Ground Support PLLC

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Design Memorandum

PROJECT: Mercer Island Mixed-Use (Project No. 20-37)

ADDRESS: 2885 78th Avenue SE
Mercer Island, WA

CLIENT: Mr. Kyle Lu
Xing Hua Group, LTD
929 108th Avenue NE, Suite 1200
Bellevue, WA 98004

DATE: September 22, 2020

REFERENCES:

1. "Geotechnical Engineering Design Report, Mercer Island Multi-Family Development, Seattle, Washington", prepared by Hart Crowser Inc., dated May 1, 2015.
2. 2015 International Building Code.
3. "Geotechnical Engineering Circular No. 4, Ground Anchors and Anchored Systems", FHWA, dated June 1999.

BACKGROUND:

The planned mixed-use project is located at 2885 78th Avenue SE in Mercer Island, Washington. The site is bounded by 78th Avenue SE to the east, S 29th Street to the south, 77th Avenue SE to the west, and by private property (parking lot) to the north. The site does not include a parcel to the southwest with overall dimensions of 100 feet (east-west) by 127 feet. The site slopes to the west from elevation 90 feet along 78th Avenue SE to 82-83 feet along 77th Avenue SE. Underground parking is planned that will require excavation to elevations 68-77 feet. Depths of excavation from ground surface to the base of planned footings range between 6 and 20 feet. However, except for the east portion of the site, the soils at these footing depths are unsuitable for supporting foundation loads. Suitable load bearing soils extend from a few feet up to 13 feet below foundation elevations. Procedures for dealing with this situation have not as yet been finalized and may range from over-excavate and replace where depths to good bearing soils are modest, to ground improvement or deep foundations where depths to load bearing soils are greater. Irrespective, all of these procedures will or potentially will require that the shoring be designed to support excavations that extend beyond the planned foundation levels. Therefore, at this stage, it has been conservatively assumed that the excavation will extend to the load bearing soils where these are at greater depth than the identified foundation levels. When foundation treatment methods are finalized, the shoring design might be adjusted to be less conservative at specific locations.

The overall plan dimensions of the garage footprint are on the order of 280 feet east-west by 240 feet, for a total estimated effective shored area of 13,000 SF. As noted, the actual exposed face area of the shoring might be less than this value that assumes excavation to the deeper of the foundation level or the bearing soils, whichever is deeper. This would only apply for the excavate and replace scenario which is less likely at locations where depths to the bearing soils are greater.

SUBSURFACE CONDITIONS:

The geotechnical report indicates that the subsurface soils consist of loose to medium dense silty granular fill, soft silt and peat overlying native soils consisting of medium stiff to hard silt and medium dense to dense sand and silty sand. The fill soils range from 5 to over 20 feet deep. Active dewatering of the site is likely required within the native sandy materials.

SHORING SYSTEM:

Given the variable soil conditions, the thickness of poor quality fill soils and the presence of groundwater, a soldier pile system with wood lagging offers the technically preferred shoring approach. For the planned depths of excavation, a single row of tieback anchors will be used to support the soldier piles. This shoring approach has also been demonstrated to provide the most positive method of deformation control of the adjacent streets.

DESIGN PARAMETERS:

Design earth pressures corresponding to the soil self-weight are recommended in the geotechnical report. For soldier piles that are supported by a single row of anchors, a soil self-weight design earth loading of 42 pcf was used.

Live load lateral surcharge pressures are as presented on the Plans to account for general traffic and construction loading and range from 100 to 150 psf.

The following design values were used to evaluate the depth of embedment of the soldier piles below the base of the excavation:

Passive Equivalent Fluid Density	175 pcf over 2.5 pile diameters (native soils below water table) 100 pcf (fill for initial cantilever condition)
Allowable Pile End Bearing	10 ksf
Allowable Pile Skin Friction	2 ksf

DESIGN:

Anchors:

Individual anchor loads are developed from the design earth pressure diagrams presented on the Plans, using a tributary area method to assign loads to the individual anchors and to the toe shear in the piles. Anchor lengths are then determined from the no-load zone (see Plans) and the required bond zone. The length of the bond zone is determined from the anchor design load and the allowable pullout value. An allowable pullout resistance of 2.5 kips per linear foot (klf) has been used for all anchors that will be bonded in the native soils. Anchor designs are presented in Appendix A.

Soldier Piles:

Soldier pile loadings are determined from the design earth pressure diagrams and the locations and inclinations of the anchors/rakers. The spreadsheet output presented in Appendix B summarizes the following design aspects for both the shoring piles and the toe piles that support the rakers:

- Calculation of soldier pile loads and bending moments, consistent with the design apparent earth pressure diagrams provided on the Plans. For each soldier pile, the calculated shear force, axial load and bending moment are provided. Representative earth pressure diagrams, together with calculated shear force and bending moment diagrams, are shown for a number of piles, in Appendix B.
- Calculation of pile toe embedment requirements using the criteria indicated on the Plans.
- Pile structural steel sizing in accordance with the AISC 360-10 Specification for Structural Steel Buildings. Combined flexure and axial load, shear, and compact section steel design checks are performed for the critically loaded section of each pile along the length of the wall. The spreadsheet output summarizes the minimum steel section required for each pile.

Similar information is provided in Appendix C for the Stage 1 cantilevered condition prior to installation of the top row of anchors.

Anchor/Pile Connections:

The designs of the connections of the anchors to the soldier piles are summarized in Table 1. Required weld lengths and connection plate sizes were determined in accordance with AISC 360-10 and for Grade 50 steel plates and E70XX weld electrodes.

Lagging:

Timber lagging will be used to support the soil between adjacent soldier piles. The average design earth pressures for the lagging are indicated in Appendix A, and these design earth pressures are derived

directly from the design earth pressure diagrams. Hem-Fir No. 2 lagging (4-inch) or equivalent will provide adequate support for the soil between the soldier piles, per the recommendations of the FHWA Engineering Circular No. 4.

TABLES

ANCHOR POCKET DESIGN SPREADSHEET **VERSION 2.0 (7/24/01)**

DESIGN ASSUMPTIONS

E70XX Electrodes For All Welding
Cover Plates Welded to Flange at Each End, Along Narrow End & Returned Down Edge Along Pile Web
Web Stiffener Plates Are Full Depth, Are Flush At Bearing End, & Welded Full Length & Along Bearing End On One Side Only

CONNECTION INPUT DATA

Case	Pile Section	Pile Grade (ksi)	Plate Steel Grade (ksi)	Design Anchor Load (k)	Actual Design Pile Moment (ft-k)	Max Design Pile Moment (ft-k)	Flange Width b_f (in)	Flange Thick t_f (in)	Beam Depth d (in)	Web Thick t_w (in)	Max Cutout Width (in)	Max Cutout Area (in^2)
1	W14x34	50.0	36.0	60.0	133.7	133.7	6.750	0.455	14.000	0.285	3.23	1.47
2	W14x38	50.0	36.0	60.0	150.2	150.2	6.770	0.515	14.100	0.310	3.23	1.66
3	W14x43	50.0	36.0	70.0	172.2	172.2	8.000	0.530	13.700	0.305	3.85	2.04
4	W14x48	50.0	36.0	80.0	193.1	193.1	8.030	0.595	13.800	0.340	3.85	2.29
5	W14x53	50.0	36.0	90.0	214.0	214.0	8.060	0.660	13.900	0.370	3.85	2.54
6	W18x50	50.0	36.0	90.0	244.5	244.5	7.500	0.570	18.000	0.355	3.57	2.04
7	W18x55	50.0	36.0	90.0	270.3	270.3	7.530	0.630	18.100	0.390	3.57	2.25
8	W18x60	50.0	36.0	90.0	297.0	297.0	7.560	0.695	18.200	0.415	3.57	2.48
9	W18x86	50.0	36.0	90.0	342.4	456.5	11.100	0.770	18.400	0.480	5.31	4.09

DESIGN CALCULATIONS FOR COVER PLATE

Case	Max Cutout Force (k)	Design Cutout Force (k)	Cover Plate E70XX Weld Size (in)	Req'd Weld Length L (in)	Design Weld Length L (in)	Design Weld Width (in)	Req'd Weld Return Length (in)	Design Cover Plate Thick (in)	Req'd Cover Plate Width (in)	Design Cover Plate Width (in)	Req'd Cover Plate Length (in)	Design Cover Plate Length (in)
1	48.5	48.5	0.3125	10.5	11.5	2.5	9.0	0.500	4.09	4.00	24.0	24.0
2	54.9	54.9	0.3125	11.8	11.5	2.5	9.0	0.750	3.08	4.00	24.0	24.0
3	67.3	67.3	0.3125	14.5	14.5	2.5	12.0	0.750	3.78	4.00	30.0	30.0
4	75.5	75.5	0.3125	16.3	16.0	2.5	13.5	0.750	4.24	4.00	33.0	33.0
5	83.7	83.7	0.3125	18.0	17.5	2.5	15.0	1.000	3.52	4.00	36.0	36.0
6	67.2	67.2	0.3125	14.5	14.5	2.5	12.0	0.750	3.77	4.00	30.0	30.0
7	74.2	74.2	0.3125	16.0	16.0	2.5	13.5	0.750	4.17	4.00	33.0	33.0
8	81.9	81.9	0.3125	17.7	17.5	2.5	15.0	1.000	3.45	4.00	36.0	36.0
9	134.9	64.4	0.3125	13.9	14.5	4.0	10.5	0.750	3.61	4.00	27.0	27.0

DESIGN CALCULATIONS FOR WEB STIFFENER

Case	Single Stiffener Force (k)	Total Stiffener E70XX Weld Size (in)	Stiffener Thickness (in)	Req'd Weld Length (in)	Design Weld & Stiffener Length (in)	Req'd Stiffener Compress Area (in^2)	Req'd Stiffener Width (in)	Design Stiffener Width (in)	Stiffener "b/t" Ratio	Allowable Stiffener "b/t" Ratio
1	30.0	0.2500	0.500	8.1	12.0	1.389	2.8	4.0	8.0	10.7
2	30.0	0.2500	0.500	8.1	12.0	1.389	2.8	4.0	8.0	10.7
3	35.0	0.2500	0.500	9.4	12.0	1.620	3.2	4.0	8.0	10.7
4	40.0	0.2500	0.500	10.8	12.0	1.852	3.7	4.0	8.0	10.7
5	45.0	0.2500	0.500	12.1	12.0	2.083	4.2	4.0	8.0	10.7
6	45.0	0.2500	0.500	12.1	16.0	2.083	4.2	4.0	8.0	10.7
7	45.0	0.2500	0.500	12.1	16.0	2.083	4.2	4.0	8.0	10.7
8	45.0	0.2500	0.500	12.1	16.0	2.083	4.2	4.0	8.0	10.7
9	45.0	0.2500	0.500	12.1	16.0	2.083	4.2	4.0	8.0	10.7

TABLE 1
ANCHOR POCKET DESIGN

APPENDIX A

ANCHOR DESIGN

							Anchor 1						Design	Pile Top	Pile Toe	Pile Toe	Pile	Lagging
					$L=NH^2$	Unif. Press.	Elevation	Angle	Anchor Load	No. of	Total Length	Bond Length	Beam	Elevation	Embed	Elevation	Length	Pressure
Pile ID	Station (ft)	Height (ft)	Spacing (ft)	No. Anchors	N (psf/ft)	P (psf)	(feet)	(degrees)	(kips)	Strands	(feet)	(feet)		(feet)	(feet)	(feet)	(feet)	(psf)
N1	4	16.4	8	1	21	150	76.50	45	69	2	42.8	27.8	W14x38	83.0	8.4	57.0	26.0	839
N2	12	16.6	8	1	21	150	76.50	45	71	3	43.6	28.3	W14x38	83.0	8.5	57.0	26.0	848
N3	20	16.8	8	1	21	150	76.50	45	72	3	44.4	28.8	W14x43	83.0	8.6	56.0	27.0	856
N4	28	17.0	8	1	21	150	76.50	45	73	3	45.1	29.3	W14x43	83.0	8.7	56.0	27.0	865
N5	36	17.2	8	1	21	150	76.50	45	74	3	45.9	29.8	W14x43	83.0	8.8	56.0	27.0	873
N6	44	17.4	8	1	21	150	76.50	45	76	3	46.7	30.3	W14x48	83.0	8.9	56.0	27.0	882
N7	52	17.6	8	1	21	150	76.50	45	77	3	47.4	30.8	W14x48	83.0	9.1	55.0	28.0	891
N8	60	17.8	8	1	21	150	76.50	45	78	3	48.2	31.3	W14x48	83.0	9.2	55.0	28.0	899
N9	68	18.0	8	1	21	150	76.50	45	79	3	49.0	31.8	W14x53	83.0	9.3	55.0	28.0	908
N10	76	18.3	8	1	21	150	76.50	45	81	3	49.8	32.4	W14x53	83.0	9.4	54.0	29.0	917
N11	84	18.5	8	1	21	150	76.50	45	82	3	50.6	32.9	W14x53	83.0	9.5	54.0	29.0	925
N12	92	18.7	8	1	21	150	76.50	45	83	3	51.2	33.2	W18x50	83.0	9.0	54.0	29.0	934
N13	100	18.9	8	1	21	150	76.50	45	85	3	52.1	33.9	W18x50	83.0	9.1	54.0	29.0	944
N14	108	19.2	8	1	21	150	76.50	45	87	3	53.2	34.7	W18x50	83.0	9.2	54.0	29.0	955
N15	116	19.5	8	1	21	150	76.50	45	89	3	54.4	35.6	W18x55	83.0	9.3	53.0	30.0	967
N16	124	20.0	8	1	21	150	76.50	45	94	3	56.6	37.6	W18x55	84.0	9.5	53.0	31.0	991
N17	132	19.9	8	1	21	150	77.00	45	93	3	56.2	37.1	W18x55	84.0	9.5	54.0	30.0	987
N18	140	19.4	8	1	21	150	77.00	45	91	3	54.3	36.4	W18x50	84.0	9.1	55.0	29.0	966
N19	148	18.9	8	1	21	150	78.00	45	85	3	52.1	34.0	W18x50	85.0	9.1	56.0	29.0	943
N20	156	18.2	8	1	21	150	78.00	45	82	3	49.8	33.0	W14x48	85.0	9.2	56.0	29.0	916
N21	164	17.2	8	1	21	150	78.00	45	77	3	46.0	31.0	W14x38	85.0	8.5	58.0	27.0	874
N22	172	16.2	8	1	21	150	78.00	45	73	3	44.2	29.2	W14x34	85.0	8.0	60.0	25.0	832
N23	180	16.1	8	1	21	150	81.50	45	62	2	41.0	24.7	W14x48	86.0	8.8	60.0	26.0	824
N24	188	16.8	8	1	21	150	81.50	45	68	2	42.3	27.3	W14x48	87.0	9.0	60.0	27.0	855
N25	196	17.5	8	1	21	150	81.50	40	69	2	42.7	27.7	W14x48	88.0	9.2	60.0	28.0	886
N26	204	18.2	8	1	21	150	81.50	30	67	2	42.0	26.7	W14x48	88.0	9.3	60.0	28.0	915
N27	212	18.6	8	1	21	150	82.00	30	68	2	42.4	27.4	W14x53	89.0	9.6	59.0	30.0	932
N28	220	18.9	8	1	21	150	82.00	25	67	2	41.9	26.9	W14x53	89.0	9.6	59.0	30.0	942
N29	228	19.1	8	1	21	150	82.00	20	67	2	41.7	26.7	W14x53	89.0	9.7	59.0	30.0	952
N30	236	19.3	8.5	1	21	150	82.50	20	71	3	43.3	28.3	W18x50	89.0	9.4	60.0	29.0	962
N31	245	19.7	8	1	21	150	82.50	20	69	2	42.7	27.7	W18x50	90.0	9.3	60.0	30.0	976
N32	252	18.0	7.5	1	21	150	83.50	20	56	2	37.5	22.5	W14x48	90.0	9.1	62.0	28.0	907
N33	260	13.9	8	1	21	150	85.50	20	39	2	30.7	15.7	W14x34	90.0	8.0	68.0	22.0	736
N34	268	14.4	8	1	21	150	86.00	20	40	2	31.2	16.2	W14x34	91.0	8.0	68.0	23.0	753
N35	276	14.8	8	1	21	150	86.00	20	43	2	32.3	17.3	W14x34	91.0	8.0	68.0	23.0	771
E1	303	15.0	8	1	21	100	86.00	35	45	2	33.0	18.0	W14x34	92.0	8.0	68.0	24.0	731
E2	310.5	15.1	8	1	21	100	86.00	35	45	2	33.1	18.1	W14x34	92.0	8.0	68.0	24.0	733
E3	319	15.1	7.75	1	21	100	86.00	35	44	2	32.7	17.7	W14x34	92.0	8.0	68.0	24.0	735
E4	326	15.2	7.75	1	21	100	86.00	37.5	46	2	33.4	18.4	W14x34	92.0	8.0	68.0	24.0	737
E5	334.5	15.2	8.25	1	21	100	86.00	37.5	49	2	34.7	19.7	W14x34	92.0	8.0	68.0	24.0	739
E6	342.5	15.3	8.25	1	21	100	86.00	37.5	50	2	34.9	19.9	W14x34	92.0	8.0	68.0	24.0	741
E7	351	15.3	8.5	1	21	100	86.00	40	53	2	36.2	21.2	W14x34	92.0	8.0	68.0	24.0	742
E8	359.5	15.2	8.5	1	21	100	86.00	40	53	2	36.1	21.1	W14x34	92.0	8.0	68.0	24.0	740
E9	368	15.2	8.5	1	21	100	86.00	40	52	2	36.0	21.0	W14x34	92.0	8.0	68.0	24.0	738
E10	376.5	15.2	8.5	1	21	100	86.00	42.5	54	2	36.7	21.7	W14x34	92.0	8.0	68.0	24.0	737
E11	385	15.1	8.5	1	21	100	86.00	42.5	54	2	36.5	21.5	W14x34	92.0	8.0	68.0	24.0	735
E12	393.5	15.1	8.5	1	21	100	86.00	42.5	53	2	36.4	21.4	W14x34	92.0	8.0	68.0	24.0	733
E13	402	15.0	8.5	1	21	100	86.00	45	55	2	37.2	22.2	W14x34	92.0	8.0	68.0	24.0	732
E14	410.5	15.0	8.25	1	21	100	86.00	45	53	2	36.4	21.4	W14x34	91.0	8.0	68.0	23.0	730
E15	418.5	16.4	8	1	21	100	86.00	45	59	2	38.6	23.6	W14x43	91.0	8.6	65.0	26.0	790
E16	426.5	16.4	8	1	21	100	85.00	40	57	2	37.7	22.7	W14x34	91.0	8.2	66.0	25.0	788
E17	434.5	17.8	8.5	1	21	100	85.00	40	68	2	42.2	27.2	W14x48	91.0	9.2	63.0	28.0	848
E18	443.5	17.7	8.75	1	21	100	85.00	42.5	72	3	43.8	28.8	W14x53	91.0	9.3	63.0	28.0	845
E19	452	17.7	8.75	1	21	100	85.00	42.5	71	3	43.5	28.5	W14x53	91.0	9.3	63.0	28.0	842
E20	461	17.5	8.75	1	21	100	84.50	40	69	2	42.6	27.6	W14x48	91.0	9.0	63.0	28.0	836
E21	469.5	17.4	8.75	1	21	100	84.50	40	68	2	42.1	27.1	W14x48	91.0	9.0	63.0	28.0	831
E22	478.5	17.3	9	1	21	100	84.50	42.5	71	3	43.5	28.5	W14x48	91.0	9.1	63.0	28.0	825
E23	487.5	17.1	8.5	1	21	100	84.50	42.5	66	2	41.4	26.4	W14x43	91.0	8.9	64.0	27.0	819
E24	495.5	17.0	8	1	21	100	84.50	42.5	61	2	39.4	24.4	W14x43	90.0	8.7	64.0	26.0	814
E25	503.5	16.9	8	1	21	100	84.50	45	62	2	40.0	25.0	W14x43	90.0	8.7	64.0	26.0	808
E26	511.5	16.7	8	1	21	100	84.50	45	61	2	39.6	24.6	W14x43	90.0	8.6	64.0	26.0	803
E27	519.5	16.6	8	1	21	100	84.50	45	60	2	39.2	24.2	W14x43	90.0	8.6	64.0	26.0	798
E28	527.5	16.5	8.25	1	21	100	84.00	45	63	2	40.1	25.1	W14x38	90.0	8.5	64.0	26.0	793
E29	536	16.4	8.25	1	21	100	84.00	45	62	2	39.7	24.7	W14x38	90.0	8.4	64.0	26.0	787
S1	606	14.6	9	1	21	150	84.00	45	65	2	40.9	25.9	W14x34	90.0	8.0	66.0	24.0	763
S2	613	14.4	7.5	1	21	150	84.00	45	52	2	35.8	20.8	W14x34	89.0	8.0	66.0	23.0	753
S3	621	14.1	7.75	1	21	150	84.00	45	51	2	35.6	20.6	W14x34	89.0	8.0	66.0	23.0	742
S4	628.5	13.9	7.5	1	21	150	83.50	45	49	2	34.8	19.8	W14x34	89.0	8.0	66.0	23.0	732
S5	636	13.5	7.5	1	21	150	83.00	45	48	2	34.3	19.3	W14x34	88.0	8.0	66.0	22.0	716
S6	643.5	13.1	7.75	1	21	150	83.00	45	47	2	33.8	18.8	W14x34	88.0	8.0	66.0	22.0	700
S7	651.5	12.9	8	1	21	150	83.00	45	46	2	33.4	18.4	W14x34	88.0	8.0	66.0	22.0	690
S8	659.5	12.7	8	1	21	150	82.50	45	45	2	33.2	18.2	W14x34	87.0	8.0	66.0	21.0	683
S9	667.5	12.5	8	1	21	150	82.00	45	45	2	33.0	18.0	W14x34	87.0	8.0	65.0	22.0	675
S10	675.5	12.2	8	1	21	150	81.50	45	44	2	32.5	17.5	W14x34	86.0	8.0	65.0	21.0	664
S11	683.5	11.6	8	1	21	150	81.00	45	40	2	31.0	16.0	W14x34	85.0	8.0	65.0	20.0	639
S12	691.5	11.4	8	1	21	150	80.50	45	39	2	30.6	15.6	W14x34	85.0	8.0	65.0	20.0	628
S13	699.5	11.1	8	1	21	150	80.00	45	38	2	30.2	15.2	W14x34	85.0	8.0	64.0	21.0	618
S14	707.5	11.3	8	1	21	150	80.00	45	39	2	30.5	15.5	W14x34	84.0	8.0	64.0	20.0	626
S15	715.5	11.6	8.25	1	21	150	80.00	45	41	2	31.4	16.4	W14x34	84.0	8.0	64.0	20.0	636
S16	724	11.5	8.5	1	21	150	79.50	45	43	2	32.1	17.1	W14x34	84.0	8.0	64.0	20.0	634
S17	732.5	11.8	8.25	1	21	150	79.00	45	43	2	32.3	17.3	W14x34	84.0	8.0	63.0	21.0	646
S18	740.5	12.9	8	1	21	150	78.50	45	48	2	34.1	19.1	W14x34	84.0	8.0	62.0	22.0	693
S19	748.5	14.1	8	1	21	150	78.00	45	54	2	36.5	21.5	W14x34	83.0	8.0	60.0	23.0	740
S20	756.5	15.2	7.5	1	21	150	77.50	45	56	2	37.5	22.5	W14x34	83.0	8.0	59.0	24.0	787
S21	763.5	16.4	7	1	21	150	77.00	45	59	2	39.2	23.7	W14x34	83.0	8.1	57.0	26.0	837
S22	770.5	17.5	7	1	21	150	76.50	45	66	2	43.1	26.6	W14x43	83.0	8.6	56.0	27.0	886
S23	777.5	18.7	7	1	21	150	76.00	45	74	3	47.3	29.7	W14x48	83.0	9.1	54.0	29.0	936

TABLE A1
ANCHOR DESIGN - NORTH, EAST AND SOUTH WALLS

							Anchor 1											
					L=NH^2	Unif. Press.	Elevation	Angle	Anchor Load	No. of	Total Length	Bond Length	Design	Pile Top	Pile Toe	Pile Toe	Pile	Lagging
Pile ID	Station (ft)	Height (ft)	Spacing (ft)	No. Anchors	N (psf/ft)	P (psf)	(feet)	(degrees)	(kips)	Strands	(feet)	(feet)	Beam	Elevation (feet)	Embed (feet)	Elevation (feet)	Length (feet)	Pressure (psf)
W1	4	19.2	8	1	21	100	75.50	45	80	3	49.7	32.0	W14x53	83.0	9.5	53.0	30.0	905
W2	12.5	18.9	8.25	1	21	100	75.50	45	80	3	49.7	32.0	W14x53	82.0	9.6	53.0	29.0	895
W3	20.5	18.7	8.25	1	21	100	75.50	45	78	3	48.8	31.1	W14x53	82.0	9.5	53.0	29.0	884
W4	29	18.4	8.25	1	21	100	75.00	45	77	3	47.8	30.8	W14x48	82.0	9.3	53.0	29.0	873
W5	37	18.2	8	1	21	100	75.00	45	72	3	46.0	29.0	W14x48	82.0	9.1	53.0	29.0	864
W6	45	18.0	8	1	21	100	75.00	45	71	3	45.4	28.4	W14x48	82.0	9.1	53.0	29.0	857
W7	53	17.9	8	1	21	100	75.00	45	70	2	44.9	27.9	W14x48	81.0	9.1	53.0	28.0	851
W8	61	17.7	8	1	21	100	75.00	45	68	2	44.4	27.4	W14x48	81.0	9.0	53.0	28.0	845
W9	69	17.6	8	1	21	100	75.00	45	67	2	43.9	26.9	W14x48	81.0	9.0	54.0	27.0	839
W10	77	17.5	8	1	21	100	75.00	45	67	2	43.7	26.7	W14x48	81.0	9.0	54.0	27.0	837
W11	85	17.7	8	1	21	100	75.00	45	68	2	44.1	27.1	W14x48	81.0	9.0	53.0	28.0	841
W12	93	17.8	8	1	21	100	75.00	45	69	2	44.5	27.5	W14x48	81.0	9.0	53.0	28.0	846
W13	101	17.9	8.25	1	21	100	75.00	55	88	3	50.4	35.4	W14x53	81.0	9.1	53.0	28.0	851
W14	109.5	18.0	8.5	1	21	100	75.00	50	83	3	48.8	33.1	W14x53	81.0	9.3	53.0	28.0	856
W15	118	17.9	7.75	1	21	100	75.00	45	68	2	44.2	27.2	W14x48	81.0	9.0	54.0	27.0	853
W16	125	17.9	7.5	1	21	100	75.00	45	65	2	43.1	26.1	W14x43	81.0	8.9	54.0	27.0	851
W17	133	17.8	7	1	21	100	76.00	45	57	2	41.4	23.0	W14x48	81.0	9.0	53.0	28.0	849
W18	139	17.9	7	1	21	100	73.00	45	67	2	42.0	27.0	W14x34	81.0	8.0	55.0	26.0	851
W19	147	18.1	8	1	21	100	75.00	25	56	2	50.8	22.4	W14x48	82.0	9.1	53.0	29.0	861
W20	155	18.3	8	1	21	100	75.00	32.5	62	2	47.2	24.8	W14x48	82.0	9.1	53.0	29.0	870
W21	163	18.5	8	1	21	100	75.50	42.5	71	3	47.0	28.4	W14x53	82.0	9.4	53.0	29.0	879
W22	171	18.7	8	1	21	100	75.50	45	75	3	47.9	30.2	W14x53	82.0	9.4	53.0	29.0	886
W23	179	18.9	8	1	21	100	75.50	45	77	3	48.5	30.8	W14x53	82.0	9.5	53.0	29.0	892
W24	187	19.0	8	1	21	100	75.50	45	78	3	49.1	31.4	W14x53	83.0	9.5	53.0	30.0	899
W25	195	19.2	7.5	1	21	100	74.00	45	80	3	47.8	32.2	W14x38	83.0	8.6	54.0	29.0	906
W26	202	19.3	7.25	1	21	100	75.00	45	75	3	47.2	30.2	W14x48	83.0	9.0	53.0	30.0	912
W27	209.5	19.5	7.5	1	21	100	75.00	45	79	3	48.8	31.8	W14x48	83.0	9.2	53.0	30.0	918
W28	217	19.6	7.5	1	21	100	75.00	45	81	3	49.4	32.4	W14x48	83.0	9.2	53.0	30.0	925
W29	224.5	19.8	7.5	1	21	100	73.00	45	91	3	51.5	36.5	W14x34	83.0	8.1	54.0	29.0	931
W30	232	19.9	7.25	1	21	100	75.00	45	81	3	49.4	32.4	W14x48	83.0	9.1	53.0	30.0	937
W31	239	19.9	7.5	1	21	150	76.00	45	88	3	53.7	35.4	W18x50	83.0	9.1	54.0	29.0	984
W32	247	19.6	8	1	21	150	76.00	45	93	3	55.0	37.1	W18x50	83.0	9.1	54.0	29.0	973
W33	255	19.3	8	1	21	150	76.00	45	91	3	53.9	36.3	W18x50	83.0	9.0	54.0	29.0	962
W34	263	19.1	8	1	21	150	76.00	45	89	3	53.1	35.8	W14x53	83.0	9.5	54.0	29.0	950
W35	271	18.8	8	1	21	150	75.50	45	90	3	52.2	35.9	W14x48	83.0	9.1	54.0	29.0	939
W36	279	18.5	8	1	21	150	75.50	45	88	3	51.0	35.1	W14x48	83.0	9.0	55.0	28.0	928
W37	287	18.3	8	1	21	150	75.50	45	86	3	50.0	34.4	W14x43	83.0	8.8	55.0	28.0	917
W38	295	18.0	8	1	21	150	75.50	45	84	3	49.0	33.7	W14x43	83.0	8.7	56.0	27.0	905
W39	303	17.7	8	1	21	150	75.50	45	82	3	48.0	33.0	W14x38	83.0	8.5	56.0	27.0	894
W40	311	17.4	8	1	21	150	75.50	45	81	3	47.3	32.3	W14x38	83.0	8.3	56.0	27.0	883
W41	319	17.2	8.25	1	21	150	75.00	45	84	3	48.5	33.5	W14x34	83.0	8.0	57.0	26.0	871
W42	327.5	16.9	8.5	1	21	150	75.00	45	84	3	48.8	33.8	W14x34	83.0	8.0	57.0	26.0	859
W43	336	16.6	8	1	21	150	75.00	45	78	3	46.1	31.1	W14x34	83.0	8.0	57.0	26.0	847

TABLE A2
ANCHOR DESIGN - WEST WALL

APPENDIX B

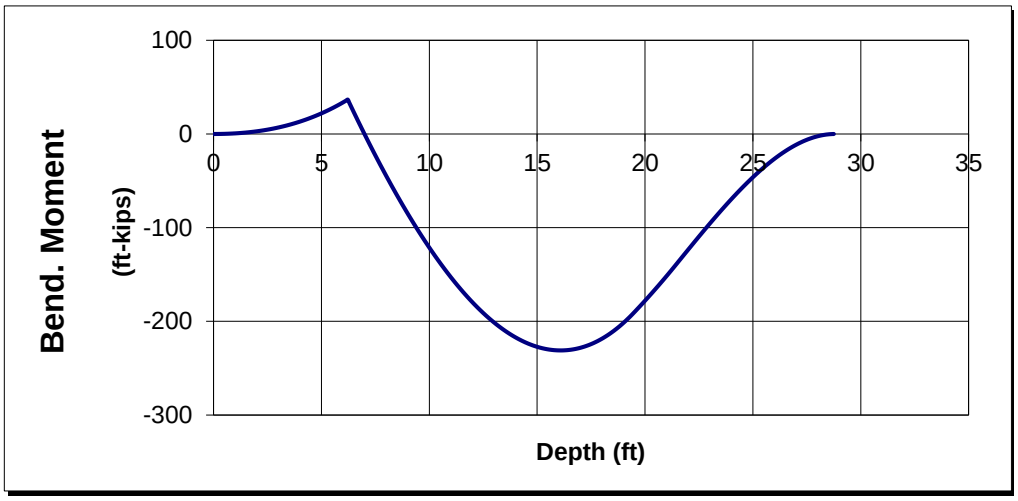
SOLDIER PILE DESIGN

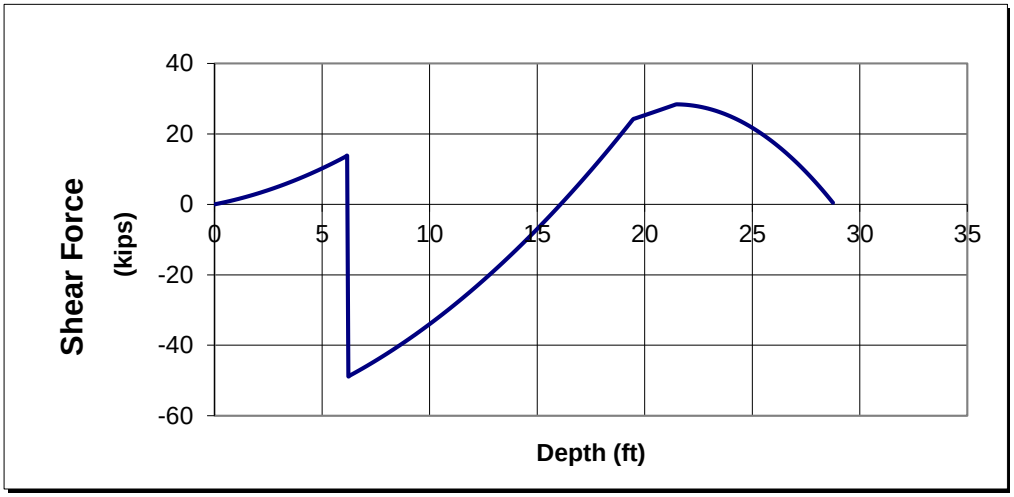
		Soldier Beam Loads-Below Anchor 1					Pile Vertical Load Analysis									Toe Dist. Depth (ft) 2
Pile ID	Design Beam	Axial Load (kips)	Moment (ft-kips)	Free Length (feet)	Steel Section	Flex/Ax Ratio	Pile Diameter (ft)	Pile End Area (ft^2)	Pile Skin Area (ft^2/ft)	Pile End Bear (ksf)	Pile Skin Frict (ksf)	End Bearing (kips)	Skin Friction (klf)	Axial Load (kips)	Embed Length (ft)
N1	W14x38	49	131	10.59	W14x38	0.94	2.00	3.14	6.28	10.00	2.00	31.4	12.6	49	3.4
N2	W14x38	50	137	10.78	W14x38	0.98	2.00	3.14	6.28	10.00	2.00	31.4	12.6	50	3.5
N3	W14x43	51	143	10.97	W14x43	0.90	2.00	3.14	6.28	10.00	2.00	31.4	12.6	51	3.5
N4	W14x43	52	150	11.16	W14x43	0.94	2.00	3.14	6.28	10.00	2.00	31.4	12.6	52	3.6
N5	W14x43	53	157	11.35	W14x43	0.98	2.00	3.14	6.28	10.00	2.00	31.4	12.6	53	3.7
N6	W14x48	53	163	11.54	W14x48	0.91	2.00	3.14	6.28	10.00	2.00	31.4	12.6	53	3.8
N7	W14x48	54	170	11.73	W14x48	0.95	2.00	3.14	6.28	10.00	2.00	31.4	12.6	54	3.8
N8	W14x48	55	178	11.92	W14x48	0.99	2.00	3.14	6.28	10.00	2.00	31.4	12.6	55	3.9
N9	W14x53	56	185	12.11	W14x53	0.92	2.00	3.14	6.28	10.00	2.00	31.4	12.6	56	4.0
N10	W14x53	57	193	12.30	W14x53	0.96	2.00	3.14	6.28	10.00	2.00	31.4	12.6	57	4.0
N11	W14x53	58	200	12.48	W14x53	1.00	2.00	3.14	6.28	10.00	2.00	31.4	12.6	58	4.1
N12	W18x50	59	205	12.67	W18x50	0.91	2.50	4.91	7.85	10.00	2.00	49.1	15.7	59	2.6
N13	W18x50	60	213	12.86	W18x50	0.94	2.50	4.91	7.85	10.00	2.00	49.1	15.7	60	2.7
N14	W18x50	61	222	13.05	W18x50	0.98	2.50	4.91	7.85	10.00	2.00	49.1	15.7	61	2.8
N15	W18x55	63	231	13.24	W18x55	0.92	2.50	4.91	7.85	10.00	2.00	49.1	15.7	63	2.9
N16	W18x55	66	243	13.43	W18x55	0.96	2.50	4.91	7.85	10.00	2.00	49.1	15.7	66	3.1
N17	W18x55	65	243	13.46	W18x55	0.97	2.50	4.91	7.85	10.00	2.00	49.1	15.7	65	3.0
N18	W18x50	64	208	12.61	W18x50	0.93	2.50	4.91	7.85	10.00	2.00	49.1	15.7	64	3.0
N19	W18x50	60	209	12.75	W18x50	0.93	2.50	4.91	7.85	10.00	2.00	49.1	15.7	60	2.7
N20	W14x48	58	177	11.84	W14x48	0.99	2.00	3.14	6.28	10.00	2.00	31.4	12.6	58	4.1
N21	W14x38	55	133	10.57	W14x38	0.96	2.00	3.14	6.28	10.00	2.00	31.4	12.6	55	3.9
N22	W14x34	52	93	9.30	W14x34	0.78	2.00	3.14	6.28	10.00	2.00	31.4	12.6	52	3.6
N23	W14x48	44	166	12.00	W14x48	0.91	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0
N24	W14x48	48	172	12.00	W14x48	0.95	2.00	3.14	6.28	10.00	2.00	31.4	12.6	48	3.3
N25	W14x48	44	178	12.00	W14x48	0.97	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0
N26	W14x48	33	183	12.00	W14x48	0.98	2.00	3.14	6.28	10.00	2.00	31.4	12.6	33	2.1
N27	W14x53	34	202	12.50	W14x53	0.97	2.00	3.14	6.28	10.00	2.00	31.4	12.6	34	2.2
N28	W14x53	28	204	12.50	W14x53	0.97	2.00	3.14	6.28	10.00	2.00	31.4	12.6	28	1.8
N29	W14x53	23	205	12.50	W14x53	0.97	2.00	3.14	6.28	10.00	2.00	31.4	12.6	23	1.3
N30	W18x50	24	236	13.00	W18x50	0.99	2.50	4.91	7.85	10.00	2.00	49.1	15.7	24	0.4
N31	W18x50	24	224	13.00	W18x50	0.93	2.50	4.91	7.85	10.00	2.00	49.1	15.7	24	0.4
N32	W14x48	19	169	12.00	W14x48	0.89	2.00	3.14	6.28	10.00	2.00	31.4	12.6	19	1.0
N33	W14x34	13	95	9.50	W14x34	0.72	2.00	3.14	6.28	10.00	2.00	31.4	12.6	13	0.6
N34	W14x34	14	107	10.00	W14x34	0.81	2.00	3.14	6.28	10.00	2.00	31.4	12.6	14	0.6
N35	W14x34	15	109	10.00	W14x34	0.83	2.00	3.14	6.28	10.00	2.00	31.4	12.6	15	0.7
E1	W14x34	26	103	10.00	W14x34	0.80	2.00	3.14	6.28	10.00	2.00	31.4	12.6	26	1.5
E2	W14x34	26	103	10.00	W14x34	0.80	2.00	3.14	6.28	10.00	2.00	31.4	12.6	26	1.6
E3	W14x34	25	100	10.00	W14x34	0.78	2.00	3.14	6.28	10.00	2.00	31.4	12.6	25	1.5
E4	W14x34	28	100	10.00	W14x34	0.79	2.00	3.14	6.28	10.00	2.00	31.4	12.6	28	1.7
E5	W14x34	30	107	10.00	W14x34	0.84	2.00	3.14	6.28	10.00	2.00	31.4	12.6	30	1.9
E6	W14x34	30	107	10.00	W14x34	0.85	2.00	3.14	6.28	10.00	2.00	31.4	12.6	30	1.9
E7	W14x34	34	111	10.00	W14x34	0.88	2.00	3.14	6.28	10.00	2.00	31.4	12.6	34	2.2
E8	W14x34	34	111	10.00	W14x34	0.88	2.00	3.14	6.28	10.00	2.00	31.4	12.6	34	2.2
E9	W14x34	34	110	10.00	W14x34	0.88	2.00	3.14	6.28	10.00	2.00	31.4	12.6	34	2.2
E10	W14x34	37	110	10.00	W14x34	0.88	2.00	3.14	6.28	10.00	2.00	31.4	12.6	37	2.4
E11	W14x34	36	110	10.00	W14x34	0.88	2.00	3.14	6.28	10.00	2.00	31.4	12.6	36	2.4
E12	W14x34	36	110	10.00	W14x34	0.88	2.00	3.14	6.28	10.00	2.00	31.4	12.6	36	2.4
E13	W14x34	39	110	10.00	W14x34	0.88	2.00	3.14	6.28	10.00	2.00	31.4	12.6	39	2.6
E14	W14x34	38	106	10.00	W14x34	0.85	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.5
E15	W14x43	42	145	11.50	W14x43	0.90	2.00	3.14	6.28	10.00	2.00	31.4	12.6	42	2.8
E16	W14x34	36	121	10.50	W14x34	0.96	2.00	3.14	6.28	10.00	2.00	31.4	12.6	36	2.4
E17	W14x48	44	181	12.00	W14x48	0.99	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0
E18	W14x53	49	186	12.00	W14x53	0.92	2.00	3.14	6.28	10.00	2.00	31.4	12.6	49	3.4
E19	W14x53	48	185	12.00	W14x53	0.91	2.00	3.14	6.28	10.00	2.00	31.4	12.6	48	3.3
E20	W14x48	44	169	11.50	W14x48	0.92	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0
E21	W14x48	44	168	11.50	W14x48	0.92	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0
E22	W14x48	48	172	11.50	W14x48	0.95	2.00	3.14	6.28	10.00	2.00	31.4	12.6	48	3.3
E23	W14x43	44	161	11.50	W14x43	1.00	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0
E24	W14x43	41	150	11.50	W14x43	0.93	2.00	3.14	6.28	10.00	2.00	31.4	12.6	41	2.8
E25	W14x43	44	149	11.50	W14x43	0.93	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0
E26	W14x43	43	148	11.50	W14x43	0.92	2.00	3.14	6.28	10.00	2.00	31.4	12.6	43	3.0
E27	W14x43	43	147	11.50	W14x43	0.91	2.00	3.14	6.28	10.00	2.00	31.4	12.6	43	2.9
E28	W14x38	44	138	11.00	W14x38	0.98	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0
E29	W14x38	44	137	11.00	W14x38	0.97	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0
S1	W14x34	46	110	9.50	W14x34	0.89	2.00	3.14	6.28	10.00	2.00	31.4	12.6	46	3.1
S2	W14x34	37	90	9.50	W14x34	0.73	2.00	3.14	6.28	10.00	2.00	31.4	12.6	37	2.4
S3	W14x34	36	92	9.50	W14x34	0.74	2.00	3.14	6.28	10.00	2.00	31.4	12.6	36	2.4
S4	W14x34	35	78	9.00	W14x34	0.64	2.00	3.14	6.28	10.00	2.00	31.4	12.6	35	2.3
S5	W14x34	34	68	8.50	W14x34	0.56	2.00	3.14	6.28	10.00	2.00	31.4	12.6	34	2.2
S6	W14x34	33	69	8.50	W14x34	0.57	2.00	3.14	6.28	10.00	2.00	31.4	12.6	33	2.1
S7	W14x34	33	75	8.69	W14x34	0.61	2.00	3.14	6.28	10.00	2.00	31.4	12.6	33	2.1
S8	W14x34	32	69	8.43	W14x34	0.57	2.00	3.14	6.28	10.00	2.00	31.4	12.6	32	2.1
S9	W14x34	32	64	8.16	W14x34	0.53	2.00	3.14	6.28	10.00	2.00	31.4	12.6	32	2.0
S10	W14x34	31	59	7.90	W14x34	0.49	2.00	3.14	6.28	10.00	2.00	31.4	12.6	31	2.0
S11	W14x34	28	54	7.63	W14x34	0.44	2.00	3.14	6.28	10.00	2.00	31.4	12.6	28	1.7
S12	W14x34	28	49	7.37	W14x34	0.41	2.00	3.14	6.28	10.00	2.00	31.4	12.6	28	1.7
S13	W14x34	27	45	7.10	W14x34	0.38	2.00	3.14	6.28	10.00	2.00	31.4	12.6	27	1.6
S14	W14x34	27	49	7.34	W14x34	0.41	2.00	3.14	6.28	10.00	2.00	31.4	12.6	27	1.7
S15	W14x34	29	54	7.57	W14x34	0.45	2.00	3.14	6.28	10.00	2.00	31.4	12.6	29	1.8
S16	W14x34	30	52	7.32	W14x34	0.43	2.00	3.14	6.28	10.00	2.00	31.4	12.6	30	1.9
S17	W14x34	31	52	7.44	W14x34	0.44	2.00	3.14	6.28	10.00	2.00	31.4	12.6	31	1.9
S18	W14x34	34	69	8.35	W14x34	0.57	2.00	3.14	6.28	10.00	2.00	31.4	12.6	34	2.2
S19	W14x34	38	90	9.26	W14x34	0.73	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.5
S20	W14x34	40	107	10.18	W14x34	0.87	2.00	3.14	6.28	10.00	2.00	31.4	12.6	40	2.7
S21	W14x34	42	121	10.91	W14x34	0.97	2.00	3.14	6.28	10.00	2.00	31.4	12.6	42	2.8
S22	W14x43	47	145	11.65	W14x43	0.91	2.00	3.14	6.28	10.00	2.00	31.4	12.6	47	3.2
S23	W14x48	52	172	12.38	W14x48	0.96	2.00	3.14	6.28	10.00	2.00	31.4	12.6	52	3.7

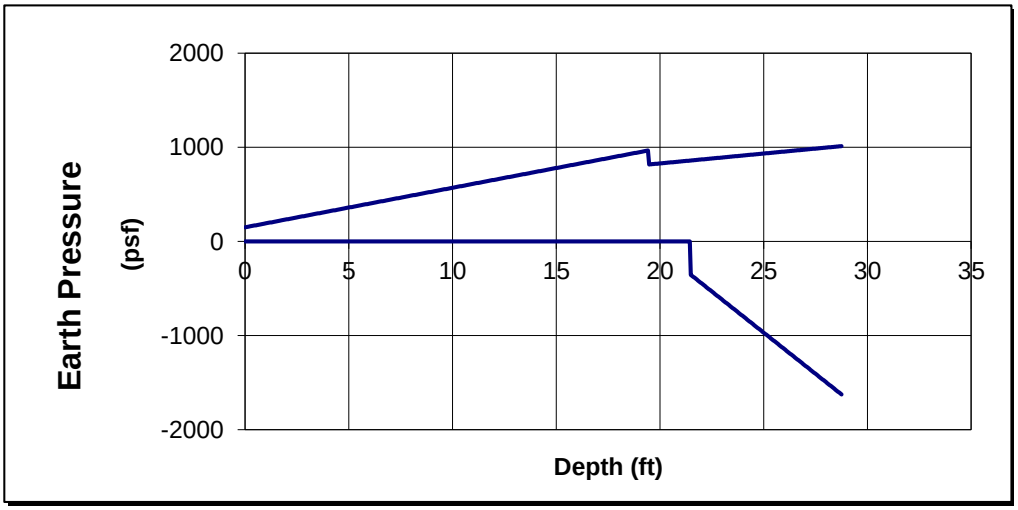
TABLE B1
SOLDIER PILE DESIGN - NORTH, EAST AND SOUTH WALLS

		Soldier Beam Loads-Below Anchor 1					Pile Vertical Load Analysis								Toe Dist. Depth (ft) 2
Pile ID	Design Beam	Axial Load (kips)	Moment (ft-kips)	Free Length (feet)	Steel Section	Flex/Ax Ratio	Pile Diameter (ft)	Pile End Area (ft^2)	Pile Skin Area (ft^2/ft)	Pile End Bear (ksf)	Pile Skin Frict (ksf)	End Bearing (kips)	Skin Friction (klf)	Axial Load (kips)	Embed Length (ft)
W1	W14x53	56	195	12.50	W14x53	0.97	2.00	3.14	6.28	10.00	2.00	31.4	12.6	56	4.0
W2	W14x53	56	199	12.50	W14x53	0.99	2.00	3.14	6.28	10.00	2.00	31.4	12.6	56	4.0
W3	W14x53	55	197	12.50	W14x53	0.98	2.00	3.14	6.28	10.00	2.00	31.4	12.6	55	3.9
W4	W14x48	54	179	12.00	W14x48	1.00	2.00	3.14	6.28	10.00	2.00	31.4	12.6	54	3.8
W5	W14x48	51	172	12.00	W14x48	0.95	2.00	3.14	6.28	10.00	2.00	31.4	12.6	51	3.6
W6	W14x48	50	171	12.00	W14x48	0.95	2.00	3.14	6.28	10.00	2.00	31.4	12.6	50	3.5
W7	W14x48	49	170	12.00	W14x48	0.94	2.00	3.14	6.28	10.00	2.00	31.4	12.6	49	3.4
W8	W14x48	48	169	12.00	W14x48	0.93	2.00	3.14	6.28	10.00	2.00	31.4	12.6	48	3.3
W9	W14x48	47	167	12.00	W14x48	0.92	2.00	3.14	6.28	10.00	2.00	31.4	12.6	47	3.3
W10	W14x48	47	167	12.00	W14x48	0.92	2.00	3.14	6.28	10.00	2.00	31.4	12.6	47	3.2
W11	W14x48	48	168	12.00	W14x48	0.93	2.00	3.14	6.28	10.00	2.00	31.4	12.6	48	3.3
W12	W14x48	48	169	12.00	W14x48	0.93	2.00	3.14	6.28	10.00	2.00	31.4	12.6	48	3.4
W13	W14x53	72	175	12.00	W14x53	0.90	2.00	3.14	6.28	10.00	2.00	31.4	12.6	72	5.3
W14	W14x53	63	182	12.00	W14x53	0.92	2.00	3.14	6.28	10.00	2.00	31.4	12.6	63	4.5
W15	W14x48	48	164	12.00	W14x48	0.91	2.00	3.14	6.28	10.00	2.00	31.4	12.6	48	3.3
W16	W14x43	46	158	12.00	W14x43	0.99	2.00	3.14	6.28	10.00	2.00	31.4	12.6	46	3.2
W17	W14x48	41	170	13.00	W14x48	0.93	2.00	3.14	6.28	10.00	2.00	31.4	12.6	41	2.7
W18	W14x34	48	96	10.00	W14x34	0.80	2.00	3.14	6.28	10.00	2.00	31.4	12.6	48	3.3
W19	W14x48	24	171	12.00	W14x48	0.91	2.00	3.14	6.28	10.00	2.00	31.4	12.6	24	1.4
W20	W14x48	33	173	12.00	W14x48	0.93	2.00	3.14	6.28	10.00	2.00	31.4	12.6	33	2.1
W21	W14x53	48	190	12.50	W14x53	0.93	2.00	3.14	6.28	10.00	2.00	31.4	12.6	48	3.3
W22	W14x53	53	191	12.50	W14x53	0.95	2.00	3.14	6.28	10.00	2.00	31.4	12.6	53	3.7
W23	W14x53	54	192	12.50	W14x53	0.96	2.00	3.14	6.28	10.00	2.00	31.4	12.6	54	3.8
W24	W14x53	55	194	12.50	W14x53	0.96	2.00	3.14	6.28	10.00	2.00	31.4	12.6	55	3.9
W25	W14x38	57	135	11.00	W14x38	0.98	2.00	3.14	6.28	10.00	2.00	31.4	12.6	57	4.0
W26	W14x48	53	162	12.00	W14x48	0.90	2.00	3.14	6.28	10.00	2.00	31.4	12.6	53	3.7
W27	W14x48	56	168	12.00	W14x48	0.94	2.00	3.14	6.28	10.00	2.00	31.4	12.6	56	4.0
W28	W14x48	57	169	12.00	W14x48	0.95	2.00	3.14	6.28	10.00	2.00	31.4	12.6	57	4.0
W29	W14x34	64	101	10.00	W14x34	0.90	2.00	3.14	6.28	10.00	2.00	31.4	12.6	64	4.6
W30	W14x48	57	164	12.00	W14x48	0.92	2.00	3.14	6.28	10.00	2.00	31.4	12.6	57	4.1
W31	W18x50	63	207	12.88	W18x50	0.92	2.50	4.91	7.85	10.00	2.00	49.1	15.7	63	2.9
W32	W18x50	65	211	12.65	W18x50	0.94	2.50	4.91	7.85	10.00	2.00	49.1	15.7	65	3.0
W33	W18x50	64	201	12.42	W18x50	0.90	2.50	4.91	7.85	10.00	2.00	49.1	15.7	64	3.0
W34	W14x53	63	194	12.19	W14x53	0.97	2.00	3.14	6.28	10.00	2.00	31.4	12.6	63	4.5
W35	W14x48	63	166	11.46	W14x48	0.94	2.00	3.14	6.28	10.00	2.00	31.4	12.6	63	4.5
W36	W14x48	62	158	11.23	W14x48	0.89	2.00	3.14	6.28	10.00	2.00	31.4	12.6	62	4.4
W37	W14x43	61	149	11.00	W14x43	0.95	2.00	3.14	6.28	10.00	2.00	31.4	12.6	61	4.3
W38	W14x43	60	141	10.77	W14x43	0.90	2.00	3.14	6.28	10.00	2.00	31.4	12.6	60	4.2
W39	W14x38	58	132	10.54	W14x38	0.97	2.00	3.14	6.28	10.00	2.00	31.4	12.6	58	4.1
W40	W14x38	57	125	10.31	W14x38	0.91	2.00	3.14	6.28	10.00	2.00	31.4	12.6	57	4.0
W41	W14x34	59	104	9.58	W14x34	0.90	2.00	3.14	6.28	10.00	2.00	31.4	12.6	59	4.2
W42	W14x34	60	100	9.33	W14x34	0.87	2.00	3.14	6.28	10.00	2.00	31.4	12.6	60	4.2
W43	W14x34	55	87	9.09	W14x34	0.74	2.00	3.14	6.28	10.00	2.00	31.4	12.6	55	3.9

TABLE B2
SOLDIER PILE DESIGN - WEST WALL







Wall Height (ft)	**19.5**
Pile Spacing (ft)	**8.00**

FIGURE B1 SOLDIER BEAM - N15

Point	Depth	Pressure	Width		Force	Depth(CG)	Moment
A	0.00	0.0	8.00	F_{AB}	63640	12.98	1007736
B	19.46	817.4	8.00	F_{BC}	0	0.00	0
C	19.46	817.4	8.00	F_{CD}	0	0.00	0
D	19.46	0.0	8.00	F_{AD}	63640	12.98	
	19.46	0.0					
E	19.46	817.4	2.50	F_{EF}	21396	24.30	96425
F	28.81	1013.7	2.50				
	28.81	0.0					
G	21.46	0.0	6.25	F_{GH}	0	0.00	0
H	21.46	-350.0	6.25	F_{HI}	-45595	25.93	-131350
I	28.81	-1635.8	6.25	F_{IJ}	0	0.00	0
J	28.81	-1635.8	6.25	F_{JK}	0	0.00	0
K	28.81	-1635.8	6.25	F_{GK}	-45595	25.93	
	28.81	0.0					
	0.00	0.0					
L	0.00	150.0	8.00	F_{LM}	23356	9.73	445598
M	19.46	150.0	8.00				
	19.46	0.0					
	0.00	0.0					
N	0.00	0.0	8.00	F_{NO}	0	0.00	0
O	0.00	0.0	8.00				
	0.00	0.0					
	0.00	0.0					
P	0.00	0.0	8.00	F_{PQ}	0	0.00	0
Q	0.00	0.0	8.00				
	0.00	0.0					
	0.00	0.0					
R	0.00	0.0	8.00	F_{RS}	0	0.00	0
S	0.00	0.0	8.00				
	0.00	0.0					
T	19.46	0.0	8.00	F_{TU}	0	0.00	0
U	19.46	0.0	8.00	F_{UV}	0	0.00	0
V	19.46	0.0	8.00	F_{VW}	0	0.00	0
W	28.81	0.0	8.00	F_{TW}	0	0.00	
	28.81	0					
				Anchor 1	62796	6.22	1418409
				Amchor 2	0	0.00	0
				Anchor 3	0	0.00	0
				Anchor 4	0	0.00	0
				Load 1	0	0.00	0
				Σ Forces	0	Σ Moments	0

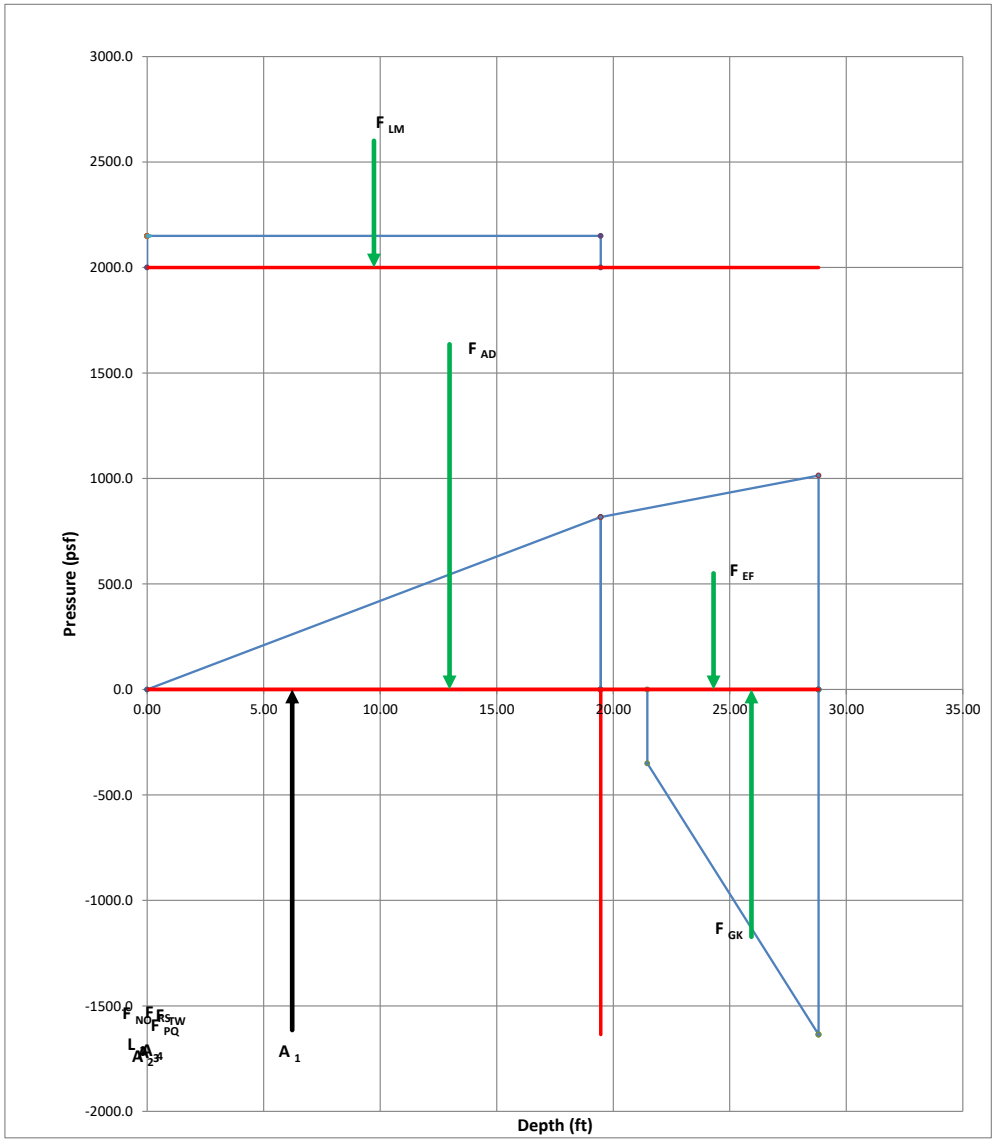
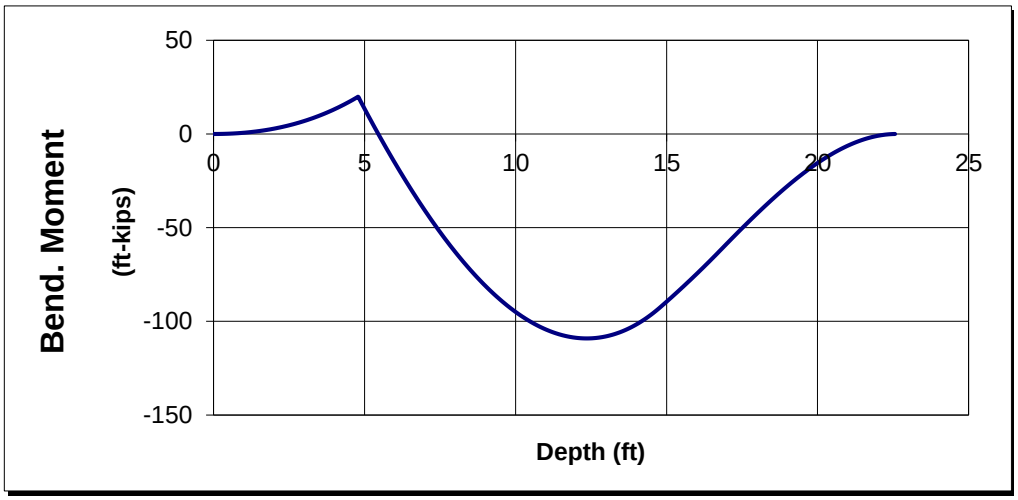
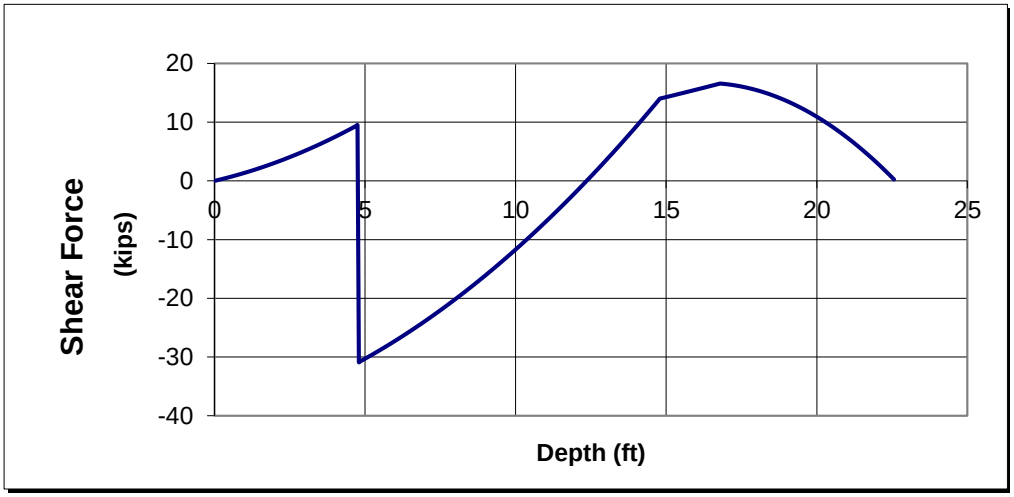
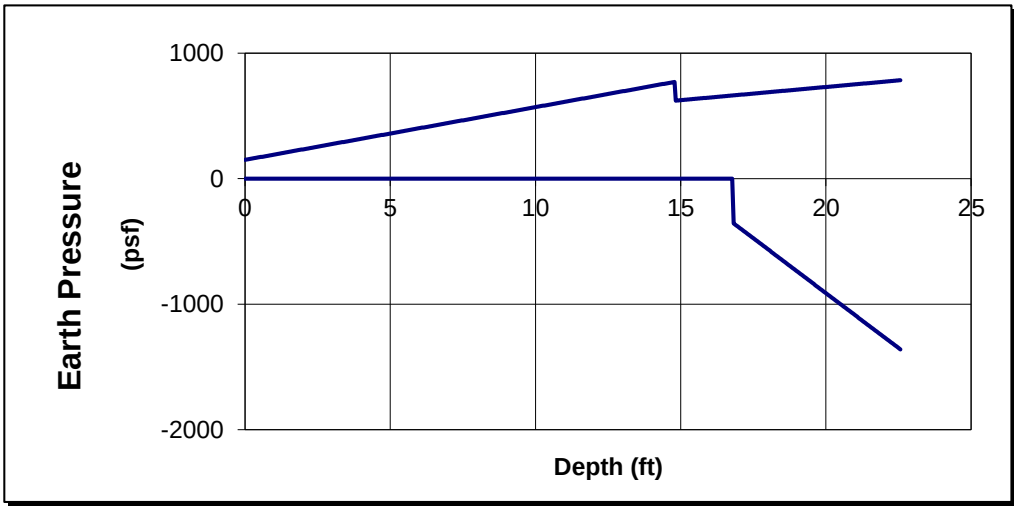


FIGURE B1 (cont'd) SOLDIER BEAM - N15

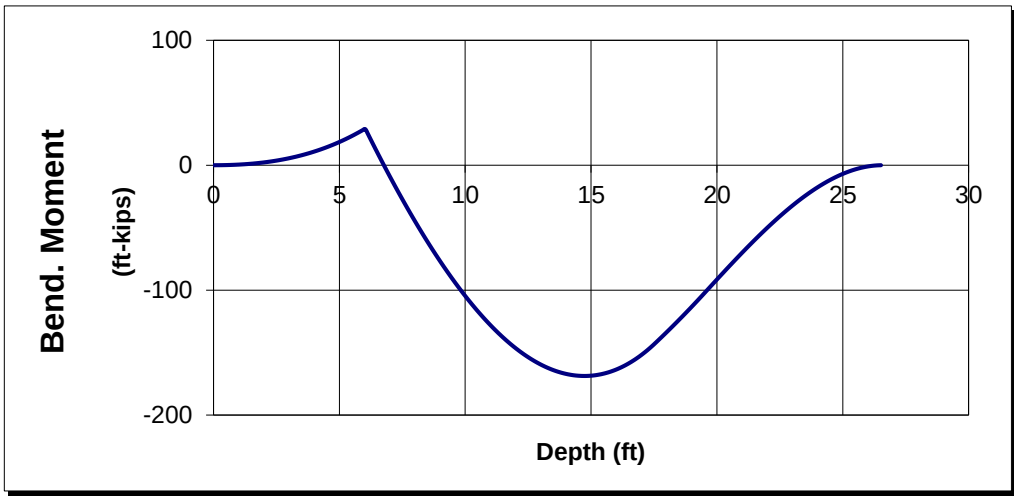


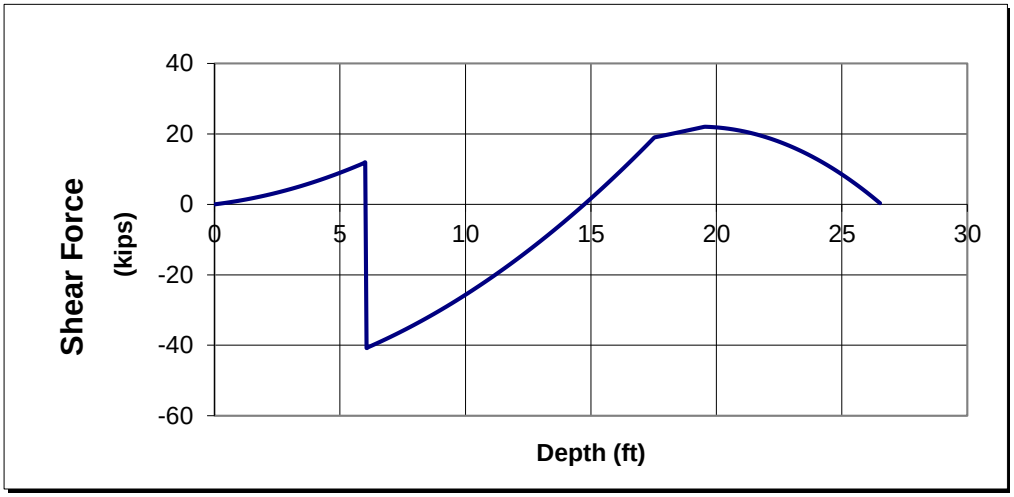


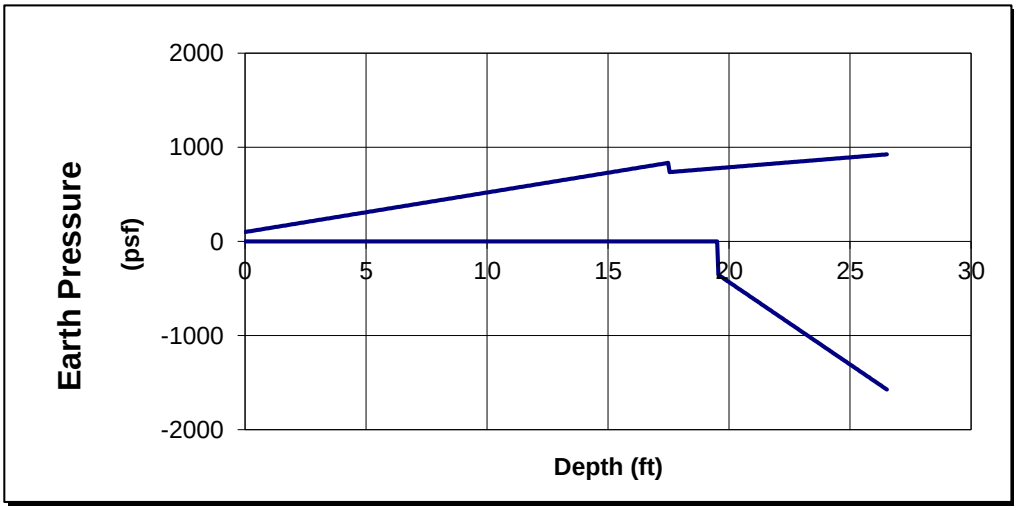


Wall Height (ft)	**14.8**
Pile Spacing (ft)	**8.00**

FIGURE B2 SOLDIER BEAM - N35

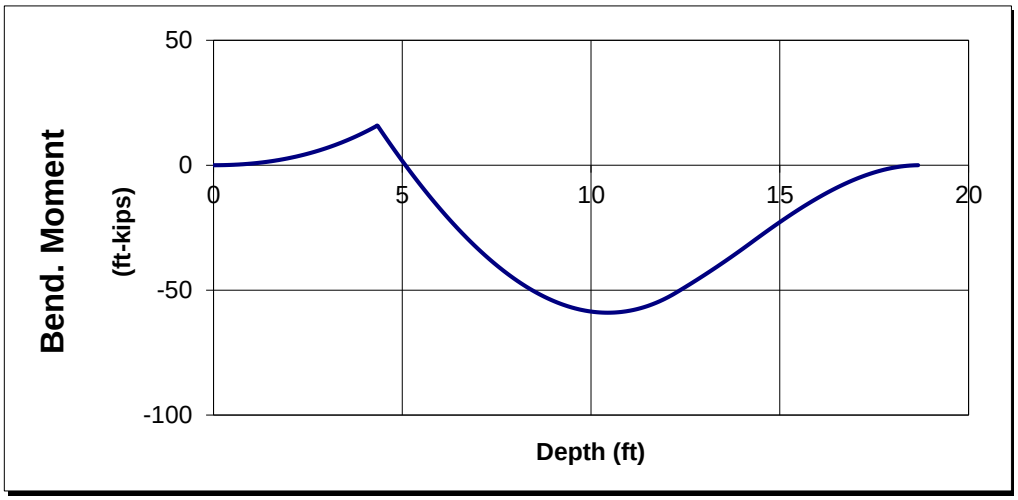


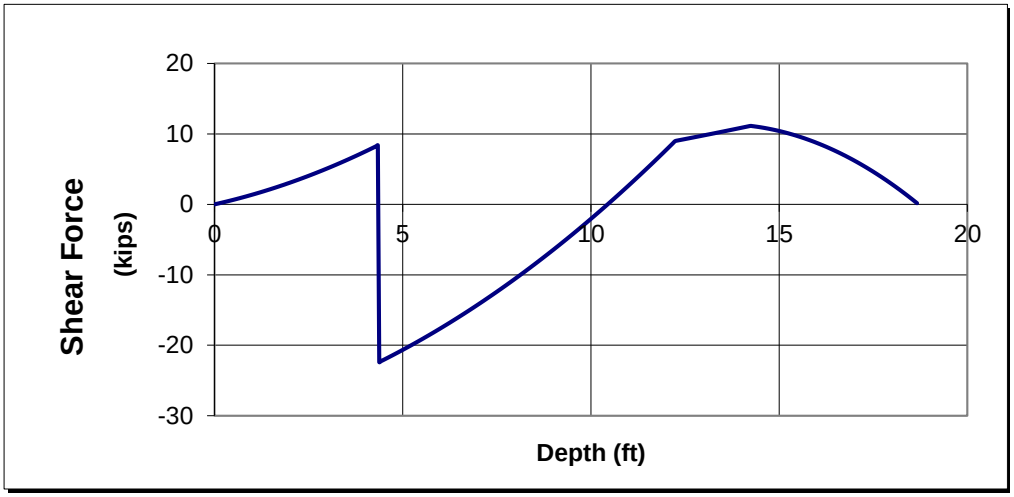


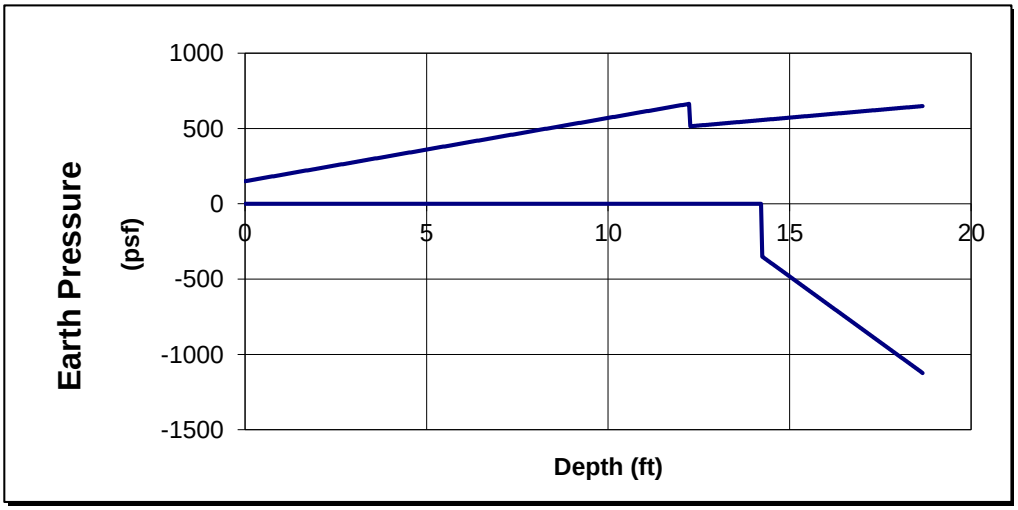


Wall Height (ft)	**17.5**
Pile Spacing (ft)	**8.75**

FIGURE B3 SOLDIER BEAM - E20

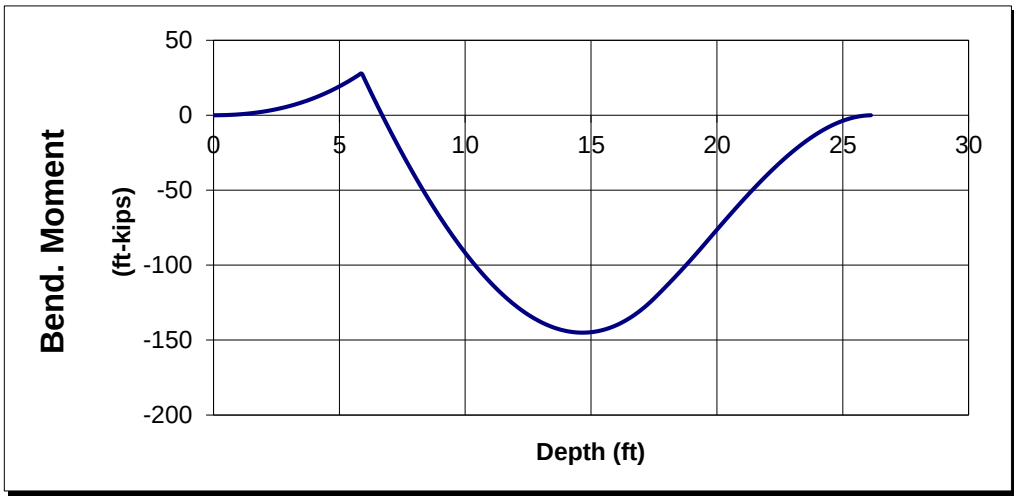


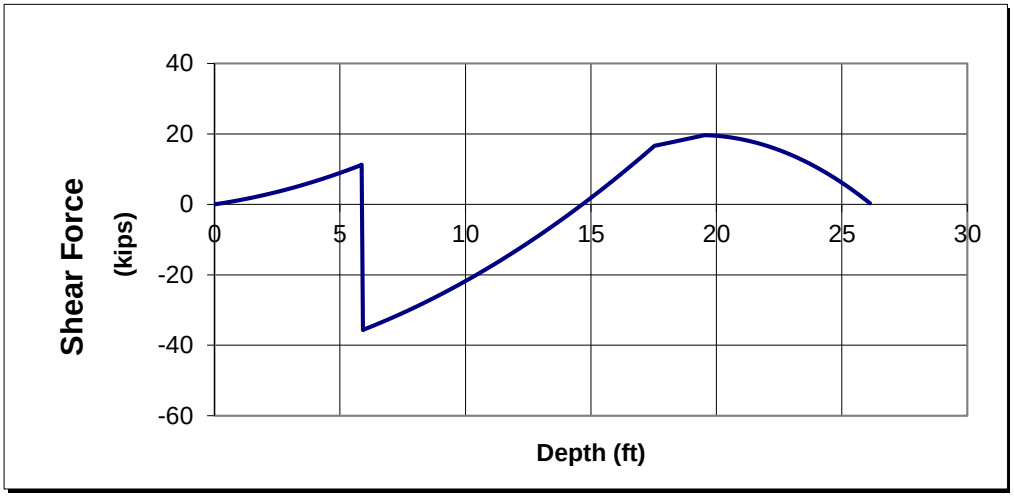


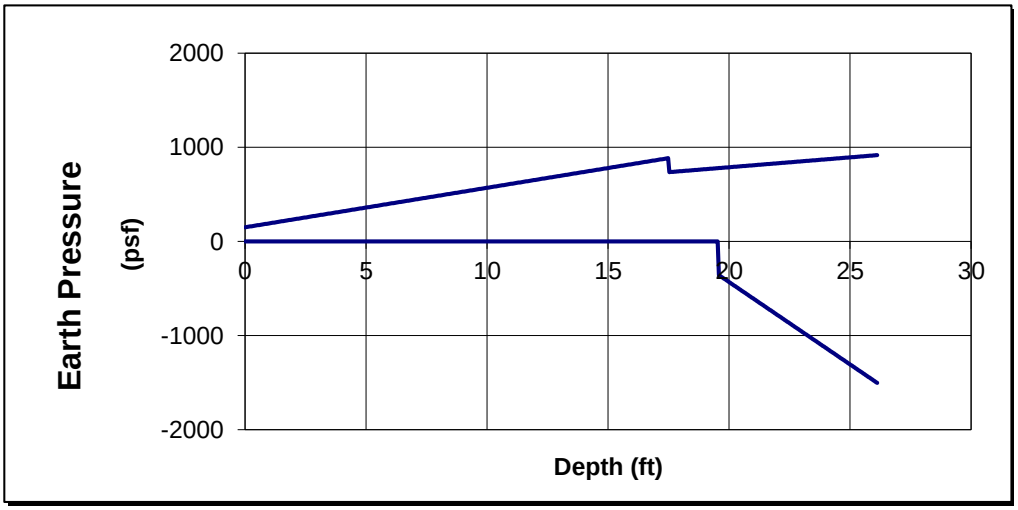


Wall Height (ft)	**12.2**
Pile Spacing (ft)	**8.00**

FIGURE B4 SOLDIER BEAM - S10

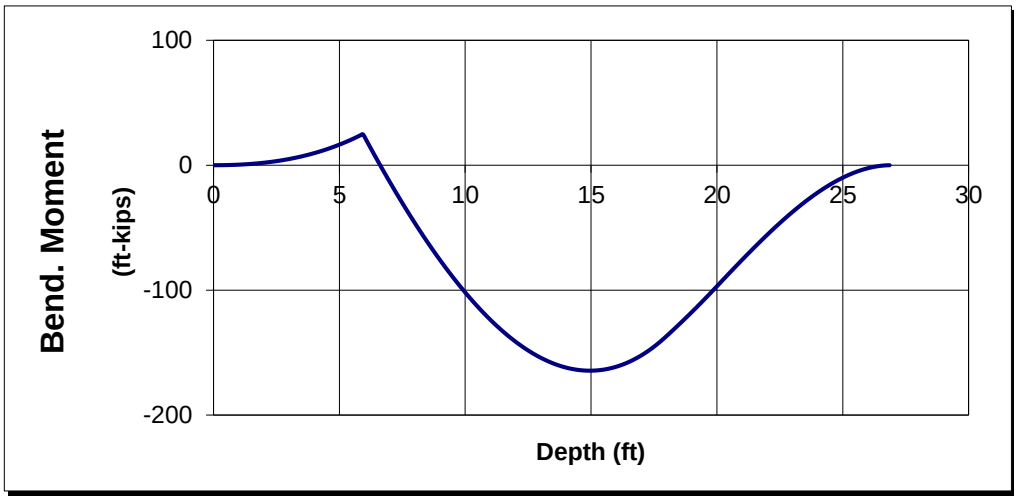


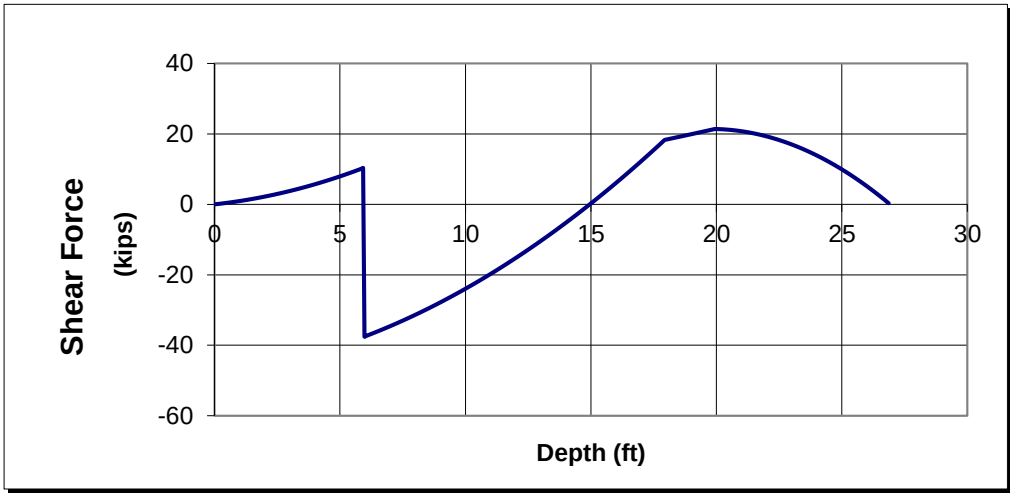


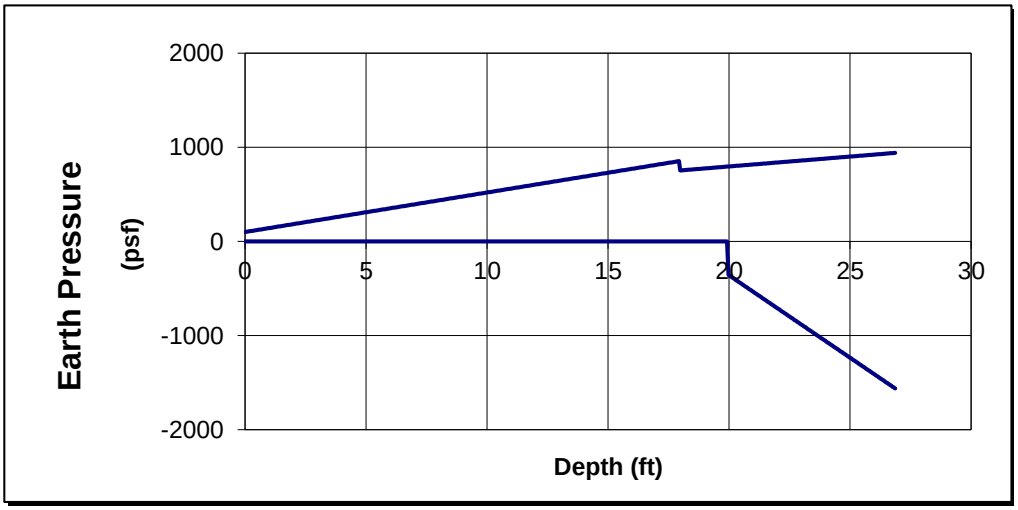


Wall Height (ft)	**17.5**
Pile Spacing (ft)	**7.00**

FIGURE B5 SOLDIER BEAM - S22

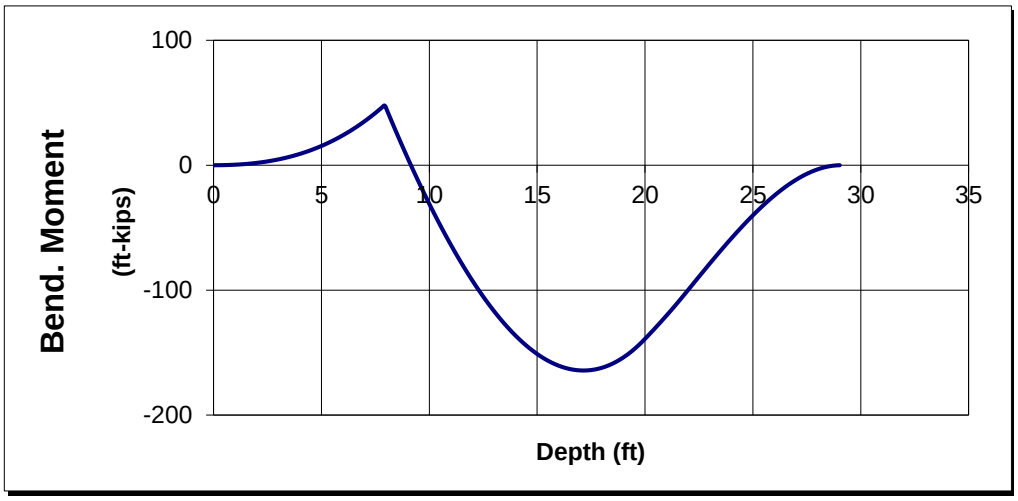


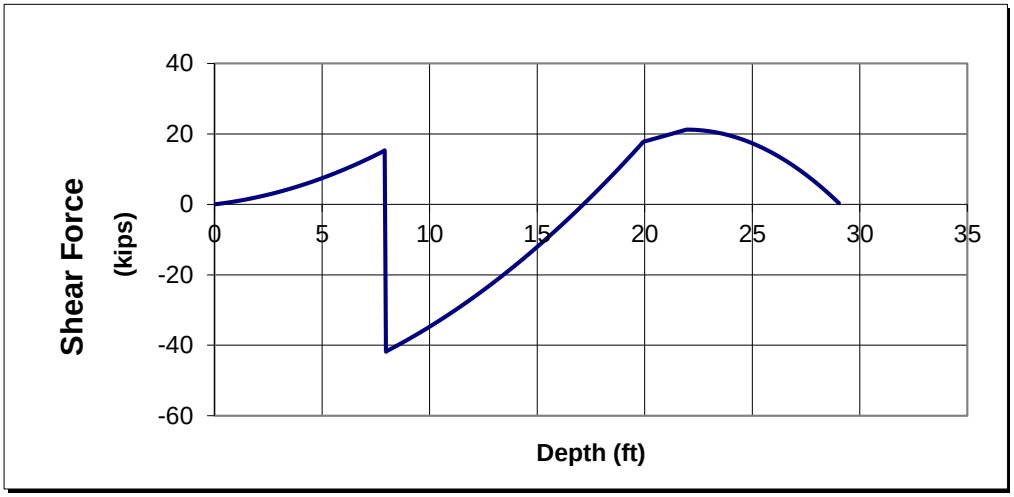


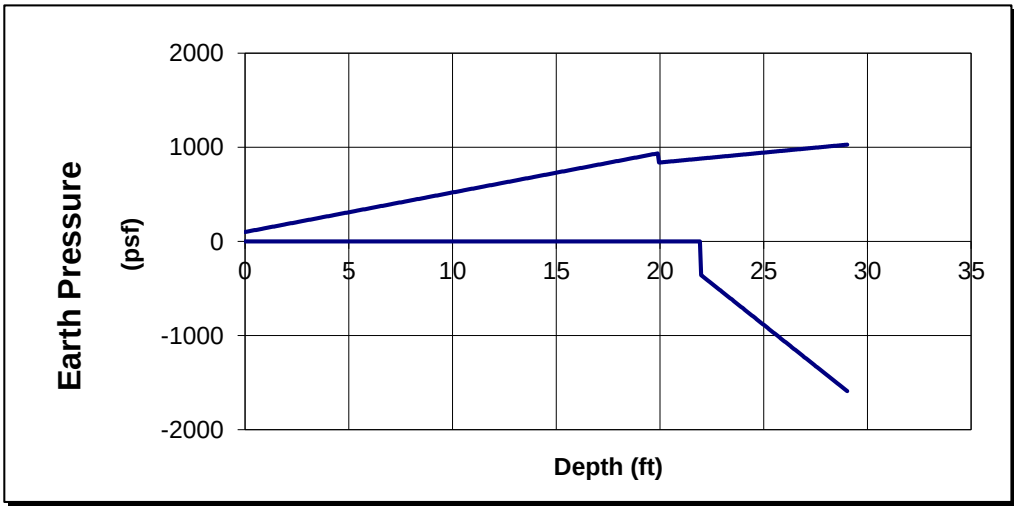


Wall Height (ft)	**17.9**
Pile Spacing (ft)	**7.75**

FIGURE B6 SOLDIER BEAM - W15







Wall Height (ft)	**19.9**
Pile Spacing (ft)	**7.25**

FIGURE B7 SOLDIER BEAM - W30

APPENDIX C

SOLDIER PILE DESIGN – STAGE 1 CANTILEVER

														Soldier Beam - Flexure/Compression				
					$L=NH^2$	Unif. Press.	Design	Pile Top	Pile Toe	Pile Toe	Pile	Lagging	Axial		Free		
Pile ID	Station (ft)	Height (ft)	Spacing (ft)	No. Anchors	N (psf/ft)	P (psf)	Beam	Elevation (feet)	Embed (feet)	Elevation (feet)	Length (feet)	Pressure (psf)	Load (kips)	Moment (ft-kips)	Length (feet)	Steel Section	Flex/Ax Ratio
N1	4	7.8	8	0	21	100	W14x48	83.0	17.1	57.0	26.0	428	0	179	7.81	W14x48	0.91
N2	12	7.8	8	0	21	100	W14x48	83.0	17.2	57.0	26.0	429	0	180	7.83	W14x48	0.92
N3	20	7.8	8	0	21	100	W14x48	83.0	17.3	57.0	26.0	429	0	181	7.84	W14x48	0.93
N4	28	7.9	8	0	21	100	W14x48	83.0	17.4	57.0	26.0	430	0	183	7.86	W14x48	0.93
N5	36	7.9	8	0	21	100	W14x48	83.0	17.5	57.0	26.0	431	0	184	7.88	W14x48	0.94
N6	44	7.9	8	0	21	100	W14x48	83.0	17.6	56.0	27.0	431	0	185	7.89	W14x48	0.95
N7	52	7.9	8	0	21	100	W14x48	83.0	17.7	56.0	27.0	432	0	187	7.91	W14x48	0.95
N8	60	7.9	8	0	21	100	W14x48	83.0	17.8	56.0	27.0	433	0	188	7.93	W14x48	0.96
N9	68	7.9	8	0	21	100	W14x48	83.0	17.9	56.0	27.0	434	0	189	7.94	W14x48	0.96
N10	76	8.0	8	0	21	100	W14x48	83.0	18.0	56.0	27.0	434	0	190	7.96	W14x48	0.97
N11	84	8.0	8	0	21	100	W14x48	83.0	18.1	56.0	27.0	435	0	191	7.98	W14x48	0.97
N12	92	8.0	8	0	21	100	W14x48	83.0	18.2	56.0	27.0	436	0	192	7.99	W14x48	0.98
N13	100	8.0	8	0	21	100	W14x48	83.0	18.3	56.0	27.0	438	0	195	8.05	W14x48	1.00
N14	108	8.1	8	0	21	100	W14x53	83.0	18.5	55.0	28.0	441	0	200	8.13	W14x53	0.92
N15	116	8.2	8	0	21	100	W14x53	83.0	18.7	55.0	28.0	445	0	206	8.22	W14x53	0.94
N16	124	8.6	8	0	21	100	W18x50	84.0	18.1	56.0	28.0	461	0	218	8.59	W18x50	0.86
N17	132	8.5	8	0	21	100	W14x53	84.0	19.1	55.0	29.0	455	0	220	8.45	W14x53	0.96
N18	140	8.8	8	0	21	100	W18x50	84.0	18.1	56.0	28.0	470	0	233	8.82	W18x50	0.92
N19	148	8.1	8	0	21	100	W14x53	85.0	18.4	57.0	28.0	442	0	200	8.13	W14x53	0.92
N20	156	8.4	8	0	21	100	W14x53	85.0	18.4	57.0	28.0	453	0	215	8.40	W14x53	0.99
N21	164	8.7	8	0	21	100	W18x50	85.0	17.1	58.0	27.0	464	0	220	8.67	W18x50	0.87
N22	172	8.9	8	0	21	100	W18x50	85.0	16.9	59.0	26.0	475	0	230	8.93	W18x50	0.91
N23	180	6.1	8	0	21	100	W14x34	86.0	14.9	64.0	22.0	354	0	99	6.05	W14x34	0.73
N24	188	6.8	8	0	21	100	W14x34	87.0	15.5	63.0	24.0	385	0	129	6.79	W14x34	0.95
N25	196	7.5	8	0	21	100	W14x43	88.0	16.1	63.0	25.0	416	0	159	7.53	W14x43	0.91
N26	204	8.2	8	0	21	100	W14x48	88.0	16.7	62.0	26.0	445	0	186	8.22	W14x48	0.95
N27	212	8.1	8	0	21	100	W14x48	89.0	16.3	63.0	26.0	441	0	176	8.13	W14x48	0.90
N28	220	8.4	8	0	21	100	W14x48	89.0	16.3	63.0	26.0	451	0	180	8.36	W14x48	0.92
N29	228	8.6	8	0	21	100	W14x48	89.0	16.4	63.0	26.0	461	0	184	8.59	W14x48	0.94
N30	236	8.3	8.5	0	21	100	W14x48	89.0	16.3	64.0	25.0	450	0	182	8.33	W14x48	0.93
N31	245	8.7	8	0	21	100	W14x48	90.0	16.4	64.0	26.0	464	0	186	8.66	W14x48	0.95
N32	252	8.0	7.5	0	21	100	W14x38	90.0	15.1	66.0	24.0	437	0	144	8.03	W14x38	0.93
N33	260	6.4	8	0	21	100	W14x34	90.0	13.0	70.0	20.0	371	0	93	6.45	W14x34	0.68
N34	268	6.4	8	0	21	100	W14x34	91.0	12.9	71.0	20.0	367	0	90	6.37	W14x34	0.66
N35	276	6.8	8	0	21	100	W14x34	91.0	13.5	70.0	21.0	385	0	105	6.79	W14x34	0.77
E1	303	7.0	8	0	21	100	W14x34	92.0	13.9	70.0	22.0	395	0	113	7.02	W14x34	0.83
E2	310.5	7.1	8	0	21	100	W14x34	92.0	14.0	70.0	22.0	397	0	115	7.07	W14x34	0.84
E3	319	7.1	7.75	0	21	100	W14x34	92.0	13.9	70.0	22.0	399	0	113	7.12	W14x34	0.83
E4	326	7.2	7.75	0	21	100	W14x34	92.0	13.9	70.0	22.0	401	0	114	7.17	W14x34	0.84
E5	334.5	7.2	8.25	0	21	100	W14x34	92.0	14.4	69.0	23.0	403	0	125	7.22	W14x34	0.92
E6	342.5	7.3	8.25	0	21	100	W14x34	92.0	14.5	69.0	23.0	405	0	127	7.27	W14x34	0.93
E7	351	7.3	8.5	0	21	100	W14x34	92.0	14.6	69.0	23.0	406	0	132	7.28	W14x34	0.97
E8	359.5	7.2	8.5	0	21	100	W14x34	92.0	14.6	69.0	23.0	404	0	131	7.24	W14x34	0.96
E9	368	7.2	8.5	0	21	100	W14x34	92.0	14.5	69.0	23.0	402	0	129	7.20	W14x34	0.95
E10	376.5	7.2	8.5	0	21	100	W14x34	92.0	14.5	69.0	23.0	401	0	127	7.16	W14x34	0.93
E11	385	7.1	8.5	0	21	100	W14x34	92.0	14.4	69.0	23.0	399	0	126	7.12	W14x34	0.92
E12	393.5	7.1	8.5	0	21	100	W14x34	92.0	14.3	69.0	23.0	397	0	124	7.08	W14x34	0.91
E13	402	7.0	8.5	0	21	100	W14x34	92.0	14.3	69.0	23.0	396	0	122	7.04	W14x34	0.90
E14	410.5	7.0	8.25	0	21	100	W14x34	91.0	14.0	69.0	22.0	394	0	116	7.00	W14x34	0.85
E15	418.5	6.9	8	0	21	100	W14x34	91.0	13.8	70.0	21.0	391	0	110	6.94	W14x34	0.81
E16	426.5	7.9	8	0	21	100	W14x38	91.0	15.2	67.0	24.0	431	0	148	7.88	W14x38	0.97
E17	434.5	7.8	8.5	0	21	100	W14x43	91.0	15.5	67.0	24.0	428	0	157	7.82	W14x43	0.90
E18	443.5	7.7	8.75	0	21	100	W14x43	91.0	15.6	67.0	24.0	425	0	159	7.75	W14x43	0.91
E19	452	7.7	8.75	0	21	100	W14x43	91.0	15.4	67.0	24.0	422	0	155	7.67	W14x43	0.89
E20	461	8.0	8.75	0	21	100	W14x43	91.0	16.0	66.0	25.0	437	0	173	8.03	W14x43	0.99
E21	469.5	7.9	8.75	0	21	100	W14x43	91.0	15.8	66.0	25.0	432	0	166	7.90	W14x43	0.96
E22	478.5	7.8	9	0	21	100	W14x43	91.0	15.7	66.0	25.0	426	0	165	7.76	W14x43	0.95
E23	487.5	7.6	8.5	0	21	100	W14x38	91.0	15.2	67.0	24.0	420	0	147	7.62	W14x38	0.96
E24	495.5	7.5	8	0	21	100	W14x34	90.0	14.6	67.0	23.0	415	0	132	7.49	W14x34	0.97
E25	503.5	7.4	8	0	21	100	W14x34	90.0	14.4	68.0	22.0	409	0	127	7.37	W14x34	0.93
E26	511.5	7.2	8	0	21	100	W14x34	90.0	14.2	68.0	22.0	404	0	122	7.24	W14x34	0.89
E27	519.5	7.1	8	0	21	100	W14x34	90.0	14.1	68.0	22.0	399	0	117	7.12	W14x34	0.86
E28	527.5	7.5	8.25	0	21	100	W14x38	90.0	14.8	67.0	23.0	415	0	137	7.49	W14x38	0.89
E29	536	7.4	8.25	0	21	100	W14x34	90.0	14.6	67.0	23.0	409	0	131	7.36	W14x34	0.96
S1	606	7.1	9	0	21	100	W14x34	90.0	14.7	67.0	23.0	398	0	134	7.10	W14x34	0.98
S2	613	6.9	7.5	0	21	100	W14x34	89.0	13.5	68.0	21.0	388	0	103	6.87	W14x34	0.75
S3	621	6.6	7.75	0	21	100	W14x34	89.0	13.6	68.0	21.0	377	0	103	6.60	W14x34	0.75
S4	628.5	6.8	7.5	0	21	100	W14x34	89.0	14.0	67.0	22.0	388	0	110	6.85	W14x34	0.81
S5	636	7.0	7.5	0	21	100	W14x34	88.0	14.4	66.0	22.0	393	0	118	6.99	W14x34	0.86
S6	643.5	6.6	7.75	0	21	100	W14x34	88.0	14.3	66.0	22.0	377	0	112	6.59	W14x34	0.82
S7	651.5	6.2	8	0	21	100	W14x34	88.0	14.0	66.0	22.0	359	0	101	6.18	W14x34	0.74
S8	659.5	6.3	8	0	21	100	W14x34	87.0	14.1	66.0	21.0	363	0	104	6.26	W14x34	0.76
S9	667.5	6.3	8	0	21	100	W14x34	87.0	14.1	65.0	22.0	366	0	106	6.34	W14x34	0.77
S10	675.5	6.3	8	0	21	100	W14x34	86.0	14.0	65.0	21.0	366	0	105	6.34	W14x34	0.77
S11	683.5	6.0	8	0	21	100	W14x34	85.0	13.4	65.0	20.0	352	0	92	6.00	W14x34	0.68
S12	691.5	6.0	8	0	21	100	W14x34	85.0	13.3	65.0	20.0	353	0	92	6.02	W14x34	0.67
S13	699.5	6.0	8	0	21	100	W14x34	85.0	13.2	64.0	21.0	353	0	91	6.03	W14x34	0.67
S14	707.5	6.0	8	0	21	100	W14x34	84.0	13.3	64.0	20.0	352	0	91	6.00	W14x34	0.67
S15	715.5	6.0	8.25	0	21	100	W14x34	84.0	13.5	64.0	20.0	352	0	95	6.00	W14x34	0.70
S16	724	6.2	8.5	0	21	100	W14x34	84.0	13.8	63.0	21.0	360	0	104	6.19	W14x34	0.77
S17	732.5	6.4	8.25	0	21	100	W14x34	84.0	14.0	62.0	22.0	368	0	108	6.38	W14x34	0.79
S18	740.5	6.6	8	0	21	100	W14x34	84.0	14.5	61.0	23.0	377	0	116	6.59	W14x34	0.85
S19	748.5	6.8	8	0	21	100	W14x34	83.0	15.1	60.0	23.0	385	0	127	6.79	W14x34	0.93
S20	756.5	7.0	7.5	0	21	100	W14x34	83.0	15.5	60.0	23.0	394	0	128	7.00	W14x34	0.94
S21	763.5	7.4	7	0	21	100	W14x38	83.0	16.0	58.0	25.0	413	0	137	7.44	W14x38	0.89
S22	770.5	7.9	7	0	21	100	W14x43	83.0	16.9	57.0	26.0	431	0	158	7.89	W14x43	0.91
S23	777.5	8.3	7	0	21	100	W14x48	83.0	17.8	56.0	27.0	450	0	180	8.33	W14x48	0.92

TABLE C1
SOLDIER PILE DESIGN - STAGE 1 CANTILEVER
NORTH, EAST AND SOUTH WALLS

													Soldier Beam - Flexure/Compression				
					L=NH^2	Unif. Press.	Design	Pile Top	Pile Toe	Pile Toe	Pile	Lagging	Axial		Free		
Pile ID	Station (ft)	Height (ft)	Spacing (ft)	No. Anchors	N (psf/ft)	P (psf)	Beam	Elevation (feet)	Embed (feet)	Elevation (feet)	Length (feet)	Pressure (psf)	Load (kips)	Moment (ft-kips)	Length (feet)	Steel Section	Flex/Ax Ratio
W1	4	8.7	8	0	21	100	W18x50	83.0	17.8	55.0	28.0	464	0	224	8.68	W18x50	0.89
W2	12.5	8.4	8.25	0	21	100	W14x53	82.0	18.9	54.0	28.0	454	0	226	8.42	W14x53	0.99
W3	20.5	8.2	8.25	0	21	100	W14x53	82.0	18.5	54.0	28.0	443	0	210	8.17	W14x53	0.97
W4	29	8.4	8.25	0	21	100	W14x53	82.0	18.7	54.0	28.0	453	0	225	8.41	W14x53	0.99
W5	37	8.2	8	0	21	100	W14x53	82.0	18.2	54.0	28.0	444	0	203	8.18	W14x53	0.93
W6	45	8.0	8	0	21	100	W14x48	82.0	18.0	55.0	27.0	437	0	194	8.03	W14x48	0.99
W7	53	7.9	8	0	21	100	W14x48	81.0	17.8	55.0	26.0	431	0	186	7.89	W14x48	0.95
W8	61	7.7	8	0	21	100	W14x48	81.0	17.5	55.0	26.0	425	0	177	7.74	W14x48	0.90
W9	69	7.6	8	0	21	100	W14x43	81.0	17.3	55.0	26.0	419	0	169	7.59	W14x43	0.97
W10	77	7.5	8	0	21	100	W14x43	81.0	17.3	55.0	26.0	417	0	167	7.54	W14x43	0.96
W11	85	7.7	8	0	21	100	W14x43	81.0	17.4	55.0	26.0	421	0	173	7.65	W14x43	0.99
W12	93	7.8	8	0	21	100	W14x48	81.0	17.6	55.0	26.0	426	0	179	7.76	W14x48	0.91
W13	101	7.9	8.25	0	21	100	W14x48	81.0	17.9	55.0	26.0	431	0	192	7.88	W14x48	0.98
W14	109.5	8.0	8.5	0	21	100	W14x53	81.0	18.3	54.0	27.0	436	0	206	7.99	W14x53	0.95
W15	118	7.9	7.75	0	21	100	W14x48	81.0	17.7	55.0	26.0	433	0	181	7.94	W14x48	0.93
W16	125	7.9	7.5	0	21	100	W14x43	81.0	17.4	55.0	26.0	431	0	172	7.88	W14x43	0.99
W17	133	6.8	7	0	21	100	W14x34	81.0	16.0	58.0	23.0	387	0	112	6.82	W14x34	0.82
W18	139	9.9	7	0	21	100	W18x55	81.0	17.7	53.0	28.0	515	0	254	9.88	W18x55	0.91
W19	147	8.1	8	0	21	100	W14x53	82.0	18.1	54.0	28.0	441	0	198	8.11	W14x53	0.91
W20	155	8.3	8	0	21	100	W14x53	82.0	18.4	54.0	28.0	450	0	212	8.33	W14x53	0.97
W21	163	8.0	8	0	21	100	W14x48	82.0	18.2	55.0	27.0	438	0	195	8.04	W14x48	0.99
W22	171	8.2	8	0	21	100	W14x53	82.0	18.4	55.0	27.0	445	0	204	8.20	W14x53	0.94
W23	179	8.4	8	0	21	100	W14x53	82.0	18.6	54.0	28.0	451	0	214	8.36	W14x53	0.98
W24	187	8.5	8	0	21	100	W14x53	83.0	18.9	54.0	29.0	458	0	224	8.53	W14x53	0.98
W25	195	10.2	7.5	0	21	100	W18x60	83.0	18.8	53.0	30.0	528	0	302	10.19	W18x60	0.98
W26	202	9.3	7.25	0	21	100	W18x50	83.0	17.9	55.0	28.0	492	0	238	9.33	W18x50	0.94
W27	209.5	9.5	7.5	0	21	100	W18x55	83.0	18.3	54.0	29.0	498	0	257	9.48	W18x55	0.92
W28	217	9.6	7.5	0	21	100	W18x55	83.0	18.5	54.0	29.0	505	0	267	9.64	W18x55	0.95
W29	224.5	11.8	7.5	0	21	100	W18x86	83.0	20.5	50.0	33.0	595	0	417	11.79	W18x86	0.90
W30	232	9.9	7.25	0	21	100	W18x55	83.0	18.7	54.0	29.0	517	0	277	9.94	W18x55	0.99
W31	239	9.0	7.5	0	21	100	W18x50	83.0	18.0	55.0	28.0	477	0	225	8.98	W18x50	0.89
W32	247	8.9	8	0	21	100	W18x50	83.0	18.2	55.0	28.0	476	0	241	8.94	W18x50	0.95
W33	255	8.9	8	0	21	100	W18x50	83.0	18.1	55.0	28.0	474	0	238	8.90	W18x50	0.94
W34	263	8.9	8	0	21	100	W18x50	83.0	18.0	56.0	27.0	472	0	236	8.87	W18x50	0.93
W35	271	9.3	8	0	21	100	W18x55	83.0	18.3	55.0	28.0	492	0	265	9.33	W18x55	0.95
W36	279	9.3	8	0	21	100	W18x55	83.0	18.1	55.0	28.0	490	0	262	9.29	W18x55	0.93
W37	287	9.3	8	0	21	100	W18x55	83.0	18.0	55.0	28.0	489	0	258	9.25	W18x55	0.92
W38	295	9.2	8	0	21	100	W18x55	83.0	17.9	55.0	28.0	487	0	255	9.21	W18x55	0.91
W39	303	9.2	8	0	21	100	W18x50	83.0	17.7	55.0	28.0	485	0	251	9.17	W18x50	0.99
W40	311	9.1	8	0	21	100	W18x50	83.0	17.6	55.0	28.0	484	0	247	9.13	W18x50	0.98
W41	319	9.6	8.25	0	21	100	W18x60	83.0	18.1	54.0	29.0	503	0	283	9.60	W18x60	0.92
W42	327.5	9.6	8.5	0	21	100	W18x60	83.0	18.1	54.0	29.0	501	0	288	9.56	W18x60	0.94
W43	336	9.5	8	0	21	100	W18x55	83.0	17.6	55.0	28.0	500	0	264	9.51	W18x55	0.94

TABLE C2
SOLDIER PILE DESIGN - STAGE 1 CANTILEVER
WEST WALL

Wall Height (ft)	8.40
Depth of Embed (ft)	18.44
Depth to Top of Passive (ft)	10.40

	Force	p (psf)	K_γ (psf)	h (ft)	w (ft)	phw (lbf)	$K_\gamma h^2 w/2$ (lbf)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	A1	100.0		8.40	8.00	6720		4.20	22.64	152120
	A2		42.0	8.40	8.00		11854	5.60	21.24	251744
	A3	352.8		18.44	2.00	13009		17.62	9.22	119923
	A4		21.0	18.44	2.00		7138	20.69	6.15	43869
Resisting	P1	200.0		16.44	5.00	16437		18.62	8.22	135085
	P2		100.0	7.84	5.00		15370	15.63	11.21	172291
	P3	1522.2		8.60	5.00	65422		22.54	4.30	281183
	P4		175.0	8.60	5.00		32327	23.97	2.87	92627

Moments about pile toe

Sum of resisting moments (ft-lbf)	681187
Sum of driving moments (ft-lbf)	567656
FS	1.20

Depth to Zero Shear (ft) at "M"	18.80

	Force	p (psf)	K_γ (psf)	h (ft)	w (ft)	phw (lbf)	$K_\gamma h^2 w/2$ (lbf)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	a1	100.0		8.40	8.00	6720		4.20	14.60	98130
	a2		42.0	8.40	8.00		11854	5.60	13.20	156506
	a3	352.8		10.40	2.00	7340		13.60	5.20	38179
	a4		21.0	10.40	2.00		2273	15.34	3.47	7880
Resisting	p1	200.0		8.40	5.00	8403		14.60	4.20	35303
	p2		100.0	7.84	5.00		15370	15.63	3.18	48807
	p3	1522.2		0.56	5.00	4276		18.52	0.28	1201
	p4		175.0	0.56	5.00		138	18.62	0.19	26

Moments at Zero Shear Point

Sum of shear forces (lbf) at "M"	0
Sum of moments (ft-lbf) at "M"	215359

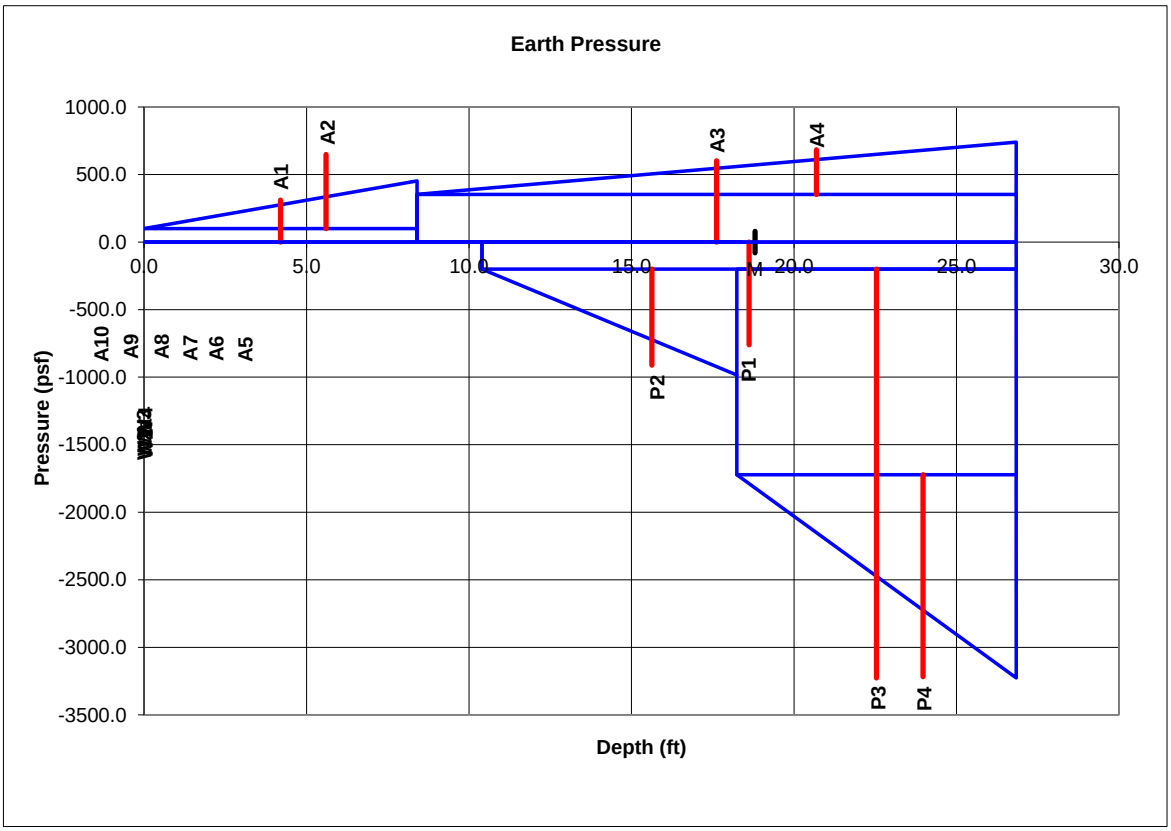


FIGURE C1 SOLDIER BEAM - N20

Wall Height (ft)	6.99
Depth of Embed (ft)	14.36
Depth to Top of Passive (ft)	8.99

	Force	p (psf)	K_γ (psf)	h (ft)	w (ft)	phw (lbf)	$K_\gamma h^2 w/2$ (lbf)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	A1	100.0		6.99	7.50	5240		3.49	17.86	93557
	A2		42.0	6.99	7.50		7687	4.66	16.69	128310
	A3	293.4		14.36	2.00	8428		14.17	7.18	60525
	A4		21.0	14.36	2.00		4332	16.56	4.79	20737
Resisting	P1	200.0		12.36	5.00	12362		15.17	6.18	76410
	P2		100.0	3.20	5.00		2560	11.12	10.23	26186
	P3	710.0		9.16	5.00	32525		16.77	4.58	149000
	P4		175.0	9.16	5.00		36725	18.29	3.05	112160

Moments about pile toe

Sum of resisting moments (ft-lbf)	363756
Sum of driving moments (ft-lbf)	303130
FS	1.20

Depth to Zero Shear (ft) at "M"	14.48

	Force	p (psf)	K_γ (psf)	h (ft)	w (ft)	phw (lbf)	$K_\gamma h^2 w/2$ (lbf)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	a1	100.0		6.99	7.50	5240		3.49	10.99	57574
	a2		42.0	6.99	7.50		7687	4.66	9.82	75518
	a3	293.4		7.49	2.00	4398		10.73	3.75	16482
	a4		21.0	7.49	2.00		1180	11.98	2.50	2947
Resisting	p1	200.0		5.49	5.00	5495		11.73	2.75	15096
	p2		100.0	3.20	5.00		2560	11.12	3.36	8605
	p3	710.0		2.29	5.00	8147		13.33	1.15	9347
	p4		175.0	2.29	5.00		2304	13.72	0.76	1762

Moments at Zero Shear Point

Sum of shear forces (lbf) at "M"	0
Sum of moments (ft-lbf) at "M"	117711

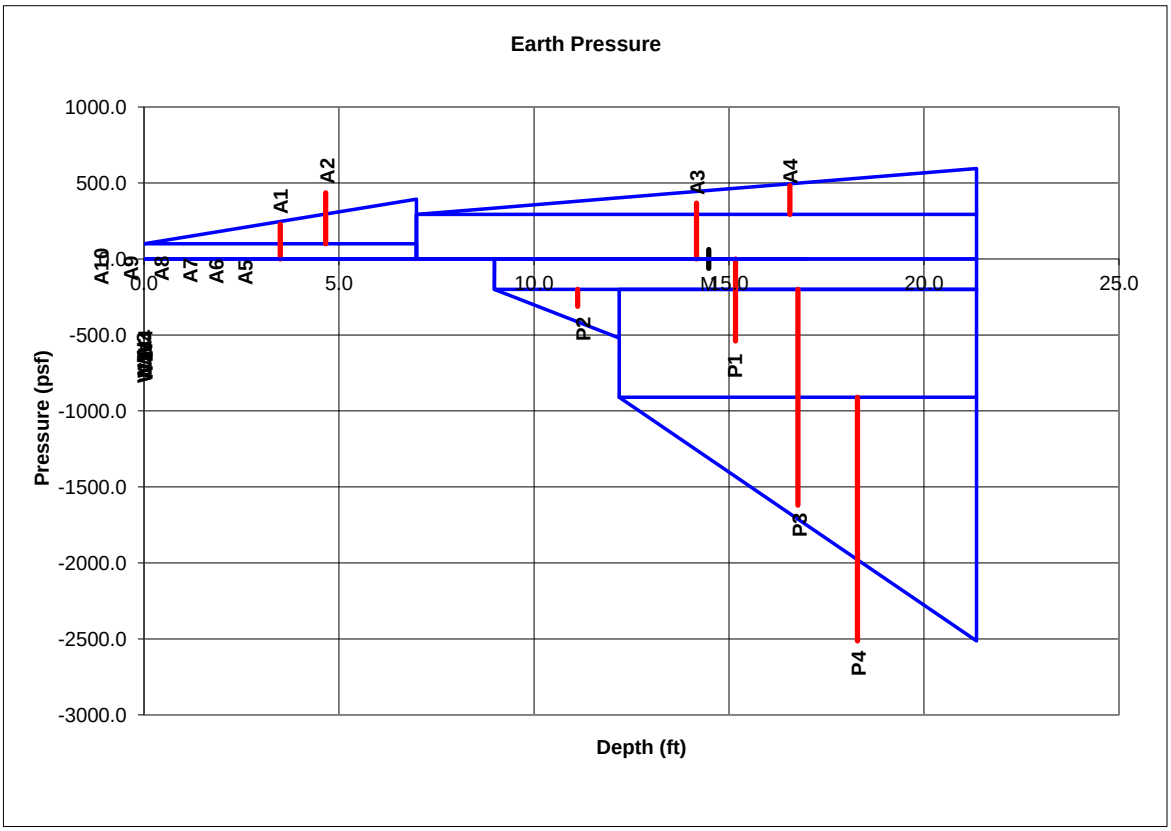


FIGURE C2 SOLDIER BEAM - S5

Wall Height (ft)	10.19
Depth of Embed (ft)	18.84
Depth to Top of Passive (ft)	12.19

	Force	p (psf)	Kγ (psf)	h (ft)	w (ft)	phw (lbf)	Kγ h²w/2 (lbf)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	A1	100.0		10.19	7.50	7642		5.09	23.94	182940
	A2		42.0	10.19	7.50		16352	6.79	22.24	363674
	A3	427.9		18.84	2.50	20161		19.61	9.42	189963
	A4		21.0	18.84	2.50		9322	22.75	6.28	58555
Resisting	P1	200.0		16.84	6.25	21056		20.61	8.42	177336
	P2		100.0	7.00	6.25		15313	16.86	12.18	186473
	P3	1375.0		9.84	6.25	84601		24.11	4.92	416429
	P4		175.0	9.84	6.25		53000	25.75	3.28	173920

Moments about pile toe

Sum of resisting moments (ft-lbf)	954158
Sum of driving moments (ft-lbf)	795132
FS	1.20

Depth to Zero Shear (ft) at "M"	20.49

	Force	p (psf)	Kγ (psf)	h (ft)	w (ft)	phw (lbf)	Kγ h²w/2 (lbf)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	a1	100.0		10.19	7.50	7642		5.09	15.40	117655
	a2		42.0	10.19	7.50		16352	6.79	13.70	223982
	a3	427.9		10.30	2.50	11021		15.34	5.15	56767
	a4		21.0	10.30	2.50		2786	17.06	3.43	9566
Resisting	p1	200.0		8.30	6.25	10377		16.34	4.15	43072
	p2		100.0	7.00	6.25		15313	16.86	3.63	55658
	p3	1375.0		1.30	6.25	11185		19.84	0.65	7278
	p4		175.0	1.30	6.25		926	20.06	0.43	402

Moments at Zero Shear Point

Sum of shear forces (lbf) at "M"	0
Sum of moments (ft-lbf) at "M"	301560

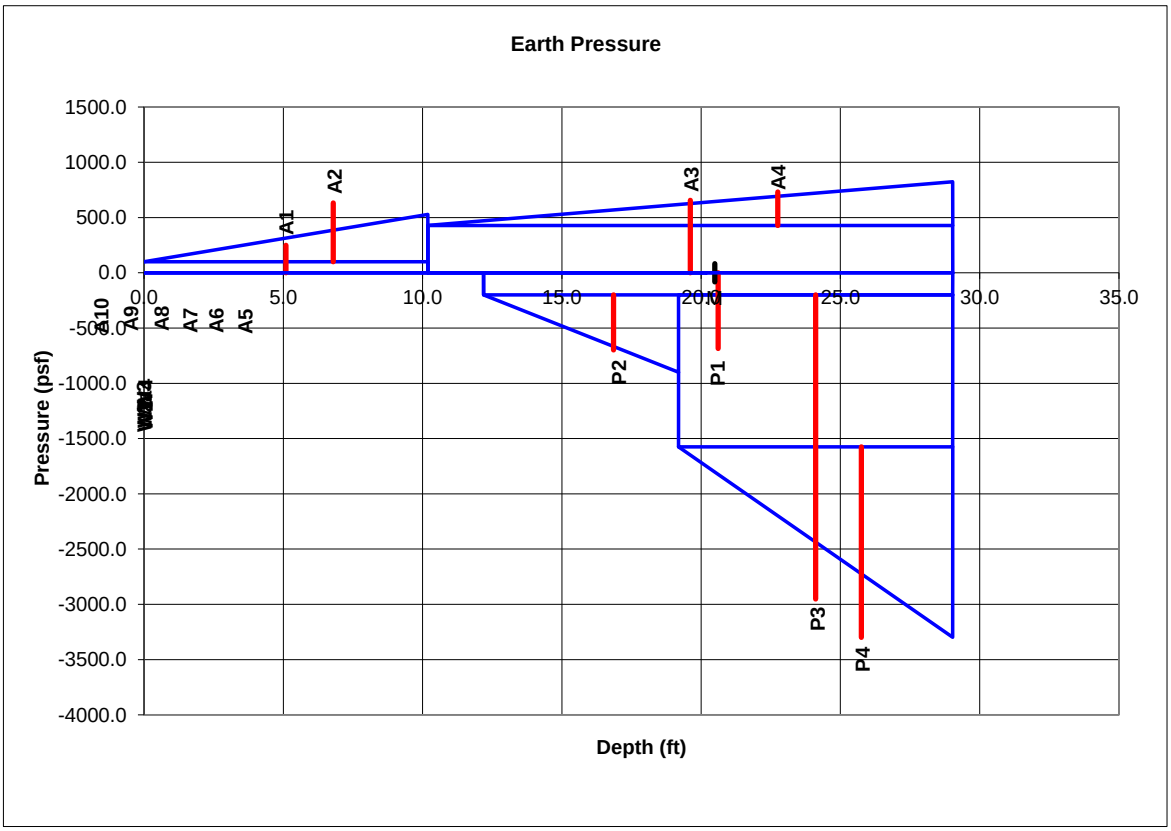


FIGURE C3 SOLDIER BEAM - W25

Wall Height (ft)	11.79
Depth of Embed (ft)	20.54
Depth to Top of Passive (ft)	13.79

	Force	p (psf)	K_γ (psf)	h (ft)	w (ft)	phw (lbf)	$K_\gamma h^2 w/2$ (lbf)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	A1	100.0		11.79	7.50	8840		5.89	26.43	233661
	A2		42.0	11.79	7.50		21883	7.86	24.47	535393
	A3	495.1		20.54	2.50	25418		22.06	10.27	261015
	A4		21.0	20.54	2.50		11072	25.48	6.85	75797
Resisting	P1	200.0		18.54	6.25	23172		23.06	9.27	214775
	P2		100.0	6.00	6.25		11250	17.79	14.54	163547
	P3	1200.0		12.54	6.25	94031		26.06	6.27	589461
	P4		175.0	12.54	6.25		85963	28.15	4.18	359255

Moments about pile toe

Sum of resisting moments (ft-lbf)	1327038
Sum of driving moments (ft-lbf)	1105865
FS	1.20

Depth to Zero Shear (ft) at "M" 22.55

	Force	p (psf)	K_γ (psf)	h (ft)	w (ft)	phw (lbf)	$K_\gamma h^2 w/2$ (lbf)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	a1	100.0		11.79	7.50	8840		5.89	16.65	147236
	a2		42.0	11.79	7.50		21883	7.86	14.69	321464
	a3	495.1		10.76	2.50	13319		17.17	5.38	71664
	a4		21.0	10.76	2.50		3040	18.96	3.59	10905
Resisting	p1	200.0		8.76	6.25	10952		18.17	4.38	47976
	p2		100.0	6.00	6.25		11250	17.79	4.76	53565
	p3	1200.0		2.76	6.25	20710		21.17	1.38	28594
	p4		175.0	2.76	6.25		4170	21.63	0.92	3838

Moments at Zero Shear Point

Sum of shear forces (lbf) at "M"	0
Sum of moments (ft-lbf) at "M"	417296

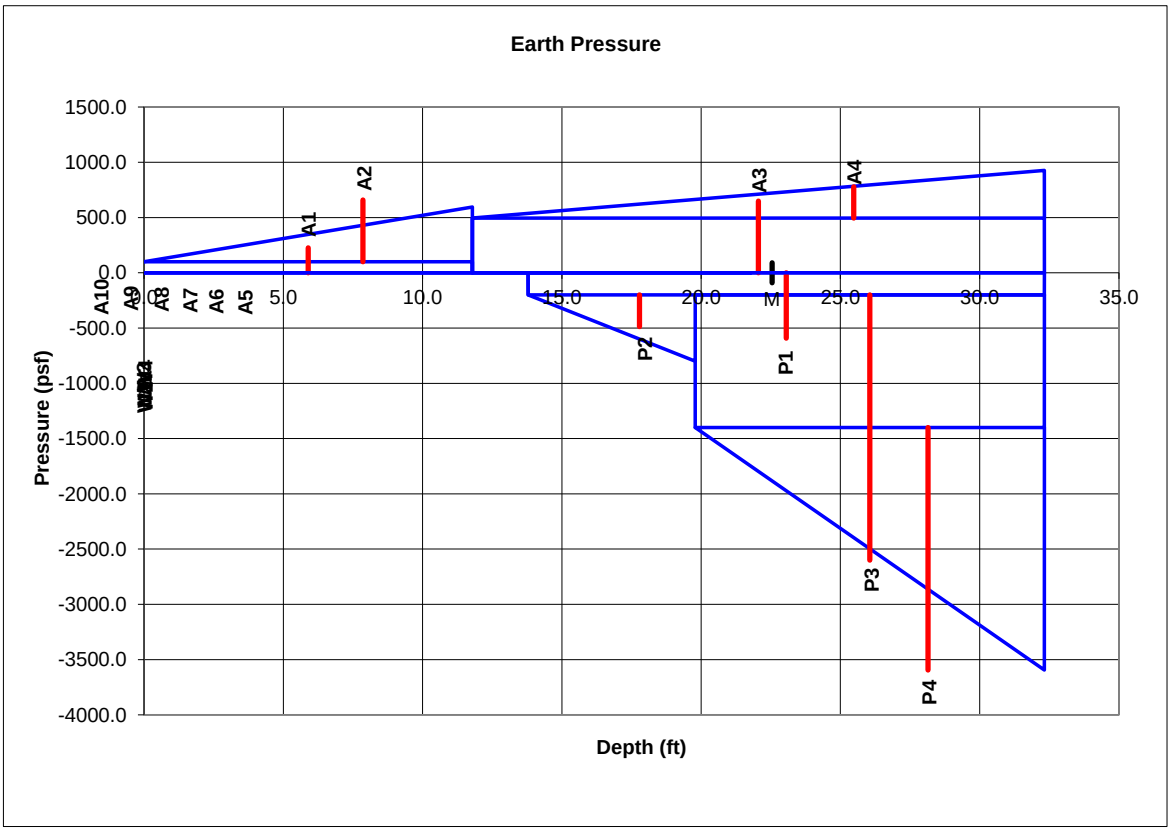


FIGURE C4 SOLDIER BEAM - W29