4156
40	496	15.62	2244	15	6.47	1080	496 to 721	32.88	4979
45	496	15.08	2553	16	5.91	1250	496 to 722	31.17	5700
50	496	14.15	2843	16	5.52	1390	496 to 723	29.20	6344
55	496	12.90	3052	17	5.11	1493	496 to 723	26.76	6811
60	496	11.42	3219	17	4.49	1556	496 to 724	23.64	7153
65	496	9.80	3299	17	4.53	1589	496 to 724	21.44	7320
70	496	8.12	3299	17	4.37	1585	496 to 725	18.81	7313
75	496	6.45	3221	17	4.94	1535	496 to 725	17.43	7120
80	496	8.09	3042	17	5.22	1441	496 to 724	20.20	6711
85	496	10.84	2774	17	5.64	1303	496 to 724	24.77	6100
90	496	13.72	2414	17	6.59	1122	496 to 723	30.43	5289
95	496	16.73	1953	16	7.92	899	496 to 722	36.90	4264
100	496	19.78	1394	15	9.19	637	496 to 721	43.34	3035
105	496	22.77	745	15	10.40	336	496 to 720	49.56	1615
110	496	25.80	0	14	11.52	0	496 to 719	55.72	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 101 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 101

INPUT DATA

Applied Load = 17556 lb./ft.
Arc Subtended = 110 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.095
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	562	0.00	0	14	0.00	0	562 to 812	0.00	0
5	562	3.99	61	14	1.33	17	562 to 812	7.86	116
10	562	7.41	227	14	3.37	83	562 to 812	16.12	461
15	562	10.23	473	14	4.31	198	562 to 812	21.66	1000
20	562	12.44	772	14	5.69	345	562 to 812	27.10	1670
25	562	14.03	1132	14	6.06	524	562 to 812	29.95	2477
30	562	15.03	1498	14	6.71	713	562 to 813	32.45	3310
35	562	15.46	1850	15	6.52	898	562 to 813	32.75	4116
40	562	15.39	2211	15	6.47	1080	562 to 814	32.55	4932
45	562	14.85	2514	16	5.91	1250	562 to 815	30.85	5646
50	562	13.93	2800	16	5.52	1390	562 to 816	28.91	6284
55	562	12.71	3006	17	5.11	1493	562 to 817	26.49	6747
60	562	11.25	3171	17	4.49	1556	562 to 817	23.40	7085
65	562	9.65	3249	17	4.53	1589	562 to 818	21.23	7251
70	562	7.99	3249	17	4.37	1585	562 to 818	18.64	7244
75	562	6.35	3172	17	4.94	1535	562 to 818	17.29	7052
80	562	7.97	2997	17	5.22	1441	562 to 818	20.03	6647
85	562	10.67	2732	17	5.64	1303	562 to 817	24.54	6041
90	562	13.52	2378	17	6.59	1122	562 to 816	30.14	5238
95	562	16.47	1924	16	7.92	899	562 to 816	36.54	4223
100	562	19.49	1373	15	9.19	637	562 to 815	42.92	3006
105	562	22.42	733	15	10.40	336	562 to 813	49.08	1599
110	562	25.42	0	14	11.52	0	562 to 812	55.18	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 102 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 102

INPUT DATA

Applied Load = 19177 lb./ft.
Arc Subtended = 110 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.071
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	601	0.00	0	9	0.00	0	601 to 858	0.00	0
5	601	3.25	50	9	0.90	12	601 to 858	6.09	90
10	601	6.05	186	9	2.27	56	601 to 858	12.34	356
15	601	8.35	386	9	2.90	133	601 to 858	16.63	768
20	601	10.16	630	9	3.83	232	601 to 858	20.74	1279
25	601	11.46	924	9	4.08	353	601 to 858	22.98	1895
30	601	12.27	1223	9	4.52	480	601 to 858	24.87	2529
35	601	12.62	1510	10	4.39	605	601 to 859	25.15	3142
40	601	12.56	1805	10	4.36	727	601 to 859	25.00	3764
45	601	12.12	2053	10	3.98	842	601 to 860	23.75	4306
50	601	11.37	2286	11	3.72	936	601 to 861	22.26	4792
55	601	10.37	2454	11	3.44	1005	601 to 861	20.38	5145
60	601	9.18	2589	11	3.02	1048	601 to 861	18.01	5407
65	601	7.88	2652	11	3.05	1070	601 to 862	16.23	5534
70	601	6.53	2652	12	2.94	1067	601 to 862	14.15	5529
75	601	5.18	2590	12	3.32	1034	601 to 862	12.92	5385
80	601	6.50	2446	11	3.51	971	601 to 862	15.08	5076
85	601	8.71	2230	11	3.80	878	601 to 861	18.67	4616
90	601	11.03	1941	11	4.44	756	601 to 861	23.00	4003
95	601	13.45	1570	11	5.34	606	601 to 860	27.91	3229
100	601	15.91	1121	10	6.19	429	601 to 860	32.81	2299
105	601	18.30	599	10	7.00	226	601 to 859	37.54	1224
110	601	20.75	0	9	7.76	0	601 to 858	42.25	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 103 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 103

INPUT DATA

Applied Load = 18720 lb./ft.
Arc Subtended = 110 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.073
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	588	0.00	0	9	0.00	0	588 to 839	0.00	0
5	588	3.27	50	9	0.90	12	588 to 839	6.11	90
10	588	6.07	186	9	2.27	56	588 to 839	12.37	357
15	588	8.38	388	9	2.90	133	588 to 839	16.68	770
20	588	10.19	633	9	3.83	232	588 to 839	20.80	1282
25	588	11.50	928	9	4.08	353	588 to 839	23.04	1900
30	588	12.31	1227	9	4.52	480	588 to 840	24.93	2536
35	588	12.67	1515	10	4.39	605	588 to 840	25.21	3150
40	588	12.61	1811	10	4.36	727	588 to 841	25.07	3773
45	588	12.17	2060	10	3.98	842	588 to 841	23.81	4317
50	588	11.42	2294	11	3.72	936	588 to 842	22.31	4804
55	588	10.41	2463	11	3.44	1005	588 to 843	20.44	5158
60	588	9.22	2598	11	3.02	1048	588 to 843	18.06	5420
65	588	7.91	2662	11	3.05	1070	588 to 843	16.27	5547
70	588	6.55	2662	12	2.94	1067	588 to 843	14.19	5542
75	588	5.20	2599	12	3.32	1034	588 to 843	12.94	5398
80	588	6.53	2455	11	3.51	971	588 to 843	15.12	5089
85	588	8.74	2238	11	3.80	878	588 to 843	18.71	4627
90	588	11.07	1948	11	4.44	756	588 to 842	23.06	4013
95	588	13.50	1576	11	5.34	606	588 to 842	27.98	3237
100	588	15.97	1125	10	6.19	429	588 to 841	32.89	2305
105	588	18.37	601	10	7.00	226	588 to 840	37.63	1227
110	588	20.82	0	9	7.76	0	588 to 839	42.35	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 104 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 104

INPUT DATA

Applied Load = 35045 lb./ft.
Arc Subtended = 110 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = .991
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1026	0.00	0	9	0.00	0	1026 to 1453	0.00	0
5	1026	0.75	11	9	0.90	12	1026 to 1453	2.59	36
10	1026	1.40	43	9	2.27	56	1026 to 1452	5.83	155
15	1026	1.93	89	9	2.90	133	1026 to 1452	7.64	352
20	1026	2.35	146	9	3.83	232	1026 to 1452	9.81	600
25	1026	2.65	214	9	4.08	353	1026 to 1453	10.65	900
30	1026	2.84	283	9	4.52	480	1026 to 1453	11.66	1214
35	1026	2.92	349	10	4.39	605	1026 to 1453	11.56	1518
40	1026	2.91	418	10	4.36	727	1026 to 1454	11.49	1822
45	1026	2.80	475	10	3.98	842	1026 to 1455	10.70	2097
50	1026	2.63	529	11	3.72	936	1026 to 1455	10.02	2333
55	1026	2.40	568	11	3.44	1005	1026 to 1456	9.22	2506
60	1026	2.12	599	11	3.02	1048	1026 to 1456	8.13	2621
65	1026	1.82	614	11	3.05	1070	1026 to 1456	7.75	2680
70	1026	1.51	614	12	2.94	1067	1026 to 1456	7.13	2675
75	1026	1.20	599	12	3.32	1034	1026 to 1456	7.33	2598
80	1026	1.50	566	11	3.51	971	1026 to 1456	8.08	2444
85	1026	2.01	516	11	3.80	878	1026 to 1456	9.29	2216
90	1026	2.55	449	11	4.44	756	1026 to 1456	11.13	1915
95	1026	3.11	363	11	5.34	606	1026 to 1455	13.44	1539
100	1026	3.68	259	10	6.19	429	1026 to 1454	15.69	1093
105	1026	4.24	138	10	7.00	226	1026 to 1454	17.84	579
110	1026	4.80	0	9	7.76	0	1026 to 1453	19.92	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 105 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 105

INPUT DATA

Applied Load = 5965 lb./ft.
Arc Subtended = 125 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.309
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	228	0.00	0	3	0.00	0	228 to 326	0.00	0
5	228	4.48	68	3	0.43	5	228 to 326	7.02	105
10	228	8.47	260	3	1.09	27	228 to 326	13.72	411
15	228	11.91	551	3	1.43	64	228 to 326	19.10	881
20	228	14.76	914	3	1.89	114	228 to 326	23.88	1476
25	228	17.01	1349	3	2.07	174	228 to 326	27.34	2186
30	228	18.64	1822	3	2.31	239	228 to 326	30.03	2958
35	228	19.67	2297	4	2.32	304	228 to 326	31.49	3733
40	228	20.12	2776	4	2.35	373	228 to 327	32.18	4522
45	228	20.04	3241	4	2.23	437	228 to 327	31.85	5281
50	228	19.47	3658	4	2.13	492	228 to 327	30.89	5959
55	228	18.48	4044	4	2.00	538	228 to 328	29.28	6577
60	228	17.14	4356	4	1.77	577	228 to 328	27.03	7081
65	228	15.54	4605	5	1.68	607	228 to 328	24.61	7481
70	228	13.74	4775	5	1.54	624	228 to 328	21.85	7747
75	228	11.83	4843	5	1.55	628	228 to 328	19.21	7849
80	228	9.89	4840	5	1.53	620	228 to 328	16.45	7830
85	228	7.99	4723	5	1.71	598	228 to 328	14.10	7630
90	228	10.03	4499	5	1.80	564	228 to 328	17.10	7258
95	228	13.10	4183	4	1.98	517	228 to 328	21.72	6736
100	228	16.30	3751	4	2.11	459	228 to 328	26.43	6033
105	228	19.65	3207	4	2.49	390	228 to 328	31.74	5153
110	228	23.00	2563	4	2.84	308	228 to 327	37.03	4114
115	228	26.28	1812	4	3.19	216	228 to 327	42.23	2904
120	228	29.58	955	4	3.53	113	228 to 327	47.42	1529
125	228	32.69	0	3	3.84	0	228 to 326	52.29	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 106 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 106

INPUT DATA

Applied Load = 7808 lb./ft.
Arc Subtended = 125 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.22
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	278	0.00	0	3	0.00	0	278 to 397	0.00	0
5	278	4.17	64	3	0.43	5	278 to 396	6.59	98
10	278	7.89	242	3	1.09	27	278 to 396	12.91	386
15	278	11.10	513	3	1.43	64	278 to 396	17.97	828
20	278	13.76	852	3	1.89	114	278 to 396	22.47	1389
25	278	15.85	1257	3	2.07	174	278 to 396	25.71	2057
30	278	17.37	1698	3	2.31	239	278 to 397	28.25	2784
35	278	18.33	2140	4	2.32	304	278 to 397	29.62	3514
40	278	18.75	2587	4	2.35	373	278 to 397	30.26	4258
45	278	18.67	3020	4	2.23	437	278 to 397	29.94	4972
50	278	18.14	3409	4	2.13	492	278 to 398	29.04	5611
55	278	17.22	3769	4	2.00	538	278 to 398	27.52	6192
60	278	15.98	4060	4	1.77	577	278 to 398	25.39	6666
65	278	14.48	4292	5	1.68	607	278 to 399	23.13	7042
70	278	12.80	4450	5	1.54	624	278 to 399	20.54	7292
75	278	11.02	4513	5	1.55	628	278 to 399	18.08	7388
80	278	9.21	4510	5	1.53	620	278 to 399	15.51	7369
85	278	7.44	4402	5	1.71	598	278 to 399	13.34	7180
90	278	9.35	4193	5	1.80	564	278 to 399	16.15	6829
95	278	12.21	3898	4	1.98	517	278 to 398	20.47	6337
100	278	15.19	3496	4	2.11	459	278 to 398	24.87	5676
105	278	18.31	2989	4	2.49	390	278 to 398	29.87	4848
110	278	21.43	2389	4	2.84	308	278 to 398	34.84	3870
115	278	24.49	1688	4	3.19	216	278 to 397	39.73	2732
120	278	27.57	890	4	3.53	113	278 to 397	44.61	1438
125	278	30.46	0	3	3.84	0	278 to 397	49.18	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 107 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 107

INPUT DATA

Applied Load = 3546 lb./ft.
Arc Subtended = 125 degrees
Surcharge Load = 302 lb./ft.

Variation Factor = 1.619
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	168	0.00	0	3	0.00	0	168 to 241	0.00	0
5	168	5.33	81	3	0.43	5	168 to 241	8.22	123
10	168	10.08	310	3	1.09	27	168 to 241	15.98	480
15	168	14.18	656	3	1.43	64	168 to 241	22.29	1028
20	168	17.58	1089	3	1.89	114	168 to 241	27.83	1720
25	168	20.25	1606	3	2.07	174	168 to 241	31.88	2546
30	168	22.20	2170	3	2.31	239	168 to 241	35.01	3445
35	168	23.42	2735	4	2.32	304	168 to 242	36.75	4347
40	168	23.96	3306	4	2.35	373	168 to 242	37.56	5264
45	168	23.86	3860	4	2.23	437	168 to 242	37.21	6147
50	168	23.18	4356	4	2.13	492	168 to 243	36.10	6937
55	168	22.01	4816	4	2.00	538	168 to 243	34.22	7658
60	168	20.42	5188	4	1.77	577	168 to 243	31.61	8245
65	168	18.50	5485	5	1.68	607	168 to 243	28.77	8712
70	168	16.36	5686	5	1.54	624	168 to 244	25.53	9023
75	168	14.09	5767	5	1.55	628	168 to 244	22.37	9144
80	168	11.78	5763	5	1.53	620	168 to 244	19.10	9123
85	168	9.51	5625	5	1.71	598	168 to 244	16.24	8893
90	168	11.94	5358	5	1.80	564	168 to 243	19.79	8460
95	168	15.61	4982	4	1.98	517	168 to 243	25.23	7854
100	168	19.42	4467	4	2.11	459	168 to 243	30.78	7036
105	168	23.40	3819	4	2.49	390	168 to 243	37.00	6010
110	168	27.39	3053	4	2.84	308	168 to 243	43.18	4799
115	168	31.30	2158	4	3.19	216	168 to 242	49.25	3389
120	168	35.23	1137	4	3.53	113	168 to 242	55.33	1785
125	168	38.93	0	3	3.84	0	168 to 241	61.03	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 108 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 108

INPUT DATA

Applied Load = 15255 lb./ft.
Arc Subtended = 125 degrees
Surcharge Load = 1008 lb./ft.

Variation Factor = 1.111
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	496	0.00	0	12	0.00	0	496 to 716	0.00	0
5	496	4.11	63	12	1.46	17	496 to 716	8.26	117
10	496	7.78	239	12	3.65	91	496 to 716	17.10	490
15	496	10.94	506	12	4.77	215	496 to 716	23.43	1075
20	496	13.56	840	12	6.30	383	496 to 715	29.71	1828
25	496	15.62	1239	12	6.91	583	496 to 716	33.64	2727
30	496	17.12	1674	12	7.72	798	496 to 716	37.11	3700
35	496	18.07	2110	13	7.76	1016	496 to 717	38.50	4682
40	496	18.48	2551	14	7.87	1246	496 to 718	39.26	5691
45	496	18.41	2977	14	7.46	1459	496 to 719	38.45	6649
50	496	17.88	3360	15	7.13	1644	496 to 720	37.17	7501
55	496	16.98	3715	15	6.68	1797	496 to 721	35.14	8257
60	496	15.75	4002	16	5.93	1928	496 to 722	32.14	8881
65	496	14.27	4231	16	5.61	2028	496 to 723	29.53	9371
70	496	12.62	4387	17	5.14	2085	496 to 723	26.41	9687
75	496	10.87	4449	17	5.19	2099	496 to 724	24.05	9798
80	496	9.08	4446	17	5.11	2070	496 to 724	21.42	9744
85	496	7.34	4339	17	5.72	1997	496 to 724	20.01	9471
90	496	9.21	4133	17	6.00	1882	496 to 723	23.12	8988
95	496	12.04	3843	16	6.62	1726	496 to 723	28.12	8315
100	496	14.98	3446	16	7.06	1533	496 to 722	32.99	7431
105	496	18.05	2946	15	8.31	1302	496 to 721	39.40	6339
110	496	21.13	2355	15	9.49	1031	496 to 720	45.72	5050
115	496	24.14	1664	14	10.67	722	496 to 719	51.94	3558
120	496	27.18	877	13	11.79	377	496 to 717	58.10	1870
125	496	30.03	0	12	12.82	0	496 to 716	63.84	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 109 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 109

INPUT DATA

Applied Load = 17556 lb./ft.
Arc Subtended = 125 degrees
Surcharge Load = 1008 lb./ft.
Variation Factor = 1.095
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	562	0.00	0	12	0.00	0	562 to 809	0.00	0
5	562	4.05	62	12	1.46	17	562 to 809	8.17	116
10	562	7.66	235	12	3.65	91	562 to 809	16.94	485
15	562	10.77	498	12	4.77	215	562 to 809	23.20	1065
20	562	13.36	827	12	6.30	383	562 to 809	29.43	1811
25	562	15.39	1220	12	6.91	583	562 to 809	33.31	2701
30	562	16.86	1649	12	7.72	798	562 to 809	36.75	3665
35	562	17.80	2078	13	7.76	1016	562 to 810	38.12	4637
40	562	18.20	2512	14	7.87	1246	562 to 811	38.88	5637
45	562	18.13	2933	14	7.46	1459	562 to 813	38.07	6586
50	562	17.62	3310	15	7.13	1644	562 to 814	36.80	7430
55	562	16.72	3659	15	6.68	1797	562 to 815	34.78	8178
60	562	15.51	3942	16	5.93	1928	562 to 815	31.81	8797
65	562	14.06	4167	16	5.61	2028	562 to 816	29.23	9282
70	562	12.43	4321	17	5.14	2085	562 to 817	26.14	9594
75	562	10.70	4382	17	5.19	2099	562 to 817	23.83	9704
80	562	8.95	4379	17	5.11	2070	562 to 817	21.23	9650
85	562	7.23	4274	17	5.72	1997	562 to 817	19.86	9380
90	562	9.07	4071	17	6.00	1882	562 to 816	22.92	8901
95	562	11.86	3785	16	6.62	1726	562 to 816	27.87	8234
100	562	14.75	3394	16	7.06	1533	562 to 815	32.67	7359
105	562	17.78	2902	15	8.31	1302	562 to 814	39.02	6276
110	562	20.81	2319	15	9.49	1031	562 to 813	45.27	5000
115	562	23.78	1639	14	10.67	722	562 to 812	51.43	3523
120	562	26.77	864	13	11.79	377	562 to 811	57.52	1852
125	562	29.58	0	12	12.82	0	562 to 809	63.20	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 110 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 110

INPUT DATA

Applied Load = 19177 lb./ft.
Arc Subtended = 125 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.071
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	601	0.00	0	8	0.00	0	601 to 856	0.00	0
5	601	3.31	50	8	0.98	11	601 to 856	6.31	91
10	601	6.25	192	8	2.46	61	601 to 856	12.94	374
15	601	8.79	407	8	3.21	145	601 to 856	17.78	817
20	601	10.90	675	8	4.25	258	601 to 856	22.49	1385
25	601	12.56	996	8	4.66	393	601 to 856	25.51	2063
30	601	13.77	1346	8	5.20	537	601 to 856	28.12	2798
35	601	14.53	1696	9	5.23	684	601 to 857	29.23	3539
40	601	14.86	2051	9	5.30	839	601 to 857	29.82	4299
45	601	14.80	2394	9	5.02	982	601 to 858	29.26	5023
50	601	14.38	2702	10	4.80	1108	601 to 859	28.31	5667
55	601	13.65	2987	10	4.50	1210	601 to 860	26.77	6240
60	601	12.66	3218	11	3.99	1298	601 to 860	24.53	6713
65	601	11.48	3402	11	3.78	1366	601 to 861	22.50	7086
70	601	10.15	3527	11	3.46	1404	601 to 861	20.09	7326
75	601	8.74	3577	11	3.50	1414	601 to 861	18.19	7412
80	601	7.30	3575	11	3.44	1394	601 to 861	16.09	7376
85	601	5.90	3489	11	3.85	1345	601 to 861	14.82	7173
90	601	7.41	3323	11	4.04	1268	601 to 861	17.25	6809
95	601	9.68	3090	11	4.46	1162	601 to 860	21.14	6303
100	601	12.04	2771	10	4.76	1032	601 to 860	24.96	5635
105	601	14.51	2369	10	5.59	877	601 to 859	29.84	4808
110	601	16.99	1893	10	6.39	694	601 to 859	34.65	3832
115	601	19.41	1338	9	7.18	486	601 to 858	39.40	2701
120	601	21.85	705	9	7.94	254	601 to 857	44.10	1420
125	601	24.14	0	8	8.63	0	601 to 856	48.49	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 111 OF ___

CHKD. BY: _____ DATE: _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 111

INPUT DATA

Applied Load = 18720 lb./ft.
Arc Subtended = 125 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = 1.073
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	588	0.00	0	8	0.00	0	588 to 838	0.00	0
5	588	3.32	50	8	0.98	11	588 to 838	6.33	91
10	588	6.28	193	8	2.46	61	588 to 837	12.97	375
15	588	8.83	408	8	3.21	145	588 to 837	17.83	819
20	588	10.94	678	8	4.25	258	588 to 837	22.55	1389
25	588	12.61	1000	8	4.66	393	588 to 837	25.58	2068
30	588	13.82	1351	8	5.20	537	588 to 838	28.19	2805
35	588	14.58	1703	9	5.23	684	588 to 838	29.31	3548
40	588	14.92	2058	9	5.30	839	588 to 839	29.90	4310
45	588	14.85	2403	9	5.02	982	588 to 840	29.34	5035
50	588	14.43	2712	10	4.80	1108	588 to 840	28.38	5681
55	588	13.70	2998	10	4.50	1210	588 to 841	26.84	6256
60	588	12.71	3229	11	3.99	1298	588 to 842	24.59	6730
65	588	11.52	3414	11	3.78	1366	588 to 842	22.56	7103
70	588	10.18	3540	11	3.46	1404	588 to 842	20.15	7344
75	588	8.77	3590	11	3.50	1414	588 to 843	18.23	7431
80	588	7.33	3588	11	3.44	1394	588 to 843	16.13	7394
85	588	5.92	3502	11	3.85	1345	588 to 843	14.85	7190
90	588	7.43	3336	11	4.04	1268	588 to 842	17.29	6826
95	588	9.71	3101	11	4.46	1162	588 to 842	21.19	6319
100	588	12.09	2781	10	4.76	1032	588 to 841	25.02	5650
105	588	14.57	2378	10	5.59	877	588 to 841	29.91	4820
110	588	17.05	1900	10	6.39	694	588 to 840	34.74	3841
115	588	19.48	1343	9	7.18	486	588 to 839	39.50	2708
120	588	21.93	708	9	7.94	254	588 to 838	44.21	1424
125	588	24.23	0	8	8.63	0	588 to 838	48.61	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 112 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 112

INPUT DATA

Applied Load = 35045 lb./ft.
Arc Subtended = 125 degrees
Surcharge Load = 679 lb./ft.

Variation Factor = .991
Radius CL = 29.28 feet
Distance to Surcharge = 23.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1026	0.00	0	8	0.00	0	1026 to 1451	0.00	0
5	1026	0.76	11	8	0.98	11	1026 to 1451	2.75	36
10	1026	1.44	44	8	2.46	61	1026 to 1451	6.21	167
15	1026	2.03	94	8	3.21	145	1026 to 1450	8.32	379
20	1026	2.52	156	8	4.25	258	1026 to 1450	10.76	658
25	1026	2.91	230	8	4.66	393	1026 to 1450	11.99	991
30	1026	3.19	311	8	5.20	537	1026 to 1451	13.31	1350
35	1026	3.36	393	9	5.23	684	1026 to 1451	13.60	1714
40	1026	3.44	475	9	5.30	839	1026 to 1452	13.83	2093
45	1026	3.42	554	9	5.02	982	1026 to 1453	13.34	2447
50	1026	3.33	626	10	4.80	1108	1026 to 1454	12.83	2760
55	1026	3.16	692	10	4.50	1210	1026 to 1454	12.08	3026
60	1026	2.93	745	11	3.99	1298	1026 to 1455	10.90	3251
65	1026	2.65	788	11	3.78	1366	1026 to 1455	10.15	3426
70	1026	2.35	817	11	3.46	1404	1026 to 1456	9.17	3532
75	1026	2.02	828	11	3.50	1414	1026 to 1456	8.78	3564
80	1026	1.69	828	11	3.44	1394	1026 to 1456	8.23	3530
85	1026	1.36	808	11	3.85	1345	1026 to 1456	8.47	3419
90	1026	1.71	769	11	4.04	1268	1026 to 1456	9.28	3234
95	1026	2.24	715	11	4.46	1162	1026 to 1455	10.72	2979
100	1026	2.79	641	10	4.76	1032	1026 to 1455	12.00	2654
105	1026	3.36	548	10	5.59	877	1026 to 1454	14.22	2259
110	1026	3.93	438	10	6.39	694	1026 to 1453	16.38	1795
115	1026	4.49	310	9	7.18	486	1026 to 1453	18.51	1261
120	1026	5.06	163	9	7.94	254	1026 to 1452	20.59	661
125	1026	5.59	0	8	8.63	0	1026 to 1451	22.51	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 113 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 113

INPUT DATA

Applied Load = 5694 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 3589 lb./ft.
Variation Factor = 1.653
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	364	0.00	0	47	0.00	0	364 to 591	0.00	0
5	364	11.62	235	47	8.06	130	364 to 591	29.99	551
10	364	21.30	866	47	14.81	587	364 to 590	55.01	2211
15	364	28.98	1773	47	21.97	1333	364 to 590	77.93	4750
20	364	34.67	2884	48	24.65	2248	364 to 592	90.46	7860
25	364	38.43	4160	50	25.45	3183	364 to 595	97.07	11235
30	364	40.36	5407	52	25.85	4048	364 to 599	100.47	14453
35	364	40.63	6626	54	23.53	4925	364 to 603	96.89	17650
40	364	39.43	7761	56	21.85	5690	364 to 606	92.36	20539
45	364	36.99	8709	57	19.47	6271	364 to 608	84.91	22854
50	364	33.57	9480	59	18.12	6659	364 to 610	77.82	24594
55	364	29.43	10003	59	17.40	6851	364 to 611	70.79	25652
60	364	24.86	10220	59	16.98	6845	364 to 612	63.68	25945
65	364	20.11	10192	59	17.29	6641	364 to 611	57.55	25560
70	364	16.70	9794	59	19.48	6242	364 to 611	56.50	24324
75	364	24.13	9056	58	21.22	5650	364 to 609	69.86	22284
80	364	32.14	7990	57	24.68	4885	364 to 607	86.96	19492
85	364	40.71	6539	55	25.94	3942	364 to 604	101.10	15857
90	364	49.50	4714	53	30.26	2807	364 to 600	120.76	11373
95	364	58.19	2542	50	34.65	1490	364 to 596	140.38	6093
100	364	67.15	0	47	38.78	0	364 to 591	159.94	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 114 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 114

INPUT DATA

Applied Load = 8698 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 3589 lb./ft.

Variation Factor = 1.349
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	454	0.00	0	47	0.00	0	454 to 717	0.00	0
5	454	9.49	192	47	8.06	130	454 to 716	27.00	491
10	454	17.39	707	47	14.81	587	454 to 716	49.53	1988
15	454	23.66	1448	47	21.97	1333	454 to 716	70.48	4294
20	454	28.31	2355	48	24.65	2248	454 to 718	81.55	7119
25	454	31.37	3396	50	25.45	3183	454 to 721	87.19	10166
30	454	32.95	4415	52	25.85	4048	454 to 725	90.10	13063
35	454	33.17	5410	54	23.53	4925	454 to 728	86.45	15947
40	454	32.19	6336	56	21.85	5690	454 to 732	82.23	18544
45	454	30.20	7110	57	19.47	6271	454 to 734	75.40	20616
50	454	27.41	7740	59	18.12	6659	454 to 736	69.19	22157
55	454	24.03	8167	59	17.40	6851	454 to 737	63.23	23081
60	454	20.29	8343	59	16.98	6845	454 to 738	57.29	23318
65	454	16.41	8321	59	17.29	6641	454 to 737	52.38	22940
70	454	13.63	7996	59	19.48	6242	454 to 737	52.21	21806
75	454	19.70	7394	58	21.22	5650	454 to 735	63.66	19956
80	454	26.24	6523	57	24.68	4885	454 to 733	78.70	17439
85	454	33.23	5338	55	25.94	3942	454 to 730	90.64	14176
90	454	40.41	3848	53	30.26	2807	454 to 726	108.04	10161
95	454	47.50	2076	50	34.65	1490	454 to 722	125.43	5439
100	454	54.82	0	47	38.78	0	454 to 717	142.68	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 115 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 115

INPUT DATA

Applied Load = 13158 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 1991 lb./ft.

Variation Factor = 1.102
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	561	0.00	0	26	0.00	0	561 to 831	0.00	0
5	561	4.19	85	26	4.47	72	561 to 830	13.48	242
10	561	7.69	312	26	8.21	325	561 to 830	24.73	991
15	561	10.46	640	26	12.18	739	561 to 830	35.37	2153
20	561	12.51	1041	26	13.67	1247	561 to 831	40.77	3578
25	561	13.87	1501	27	14.12	1765	561 to 833	43.42	5104
30	561	14.57	1952	29	14.34	2245	561 to 835	44.78	6550
35	561	14.66	2392	30	13.05	2732	561 to 837	42.72	7993
40	561	14.23	2801	31	12.12	3156	561 to 839	40.54	9288
45	561	13.35	3143	32	10.80	3479	561 to 840	37.06	10315
50	561	12.11	3422	32	10.05	3694	561 to 841	34.06	11071
55	561	10.62	3611	33	9.65	3800	561 to 842	31.28	11516
60	561	8.97	3689	33	9.42	3797	561 to 842	28.58	11620
65	561	7.25	3678	33	9.59	3684	561 to 842	26.47	11414
70	561	6.02	3535	32	10.80	3463	561 to 842	26.81	10836
75	561	8.71	3269	32	11.77	3134	561 to 841	32.21	9905
80	561	11.60	2884	31	13.69	2710	561 to 840	39.52	8645
85	561	14.69	2360	30	14.39	2187	561 to 838	45.04	7022
90	561	17.86	1701	29	16.79	1557	561 to 836	53.56	5030
95	561	21.00	917	28	19.22	826	561 to 833	62.09	2690
100	561	24.23	0	26	21.51	0	561 to 831	70.51	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 116 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 116

INPUT DATA

Applied Load = 12614 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 1991 lb./ft.

Variation Factor = 1.106
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	540	0.00	0	26	0.00	0	540 to 801	0.00	0
5	540	4.18	84	26	4.47	72	540 to 801	13.46	241
10	540	7.66	311	26	8.21	325	540 to 801	24.69	990
15	540	10.42	637	26	12.18	739	540 to 801	35.31	2150
20	540	12.47	1037	26	13.67	1247	540 to 801	40.71	3572
25	540	13.82	1496	27	14.12	1765	540 to 803	43.35	5096
30	540	14.51	1944	29	14.34	2245	540 to 805	44.71	6540
35	540	14.61	2383	30	13.05	2732	540 to 807	42.65	7981
40	540	14.18	2791	31	12.12	3156	540 to 809	40.46	9273
45	540	13.30	3131	32	10.80	3479	540 to 811	36.99	10299
50	540	12.07	3409	32	10.05	3694	540 to 812	34.00	11053
55	540	10.58	3597	33	9.65	3800	540 to 812	31.23	11497
60	540	8.93	3675	33	9.42	3797	540 to 812	28.53	11601
65	540	7.23	3665	33	9.59	3684	540 to 812	26.43	11395
70	540	6.00	3521	32	10.80	3463	540 to 812	26.78	10817
75	540	8.67	3256	32	11.77	3134	540 to 811	32.16	9888
80	540	11.56	2873	31	13.69	2710	540 to 810	39.46	8630
85	540	14.64	2351	30	14.39	2187	540 to 808	44.96	7010
90	540	17.80	1695	29	16.79	1557	540 to 806	53.47	5021
95	540	20.92	914	28	19.22	826	540 to 804	61.98	2685
100	540	24.14	0	26	21.51	0	540 to 801	70.38	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 117 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 117

INPUT DATA

Applied Load = 24558 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 1991 lb./ft.

Variation Factor = 1.114
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1059	0.00	0	26	0.00	0	1059 to 1528	0.00	0
5	1059	8.75	177	26	4.47	72	1059 to 1528	19.86	371
10	1059	16.04	652	26	8.21	325	1059 to 1527	36.43	1467
15	1059	21.82	1335	26	12.18	739	1059 to 1528	51.28	3127
20	1059	26.11	2171	26	13.67	1247	1059 to 1528	59.80	5161
25	1059	28.93	3132	27	14.12	1765	1059 to 1530	64.51	7387
30	1059	30.39	4071	29	14.34	2245	1059 to 1532	66.93	9518
35	1059	30.59	4989	30	13.05	2732	1059 to 1534	65.02	11630
40	1059	29.69	5844	31	12.12	3156	1059 to 1536	62.18	13548
45	1059	27.85	6557	32	10.80	3479	1059 to 1538	57.36	15095
50	1059	25.28	7138	32	10.05	3694	1059 to 1539	52.49	16274
55	1059	22.16	7532	33	9.65	3800	1059 to 1539	47.44	17006
60	1059	18.71	7695	33	9.42	3797	1059 to 1539	42.22	17228
65	1059	15.14	7674	33	9.59	3684	1059 to 1539	37.50	17007
70	1059	12.57	7374	32	10.80	3463	1059 to 1539	35.98	16211
75	1059	18.17	6819	32	11.77	3134	1059 to 1538	45.45	14875
80	1059	24.20	6016	31	13.69	2710	1059 to 1537	57.16	13030
85	1059	30.65	4923	30	14.39	2187	1059 to 1535	67.38	10611
90	1059	37.27	3549	29	16.79	1557	1059 to 1533	80.73	7617
95	1059	43.81	1914	28	19.22	826	1059 to 1531	94.02	4085
100	1059	50.56	0	26	21.51	0	1059 to 1528	107.36	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 118 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 118

INPUT DATA

Applied Load = 5694 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 3589 lb./ft.

Variation Factor = 1.653
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	364	0.00	0	35	0.00	0	364 to 570	0.00	0
5	364	12.02	243	35	8.87	146	364 to 570	31.91	590
10	364	22.83	928	34	17.01	664	364 to 569	60.89	2428
15	364	32.27	1974	34	25.25	1534	364 to 568	88.11	5373
20	364	40.23	3297	34	29.74	2603	364 to 568	106.90	9042
25	364	46.63	4867	36	31.74	3735	364 to 571	119.25	13164
30	364	51.44	6616	38	33.62	4929	364 to 576	129.17	17642
35	364	54.66	8392	41	32.43	6176	364 to 581	131.66	22249
40	364	56.34	10169	44	31.44	7308	364 to 586	132.34	26662
45	364	56.58	11955	46	29.05	8297	364 to 590	128.61	30844
50	364	55.49	13540	49	26.46	9130	364 to 593	122.67	34479
55	364	53.22	15092	50	24.59	9801	364 to 596	116.32	37790
60	364	49.95	16333	52	22.63	10304	364 to 599	108.41	40384
65	364	45.87	17436	53	21.57	10669	364 to 601	100.88	42548
70	364	41.18	18199	54	20.65	10918	364 to 602	92.76	44041
75	364	36.10	18681	54	20.19	10978	364 to 603	84.87	44818
80	364	30.83	18853	54	21.06	10848	364 to 602	78.99	44837
85	364	25.57	18627	54	21.72	10529	364 to 602	72.73	43979
90	364	22.66	18092	53	22.82	10024	364 to 600	70.53	42370
95	364	30.63	17169	51	25.51	9335	364 to 598	86.26	39907
100	364	39.15	15836	50	27.46	8469	364 to 595	101.51	36569
105	364	47.99	14141	48	29.69	7432	364 to 592	117.66	32432
110	364	56.90	12067	46	33.31	6231	364 to 588	136.30	27488
115	364	65.82	9595	43	35.20	4877	364 to 584	152.00	21726
120	364	74.76	6745	40	38.60	3379	364 to 579	170.30	15189
125	364	83.26	3550	37	41.72	1749	364 to 574	187.49	7946
130	364	91.74	0	35	44.51	0	364 to 570	204.11	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 119 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 119

INPUT DATA

Applied Load = 8698 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 3589 lb./ft.

Variation Factor = 1.349
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	454	0.00	0	35	0.00	0	454 to 696	0.00	0
5	454	9.81	199	35	8.87	146	454 to 696	28.82	527
10	454	18.64	757	34	17.01	664	454 to 695	55.02	2190
15	454	26.35	1612	34	25.25	1534	454 to 694	79.82	4865
20	454	32.84	2691	34	29.74	2603	454 to 694	96.56	8195
25	454	38.07	3974	36	31.74	3735	454 to 697	107.26	11913
30	454	41.99	5401	38	33.62	4929	454 to 702	115.95	15941
35	454	44.62	6851	41	32.43	6176	454 to 707	117.61	20092
40	454	46.00	8302	44	31.44	7308	454 to 711	117.86	24048
45	454	46.19	9760	46	29.05	8297	454 to 716	114.07	27771
50	454	45.30	11055	49	26.46	9130	454 to 719	108.40	30998
55	454	43.45	12321	50	24.59	9801	454 to 722	102.64	33912
60	454	40.78	13335	52	22.63	10304	454 to 725	95.57	36186
65	454	37.44	14235	53	21.57	10669	454 to 727	89.10	38067
70	454	33.62	14858	54	20.65	10918	454 to 728	82.18	39363
75	454	29.47	15252	54	20.19	10978	454 to 728	75.59	40017
80	454	25.17	15392	54	21.06	10848	454 to 728	71.06	39992
85	454	20.88	15208	54	21.72	10529	454 to 728	66.16	39192
90	454	18.50	14770	53	22.82	10024	454 to 726	64.71	37720
95	454	25.01	14017	51	25.51	9335	454 to 724	78.39	35494
100	454	31.97	12929	50	27.46	8469	454 to 721	91.44	32499
105	454	39.18	11545	48	29.69	7432	454 to 718	105.33	28798
110	454	46.46	9851	46	33.31	6231	454 to 714	121.68	24386
115	454	53.74	7834	43	35.20	4877	454 to 710	135.08	19259
120	454	61.03	5507	40	38.60	3379	454 to 705	151.08	13456
125	454	67.98	2899	37	41.72	1749	454 to 700	166.09	7033
130	454	74.89	0	35	44.51	0	454 to 696	180.53	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 117 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 117

INPUT DATA

Applied Load = 24558 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 1991 lb./ft.
Variation Factor = 1.114
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1059	0.00	0	26	0.00	0	1059 to 1528	0.00	0
5	1059	8.75	177	26	4.47	72	1059 to 1528	19.86	371
10	1059	16.04	652	26	8.21	325	1059 to 1527	36.43	1467
15	1059	21.82	1335	26	12.18	739	1059 to 1528	51.28	3127
20	1059	26.11	2171	26	13.67	1247	1059 to 1528	59.80	5161
25	1059	28.93	3132	27	14.12	1765	1059 to 1530	64.51	7387
30	1059	30.39	4071	29	14.34	2245	1059 to 1532	66.93	9518
35	1059	30.59	4989	30	13.05	2732	1059 to 1534	65.02	11630
40	1059	29.69	5844	31	12.12	3156	1059 to 1536	62.18	13548
45	1059	27.85	6557	32	10.80	3479	1059 to 1538	57.36	15095
50	1059	25.28	7138	32	10.05	3694	1059 to 1539	52.49	16274
55	1059	22.16	7532	33	9.65	3800	1059 to 1539	47.44	17006
60	1059	18.71	7695	33	9.42	3797	1059 to 1539	42.22	17228
65	1059	15.14	7674	33	9.59	3684	1059 to 1539	37.50	17007
70	1059	12.57	7374	32	10.80	3463	1059 to 1539	35.98	16211
75	1059	18.17	6819	32	11.77	3134	1059 to 1538	45.45	14875
80	1059	24.20	6016	31	13.69	2710	1059 to 1537	57.16	13030
85	1059	30.65	4923	30	14.39	2187	1059 to 1535	67.38	10611
90	1059	37.27	3549	29	16.79	1557	1059 to 1533	80.73	7617
95	1059	43.81	1914	28	19.22	826	1059 to 1531	94.02	4085
100	1059	50.56	0	26	21.51	0	1059 to 1528	107.36	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 118 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 118

INPUT DATA

Applied Load = 5694 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 3589 lb./ft.

Variation Factor = 1.653
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	364	0.00	0	35	0.00	0	364 to 570	0.00	0
5	364	12.02	243	35	8.87	146	364 to 570	31.91	590
10	364	22.83	928	34	17.01	664	364 to 569	60.89	2428
15	364	32.27	1974	34	25.25	1534	364 to 568	88.11	5373
20	364	40.23	3297	34	29.74	2603	364 to 568	106.90	9042
25	364	46.63	4867	36	31.74	3735	364 to 571	119.25	13164
30	364	51.44	6616	38	33.62	4929	364 to 576	129.17	17642
35	364	54.66	8392	41	32.43	6176	364 to 581	131.66	22249
40	364	56.34	10169	44	31.44	7308	364 to 586	132.34	26662
45	364	56.58	11955	46	29.05	8297	364 to 590	128.61	30844
50	364	55.49	13540	49	26.46	9130	364 to 593	122.67	34479
55	364	53.22	15092	50	24.59	9801	364 to 596	116.32	37790
60	364	49.95	16333	52	22.63	10304	364 to 599	108.41	40384
65	364	45.87	17436	53	21.57	10669	364 to 601	100.88	42548
70	364	41.18	18199	54	20.65	10918	364 to 602	92.76	44041
75	364	36.10	18681	54	20.19	10978	364 to 603	84.87	44818
80	364	30.83	18853	54	21.06	10848	364 to 602	78.99	44837
85	364	25.57	18627	54	21.72	10529	364 to 602	72.73	43979
90	364	22.66	18092	53	22.82	10024	364 to 600	70.53	42370
95	364	30.63	17169	51	25.51	9335	364 to 598	86.26	39907
100	364	39.15	15836	50	27.46	8469	364 to 595	101.51	36569
105	364	47.99	14141	48	29.69	7432	364 to 592	117.66	32432
110	364	56.90	12067	46	33.31	6231	364 to 588	136.30	27488
115	364	65.82	9595	43	35.20	4877	364 to 584	152.00	21726
120	364	74.76	6745	40	38.60	3379	364 to 579	170.30	15189
125	364	83.26	3550	37	41.72	1749	364 to 574	187.49	7946
130	364	91.74	0	35	44.51	0	364 to 570	204.11	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 119 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 119

INPUT DATA

Applied Load = 8698 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 3589 lb./ft.

Variation Factor = 1.349
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	454	0.00	0	35	0.00	0	454 to 696	0.00	0
5	454	9.81	199	35	8.87	146	454 to 696	28.82	527
10	454	18.64	757	34	17.01	664	454 to 695	55.02	2190
15	454	26.35	1612	34	25.25	1534	454 to 694	79.82	4865
20	454	32.84	2691	34	29.74	2603	454 to 694	96.56	8195
25	454	38.07	3974	36	31.74	3735	454 to 697	107.26	11913
30	454	41.99	5401	38	33.62	4929	454 to 702	115.95	15941
35	454	44.62	6851	41	32.43	6176	454 to 707	117.61	20092
40	454	46.00	8302	44	31.44	7308	454 to 711	117.86	24048
45	454	46.19	9760	46	29.05	8297	454 to 716	114.07	27771
50	454	45.30	11055	49	26.46	9130	454 to 719	108.40	30998
55	454	43.45	12321	50	24.59	9801	454 to 722	102.64	33912
60	454	40.78	13335	52	22.63	10304	454 to 725	95.57	36186
65	454	37.44	14235	53	21.57	10669	454 to 727	89.10	38067
70	454	33.62	14858	54	20.65	10918	454 to 728	82.18	39363
75	454	29.47	15252	54	20.19	10978	454 to 728	75.59	40017
80	454	25.17	15392	54	21.06	10848	454 to 728	71.06	39992
85	454	20.88	15208	54	21.72	10529	454 to 728	66.16	39192
90	454	18.50	14770	53	22.82	10024	454 to 726	64.71	37720
95	454	25.01	14017	51	25.51	9335	454 to 724	78.39	35494
100	454	31.97	12929	50	27.46	8469	454 to 721	91.44	32499
105	454	39.18	11545	48	29.69	7432	454 to 718	105.33	28798
110	454	46.46	9851	46	33.31	6231	454 to 714	121.68	24386
115	454	53.74	7834	43	35.20	4877	454 to 710	135.08	19259
120	454	61.03	5507	40	38.60	3379	454 to 705	151.08	13456
125	454	67.98	2899	37	41.72	1749	454 to 700	166.09	7033
130	454	74.89	0	35	44.51	0	454 to 696	180.53	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 120 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 120

INPUT DATA

Applied Load = 13158 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 1991 lb./ft.

Variation Factor = 1.102
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	561	0.00	0	19	0.00	0	561 to 819	0.00	0
5	561	4.33	88	19	4.92	81	561 to 819	14.44	261
10	561	8.24	335	19	9.43	368	561 to 819	27.58	1095
15	561	11.65	712	19	14.00	851	561 to 818	40.12	2444
20	561	14.52	1190	18	16.50	1444	561 to 818	48.38	4121
25	561	16.83	1757	20	17.60	2072	561 to 820	53.50	5982
30	561	18.56	2388	21	18.65	2734	561 to 822	57.70	7992
35	561	19.73	3029	23	17.99	3426	561 to 825	58.20	10065
40	561	20.33	3670	24	17.44	4054	561 to 828	58.13	12031
45	561	20.42	4315	26	16.11	4603	561 to 830	55.99	13867
50	561	20.02	4887	27	14.67	5065	561 to 832	52.99	15453
55	561	19.21	5447	28	13.64	5437	561 to 834	50.09	16869
60	561	18.03	5895	29	12.55	5716	561 to 835	46.59	17972
65	561	16.55	6293	29	11.96	5918	561 to 836	43.52	18873
70	561	14.86	6569	30	11.45	6057	561 to 837	40.28	19494
75	561	13.03	6743	30	11.20	6090	561 to 837	37.28	19794
80	561	11.13	6805	30	11.68	6018	561 to 837	35.45	19758
85	561	9.23	6723	29	12.05	5841	561 to 837	33.41	19343
90	561	8.18	6530	29	12.66	5560	561 to 836	32.98	18596
95	561	11.05	6197	28	14.15	5178	561 to 835	39.54	17480
100	561	14.13	5716	27	15.23	4698	561 to 833	45.69	15990
105	561	17.32	5104	26	16.47	4122	561 to 831	52.25	14155
110	561	20.54	4355	25	18.48	3457	561 to 829	60.17	11975
115	561	23.76	3463	24	19.52	2705	561 to 827	66.46	9449
120	561	26.98	2434	22	21.41	1875	561 to 824	74.19	6596
125	561	30.05	1281	21	23.14	970	561 to 822	81.42	3444
130	561	33.11	0	19	24.69	0	561 to 819	88.34	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 121 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 121

INPUT DATA

Applied Load = 12614 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 1991 lb./ft.

Variation Factor = 1.106
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	540	0.00	0	19	0.00	0	540 to 789	0.00	0
5	540	4.32	87	19	4.92	81	540 to 789	14.41	261
10	540	8.21	333	19	9.43	368	540 to 789	27.54	1093
15	540	11.60	710	19	14.00	851	540 to 788	40.06	2441
20	540	14.46	1185	18	16.50	1444	540 to 788	48.31	4115
25	540	16.77	1750	20	17.60	2072	540 to 790	53.41	5973
30	540	18.49	2379	21	18.65	2734	540 to 793	57.60	7979
35	540	19.65	3018	23	17.99	3426	540 to 795	58.10	10049
40	540	20.26	3657	24	17.44	4054	540 to 798	58.02	12012
45	540	20.34	4299	26	16.11	4603	540 to 800	55.88	13844
50	540	19.95	4869	27	14.67	5065	540 to 802	52.89	15427
55	540	19.13	5427	28	13.64	5437	540 to 804	49.99	16841
60	540	17.96	5873	29	12.55	5716	540 to 805	46.49	17941
65	540	16.49	6270	29	11.96	5918	540 to 806	43.43	18840
70	540	14.81	6544	30	11.45	6057	540 to 807	40.21	19459
75	540	12.98	6718	30	11.20	6090	540 to 807	37.21	19759
80	540	11.08	6779	30	11.68	6018	540 to 807	35.39	19722
85	540	9.19	6698	29	12.05	5841	540 to 807	33.36	19308
90	540	8.14	6506	29	12.66	5560	540 to 806	32.93	18561
95	540	11.01	6174	28	14.15	5178	540 to 805	39.48	17448
100	540	14.08	5694	27	15.23	4698	540 to 803	45.61	15960
105	540	17.25	5085	26	16.47	4122	540 to 801	52.16	14128
110	540	20.46	4339	25	18.48	3457	540 to 799	60.06	11952
115	540	23.67	3450	24	19.52	2705	540 to 797	66.34	9430
120	540	26.88	2425	22	21.41	1875	540 to 794	74.05	6583
125	540	29.94	1276	21	23.14	970	540 to 792	81.26	3437
130	540	32.99	0	19	24.69	0	540 to 789	88.16	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-09-2006 SUBJECT _____ SHT. NO.: RAC - 122 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 122

INPUT DATA

Applied Load = 24558 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 1991 lb./ft.

Variation Factor = 1.114
Radius CL = 38.73 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1059	0.00	0	19	0.00	0	1059 to 1516	0.00	0
5	1059	9.05	183	19	4.92	81	1059 to 1516	21.03	395
10	1059	17.19	699	19	9.43	368	1059 to 1516	40.11	1605
15	1059	24.30	1486	19	14.00	851	1059 to 1515	57.84	3528
20	1059	30.29	2482	18	16.50	1444	1059 to 1515	70.46	5931
25	1059	35.11	3665	20	17.60	2072	1059 to 1517	79.09	8653
30	1059	38.73	4981	21	18.65	2734	1059 to 1520	85.93	11622
35	1059	41.15	6319	23	17.99	3426	1059 to 1522	88.20	14671
40	1059	42.42	7657	24	17.44	4054	1059 to 1525	89.05	17613
45	1059	42.60	9002	26	16.11	4603	1059 to 1527	87.04	20428
50	1059	41.78	10195	27	14.67	5065	1059 to 1529	83.44	22884
55	1059	40.07	11363	28	13.64	5437	1059 to 1531	79.29	25152
60	1059	37.61	12298	29	12.55	5716	1059 to 1532	74.00	26935
65	1059	34.53	13128	29	11.96	5918	1059 to 1533	68.69	28442
70	1059	31.01	13703	30	11.45	6057	1059 to 1534	62.89	29481
75	1059	27.18	14066	30	11.20	6090	1059 to 1534	57.10	30047
80	1059	23.21	14195	30	11.68	6018	1059 to 1534	52.37	30105
85	1059	19.25	14025	29	12.05	5841	1059 to 1534	47.44	29566
90	1059	17.06	13622	29	12.66	5560	1059 to 1533	45.42	28525
95	1059	23.06	12927	28	14.15	5178	1059 to 1532	56.35	26903
100	1059	29.48	11924	27	15.23	4698	1059 to 1530	67.18	24681
105	1059	36.13	10647	26	16.47	4122	1059 to 1528	78.59	21916
110	1059	42.84	9085	25	18.48	3457	1059 to 1526	91.40	18597
115	1059	49.56	7224	24	19.52	2705	1059 to 1524	102.59	14715
120	1059	56.29	5079	22	21.41	1875	1059 to 1521	115.22	10298
125	1059	62.69	2673	21	23.14	970	1059 to 1519	127.11	5393
130	1059	69.07	0	19	24.69	0	1059 to 1516	138.68	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-20-2006 SUBJECT _____ SHT. NO.: RAC - 123 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 123

INPUT DATA

Applied Load = 5732 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 3589 lb./ft.

Variation Factor = 1.653
Radius CL = 37.98 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	359	0.00	0	47	0.00	0	359 to 584	0.00	0
5	359	11.47	228	47	8.07	123	359 to 583	29.79	529
10	359	21.03	838	46	14.86	562	359 to 583	54.71	2131
15	359	28.61	1717	47	19.88	1276	359 to 583	73.86	4574
20	359	34.23	2792	47	24.73	2158	359 to 584	89.97	7578
25	359	37.94	4027	49	25.42	3061	359 to 588	96.34	10843
30	359	39.84	5235	51	24.78	3899	359 to 591	97.92	13958
35	359	40.11	6415	53	23.72	4749	359 to 595	96.48	17054
40	359	38.92	7513	55	21.37	5492	359 to 598	90.84	19855
45	359	36.52	8431	57	19.04	6057	359 to 601	83.50	22100
50	359	33.14	9178	58	17.94	6435	359 to 603	76.90	23789
55	359	29.06	9684	59	16.85	6623	359 to 604	69.33	24817
60	359	24.54	9893	59	16.48	6619	359 to 604	62.37	25104
65	359	19.85	9866	59	18.00	6424	359 to 604	58.40	24735
70	359	16.48	9481	58	19.13	6039	359 to 603	55.60	23540
75	359	23.82	8767	57	20.91	5467	359 to 602	68.91	21568
80	359	31.73	7735	56	24.44	4735	359 to 599	85.98	18879
85	359	40.18	6330	54	25.59	3821	359 to 597	99.78	15359
90	359	48.87	4563	52	29.91	2722	359 to 593	119.27	11016
95	359	57.44	2461	50	34.26	1444	359 to 588	138.67	5902
100	359	66.28	0	47	38.34	0	359 to 584	157.99	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-20-2006 SUBJECT _____ SHT. NO.: RAC - 124 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 124

INPUT DATA

Applied Load = 8757 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 3589 lb./ft.

Variation Factor = 1.349
Radius CL = 37.98 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	448	0.00	0	47	0.00	0	448 to 708	0.00	0
5	448	9.37	186	47	8.07	123	448 to 708	26.85	470
10	448	17.17	684	46	14.86	562	448 to 707	49.31	1915
15	448	23.36	1402	47	19.88	1276	448 to 708	66.51	4133
20	448	27.95	2280	47	24.73	2158	448 to 709	81.18	6860
25	448	30.97	3288	49	25.42	3061	448 to 712	86.59	9808
30	448	32.53	4274	51	24.78	3899	448 to 716	87.68	12613
35	448	32.75	5238	53	23.72	4749	448 to 719	86.18	15406
40	448	31.78	6135	55	21.37	5492	448 to 723	80.84	17925
45	448	29.82	6884	57	19.04	6057	448 to 725	74.12	19935
50	448	27.06	7493	58	17.94	6435	448 to 727	68.39	21431
55	448	23.72	7907	59	16.85	6623	448 to 728	61.86	22329
60	448	20.03	8078	59	16.48	6619	448 to 728	56.07	22563
65	448	16.21	8056	59	18.00	6424	448 to 728	53.30	22200
70	448	13.46	7741	58	19.13	6039	448 to 728	51.36	21105
75	448	19.45	7158	57	20.91	5467	448 to 726	62.78	19316
80	448	25.91	6316	56	24.44	4735	448 to 724	77.83	16892
85	448	32.81	5169	54	25.59	3821	448 to 721	89.46	13733
90	448	39.90	3726	52	29.91	2722	448 to 717	106.72	9844
95	448	46.90	2009	50	34.26	1444	448 to 713	123.91	5270
100	448	54.12	0	47	38.34	0	448 to 708	140.97	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-20-2006 SUBJECT _____ SHT. NO.: RAC - 125 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 125

INPUT DATA

Applied Load = 5732 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 3589 lb./ft.

Variation Factor = 1.653
Radius CL = 37.98 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	359	0.00	0	35	0.00	0	359 to 563	0.00	0
5	359	11.86	236	35	8.87	139	359 to 563	31.69	567
10	359	22.54	898	34	17.03	636	359 to 562	60.52	2340
15	359	31.86	1911	34	23.12	1471	359 to 561	83.91	5177
20	359	39.71	3191	33	29.76	2502	359 to 561	106.20	8722
25	359	46.03	4712	35	31.64	3596	359 to 564	118.24	12711
30	359	50.78	6404	38	32.46	4752	359 to 569	126.28	17046
35	359	53.96	8124	41	32.28	5960	359 to 574	130.42	21507
40	359	55.62	9844	44	30.88	7059	359 to 578	130.37	25784
45	359	55.85	11573	46	28.54	8019	359 to 582	126.72	29837
50	359	54.77	13108	48	26.53	8828	359 to 586	121.79	33360
55	359	52.53	14610	50	24.21	9480	359 to 589	114.72	36571
60	359	49.31	15812	51	22.28	9970	359 to 591	106.91	39086
65	359	45.28	16879	52	21.34	10341	359 to 593	99.68	41211
70	359	40.65	17618	53	20.39	10584	359 to 595	91.59	42659
75	359	35.64	18085	54	19.95	10644	359 to 595	83.83	43414
80	359	30.44	18251	54	20.85	10519	359 to 595	78.07	43434
85	359	25.24	18033	53	21.56	10211	359 to 594	72.01	42605
90	359	22.37	17514	52	22.74	9721	359 to 593	69.98	41046
95	359	30.24	16621	51	24.32	9054	359 to 591	83.69	38662
100	359	38.65	15331	49	27.48	8215	359 to 588	100.85	35428
105	359	47.37	13690	47	29.79	7209	359 to 585	116.97	31422
110	359	56.17	11681	45	32.29	6045	359 to 581	133.55	26631
115	359	64.98	9289	43	34.82	4732	359 to 577	150.17	21049
120	359	73.80	6530	40	38.19	3279	359 to 572	168.25	14716
125	359	82.19	3437	37	41.27	1697	359 to 567	185.24	7698
130	359	90.56	0	35	44.04	0	359 to 563	201.66	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-20-2006 SUBJECT _____ SHT. NO.: RAC - 126 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 126

INPUT DATA

Applied Load = 8757 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 3589 lb./ft.

Variation Factor = 1.349
Radius CL = 37.98 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	448	0.00	0	35	0.00	0	448 to 688	0.00	0
5	448	9.69	192	35	8.87	139	448 to 687	28.64	506
10	448	18.40	733	34	17.03	636	448 to 687	54.73	2109
15	448	26.01	1560	34	23.12	1471	448 to 685	75.73	4686
20	448	32.43	2606	33	29.76	2502	448 to 685	96.00	7902
25	448	37.58	3847	35	31.64	3596	448 to 688	106.41	11501
30	448	41.46	5229	38	32.46	4752	448 to 693	113.23	15400
35	448	44.05	6633	41	32.28	5960	448 to 698	116.56	19420
40	448	45.41	8038	44	30.88	7059	448 to 703	116.09	23255
45	448	45.60	9450	46	28.54	8019	448 to 707	112.37	26864
50	448	44.72	10703	48	26.53	8828	448 to 710	107.72	29993
55	448	42.89	11929	50	24.21	9480	448 to 713	101.22	32818
60	448	40.26	12910	51	22.28	9970	448 to 716	94.25	35024
65	448	36.97	13782	52	21.34	10341	448 to 718	88.04	36874
70	448	33.19	14385	53	20.39	10584	448 to 719	81.14	38133
75	448	29.10	14766	54	19.95	10644	448 to 720	74.67	38769
80	448	24.85	14902	54	20.85	10519	448 to 719	70.25	38746
85	448	20.61	14724	53	21.56	10211	448 to 719	65.52	37972
90	448	18.26	14300	52	22.74	9721	448 to 717	64.23	36547
95	448	24.69	13571	51	24.32	9054	448 to 715	75.93	34392
100	448	31.56	12517	49	27.48	8215	448 to 712	90.92	31490
105	448	38.68	11178	47	29.79	7209	448 to 709	104.80	27905
110	448	45.87	9538	45	32.29	6045	448 to 705	119.11	23631
115	448	53.06	7584	43	34.82	4732	448 to 701	133.48	18663
120	448	60.26	5331	40	38.19	3279	448 to 696	149.29	13039
125	448	67.11	2806	37	41.27	1697	448 to 692	164.13	6815
130	448	73.94	0	35	44.04	0	448 to 688	178.40	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-20-2006 SUBJECT _____ SHT. NO.: RAC - 127 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 127

INPUT DATA

Applied Load = 13422 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 1991 lb./ft.
Variation Factor = 1.102
Radius CL = 38.48 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	569	0.00	0	26	0.00	0	569 to 841	0.00	0
5	569	4.25	85	26	4.47	70	569 to 841	13.56	240
10	569	7.79	314	26	8.22	321	569 to 841	24.89	987
15	569	10.60	644	26	12.18	728	569 to 841	35.56	2141
20	569	12.68	1048	26	13.69	1230	569 to 842	41.04	3559
25	569	14.06	1512	27	14.11	1743	569 to 843	43.68	5080
30	569	14.76	1965	28	14.35	2218	569 to 846	45.07	6522
35	569	14.86	2408	30	13.09	2699	569 to 848	43.06	7961
40	569	14.42	2821	31	11.84	3119	569 to 849	40.33	9253
45	569	13.53	3165	32	10.82	3439	569 to 851	37.34	10278
50	569	12.28	3445	32	9.88	3652	569 to 852	33.99	11033
55	569	10.76	3636	33	9.12	3758	569 to 852	30.59	11479
60	569	9.09	3714	33	9.54	3755	569 to 853	28.95	11585
65	569	7.35	3704	33	9.73	3644	569 to 853	26.84	11381
70	569	6.10	3559	32	10.94	3425	569 to 852	27.15	10806
75	569	8.82	3291	32	11.92	3100	569 to 851	32.63	9879
80	569	11.76	2904	31	13.24	2682	569 to 850	38.97	8626
85	569	14.89	2376	30	14.33	2164	569 to 848	45.21	7007
90	569	18.11	1713	29	16.72	1541	569 to 846	53.79	5019
95	569	21.28	924	27	19.15	818	569 to 844	62.36	2685
100	569	24.56	0	26	21.43	0	569 to 841	70.83	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-20-2006 SUBJECT _____ SHT. NO.: RAC - 128 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 128

INPUT DATA

Applied Load = 12868 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 1991 lb./ft.

Variation Factor = 1.106
Radius CL = 38.48 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	547	0.00	0	26	0.00	0	547 to 811	0.00	0
5	547	4.23	85	26	4.47	70	547 to 811	13.54	240
10	547	7.76	313	26	8.22	321	547 to 811	24.85	985
15	547	10.56	642	26	12.18	728	547 to 811	35.50	2138
20	547	12.63	1044	26	13.69	1230	547 to 811	40.97	3554
25	547	14.00	1506	27	14.11	1743	547 to 813	43.60	5072
30	547	14.71	1958	28	14.35	2218	547 to 815	45.00	6512
35	547	14.81	2399	30	13.09	2699	547 to 817	42.99	7949
40	547	14.37	2810	31	11.84	3119	547 to 819	40.25	9238
45	547	13.48	3153	32	10.82	3439	547 to 821	37.27	10262
50	547	12.23	3433	32	9.88	3652	547 to 822	33.92	11016
55	547	10.72	3622	33	9.12	3758	547 to 822	30.53	11461
60	547	9.06	3700	33	9.54	3755	547 to 822	28.90	11565
65	547	7.32	3690	33	9.73	3644	547 to 822	26.80	11362
70	547	6.08	3546	32	10.94	3425	547 to 822	27.12	10788
75	547	8.79	3279	32	11.92	3100	547 to 821	32.59	9862
80	547	11.71	2893	31	13.24	2682	547 to 820	38.91	8611
85	547	14.83	2368	30	14.33	2164	547 to 818	45.13	6995
90	547	18.04	1707	29	16.72	1541	547 to 816	53.69	5010
95	547	21.20	920	27	19.15	818	547 to 814	62.25	2680
100	547	24.47	0	26	21.43	0	547 to 811	70.70	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-20-2006 SUBJECT _____ SHT. NO.: RAC - 129 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 129

INPUT DATA

Applied Load = 25051 lb./ft.
Arc Subtended = 100 degrees
Surcharge Load = 1991 lb./ft.
Variation Factor = 1.114
Radius CL = 38.48 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1073	0.00	0	26	0.00	0	1073 to 1548	0.00	0
5	1073	8.87	178	26	4.47	70	1073 to 1548	20.03	371
10	1073	16.25	656	26	8.22	321	1073 to 1547	36.74	1465
15	1073	22.12	1344	26	12.18	728	1073 to 1547	51.68	3122
20	1073	26.46	2186	26	13.69	1230	1073 to 1548	60.32	5153
25	1073	29.32	3154	27	14.11	1743	1073 to 1550	65.05	7379
30	1073	30.80	4100	28	14.35	2218	1073 to 1552	67.53	9511
35	1073	31.00	5024	30	13.09	2699	1073 to 1554	65.66	11623
40	1073	30.09	5884	31	11.84	3119	1073 to 1556	62.26	13542
45	1073	28.23	6603	32	10.82	3439	1073 to 1557	57.92	15091
50	1073	25.62	7188	32	9.88	3652	1073 to 1558	52.66	16273
55	1073	22.46	7584	33	9.12	3758	1073 to 1559	46.96	17007
60	1073	18.97	7748	33	9.54	3755	1073 to 1559	42.77	17232
65	1073	15.34	7727	33	9.73	3644	1073 to 1559	38.03	17013
70	1073	12.74	7425	32	10.94	3425	1073 to 1559	36.44	16219
75	1073	18.41	6866	32	11.92	3100	1073 to 1558	46.06	14884
80	1073	24.53	6058	31	13.24	2682	1073 to 1557	56.85	13041
85	1073	31.06	4958	30	14.33	2164	1073 to 1555	67.85	10621
90	1073	37.77	3574	29	16.72	1541	1073 to 1553	81.32	7624
95	1073	44.40	1927	27	19.15	818	1073 to 1550	94.73	4090
100	1073	51.24	0	26	21.43	0	1073 to 1548	108.18	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-20-2006 SUBJECT _____ SHT. NO.: RAC - 130 OF ___

CHKD. BY: _____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 130

INPUT DATA

Applied Load = 13422 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 1991 lb./ft.
Variation Factor = 1.102
Radius CL = 38.48 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	569	0.00	0	19	0.00	0	569 to 830	0.00	0
5	569	4.39	88	19	4.92	79	569 to 830	14.52	260
10	569	8.35	337	19	9.44	363	569 to 829	27.74	1090
15	569	11.80	717	18	13.99	839	569 to 829	40.32	2431
20	569	14.71	1198	18	16.50	1425	569 to 828	48.66	4101
25	569	17.06	1769	19	17.59	2046	569 to 830	53.78	5955
30	569	18.81	2404	21	18.64	2701	569 to 833	58.04	7959
35	569	19.99	3050	23	17.96	3386	569 to 836	58.53	10027
40	569	20.61	3696	24	17.15	4008	569 to 838	58.01	11989
45	569	20.69	4345	25	16.11	4551	569 to 840	56.38	13821
50	569	20.29	4921	27	14.69	5009	569 to 842	53.40	15405
55	569	19.46	5485	28	13.38	5377	569 to 844	50.00	16821
60	569	18.27	5936	28	12.58	5654	569 to 845	46.98	17923
65	569	16.78	6337	29	11.85	5857	569 to 847	43.64	18830
70	569	15.06	6614	29	11.49	5995	569 to 847	40.63	19452
75	569	13.20	6790	30	11.25	6028	569 to 848	37.62	19754
80	569	11.28	6852	30	11.29	5957	569 to 848	35.00	19721
85	569	9.35	6770	29	12.21	5782	569 to 847	33.87	19308
90	569	8.29	6575	29	12.86	5504	569 to 846	33.47	18564
95	569	11.20	6240	28	13.73	5126	569 to 845	39.03	17452
100	569	14.32	5756	27	15.44	4651	569 to 843	46.30	15965
105	569	17.55	5139	26	16.70	4081	569 to 842	52.98	14134
110	569	20.81	4385	25	18.08	3422	569 to 840	59.88	11958
115	569	24.08	3487	24	19.45	2678	569 to 837	66.79	9436
120	569	27.34	2451	22	21.34	1856	569 to 835	74.57	6588
125	569	30.46	1290	21	23.06	961	569 to 832	81.85	3440
130	569	33.56	0	19	24.60	0	569 to 830	88.82	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-20-2006 SUBJECT _____ SHT. NO.: RAC - 131 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 131

INPUT DATA

Applied Load = 12868 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 1991 lb./ft.
Variation Factor = 1.106
Radius CL = 38.48 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	547	0.00	0	19	0.00	0	547 to 800	0.00	0
5	547	4.38	88	19	4.92	79	547 to 799	14.50	259
10	547	8.32	336	19	9.44	363	547 to 799	27.70	1088
15	547	11.76	715	18	13.99	839	547 to 798	40.26	2427
20	547	14.66	1193	18	16.50	1425	547 to 798	48.59	4095
25	547	16.99	1762	19	17.59	2046	547 to 800	53.70	5946
30	547	18.74	2395	21	18.64	2701	547 to 803	57.94	7946
35	547	19.92	3039	23	17.96	3386	547 to 805	58.43	10011
40	547	20.53	3682	24	17.15	4008	547 to 808	57.91	11970
45	547	20.62	4329	25	16.11	4551	547 to 810	56.27	13799
50	547	20.22	4903	27	14.69	5009	547 to 812	53.29	15380
55	547	19.39	5465	28	13.38	5377	547 to 814	49.90	16793
60	547	18.20	5914	28	12.58	5654	547 to 815	46.88	17893
65	547	16.71	6314	29	11.85	5857	547 to 816	43.55	18798
70	547	15.01	6590	29	11.49	5995	547 to 817	40.56	19418
75	547	13.15	6765	30	11.25	6028	547 to 818	37.55	19719
80	547	11.23	6827	30	11.29	5957	547 to 817	34.94	19685
85	547	9.32	6745	29	12.21	5782	547 to 817	33.82	19274
90	547	8.26	6551	29	12.86	5504	547 to 816	33.42	18530
95	547	11.16	6217	28	13.73	5126	547 to 815	38.97	17420
100	547	14.27	5734	27	15.44	4651	547 to 813	46.23	15935
105	547	17.49	5121	26	16.70	4081	547 to 812	52.89	14108
110	547	20.74	4369	25	18.08	3422	547 to 810	59.77	11936
115	547	23.99	3474	24	19.45	2678	547 to 807	66.67	9418
120	547	27.24	2442	22	21.34	1856	547 to 805	74.43	6575
125	547	30.34	1285	21	23.06	961	547 to 802	81.69	3434
130	547	33.43	0	19	24.60	0	547 to 800	88.64	0

HARTMAN ENGINEERING

BY: RJH DATE: 05-20-2006 SUBJECT _____ SHT. NO.: RAC - 132 OF ___

CHKD. BY: ____ DATE: _____ _____ JOB NO.: 06-602

ANALYSIS AND DESIGN LOADS FOR WALE NO. 132

INPUT DATA

Applied Load = 25051 lb./ft.
Arc Subtended = 130 degrees
Surcharge Load = 1991 lb./ft.
Variation Factor = 1.114
Radius CL = 38.48 feet
Distance to Surcharge = 12.5 feet

TABULATION OF INTERNAL LOADS

Point	Analysis Loads						Design Loads		
	Soil & Water			Surcharge			Range of P	V	M
	P (kips)	V (kips)	M (k-in)	P (kips)	V (kips)	M (k-in)	(kips)	(kips)	(k-in)
0	1073	0.00	0	19	0.00	0	1073 to 1536	0.00	0
5	1073	9.17	184	19	4.92	79	1073 to 1536	21.21	394
10	1073	17.42	703	19	9.44	363	1073 to 1536	40.44	1603
15	1073	24.63	1497	18	13.99	839	1073 to 1535	58.27	3522
20	1073	30.70	2499	18	16.50	1425	1073 to 1535	71.04	5923
25	1073	35.58	3690	19	17.59	2046	1073 to 1537	79.72	8645
30	1073	39.25	5016	21	18.64	2701	1073 to 1539	86.65	11615
35	1073	41.71	6363	23	17.96	3386	1073 to 1542	88.93	14665
40	1073	42.99	7710	24	17.15	4008	1073 to 1545	89.35	17608
45	1073	43.17	9064	25	16.11	4551	1073 to 1547	87.85	20428
50	1073	42.34	10266	27	14.69	5009	1073 to 1549	84.26	22888
55	1073	40.61	11442	28	13.38	5377	1073 to 1551	79.60	25161
60	1073	38.11	12384	28	12.58	5654	1073 to 1552	74.76	26950
65	1073	35.00	13219	29	11.85	5857	1073 to 1553	69.15	28466
70	1073	31.42	13798	29	11.49	5995	1073 to 1554	63.54	29509
75	1073	27.55	14164	30	11.25	6028	1073 to 1554	57.70	30078
80	1073	23.53	14294	30	11.29	5957	1073 to 1554	52.15	30139
85	1073	19.51	14123	29	12.21	5782	1073 to 1554	48.09	29602
90	1073	17.29	13717	29	12.86	5504	1073 to 1553	46.07	28562
95	1073	23.37	13017	28	13.73	5126	1073 to 1552	56.07	26940
100	1073	29.88	12007	27	15.44	4651	1073 to 1550	68.08	24717
105	1073	36.62	10721	26	16.70	4081	1073 to 1548	79.67	21949
110	1073	43.42	9149	25	18.08	3422	1073 to 1546	91.53	18627
115	1073	50.23	7275	24	19.45	2678	1073 to 1544	103.40	14739
120	1073	57.05	5114	22	21.34	1856	1073 to 1541	116.15	10315
125	1073	63.54	2692	21	23.06	961	1073 to 1539	128.16	5402
130	1073	70.00	0	19	24.60	0	1073 to 1536	139.84	0

APPENDIX A

Selected Pages from Foundation Design
by Wayne C. Teng

FOUNDATION DESIGN

Wayne C. Teng

Teng and Associates
Consulting Engineers, Chicago, Illinois

Prentice-Hall, Inc.

Englewood Cliffs, New Jersey

tential lines at various points. At point j, for example, it intersects equipotential line 2, hence the pressure

$$p_w = \frac{2}{9} h\gamma_w$$

With the pressure at the various intersections known, as shown on the right hand side of Fig. 4-13(a), the total pressure P_w, acting at right angle to the sliding surface ab, can be computed.

In computing the earth pressure during a rain storm, the wedge theory (Sec. 4-4) is used. The computation should include the total hydraulic pressure P_w (pore pressure) acting on the sliding surface; the saturated weight of soil should be used. These forces are shown in Fig. 4-13(d) and the force polygon is shown in Fig. 4-13(e). If the back of wall is vertical, the wall is built on top of a relatively impervious layer, and an adequate drain layer is provided against the back of the wall, the value of total pressure P_w acting on any trial sliding surface can be obtained directly from Fig. 4-13(f).

With the aid of flow net, the hydraulic uplift against the base of the wall can be determined at intersections of equipotential lines.

4-9 Surcharge Load

The lateral pressure introduced on a retaining structure may be classified into four types for convenience of computation.

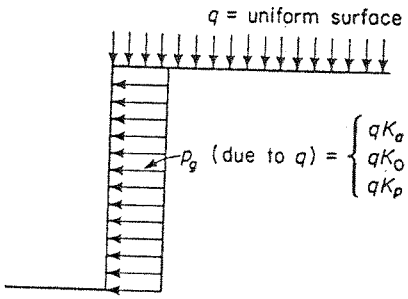


Fig. 4-14 Lateral pressure due to uniform surcharge.

A. Uniform load. When the ground surface is subjected to a uniformly distributed load, the earth pressure computation is often made by substituting the load by an equivalent surcharge layer. The thickness of this surcharge layer is equal to the distributed load divided by the unit weight of the underlying soil.

The computation of lateral pressure due to a uniform surcharge is relatively simple. In the case where the wedge theory is used, the surcharge load can be readily included in the computation of the weight of wedges. In the case where Rankine theory is applicable, the pressure caused by a uniform surcharge q is a constant pressure and is equal to

$$p_q = qK_a, \quad p_q = qK_0, \quad \text{or} \quad p_q = qK_p \tag{4-6}$$

where the earth pressure coefficient K_a, K_0, or K_p is a constant within any soil stratum having a constant φ value, Fig. 4-14.

Contrary to the uniform surcharge, the lateral pressure due to a surcharge applied on a limited area of the ground surface is difficult to determine. The effect of a strip load or a line load parallel to a retaining wall may be included in the trial wedge method. In other cases, the theory of elasticity has been widely used. However, the validity of the elastic theory has not been proved in all cases. The results of a limited number of tests (Terzaghi, 1954) have proved that the measured horizontal unit pressure against a vertical rigid wall are about twice as high as those calculated by the elastic theory.

B. Strip load. Highways, railroads and continuous wall footings are strip loads when they are parallel to the retaining structure. Refer to Fig. 4-15 and let:

p_q = horizontal pressure at point a;

β = angle of visibility at point a, in radian;

α = angle between vertical and the bisector of β;

q = strip load, psf.

The actual lateral pressure against a rigid wall is twice the value determined by theory of elasticity:

$$p_q = \frac{2q}{\pi}(\beta + \sin\beta)\sin^2\alpha + \frac{2q}{\pi}(\beta - \sin\beta)\cos^2\alpha \qquad (4\text{-}7)$$

as shown in Fig. 4-15, the value of p_q varies with depth.

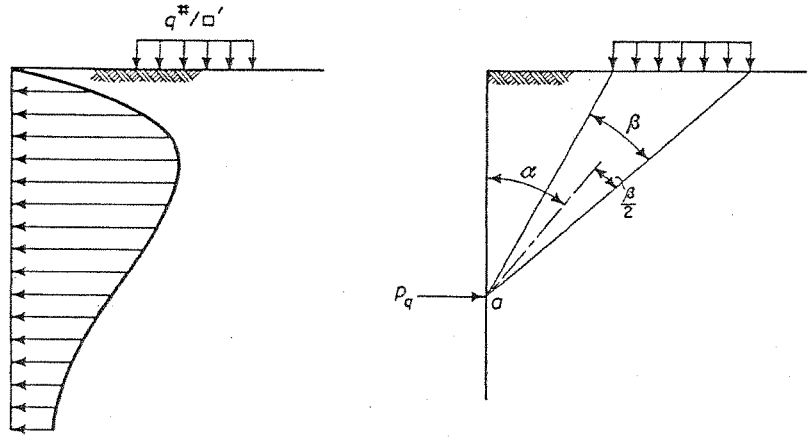


Fig. 4-15 Lateral pressure due to strip load.

C. Line load. A continuous wall footing of narrow width may be taken as a line load when located parallel to the retaining structure. Similar to the case of strip load, the lateral pressure increases from zero at the ground surface to a maximum value at a certain depth and gradually diminishes to

zero at a greater depth, Fig. 4-16. The unit horizontal pressure may be computed by the following equation (Terzaghi, 1954):

$$\left.\begin{aligned} p_q &= 1.27q\,\frac{xz}{R^4} \\ &= 1.27\,\frac{q}{H}\,\frac{m^2n}{(m^2+n^2)^2} \end{aligned}\right\} \quad (m > 0.4) \tag{4-8a}$$

$$p_q = 0.203\,\frac{q}{H}\,\frac{n}{(0.16+n^2)^2} \quad (m < 0.4) \tag{4-8b}$$

D. Point load. A wheel load or any load concentrated on a small area may be treated as a point load. The intensity of lateral pressure in this case varies not only with the depth but also with the horizontal distance from the load. The pressure is greatest along the vertical line *ab* closest to the load, Fig. 4-17. Along this line *ab*, the unit horizontal pressure p may be computed by the following empirical equations (Terzaghi, 1954):

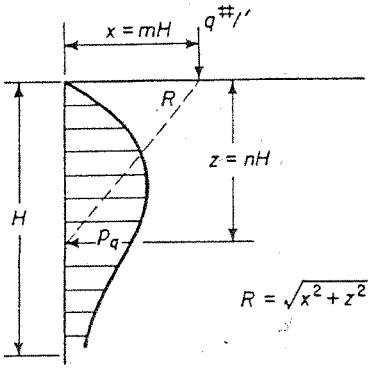


Fig. 4-16 Lateral pressure due to line load.

$$p_1 = 1.77\,\frac{Q}{H^2}\,\frac{m^2n^2}{(m^2+n^2)^3} \quad (m > 0.4) \tag{4-9a}$$

$$p_1 = 0.28\,\frac{Q}{H^2}\,\frac{n^2}{(0.16+n^2)^3} \quad (m < 0.4) \tag{4-9b}$$

The unit horizontal pressure on any other points on both sides of *ab* is smaller than p_1 at the same depth, and may be calculated by the following equation.

$$p_Q = p_1 \cos^2(1.1\psi) \tag{4-9c}$$

The notations used in the equations above are self-explanatory in Fig. 4-17.

4-10 Ice Thrust

Substructures are subjected to ice thrust where the ground water or capillary water is above the frost line (depth of frost penetration). Lateral thrust is caused by the volume expansion of ice upon change in temperature. The magnitude of the thrust is very large, being equal to the buckling or crushing strength of the ice sheet. In practice the horizontal ice thrust acting

The maximum water level should be established.

3. Compute the lateral pressure–Sec. 13-4.
4. Select the type and material for the components of the cofferdam–Sec. 13-2.
5. Design the various components–Sec. 13-5.
6. Investigate the stability of the cofferdam–Sec. 13-6.
7. Investigate the safety against piping–Sec. 13-7.

The plan dimension of a braced cofferdam is controlled by the size of the substructure to be constructed within the cofferdam. The cofferdam should be at least 5 ft larger on each side so as to allow sufficient room for work and the installation of formwork. Space should also be provided for sumps if they are used for dewatering the cofferdam. If the substructure will be poured against the lagging or sheeting, the plan size of the cofferdam is, of course, the size of the substructure. It should be borne in mind, in this case, that the final dimensions of the cofferdam are likely to differ somewhat from the design dimensions. Therefore, it is essential to allow for such variations in the design. The amount of variation between the design and the actual dimensions depends on the characteristics of the soil and the workmanship of the constructor. In unfavorable conditions, the variation may exceed 6 in. Sheetpiling tends to creep in the direction of driving. Consequently, the total length of wall is generally longer than the theoretical dimension.

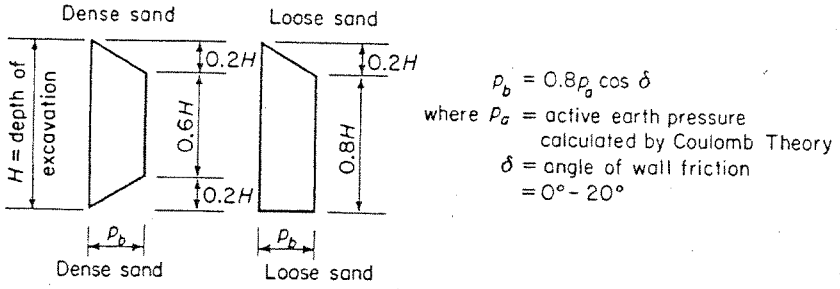
In water, the height of a cofferdam is controlled by the high water level expected during the useful life of the cofferdam. The high water level also controls the necessary depth of penetration of the piling in order to prevent boil and heave of the bottom of excavation.

13-4 Lateral Pressure on Braced Cofferdams

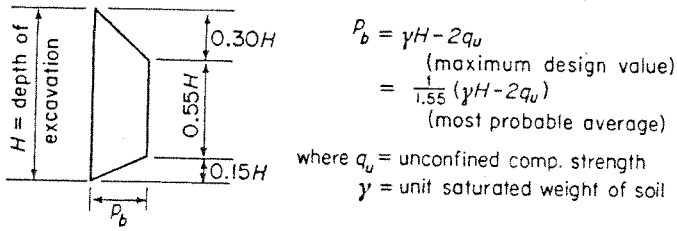
A braced cofferdam may be subjected to earth pressure, surcharge load, hydrostatic pressure, wave pressure, and earthquake forces. With the exception of earth pressure, all these forces may be evaluated by the principles discussed in Chapter 4. The earth pressure, however, cannot be calculated by the classical earth pressure theories (Rankine, Coulomb and wedge theories) because the yield (movement) of cofferdam walls does not satisfy the basic assumptions of these theories. For cofferdams in sand and soft to medium clays, the trapezoidal rules proposed by Terzaghi and Peck (1948) may be used for design purposes. In stiff clays, the earth pressure is very small in the beginning but frequently increases with time and may approach a value corresponding to the earth pressure assuming a zero cohesion (Kirkdam, 1958). These cases are discussed below.

A. Earth pressure on braced cofferdam in sand. The actual earth pressure at a given vertical profile of the cofferdam varies considerably from place to place. The greatest load that a strut may be required to take can be calculated by the trapezoidal pressure diagrams shown in Fig. 13-2(a). These trapezoids represent the maximum pressure which may exist on some of the profiles in a given braced cofferdam in sand. However, the actual loads on many struts are likely to be smaller.

For ordinary design, the value of φ to be used for calculation of P_a may be



(a)



(b)

	Theoretical rupture surface	Av measured pressure t/m^2	Values used for computing earth pressure, in percentage of triaxial values	
			ϕ	C
Shortly after excavation (September)		2.27	100	80
September 20th		2.27	100	60
October 21st		4.29	100	15
November 15th		7.13	100	0

(c)

Fig. 13-2 Earth pressure on braced cofferdams: (a) in sand; (b) in soft and medium clays (after Terzaghi and Peck); (c) on an experimental cofferdam in stiff fissured clay (after Kirkdam).

estimated on the basis of the standard penetration resistance using the relationship between φ and N shown in Table 1-1. The angle of wall friction δ should be assumed zero unless the sheeting or soldier beams are driven to dense soil. In the latter case, the value of δ may be taken up to 20 degrees.

B. Earth pressure on braced cofferdams in soft and medium clays. Similar to the case of braced cofferdams in sand, the earth pressure varies from place to place and may be approximated, for the design purpose, by a trapezoid shown in Fig. 13-2(b). The total earth pressure represented by the area of the trapezoid is probably equal to the total Rankine active earth pressure, by assuming the angle of internal friction φ equal to zero and the cohesion c equal to one-half the unconfined compression strength. According to Rankine, the total active pressure is equal to $\frac{1}{2}\gamma H^2[1 - (2q_u/\gamma H)]$. The total area of the trapezoid is $\frac{1}{2}(1.55p_bH)$. Equating these two values, we get

$$p_b = \frac{1}{1.55}(\gamma H - 2q_u)$$

This value is the probable average pressure. Since the actual pressure varies considerably from place to place, the design should be made for the most unfavorable condition using

$$p_b = \gamma H - 2q_u \tag{13-1}$$

where q_u = unconfined compression strength of the soil.

C. Earth pressure on braced cofferdams in stiff clays. Immediately after the installation of a cofferdam, the earth pressure due to stiff clays is relatively small. However, as time goes on, the fissures in the stiff clay become softened and the earth pressure increases considerably. This phenomenon has been studied in a test trench, the results of which are shown in Fig. 13-2(c). At a time shortly after excavation, the average earth pressure was 2.27 tons per square meter, corresponding to $\varphi = 100$ per cent, and $c = 80$ per cent of the values determined by triaxial test. At the end of about two months, the earth pressure increased to 7.13 tons per square meter, corresponding to $\varphi = 100$ per cent and $c = 0$ per cent of the test values. The results of this experiment leads to the conclusion that the final maximum earth pressure may be calculated on the basis of $c = 0$ and φ = the value determined by tri-axial test

D. Earth pressure on braced cofferdams in stratified soils. When layers of sand and soft clay are encountered, the trapezoidal distribution shown in Fig. 13-2(b) may be used if the unconfined compression strength q_u is substituted by the average value q_a and the unit weight of the soil by the average value γ_a (Peck, 1943).

$$q_a = \frac{1}{H}[\gamma_s K_s H_s^2 \tan \varphi_s (H - H_s) n q_u] \tag{13-2}$$

$$\gamma_a = \frac{1}{H}[\gamma_s H_s + (H - H_s)\gamma_c] \tag{13-3}$$

where γ_s = unit saturated weight of sand;

K_s = hydrostatic pressure ratio for the sand layer, may be taken as 1.0 for design purposes;

H_s = thickness of the sand layer;

φ = angle of internal friction of the sand;

H = total depth of excavation;

q_u = unconfined compression strength of the clay;

γ_c = unit saturated weight of the clay;

n = coefficient of progressive failure, the value ranges usually from 0.5 to 1.0. This value varies with the creep characteristics of the clay, the length of time during which the excavation remains open, and the care excercised in construction. In Chicago clay, the value ranges between 0.75 to 1.0.

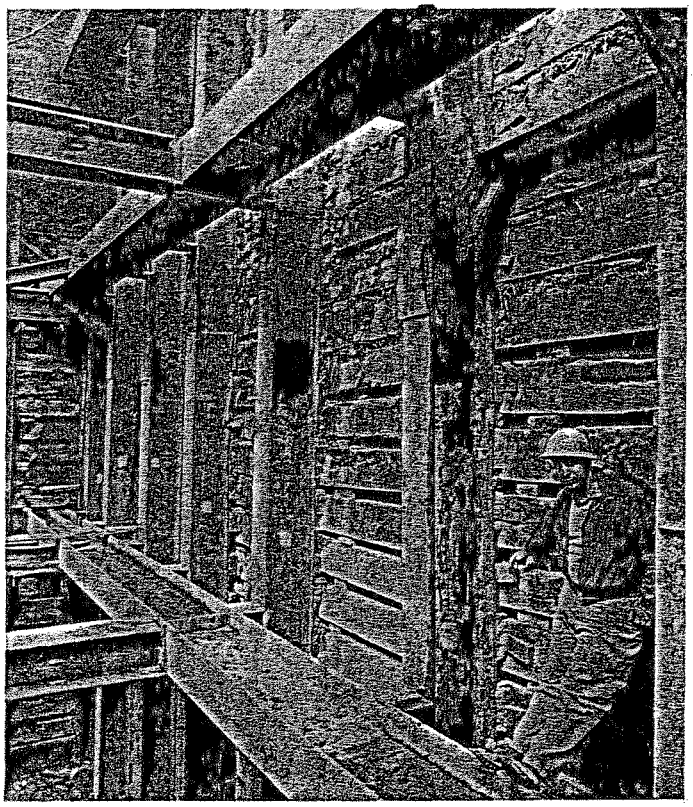


Fig. 13-3 Interior of a braced cofferdam. Courtesy of Spencer, White & Prentis.

13-5 Components of Braced Cofferdams

A. Lagging. Usually made of 2 in. or 3 in. planks, the lagging is installed by hand after a depth of several feet is excavated. The maximum depth made each time before a series of lagging is placed depends on the soil characteristics. Soft clay and loose sand must be planked in short depths to reduce the amount of soil moving or running into the excavation. Immediately after placement of lagging, wedges should be driven to force it tightly against the soil. Voids behind the lagging should be packed by hand to reduce the amount of loss of ground. Figure 13-3 shows an interior view of a braced cofferdam using lagging.

Due to flexibility of wood, lagging usually deflects considerably. This deflection tends to reduce the magnitude of the earth pressure at the midspan of the lagging. Consequently, lagging is seldom subjected to high bending stress even if the calculated value is high.

B. Sheetpiling. Generally sheetpiling is designed as a continuous member supported at the strut levels. In addition, a fictitious support is introduced at the bottom of excavation and the sheetpiling is assumed to be hinged at this level, Fig. 13-4(a). The struts may be arranged at such levels that either

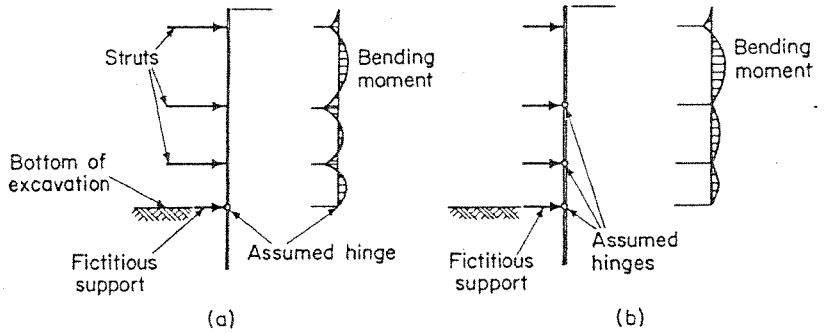


Fig. 13-4 Assumptions used in the design of sheeting and soldier beams: (a) sheeting and soldier beams; (b) soldier beams (alternate design).

the maximum bending moments are equal in all spans of the sheetpiling, or the reactions on the struts at all levels are equal. In many cases, the arrangements of struts is governed by the details of the permanent substructure.

Sheetpiling driven in soft soil also offers resistance against heaving force of the soil at the bottom of excavation. This is discussed in Sec. 13-7.

C. Soldier beams. Soldier beams may be designed as fully continuous over-all supports as discussed above, or as simple spans as shown in Fig. 13-4(b). The latter assumption gives a more conservative design.

D. Wales. Wales are designed to resist horizontal reactions from soldier beams or sheetpiling. In addition they are also subjected to axial load due

to reaction from the perpendicular wales at the corner of the cofferdam. Usually moment splices are provided in wales and in such cases, they are designed as continuous beams subjected to lateral and axial loads.

E. Struts. Struts are pure compression members. They must be tightened against the wales for several reasons. Excessive yielding of struts means horizontal movement of the sides of excavation and therefore, causing settlement of the adjacent ground. In fissured clays, such lateral movement opens up the fissures which readily absorb moisture and become soft. Once the shear strength is reduced on the fissures, large earth pressure will be inevitable. Furthermore, unyielding supports are essential to maintain minimum bending moment in the wales.

Long struts required in large excavations are also subjected to considerable expansion and contraction due to temperature variations. At high ambient temperature, additional stress exists in the struts.

It is always advantageous to provide posts at some intermediate points for the purpose of reducing l/r value of the horizontal struts. It also reduces undue stresses due to excessive sagging of the struts.

Although close spacing of struts may be desirable from the designer's point of view, a spacing of 8 ft is considered minimum for construction operations. The struts and wales in each tier may be located at the same elevation in both directions. At the point of intersection, the strut in one direction is continuous and the perpendicular struts are framed into it. Each point of intersection is a field connection which must be designed and constructed to carry the axial stress of the strut. This field connections may be eliminated by running continuous struts in both directions, one strut being immediately above the other. Since the struts meet the wales at the same elevation, this arrangement will have wales meeting at different elevations at each corner of the cofferdam. The horizontal reaction transferred from one wale to the other introduces axial stress as well as bending moment resulting from the eccentricity of the reaction. In such cases, the wale must be designed for the combined stress due to the axial force, the bending moment from the lateral earth pressure, and the bending moment from the eccentrically applied longitudinal force.

13-6 Stability of Braced Cofferdams

A braced cofferdam may fail as a unit due to unbalanced external forces or by heaving of the bottom of excavation.

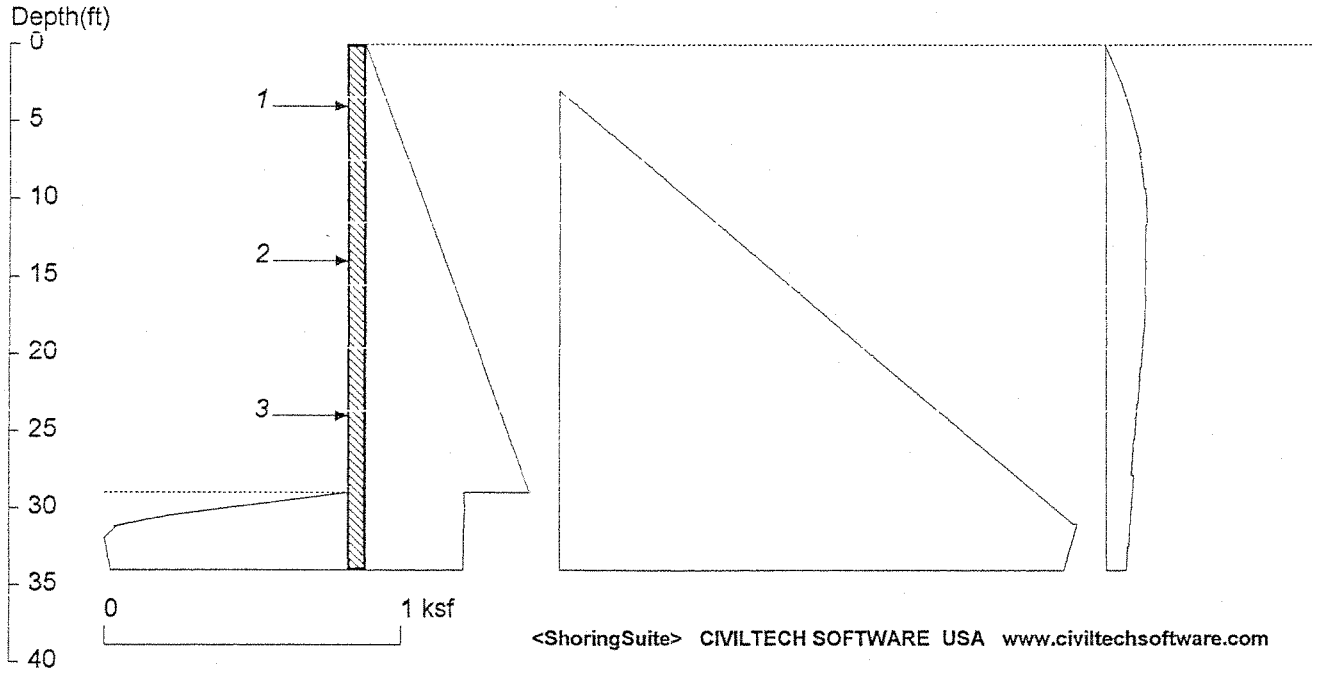
A. Unbalanced external forces. If the external forces acting on the opposite sides of cofferdams are unequal, the stability of the entire cofferdam as a unit should be analyzed. For example, a cofferdam driven to shallow depth in a river may be damaged by forces from swift current during a flash flood. Soil

APPENDIX B

Software Output for Analysis on Sheet WA-7

Raytheon Facility - Wayland, MA

Ref: WA-7



Licensed to Richard Hartman Hartman Engineering
Date: 5/3/2006 File Name: UNTITLED

Wall Height=29.0 Pile Diameter=1.0 Pile Spacing=1.0

ACTIVE SPACE:	Z depth	Spacing
1	0.00	1.00
2	29.00	1.00

PASSIVE SPACE:	Z depth	Spacing
1	29.00	1.00

PILE LENGTH: Min. Embedment=5.01, Min. Pile Length=34.01
MOMENT IN PILE: Max. Moment=80.06 at Depth of 24.01

PILE SELECTION:
Request Min. Section Modulus = 29.1 in3/feet, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
PZC18 has Section Modulus = 33.5. It is greater than Min. Requirements!

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

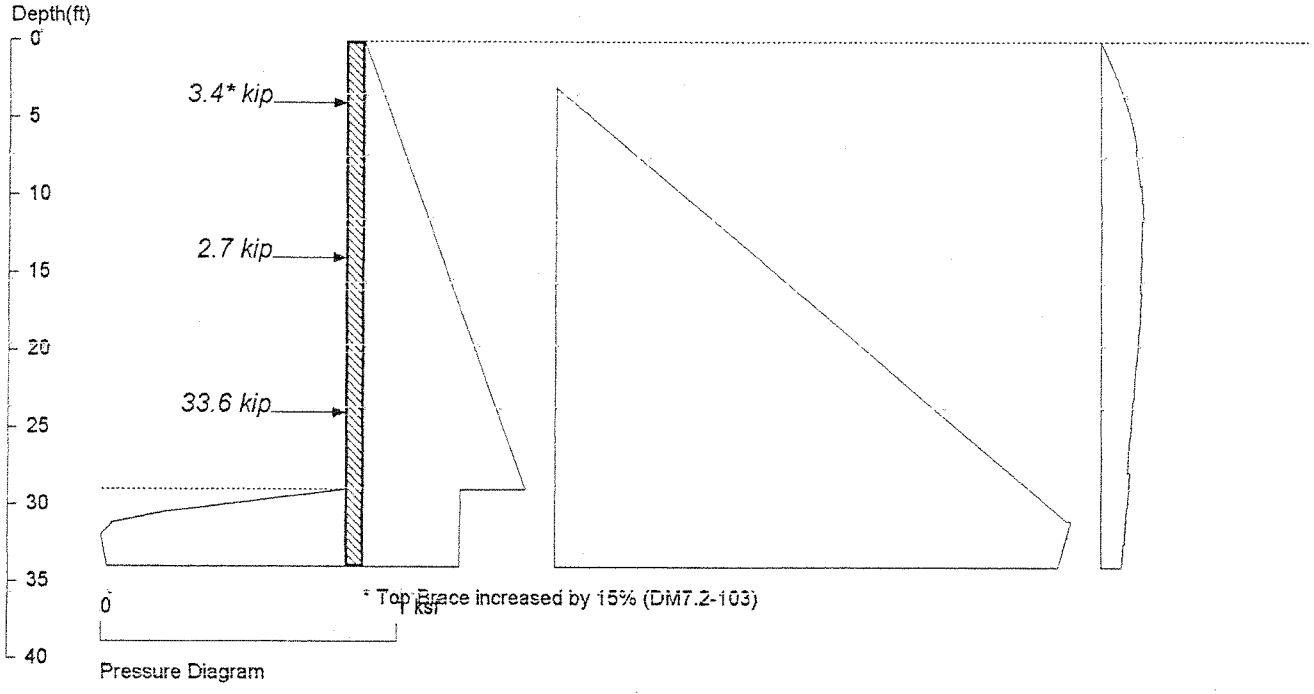
No. & Type	Depth	Angle	Total	Horiz.	Vert.	N/A	N/A
1. Strut	4.0	0.0	3.4*	3.4	0.0	0.0	0.0
2. Strut	14.0	0.0	2.7	2.7	0.0	0.0	0.0
3. Strut	24.0	0.0	33.6	33.6	0.0	0.0	0.0

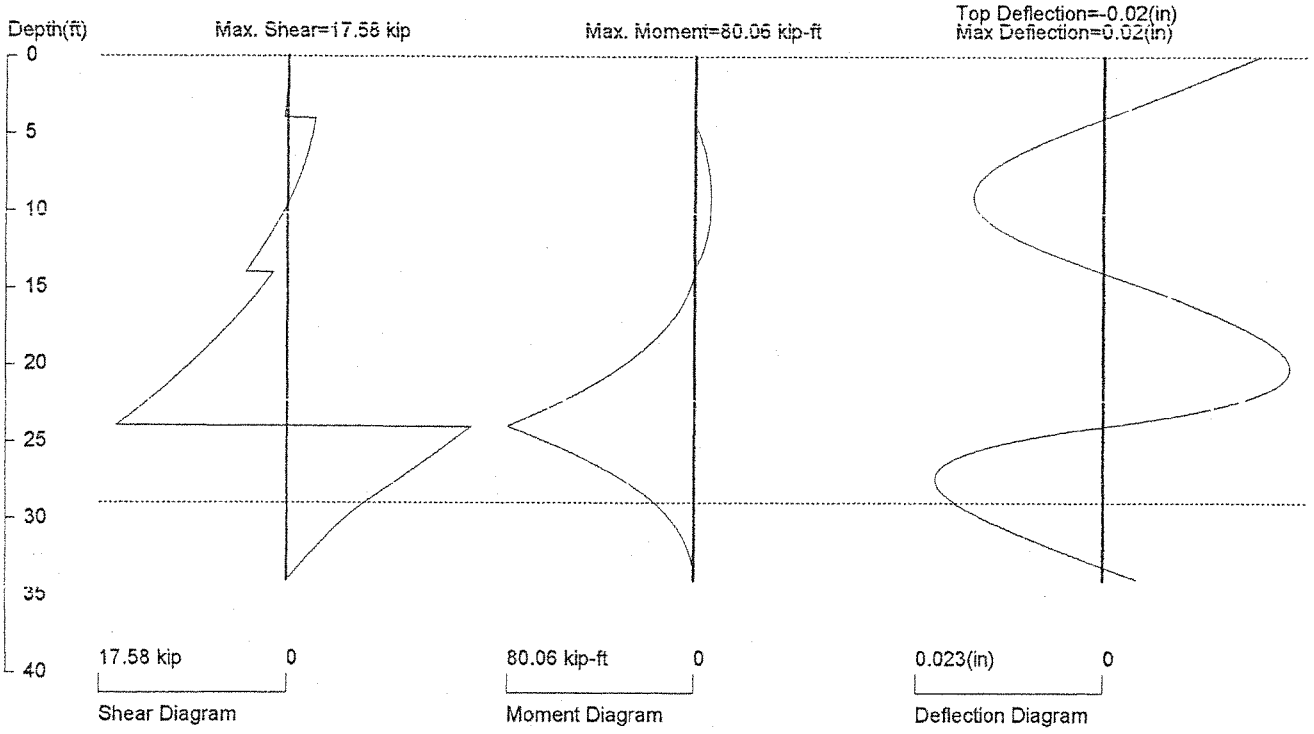
* Top Brace increased by 15% (DM7.2-103)

UNITS: Length/Depth - ft, Force - kip, Moment - kip-ft, Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Raytheon Facility - Wayland, MA

Ref: WA-7





PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on one soldier pile or one foot spacing of sheet pile

Pile: PZC18 meet Section Requirements. Properties: 6. E (ksi)=29000, 4. I (in4)=255.5

Date: 5/3/2006 File Name: UNTITLED

report.out

****

SHORING WALL CALCULATION SUMMARY
The leading shoring design and calculation software
Software Copyright by CivilTech Software
www.civiltechsoftware.com

****

ShoringSuite Software is developed by CivilTech Software, Bellevue, WA, USA.
The calculation method is based on the following references:

1. FHWA 98-011, FHWA-RD-97-130, FHWA SA 96-069, FHWA-IF-99-015
2. STEEL SHEET PILING DESIGN MANUAL by Pile Buck Inc., 1987
3. DESIGN MANUAL DM-7 (NAVFAC), Department of the Navy, May 1982
4. TRENCHING AND SHORING MANUAL Revision 12, California Department of Transportation, January 2000
6. EARTH SUPPORT SYSTEM & RETAINING STRUCTURES, Pile Buck Inc. 2002
5. DESIGN OF SHEET PILE WALLS, EM 1110-2-2504, U.S. Army Corps of Engineers, 31 March 1994
7. EARTH RETENTION SYSTEMS HANDBOOK, Alan Macnab, McGraw-Hill. 2002

DEPTH: ft, PRESSURE, FRICTION, BEARING: ksf, SLOPE: kcf, FORCE: kip, MOMENT: kip-ft, DEFLECTION: in, I: in4, E: ksi

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Date: 5/3/2006 File: UNTITLED

Title: Raytheon Facility - Wayland, MA
Subtitle: Ref: WA-7

**********INPUT DATA**********

Wall Type: 1. Sheet Pile
Wall Height: 29.00
Pile Diameter: 1.00
Pile Spacing: 1.00
Factor of Safety (F.S.): 1.00
Max. Moment reduce 20%
Lateral Support Type (Braces): 2. Strut, Raker
Top Brace Increase (Multi-Bracing): Add 15%*
Embedment Option: 1. Yes
Friction at Pile Tip: No*
Pile Properties:
Allowable Fb/Fy: 0.66
Steel Strength, Fy: 50 ksi = 345 MPa
Elastic Module, E: 29000.00
Moment of Inertia, I: 100.00
User Input Pile: PZC18

* ACTIVE PRESSURE (ACTIVE, WATER, & SURCHARGE) *

No.	Z2 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	0.00	0.00	29.00	0.56	0.0190
2	29.00	0.33	30.45	0.33	0.0010
3	30.45	0.33	36.97	0.32	-0.0010
4	36.97	0.32	38.43	0.32	0.0010
5	38.43	0.32	39.15	0.32	-0.0010
6	39.15	0.32	40.60	0.32	-0.0050
7	40.60	0.32	47.13	0.31	0.0000
8	47.13	0.31	47.85	0.30	-0.0170
9	47.85	0.30	48.57	0.29	-0.0180
10	48.57	0.29	49.30	0.29	-0.0010
11	49.30	0.29	50.75	0.29	0.0020
12	50.75	0.29	51.47	0.29	-0.0020

13	51.47	0.29	54.38	0.28	-0.0040
14	54.38	0.28	55.10	0.28	-0.0010
15	55.10	0.28	56.55	0.29	0.0060
16	56.55	0.29	57.28	0.28	-0.0010
17	57.28	0.28	59.45	0.28	-0.0020
18	59.45	0.28	60.18	0.28	0.0000
19	60.18	0.28	60.90	0.28	0.0010
20	60.90	0.28	62.35	0.29	0.0040
21	62.35	0.29	63.07	0.29	0.0000
22	63.07	0.29	63.80	0.28	-0.0120
23	63.80	0.28	64.52	0.27	-0.0160
24	64.52	0.27	65.25	0.26	-0.0030
25	65.25	0.26	65.98	0.27	0.0040
26	65.98	0.27	69.60	0.29	0.0060
27	69.60	0.29	74.68	0.31	0.0040
28	74.68	0.31	76.85	0.31	0.0030
29	76.85	0.31	78.30	0.32	0.0060
30	78.30	0.32	83.38	0.34	0.0030
31	83.38	0.34	86.27	0.35	0.0050
32	86.27	0.35	87.00	0.36	0.0070
33	87.00	0.36	87.73	0.36	0.0080
34	87.73	0.36	88.45	0.37	0.0060
35	88.45	0.37	100.77	0.43	0.0050
36	100.77	0.43	101.50	0.43	0.0060
37	101.50	0.43	102.23	0.44	0.0080
38	102.23	0.44	102.95	0.44	0.0060
39	102.95	0.44	122.52	0.54	0.0050
40	122.52	0.54	123.98	0.55	0.0070
41	123.98	0.55	145.00	0.66	0.0050
42	3.00	0.00	31.00	1.75	0.0620
43	31.00	1.75	145.00	0.00	-0.0150
44	0.00	0.00	2.32	0.05	0.0210
45	2.32	0.05	4.64	0.09	0.0170
46	4.64	0.09	6.96	0.11	0.0110
47	6.96	0.11	9.28	0.13	0.0060
48	9.28	0.13	11.60	0.13	0.0020
49	11.60	0.13	13.92	0.13	-0.0010
50	13.92	0.13	16.24	0.13	-0.0020
51	16.24	0.13	18.56	0.12	-0.0030
52	18.56	0.12	20.88	0.11	-0.0030
53	20.88	0.11	23.20	0.10	-0.0030
54	23.20	0.10	25.52	0.09	-0.0030
55	25.52	0.09	27.84	0.09	-0.0030
56	27.84	0.09	30.16	0.08	-0.0030
57	30.16	0.08	32.48	0.07	-0.0030
58	32.48	0.07	34.80	0.07	-0.0030
59	34.80	0.07	37.12	0.06	-0.0020
60	37.12	0.06	39.44	0.06	-0.0020
61	39.44	0.06	41.76	0.05	-0.0020
62	41.76	0.05	44.08	0.05	-0.0020
63	44.08	0.05	46.40	0.04	-0.0020
64	46.40	0.04	48.72	0.04	-0.0020
65	48.72	0.04	51.04	0.04	-0.0010
66	51.04	0.04	53.36	0.03	-0.0010
67	53.36	0.03	55.68	0.03	-0.0010
68	55.68	0.03	58.00	0.03	-0.0010
69	58.00	0.03	60.32	0.03	-0.0010
70	60.32	0.03	62.64	0.02	-0.0010
71	62.64	0.02	64.96	0.02	-0.0010
72	64.96	0.02	67.28	0.02	-0.0010
73	67.28	0.02	69.60	0.02	-0.0010
74	69.60	0.02	71.92	0.02	-0.0010

75	71.92	0.02	74.24	0.02	-0.0010
76	74.24	0.02	76.56	0.02	0.0000
77	76.56	0.02	78.88	0.01	0.0000
78	78.88	0.01	81.20	0.01	0.0000
79	81.20	0.01	83.52	0.01	0.0000
80	83.52	0.01	85.84	0.01	0.0000
81	85.84	0.01	88.16	0.01	0.0000
82	88.16	0.01	90.48	0.01	0.0000
83	90.48	0.01	92.80	0.01	0.0000
84	92.80	0.01	95.12	0.01	0.0000
85	95.12	0.01	97.44	0.01	0.0000
86	97.44	0.01	99.76	0.01	0.0000
87	99.76	0.01	102.08	0.01	0.0000
88	102.08	0.01	104.40	0.01	0.0000
89	104.40	0.01	106.72	0.01	0.0000
90	106.72	0.01	109.04	0.01	0.0000
91	109.04	0.01	111.36	0.01	0.0000
92	111.36	0.01	113.68	0.01	0.0000
93	113.68	0.01	116.00	0.01	0.0000

* PASSIVE PRESSURE *

No.	Z1 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	29.00	0.00	29.73	0.30	0.4140
2	29.73	0.30	30.45	0.60	0.4080
3	30.45	0.60	31.18	0.78	0.2570
4	31.18	0.78	31.90	0.82	0.0520
5	31.90	0.82	39.15	0.75	-0.0090
6	39.15	0.75	39.88	0.78	0.0280
7	39.88	0.78	40.60	0.81	0.0450
8	40.60	0.81	41.33	0.82	0.0180
9	41.33	0.82	47.13	0.88	0.0110
10	47.13	0.88	47.85	1.01	0.1730
11	47.85	1.01	48.58	1.19	0.2510
12	48.58	1.19	49.30	1.29	0.1300
13	49.30	1.29	52.20	1.56	0.0940
14	52.20	1.56	52.93	1.62	0.0900
15	52.93	1.62	53.65	1.69	0.0890
16	53.65	1.69	55.10	1.82	0.0930
17	55.10	1.82	55.83	1.84	0.0250
18	55.83	1.84	56.55	1.84	-0.0020
19	56.55	1.84	57.28	1.89	0.0620
20	57.28	1.89	60.18	2.13	0.0840
21	60.18	2.13	60.90	2.19	0.0810
22	60.90	2.19	61.63	2.24	0.0790
23	61.63	2.24	62.35	2.30	0.0820
24	62.35	2.30	63.08	2.36	0.0830
25	63.08	2.36	63.80	2.57	0.2830
26	63.80	2.57	64.53	2.85	0.3950
27	64.53	2.85	65.25	3.03	0.2370
28	65.25	3.03	68.88	3.63	0.1670
29	68.88	3.63	69.60	3.75	0.1580
30	69.60	3.75	70.32	3.86	0.1550
31	70.32	3.86	71.05	3.98	0.1630
32	71.05	3.98	78.30	5.18	0.1660
33	78.30	5.17	79.75	5.41	0.1650
34	79.75	5.41	80.48	5.53	0.1600
35	80.48	5.53	81.20	5.64	0.1520
36	81.20	5.64	81.93	5.75	0.1560
37	81.93	5.75	90.63	7.17	0.1630
38	90.63	7.17	107.30	9.87	0.1620

39	107.30	9.86	111.65	10.56	0.1610
40	111.65	10.56	112.38	10.67	0.1600
41	112.38	10.67	113.83	10.89	0.1520
42	113.83	10.89	145.00	15.90	0.1610

* ACTIVE SPACE *

No.	Z depth	Spacing
1	0.00	1.00
2	29.00	1.00

* PASSIVE SPACE *

No.	Z depth	Spacing
1	29.00	1.00

* BRACE: STRUT, TIEBACK, ANCHOR PLATE, OR DEADMAN *

No.	Z brace	Angle	Spacing	Input1*	Input2*	Type
1	4.00	0.0	1.00	1.00	1.00	Strut
2	14.00	0.0	1.00	1.00	1.00	Strut
3	24.00	0.0	1.00	1.00	1.00	Strut

*For Tieback: Input1 = Diameter; Input2 = Bond Stength
*For Plate: Input1 = Diameter; Input2 = Allowable Pressure
*For Deaman: Input1 = Horz. Width; Input2 = Allowable Pressure; Angle = 0

**********SPECIFIED PILE **********

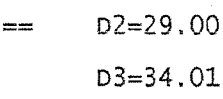
PZC18 has been found in Sheet Pile list!
PZC18 Sx= 33.5 Ix= 255.5 Weight= 24.2

* Note: All the pile dimensions are in English Units per one foot width.

Add Pile Capacity in Emdment Calculation
Pile Moment Capacity, Ms: 92.13

**********CALCULATION**********

Top Pressures start at depth = 0.00
* CALCULATE EMBEDMENT *



D1 - TOP DEPTH R1 - TOP REACTION
D2 - EXCAVATION BASE
D3 - PILE TIP

TOTAL REACTION: R1 = 17.61

```
   TOTAL PRESSURE ACTING ON WALL = 17.61
      Total Reaction = Total Pressure,     OK!
      The Calculated Embedment, Yend = 5.01

-------------------------MULTIPLE BRACE / TIEBACK CASE-------------------------
** Use the calculated embedment, Yend = 5.01

   NUMBER OF BRACE LEVEL=  3


*  CANTILEVER SPAN  *

         |       D1=0.00
         |
         |
         |<--    D2=4.00          R2=0.35, with Cantilever Moment=0.44

        D1 - TOP DEPTH
        D2 - BOTTOM DEPTH           R2 - BOTTOM REACTION

   TOTAL REACTION: R2 = 0.35
   TOTAL PRESSURE ACTING ON WALL = 0.35
      Total Reaction = Total Pressure,     OK!
   ---------------------------------------------------------------
   BRACE NO.1 AT DEPTH = 4.00
       R2 of Cantilever Span
                                  } Sum of Reaction = Brace Load = 2.98
       R1 of Span No.1
   ---------------------------------------------------------------

*  MIDDLE SPAN NO.1  *

         |<--    D1=4.00          R1=2.64, with Cantilever Moment=0.44
         |
         |
         |<--    D2=14.00          R2=3.97

        D1 - TOP DEPTH             R1 - TOP REACTION
        D2 - BOTTOM DEPTH          R2 - BOTTOM REACTION

   TOTAL REACTION: R1+R2 = 6.61
   TOTAL PRESSURE ACTING ON WALL = 6.61
      Total Reaction = Total Pressure,     OK!

   ---------------------------------------------------------------
   BRACE NO.2 AT DEPTH = 14.00
       R2 of Span No.1
                                  } Sum of Reaction = Brace Load = 2.65
       R1 of Last Span
   ---------------------------------------------------------------

*  LAST SPAN  *

         |<--    D1=14.00          R1=-1.32
         |
         |
         |<--    D2=24.00         R2=33.64
         |
         |
         |       D3=34.01
```

report.out

D1 - TOP DEPTH R1 - TOP REACTION
D2 - LAST BRACE DEPTH R2 - LAST BRACE REACTION
D3 - BOTTOM DEPTH

TOTAL REACTION: R1+R2 = 32.31
TOTAL PRESSURE ACTING ON WALL = 32.31
Total Reaction = Total Pressure, OK!

**********RESULTS**********

* EMBEDMENT *
MINIMUM EMBEDMENT = 5.01 (8~10 recommended)
TOTAL MINIMUM PILE LENGTH = 34.01

* MOMENT IN PILE *

No.	Depth	M @ Brace	Mmax in Span	Depth of Mmax
1	4.00	0.43	6.63	9.15
2	14.00	0.83	0.07	14.05
3	24.00	80.06	0.00	33.98

Overall Maximum Moment = 80.06 at 24.01
Maximum Shear = 17.58

-> Top Brace Increase 15%. (Horizontal) From 2.98 to 3.43

* BRACE: STRUT, TIEBACK, ANCHOR PLATE, OR DEADMAN *

No.	DEPTH	Tangle	SPACING	HORIZONTAL	VERTICAL	TOTAL LOAD
1	4.00	0.0	1.00	3.43	0.00	3.43
2	14.00	0.0	1.00	2.65	0.00	2.65
3	24.00	0.0	1.00	33.64	0.00	33.64

No.	DEPTH	Free length	Type and Data
1	4.00	0.00	Strut
2	14.00	0.00	Strut
3	24.00	0.00	Strut

* VERTICAL LOADING *
Vertical Loading from Braces = 0.00
Vertical Loading from External Load = 0.00
Total Vertical Loading = 0.00

**********SPECIFIED PILE **********

PZC18 has been found in Sheet Pile list!
PZC18 Sx= 33.5 Ix= 255.5 Weight= 24.2

* Note: All the pile dimensions are in English Units per one foot width.

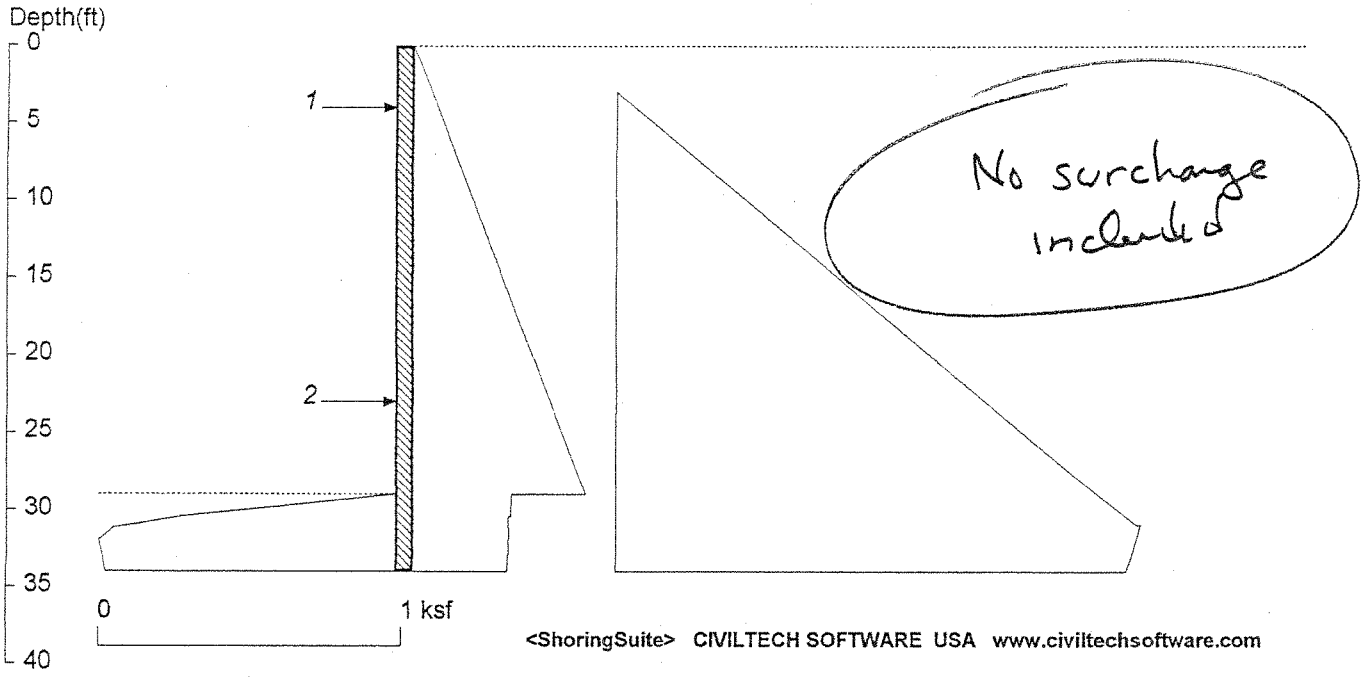
Request Min. Section Modulus = 29.1 in3/feet, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
The pile selection is based on the magnitude of the moment only. Axial force is

neglected. Ref. Note 3

PZC18 is capable to support the shoring!
Top deflection = -0.019(in)
Max. deflection = 0.023(in)

Raytheon Facility - Wayland, MA

Ref: WA-7



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Date: 4/24/2006 File Name: UNTITLED

Wall Height=29.0 Pile Diameter=1.0 Pile Spacing=1.0

ACTIVE SPACE:	Z depth	Spacing
1	0.00	1.00
2	29.00	1.00

PASSIVE SPACE:	Z depth	Spacing
1	29.00	1.00

PILE LENGTH: Min. Embedment=5.02, Min. Pile Length=34.02
MOMENT IN PILE: Max. Moment=89.16 at Depth of 23.00

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=39.5, Vertical Factor of Safety=999.00

PILE SELECTION:
Request Min. Section Modulus = 32.4 in3/feet, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
PZC18 has Section Modulus = 33.5. It is greater than Min. Requirements!

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

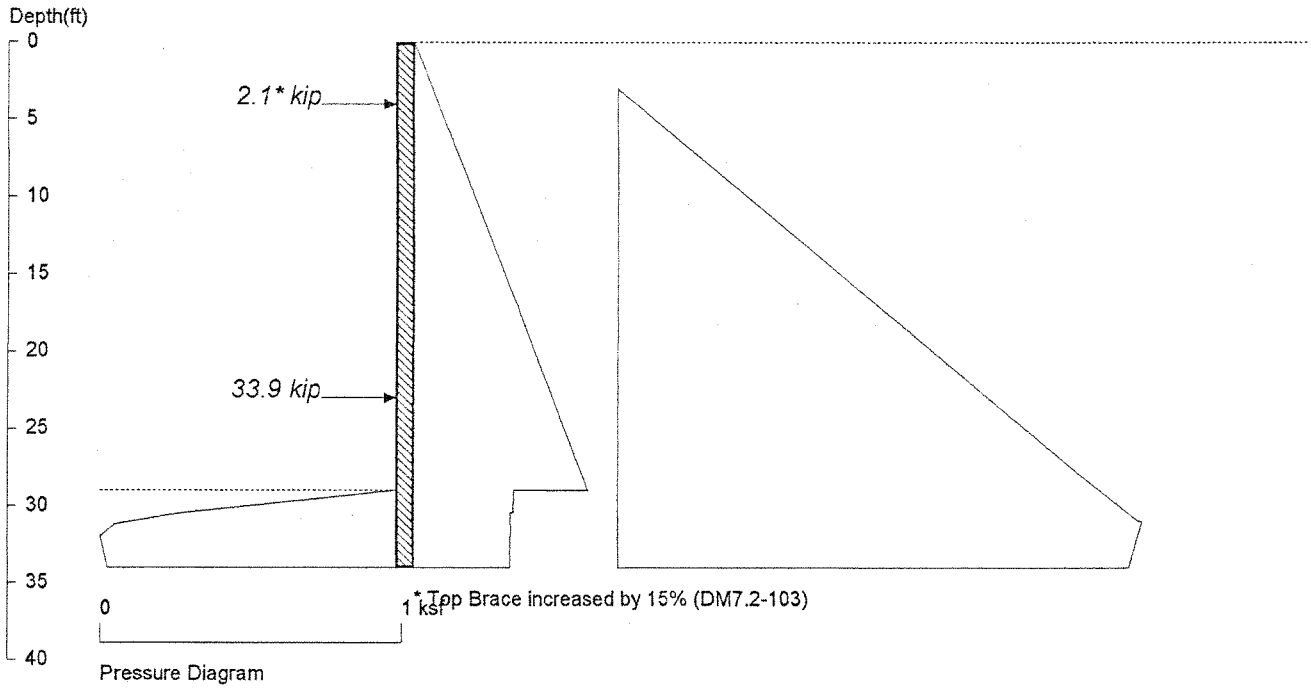
No. & Type	Depth	Angle	Total	Horiz.	Vert.	N/A	N/A
1. Strut	4.0	0.0	2.1*	2.1	0.0	0.0	0.0
2. Strut	23.0	0.0	33.9	33.9	0.0	0.0	0.0

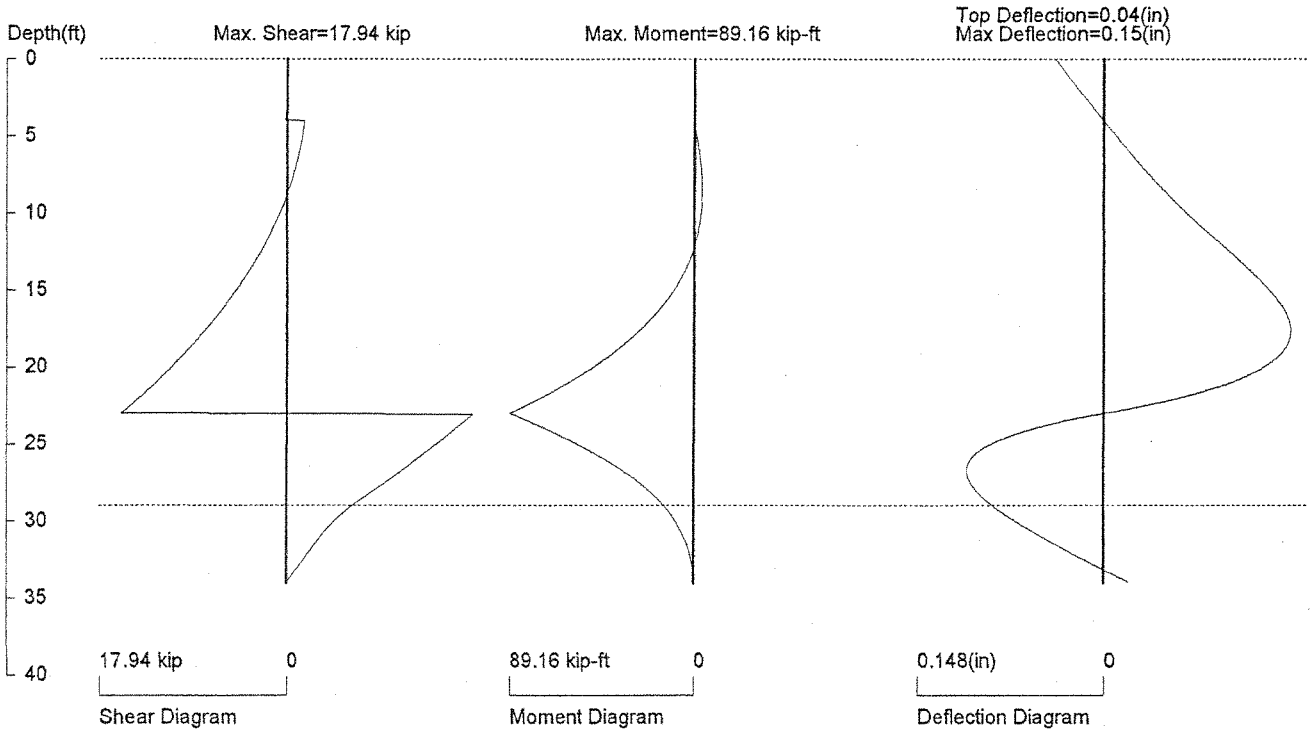
* Top Brace increased by 15% (DM7.2-103)

UNITS: Length/Depth - ft, Force - kip, Moment - kip-ft, Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Raytheon Facility - Wayland, MA

Ref: WA-7





PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on one soldier pile or one foot spacing of sheet pile

Pile: PZC18 meet Section Requirements. Properties: 6. E (ksi)=29000, 4. I (in4)=255.5

Date: 4/24/2006 File Name: UNTITLED

report.out

****

SHORING WALL CALCULATION SUMMARY
The leading shoring design and calculation software
Software Copyright by CivilTech Software
www.civiltechsoftware.com

****

ShoringSuite Software is developed by CivilTech Software, Bellevue, WA, USA.
The calculation method is based on the following references:

1. FHWA 98-011, FHWA-RD-97-130, FHWA SA 96-069, FHWA-IF-99-015
2. STEEL SHEET PILING DESIGN MANUAL by Pile Buck Inc., 1987
3. DESIGN MANUAL DM-7 (NAVFAC), Department of the Navy, May 1982
4. TRENCHING AND SHORING MANUAL Revision 12, California Department of Transportation, January 2000
6. EARTH SUPPORT SYSTEM & RETAINING STRUCTURES, Pile Buck Inc. 2002
5. DESIGN OF SHEET PILE WALLS, EM 1110-2-2504, U.S. Army Corps of Engineers, 31 March 1994
7. EARTH RETENTION SYSTEMS HANDBOOK, Alan Macnab, McGraw-Hill. 2002

DEPTH: ft, PRESSURE, FRICTION, BEARING: ksf, SLOPE: kcf, FORCE: kip, MOMENT: kip-ft, DEFLECTION: in, I: in4, E: ksi

---

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Date: 4/24/2006 File: UNTITLED

Title: Raytheon Facility - Wayland, MA
Subtitle: Ref: WA-7

**********INPUT DATA**********

Wall Type: 1. Sheet Pile
Wall Height: 29.00
Pile Diameter: 1.00
Pile Spacing: 1.00
Factor of Safety (F.S.): 1.00
Max. Moment reduce 20%
Lateral Support Type (Braces): 2. Strut, Raker
Top Brace Increase (Multi-Bracing): Add 15%*
Embedment Option: 1. Yes
Friction at Pile Tip: No*
Check Vertical Bearing Capacity:
Side Friction for Bearing: 1.00
Tip Resistance for Bearing: 1.00
Pile Properties:
Allowable Fb/Fy: 0.66
Steel Strength, Fy: 50 ksi = 345 MPa
Elastic Module, E: 29000.00
Moment of Inertia, I: 256.00
User Input Pile: PZC18

* ACTIVE PRESSURE (ACTIVE, WATER, & SURCHARGE) *

No.	Z2 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	0.00	0.00	29.00	0.57	0.0200
2	29.00	0.33	30.45	0.32	-0.0010
3	30.45	0.32	31.90	0.32	0.0010
4	31.90	0.32	39.15	0.32	-0.0010
5	39.15	0.32	40.60	0.31	-0.0050
6	40.60	0.31	47.13	0.31	0.0000
7	47.13	0.31	47.85	0.30	-0.0160
8	47.85	0.30	48.57	0.29	-0.0190
9	48.57	0.29	49.30	0.29	-0.0030

10	49.30	0.29	50.03	0.29	0.0020
11	50.03	0.29	50.75	0.29	0.0000
12	50.75	0.29	52.20	0.28	-0.0030
13	52.20	0.28	53.65	0.28	-0.0010
14	53.65	0.28	55.10	0.27	-0.0040
15	55.10	0.27	55.82	0.28	0.0020
16	55.82	0.28	56.55	0.28	0.0040
17	56.55	0.28	57.28	0.28	0.0000
18	57.28	0.28	58.00	0.28	-0.0020
19	58.00	0.28	58.73	0.28	0.0010
20	58.73	0.28	59.45	0.28	0.0030
21	59.45	0.28	60.18	0.28	0.0010
22	60.18	0.28	63.07	0.28	0.0000
23	63.07	0.28	63.80	0.27	-0.0110
24	63.80	0.27	64.52	0.26	-0.0120
25	64.52	0.26	65.25	0.27	0.0050
26	65.25	0.27	65.98	0.27	0.0090
27	65.98	0.27	66.70	0.28	0.0060
28	66.70	0.28	68.88	0.29	0.0050
29	68.88	0.29	73.23	0.30	0.0040
30	73.23	0.30	73.95	0.31	0.0070
31	73.95	0.31	74.68	0.31	0.0050
32	74.68	0.31	80.48	0.33	0.0030
33	80.48	0.33	81.20	0.33	0.0070
34	81.20	0.33	81.93	0.34	0.0080
35	81.93	0.34	91.35	0.39	0.0050
36	91.35	0.38	92.80	0.40	0.0090
37	92.80	0.40	105.13	0.46	0.0050
38	105.13	0.46	106.57	0.47	0.0070
39	106.57	0.47	126.15	0.58	0.0060
40	126.15	0.57	127.60	0.58	0.0080
41	127.60	0.58	145.00	0.67	0.0050
42	3.00	0.00	31.00	1.75	0.0620
43	31.00	1.75	145.00	0.00	-0.0150

* PASSIVE PRESSURE *

No.	Z1 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	29.00	0.00	29.73	0.36	0.4930
2	29.73	0.36	30.45	0.71	0.4860
3	30.45	0.71	31.18	0.93	0.3060
4	31.18	0.93	31.90	0.98	0.0620
5	31.90	0.98	39.15	0.90	-0.0110
6	39.15	0.90	39.88	0.93	0.0450
7	39.88	0.93	40.60	0.98	0.0680
8	40.60	0.98	41.33	1.00	0.0240
9	41.33	1.00	47.13	1.08	0.0140
10	47.13	1.08	47.85	1.28	0.2730
11	47.85	1.28	48.58	1.56	0.3930
12	48.58	1.56	49.30	1.70	0.1920
13	49.30	1.70	50.75	1.89	0.1310
14	50.75	1.89	52.20	2.07	0.1220
15	52.20	2.07	55.10	2.45	0.1310
16	55.10	2.45	55.83	2.46	0.0120
17	55.83	2.46	56.55	2.43	-0.0350
18	56.55	2.43	57.28	2.49	0.0750
19	57.28	2.49	59.45	2.73	0.1120
20	59.45	2.73	60.18	2.81	0.1060
21	60.18	2.81	60.90	2.88	0.1030
22	60.90	2.88	61.63	2.96	0.1090
23	61.63	2.96	63.08	3.12	0.1110

24	63.08	3.12	63.80	3.45	0.4600
25	63.80	3.45	64.53	3.93	0.6480
26	64.53	3.93	65.25	4.19	0.3640
27	65.25	4.19	66.70	4.54	0.2400
28	66.70	4.54	70.32	5.41	0.2410
29	70.32	5.41	71.05	5.57	0.2190
30	71.05	5.57	71.78	5.73	0.2130
31	71.78	5.73	72.50	5.90	0.2350
32	72.50	5.90	76.85	6.94	0.2380
33	76.85	6.93	80.48	7.79	0.2370
34	80.48	7.79	84.10	8.65	0.2360
35	84.10	8.64	87.00	9.33	0.2350
36	87.00	9.32	87.73	9.48	0.2110
37	87.73	9.48	88.45	9.63	0.2040
38	88.45	9.63	89.18	9.79	0.2250
39	89.18	9.79	94.25	10.96	0.2320
40	94.25	10.96	101.50	12.63	0.2310
41	101.50	12.63	113.83	15.46	0.2290
42	113.83	15.45	145.00	22.57	0.2280

* ACTIVE SPACE *

No.	Z depth	Spacing
1	0.00	1.00
2	29.00	1.00

* PASSIVE SPACE *

No.	Z depth	Spacing
1	29.00	1.00

* BRACE: STRUT, TIEBACK, ANCHOR PLATE, OR DEADMAN *

No.	Z brace	Angle	Spacing	Input1*	Input2*	Type
1	4.00	0.0	1.00	1.00	1.00	Strut
2	23.00	0.0	1.00	1.00	1.00	Strut

*For Tieback: Input1 = Diameter; Input2 = Bond Stength
*For Plate: Input1 = Diameter; Input2 = Allowable Pressure
*For Deaman: Input1 = Horz. Width; Input2 = Allowable Pressure; Angle = 0

**********SPECIFIED PILE **********

PZC18 has been found in Sheet Pile list!
PZC18 Sx= 33.5 Ix= 255.5 Weight= 24.2

* Note: All the pile dimensions are in English Units per one foot width.

Add Pile Capacity in Emdment Calculation
Pile Moment Capacity, Ms: 92.13

**********CALCULATION**********

Top Pressures start at depth = 0.00

```
*  CALCULATE EMBEDMENT  *

        |<--   D1=23.00
        |
      ==|==    D2=29.00
        |
        |      D3=34.02

       D1 - TOP DEPTH          R1 - TOP REACTION
       D2 - EXCAVATION BASE
       D3 - PILE TIP

   TOTAL REACTION: R1 = 18.01
   TOTAL PRESSURE ACTING ON WALL = 18.01
      Total Reaction = Total Pressure,    OK!
      The Calculated Embedment, Yend = 5.02

-------------------------MULTIPLE BRACE / TIEBACK CASE-------------------------
** Use the calculated embedment, Yend = 5.02

   NUMBER OF BRACE LEVEL=  2


*  CANTILEVER SPAN  *

        |      D1=0.00
        |
        |
        |<--   D2=4.00          R2=0.19, with Cantilever Moment=0.22

       D1 - TOP DEPTH
       D2 - BOTTOM DEPTH          R2 - BOTTOM REACTION

   TOTAL REACTION: R2 = 0.19
   TOTAL PRESSURE ACTING ON WALL = 0.19
      Total Reaction = Total Pressure,    OK!

   ____________________________________________________
   BRACE NO.1 AT DEPTH = 4.00
       R2 of Span No.0
                                 } Sum of Reaction = Brace Load = 1.81
       R1 of Last Span
   ____________________________________________________

*  LAST SPAN  *

        |<--   D1=4.00          R1=1.62
        |
        |
        |<--   D2=23.00         R2=33.88
        |
        |
        |      D3=34.02

       D1 - TOP DEPTH           R1 - TOP REACTION
       D2 - LAST BRACE DEPTH    R2 - LAST BRACE REACTION
       D3 - BOTTOM DEPTH

   TOTAL REACTION: R1+R2 = 35.51
   TOTAL PRESSURE ACTING ON WALL = 35.51
      Total Reaction = Total Pressure,    OK!
```

report.out

**********RESULTS**********

* EMBEDMENT *
MINIMUM EMBEDMENT = 5.02 (8~10 recommended)
TOTAL MINIMUM PILE LENGTH = 34.02

* MOMENT IN PILE *

No.	Depth	M @ Brace	Mmax in Span	Depth of Mmax
1	4.00	0.22	3.57	8.43
2	23.00	89.16	0.00	33.99

Overall Maximum Moment = 89.16 at 23.00
Maximum Shear = 17.94

-> Top Brace Increase 15%. (Horizontal) From 1.81 to 2.09

* BRACE: STRUT, TIEBACK, ANCHOR PLATE, OR DEADMAN *

No.	DEPTH	Tangle	SPACING	HORIZONTAL	VERTICAL	TOTAL LOAD
1	4.00	0.0	1.00	2.09	0.00	2.09
2	23.00	0.0	1.00	33.88	0.00	33.88

No.	DEPTH	Free length	Type and Data
1	4.00	0.00	Strut
2	23.00	0.00	Strut

* VERTICAL LOADING *
Vertical Loading from Braces = 0.00
Vertical Loading from External Load = 0.00
Total Vertical Loading = 0.00

* VERTICAL BEARING CAPACITY CHECK *

Tip Depth	Tip Area	Bearing	Tip Resistance
34.02	0.50	1.00	0.50

Embedment	Side Area*	Friction	Side Resistance
5.02	39.05	1.00	39.05

*Side Area is the surface area of embedment below base and contact area between pile and soil above base.

Total Vertical Resistance = 39.55
Total Vertical Loading = 0.00
Vertical Factor of Safety = 999.00

**********SPECIFIED PILE **********

PZC18 has been found in Sheet Pile list!

report.out

PZC18 Sx= 33.5 Ix= 255.5 Weight= 24.2

* Note: All the pile dimensions are in English Units per one foot width.

Request Min. Section Modulus = 32.4 in3/feet, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
The pile selection is based on the magnitude of the moment only. Axial force is neglected. Ref. Note 3

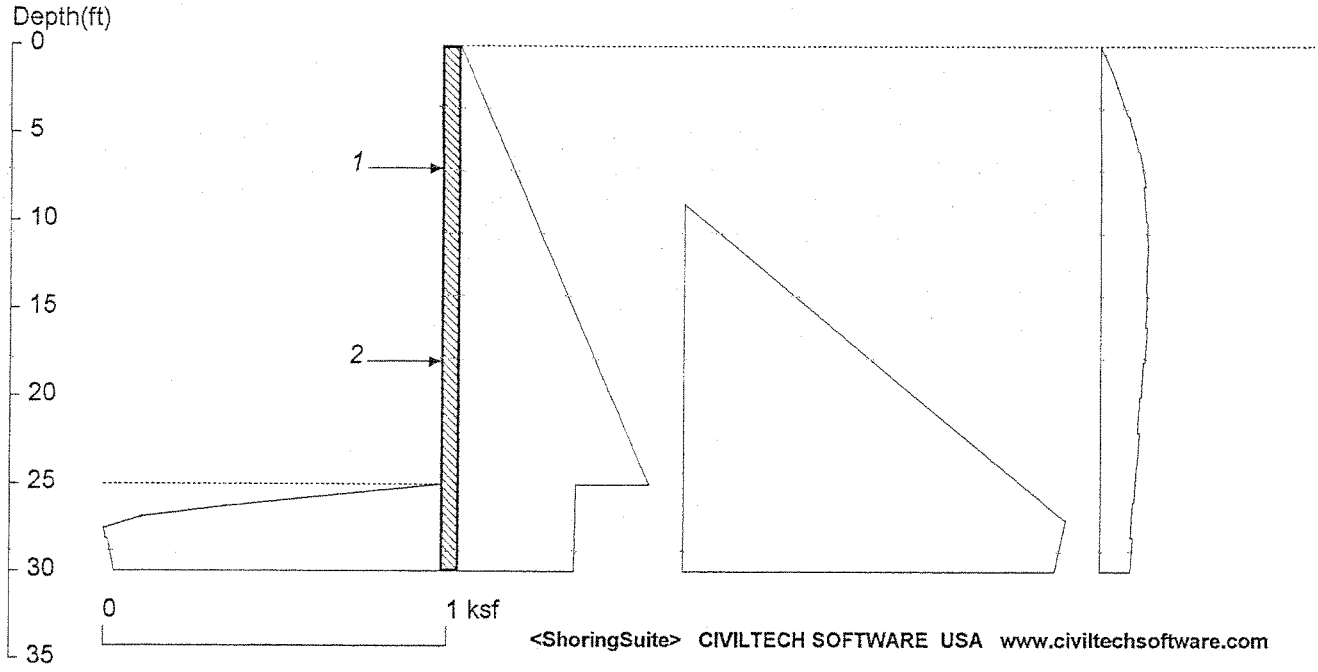
PZC18 is capable to support the shoring!
Top deflection = 0.038(in)
Max. deflection = 0.148(in)

APPENDIX C

Software Output for Analysis on Sheet WA-8

Raytheon Facility - Wayland, MA

WA-8



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Date: 5/9/2006 File Name: A:\06-602 WA-8, with surcharge.sh8

Wall Height=25.0 Pile Diameter=1.0 Pile Spacing=1.0

ACTIVE SPACE:	Z depth	Spacing
1	0.00	1.00
2	25.00	1.00

PASSIVE SPACE:	Z depth	Spacing
1	25.00	1.00

PILE LENGTH: Min. Embedment=4.98, Min. Pile Length=29.98
MOMENT IN PILE: Max. Moment=69.12 at Depth of 18.01

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=35.5, Vertical Factor of Safety=999.00

PILE SELECTION:
Request Min. Section Modulus = 25.1 in3/feet, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
PZC18 has Section Modulus = 33.5. It is greater than Min. Requirements!

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

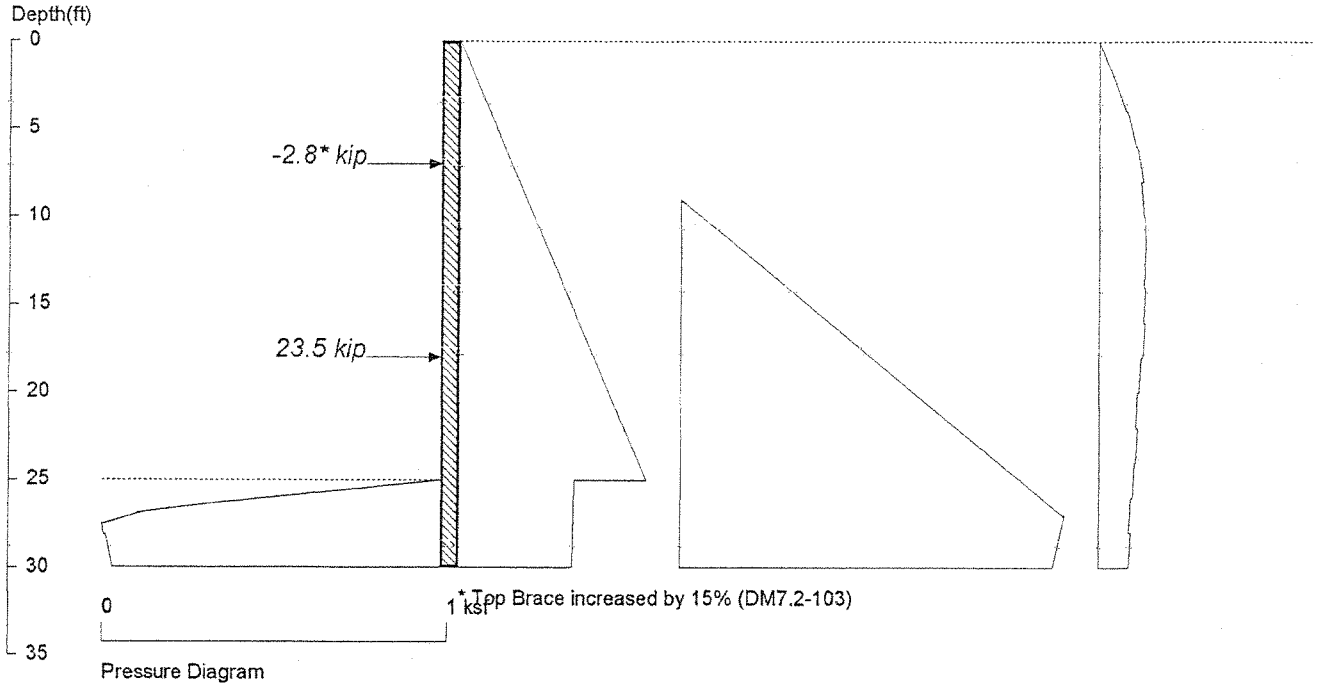
No. & Type	Depth	Angle	Total	Horiz.	Vert.	N/A	N/A
1. Strut	7.0	0.0	-2.8*	-2.8	0.0	0.0	0.0
2. Strut	18.0	0.0	23.5	23.5	0.0	0.0	0.0

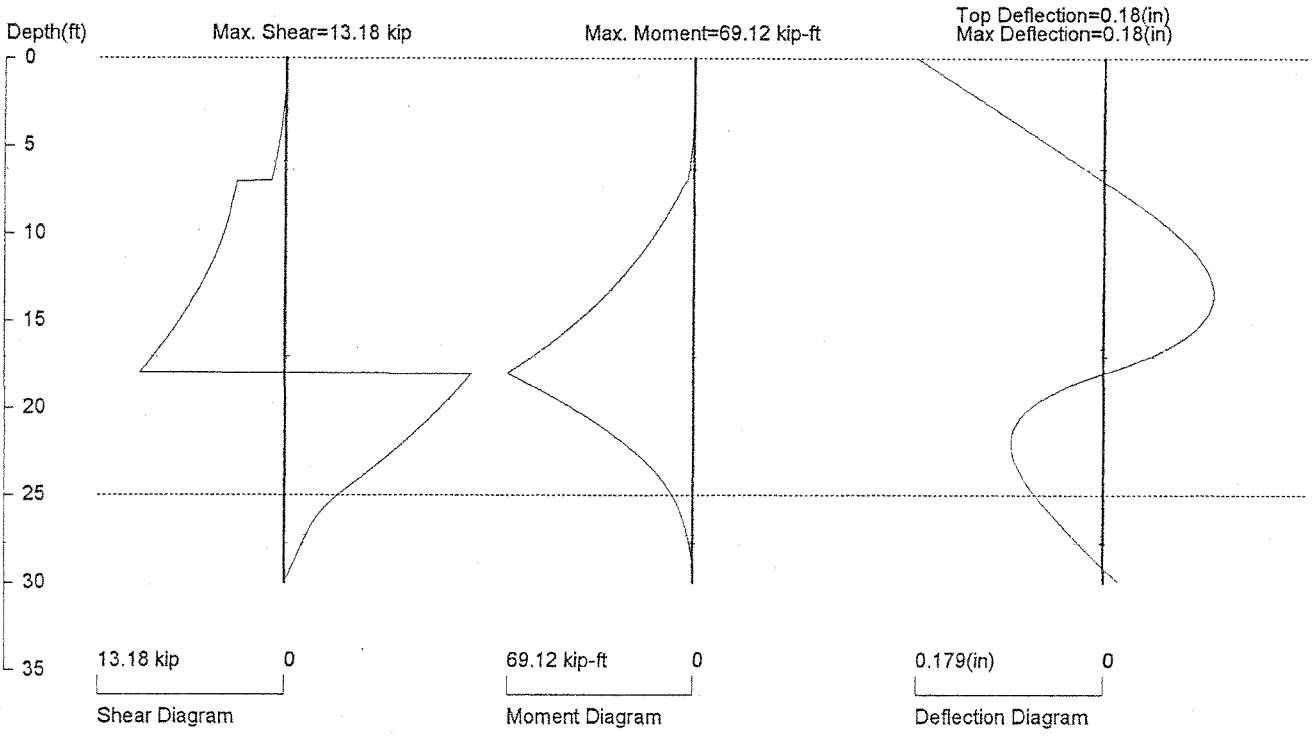
* Top Brace increased by 15% (DM7.2-103)

UNITS: Length/Depth - ft, Force - kip, Moment - kip-ft, Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Raytheon Facility - Wayland, MA

WA-8





PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on one soldier pile or one foot spacing of sheet pile

Pile: PZC18 meet Section Requirements. Properties: 6. E (ksi)=29000, 4. I (in4)=255.5

Date: 5/9/2006 File Name: A:\06-602 WA-8, with surcharge.sh8

report.out

****

SHORING WALL CALCULATION SUMMARY
The leading shoring design and calculation software
Software Copyright by CivilTech Software
www.civiltechsoftware.com

****

ShoringSuite Software is developed by CivilTech Software, Bellevue, WA, USA.
The calculation method is based on the following references:

1. FHWA 98-011, FHWA-RD-97-130, FHWA SA 96-069, FHWA-IF-99-015
2. STEEL SHEET PILING DESIGN MANUAL by Pile Buck Inc., 1987
3. DESIGN MANUAL DM-7 (NAVFAC), Department of the Navy, May 1982
4. TRENCHING AND SHORING MANUAL Revision 12, California Department of Transportation, January 2000
6. EARTH SUPPORT SYSTEM & RETAINING STRUCTURES, Pile Buck Inc. 2002
5. DESIGN OF SHEET PILE WALLS, EM 1110-2-2504, U.S. Army Corps of Engineers, 31 March 1994
7. EARTH RETENTION SYSTEMS HANDBOOK, Alan Macnab, McGraw-Hill. 2002

DEPTH: ft, PRESSURE, FRICTION, BEARING: ksf, SLOPE: kcf, FORCE: kip, MOMENT: kip-ft, DEFLECTION: in, I: in4, E: ksi

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Date: 5/9/2006 File: A:\06-602 WA-8, with surcharge.sh8

Title: Raytheon Facility - Wayland, MA
Subtitle: WA-8

**********INPUT DATA**********

Wall Type: 1. Sheet Pile
Wall Height: 25.00
Pile Diameter: 1.00
Pile Spacing: 1.00
Factor of Safety (F.S.): 1.00
Max. Moment reduce 20%
Lateral Support Type (Braces): 2. Strut, Raker
Top Brace Increase (Multi-Bracing): Add 15%*
Embedment Option: 1. Yes
Friction at Pile Tip: No*
Check Vertical Bearing Capacity:
Side Friction for Bearing: 1.00
Tip Resistance for Bearing: 1.00
Pile Properties:
Allowable Fb/Fy: 0.66
Steel Strength, Fy: 50 ksi = 345 MPa
Elastic Module, E: 29000.00
Moment of Inertia, I: 100.00
User Input Pile: PZC18

* ACTIVE PRESSURE (ACTIVE, WATER, & SURCHARGE) *

No.	Z2 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	0.00	0.00	25.00	0.56	0.0220
2	25.00	0.34	45.00	0.32	-0.0010
3	45.00	0.32	45.63	0.32	-0.0080
4	45.63	0.32	46.25	0.31	-0.0190
5	46.25	0.31	46.88	0.30	-0.0110
6	46.88	0.30	53.13	0.30	0.0010
7	53.13	0.30	53.75	0.28	-0.0420
8	53.75	0.28	54.38	0.24	-0.0690
9	54.38	0.24	55.00	0.22	-0.0250

10	55.00	0.22	58.75	0.23	0.0030
11	58.75	0.23	60.00	0.24	0.0060
12	60.00	0.24	63.13	0.25	0.0030
13	63.13	0.25	63.75	0.26	0.0150
14	63.75	0.26	64.38	0.27	0.0230
15	64.38	0.27	65.00	0.28	0.0110
16	65.00	0.28	69.38	0.29	0.0040
17	69.38	0.29	70.00	0.27	-0.0370
18	70.00	0.27	70.63	0.25	-0.0340
19	70.63	0.25	71.25	0.26	0.0080
20	71.25	0.26	80.00	0.30	0.0060
21	80.00	0.30	81.25	0.31	0.0080
22	81.25	0.31	93.13	0.37	0.0050
23	93.13	0.37	93.75	0.37	0.0080
24	93.75	0.37	94.38	0.38	0.0070
25	94.38	0.38	111.25	0.46	0.0050
26	111.25	0.46	112.50	0.47	0.0080
27	112.50	0.47	125.00	0.53	0.0050
28	9.00	0.00	27.00	1.12	0.0620
29	27.00	1.12	125.00	0.00	-0.0110
30	0.00	0.00	2.00	0.04	0.0210
31	2.00	0.04	4.00	0.08	0.0180
32	4.00	0.08	6.00	0.11	0.0130
33	6.00	0.11	8.00	0.12	0.0080
34	8.00	0.12	10.00	0.13	0.0040
35	10.00	0.13	12.00	0.13	0.0010
36	12.00	0.13	14.00	0.13	-0.0010
37	14.00	0.13	16.00	0.13	-0.0020
38	16.00	0.13	18.00	0.12	-0.0030
39	18.00	0.12	20.00	0.11	-0.0030
40	20.00	0.11	22.00	0.11	-0.0030
41	22.00	0.11	24.00	0.10	-0.0030
42	24.00	0.10	26.00	0.09	-0.0030
43	26.00	0.09	28.00	0.09	-0.0030
44	28.00	0.09	30.00	0.08	-0.0030
45	30.00	0.08	32.00	0.07	-0.0030
46	32.00	0.07	34.00	0.07	-0.0030
47	34.00	0.07	36.00	0.06	-0.0030
48	36.00	0.06	38.00	0.06	-0.0020
49	38.00	0.06	40.00	0.06	-0.0020
50	40.00	0.06	42.00	0.05	-0.0020
51	42.00	0.05	44.00	0.05	-0.0020
52	44.00	0.05	46.00	0.04	-0.0020
53	46.00	0.04	48.00	0.04	-0.0020
54	48.00	0.04	50.00	0.04	-0.0010
55	50.00	0.04	52.00	0.04	-0.0010
56	52.00	0.04	54.00	0.03	-0.0010
57	54.00	0.03	56.00	0.03	-0.0010
58	56.00	0.03	58.00	0.03	-0.0010
59	58.00	0.03	60.00	0.03	-0.0010
60	60.00	0.03	62.00	0.02	-0.0010
61	62.00	0.02	64.00	0.02	-0.0010
62	64.00	0.02	66.00	0.02	-0.0010
63	66.00	0.02	68.00	0.02	-0.0010
64	68.00	0.02	70.00	0.02	-0.0010
65	70.00	0.02	72.00	0.02	-0.0010
66	72.00	0.02	74.00	0.02	-0.0010
67	74.00	0.02	76.00	0.02	-0.0010
68	76.00	0.02	78.00	0.01	0.0000
69	78.00	0.01	80.00	0.01	0.0000
70	80.00	0.01	82.00	0.01	0.0000
71	82.00	0.01	84.00	0.01	0.0000

72	84.00	0.01	86.00	0.01	0.0000
73	86.00	0.01	88.00	0.01	0.0000
74	88.00	0.01	90.00	0.01	0.0000
75	90.00	0.01	92.00	0.01	0.0000
76	92.00	0.01	94.00	0.01	0.0000
77	94.00	0.01	96.00	0.01	0.0000
78	96.00	0.01	98.00	0.01	0.0000
79	98.00	0.01	100.00	0.01	0.0000

* PASSIVE PRESSURE *

No.	Z1 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	25.00	0.00	26.25	0.62	0.4930
2	26.25	0.62	26.88	0.87	0.4130
3	26.88	0.87	27.50	0.98	0.1660
4	27.50	0.98	28.13	0.97	-0.0060
5	28.13	0.97	45.00	0.79	-0.0110
6	45.00	0.79	45.63	0.80	0.0160
7	45.63	0.80	46.25	0.84	0.0640
8	46.25	0.84	46.88	0.87	0.0500
9	46.88	0.87	53.13	0.96	0.0130
10	53.13	0.96	53.75	1.09	0.2080
11	53.75	1.09	54.38	1.32	0.3800
12	54.38	1.32	55.00	1.47	0.2390
13	55.00	1.47	55.63	1.55	0.1210
14	55.63	1.55	56.88	1.70	0.1220
15	56.88	1.70	58.13	1.86	0.1240
16	58.13	1.86	59.38	2.02	0.1260
17	59.38	2.02	60.00	2.09	0.1170
18	60.00	2.09	60.63	2.16	0.1150
19	60.63	2.16	61.25	2.24	0.1260
20	61.25	2.24	63.13	2.48	0.1270
21	63.13	2.48	63.75	2.49	0.0220
22	63.75	2.49	64.38	2.46	-0.0560
23	64.38	2.46	65.00	2.48	0.0420
24	65.00	2.48	69.38	2.97	0.1120
25	69.38	2.97	70.00	3.36	0.6270
26	70.00	3.36	70.63	3.80	0.6900
27	70.63	3.80	71.25	3.93	0.2200
28	71.25	3.93	71.88	4.07	0.2120
29	71.88	4.07	72.50	4.21	0.2290
30	72.50	4.21	73.75	4.51	0.2370
31	73.75	4.51	75.00	4.80	0.2390
32	75.00	4.80	76.88	5.25	0.2400
33	76.88	5.25	80.63	6.16	0.2410
34	80.63	6.16	81.25	6.30	0.2210
35	81.25	6.30	81.88	6.43	0.2050
36	81.88	6.43	82.50	6.57	0.2240
37	82.50	6.57	88.13	7.91	0.2380
38	88.13	7.90	91.88	8.79	0.2370
39	91.88	8.79	95.63	9.67	0.2360
40	95.63	9.67	100.00	10.70	0.2350
41	100.00	10.70	100.63	10.82	0.2000
42	100.63	10.82	101.25	10.94	0.1940
43	101.25	10.94	101.88	11.09	0.2270
44	101.88	11.09	108.13	12.53	0.2320
45	108.13	12.53	116.88	14.55	0.2300
46	116.88	14.54	125.00	16.41	0.2290

* ACTIVE SPACE *

No.	Z depth	Spacing
1	0.00	1.00
2	25.00	1.00

* PASSIVE SPACE *

No.	Z depth	Spacing
1	25.00	1.00

* BRACE: STRUT, TIEBACK, ANCHOR PLATE, OR DEADMAN *

No.	Z brace	Angle	Spacing	Input1*	Input2*	Type
1	7.00	0.0	1.00	1.00	1.00	Strut
2	18.00	0.0	1.00	1.00	1.00	Strut

*For Tieback: Input1 = Diameter; Input2 = Bond Stength
*For Plate: Input1 = Diameter; Input2 = Allowable Pressure
*For Deaman: Input1 = Horz. Width; Input2 = Allowable Pressure; Angle = 0

**********SPECIFIED PILE **********

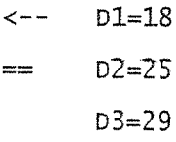
PZC18 has been found in Sheet Pile list!
PZC18 Sx= 33.5 Ix= 255.5 Weight= 24.2

* Note: All the pile dimensions are in English Units per one foot width.

Add Pile Capacity in Emdment Calculation
Pile Moment Capacity, Ms: 92.13

**********CALCULATION**********

Top Pressures start at depth = 0.00
* CALCULATE EMBEDMENT *



D1 - TOP DEPTH R1 - TOP REACTION
D2 - EXCAVATION BASE
D3 - PILE TIP

TOTAL REACTION: R1 = 13.19
TOTAL PRESSURE ACTING ON WALL = 13.19
Total Reaction = Total Pressure, OK!
The Calculated Embedment, Yend = 4.98

----------MULTIPLE BRACE / TIEBACK CASE----------
** Use the calculated embedment, Yend = 4.98

NUMBER OF BRACE LEVEL= 2

```
*  CANTILEVER SPAN  *

        |       D1=0.00
        |
        |
        |<--    D2=7.00          R2=1.00, with Cantilever Moment=2.37

       D1 - TOP DEPTH
       D2 - BOTTOM DEPTH          R2 - BOTTOM REACTION

   TOTAL REACTION: R2 = 1.00
   TOTAL PRESSURE ACTING ON WALL = 1.00
      Total Reaction = Total Pressure,     OK!

   ------------------------------------------------------
   BRACE NO.1 AT DEPTH = 7.00
       R2 of Span No.0
                                  } Sum of Reaction = Brace Load = -2.39
       R1 of Last Span
   ------------------------------------------------------

*  LAST SPAN  *

        |<--    D1=7.00          R1=-3.39
        |
        |
        |<--    D2=18.00         R2=23.52
        |
        |
        |       D3=29.98

       D1 - TOP DEPTH             R1 - TOP REACTION
       D2 - LAST BRACE DEPTH      R2 - LAST BRACE REACTION
       D3 - BOTTOM DEPTH

   TOTAL REACTION: R1+R2 = 20.13
   TOTAL PRESSURE ACTING ON WALL = 20.13
      Total Reaction = Total Pressure,     OK!

**********************************RESULTS*****************************************

* EMBEDMENT *
MINIMUM EMBEDMENT = 4.98 (8~10 recommended)
TOTAL MINIMUM PILE LENGTH = 29.98

* MOMENT IN PILE *
 No.     Depth            M @ Brace        Mmax in Span     Depth of Mmax
-------------------------------------------------------------------------
 1       7.00             2.43             2.43             7.02
 2       18.00            69.12            0.00             29.95
-------------------------------------------------------------------------
Overall Maximum Moment = 69.12 at 18.01
Maximum Shear = 13.18

-> Top Brace Increase 15%. (Horizontal) From -2.39 to -2.75

* BRACE: STRUT, TIEBACK, ANCHOR PLATE, OR DEADMAN *
 No.     DEPTH            Tangle           SPACING          HORIZONTAL       VERTICAL
TOTAL LOAD
-------------------------------------------------------------------------------------
```

The Braces around No.1 are too low or too close! Move brace up! Results may be incorrect.
The Braces around No.1 are too low or too close! Move brace up! Results may be incorrect.

2	18.00	0.0	1.00	23.52	0.00

23.52

No.	DEPTH	Free length	Type and Data
1	7.00	0.00	Strut
2	18.00	0.00	Strut

---

* VERTICAL LOADING *
Vertical Loading from Braces = 0.00
Vertical Loading from External Load = 0.00
Total Vertical Loading = 0.00

* VERTICAL BEARING CAPACITY CHECK *

Tip Depth	Tip Area	Bearing	Tip Resistance
29.98	0.50	1.00	0.50

Embedment	Side Area*	Friction	Side Resistance
4.98	34.96	1.00	34.96

*Side Area is the surface area of embedment below base and contact area between pile and soil above base.

Total Vertical Resistance = 35.46
Total Vertical Loading = 0.00
Vertical Factor of Safety = 999.00

**********SPECIFIED PILE **********

PZC18 has been found in Sheet Pile list!
PZC18 SX= 33.5 IX= 255.5 Weight= 24.2

* Note: All the pile dimensions are in English Units per one foot width.

Request Min. Section Modulus = 25.1 in3/feet, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
The pile selection is based on the magnitude of the moment only. Axial force is neglected. Ref. Note 3

PZC18 is capable to support the shoring!
Top deflection = 0.179(in)
Max. deflection = 0.179(in)

Raytheon Facility - Wayland, MA

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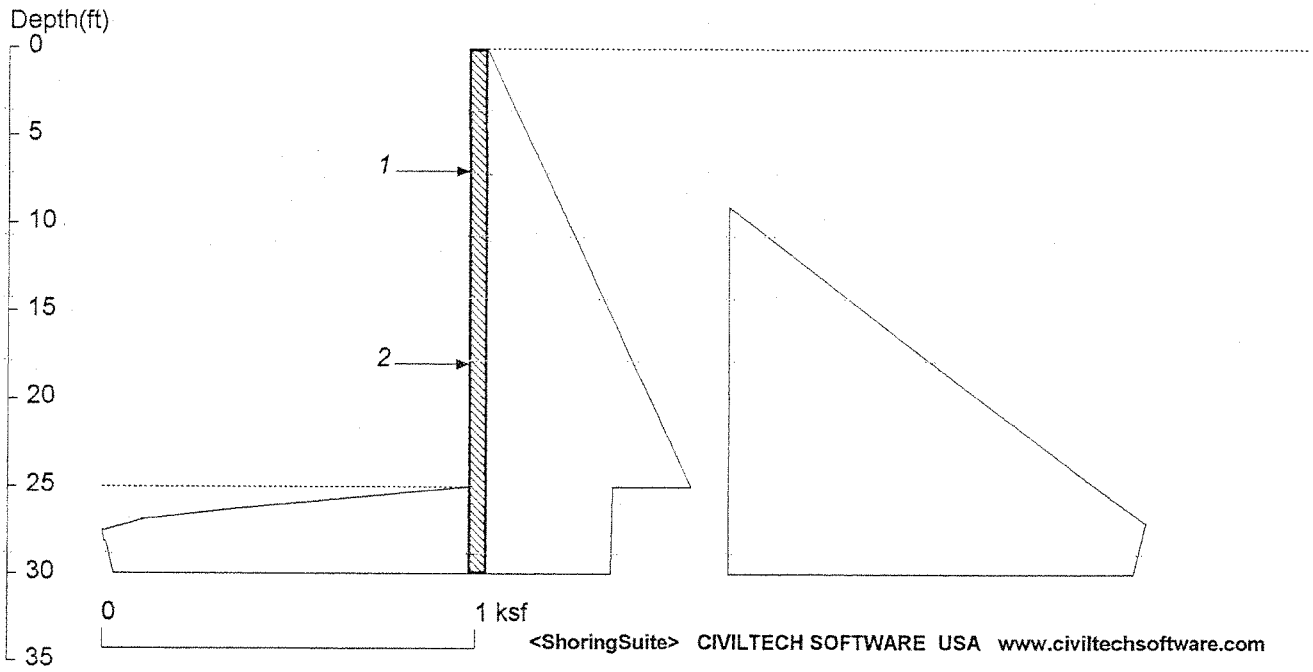

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Wall Height=25.0 Pile Diameter=1.0 Pile Spacing=1.0

ACTIVE SPACE:	Z depth	Spacing
1	0.00	1.00
2	25.00	1.00

PASSIVE SPACE:	Z depth	Spacing
1	25.00	1.00

PILE LENGTH: Min. Embedment=4.97, Min. Pile Length=29.97
MOMENT IN PILE: Max. Moment=62.28 at Depth of 18.01

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=35.4, Vertical Factor of Safety=999.00

PILE SELECTION:
Request Min. Section Modulus = 22.6 in3/feet, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
PZC18 has Section Modulus = 33.5. It is greater than Min. Requirements!

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total	Horiz.	Vert.	N/A	N/A
1. Strut	7.0	0.0	-3.5*	-3.5	0.0	0.0	0.0
2. Strut	18.0	0.0	21.1	21.1	0.0	0.0	0.0

* Top Brace increased by 15% (DM7.2-103)

UNITS: Length/Depth - ft, Force - kip, Moment - kip-ft, Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Raytheon Facility - Wayland, MA

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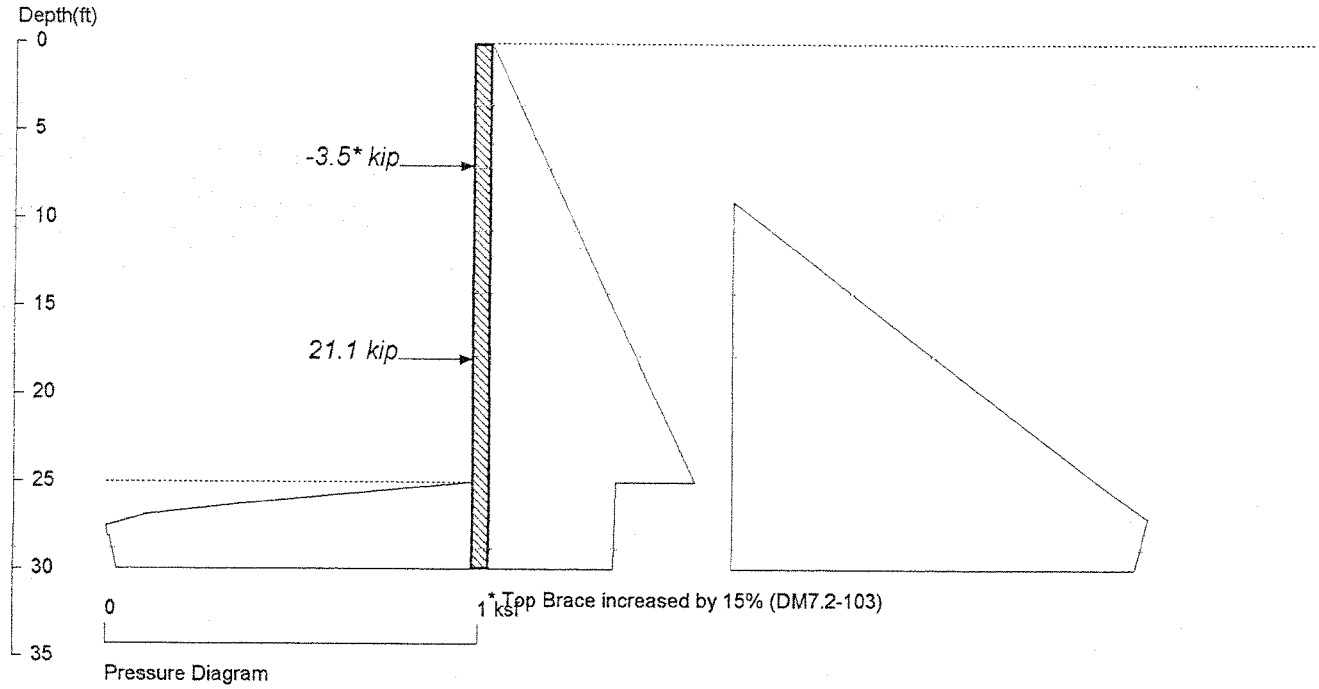

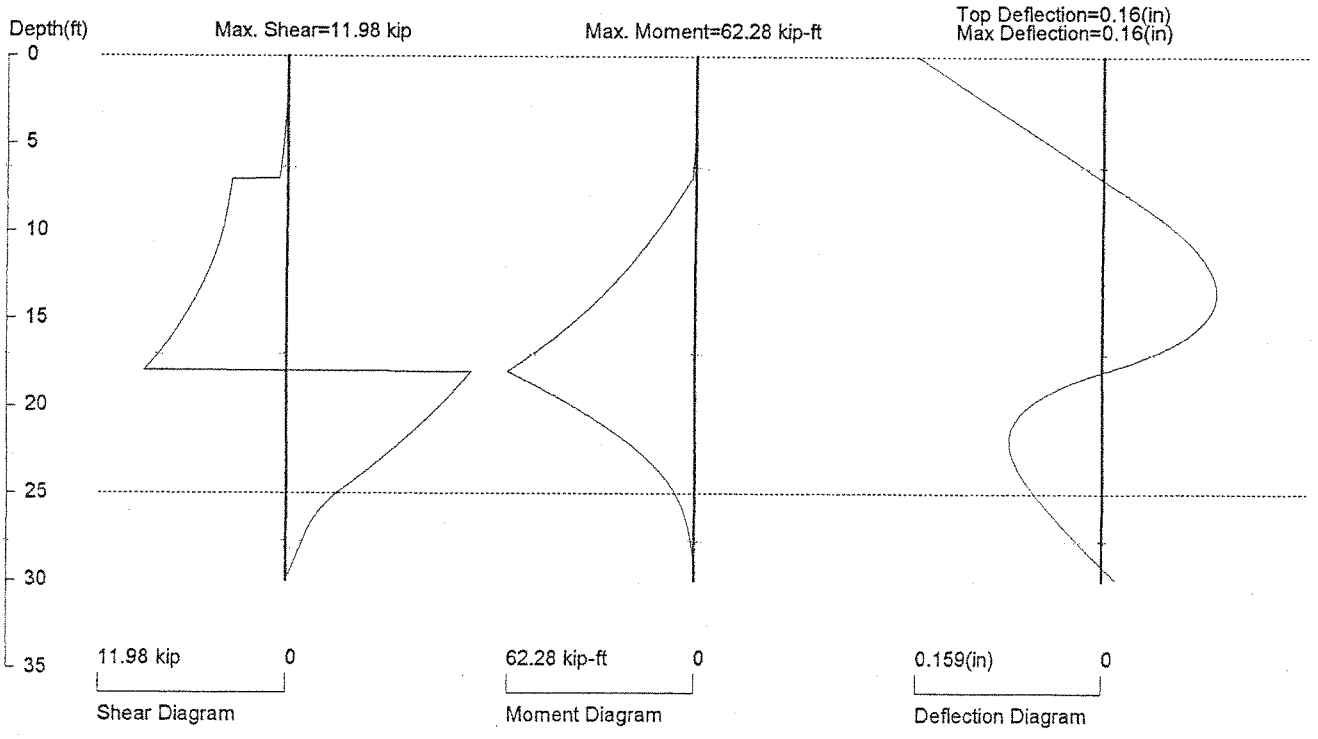

PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on one soldier pile or one foot spacing of sheet pile

Pile: PZC18 meet Section Requirements. Properties: 6. E (ksi)=29000, 4. I (in4)=255.5

Date: 5/9/2006 File Name: A:\06-602 WA-8, no surcharge.sh8

report.out

****

SHORING WALL CALCULATION SUMMARY
The leading shoring design and calculation software

www.civiltechsoftware.com

****

ShoringSuite Software is developed by CivilTech Software, Bellevue, WA, USA.
The calculation method is based on the following references:

1. FHWA 98-011, FHWA-RD-97-130, FHWA SA 96-069, FHWA-IF-99-015
2. STEEL SHEET PILING DESIGN MANUAL by Pile Buck Inc., 1987
3. DESIGN MANUAL DM-7 (NAVFAC), Department of the Navy, May 1982
4. TRENCHING AND SHORING MANUAL Revision 12, California Department of Transportation, January 2000
6. EARTH SUPPORT SYSTEM & RETAINING STRUCTURES, Pile Buck Inc. 2002
5. DESIGN OF SHEET PILE WALLS, EM 1110-2-2504, U.S. Army Corps of Engineers, 31 March 1994
7. EARTH RETENTION SYSTEMS HANDBOOK, Alan Macnab, McGraw-Hill. 2002

DEPTH: ft, PRESSURE, FRICTION, BEARING: ksf, SLOPE: kcf, FORCE: kip, MOMENT: kip-ft, DEFLECTION: in, I: in4, E: ksi

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Title: Raytheon Facility - Wayland, MA
Subtitle: WA-8

**********INPUT DATA**********

Wall Type: 1. Sheet Pile
Wall Height: 25.00
Pile Diameter: 1.00
Pile Spacing: 1.00
Factor of Safety (F.S.): 1.00
Max. Moment reduce 20%
Lateral Support Type (Braces): 2. Strut, Raker
Top Brace Increase (Multi-Bracing): Add 15%*
Embedment Option: 1. Yes
Friction at Pile Tip: No*
Check Vertical Bearing Capacity:
Side Friction for Bearing: 1.00
Tip Resistance for Bearing: 1.00
Pile Properties:
Allowable Fb/Fy: 0.66
Steel Strength, Fy: 50 ksi = 345 MPa
Elastic Module, E: 29000.00
Moment of Inertia, I: 100.00
User Input Pile: PZC18

* ACTIVE PRESSURE (ACTIVE, WATER, & SURCHARGE) *

No.	Z2 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	0.00	0.00	25.00	0.56	0.0220
2	25.00	0.34	45.00	0.32	-0.0010
3	45.00	0.32	45.63	0.32	-0.0080
4	45.63	0.32	46.25	0.31	-0.0190
5	46.25	0.31	46.88	0.30	-0.0110
6	46.88	0.30	53.13	0.30	0.0010
7	53.13	0.30	53.75	0.28	-0.0420
8	53.75	0.28	54.38	0.24	-0.0690
9	54.38	0.24	55.00	0.22	-0.0250

10	55.00	0.22	58.75	0.23	0.0030
11	58.75	0.23	60.00	0.24	0.0060
12	60.00	0.24	63.13	0.25	0.0030
13	63.13	0.25	63.75	0.26	0.0150
14	63.75	0.26	64.38	0.27	0.0230
15	64.38	0.27	65.00	0.28	0.0110
16	65.00	0.28	69.38	0.29	0.0040
17	69.38	0.29	70.00	0.27	-0.0370
18	70.00	0.27	70.63	0.25	-0.0340
19	70.63	0.25	71.25	0.26	0.0080
20	71.25	0.26	80.00	0.30	0.0060
21	80.00	0.30	81.25	0.31	0.0080
22	81.25	0.31	93.13	0.37	0.0050
23	93.13	0.37	93.75	0.37	0.0080
24	93.75	0.37	94.38	0.38	0.0070
25	94.38	0.38	111.25	0.46	0.0050
26	111.25	0.46	112.50	0.47	0.0080
27	112.50	0.47	125.00	0.53	0.0050
28	9.00	0.00	27.00	1.12	0.0620
29	27.00	1.12	125.00	0.00	-0.0110

* PASSIVE PRESSURE *

No.	Z1 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	25.00	0.00	26.25	0.62	0.4930
2	26.25	0.62	26.88	0.87	0.4130
3	26.88	0.87	27.50	0.98	0.1660
4	27.50	0.98	28.13	0.97	-0.0060
5	28.13	0.97	45.00	0.79	-0.0110
6	45.00	0.79	45.63	0.80	0.0160
7	45.63	0.80	46.25	0.84	0.0640
8	46.25	0.84	46.88	0.87	0.0500
9	46.88	0.87	53.13	0.96	0.0130
10	53.13	0.96	53.75	1.09	0.2080
11	53.75	1.09	54.38	1.32	0.3800
12	54.38	1.32	55.00	1.47	0.2390
13	55.00	1.47	55.63	1.55	0.1210
14	55.63	1.55	56.88	1.70	0.1220
15	56.88	1.70	58.13	1.86	0.1240
16	58.13	1.86	59.38	2.02	0.1260
17	59.38	2.02	60.00	2.09	0.1170
18	60.00	2.09	60.63	2.16	0.1150
19	60.63	2.16	61.25	2.24	0.1260
20	61.25	2.24	63.13	2.48	0.1270
21	63.13	2.48	63.75	2.49	0.0220
22	63.75	2.49	64.38	2.46	-0.0560
23	64.38	2.46	65.00	2.48	0.0420
24	65.00	2.48	69.38	2.97	0.1120
25	69.38	2.97	70.00	3.36	0.6270
26	70.00	3.36	70.63	3.80	0.6900
27	70.63	3.80	71.25	3.93	0.2200
28	71.25	3.93	71.88	4.07	0.2120
29	71.88	4.07	72.50	4.21	0.2290
30	72.50	4.21	73.75	4.51	0.2370
31	73.75	4.51	75.00	4.80	0.2390
32	75.00	4.80	76.88	5.25	0.2400
33	76.88	5.25	80.63	6.16	0.2410
34	80.63	6.16	81.25	6.30	0.2210
35	81.25	6.30	81.88	6.43	0.2050
36	81.88	6.43	82.50	6.57	0.2240
37	82.50	6.57	88.13	7.91	0.2380

38	88.13	7.90	91.88	8.79	0.2370
39	91.88	8.79	95.63	9.67	0.2360
40	95.63	9.67	100.00	10.70	0.2350
41	100.00	10.70	100.63	10.82	0.2000
42	100.63	10.82	101.25	10.94	0.1940
43	101.25	10.94	101.88	11.09	0.2270
44	101.88	11.09	108.13	12.53	0.2320
45	108.13	12.53	116.88	14.55	0.2300
46	116.88	14.54	125.00	16.41	0.2290

* ACTIVE SPACE *

No.	Z depth	Spacing
1	0.00	1.00
2	25.00	1.00

* PASSIVE SPACE *

No.	Z depth	Spacing
1	25.00	1.00

* BRACE: STRUT, TIEBACK, ANCHOR PLATE, OR DEADMAN *

No.	Z brace	Angle	Spacing	Input1*	Input2*	Type
1	7.00	0.0	1.00	1.00	1.00	Strut
2	18.00	0.0	1.00	1.00	1.00	Strut

*For Tieback: Input1 = Diameter; Input2 = Bond Stength
*For Plate: Input1 = Diameter; Input2 = Allowable Pressure
*For Deaman: Input1 = Horz. Width; Input2 = Allowable Pressure; Angle = 0

**********SPECIFIED PILE **********

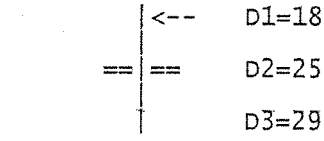
PZC18 has been found in Sheet Pile list!
PZC18 Sx= 33.5 Ix= 255.5 Weight= 24.2

* Note: All the pile dimensions are in English Units per one foot width.

Add Pile Capacity in Emdment Calculation
Pile Moment Capacity, Ms: 92.13

**********CALCULATION**********

Top Pressures start at depth = 0.00
* CALCULATE EMBEDMENT *



D1 - TOP DEPTH R1 - TOP REACTION
D2 - EXCAVATION BASE

```
        D3 - PILE TIP

    TOTAL REACTION: R1 = 11.99
    TOTAL PRESSURE ACTING ON WALL = 11.99
       Total Reaction = Total Pressure,     OK!
       The Calculated Embedment, Yend = 4.97

-------------------------MULTIPLE BRACE / TIEBACK CASE-------------------------
** Use the calculated embedment, Yend = 4.97

    NUMBER OF BRACE LEVEL=  2


*  CANTILEVER SPAN  *

          |       D1=0.00
          |
          |
          |<--    D2=7.00          R2=0.54, with Cantilever Moment=1.26

        D1 - TOP DEPTH
        D2 - BOTTOM DEPTH           R2 - BOTTOM REACTION

    TOTAL REACTION: R2 = 0.54
    TOTAL PRESSURE ACTING ON WALL = 0.54
       Total Reaction = Total Pressure,     OK!

    ------------------------------------------------------
    BRACE NO.1 AT DEPTH = 7.00
        R2 of Span No.0
                                  } Sum of Reaction = Brace Load = -3.03
        R1 of Last Span
    ------------------------------------------------------

*  LAST SPAN  *

          |<--    D1=7.00          R1=-3.57
          |
          |
          |<--    D2=18.00         R2=21.10
          |
          |       D3=29.97

        D1 - TOP DEPTH              R1 - TOP REACTION
        D2 - LAST BRACE DEPTH       R2 - LAST BRACE REACTION
        D3 - BOTTOM DEPTH

    TOTAL REACTION: R1+R2 = 17.53
    TOTAL PRESSURE ACTING ON WALL = 17.53
       Total Reaction = Total Pressure,     OK!

**********************************RESULTS*********************************************

* EMBEDMENT *
MINIMUM EMBEDMENT = 4.97 (8~10 recommended)
TOTAL MINIMUM PILE LENGTH = 29.97

* MOMENT IN PILE *
 No.     Depth            M @ Brace        Mmax in Span     Depth of Mmax
-------------------------------------------------------------------------
```

1	7.00	1.32	1.32	7.02
2	18.00	62.28	0.00	29.94

Overall Maximum Moment = 62.28 at 18.01
Maximum Shear = 11.98

-> Top Brace Increase 15%. (Horizontal) From -3.03 to -3.49

* BRACE: STRUT, TIEBACK, ANCHOR PLATE, OR DEADMAN *

No.	DEPTH	Tangle	SPACING	HORIZONTAL	VERTICAL TOTAL LOAD
The Braces around No.1 are too low or too close! Move brace up! Results may be incorrect.					
The Braces around No.1 are too low or too close! Move brace up! Results may be incorrect.					
2	18.00	0.0	1.00	21.10	0.00 21.10

No.	DEPTH	Free length	Type and Data
1	7.00	0.00	Strut
2	18.00	0.00	Strut

* VERTICAL LOADING *
Vertical Loading from Braces = 0.00
Vertical Loading from External Load = 0.00
Total Vertical Loading = 0.00

* VERTICAL BEARING CAPACITY CHECK *

Tip Depth	Tip Area	Bearing	Tip Resistance
29.97	0.50	1.00	0.50

Embedment	Side Area*	Friction	Side Resistance
4.97	34.95	1.00	34.95

*Side Area is the surface area of embedment below base and contact area between pile and soil above base.

Total Vertical Resistance = 35.45
Total Vertical Loading = 0.00
Vertical Factor of Safety = 999.00

**********SPECIFIED PILE **********

PZC18 has been found in Sheet Pile list!
PZC18 Sx= 33.5 Ix= 255.5 Weight= 24.2

* Note: All the pile dimensions are in English Units per one foot width.

Request Min. Section Modulus = 22.6 in3/feet, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
The pile selection is based on the magnitude of the moment only. Axial force is neglected. Ref. Note 3

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PZC18 is capable to support the shoring!
Top deflection = 0.159(in)
Max. deflection = 0.159(in)