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# Design Memorandum

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

**ADDRESS:** 2885 78<sup>th</sup> Avenue SE  
Mercer Island, WA

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

**DATE:** September 10, 2023

**REFERENCES:**

1. "Report on Mercer Island Mixed-Use Design, 2885 78<sup>th</sup> Avenue SE, Mercer Island, Washington", prepared by Haley & Aldrich, Inc., dated June 12, 2023.
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 78<sup>th</sup> Avenue SE in Mercer Island, Washington. The site is bounded by 78<sup>th</sup> Avenue SE to the east, S 29<sup>th</sup> Street to the south, 77<sup>th</sup> 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 78<sup>th</sup> Avenue SE to 82-83 feet along 77<sup>th</sup> Avenue SE. Underground parking is planned that will require excavation to elevations 75-77 feet in general, with locally deeper excavations to accommodate a detention vault. Depths of excavation from ground surface to the base of planned footings range up to 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. It is planned therefore to use ground improvement measures over the western two-thirds of the building footprint. It is understood that ground improvement measures will be undertaken from close to existing grades and will not therefore undermine the planned shoring system.

Except for the northwest corner of the site, shoring will be required along the entire building perimeter. Within the footprint of the building, grade separation will be accomplished by temporary construction sloping. The planned detention vault in the northeast portion of the footprint is in close proximity to the north wall and is the area of the deepest excavation below existing ground surface. The overall plan dimensions of the garage footprint are on the order of 280 feet east-west by 240 feet. The total effective shored area of 8,300 SF.

**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. The planned excavation will extend to approximately the water table elevation that is at elevation approximate elevation 75 feet, depending on the time of year. Active dewatering of the site is likely required within the locally deeper areas of excavation.

**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, both cantilevered soldier piles and soldier piles supported by a single row of tieback anchors will be used. 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 both cantilevered soldier piles and 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
Allowable Pile End Bearing	10 ksf (native soils)
Allowable Pile Skin Friction	2 ksf (other than Unit 1 soils, per the geotechnical report)
	0.5 ksf (Unit 1 soils, per the geotechnical report)

### **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 360-16 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 360-16 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.

**Deformations:**

For the design earth pressures from the geotechnical report and the shoring design presented, it is anticipated that deformations adjacent property boundaries will not exceed 1-inch.

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 <sup>2</sup> )
1	W14x34	50.0	50.0	70.0	133.7	133.7	6.750	0.455	14.000	0.285	3.23	1.47
2	W14x38	50.0	50.0	70.0	150.2	150.2	6.770	0.515	14.100	0.310	3.23	1.66
3	w14x43	50.0	50.0	70.0	172.2	172.2	8.000	0.530	13.700	0.305	3.85	2.04
4	W14x48	50.0	50.0	70.0	193.1	193.1	8.030	0.595	13.800	0.340	3.85	2.29
5	W14x53	50.0	50.0	70.0	214.0	214.0	8.060	0.660	13.900	0.370	3.85	2.54

**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	2.94	3.00	24.0	24.0
2	54.9	54.9	0.3125	11.8	11.5	2.5	9.0	0.500	3.33	3.50	24.0	24.0
3	67.3	67.3	0.3125	14.5	14.5	2.5	12.0	0.500	4.08	4.00	30.0	30.0
4	75.5	75.5	0.3125	16.3	16.0	2.5	13.5	0.750	3.05	3.00	33.0	33.0
5	83.7	83.7	0.3125	18.0	17.5	2.5	15.0	0.750	3.38	3.50	36.0	36.0

**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 <sup>2</sup> )	Req'd Stiffener Width (in)	Design Stiffener Width (in)	Stiffener "b/t" Ratio	Allowable Stiffener "b/t" Ratio
1	35.0	0.2500	0.500	9.4	12.0	1.167	2.3	4.0	8.0	10.7
2	35.0	0.2500	0.500	9.4	12.0	1.167	2.3	4.0	8.0	10.7
3	35.0	0.2500	0.500	9.4	12.0	1.167	2.3	4.0	8.0	10.7
4	35.0	0.2500	0.500	9.4	12.0	1.167	2.3	4.0	8.0	10.7
5	35.0	0.2500	0.500	9.4	12.0	1.167	2.3	4.0	8.0	10.7

TABLE 1  
ANCHOR POCKET DESIGN

APPENDIX A  
ANCHOR DESIGN

Pile ID	Station (ft)	Height (ft)	Spacing (ft)	No. Anchors	L=NH <sup>2</sup> N (psf/ft)	Unif. Press. P (psf)	Anchor 1						Design Beam	Pile Top Elevation (feet)	Pile Toe Embed (feet)	Pile Toe Elevation (feet)	Pile Length (feet)	Lagging Pressure (psf)
							Elevation (feet)	Angle (degrees)	Anchor Load (kips)	No. of Strands	Total Length (feet)	Bond Length (feet)						
N1	116	6.1	8	0	21	150	0.00	0	0	0	0.0	0.0	W14x34	83.0	13.5	63.0	20.0	405
N2	124	10.6	8	1	21	150	79.00	45	36	2	37.6	15.0	W14x34	83.3	10.5	62.0	21.3	596
N3	132	14.5	8	1	21	150	78.50	45	56	2	43.2	22.5	W14x34	83.5	8.0	61.0	22.5	758
N4	140	14.8	8	1	21	150	78.50	45	59	2	43.2	23.7	W14x34	84.0	8.0	61.0	23.0	773
N5	148	15.2	8	1	21	150	78.50	45	62	2	43.2	24.9	W14x34	84.3	8.0	61.0	23.3	787
N6	156	15.4	8	1	21	150	78.50	45	64	2	42.5	25.8	W14x34	84.5	8.0	61.0	23.5	797
N7	164	15.7	8	1	21	150	79.00	45	65	2	41.5	26.0	W14x34	84.8	8.0	61.0	23.8	808
N8	172	15.9	8	1	21	150	79.00	40	62	2	39.9	24.9	W14x34	85.0	8.0	61.0	24.0	819
N9	180	16.4	8	1	21	150	79.50	35	60	2	39.2	24.2	W14x38	85.5	8.3	60.5	25.0	840
N10	188	17.4	8	1	21	150	80.00	30	63	2	40.4	25.4	W14x43	86.5	8.7	60.3	26.3	882
N11	196	18.4	8	1	21	150	81.00	27.5	67	2	41.7	26.7	W14x48	87.5	9.3	59.5	28.0	924
N12	204	19.2	8	1	21	150	81.50	25	70	2	43.0	28.0	W14x53	88.3	9.7	59.3	29.0	957
N13	212	17.5	8	1	21	150	82.00	20	58	2	38.4	23.4	W14x43	88.5	8.8	61.8	26.8	887
N14	220	13.7	8	1	21	150	83.50	20	39	2	30.8	15.8	W14x34	88.5	8.0	66.5	22.0	727
N15	228	11.7	8	1	21	150	84.50	20	30	1	30.0	15.0	W14x34	88.8	8.0	68.8	20.0	642
N16	236	12.1	8	1	21	150	84.50	20	32	1	30.0	15.0	W14x34	89.0	8.0	68.8	20.3	658
N17	244	12.5	8	1	21	150	85.00	20	33	1	30.0	15.0	W14x34	89.5	8.0	68.8	20.8	673
N18	252	12.8	8	1	21	150	85.00	20	36	2	30.0	15.0	W14x34	89.8	8.0	68.8	21.0	689
N19	260	13.2	8	1	21	150	85.50	20	37	2	30.0	15.0	W14x34	90.0	8.0	68.8	21.3	704
N20	268	13.5	8	1	21	150	85.50	20	38	2	30.4	15.4	W14x34	90.5	8.0	68.8	21.8	717
N21	276	13.8	8	1	21	150	86.00	20	39	2	30.6	15.6	W14x34	90.8	8.0	68.8	22.0	729
E1	304	14.3	8	1	21	150	86.00	45	56	2	37.3	22.3	W14x34	91.3	8.0	68.8	22.5	750
E2	312	14.2	8	1	21	150	86.00	45	55	2	37.1	22.1	W14x34	91.3	8.0	68.8	22.5	748
E3	320	14.2	8	1	21	150	86.00	45	55	2	37.0	22.0	W14x34	91.0	8.0	68.8	22.3	746
E4	328	14.1	8	1	21	150	86.00	45	54	2	36.8	21.8	W14x34	91.0	8.0	68.8	22.3	744
E5	336	14.1	7.75	1	21	150	86.00	45	52	2	36.0	21.0	W14x34	91.0	8.0	68.8	22.3	742
E6	343.5	14.0	7.5	1	21	150	86.00	45	50	2	35.1	20.1	W14x34	91.0	8.0	68.8	22.3	740
E7	351	14.0	7.75	1	21	150	86.00	45	52	2	35.7	20.7	W14x34	91.0	8.0	68.8	22.3	738
E8	359	13.9	8	1	21	150	86.00	45	53	2	36.1	21.1	W14x34	90.8	8.0	68.8	22.0	734
E9	367	13.8	8	1	21	150	86.00	45	52	2	35.8	20.8	W14x34	90.8	8.0	68.8	22.0	731
E10	375	13.7	8.25	1	21	150	86.00	45	53	2	36.2	21.2	W14x34	90.8	8.0	68.8	22.0	727
E11	383.5	13.7	8.5	1	21	150	86.00	45	54	2	36.5	21.5	W14x34	90.5	8.0	68.8	21.8	723
E12	392	13.6	8.5	1	21	150	86.00	45	53	2	36.2	21.2	W14x34	90.5	8.0	68.8	21.8	720
E13	400.5	13.5	8.5	1	21	150	85.50	45	54	2	36.6	21.6	W14x34	90.5	8.0	68.8	21.8	716
E14	409	13.4	8.5	1	21	150	85.50	45	53	2	36.4	21.4	W14x34	90.3	8.0	68.8	21.5	713
E15	417.5	13.4	8.5	1	21	150	85.50	45	53	2	36.4	21.4	W14x34	90.3	8.0	68.8	21.5	713
E16	426	13.4	8.5	1	21	150	85.50	45	53	2	36.4	21.4	W14x34	90.3	8.0	68.8	21.5	713
E17	434.5	13.4	8.5	1	21	150	85.50	45	53	2	36.4	21.4	W14x34	90.3	8.0	68.8	21.5	713
E18	443	13.6	7.75	1	21	150	85.50	45	49	2	34.8	19.8	W14x34	90.3	8.0	68.5	21.8	721
E19	450	13.8	7.25	1	21	150	85.50	45	47	2	33.9	18.9	W14x34	90.3	8.0	68.3	22.0	731
E20	457.5	14.1	7.5	1	21	150	85.50	45	50	2	35.0	20.0	W14x34	90.3	8.0	68.0	22.3	741
E21	465	14.3	7.75	1	21	150	85.50	45	53	2	36.1	21.1	W14x34	90.3	8.0	67.8	22.5	751
E22	473	14.6	8	1	21	150	85.00	45	57	2	37.9	22.9	W14x34	90.3	8.0	67.5	22.8	762
E23	481	14.8	8	1	21	150	85.00	45	58	2	38.4	23.4	W14x34	90.3	8.0	67.0	23.3	773
E24	489	15.1	7.5	1	21	150	85.00	45	56	2	37.3	22.3	W14x34	90.3	8.0	66.8	23.5	783
E25	496	15.2	7.25	1	21	150	85.00	45	54	2	36.7	21.7	W14x34	90.0	8.0	66.8	23.3	788
E26	503.5	15.1	7.25	1	21	150	84.50	45	55	2	37.0	22.0	W14x34	90.0	8.0	66.8	23.3	783
E27	510.5	15.0	7.25	1	21	150	84.50	45	54	2	36.7	21.7	W14x34	90.0	8.0	66.8	23.3	779
E28	518	14.9	7.5	1	21	150	84.50	45	55	2	37.1	22.1	W14x34	89.8	8.0	66.8	23.0	774
E29	525.5	14.8	7.5	1	21	150	84.50	45	54	2	36.8	21.8	W14x34	89.8	8.0	66.8	23.0	770
E30	533	14.6	7	1	21	150	84.50	45	50	2	35.0	20.0	W14x34	89.5	8.0	66.8	22.8	765
S1	603	14.7	8.5	1	21	150	84.00	45	63	2	40.2	25.2	W14x34	89.5	8.0	66.8	22.8	767
S2	611.5	14.6	8.75	1	21	150	83.00	45	68	2	42.3	27.3	W14x34	89.5	8.0	66.8	22.8	763
S3	620.5	14.2	9	1	21	150	83.00	45	66	2	41.4	26.4	W14x34	89.0	8.0	66.8	22.3	746
S4	629.5	13.8	9	1	21	150	83.00	45	62	2	39.7	24.7	W14x34	88.8	8.0	66.8	22.0	728
S5	638.5	13.3	9	1	21	150	83.00	45	58	2	38.2	23.2	W14x34	88.3	8.0	66.8	21.5	711
S6	647.5	12.9	9	1	21	150	82.00	45	57	2	38.0	23.0	W14x34	87.8	8.0	66.8	21.0	691
S7	656.5	12.4	9	1	21	150	82.00	45	53	2	36.2	21.2	W14x34	87.3	8.0	66.8	20.5	669
S8	665.5	11.9	9	1	21	150	82.00	45	48	2	34.4	19.4	W14x34	86.8	8.0	66.8	20.0	648
S9	674.5	10.9	8.5	1	21	150	81.50	45	40	2	30.9	15.9	W14x34	85.8	8.0	66.8	19.0	607
S10	682.5	9.4	8	0	21	150	0.00	0	0	0	0.0	0.0	W18x55	84.3	17.2	57.5	26.8	546
S11	690.5	6.8	8	0	21	150	0.00	0	0	0	0.0	0.0	W14x34	81.8	14.7	60.0	21.8	437
S12	698.5	6.6	8	0	21	150	0.00	0	0	0	0.0	0.0	W14x34	81.5	14.3	60.3	21.3	428
S13	706.5	6.4	8	0	21	150	0.00	0	0	0	0.0	0.0	W14x34	81.3	14.0	60.8	20.5	419
S14	714.5	6.4	8.25	0	21	150	0.00	0	0	0	0.0	0.0	W14x34	81.3	14.1	60.5	20.8	418
S15	723	6.4	8.5	0	21	150	0.00	0	0	0	0.0	0.0	W14x34	81.3	14.3	60.5	20.8	417
S16	731.5	6.3	8.25	0	21	150	0.00	0	0	0	0.0	0.0	W14x34	81.3	14.1	60.5	20.8	416
S17	739.5	6.3	8	0	21	150	0.00	0	0	0	0.0	0.0	W14x34	81.3	13.9	60.8	20.5	415
S18	747.5	7.2	8	0	21	150	0.00	0	0	0	0.0	0.0	W14x38	82.0	15.3	59.5	22.5	452
S19	755.5	7.5	7.5	0	21	150	0.00	0	0	0	0.0	0.0	W14x38	82.5	15.3	59.5	23.0	463
S20	762.5	7.4	7	0	21	150	0.00	0	0	0	0.0	0.0	W14x38	82.3	14.8	60.0	22.3	461
S21	769.5	7.4	7	0	21	150	0.00	0	0	0	0.0	0.0	W14x34	82.3	14.7	60.0	22.3	459
S22	776.5	7.3	7	0	21	150	0.00	0	0	0	0.0	0.0	W14x34	82.3	14.0	60.8	21.5	458

TABLE A1  
ANCHOR DESIGN - NORTH, EAST AND SOUTH WALLS

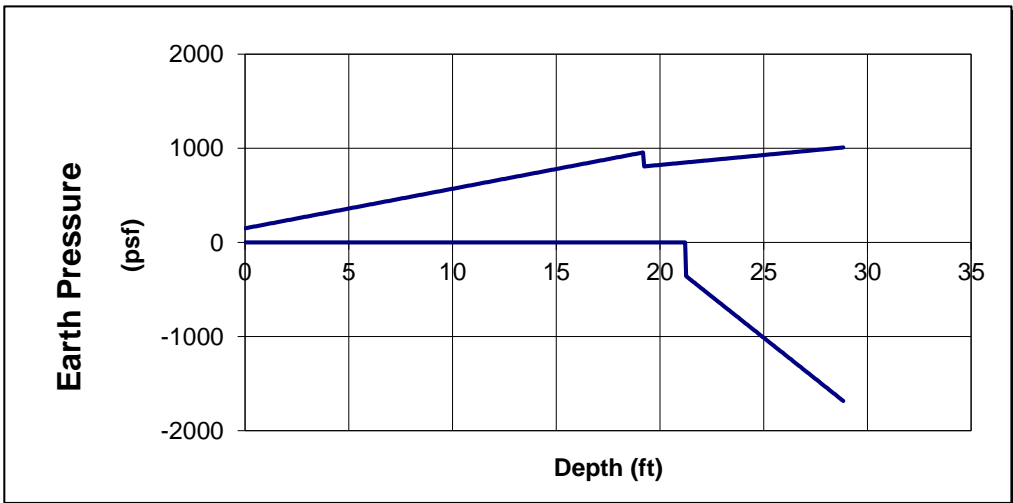
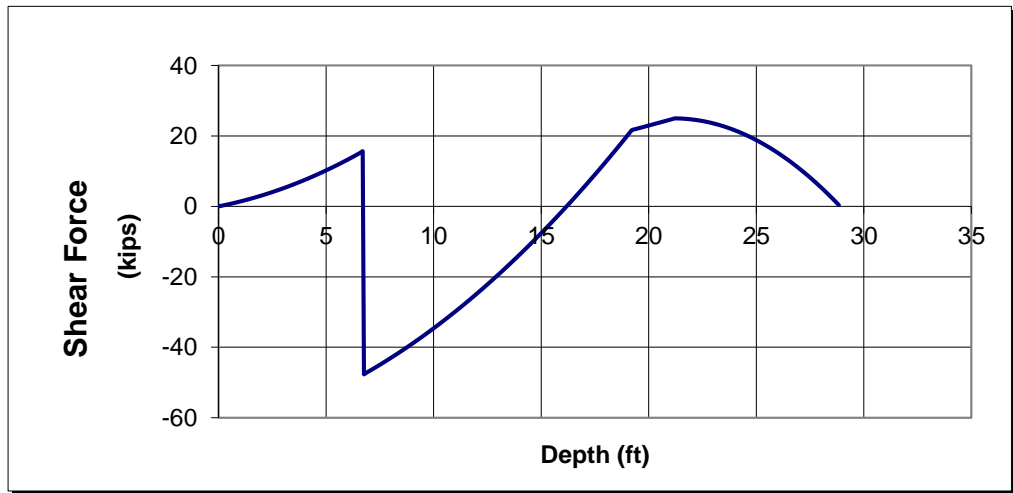
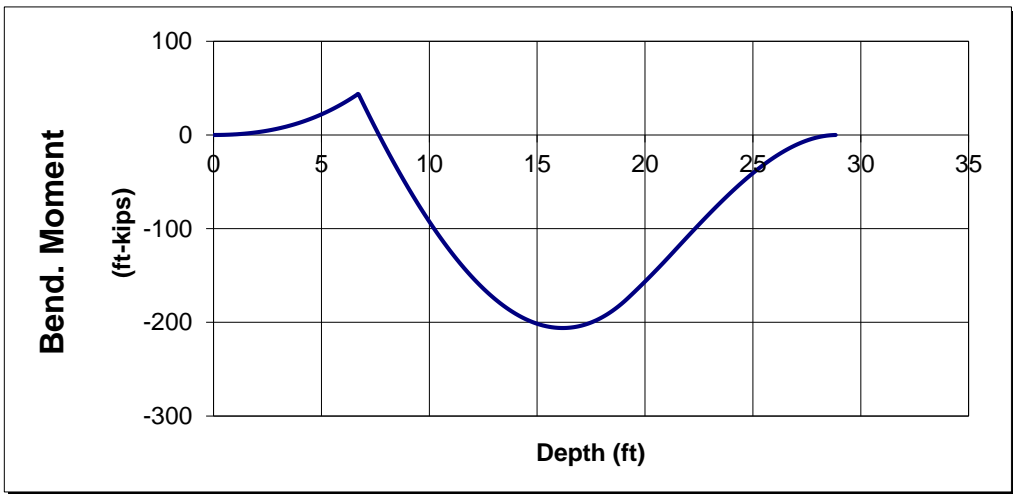


APPENDIX B  
SOLDIER PILE DESIGN

		Soldier Beam Loads-Below Anchor 1					Pile Vertical Load Analysis					Toe Dist. Depth (ft)		2		Pile Vertical Punching Analysis									
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 <sup>2</sup> )	Pile Skin Area (ft <sup>2</sup> /ft)	Pile End Bear (ksf)	Pile Skin Frict (ksf)	End Bearing (kips)	Skin Friction (klf)	Axial Load (kips)	Embed Length (ft)	Pile Depth (in)	Pile Flange (in)	Pile End Area (ft <sup>2</sup> )	Pile Skin Area (ft <sup>2</sup> /ft)	Pile End Bear (ksf)	Pile Skin Frict (ksf)	Bearing (kips)	Skin Friction (klf)	Axial Load (kips)	Embed Length (ft)
N1	W14x34	0	104	6.07	W14x34	0.76	2.00	3.14	6.28	10.00	2.00	31.4	12.6	0	0.0	14	6.75	0.66	3.46	10	3.6	0.0	12.5	0	0.0
N2	W14x34	26	35	6.49	W14x34	0.30	2.00	3.14	6.28	10.00	0.50	31.4	3.1	26	0.1	14	6.75	0.66	3.46	10	3.6	6.6	12.5	26	1.5
N3	W14x34	40	96	9.50	W14x34	0.78	2.00	3.14	6.28	10.00	0.50	31.4	3.1	40	4.7	14	6.75	0.66	3.46	10	3.6	6.6	12.5	40	2.7
N4	W14x34	42	97	9.50	W14x34	0.80	2.00	3.14	6.28	10.00	0.50	31.4	3.1	42	5.3	14	6.75	0.66	3.46	10	3.6	6.6	12.5	42	2.8
N5	W14x34	44	98	9.50	W14x34	0.80	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0	14	6.75	0.66	3.46	10	3.6	6.6	12.5	44	3.0
N6	W14x34	46	99	9.50	W14x34	0.81	2.00	3.14	6.28	10.00	2.00	31.4	12.6	46	3.1	14	6.75	0.66	3.46	10	3.6	6.6	12.5	46	3.1
N7	W14x34	46	112	10.00	W14x34	0.91	2.00	3.14	6.28	10.00	2.00	31.4	12.6	46	3.2	14	6.75	0.66	3.46	10	3.6	6.6	12.5	46	3.2
N8	W14x34	40	113	10.00	W14x34	0.91	2.00	3.14	6.28	10.00	2.00	31.4	12.6	40	2.7	14	6.75	0.66	3.46	10	3.6	6.6	12.5	40	2.7
N9	W14x38	35	128	10.50	W14x38	0.90	2.00	3.14	6.28	10.00	2.00	31.4	12.6	35	2.3	14.1	6.77	0.66	3.48	10	3.6	6.6	12.5	35	2.2
N10	W14x43	32	147	11.00	W14x43	0.89	2.00	3.14	6.28	10.00	2.00	31.4	12.6	32	2.0	13.7	8	0.76	3.62	10	3.6	7.6	13.0	32	1.8
N11	W14x48	21	184	12.00	W14x48	0.98	2.00	3.14	6.28	10.00	2.00	31.4	12.6	31	1.9	13.8	8.03	0.77	3.64	10	3.6	7.7	13.1	31	1.8
N12	W14x53	30	206	12.50	W14x53	0.99	2.00	3.14	6.28	10.00	2.00	31.4	12.6	30	1.9	13.9	8.06	0.78	3.66	10	3.6	7.8	13.2	30	1.7
N13	W14x43	20	155	11.26	W14x43	0.92	2.00	3.14	6.28	10.00	2.00	31.4	12.6	20	1.1	13.7	8	0.76	3.62	10	3.6	7.6	13.0	20	1.0
N14	W14x34	13	81	8.88	W14x34	0.62	2.00	3.14	6.28	10.00	2.00	31.4	12.6	13	0.6	14	6.75	0.66	3.46	10	3.6	6.6	12.5	13	0.6
N15	W14x34	10	55	7.70	W14x34	0.42	2.00	3.14	6.28	10.00	2.00	31.4	12.6	10	0.3	14	6.75	0.66	3.46	10	3.6	6.6	12.5	10	0.3
N16	W14x34	11	55	7.70	W14x34	0.43	2.00	3.14	6.28	10.00	2.00	31.4	12.6	11	0.4	14	6.75	0.66	3.46	10	3.6	6.6	12.5	11	0.4
N17	W14x34	11	65	8.20	W14x34	0.50	2.00	3.14	6.28	10.00	2.00	31.4	12.6	11	0.4	14	6.75	0.66	3.46	10	3.6	6.6	12.5	11	0.4
N18	W14x34	12	65	8.20	W14x34	0.50	2.00	3.14	6.28	10.00	2.00	31.4	12.6	12	0.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	12	0.4
N19	W14x34	12	76	8.70	W14x34	0.58	2.00	3.14	6.28	10.00	2.00	31.4	12.6	12	0.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	12	0.5
N20	W14x34	13	77	8.70	W14x34	0.59	2.00	3.14	6.28	10.00	2.00	31.4	12.6	13	0.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	13	0.5
N21	W14x34	13	88	9.20	W14x34	0.67	2.00	3.14	6.28	10.00	2.00	31.4	12.6	13	0.6	14	6.75	0.66	3.46	10	3.6	6.6	12.5	13	0.5
E1	W14x34	39	89	9.20	W14x34	0.73	2.00	3.14	6.28	10.00	2.00	31.4	12.6	39	2.6	14	6.75	0.66	3.46	10	3.6	6.6	12.5	39	2.6
E2	W14x34	39	89	9.20	W14x34	0.73	2.00	3.14	6.28	10.00	2.00	31.4	12.6	39	2.6	14	6.75	0.66	3.46	10	3.6	6.6	12.5	39	2.6
E3	W14x34	39	89	9.20	W14x34	0.73	2.00	3.14	6.28	10.00	2.00	31.4	12.6	39	2.6	14	6.75	0.66	3.46	10	3.6	6.6	12.5	39	2.6
E4	W14x34	38	89	9.20	W14x34	0.72	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.6	14	6.75	0.66	3.46	10	3.6	6.6	12.5	38	2.6
E5	W14x34	37	86	9.20	W14x34	0.70	2.00	3.14	6.28	10.00	2.00	31.4	12.6	37	2.4	14	6.75	0.66	3.46	10	3.6	6.6	12.5	37	2.4
E6	W14x34	36	83	9.20	W14x34	0.67	2.00	3.14	6.28	10.00	2.00	31.4	12.6	36	2.3	14	6.75	0.66	3.46	10	3.6	6.6	12.5	36	2.3
E7	W14x34	36	85	9.20	W14x34	0.70	2.00	3.14	6.28	10.00	2.00	31.4	12.6	36	2.4	14	6.75	0.66	3.46	10	3.6	6.6	12.5	36	2.4
E8	W14x34	37	88	9.20	W14x34	0.72	2.00	3.14	6.28	10.00	2.00	31.4	12.6	37	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	37	2.5
E9	W14x34	37	88	9.20	W14x34	0.71	2.00	3.14	6.28	10.00	2.00	31.4	12.6	37	2.4	14	6.75	0.66	3.46	10	3.6	6.6	12.5	37	2.4
E10	W14x34	37	90	9.20	W14x34	0.74	2.00	3.14	6.28	10.00	2.00	31.4	12.6	37	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	37	2.5
E11	W14x34	38	93	9.20	W14x34	0.76	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	38	2.5
E12	W14x34	37	93	9.20	W14x34	0.75	2.00	3.14	6.28	10.00	2.00	31.4	12.6	37	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	37	2.5
E13	W14x34	38	82	8.70	W14x34	0.67	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	38	2.5
E14	W14x34	38	81	8.70	W14x34	0.67	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	38	2.5
E15	W14x34	38	81	8.70	W14x34	0.67	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	38	2.5
E16	W14x34	38	81	8.70	W14x34	0.67	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	38	2.5
E17	W14x34	38	81	8.70	W14x34	0.67	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	38	2.5
E18	W14x34	35	78	8.90	W14x34	0.64	2.00	3.14	6.28	10.00	2.00	31.4	12.6	35	2.3	14	6.75	0.66	3.46	10	3.6	6.6	12.5	35	2.3
E19	W14x34	33	78	9.15	W14x34	0.64	2.00	3.14	6.28	10.00	2.00	31.4	12.6	33	2.2	14	6.75	0.66	3.46	10	3.6	6.6	12.5	33	2.2
E20	W14x34	35	87	9.42	W14x34	0.71	2.00	3.14	6.28	10.00	2.00	31.4	12.6	35	2.3	14	6.75	0.66	3.46	10	3.6	6.6	12.5	35	2.3
E21	W14x34	37	97	9.69	W14x34	0.78	2.00	3.14	6.28	10.00	2.00	31.4	12.6	37	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	37	2.5
E22	W14x34	40	96	9.48	W14x34	0.78	2.00	3.14	6.28	10.00	2.00	31.4	12.6	40	2.7	14	6.75	0.66	3.46	10	3.6	6.6	12.5	40	2.7
E23	W14x34	41	104	9.77	W14x34	0.84	2.00	3.14	6.28	10.00	2.00	31.4	12.6	41	2.8	14	6.75	0.66	3.46	10	3.6	6.6	12.5	41	2.8
E24	W14x34	39	104	10.05	W14x34	0.84	2.00	3.14	6.28	10.00	2.00	31.4	12.6	39	2.6	14	6.75	0.66	3.46	10	3.6	6.6	12.5	39	2.6
E25	W14x34	38	104	10.20	W14x34	0.84	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	38	2.6
E26	W14x34	39	93	9.70	W14x34	0.76	2.00	3.14	6.28	10.00	2.00	31.4	12.6	39	2.6	14	6.75	0.66	3.46	10	3.6	6.6	12.5	39	2.6
E27	W14x34	38	92	9.70	W14x34	0.75	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.5	14	6.75	0.66	3.46	10	3.6	6.6	12.5	38	2.5
E28	W14x34	39	96	9.70	W14x34	0.78	2.00	3.14	6.28	10.00	2.00	31.4	12.6	39	2.6	14	6.75	0.66	3.46	10	3.6	6.6	12.5	39	2.6
E29	W14x34	38	95	9.70	W14x34	0.77	2.00	3.14	6.28	10.00	2.00	31.4	12.6	38	2.6	14	6.75	0.66	3.46	10	3.6	6.6	12.5	38	2.6
E30	W14x34	35	88	9.70	W14x34	0.71	2.00	3.14	6.28	10.00	2.00	31.4	12.6	35	2.3	14	6.75	0.66	3.46	10	3.6	6.6	12.5	35	2.3
S1	W14x34	44	96	9.20	W14x34	0.79	2.00	3.14	6.28	10.00	2.00	31.4	12.6	44	3.0	14	6.75	0.66	3.46	10	3.6	6.6	12.5	44	3.0
S2	W14x34	48	72	8.20	W14x34	0.62	2.00	3.14	6.28	10.00	2.00	31.4	12.6	48	3.3	14	6.75	0.66	3.46	10					

Pile ID	Station (ft)	Height (ft)	Spacing (ft)	No. Anchors	L=NH <sup>2</sup> N (psf/ft)	Unif. Press. P (psf)	Design Beam	Pile Top Elevation (feet)	Pile Toe Embed (feet)	Pile Toe Elevation (feet)	Pile Length (feet)	Lagging Pressure (psf)	Soldier Beam - Flexure/Compression				
													Axial Load (kips)	Moment (ft-kips)	Free Length (feet)	Steel Section	Flex/Ax Ratio
W1	4	7.4	8.25	0	21	100	W14x34	83.0	14.6	60.0	23.0	410	0	132	7.38	W14x34	0.97
W2	12.5	7.1	8.25	0	21	100	W14x34	82.0	14.2	60.0	22.0	399	0	122	7.13	W14x34	0.89
W3	20.5	6.9	8.25	0	21	100	W14x34	82.0	13.9	60.0	22.0	389	0	112	6.89	W14x34	0.82
W4	29	6.6	8.25	0	21	100	W14x34	82.0	13.5	61.0	21.0	378	0	103	6.63	W14x34	0.75
W5	37	6.4	8.25	0	21	100	W14x34	82.0	13.1	61.0	21.0	368	0	94	6.39	W14x34	0.69
W6	45.5	6.1	8.25	0	21	100	W14x34	81.0	12.6	62.0	19.0	355	0	84	6.06	W14x34	0.61
W7	53.5	5.6	8.25	0	21	100	W14x34	81.0	11.9	63.0	18.0	336	0	71	5.62	W14x34	0.52
W8	62	5.3	8.25	0	21	100	W14x34	81.0	11.3	64.0	17.0	322	0	61	5.28	W14x34	0.45
W9	70	5.0	8.25	0	21	100	W14x34	81.0	10.8	64.0	17.0	308	0	54	4.96	W14x34	0.39
W10	78.5	4.6	8.25	0	21	100	W14x34	81.0	10.3	65.0	16.0	294	0	46	4.62	W14x34	0.34
W11	86.5	4.3	8.25	0	21	100	W14x34	81.0	9.8	66.0	15.0	280	0	39	4.29	W14x34	0.29
W12	95	4.0	8.25	0	21	100	W14x34	81.0	9.3	67.0	14.0	266	0	33	3.95	W14x34	0.24
W13	103	3.8	8	0	21	100	W14x34	81.0	8.9	67.0	14.0	258	0	29	3.77	W14x34	0.21
W14	111	3.7	8.1	0	21	100	W14x34	81.0	8.9	67.0	14.0	257	0	29	3.74	W14x34	0.21
W15	119.2	3.7	7	0	21	100	W14x34	81.0	8.4	68.0	13.0	255	0	24	3.70	W14x34	0.18

TABLE B2  
SOLDIER PILE DESIGN - WEST WALL



Wall Height (ft) 19.2  
 Pile Spacing (ft) 8.00

FIGURE B1 SOLDIER BEAM - N12

Point	Depth	Pressure	Width	Force	Depth(CG)	Moment
A	0.00	0.0	8.00	$F_{AB}$ 62027	12.81	997772
B	19.21	807.0	8.00	$F_{BC}$ 0	0.00	0
C	19.21	807.0	8.00	$F_{CD}$ 0	0.00	0
D	19.21	0.0	8.00	$F_{AD}$ 62027	12.81	
E	19.21	0.0	2.00	$F_{EF}$ 17594	24.24	81992
F	19.21	807.0	2.00			
G	28.90	1010.3	2.00			
H	21.21	0.0	5.00	$F_{GH}$ 0	0.00	0
I	21.21	-350.0	5.00	$F_{HI}$ -39256	25.90	-117722
J	28.90	-1694.2	5.00	$F_{IJ}$ 0	0.00	0
K	28.90	-1694.2	5.00	$F_{JK}$ 0	0.00	0
L	28.90	-1694.2	5.00	$F_{GK}$ -39256	25.90	
M	0.00	0.0	8.00	$F_{LM}$ 23058	9.61	444752
N	0.00	150.0	8.00			
O	19.21	150.0	8.00	$F_{NO}$ 0	0.00	0
P	19.21	0.0	8.00			
Q	0.00	0.0	8.00	$F_{PQ}$ 0	0.00	0
R	0.00	0.0	8.00			
S	0.00	0.0	8.00	$F_{RS}$ 0	0.00	0
T	0.00	0.0	8.00			
U	19.21	0.0	8.00	$F_{TU}$ 0	0.00	0
V	19.21	0.0	8.00	$F_{UV}$ 0	0.00	0
W	19.21	0.0	8.00	$F_{VW}$ 0	0.00	0
X	28.90	0.0	8.00	$F_{TW}$ 0	0.00	0
Y	28.90	0	8.00			
Z	0.00	0.0	8.00			
Anchor 1	63422	6.71	1406795			
Anchor 2	0	0.00	0			
Anchor 3	0	0.00	0			
Anchor 4	0	0.00	0			
Load 1	0	0.00	0			
$\Sigma$ Forces	0	$\Sigma$ Moments	0			

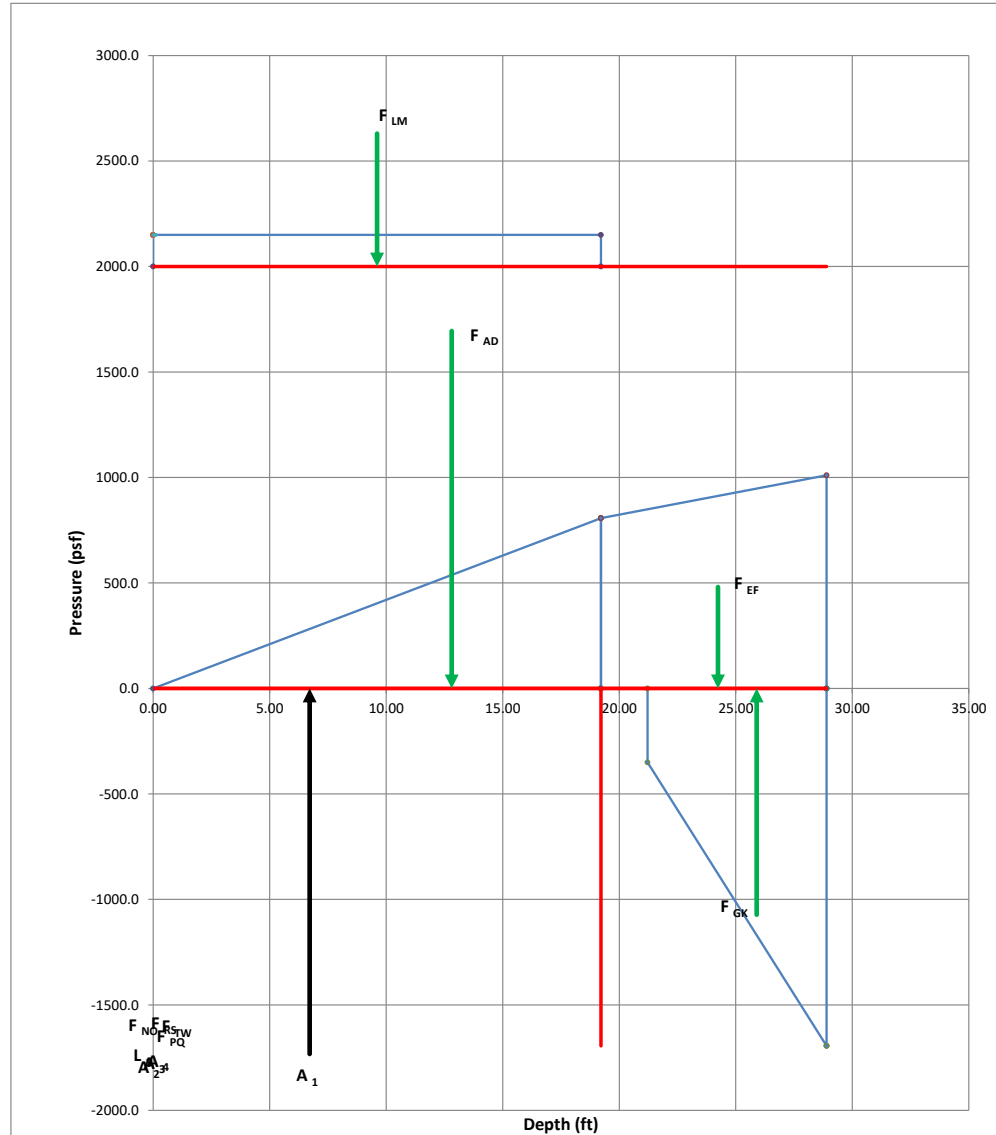
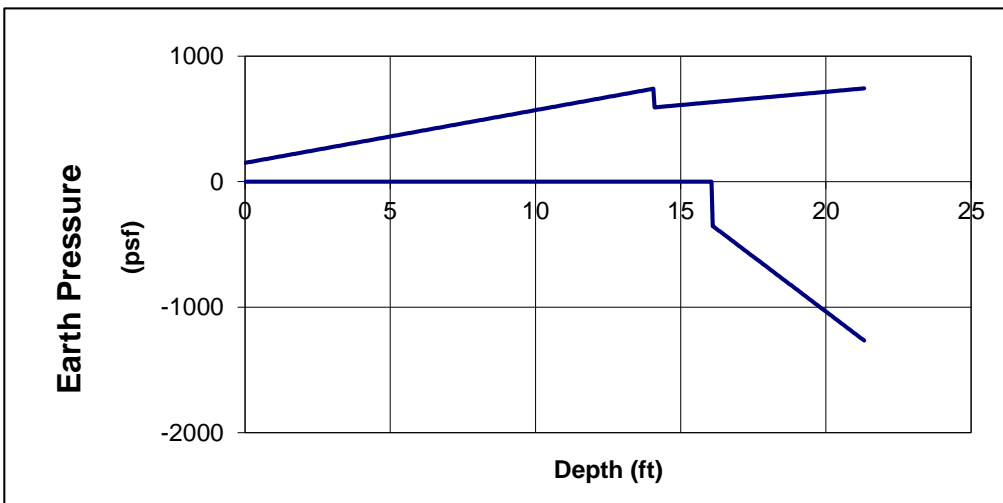
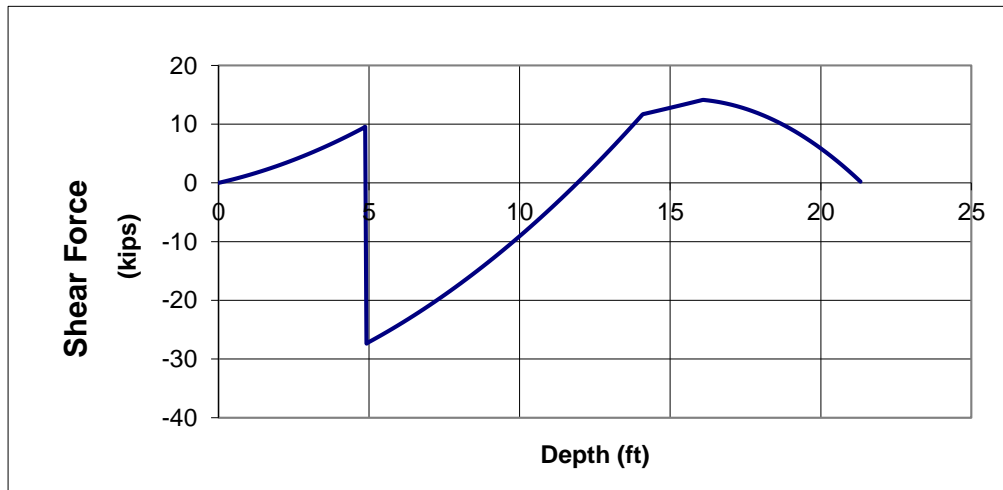
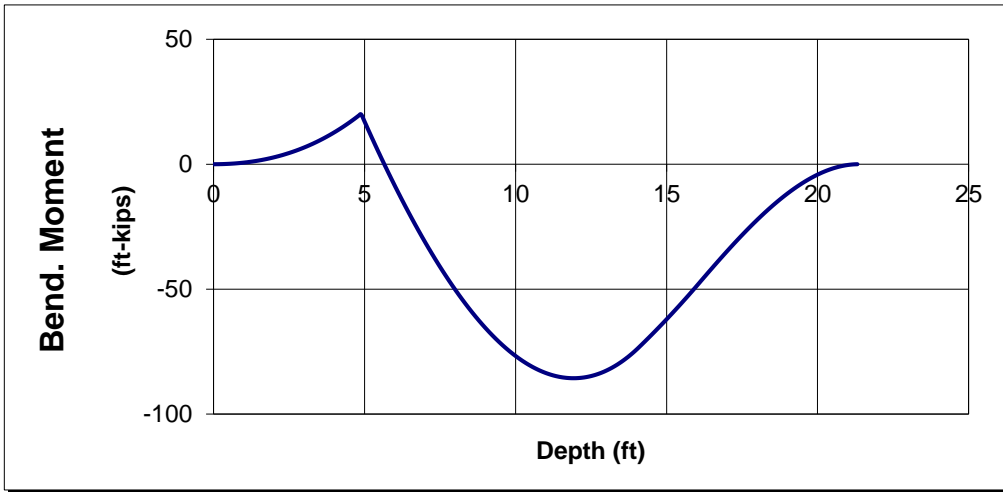
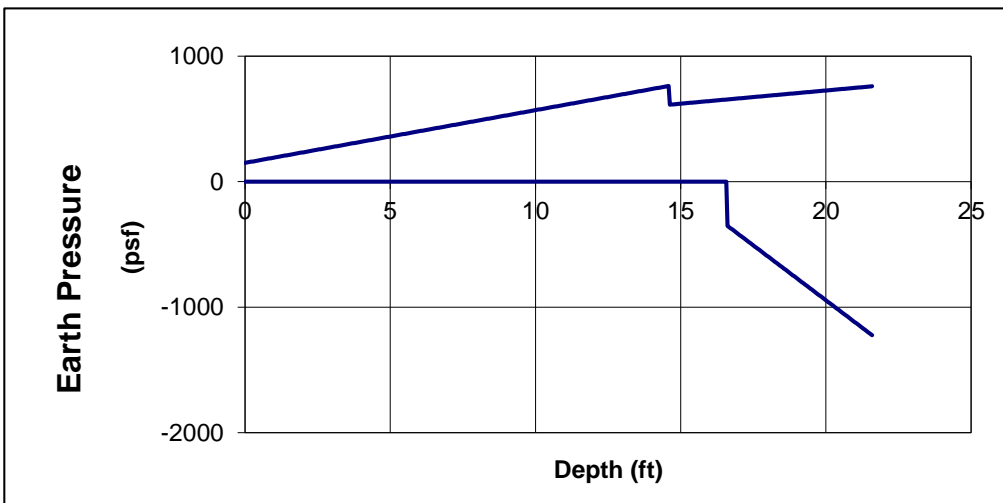
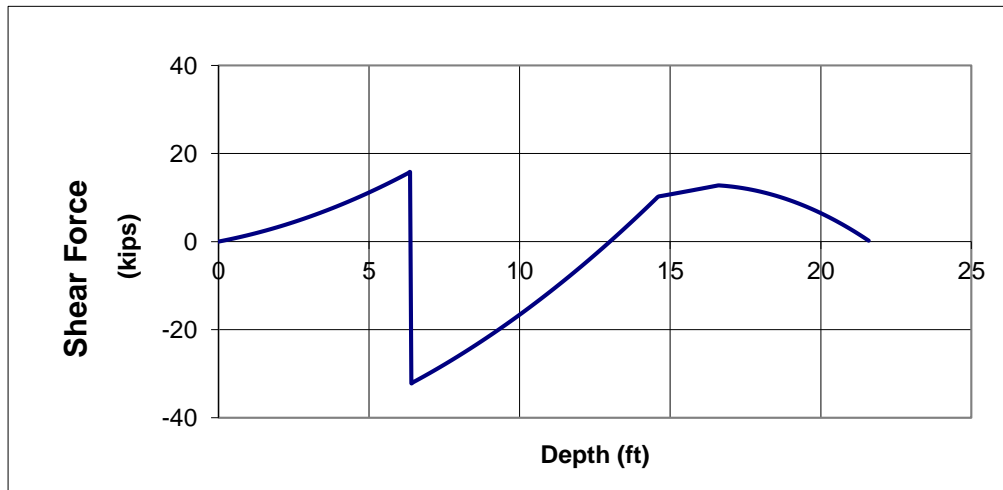
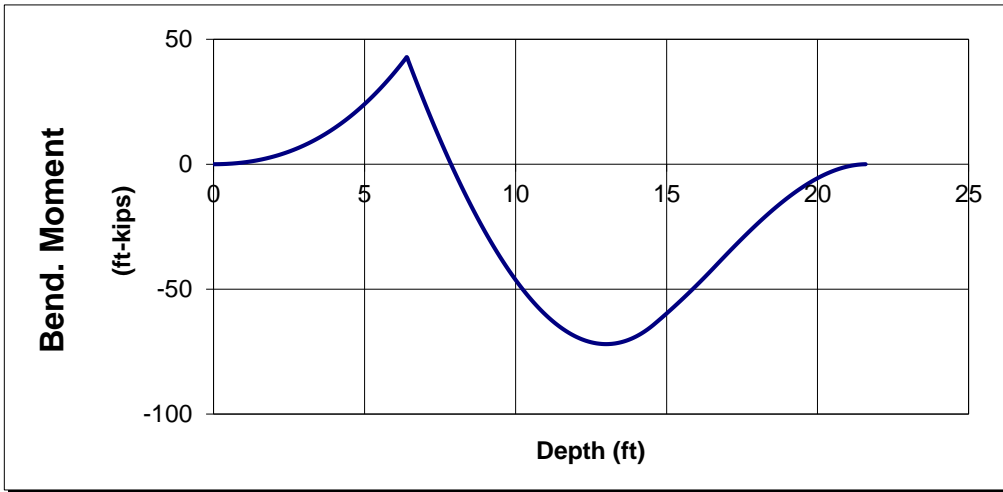


FIGURE B1 (cont'd) SOLDIER BEAM - N12



Wall Height (ft) 14.1  
 Pile Spacing (ft) 7.75

FIGURE B2 SOLDIER BEAM - E5



Wall Height (ft) 14.6  
 Pile Spacing (ft) 8.75

FIGURE B3 SOLDIER BEAM - S2

		Wall Height (ft)	9.44								
		Depth of Embed (ft)	17.20								
		Depth to Top of Passive (ft)	11.44								
		Force	p (psf)	$K\gamma$ (psf)	h (ft)	w (ft)	phw (lb/ft)	$K\gamma h^2w/2$ (lb/ft)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	A1		150.0		9.44	8.00	11325		4.72	21.92	248190
	A2			42.0	9.44	8.00		14963	6.29	20.34	304385
	A3		396.4		17.20	2.50	17041		18.04	8.60	146519
	A4			21.0	17.20	2.50		7763	20.90	5.73	44496
Resisting	P1		350.0		15.20	6.25	33242		19.04	7.60	252582
	P2			175.0	15.20	6.25		126291	21.57	5.07	639726
	P3		0.0		0.00	6.25	0		26.63	0.00	0
	P4			0.0	0.00	6.25		0	26.63	0.00	0

**Moments about pile toe**

Sum of resisting moments (ft-lbf)	892308
Sum of driving moments (ft-lbf)	743590
FS	1.20

Depth to Zero Shear (ft) at "M" 17.85

		Force	p (psf)	$K\gamma$ (psf)	h (ft)	w (ft)	phw (lb/ft)	$K\gamma h^2w/2$ (lb/ft)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	a1		150.0		9.44	8.00	11325		4.72	13.13	148664
	a2			42.0	9.44	8.00		14963	6.29	11.55	172886
	a3		396.4		8.41	2.50	8332		13.64	4.20	35029
	a4			21.0	8.41	2.50		1856	15.04	2.80	5202
Resisting	p1		350.0		6.41	6.25	14018		14.64	3.20	44916
	p2			175.0	6.41	6.25		22458	15.71	2.14	47972
	p3		0.0		0.00	6.25	0		0.00	17.85	0
	p4			0.0	0.00	6.25		0	0.00	17.85	0

**Moments at Zero Shear Point**

Sum of shear forces (lb/ft) at "M"	0
Sum of moments (ft-lbf) at "M"	268892

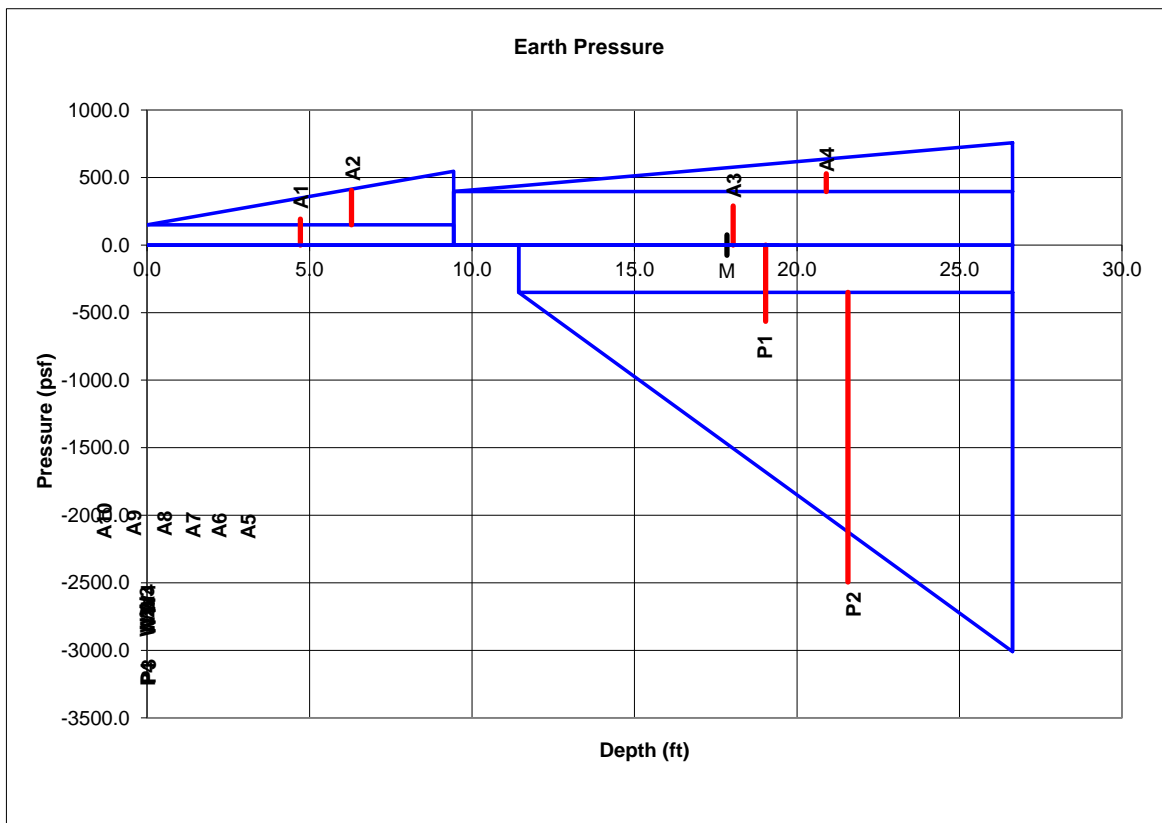


FIGURE B4 SOLDIER BEAM - S10



		Wall Height (ft)	7.38								
		Depth of Embed (ft)	14.63								
		Depth to Top of Passive (ft)	9.38								
		Force	p (psf)	$K\gamma$ (psf)	h (ft)	w (ft)	phw (lb/ft)	$K\gamma h^2 w/2$ (lb/ft)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	A1		100.0		7.38	8.25	6089		3.69	18.32	111530
	A2			42.0	7.38	8.25		9436	4.92	17.09	161242
	A3	310.0			14.63	2.00	9068		14.69	7.31	66325
	A4			21.0	14.63	2.00		4494	17.13	4.88	21911
Resisting	P1	350.0			12.63	5.00	22099		15.69	6.31	139534
	P2			175.0	12.63	5.00		69767	17.80	4.21	293675
	P3	0.0			0.00	5.00	0		22.01	0.00	0
	P4			0.0	0.00	5.00		0	22.01	0.00	0

**Moments about pile toe**

Sum of resisting moments (ft-lbf)	433209
Sum of driving moments (ft-lbf)	361008
FS	1.20

		Depth to Zero Shear (ft) at "M"	14.61								
		Force	p (psf)	$K\gamma$ (psf)	h (ft)	w (ft)	phw (lb/ft)	$K\gamma h^2 w/2$ (lb/ft)	depth (ft)	moment arm (ft)	moment (ft-lbf)
Driving	a1		100.0		7.38	8.25	6089		3.69	10.92	66469
	a2			42.0	7.38	8.25		9436	4.92	9.69	91408
	a3	310.0			7.23	2.00	4480		10.99	3.61	16190
	a4			21.0	7.23	2.00		1097	12.20	2.41	2642
Resisting	p1	350.0			5.23	5.00	9148		11.99	2.61	23908
	p2			175.0	5.23	5.00		11954	12.86	1.74	20829
	p3	0.0			0.00	5.00	0		0.00	14.61	0
	p4			0.0	0.00	5.00		0	0.00	14.61	0

**Moments at Zero Shear Point**

Sum of shear forces (lb/ft) at "M"	0
Sum of moments (ft-lbf) at "M"	131973

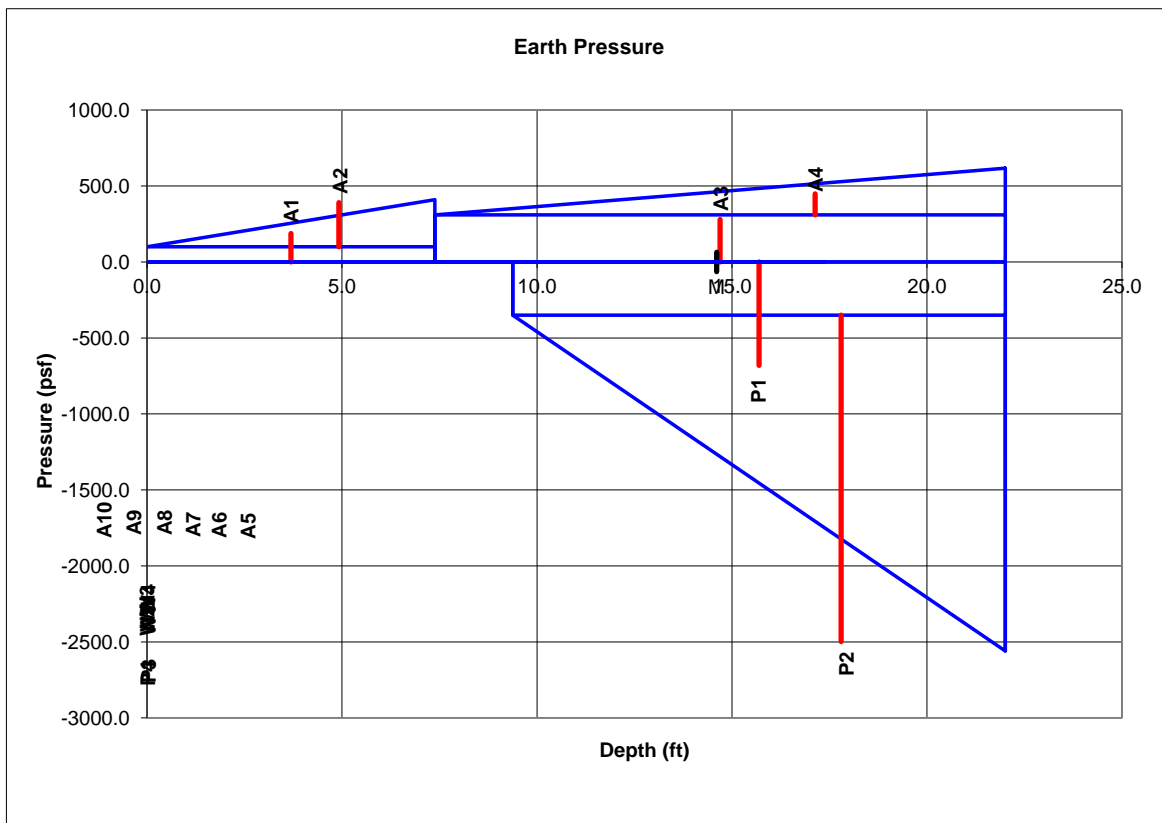


FIGURE B5 SOLDIER BEAM - W1

APPENDIX C  
SOLDIER PILE DESIGN – STAGE 1 CANTILEVER

Pile ID	Station (ft)	Height (ft)	Spacing (ft)	No. Anchors	L=NH <sup>2</sup> N (psf/ft)	Unif. Press. P (psf)	Design Beam	Pile Top Elevation (feet)	Pile Toe Embed (feet)	Pile Toe Elevation (feet)	Pile Length (feet)	Lagging Pressure (psf)	Soldier Beam - Flexure/Compression				
													Axial Load (kips)	Moment (ft-kips)	Free Length (feet)	Steel Section	Flex/Ax Ratio
N2	124	6.1	8	0	21	75	W14x34	83.3	11.9	65.0	18.3	332	0	71	6.12	W14x34	0.52
N3	132	7.0	8	0	21	75	W14x34	83.5	13.2	63.3	20.3	368	0	97	6.97	W14x34	0.71
N4	140	7.3	8	0	21	75	W14x34	84.0	13.8	62.5	21.5	383	0	109	7.33	W14x34	0.80
N5	148	7.7	8	0	21	75	W14x34	84.3	14.3	62.0	22.3	397	0	122	7.66	W14x34	0.89
N6	156	7.9	8	0	21	75	W14x34	84.5	14.7	61.8	22.8	407	0	132	7.92	W14x34	0.97
N7	164	7.7	8	0	21	75	W14x34	84.8	14.3	62.5	22.3	397	0	122	7.67	W14x34	0.90
N8	172	7.9	8	0	21	75	W14x34	85.0	14.7	62.3	22.8	408	0	133	7.93	W14x34	0.97
N9	180	7.9	8	0	21	75	W14x34	85.5	14.7	62.8	22.8	408	0	133	7.93	W14x34	0.97
N10	188	8.4	8	0	21	75	W14x43	86.5	15.4	62.5	24.0	429	0	154	8.43	W14x43	0.89
N11	196	8.4	8	0	21	75	W14x38	87.5	15.3	63.5	24.0	426	0	151	8.36	W14x38	0.98
N12	204	8.7	8	0	21	75	W14x43	88.3	15.8	63.5	24.8	440	0	166	8.69	W14x43	0.96
N13	212	8.3	8	0	21	75	W14x38	88.5	15.2	64.8	23.8	423	0	148	8.28	W14x38	0.96
N14	220	6.9	8	0	21	75	W14x34	88.5	13.1	68.3	20.3	363	0	93	6.85	W14x34	0.68
N15	228	6.0	8	0	21	75	W14x34	88.8	11.8	70.5	18.3	328	0	69	6.02	W14x34	0.50
N16	236	6.4	8	0	21	75	W14x34	89.0	12.4	70.0	19.0	343	0	79	6.39	W14x34	0.58
N17	244	6.3	8	0	21	75	W14x34	89.5	12.2	70.8	18.8	338	0	75	6.26	W14x34	0.55
N18	252	6.6	8	0	21	75	W14x34	89.8	12.7	70.3	19.5	353	0	86	6.63	W14x34	0.63
N19	260	6.5	8	0	21	75	W14x34	90.0	12.5	70.8	19.3	348	0	82	6.50	W14x34	0.60
N20	268	6.8	8	0	21	75	W14x34	90.5	13.0	70.5	20.0	360	0	91	6.79	W14x34	0.67
N21	276	6.6	8	0	21	75	W14x34	90.8	12.7	71.3	19.5	352	0	85	6.59	W14x34	0.62
E1	304	7.1	8	0	21	75	W14x34	91.3	13.4	70.5	20.8	372	0	101	7.08	W14x34	0.74
E2	312	7.0	8	0	21	75	W14x34	91.3	13.3	70.5	20.8	370	0	99	7.03	W14x34	0.73
E3	320	7.0	8	0	21	75	W14x34	91.0	13.3	70.5	20.5	368	0	97	6.98	W14x34	0.71
E4	328	6.9	8	0	21	75	W14x34	91.0	13.2	70.8	20.3	366	0	96	6.93	W14x34	0.70
E5	336	6.9	7.75	0	21	75	W14x34	91.0	12.9	71.0	20.0	364	0	91	6.89	W14x34	0.67
E6	343.5	6.8	7.5	0	21	75	W14x34	91.0	12.7	71.3	19.8	362	0	86	6.84	W14x34	0.63
E7	351	6.8	7.75	0	21	75	W14x34	91.0	12.8	71.0	20.0	360	0	88	6.79	W14x34	0.64
E8	359	6.7	8	0	21	75	W14x34	90.8	12.8	71.0	19.8	357	0	89	6.71	W14x34	0.65
E9	367	6.6	8	0	21	75	W14x34	90.8	12.7	71.3	19.5	353	0	86	6.62	W14x34	0.63
E10	375	6.5	8.25	0	21	75	W14x34	90.8	12.7	71.3	19.5	350	0	86	6.54	W14x34	0.63
E11	383.5	6.5	8.5	0	21	75	W14x34	90.5	12.7	71.3	19.3	346	0	87	6.45	W14x34	0.64
E12	392	6.4	8.5	0	21	75	W14x34	90.5	12.6	71.3	19.3	342	0	84	6.36	W14x34	0.61
E13	400.5	6.8	8.5	0	21	75	W14x34	90.5	13.2	70.3	20.3	359	0	97	6.77	W14x34	0.71
E14	409	6.7	8.5	0	21	75	W14x34	90.3	13.1	70.3	20.0	356	0	95	6.70	W14x34	0.69
E15	417.5	6.7	8.5	0	21	75	W14x34	90.3	13.1	70.3	20.0	356	0	95	6.70	W14x34	0.69
E16	426	6.7	8.5	0	21	75	W14x34	90.3	13.1	70.3	20.0	356	0	95	6.70	W14x34	0.69
E17	434.5	6.7	8.5	0	21	75	W14x34	90.3	13.1	70.3	20.0	356	0	95	6.70	W14x34	0.69
E18	443	6.7	7.75	0	21	75	W14x34	90.3	12.7	70.8	19.5	356	0	85	6.70	W14x34	0.62
E19	450	6.7	7.25	0	21	75	W14x34	90.3	12.3	71.0	19.3	356	0	78	6.69	W14x34	0.57
E20	457.5	6.7	7.5	0	21	75	W14x34	90.3	12.5	71.0	19.3	355	0	81	6.66	W14x34	0.59
E21	465	6.6	7.75	0	21	75	W14x34	90.3	12.6	70.8	19.5	353	0	83	6.63	W14x34	0.61
E22	473	7.1	8	0	21	75	W14x34	90.3	13.4	69.5	20.8	373	0	101	7.09	W14x34	0.74
E23	481	7.1	8	0	21	75	W14x34	90.3	13.4	69.5	20.8	371	0	100	7.06	W14x34	0.73
E24	489	7.0	7.5	0	21	75	W14x34	90.3	13.0	70.0	20.3	370	0	92	7.02	W14x34	0.67
E25	496	7.0	7.25	0	21	75	W14x34	90.0	12.8	70.0	20.0	368	0	87	6.98	W14x34	0.64
E26	503.5	7.4	7.25	0	21	75	W14x34	90.0	13.3	69.0	21.0	385	0	99	7.37	W14x34	0.73
E27	510.5	7.3	7.25	0	21	75	W14x34	90.0	13.2	69.3	20.8	380	0	96	7.27	W14x34	0.70
E28	518	7.2	7.5	0	21	75	W14x34	89.8	13.2	69.3	20.5	376	0	96	7.16	W14x34	0.70
E29	525.5	7.1	7.5	0	21	75	W14x34	89.8	13.0	69.3	20.5	371	0	93	7.06	W14x34	0.68
E30	533	6.9	7	0	21	75	W14x34	89.5	12.5	69.8	19.8	367	0	82	6.95	W14x34	0.60
S1	603	7.5	8.5	0	21	75	W14x34	89.5	14.3	67.5	22.0	389	0	124	7.48	W14x34	0.91
S2	611.5	8.4	8.75	0	21	75	W14x43	89.5	16.0	65.0	24.5	428	0	171	8.40	W14x43	0.98
S3	620.5	8.0	9	0	21	75	W14x43	89.0	15.5	65.5	23.5	410	0	155	7.98	W14x43	0.89
S4	629.5	7.6	9	0	21	75	W14x34	88.8	14.8	66.0	22.8	393	0	136	7.57	W14x34	1.00
S5	638.5	7.1	9	0	21	75	W14x34	88.3	14.1	66.8	21.5	375	0	119	7.15	W14x34	0.87
S6	647.5	7.7	9	0	21	75	W14x38	87.8	15.0	65.0	22.8	397	0	141	7.67	W14x38	0.92
S7	656.5	7.2	9	0	21	75	W14x34	87.3	14.2	65.8	21.5	376	0	119	7.17	W14x34	0.87
S8	665.5	6.7	9	0	21	75	W14x34	86.8	13.4	66.5	20.3	355	0	100	6.66	W14x34	0.73
S9	674.5	6.2	8.5	0	21	75	W14x34	85.8	12.3	67.0	18.8	334	0	78	6.17	W14x34	0.57

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