

# ***SHORING CALCCS***

New Single Family Residence  
5818 W Mercer Way  
Mercer Island, WA



Javid Abdi, PE, SE  
6810 NE 149<sup>th</sup> St.  
Kenmore, WA – 98028  
[Atlas.CSE@gmail.com](mailto:Atlas.CSE@gmail.com)  
206-427-7233

Project: 5818 W Mercer Way

By: JDA

Proj No: 269-2024

Date: 06/09/25

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### Summary

Use CivilTech shoring suite software to design shoring required for project.

Shoring will consist of:

- Temporary cantilevered soldier pile wall at the south face of the proposed structure (13' from the southern property line), ranging in retained height from 5' at the west to 14'-9" at the east
- Angled permanent soldier pile wall at the east side of the proposed structure, located along contour 210' (set back from the east property line 77' at the south and 58' at the north), and utilizing two rows of tieback anchors
- Permanent cantilevered soldier pile wall at the north portion of the eastern face of the proposed structure (58' from the east property line), ranging in retained height from 11' at the south to 6' at the north
- Temporary ecology blocks to retain a maximum of 5' to accommodate a grade change at the southeast corner of the proposed structure (15 LF along the south property line and 10 LF wrapping towards the north)

Shoring has been designed for the active, at-rest, passive, and seismic surcharge soil pressures defined by Cobal GeoSciences in their November 8, 2024 report; and tieback anchors have been sized using the allowable unit shaft resistance prescribed in the aforementioned report. Cantilevered soldier piles have been designed to limit deflection to a maximum of 1".

See pages 2-3 showing shoring design parameters from geotech.

See pages 4 - 39 showing pile designs (moment equilibrium, shear, moment, deflection), free body diagrams (soil pressures used), wall height, pile diameter, pile spacing, wall type, and minimum embedment.



**Subject:** Shoring Calculation Overview

**Project:** 5818 W Mercer Way

**Client:** CenterLine

Project No.: 269-2024

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reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and reducing slope erosion during construction.

Temporary cut slopes should be covered with visqueen to help reduce erosion during wet weather, and the slopes should be closely monitored until the permanent retaining systems or slope configurations are complete. Materials should not be stored or equipment operated within 10 feet of the top of any temporary cut slope.

Soil conditions may not be completely known from the geotechnical investigation. In the case of temporary cuts, the existing soil conditions may not be completely revealed until the excavation work exposes the soil. Typically, as excavation work progresses the maximum inclination of temporary slopes will need to be re-evaluated by the geotechnical engineer so that supplemental recommendations can be made. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable, to deal with unanticipated conditions, so that the project can proceed and required deadlines can be met.

If any variations or undesirable conditions are encountered during construction, we should be notified so that supplemental recommendations can be made. If room constraints or groundwater conditions do not permit temporary slopes to be cut to the maximum angles allowed by the WAC, temporary shoring systems may be required. The contractor should be responsible for developing temporary shoring systems, if needed. We recommend that Cobalt Geosciences and the project structural engineer review temporary shoring designs prior to installation, to verify the suitability of the proposed systems.

### **Soldier Pile Walls**

One or more temporary or permanent soldier pile walls with pressure treated timber (wood) or concrete lagging would be suitable to support the proposed excavations where and if required. If two pile walls are utilized, they should be spaced at least 10 feet apart.

Soldier piles typically consist of steel W or H-beams inserted into oversized drilled shafts, which are backfilled with structural concrete, lean mix {Controlled Density Fill (CDF)}, or a combination of lean mix to the base of the excavation and structural concrete below the excavation to anchor the soldier piles.

Due to the potential for local caving during drilling operations for the soldier pile holes due to soft soil conditions and shallow groundwater, consideration should be given to using slurry or drilling fluid to reduce the risk of caving of the pile holes during installation. If water is present within the pile hole at the time of soldier pile concrete placement, the concrete should be placed starting at the bottom of the hole with a tremie pipe and the column of concrete should be raised slowly to displace the water. Note that groundwater may be present near the toe of the pile along with fine grained soils at depth. Groundwater could cause local sloughing.

We recommend that soldier piles have a maximum spacing of eight feet on center. To account for arching effects, lateral loading on the lagging can be reduced by 50 percent. Unlagged excavation heights should not exceed three feet. No portion of the excavation should remain unsupported overnight. Lagging sections may be up to 6 feet in height depending on stability.

Cantilever soldier pile walls for this site may be designed based on an active lateral earth pressure of 35 pcf for level backslope conditions, provided the wall is unrestrained (not fixed; permitted to move at least 0.2 percent of the wall height). If the wall is restrained, we recommend a lateral earth pressure of 55 pcf. The pressure will act on the soldier pile width below the base of the excavation as well. All applicable surcharge pressures should be included, where anticipated or shown (buildings, construction traffic). An increase in the above pressures is necessary if sloping

backslope conditions will be present. This increase can be calculated using an increase of 0.75 pcf per degree of slope. This would result in active and at-rest pressures of 52 and 72 pcf for a 2H:1V slope and pressures of 45 and 65 pcf for a 30 percent slope.

A lateral uniform seismic pressure of 7H is recommended for seismic conditions (active). An at-rest pressure of 14H may be used if the wall is restrained. Note that seismic conditions may not be required for a temporary system.

In front of the soldier piles, resistive pressure can be estimated using an allowable passive earth pressure of 250 pcf acting over 2 times the soldier pile diameter, neglecting the upper 2 feet below the base of the excavation (upper 8 feet), and a pressure of 300 pcf below 8 feet. A factor of safety of 1.5 has been incorporated into the passive pressure value.

A lateral pressure reduction of 50 percent may be used for design of the lagging for a pile spacing of three diameters. Lagging should be backfilled with 5/8 inch clean angular rock to minimize void spaces.

The shoring system and any nearby existing structures, including roadways, should be monitored for movement during construction (if present). A system of survey points should be established prior to commencing with the excavation activities. Readings should be taken periodically (weekly) until the permanent wall is in place and these readings should be compared to the original baseline measurements.

Permanent pile walls will also require special and specific modifications to increase their design life. This can include pile upsizing, various coatings, and use of concrete lagging in lieu of pressure treated timbers.

### **Tieback Anchors**

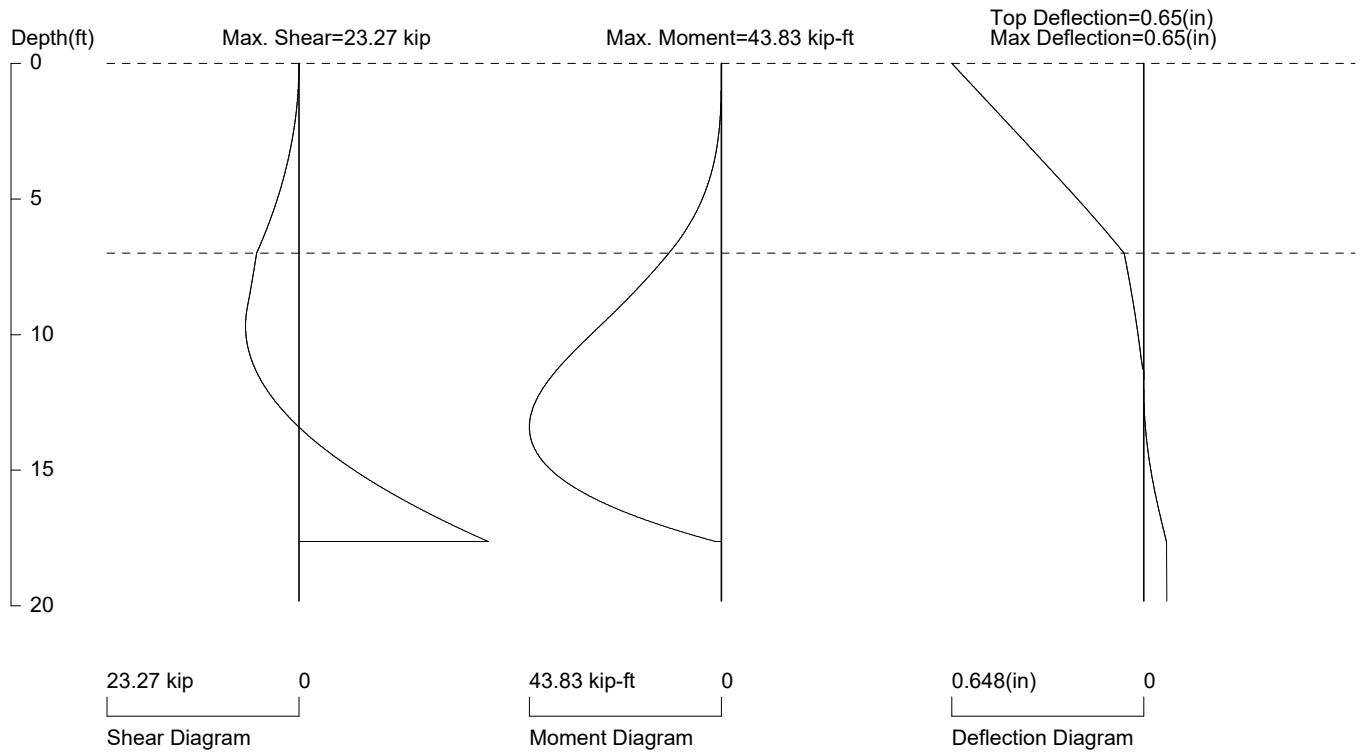
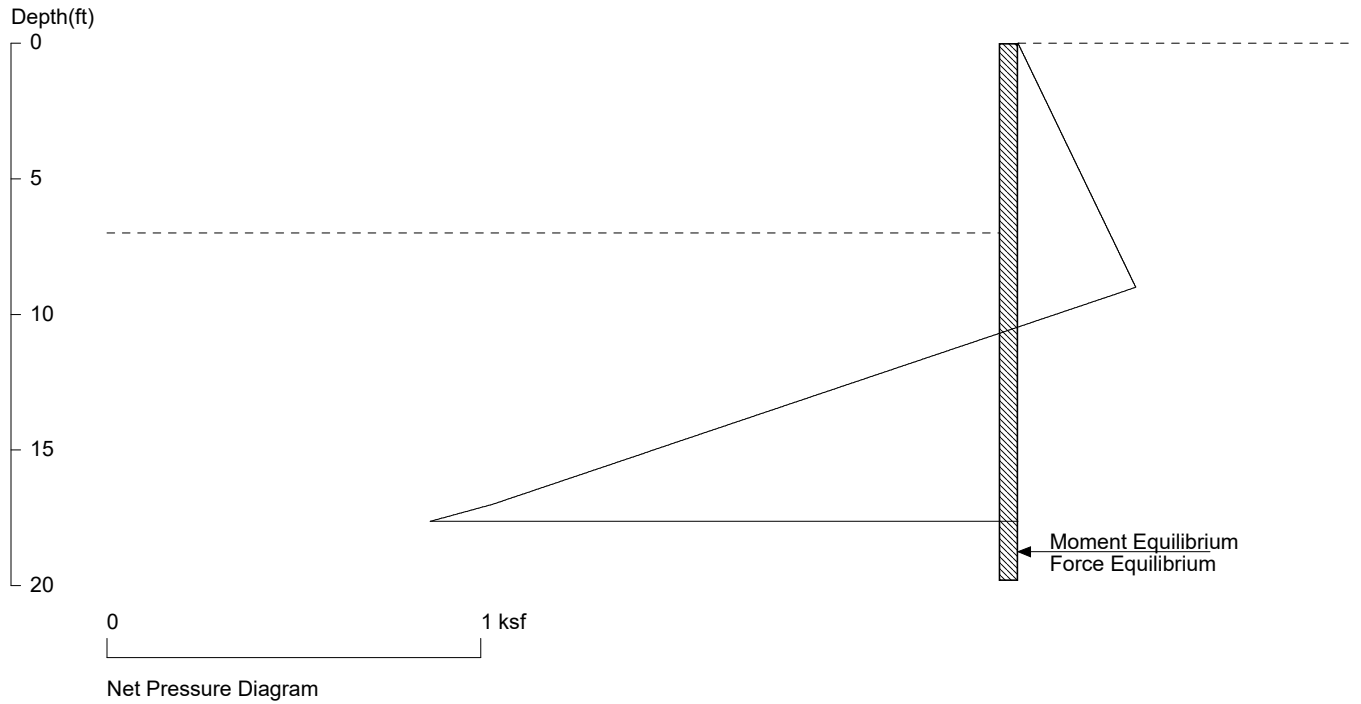
If tieback anchors are used, the following recommendations may apply:

The tieback anchors along bond length can be designed for an allowable unit shaft resistance of 3.0 kips per lineal foot of anchor bond length assuming a minimum 6 inch pressure-grouted tieback with post grouting. We note that this value is higher than our initially recommended value of 1.5 kips per foot. The shoring contractor may be able to achieve this value with specific boring techniques used to 'roughen' the silt deposits to increase friction. Additional post grouting and larger diameter holes with dywidag bars instead of tendons are intended to increase the soil to concrete/anchor adhesion value.

The bonded length is that portion of the anchor that extends beyond the no load zone. Within the no load zone, anchors should be sleeved and left ungrouted to prevent load pickup in this region. The bonded length should be at least 12 feet. To improve the performance of the tieback wall, it may be necessary to install the uppermost row of tiebacks no greater than 9 feet below the top of the piles unless beams of sufficient size are used to limit the deflections.

The manner in which the tieback anchors carry load will depend on the type of anchor selected, the method of installation, and the soil conditions surrounding the anchor. Accordingly, we recommend use of a performance specification requiring the shoring contractor to install anchors capable of satisfactorily achieving the design structural loads, with a pullout resistance factor of safety of at least 2. Permanent anchors require additional consideration. We can provide additional final design information if this option is selected.

# S1 -S2 (7 ft @ 6 ft oc)



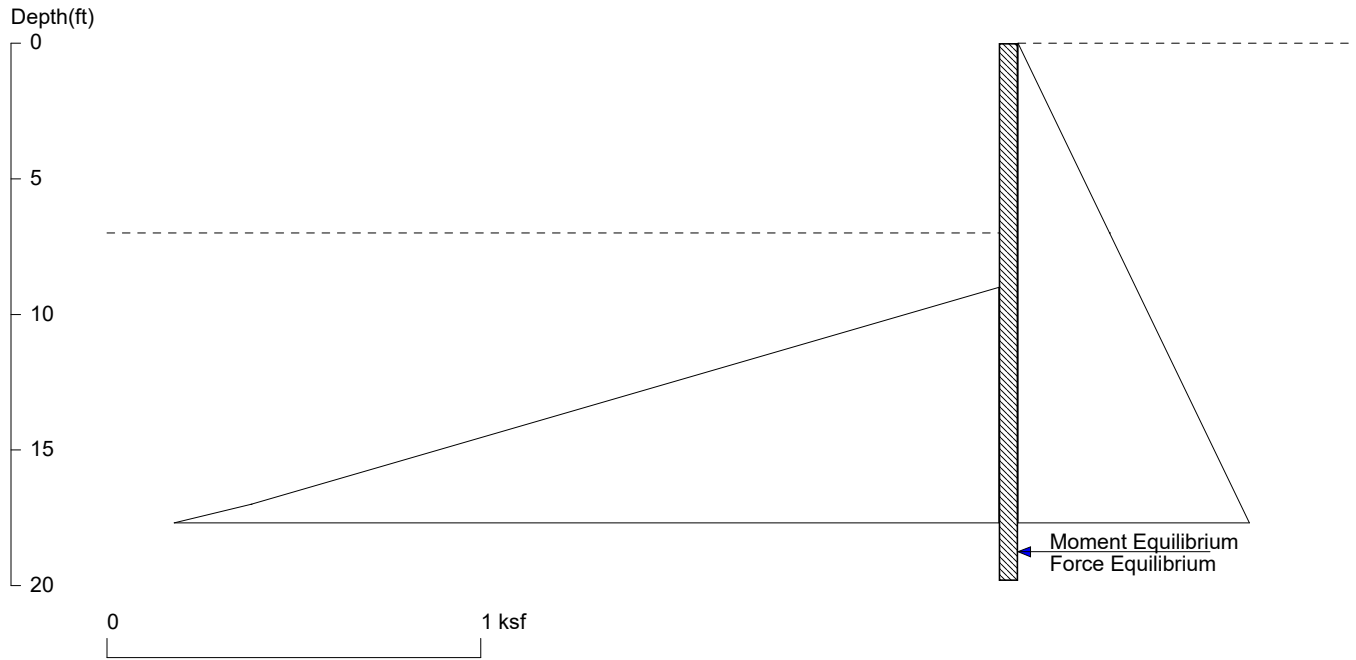
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 6.0 foot or meter

User Input Pile, W12X16: E (ksi)=29000.0, I (in4)/pile=103.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S1-S2\_7 ft @ 6 ft oc (Cant).SH8

# S1 -S2 (7 ft @ 6 ft oc)



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File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S1-S2\_7 ft @ 6 ft oc (Cant).SH8

Wall Height=7.0

Pile Diameter=2.0

Pile Spacing=6.0

Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=12.82 Min. Pile Length=19.82

MOMENT IN PILE: Max. Moment=43.83 per Pile Spacing=6.0 at Depth=13.42

## PILE SELECTION:

Request Min. Section Modulus = 15.9 in<sup>3</sup>/pile=261.17 cm<sup>3</sup>/pile, F<sub>y</sub>= 50 ksi = 345 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W12X16 has Section Modulus = 17.1 in<sup>3</sup>/pile=280.22 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.65(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=103.0

## DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	7	0.245	.035
*	Below	Base		
7	.245	100	3.500	.035

## PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
9	0	17	2.000	.25
17	2	200	56.90	.3

## ACTIVE SPACING:

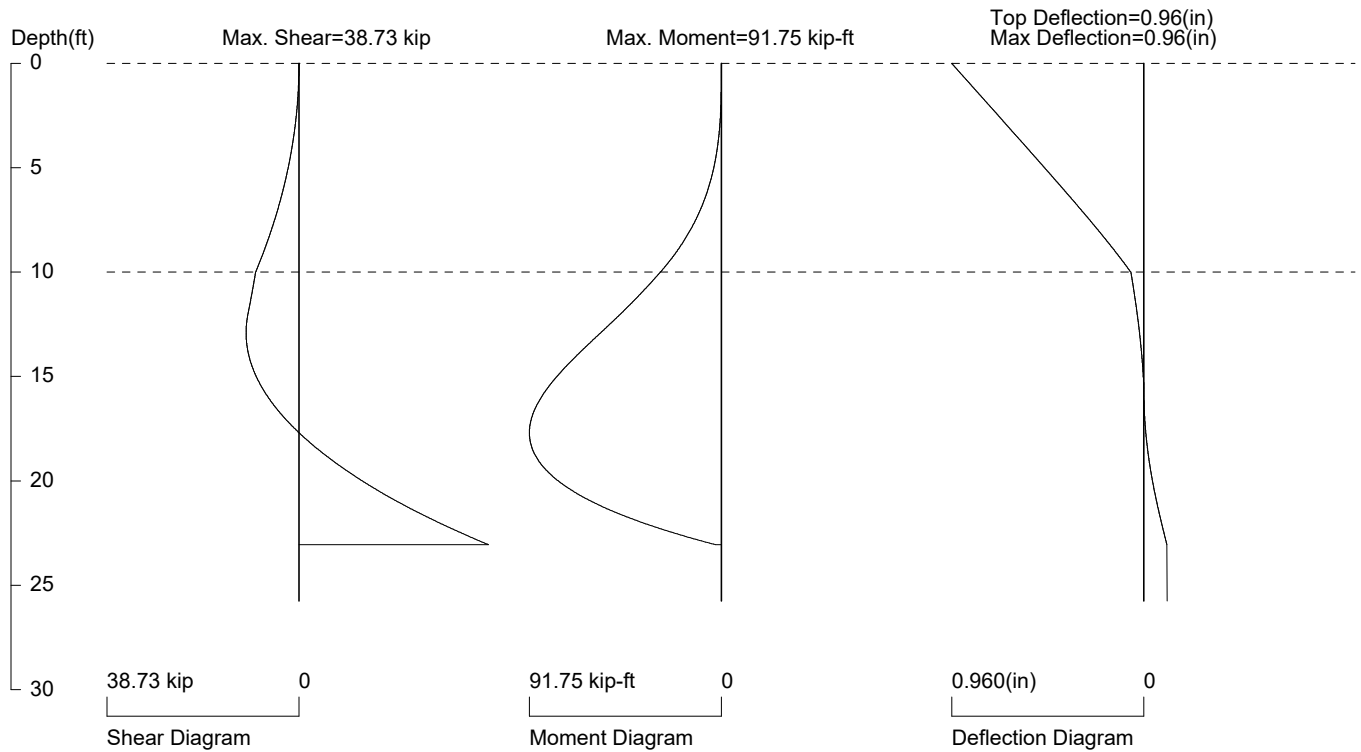
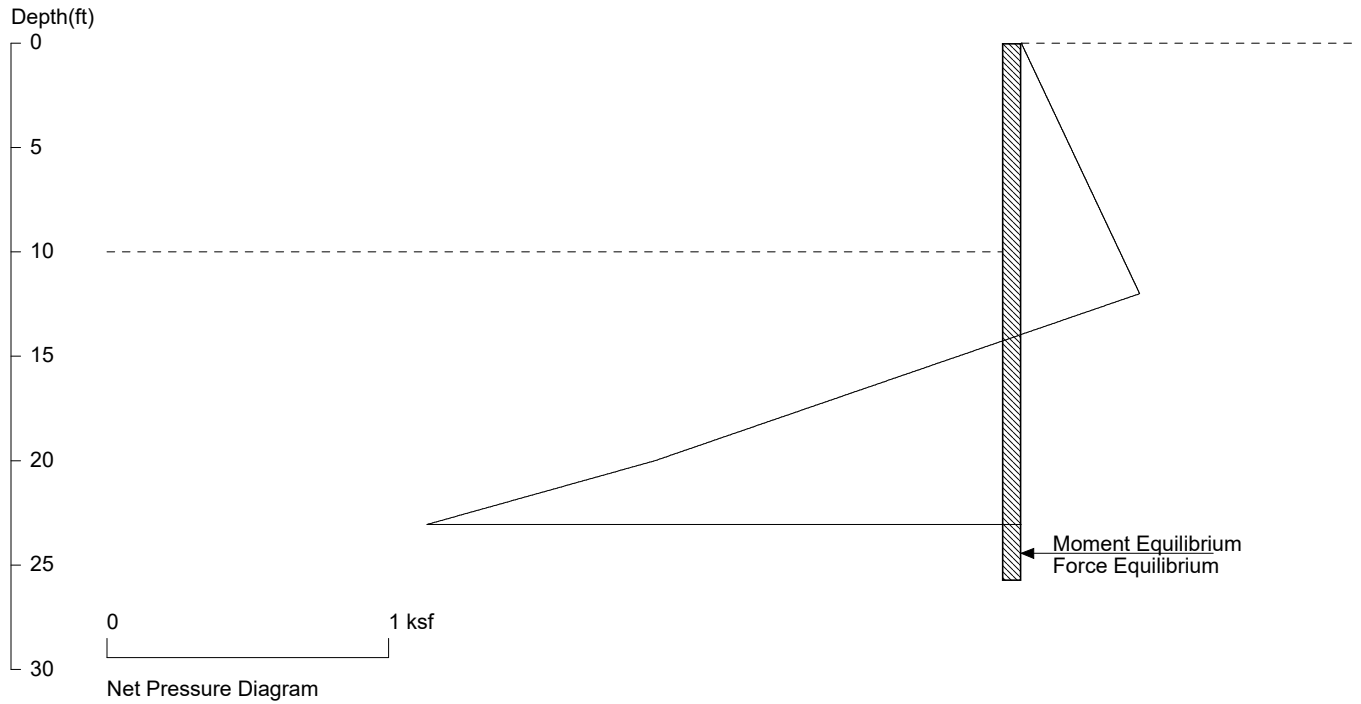
No.	Z depth	Spacing
1	0.00	6.00
2	7.00	2.00

## PASSIVE SPACING:

No.	Z depth	Spacing
1	7.00	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# S3 (10 ft @ 5 ft oc)



## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 5.0 foot or meter

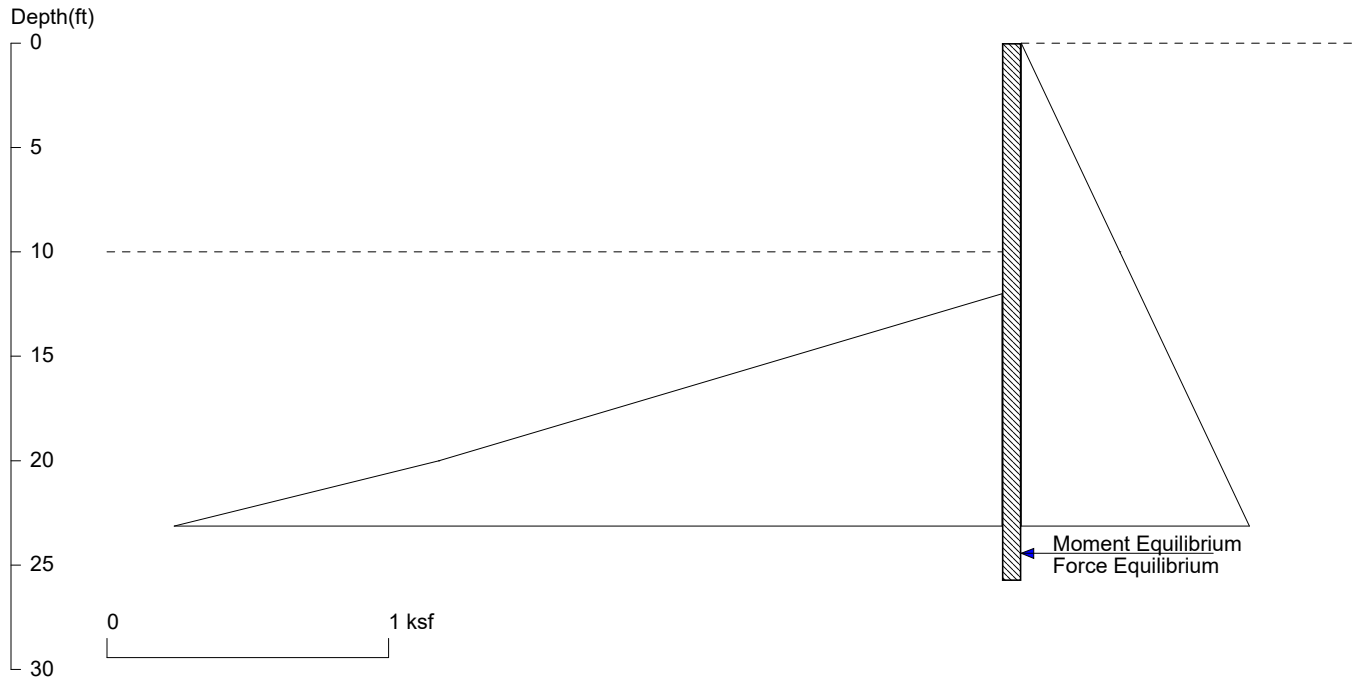
User Input Pile, W14X26: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=245.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S3\_10 ft @ 5 ft oc (Cant).SH8

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# S3 (10 ft @ 5 ft oc)



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File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S3\_10 ft @ 5 ft oc (Cant).SH8

Wall Height=10.0

Pile Diameter=2.0

Pile Spacing=5.0

Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=15.76 Min. Pile Length=25.76

MOMENT IN PILE: Max. Moment=91.75 per Pile Spacing=5.0 at Depth=17.70

## PILE SELECTION:

Request Min. Section Modulus = 33.4 in<sup>3</sup>/pile=546.75 cm<sup>3</sup>/pile, F<sub>y</sub>= 50 ksi = 345 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W14X26 has Section Modulus = 35.3 in<sup>3</sup>/pile=578.46 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.96(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=245.0

## DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	10	0.350	.035
*	Below	Base		
10	.35	100	3.500	.035

## PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
12	0	20	2.000	.25
20	2	200	56.00	.3

## ACTIVE SPACING:

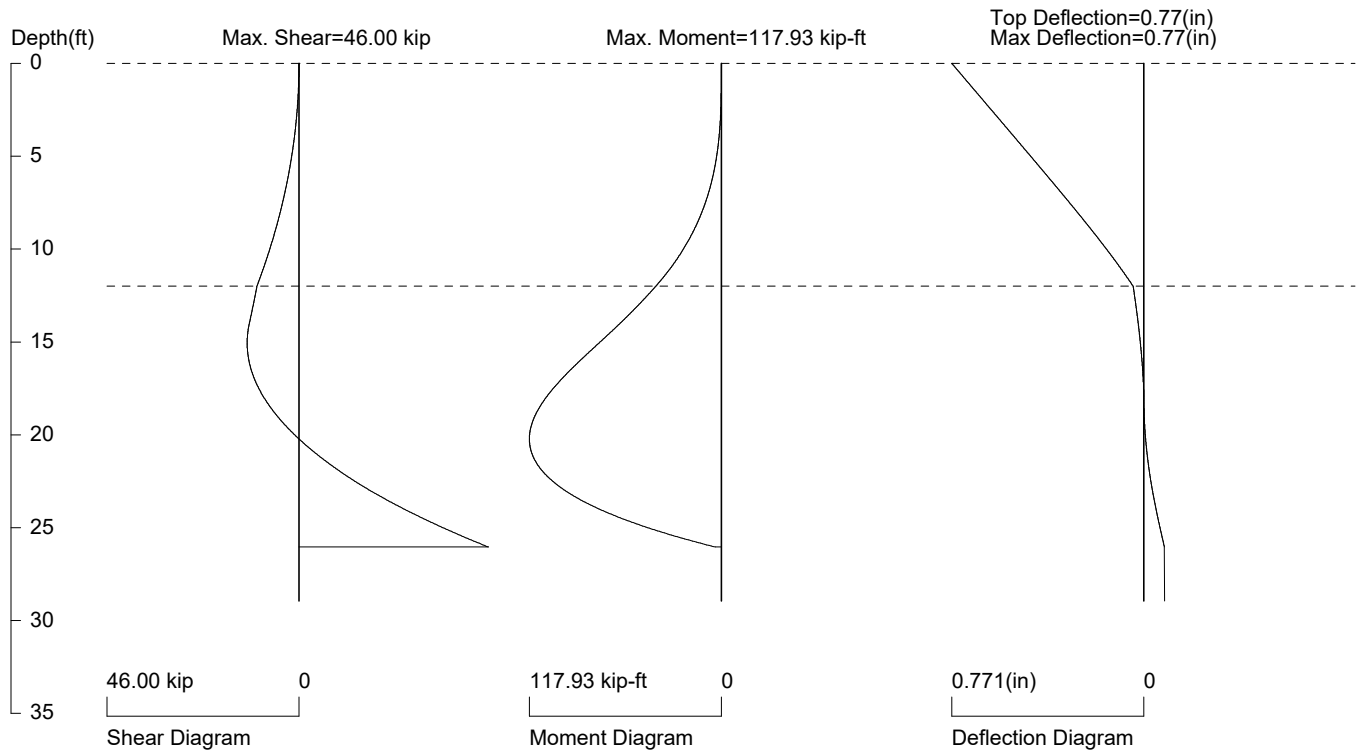
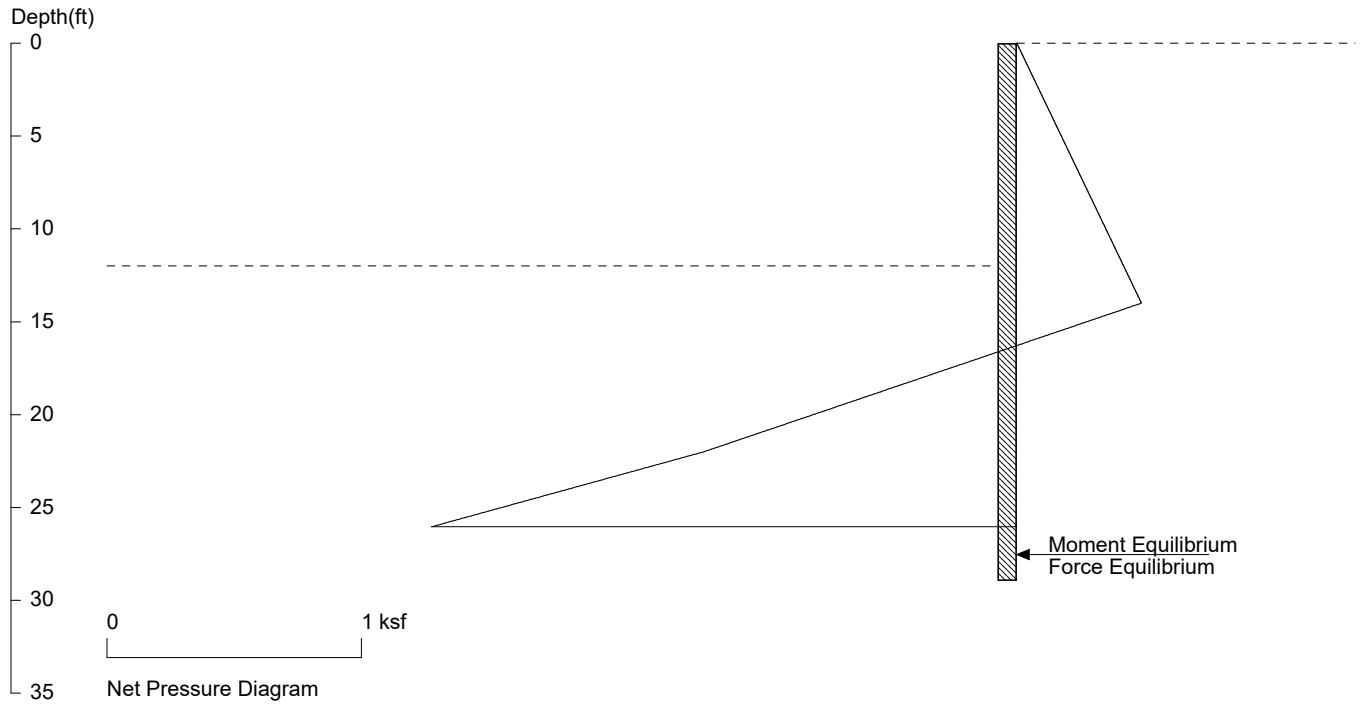
No.	Z depth	Spacing
1	0.00	5.00
2	10.00	2.00

## PASSIVE SPACING:

No.	Z depth	Spacing
1	10.00	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# S4 (12 ft @ 4 ft oc)



## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 4.0 foot or meter

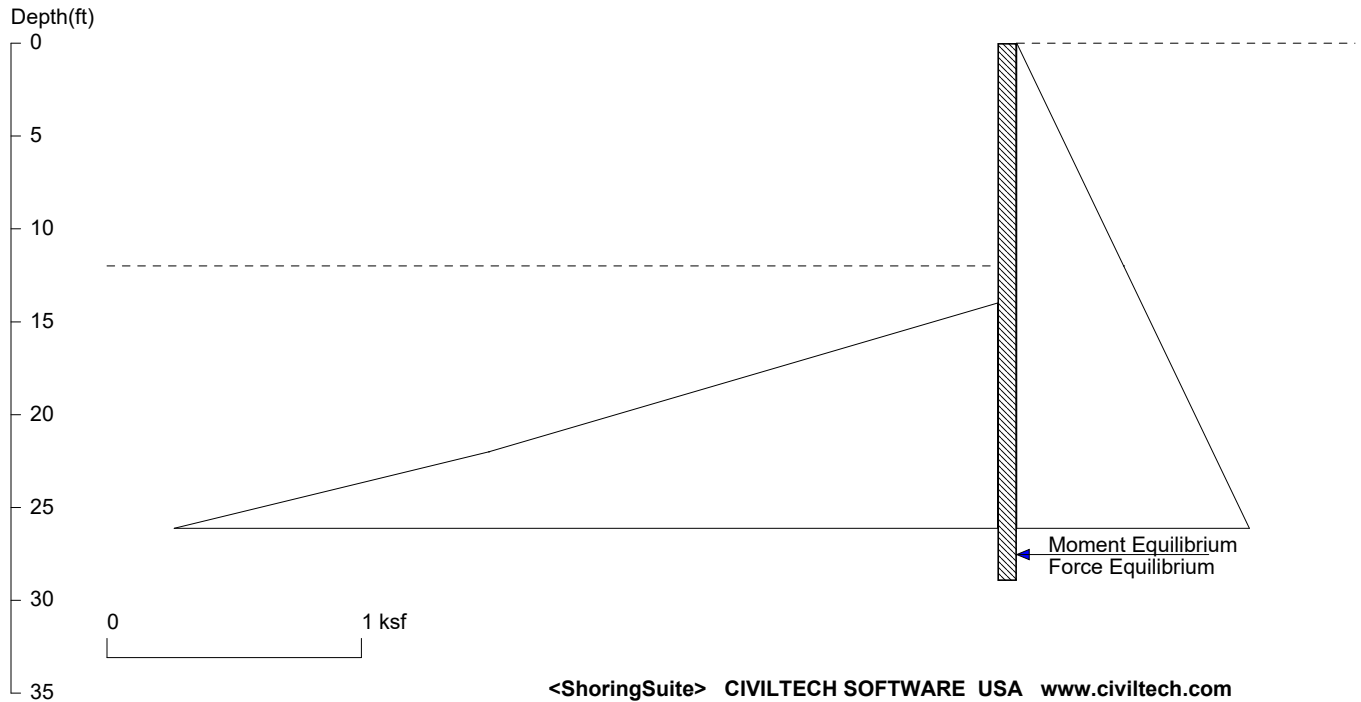
User Input Pile, W16X40: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=518.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S4\_12 ft @ 4 ft oc (Cant).SH8

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# S4 (12 ft @ 4 ft oc)



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File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S4\_12 ft @ 4 ft oc (Cant).SH8

Wall Height=12.0 Pile Diameter=2.0 Pile Spacing=4.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=16.95 Min. Pile Length=28.95

MOMENT IN PILE: Max. Moment=117.93 per Pile Spacing=4.0 at Depth=20.23

### PILE SELECTION:

Request Min. Section Modulus = 59.6 in<sup>3</sup>/pile=976.01 cm<sup>3</sup>/pile, F<sub>y</sub>= 36 ksi = 248 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W16X40 has Section Modulus = 64.7 in<sup>3</sup>/pile=1060.24 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.77(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=518.0

### DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	12	0.420	.035
*	Below	Base		
12	.42	100	3.500	.035

### PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
14	0	22	2.000	.25
22	2	200	55.40	.3

### ACTIVE SPACING:

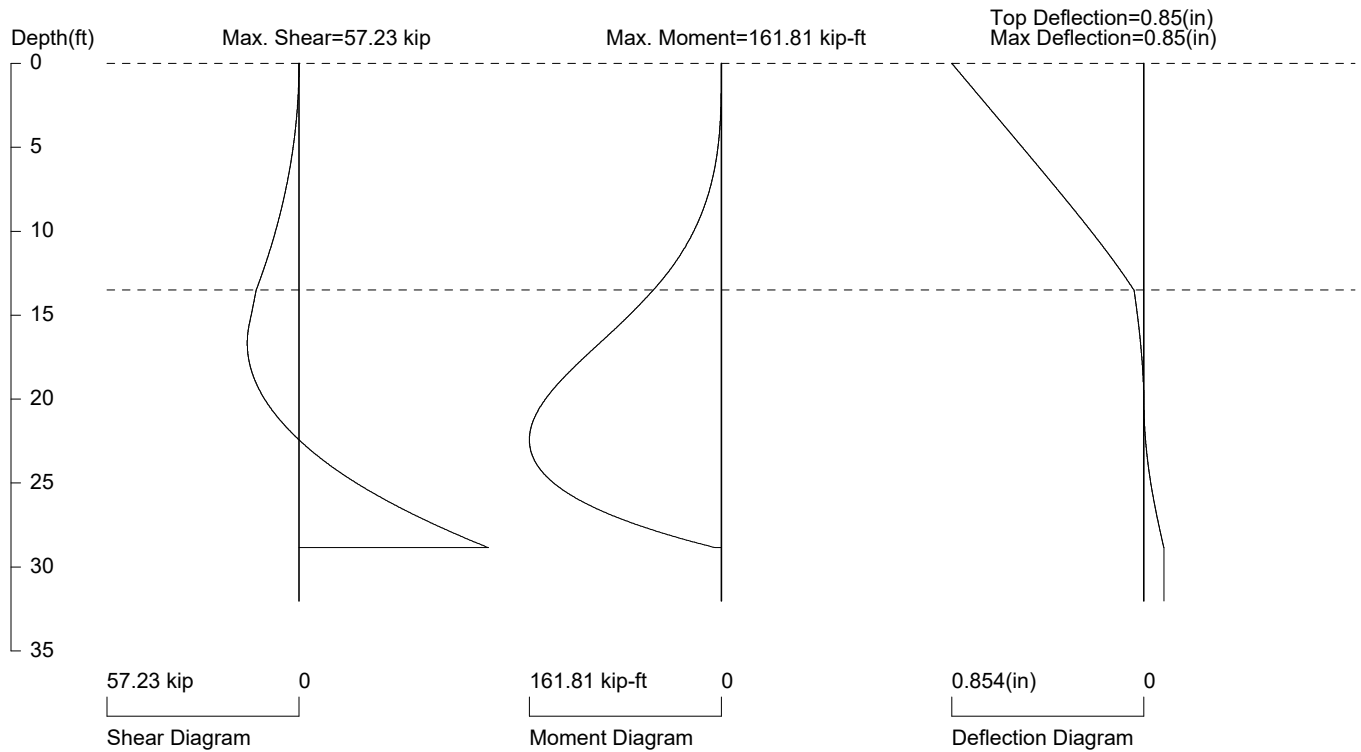
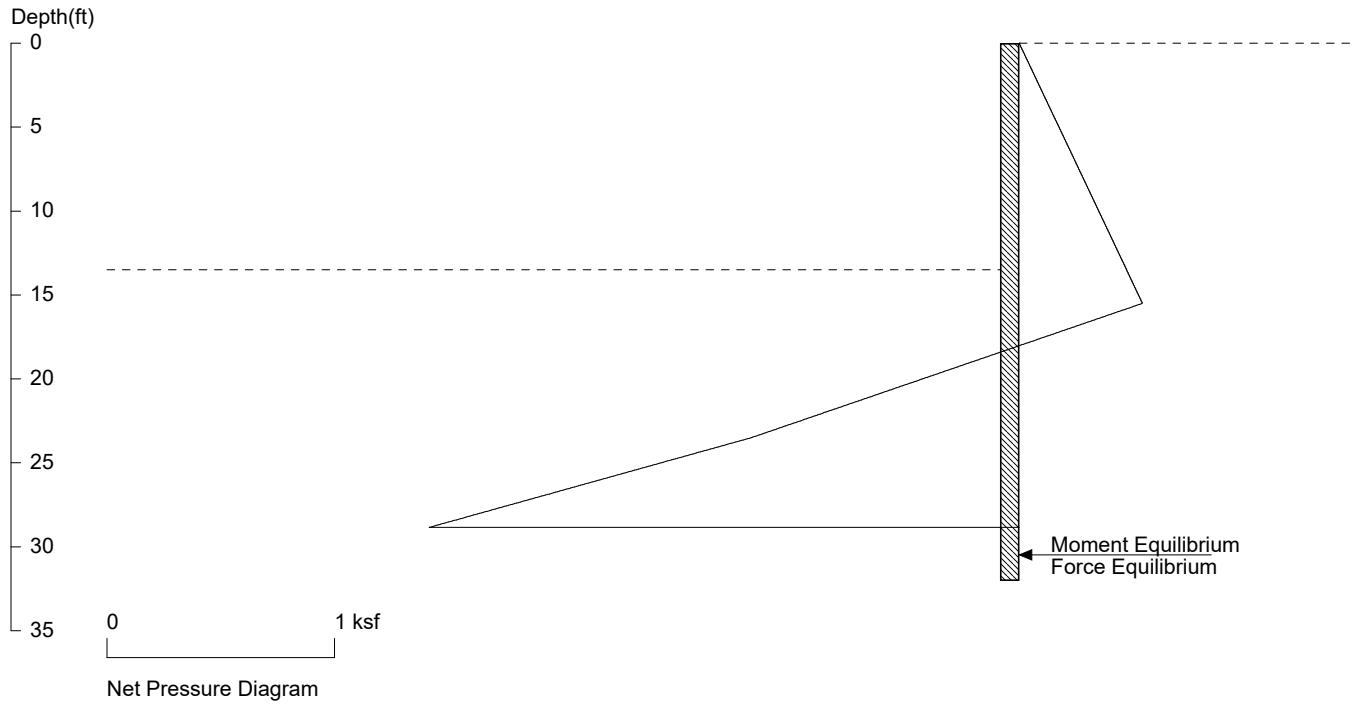
No.	Z depth	Spacing
1	0.00	4.00
2	12.00	2.00

### PASSIVE SPACING:

No.	Z depth	Spacing
1	12.00	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# S5 (13.5 ft @ 4 ft oc)



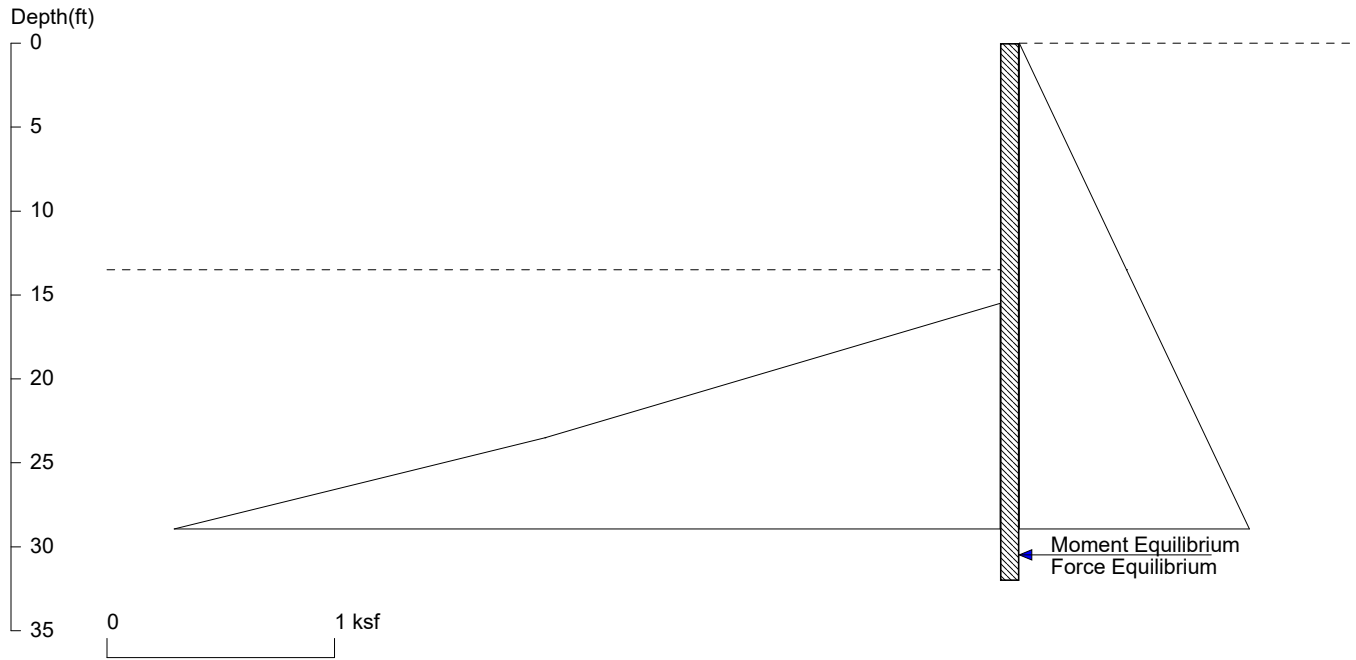
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 4.0 foot or meter

User Input Pile, W18X50: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=800.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S4-\_12 ft @ 4 ft oc (Cant).SH8

# S5 (13.5 ft @ 4 ft oc)



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Wall Height=13.5 Pile Diameter=2.0 Pile Spacing=4.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=18.53 Min. Pile Length=32.03

MOMENT IN PILE: Max. Moment=161.81 per Pile Spacing=4.0 at Depth=22.44

### PILE SELECTION:

Request Min. Section Modulus = 58.8 in<sup>3</sup>/pile=964.22 cm<sup>3</sup>/pile, F<sub>y</sub>= 50 ksi = 345 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W18X50 has Section Modulus = 88.9 in<sup>3</sup>/pile=1456.80 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.85(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=800.0

### DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	13.5	0.472	.035
*	Below	Base		
13.5	.472	100	3.500	.035

### PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
15.5	0	23.5	2.000	.25
23.5	2	200	54.950	.3

### ACTIVE SPACING:

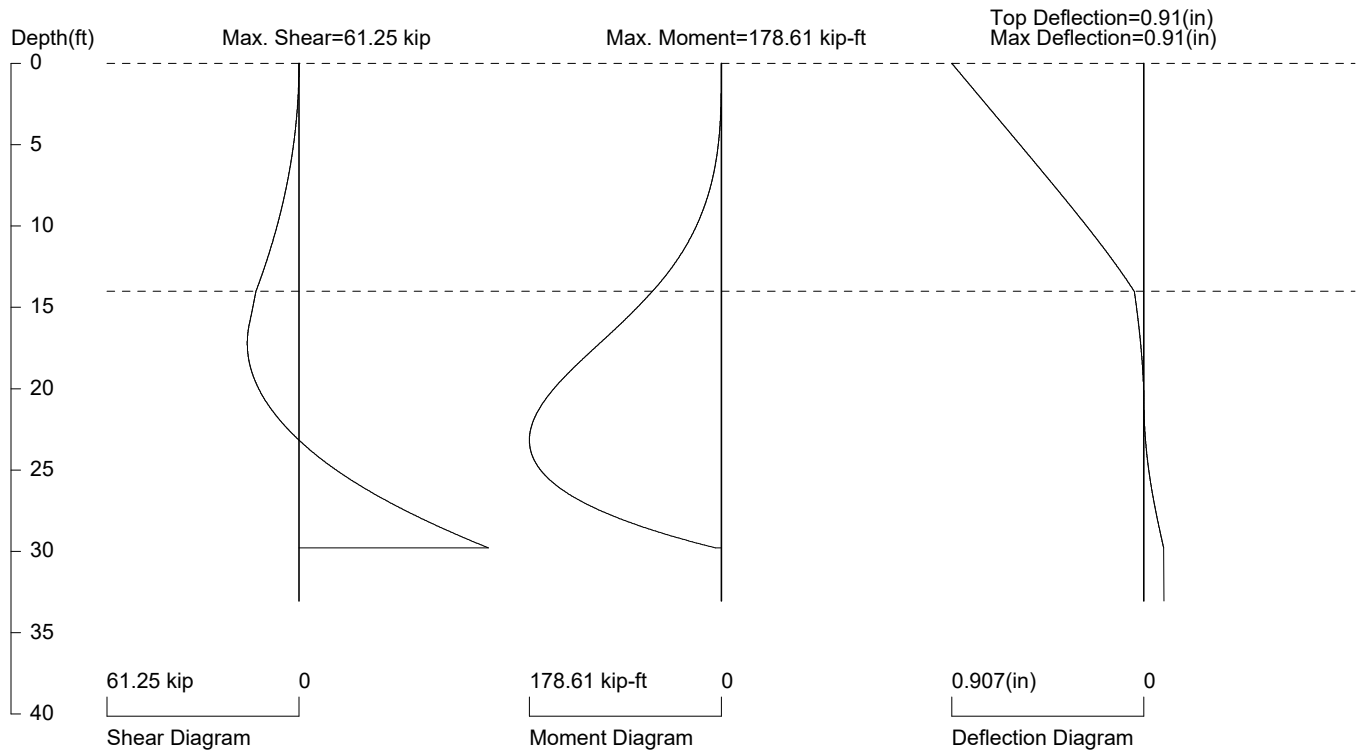
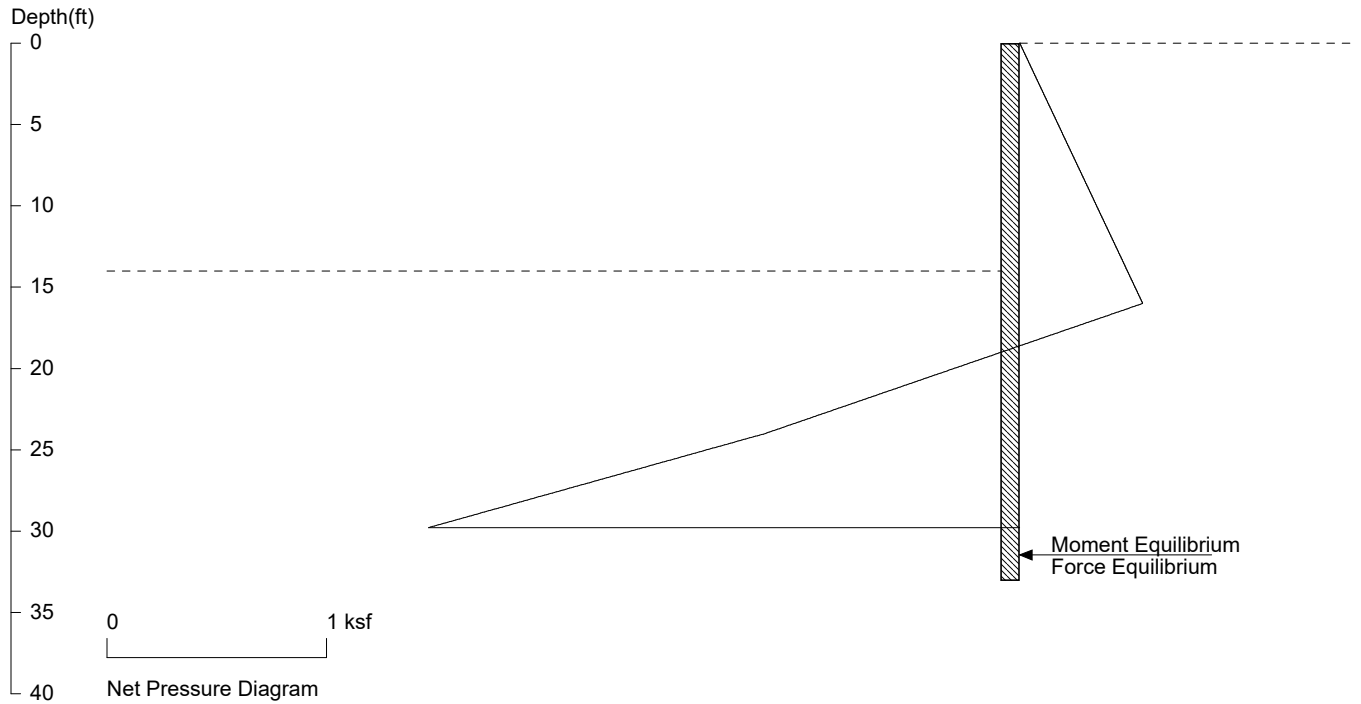
No.	Z depth	Spacing
1	0.00	4.00
2	13.50	2.00

### PASSIVE SPACING:

No.	Z depth	Spacing
1	13.50	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# S6 (14 ft @ 4 ft oc)



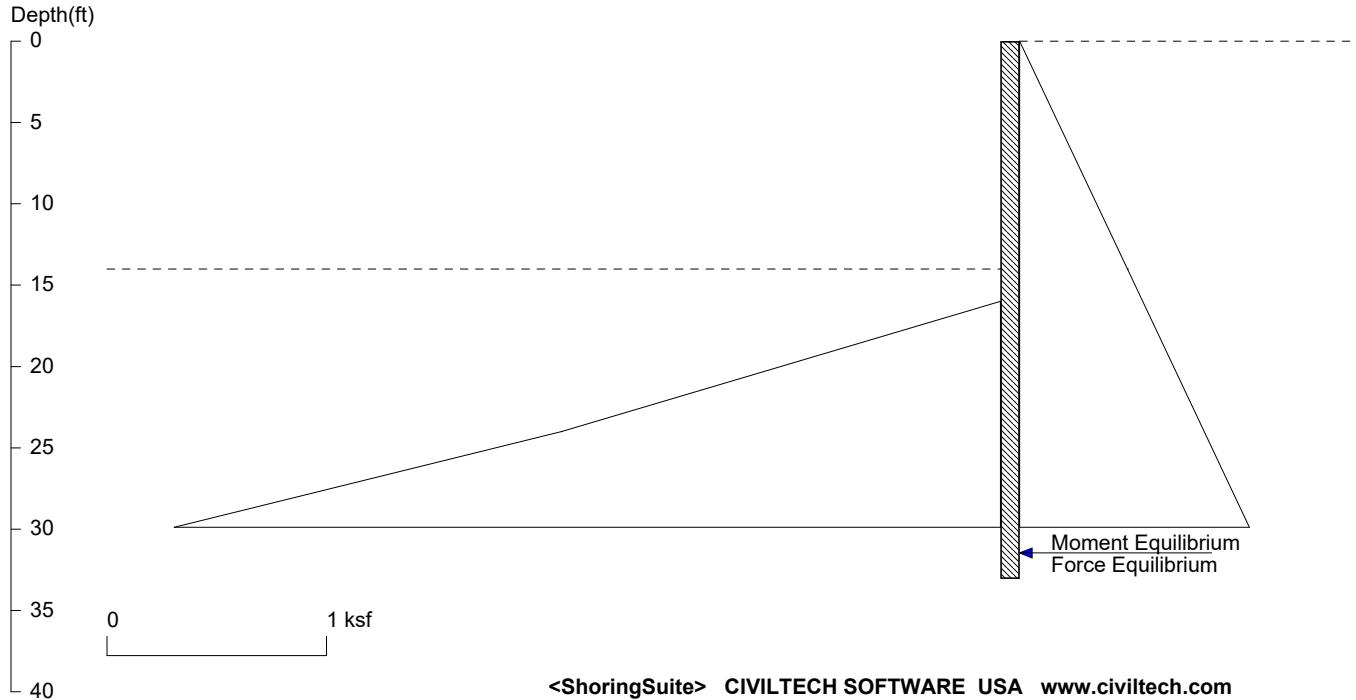
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 4.0 foot or meter

User Input Pile, W18X55: E (ksi)=29000.0, I (in4)/pile=890.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S5\_13.4 ft @ 4 ft oc (Cant).SH8

# S6 (14 ft @ 4 ft oc)



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File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S5\_13.4 ft @ 4 ft oc (Cant).SH8

Wall Height=14.0 Pile Diameter=2.0 Pile Spacing=4.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=19.05 Min. Pile Length=33.05

MOMENT IN PILE: Max. Moment=178.61 per Pile Spacing=4.0 at Depth=23.17

### PILE SELECTION:

Request Min. Section Modulus = 90.2 in<sup>3</sup>/pile=1478.18 cm<sup>3</sup>/pile, F<sub>y</sub>= 36 ksi = 248 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W18X55 has Section Modulus = 98.3 in<sup>3</sup>/pile=1610.84 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.91(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=890.0

### DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	14	0.490	.035
*	Below	Base		
14	.49	100	3.500	.035

### PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
16	0	24	2.000	.25
24	2	200	54.800	.3

### ACTIVE SPACING:

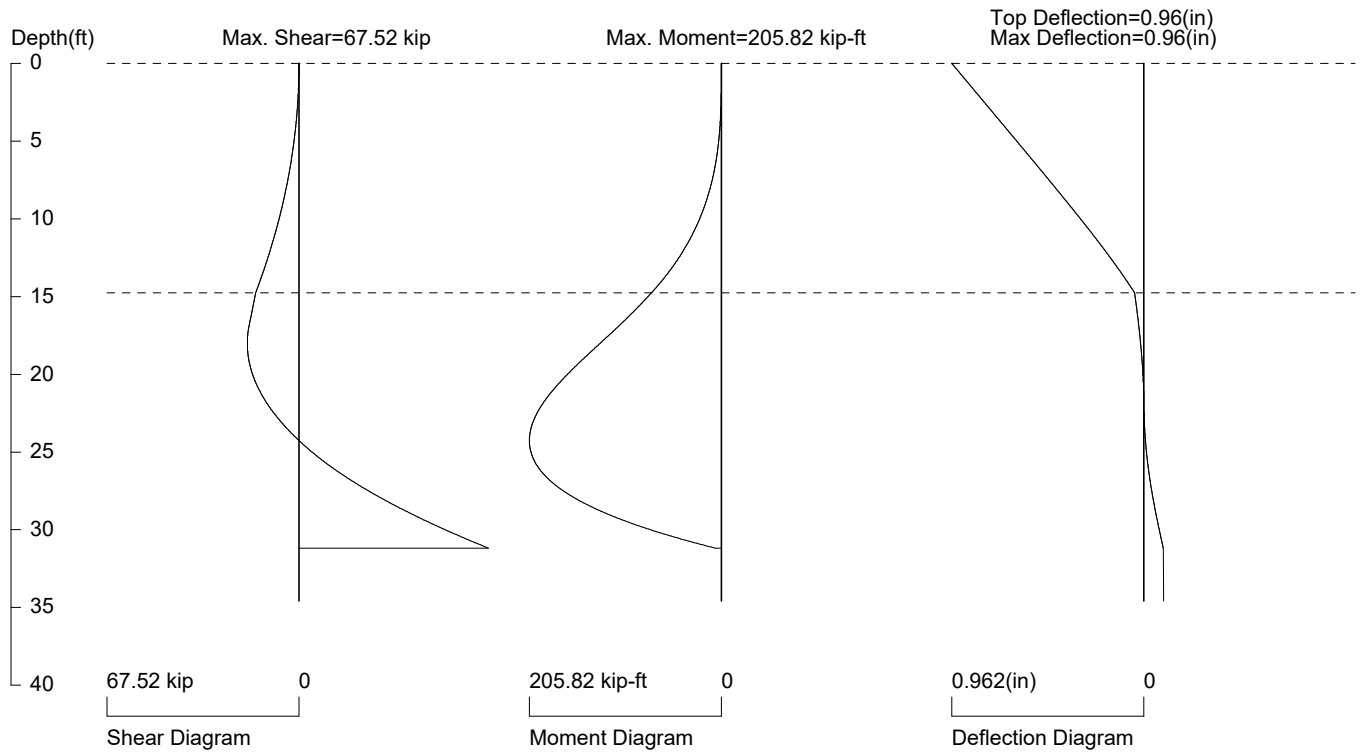
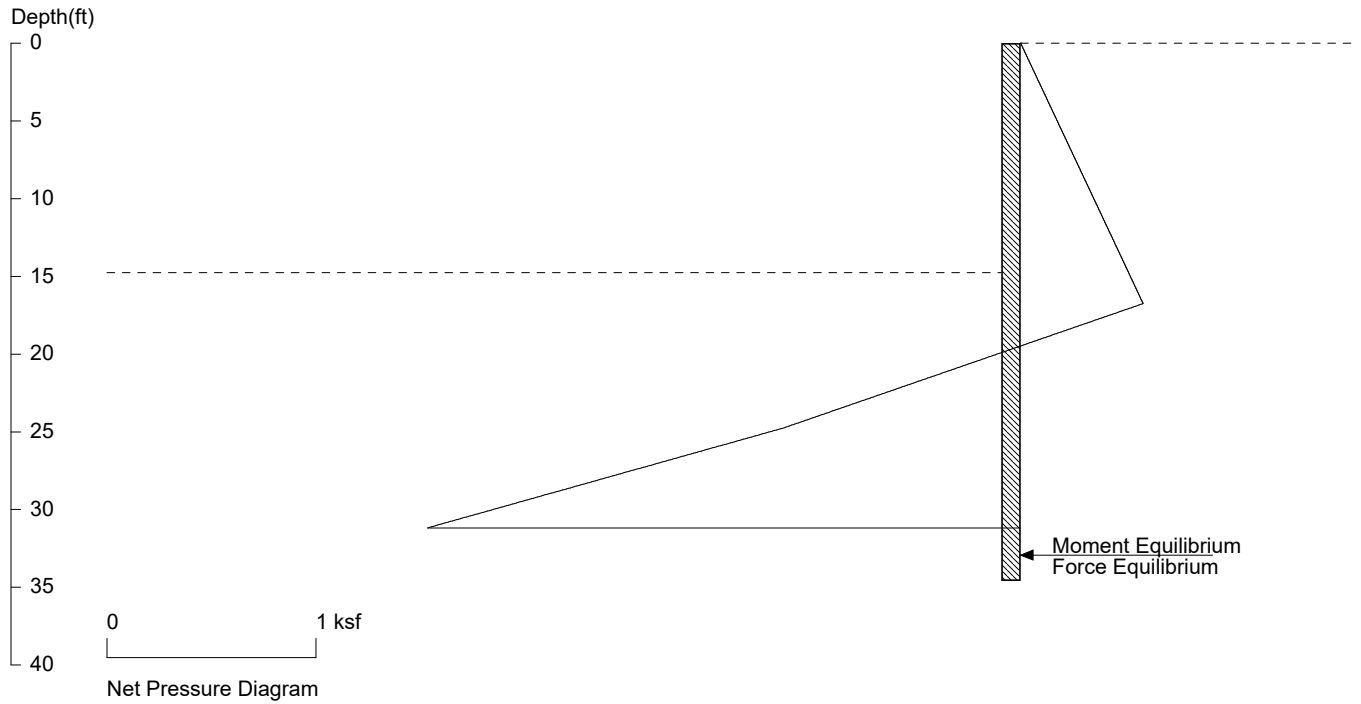
No.	Z depth	Spacing
1	0.00	4.00
2	14.00	2.00

### PASSIVE SPACING:

No.	Z depth	Spacing
1	14.00	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# S7 (14.75 ft @ 4 ft oc)



## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 4.0 foot or meter

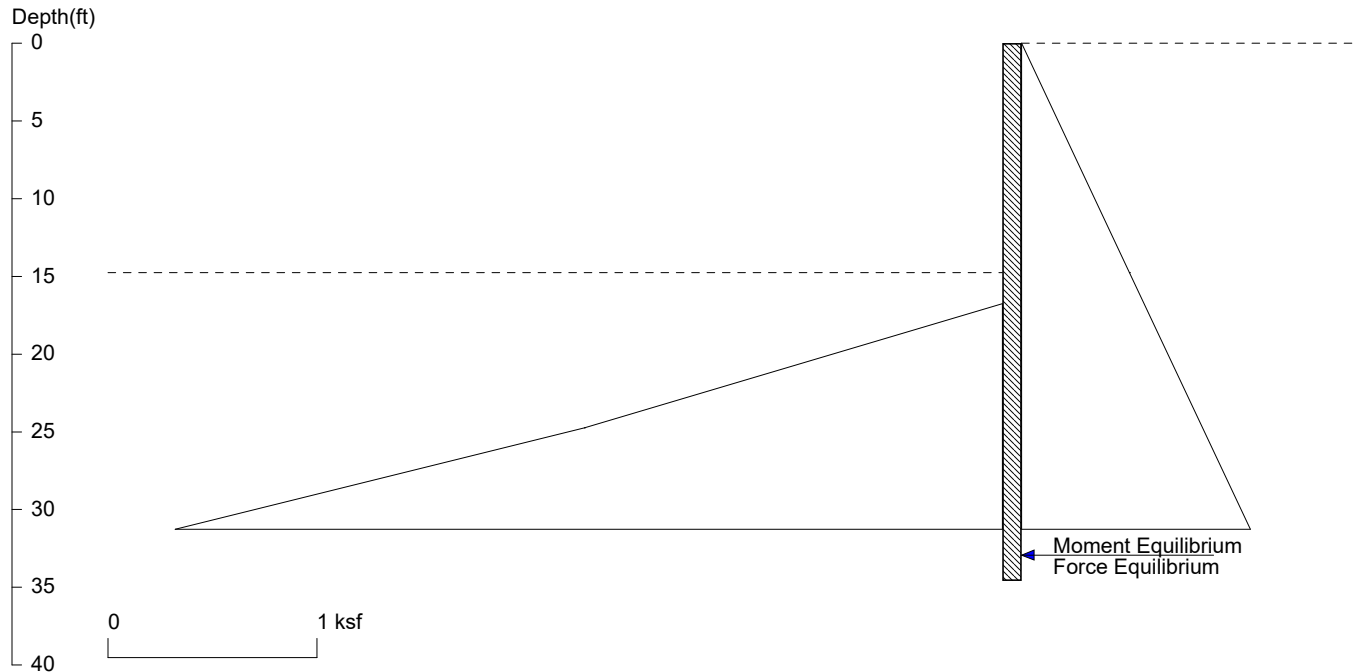
User Input Pile, W18X65: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=1070.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S6\_14 ft @ 4 ft oc (Cant).SH8

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# S7 (14.75 ft @ 4 ft oc)



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Date: 6/2/2025

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\S6\_14 ft @ 4 ft oc (Cant).SH8

Wall Height=14.8 Pile Diameter=2.0 Pile Spacing=4.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=19.83 Min. Pile Length=34.58

MOMENT IN PILE: Max. Moment=205.82 per Pile Spacing=4.0 at Depth=24.25

## PILE SELECTION:

Request Min. Section Modulus = 74.8 in<sup>3</sup>/pile=1226.44 cm<sup>3</sup>/pile, F<sub>y</sub>= 50 ksi = 345 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W18X65 has Section Modulus = 117.0 in<sup>3</sup>/pile=1917.28 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.96(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=1070.0

## DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	14.75	0.516	.035
*	Below	Base		
14.75	.516	100	3.500	.035

## PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
16.75	0	24.75	2.000	.25
24.75	2	200	54.575	.3

## ACTIVE SPACING:

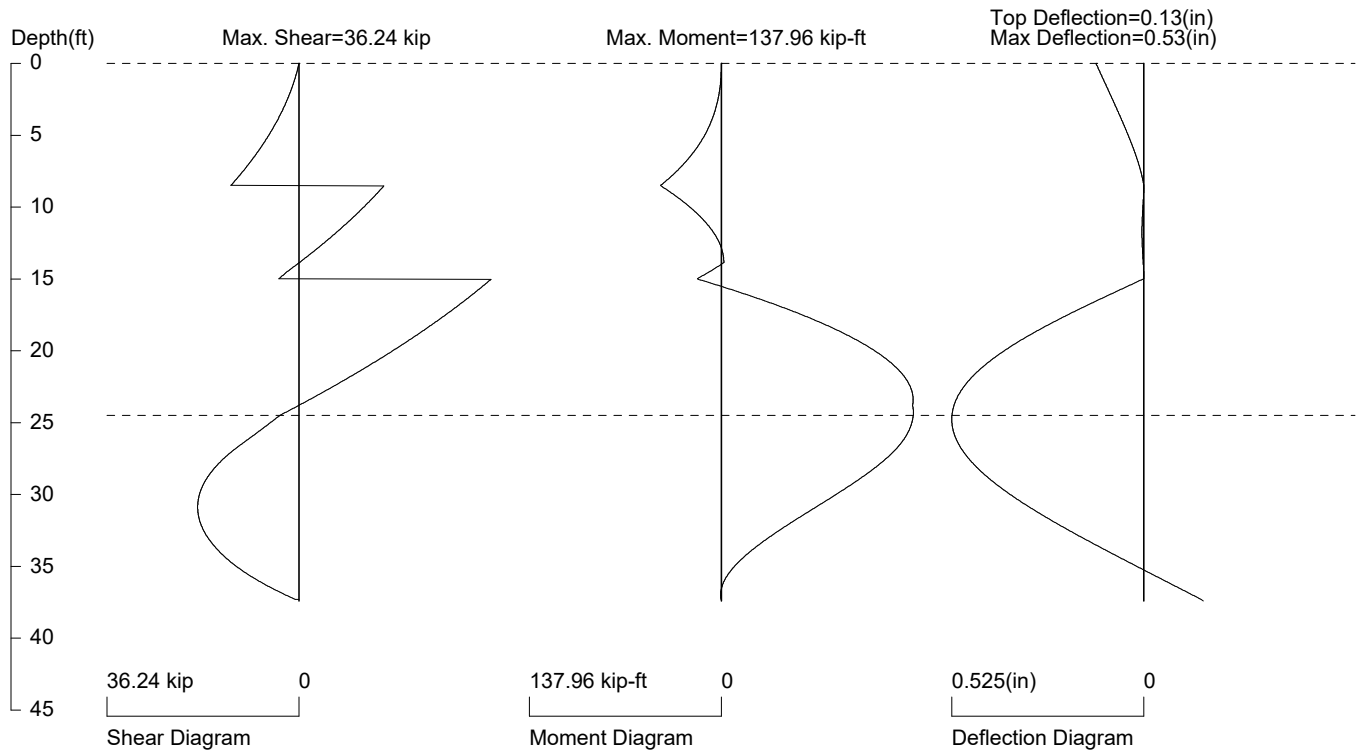
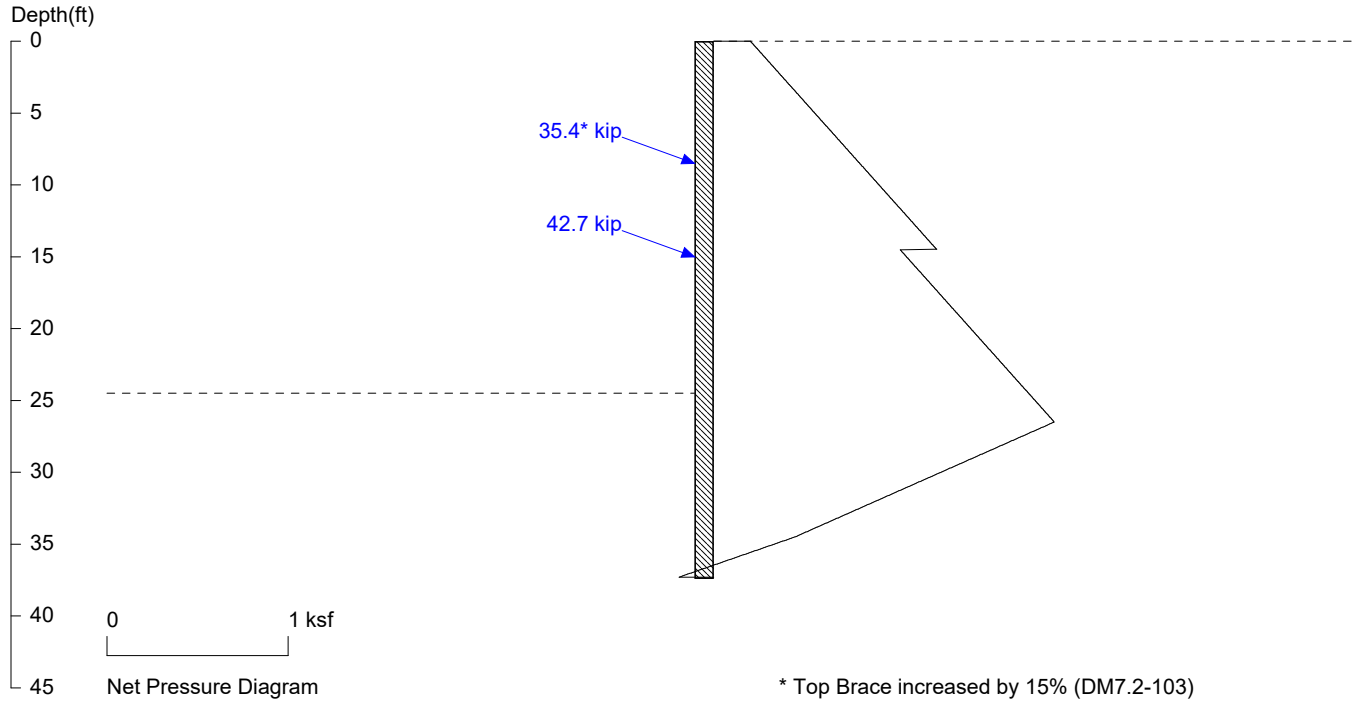
No.	Z depth	Spacing
1	0.00	4.00
2	14.75	2.00

## PASSIVE SPACING:

No.	Z depth	Spacing
1	14.75	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# E1 (24.5 ft @ 6 ft oc) Corner Pile Case



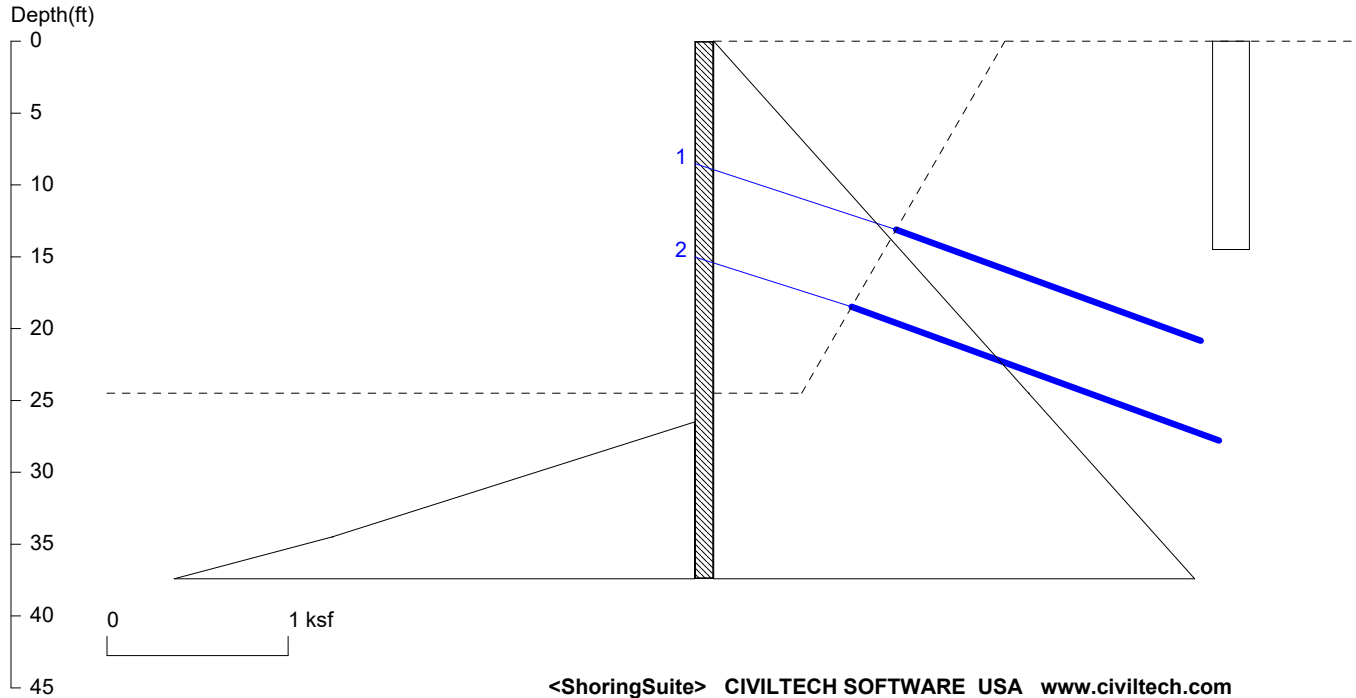
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 6.0 foot or meter

User Input Pile, W16X36: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=448.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E1\_24.5 ft @ 8 ft oc (Corner Tieback).SH8

# E1 (24.5 ft @ 6 ft oc) Corner Pile Case



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Date: 6/2/2025

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E1\_24.5 ft @ 8 ft oc (Corner Tie

Wall Height=24.5

Pile Diameter=2.0

Pile Spacing=6.0

Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=12.91 Min. Pile Length=37.41

MOMENT IN PILE: Max. Moment=137.96 per Pile Spacing=6.0 at Depth=24.26

### PILE SELECTION:

Request Min. Section Modulus = 50.2 in<sup>3</sup>/pile=822.10 cm<sup>3</sup>/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W16X36 has Section Modulus = 56.5 in<sup>3</sup>/pile=925.87 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.13(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=448.0

### BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	L_free	Fixed Length
1. Tieback	8.5	20.0	6.0	35.4*	33.3	12.1	13.5	22.6
2. Tieback	15.0	20.0	6.0	42.7	40.1	14.6	10.2	27.2

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

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

### DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	24.5	1.739	0.070980
*	Below	Base		
24.5	1.739	100	7.098	.070980
0	.203	14.5	0.203	0

### PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
26.5	0	34.5	2.000	.25
34.5	2	200	51.65	.3

### ACTIVE SPACING:

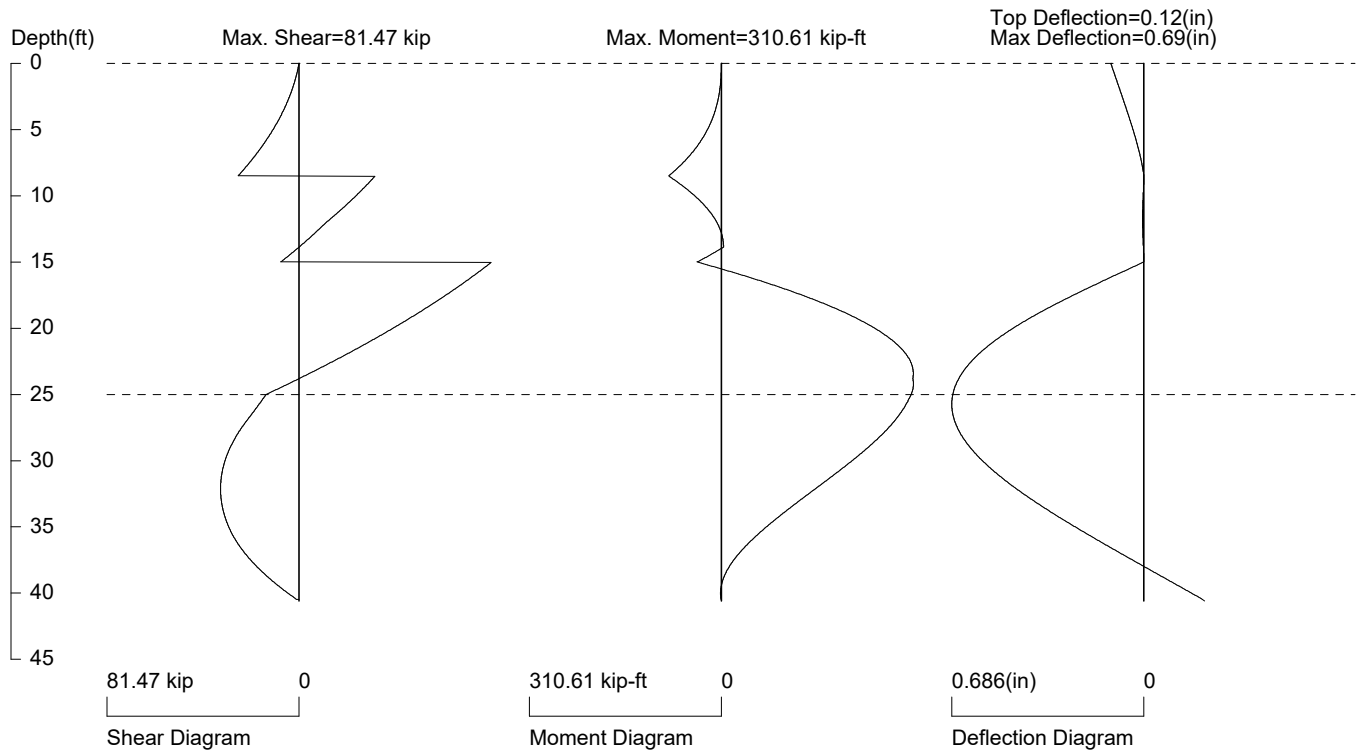
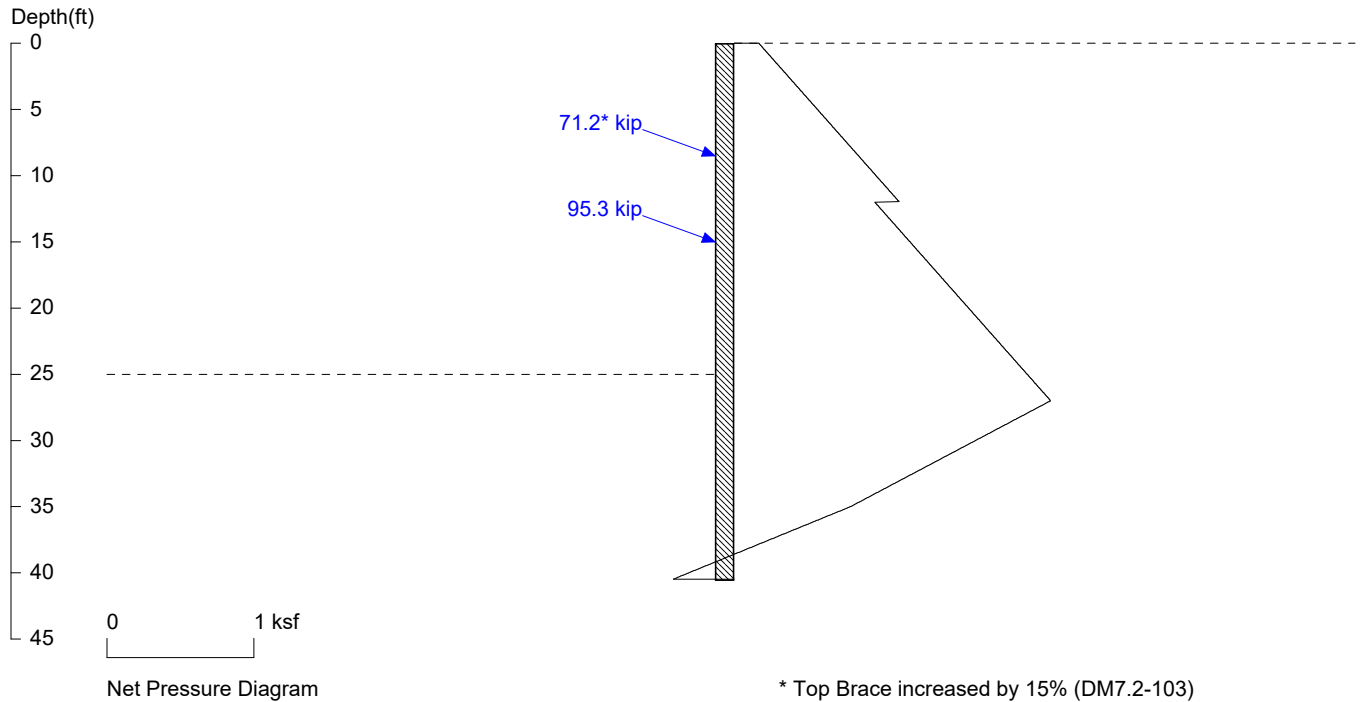
No.	Z depth	Spacing
1	0.00	3.00
2	24.50	2.00

PASSIVE SPACING:

No.	Z depth	Spacing
1	24.50	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# E2, E4-E7 (25 ft @ 6 ft oc)



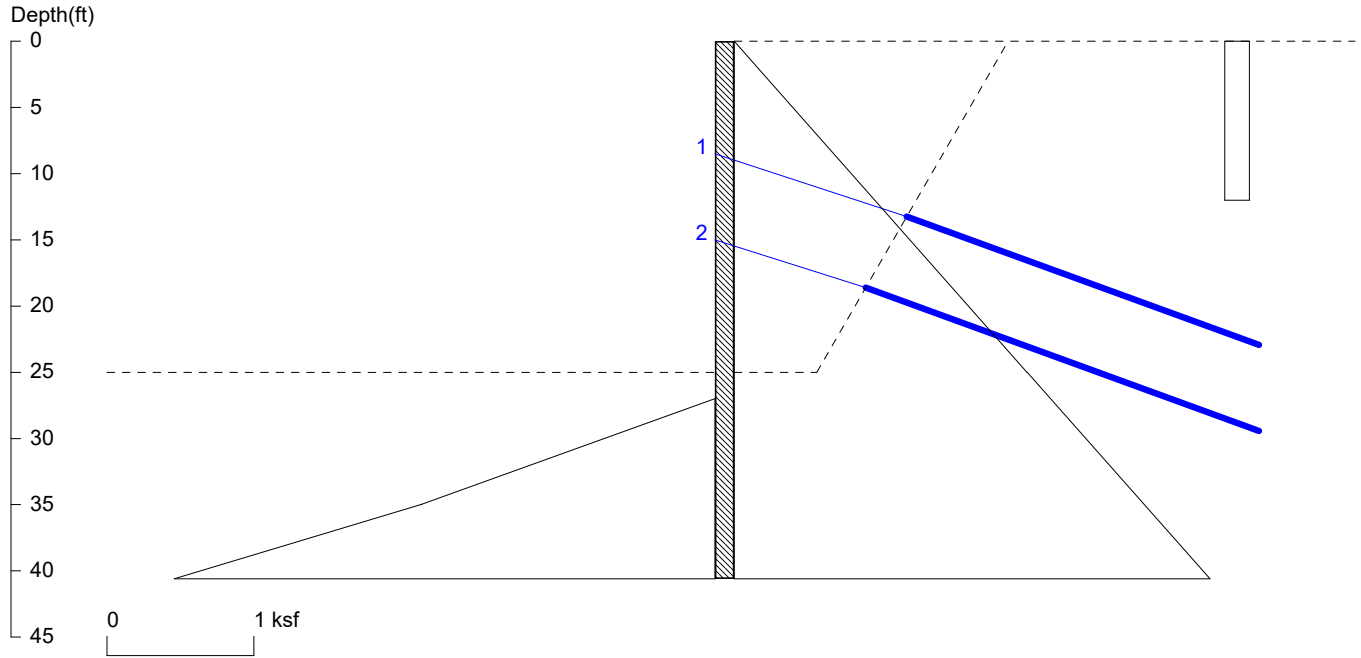
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 6.0 foot or meter

User Input Pile, W16X67: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=954.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E2,E4-E7\_25 ft @ 6 ft oc (Tieback).SH8

## E2, E4-E7 (25 ft @ 6 ft oc)



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Date: 6/2/2025

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E2,E4--E7\_25 ft @ 6 ft oc (Tieba

Wall Height=25.0

Pile Diameter=2.0

Pile Spacing=6.0

Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=15.60 Min. Pile Length=40.60

MOMENT IN PILE: Max. Moment=310.61 per Pile Spacing=6.0 at Depth=24.21

### PILE SELECTION:

Request Min. Section Modulus = 112.9 in<sup>3</sup>/pile=1850.87 cm<sup>3</sup>/pile, F<sub>y</sub>= 50 ksi = 345 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W16X67 has Section Modulus = 117.0 in<sup>3</sup>/pile=1917.28 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.12(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=954.0

BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	L_free	Fixed Length
1. Tieback	8.5	20.0	6.0	71.2*	66.9	24.3	13.9	45.3
2. Tieback	15.0	20.0	6.0	95.3	89.5	32.6	10.6	60.6

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

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

### DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	25	1.994	0.07975
*	Below	Base		
25	1.994	100	7.975	.07975
0	.168	12	0.168	0

### PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
27	0	35	2.000	.25
35	2	200	51.50	.3

### ACTIVE SPACING:

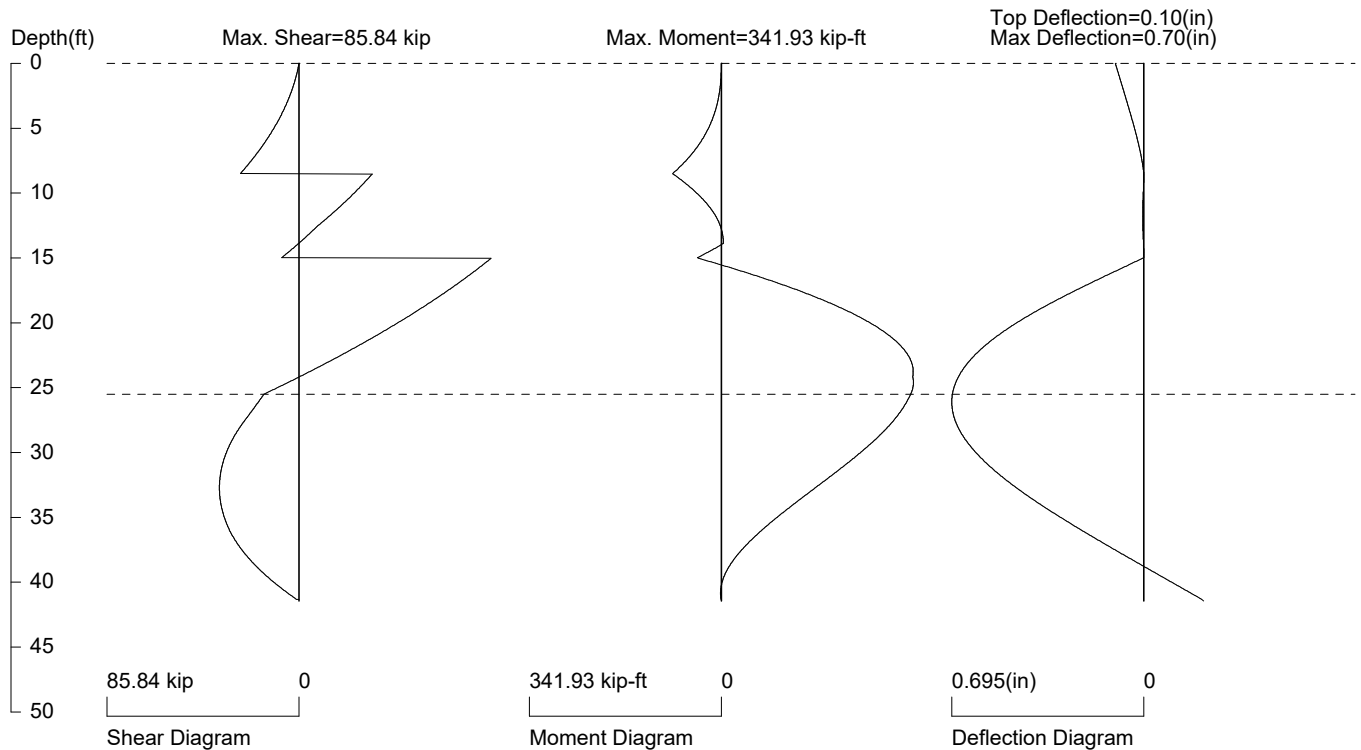
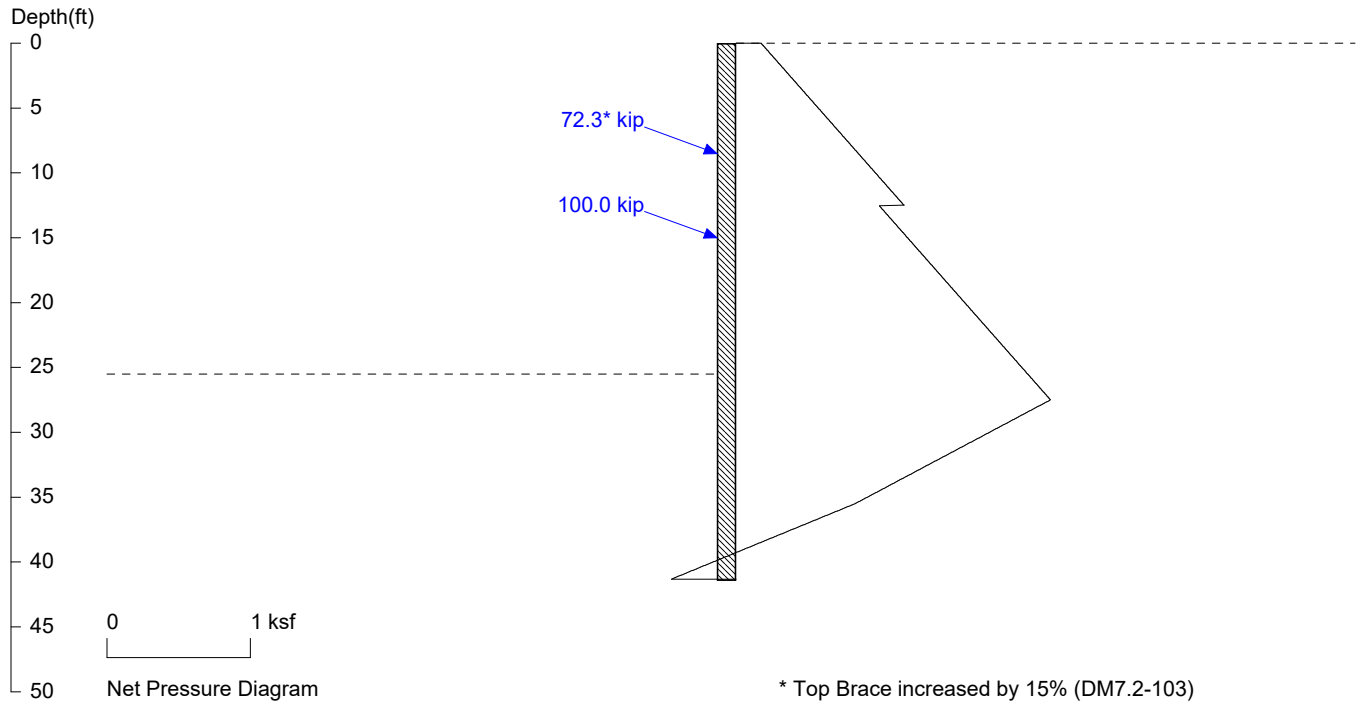
No.	Z depth	Spacing
1	0.00	6.00
2	25.00	2.00

PASSIVE SPACING:

No.	Z depth	Spacing
1	25.00	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# E3 (25.5 ft @ 6 ft oc)



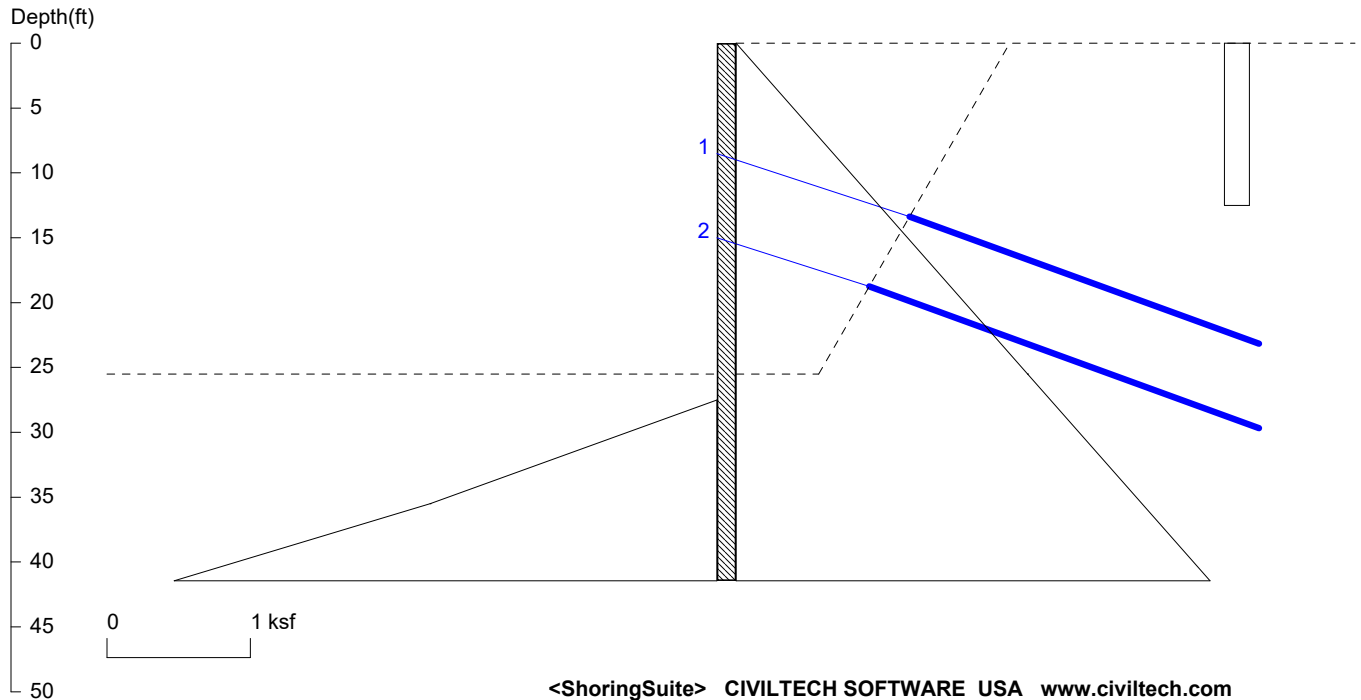
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 6.0 foot or meter

User Input Pile, W16X77: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=1110.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E3\_25.5 ft @ 6 ft oc (Tieback).SH8

# E3 (25.5 ft @ 6 ft oc)



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Date: 6/2/2025

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E3\_25.5 ft @ 6 ft oc (Tieback).S

Wall Height=25.5    Pile Diameter=2.0    Pile Spacing=6.0    Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=15.95    Min. Pile Length=41.45  
 MOMENT IN PILE: Max. Moment=341.93 per Pile Spacing=6.0 at Depth=24.62

**PILE SELECTION:**

Request Min. Section Modulus = 124.3 in<sup>3</sup>/pile=2037.52 cm<sup>3</sup>/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66  
 W16X77 has Section Modulus = 134.0 in<sup>3</sup>/pile=2195.86 cm<sup>3</sup>/pile. It is greater than Min. Requirements!  
 Top Deflection = 0.10(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=1110.0

**BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor**

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	L_free	Fixed Length
1. Tieback	8.5	20.0	6.0	72.3*	67.9	24.7	14.2	46.0
2. Tieback	15.0	20.0	6.0	100.0	94.0	34.2	10.9	63.7

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

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

**DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):**

Z1	P1	Z2	P2	Slope
0	0	25.5	2.034	0.07975
*	Below	Base		
25.5	2.034	100	7.975	.07975
0	.175	12.5	0.175	0

**PASSIVE PRESSURES:**

Z1	P1	Z2	P2	Slope
27.5	0	35.5	2.000	.25
35.5	2	200	51.35	.3

**ACTIVE SPACING:**

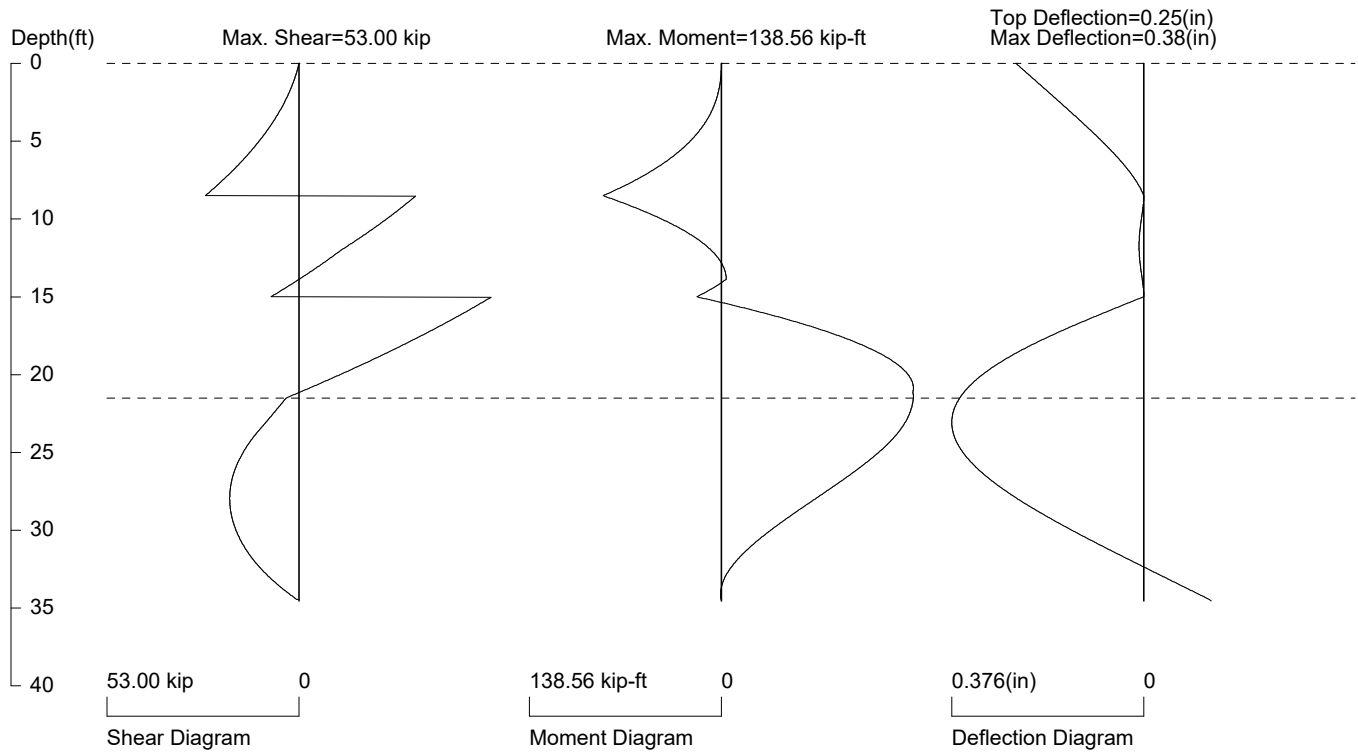
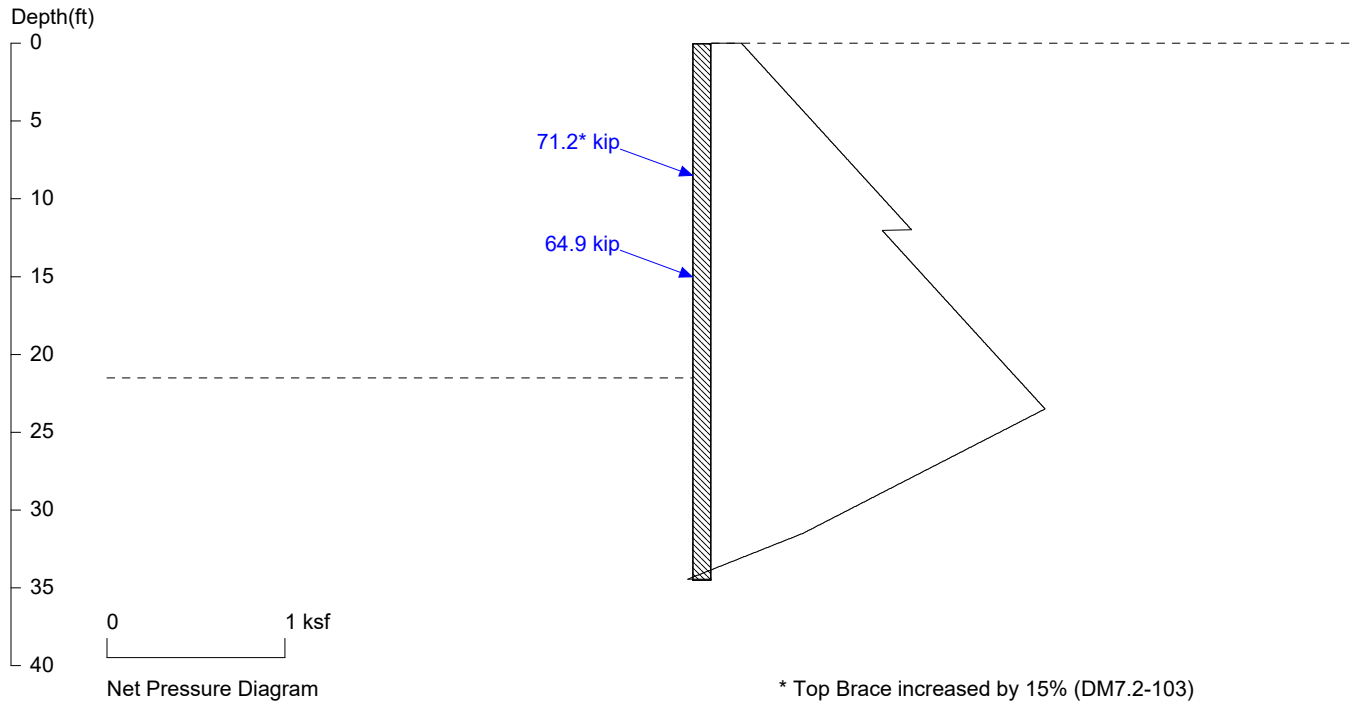
No.	Z depth	Spacing
1	0.00	6.00
2	25.50	2.00

PASSIVE SPACING:

No.	Z depth	Spacing
1	25.50	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# E8 (21.5 ft @ 6 ft oc)



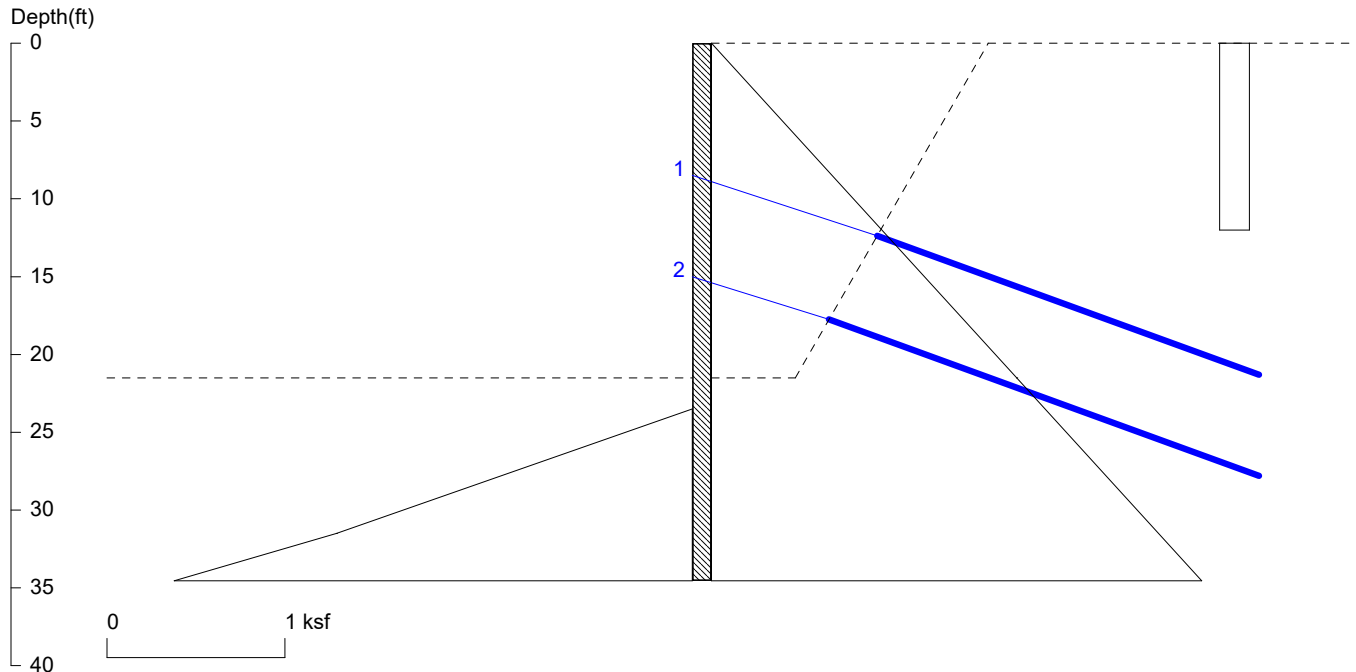
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 6.0 foot or meter

User Input Pile, W16X36: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=448.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E8\_21.5 ft @ 6 ft oc (Tieback).SH8

# E8 (21.5 ft @ 6 ft oc)



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Date: 6/2/2025

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E8\_21.5 ft @ 6 ft oc (Tieback).S

Wall Height=21.5

Pile Diameter=2.0

Pile Spacing=6.0

Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=13.04 Min. Pile Length=34.54

MOMENT IN PILE: Max. Moment=138.56 per Pile Spacing=6.0 at Depth=21.40

### PILE SELECTION:

Request Min. Section Modulus = 50.4 in<sup>3</sup>/pile=825.67 cm<sup>3</sup>/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W16X36 has Section Modulus = 56.5 in<sup>3</sup>/pile=925.87 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.25(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=448.0

BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	L_free	Fixed Length
1. Tieback	8.5	20.0	6.0	71.2*	66.9	24.3	11.3	45.3
2. Tieback	15.0	20.0	6.0	64.9	60.9	22.2	8.0	41.3

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

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

### DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	21.5	1.715	0.07975
*	Below	Base		
21.5	1.715	100	7.975	.07975
0	.168	12	0.168	0

### PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
23.5	0	31.5	2.000	.25
31.5	2	200	52.55	.3

### ACTIVE SPACING:

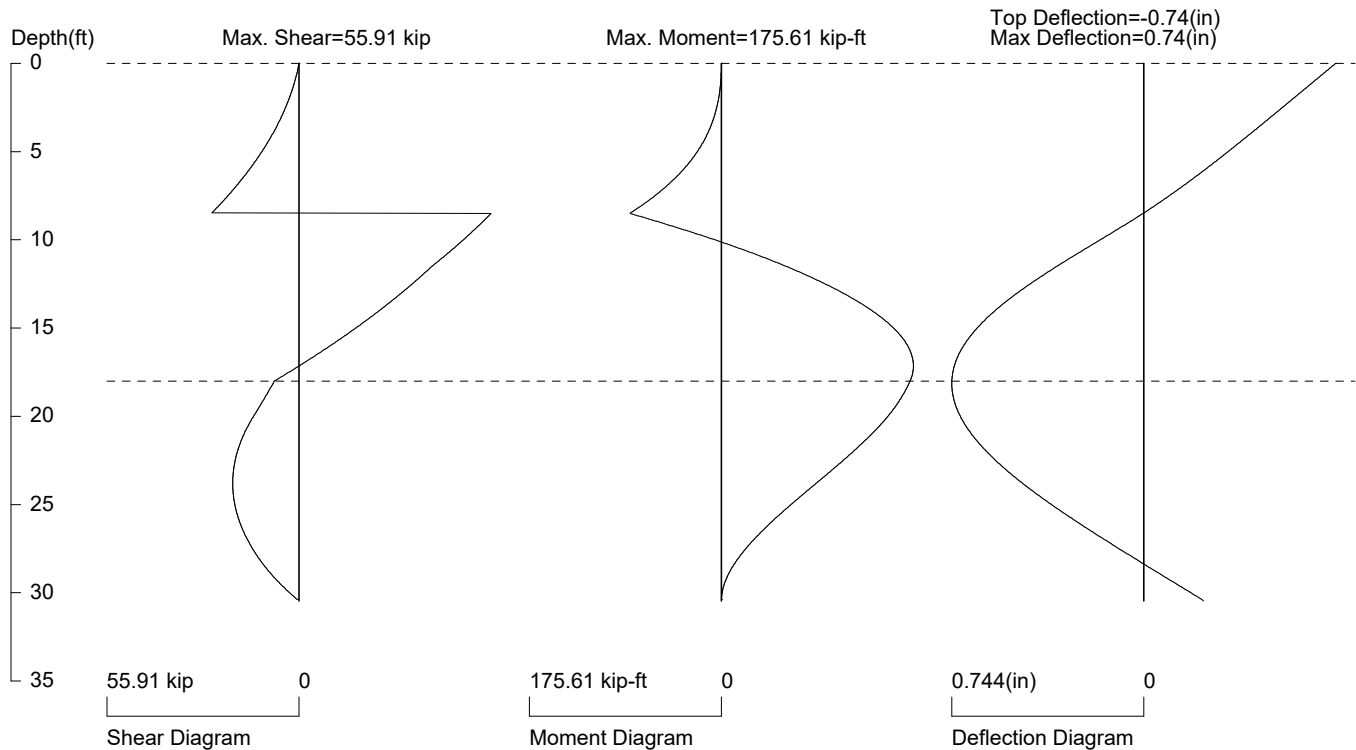
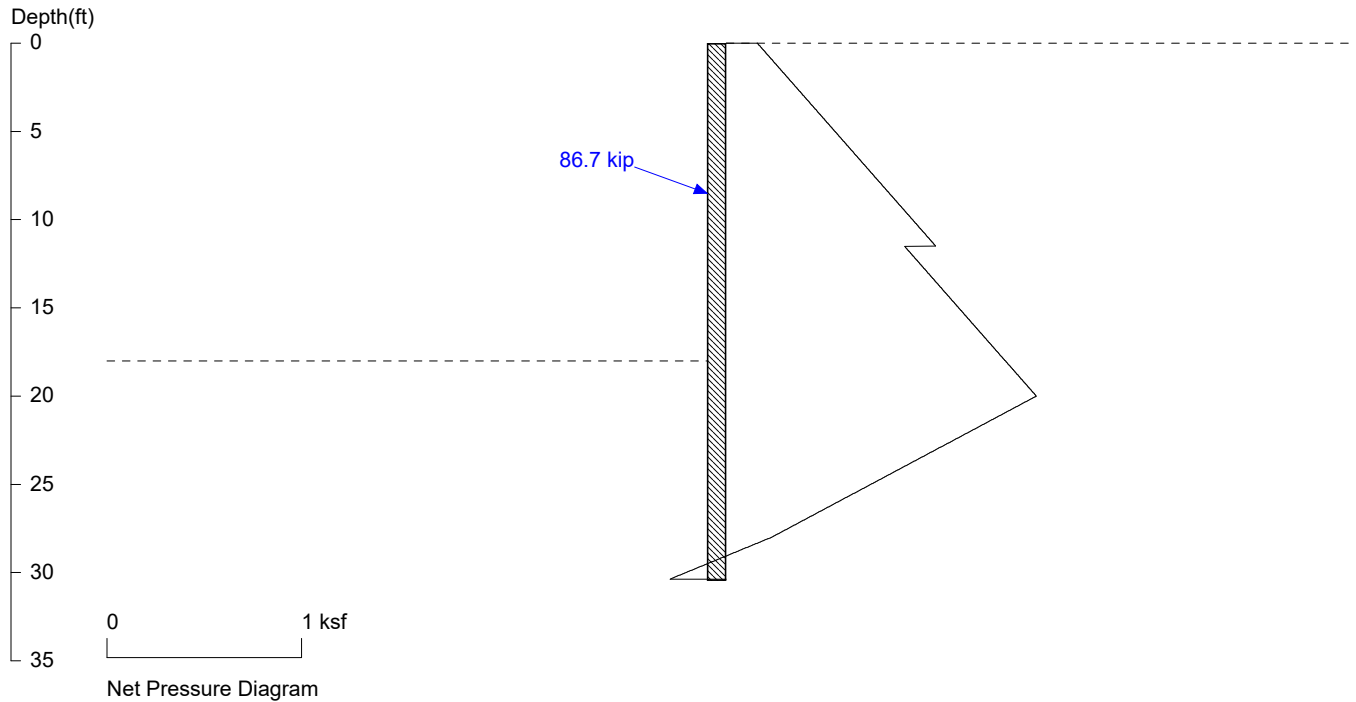
No.	Z depth	Spacing
1	0.00	6.00
2	21.50	2.00

PASSIVE SPACING:

No.	Z depth	Spacing
1	21.50	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# E9 (18 ft @ 6 ft oc)



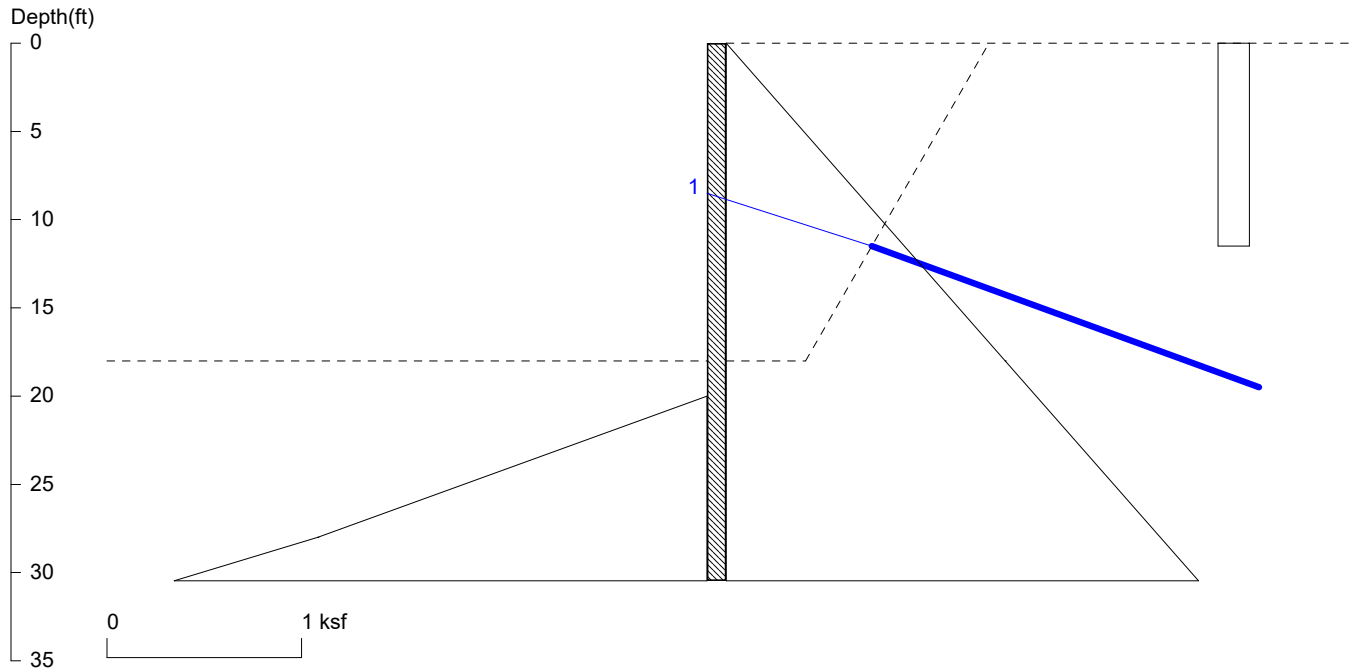
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 6.0 foot or meter

User Input Pile, W16X40: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=518.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E9\_18 ft @ 6 ft oc (Tieback).SH8

# E9 (18 ft @ 6 ft oc)



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Date: 6/2/2025

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E9\_18 ft @ 6 ft oc (Tieback).SH

Wall Height=18.0

Pile Diameter=2.0

Pile Spacing=6.0

Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=12.47 Min. Pile Length=30.47

MOMENT IN PILE: Max. Moment=175.61 per Pile Spacing=6.0 at Depth=17.15

## PILE SELECTION:

Request Min. Section Modulus = 63.9 in<sup>3</sup>/pile=1046.43 cm<sup>3</sup>/pile, F<sub>y</sub>= 50 ksi = 345 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W16X40 has Section Modulus = 64.7 in<sup>3</sup>/pile=1060.24 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = -0.74(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=518.0

## BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	L_free	Fixed Length
1. Tieback	8.5	20.0	6.0	86.7	81.4	29.6	8.8	55.2

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

## DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	18	1.436	0.07975
*	Below	Base		
18	1.436	100	7.976	.07975
0	.161	11.5	0.161	0

## PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
20	0	28	2.000	.25
28	2	200	53.60	.3

## ACTIVE SPACING:

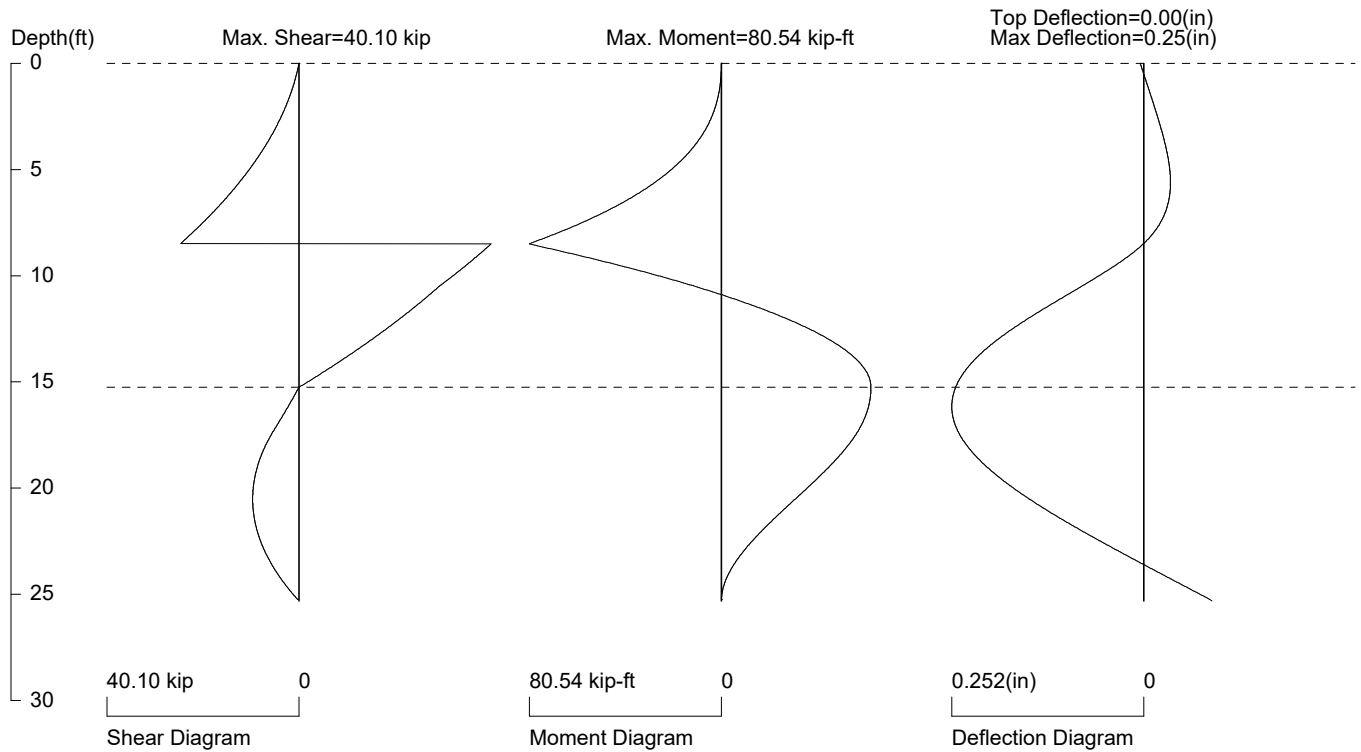
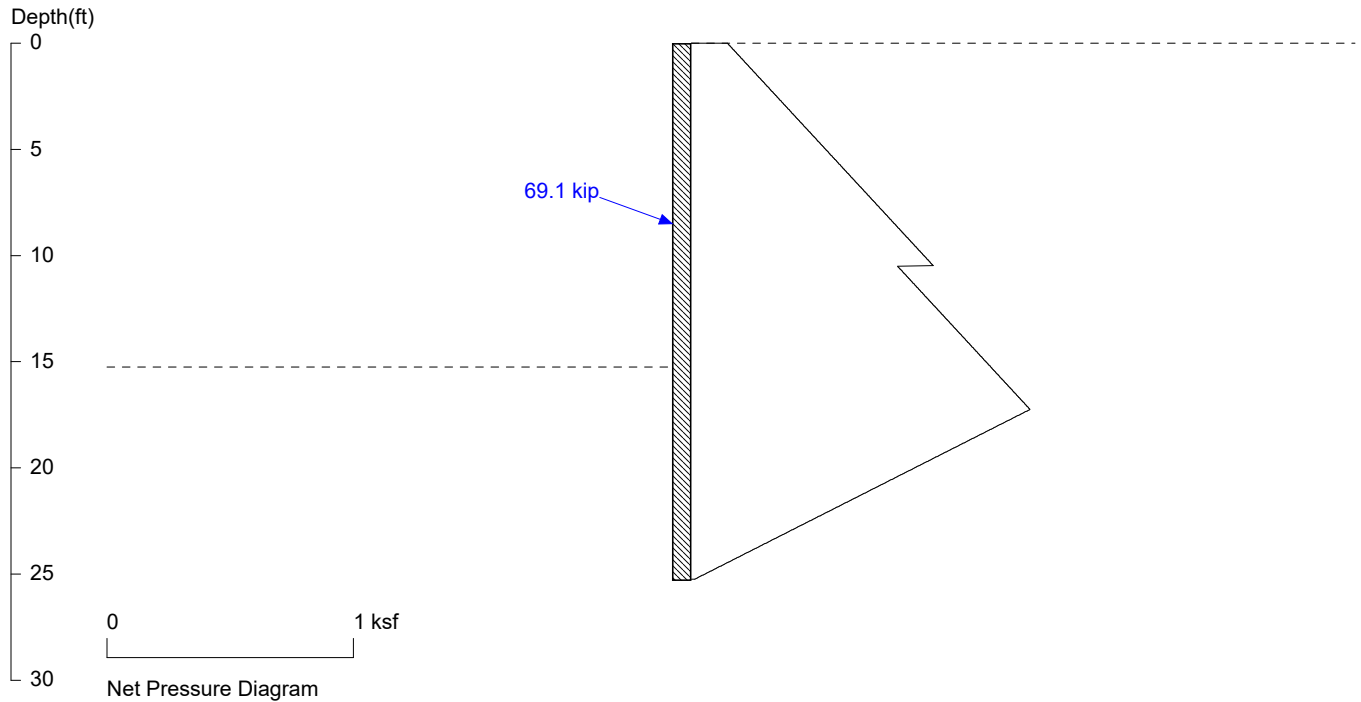
No.	Z depth	Spacing
1	0.00	6.00
2	18.00	2.00

PASSIVE SPACING:

No.	Z depth	Spacing
1	18.00	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# E10 (15.25 ft @ 6 ft oc)



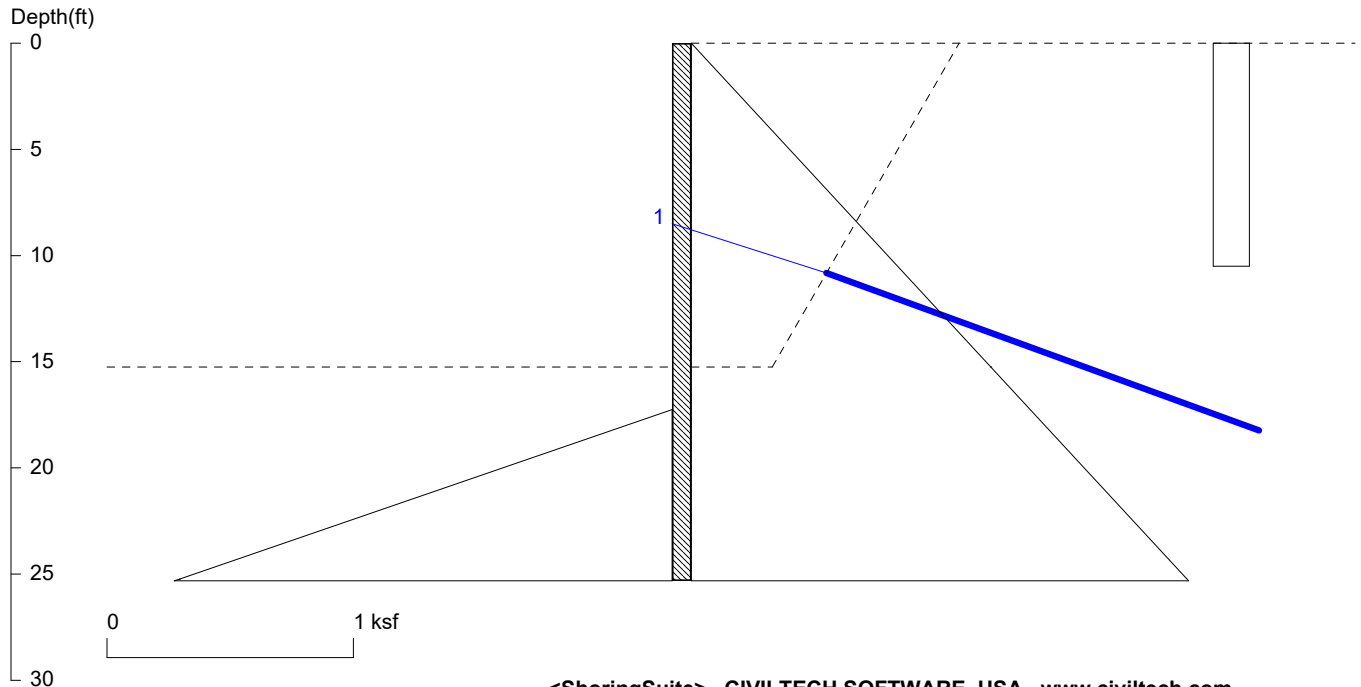
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 6.0 foot or meter

User Input Pile, W16X26: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=301.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E10\_15.25 ft @ 6 ft oc (Tieback).SH8

# E10 (15.25 ft @ 6 ft oc)



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Date: 6/2/2025

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E10\_15.25 ft @ 6 ft oc (Tieback)

Wall Height=15.3 Pile Diameter=2.0 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=10.07 Min. Pile Length=25.32  
 MOMENT IN PILE: Max. Moment=80.54 per Pile Spacing=6.0 at Depth=8.51

**PILE SELECTION:**

Request Min. Section Modulus = 29.3 in<sup>3</sup>/pile=479.92 cm<sup>3</sup>/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66  
 W16X26 has Section Modulus = 38.4 in<sup>3</sup>/pile=629.26 cm<sup>3</sup>/pile. It is greater than Min. Requirements!  
 Top Deflection = 0.00(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=301.0

**BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor**

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	L_free	Fixed Length
1. Tieback	8.5	20.0	6.0	69.1	64.9	23.6	6.8	44.0

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

**DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):**

Z1	P1	Z2	P2	Slope
0	0	15.25	1.216	0.07975
*	Below	Base		
15.25	1.216	100	7.975	.07975
0	.147	10.5	0.147	0

**PASSIVE PRESSURES:**

Z1	P1	Z2	P2	Slope
17.25	0	25.25	2.000	.25
25.25	2	200	54.425	.3

**ACTIVE SPACING:**

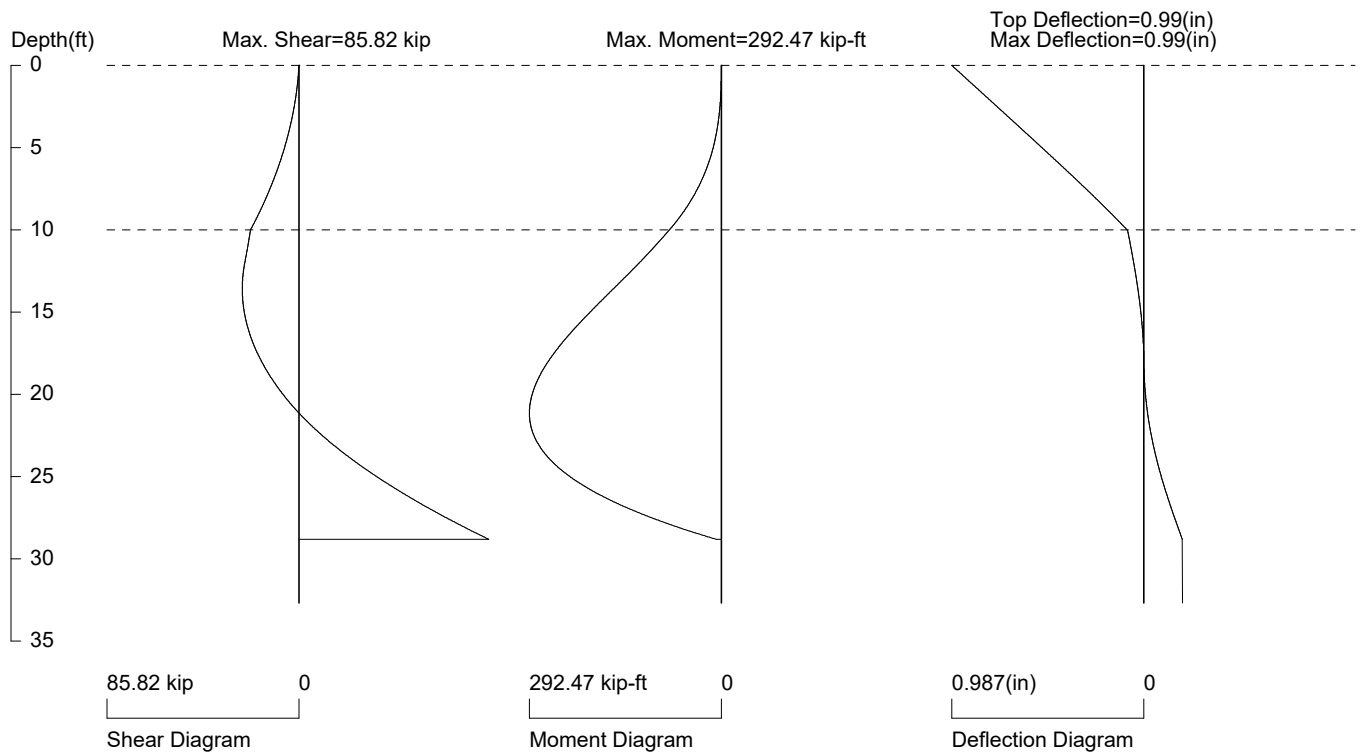
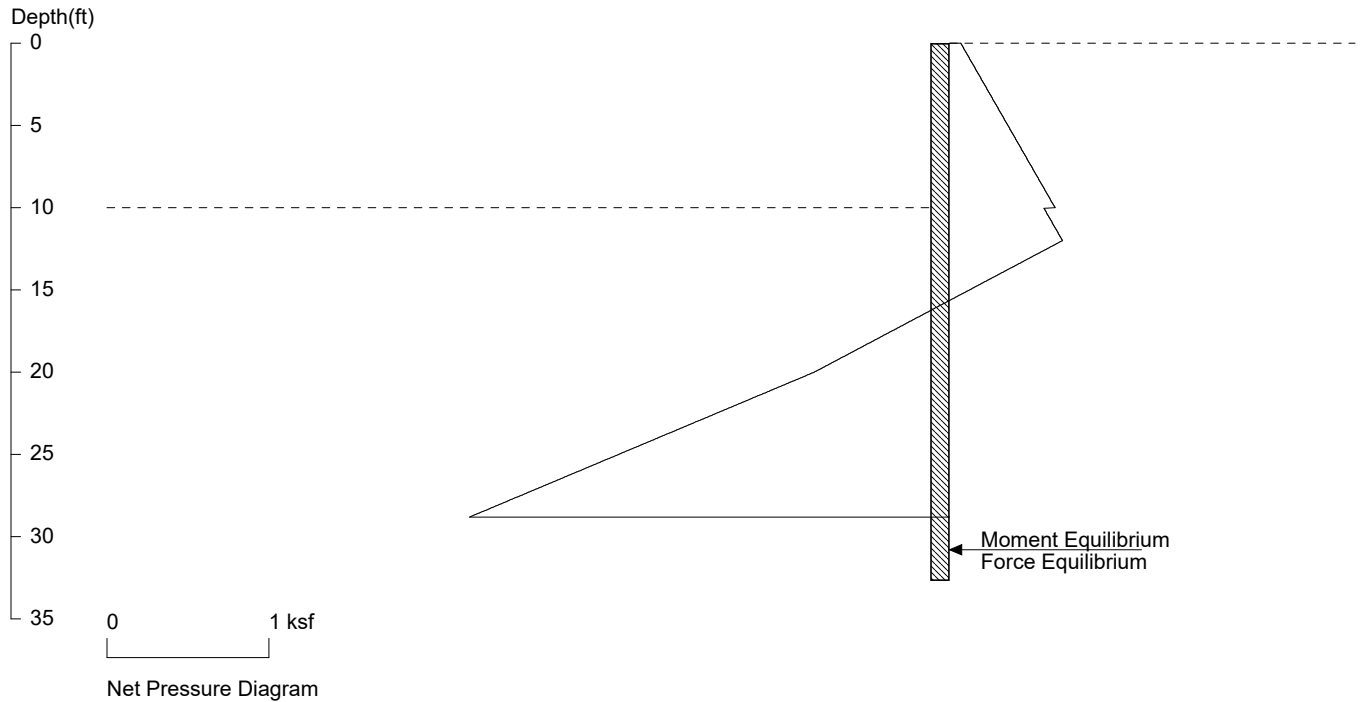
No.	Z depth	Spacing
1	0.00	6.00
2	15.25	2.00

PASSIVE SPACING:

No.	Z depth	Spacing
1	15.25	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# E11-E12 (10 ft @ 6 ft oc)



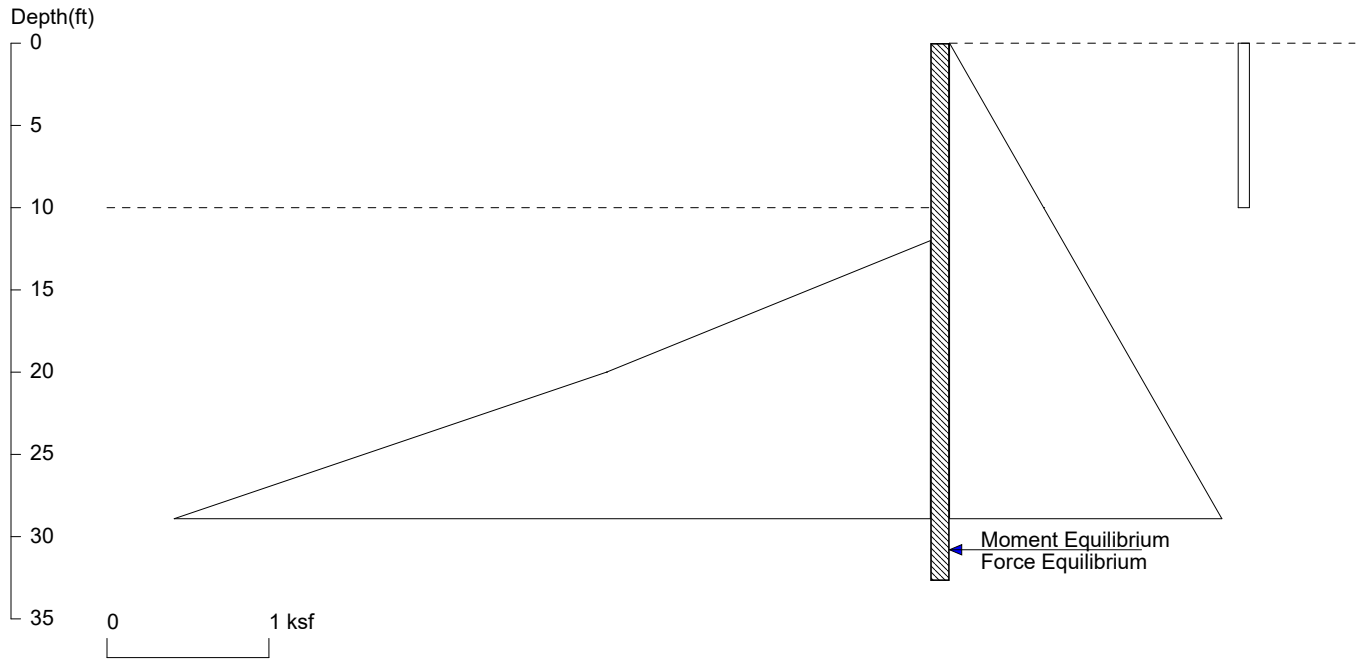
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 6.0 foot or meter

User Input Pile, W18X60: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=984.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E11,E12\_10 ft @ 6 ft oc (Cant).SH8

# E11-E12 (10 ft @ 6 ft oc)



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Date: 6/2/2025

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E11,E12\_10 ft @ 6 ft oc (Cant).

Wall Height=10.0

Pile Diameter=2.0

Pile Spacing=6.0

Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=22.68 Min. Pile Length=32.68

MOMENT IN PILE: Max. Moment=292.47 per Pile Spacing=6.0 at Depth=21.12

### PILE SELECTION:

Request Min. Section Modulus = 106.4 in<sup>3</sup>/pile=1742.80 cm<sup>3</sup>/pile, F<sub>y</sub>= 50 ksi = 345 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W18X60 has Section Modulus = 108.0 in<sup>3</sup>/pile=1769.80 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.99(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=984.0

### DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	10	0.582	0.05825
*	Below	Base		
10	.582	100	5.825	.05825
0	00.07	10	0.070	

### PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
12	0	20	2.000	.25
20	2	200	56.000	.3

### ACTIVE SPACING:

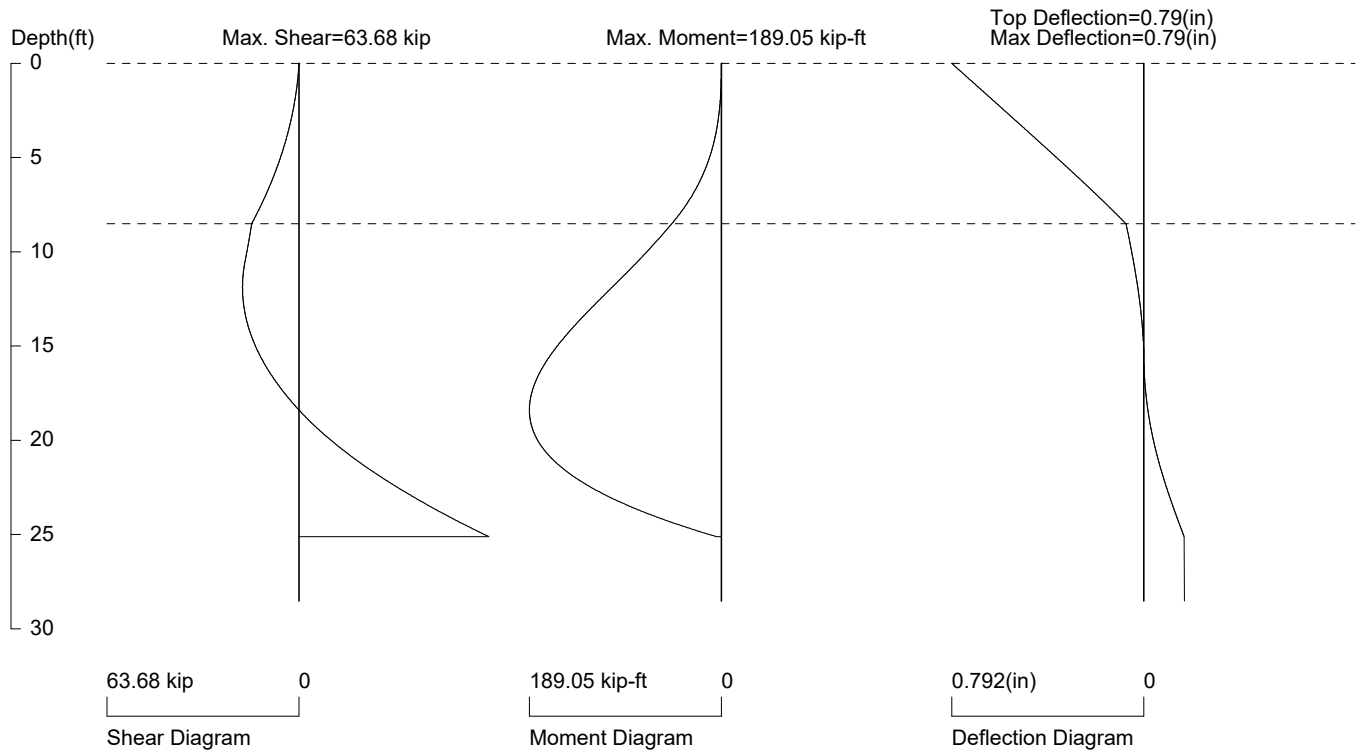
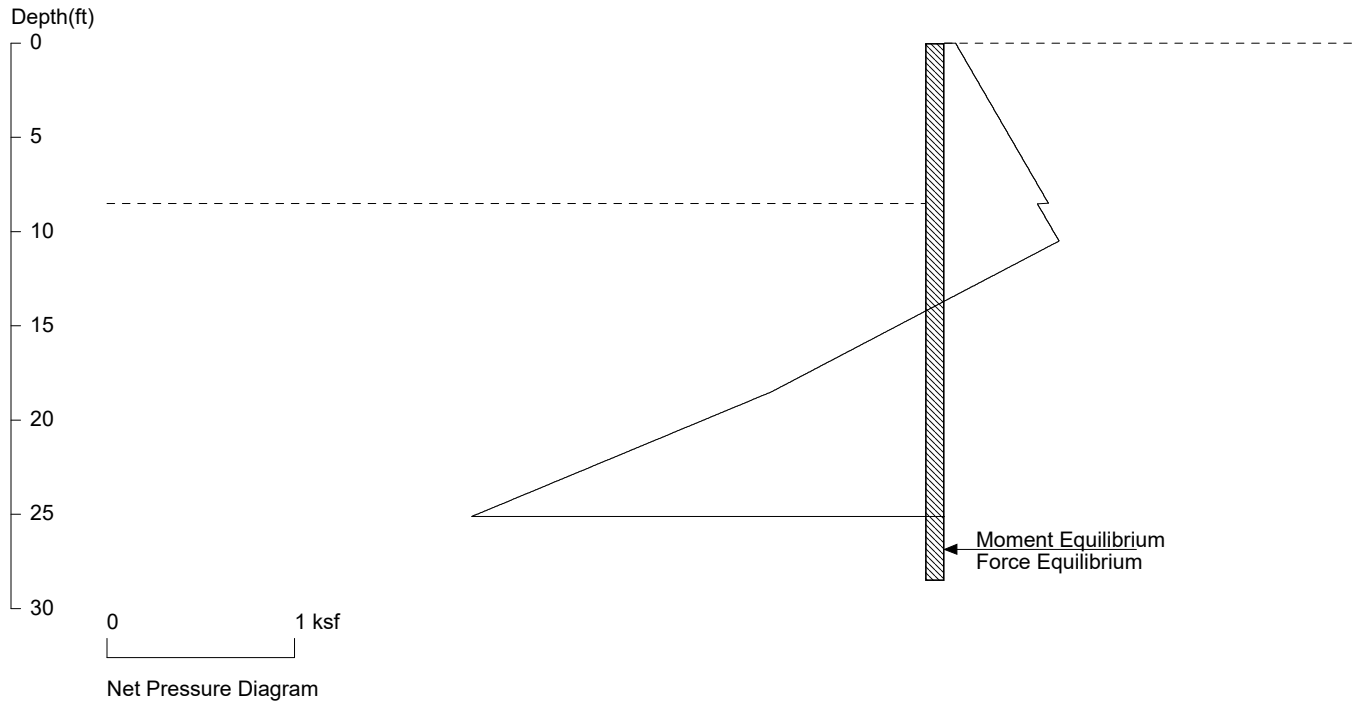
No.	Z depth	Spacing
1	0.00	6.00
2	10.00	2.00

### PASSIVE SPACING:

No.	Z depth	Spacing
1	10.00	4.00

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft  
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# E13 (8.5 ft @ 6 ft oc)



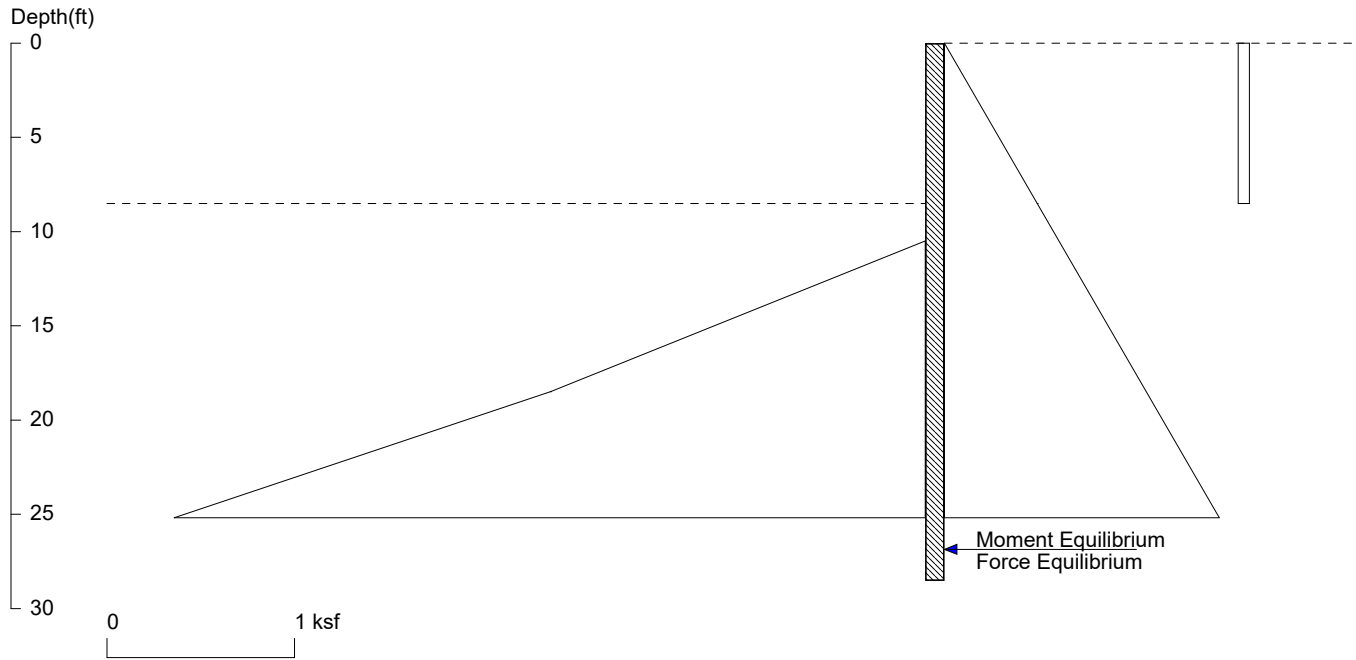
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 6.0 foot or meter

User Input Pile, W16X45: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=586.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E11,E12\_11 ft @ 6 ft oc (Cant).SH8

# E13 (8.5 ft @ 6 ft oc)



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Date: 6/2/2025

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E11,E12\_11 ft @ 6 ft oc (Cant).

Wall Height=8.5

Pile Diameter=2.0

Pile Spacing=6.0

Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=20.03 Min. Pile Length=28.53

MOMENT IN PILE: Max. Moment=189.05 per Pile Spacing=6.0 at Depth=18.39

## PILE SELECTION:

Request Min. Section Modulus = 68.7 in<sup>3</sup>/pile=1126.53 cm<sup>3</sup>/pile, F<sub>y</sub>= 50 ksi = 345 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W16X45 has Section Modulus = 72.7 in<sup>3</sup>/pile=1191.33 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.79(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=586.0

## DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	8.5	0.495	0.05825
*	Below	Base		
8.5	.495	100	5.825	.05825
0	.0595	8.5	0.060	

## PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
10.5	0	18.5	2.000	.25
18.5	2	200	56.450	.3

## ACTIVE SPACING:

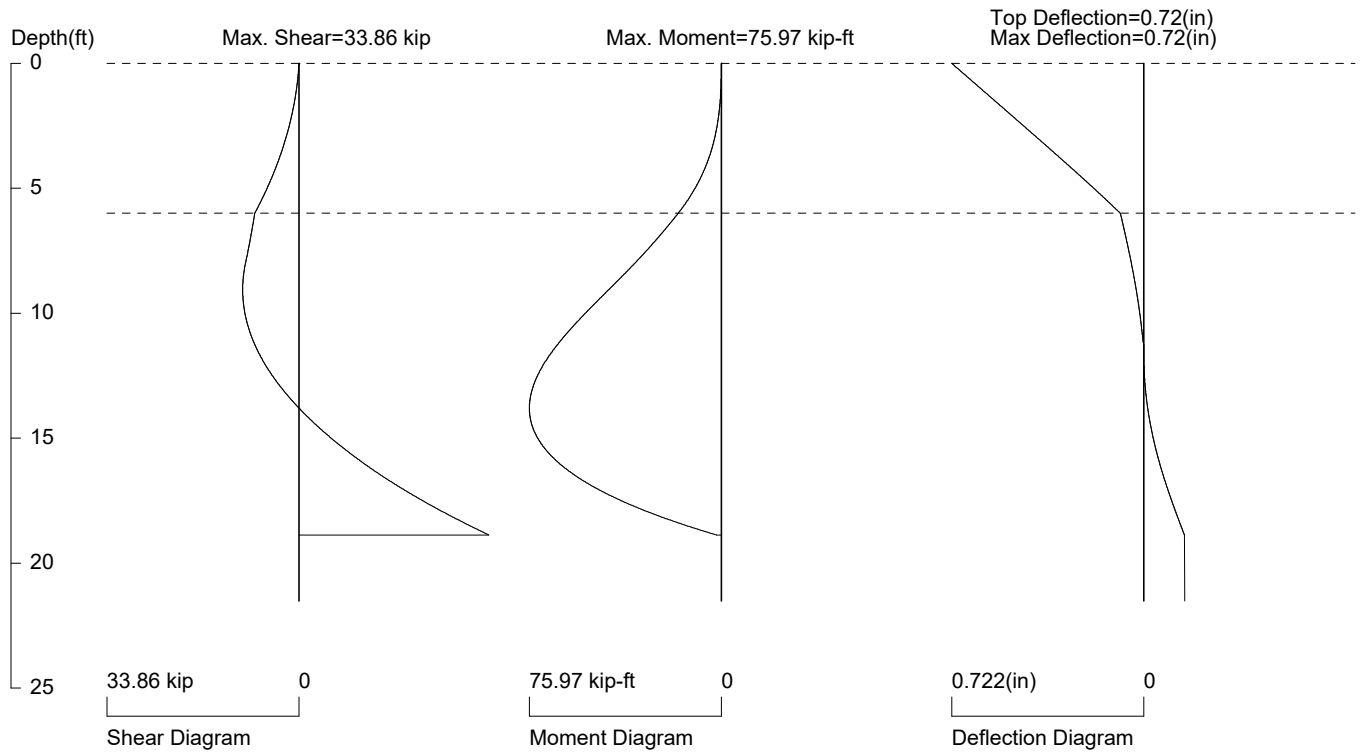
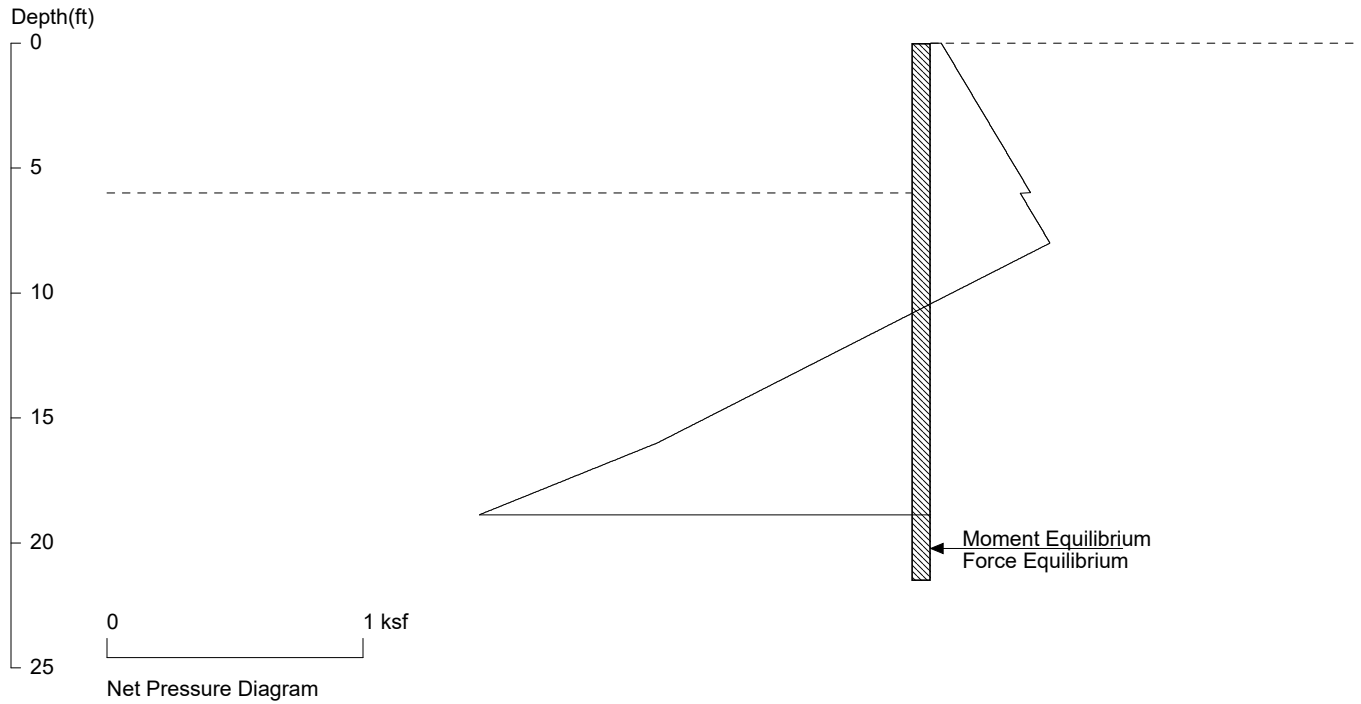
No.	Z depth	Spacing
1	0.00	6.00
2	8.50	2.00

## PASSIVE SPACING:

No.	Z depth	Spacing
1	8.50	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in

# E14 (6 ft @ 6 ft oc)



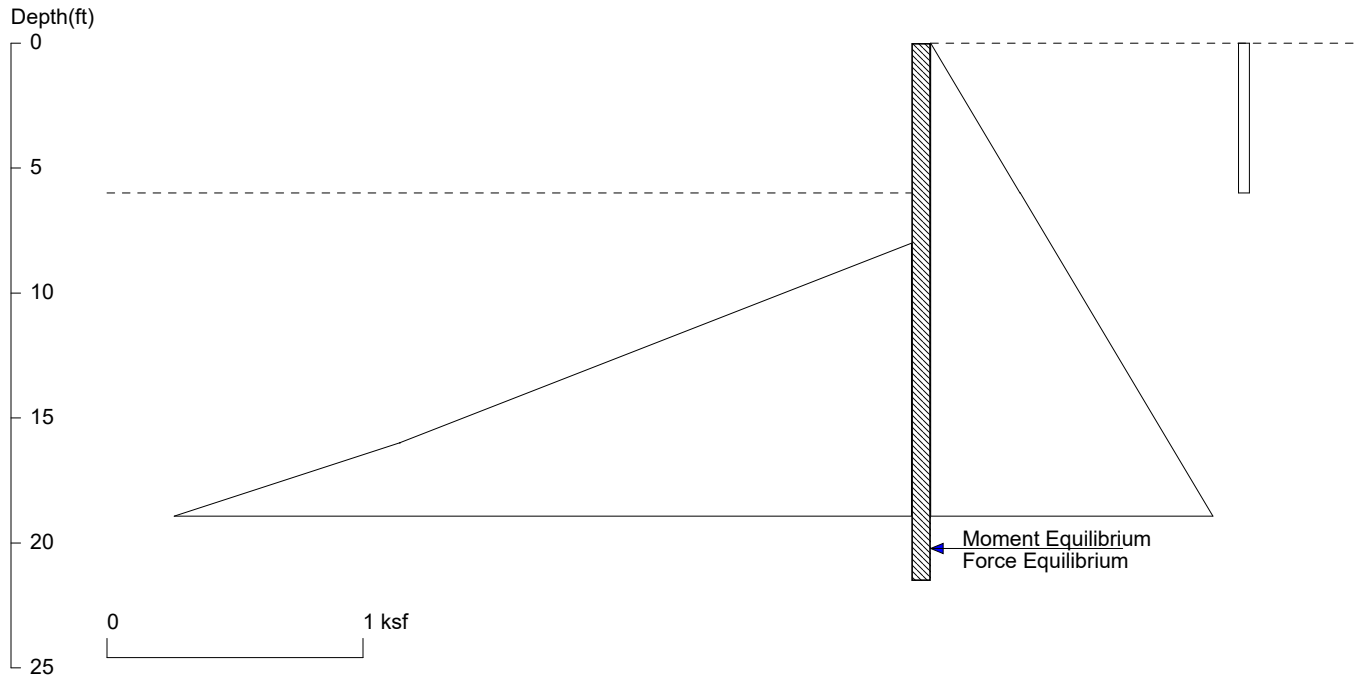
## PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 6.0 foot or meter

User Input Pile, W10X26: E (ksi)=29000.0, I (in<sup>4</sup>)/pile=144.0

File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E14 ft @ 6 ft oc (Cant).SH8

# E14 (6 ft @ 6 ft oc)



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File: C:\Users\javid\OneDrive\Desktop\Atlas Projects\269-2024 (5818 West Mercer)\Shoring\E14 ft @ 6 ft oc (Cant).SH8

Wall Height=6.0

Pile Diameter=2.0

Pile Spacing=6.0

Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=15.52 Min. Pile Length=21.52

MOMENT IN PILE: Max. Moment=75.97 per Pile Spacing=6.0 at Depth=13.80

### PILE SELECTION:

Request Min. Section Modulus = 27.6 in<sup>3</sup>/pile=452.70 cm<sup>3</sup>/pile, F<sub>y</sub>= 50 ksi = 345 MPa, F<sub>b</sub>/F<sub>y</sub>=0.66

W10X26 has Section Modulus = 27.9 in<sup>3</sup>/pile=457.20 cm<sup>3</sup>/pile. It is greater than Min. Requirements!

Top Deflection = 0.72(in) based on E (ksi)=29000.00 and I (in<sup>4</sup>)/pile=144.0

### DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	6	0.350	0.05825
*	Below	Base		
6	.35	100	5.826	.05825
0	.042	6	0.042	

### PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
8	0	16	2.000	.25
16	2	200	57.200	.3

### ACTIVE SPACING:

No.	Z depth	Spacing
1	0.00	6.00
2	6.00	2.00

### PASSIVE SPACING:

No.	Z depth	Spacing
1	6.00	4.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft  
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft<sup>3</sup>; Deflection - in