

Harriott Valentine Engineers Inc.

## STRUCTURAL CALCULATIONS

for TEMPORARY EXCAVATION SHORING

**Project:**

Sullivan Residence  
3024 69th Avenue SE  
Mercer Island, WA 98040

**Architect:**

Shed Architecture & Design  
1401 S. Jackson Street  
Seattle, WA 98144

**Structural Engineer:**

Harriott Valentine Engineers, Inc.  
1932 First Avenue, Suite 720  
Seattle, WA 98101  
tel. 206-624-4760



PROJECT: Sullivan  
 PILE ID: P1 - 3.87'

STEEL SECTION ID:	W8x10	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	16.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	3.87	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	10.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	3.87	.00	.14	4.00	1.05
TOTAL FORCE =							1.05

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	3.87	13.87	.14	.49	1.33	4.14
3	PASSIVE	5.87	10.00	-.30	-1.54	2.67	-10.13
4	PASSIVE	10.00	13.87	-1.54	-2.70	2.67	-21.88
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -27.88		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	3.87	53.87	400.00	400.00	1.33

PROJECT: Sullivan  
 PILE ID: P1 - 3.87'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	41.89	27.93	69.81

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 5.53 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	3.87	.00	1.05 OK	.00	-.17	-1.35	.32
2 EMBED	10.00	.00	1.50 OK	-1.35	-4.77	.00	.15

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: W8x10

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .070 = .070* OK
2 EMBED		.000 + .247 = .247* OK

PROJECT: Sullivan  
 PILE ID: P2 - 7.47'

STEEL SECTION ID:	w18x40	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	8.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	24.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	7.47	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	12.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	7.47	.00	.26	8.00	7.81
						TOTAL FORCE =	7.81

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	7.47	19.47	.26	.68	2.00	11.31
3	PASSIVE	9.47	10.00	-.30	-.46	4.00	-.81
4	PASSIVE	10.00	19.47	-.46	-3.30	4.00	-71.23
F.S. associated with Passive Pressure = 1.50						TOTAL FORCE =	-60.72

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	7.47	57.47	400.00	400.00	2.00

PROJECT: Sullivan  
 PILE ID: P2 - 7.47'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	75.40	62.83	138.23

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 8.93 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	7.47	.00	7.81 OK	.00	-2.43	-19.45	.75
2 EMBED	12.00	.00	10.56 OK	-19.45	-50.50	.00	.33

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w18x40

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .114 = .114* OK
2 EMBED		.000 + .295 = .295* OK

PROJECT: Sullivan  
 PILE ID: P3 - 12.32'

STEEL SECTION ID:	W24x55	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	6.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	12.32	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	15.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	12.32	.00	.43	6.00	15.94
TOTAL FORCE =							15.94

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	12.32	27.32	.43	.96	2.50	26.01
3	PASSIVE	14.32	27.32	-.60	-4.50	5.00	-165.75
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -139.74		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	12.32	62.32	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P3 - 12.32'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	117.81	98.17	215.98

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 13.93 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	12.32	.00	15.94 OK	.00	-8.18	-65.45	1.24
2 EMBED	15.00	.00	19.90 OK	-65.45	-130.34	.00	.39

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: W24x55

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .230 = .230* OK
2 EMBED		.000 + .457 = .457* OK

PROJECT: Sullivan  
 PILE ID: P4 - 13.66'

STEEL SECTION ID:	W24x55	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	13.66	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	16.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	13.66	.00	.48	4.00	13.06
TOTAL FORCE =							13.06

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	13.66	29.66	.48	1.04	2.50	30.32
3	PASSIVE	15.66	29.66	-.60	-4.80	4.00	-151.20
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -120.88		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	13.66	63.66	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P4 - 13.66'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	125.66	98.17	223.84

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 14.38 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	13.66	.00	13.06 OK	.00	-7.43	-59.46	1.22
2 EMBED	16.00	.00	17.16 OK	-59.46	-117.45	.00	.36

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: W24x55

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .209 = .209* OK
2 EMBED		.000 + .412 = .412* OK

PROJECT: Sullivan  
 PILE ID: P5 - 14.66'

STEEL SECTION ID:	W24x62	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	14.66	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	17.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	14.66	.00	.51	4.00	15.04
TOTAL FORCE =							15.04

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	14.66	31.66	.51	1.11	2.50	34.45
3	PASSIVE	16.66	31.66	-.60	-5.10	4.00	-171.00
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -136.55		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	14.66	64.66	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P5 - 14.66'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	133.52	98.17	231.69

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE  
 MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 15.19 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	14.66	.00	15.04 OK	.00	-9.18	-73.51	1.43
2 EMBED	17.00	.00	19.67 OK	-73.51	-142.52	.00	.41

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: W24x62

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .224 = .224* OK
2 EMBED		.000 + .435 = .435* OK

PROJECT: Sullivan  
 PILE ID: P6 - 15.16'

STEEL SECTION ID:	w24x68	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	15.16	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	17.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	15.16	.00	.53	4.00	16.09
TOTAL FORCE =							16.09

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	15.16	32.16	.53	1.13	2.50	35.19
3	PASSIVE	17.16	32.16	-.60	-5.10	4.00	-171.00
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -135.81		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	15.16	65.16	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P6 - 15.16'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	133.52	98.17	231.69

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 15.60 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	15.16	.00	16.09 OK	.00	-10.16	-81.30	1.47
2 EMBED	17.00	.00	21.72 OK	-81.30	-157.15	.00	.43

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w24x68

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .211 = .211* OK
2 EMBED		.000 + .408 = .408* OK

PROJECT: Sullivan  
 PILE ID: P7 - 15.65'

STEEL SECTION ID:	W24x76	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	15.65	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	18.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	15.65	.00	.55	4.00	17.14
TOTAL FORCE =							17.14

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	15.65	33.65	.55	1.18	2.50	38.82
3	PASSIVE	17.65	33.65	-.60	-5.40	4.00	-192.00
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -153.18		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	15.65	65.65	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P7 - 15.65'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	141.37	98.17	239.55

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 16.07 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	15.65	.00	17.14 OK	.00	-11.16	-89.41	1.47
2 EMBED	18.00	.00	22.14 OK	-89.41	-172.37	.00	.43

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: W24x76

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .203 = .203* OK
2 EMBED		.000 + .392 = .392* OK

PROJECT: Sullivan  
 PILE ID: P8 - 16.15'

STEEL SECTION ID:	W24x84	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	16.15	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	18.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	16.15	.00	.57	4.00	18.26
TOTAL FORCE =							18.26

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	16.15	34.15	.57	1.20	2.50	39.61
3	PASSIVE	18.15	34.15	-.60	-5.40	4.00	-192.00
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -152.39		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	16.15	66.15	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P8 - 16.15'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	141.37	98.17	239.55

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE  
 MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 16.56 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	16.15	.00	18.26 OK	.00	-12.27	-98.27	1.55
2 EMBED	18.00	.00	24.45 OK	-98.27	-188.70	.00	.45

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: W24x84

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .201 = .201* OK
2 EMBED		.000 + .385 = .385* OK

PROJECT: Sullivan  
 PILE ID: P9 - 17.18'

STEEL SECTION ID:	w24x94	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	17.18	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	21.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	17.18	.00	.60	4.00	20.66
TOTAL FORCE =							20.66

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	17.18	38.18	.60	1.34	2.50	50.86
3	PASSIVE	19.18	38.18	-.60	-6.30	4.00	-262.20
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -211.34		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	17.18	67.18	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P9 - 17.18'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	164.93	98.17	263.11

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 17.55 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	17.18	.00	20.66 OK	.00	-14.81	-118.35	1.69
2 EMBED	21.00	.00	24.64 OK	-118.35	-224.84	.00	.47

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w24x94

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .213 = .213* OK
2 EMBED		.000 + .405 = .405* OK

PROJECT: Sullivan  
 PILE ID: P10 - 17.51'

STEEL SECTION ID:	W24x94	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	17.51	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	23.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	17.51	.00	.61	4.00	21.46
TOTAL FORCE =							21.46

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	17.51	40.51	.61	1.42	2.50	58.38
3	PASSIVE	19.51	40.51	-.60	-6.90	4.00	-315.00
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -256.62		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	17.51	67.51	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P10 - 17.51'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	180.64	98.17	278.82

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE  
 MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 17.87 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR	CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)		(top)	(interior)	(bot)	(inch)
1 CANT.	17.51	.00	21.46	OK	.00	-15.65	-125.25	1.79
2 EMBED	23.00	.00	24.70	OK	-125.25	-237.04	.00	.49

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: W24x94

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .226 = .226* OK
2 EMBED		.000 + .427 = .427* OK

PROJECT: Sullivan  
 PILE ID: P11 - 16.58'

STEEL SECTION ID:	w24x94	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	16.58	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	19.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	16.58	.00	.58	4.00	19.24
TOTAL FORCE =							19.24

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	16.58	35.58	.58	1.25	2.50	43.36
3	PASSIVE	18.58	35.58	-.60	-5.70	4.00	-214.20
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -170.84		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	16.58	66.58	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P11 - 16.58'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	149.23	98.17	247.40

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 16.97 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	16.58	.00	19.24 OK	.00	-13.29	-106.34	1.52
2 EMBED	19.00	.00	24.75 OK	-106.34	-203.35	.00	.44

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w24x94

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .192 = .192* OK
2 EMBED		.000 + .366 = .366* OK

PROJECT: Sullivan  
 PILE ID: P12 - 14.75'

STEEL SECTION ID:	W24x62	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	14.75	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	17.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	14.75	.00	.52	4.00	15.23
TOTAL FORCE =							15.23

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	14.75	31.75	.52	1.11	2.50	34.58
3	PASSIVE	16.75	31.75	-.60	-5.10	4.00	-171.00
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -136.42		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	14.75	64.75	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P12 - 14.75'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	133.52	98.17	231.69

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE  
 MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 15.26 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	14.75	.00	15.23 OK	.00	-9.37	-74.91	1.47
2 EMBED	17.00	.00	20.06 OK	-74.91	-145.00	.00	.42

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: W24x62

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .229 = .229* OK
2 EMBED		.000 + .443 = .443* OK

PROJECT: Sullivan  
 PILE ID: P13 - 12.14'

STEEL SECTION ID:	w21x44	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	3.50	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	12.14	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	16.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	12.14	.00	.42	3.50	9.03
TOTAL FORCE =							9.03

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	12.14	28.14	.42	.98	2.50	28.20
3	PASSIVE	14.14	28.14	-.60	-4.22	3.50	-118.01
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -89.81		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	12.14	62.14	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P13 - 12.14'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	125.66	98.17	223.84

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE  
 MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 14.14 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	12.14	.00	9.03 OK	.00	-4.57	-36.53	.99
2 EMBED	16.00	.00	11.46 OK	-36.53	-76.65	.00	.30

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w21x44

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .179 = .179* OK
2 EMBED		.000 + .376 = .376* OK

PROJECT: Sullivan  
 PILE ID: P14 - 12.10'

STEEL SECTION ID:	w18x35	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	2.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	12.10	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	16.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	12.10	.00	.42	2.00	5.12
TOTAL FORCE =							5.12

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	12.10	28.10	.42	.98	2.50	28.14
3	PASSIVE	14.10	28.10	-.60	-4.22	2.00	-67.43
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -39.29		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	12.10	62.10	400.00	400.00	2.00

PROJECT: Sullivan  
 PILE ID: P14 - 12.10'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	125.66	98.17	223.84

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 15.15 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	12.10	.00	5.13 OK	.00	-2.58	-20.67	1.14
2 EMBED	16.00	.00	8.66 OK	-20.67	-51.10	.00	.38

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w18x35

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .144 = .144* OK
2 EMBED		.000 + .355 = .355* OK

PROJECT: Sullivan  
 PILE ID: P15 - 25.00'

STEEL SECTION ID:	w18x65	MIN.ANC.LEN. (LD.ZONE) (ft) =	10.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	6.25
SPACING BETWEEN PILES (ft) =	8.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	22.75
DEPTH OF EXCAVATION (ft) =	25.00	SKIN FRICT. ON PILE (ksf) =	1.50
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	10.00
NO. OF TIE BACK ANCHORS =	1	PILE TIP EMBEDMENT (ft) =	10.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	25.00	.00	.88	8.00	87.50
TOTAL FORCE =							87.50

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	25.00	35.00	.88	1.23	2.50	26.25
3	PASSIVE	27.00	35.00	-.60	-3.00	5.00	-72.00
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -45.75		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	25.00	75.00	400.00	400.00	2.50

S U M M A R Y O F M I S C E L L . T I E B A C K D A T A

TIE BACK NO.	TIE LOC. (ft)	TIE ANGLE (deg)	ALLOW. FRICT. (ksf)	HORIZ. STIFF. (k/ft)	TIE - BACK HORIZ. (kips)	VERT. (kips)	TOTAL FORCES (kips)	NL ANC. LENGTH (ft)
1	8.00	20.00	1.50	1436.	-53.16	19.35	56.57	14.13
TOTAL FORCE COMPONENTS =					-53.16	19.35		

PROJECT: Sullivan  
 FILE ID: P15 - 25.00'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	19.35	19.35	117.81	49.09	166.90

TIEBACK ANCHOR DESIGN FOR THE SPECIFIED SOIL FRICTION COEFFICIENTS ABOVE

TIE BACK NO.	ANCHOR EMBED.LEN.(ft) REQ'D FOR				TOTAL EMBED.LEN.(ft) REQ'D FOR			
	12" diam.	14" diam.	16" diam.	18" diam.	12" diam.	14" diam.	16" diam.	18" diam.
1	12.00	10.29	10.00	10.00	26.13	24.42	24.13	24.13

THE MOMENT OF FORCES ACTING BELOW THE LOWEST TIE BACK ( ASSUME HINGED )

DISTURBING MOMENT OF ACTIVE FORCES @ BOTTOM TIE BACK (k-ft) = 3316.08  
 RESTORING MOMENT OF PASSIVE FORCES @ BOTTOM TIE BACK (k-ft) = -94320.00  
 MINIMUM DEPTH OF PILE EMBEDMENT FOR MOMENT EQUILIBRIUM (ft) = 8.80

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR	CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)		(top)	(interior)	(bot)	(inch)
1 CANT.	8.00	.00	8.96	OK	.00	-2.99	-23.89	.44
2 CONT.	17.00	19.35	44.20	OK	-23.89	264.83	174.53	1.17
3 EMBED	10.00	19.35	38.89	OK	174.53	174.53	.00	.90

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w18x65

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .082 = .082* OK
2 CONT.		.037 + .905 = .942* OK
3 EMBED		.035 + .597 = .632* OK

PROJECT: Sullivan  
 PILE ID: P20 - 12.77'

STEEL SECTION ID:	w24x94	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	8.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	12.77	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	17.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	12.77	.00	.45	8.00	22.83
TOTAL FORCE =							22.83

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	12.77	29.77	.45	1.04	2.50	31.64
3	PASSIVE	14.77	29.77	-.60	-5.10	5.00	-213.75
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -182.11		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	12.77	62.77	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P20 - 12.77'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	133.52	98.17	231.69

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 15.88 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	12.77	.00	22.83 OK	.00	-12.15	-97.20	1.24
2 EMBED	17.00	.00	26.75 OK	-97.20	-197.83	.00	.44

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w24x94

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .175 = .175* OK
2 EMBED		.000 + .356 = .356* OK

PROJECT: Sullivan  
 PILE ID: P20 - 12.77'

STEEL SECTION ID:	w24x94	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	8.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	30.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	12.77	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	17.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	12.77	.00	.45	8.00	22.83
TOTAL FORCE =							22.83

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	12.77	29.77	.45	1.04	2.50	31.64
3	PASSIVE	14.77	29.77	-.60	-5.10	5.00	-213.75
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -182.11		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	12.77	62.77	400.00	400.00	2.50

PROJECT: Sullivan  
 PILE ID: P20 - 12.77'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	133.52	98.17	231.69

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE  
 MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 15.88 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	12.77	.00	22.83 OK	.00	-12.15	-97.20	1.24
2 EMBED	17.00	.00	26.75 OK	-97.20	-197.83	.00	.44

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w24x94

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .175 = .175* OK
2 EMBED		.000 + .356 = .356* OK

PROJECT: Sullivan  
 FILE ID: P23 - 12.08'

STEEL SECTION ID:	w18x46	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	24.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	12.08	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	16.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	12.08	.00	.42	4.00	10.21
TOTAL FORCE =							10.21

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	12.08	28.08	.42	.98	2.00	22.49
3	PASSIVE	14.08	28.08	-.60	-4.80	4.00	-151.20
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -128.71		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	12.08	62.08	400.00	400.00	2.00

PROJECT: Sullivan  
 FILE ID: P23 - 12.08'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	100.53	62.83	163.36

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE  
 MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 12.89 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	12.08	.00	10.22 OK	.00	-5.14	-41.13	1.19
2 EMBED	16.00	.00	12.05 OK	-41.13	-80.17	.00	.35

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w18x46

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .209 = .209* OK
2 EMBED		.000 + .407 = .407* OK

PROJECT: Sullivan  
 PILE ID: P24 - 9.74'

STEEL SECTION ID:	w18x65	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	8.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	24.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	9.74	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	16.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	9.74	.00	.34	8.00	13.28
TOTAL FORCE =							13.28

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	9.74	25.74	.34	.90	2.00	19.87
3	PASSIVE	11.74	25.74	-.56	-4.76	4.00	-148.96
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE = -129.09		

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	9.74	59.74	400.00	400.00	2.00

PROJECT: Sullivan  
 PILE ID: P24 - 9.74'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	100.53	62.83	163.36

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE  
 MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 13.88 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	9.74	.00	13.28 OK	.00	-5.39	-43.13	.93
2 EMBED	16.00	.00	14.79 OK	-43.13	-96.54	.00	.35

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w18x65

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .147 = .147* OK
2 EMBED		.000 + .330 = .330* OK

PROJECT: Sullivan  
 PILE ID: P25 - 8.15'

STEEL SECTION ID:	w18x46	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	8.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	24.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	8.15	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	14.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	8.15	.00	.29	8.00	9.30
						TOTAL FORCE =	9.30

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	8.15	22.15	.29	.78	2.00	14.85
3	PASSIVE	10.15	22.15	-.32	-3.92	4.00	-101.76
F.S. associated with Passive Pressure = 1.50						TOTAL FORCE =	-86.91

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	8.15	58.15	400.00	400.00	2.00

PROJECT: Sullivan  
 PILE ID: P25 - 8.15'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	87.96	62.83	150.80

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 12.26 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	8.15	.00	9.30 OK	.00	-3.16	-25.26	.78
2 EMBED	14.00	.00	10.85 OK	-25.26	-63.83	.00	.32

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w18x46

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .128 = .128* OK
2 EMBED		.000 + .324 = .324* OK

PROJECT: Sullivan  
 FILE ID: P26 - 6.94'

STEEL SECTION ID:	w18x35	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	8.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	24.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	6.94	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	12.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	6.94	.00	.24	8.00	6.74
						TOTAL FORCE =	6.74

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	6.94	18.94	.24	.66	2.00	10.87
3	PASSIVE	8.94	10.00	-.30	-.46	4.00	-1.61
4	PASSIVE	10.00	18.94	-.46	-3.14	4.00	-64.40
F.S. associated with Passive Pressure = 1.50						TOTAL FORCE =	-55.14

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	6.94	56.94	400.00	400.00	2.00

PROJECT: Sullivan  
 PILE ID: P26 - 6.94'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	75.40	62.83	138.23

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE

MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 9.38 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	6.94	.00	6.74 OK	.00	-1.95	-15.59	.69
2 EMBED	12.00	.00	9.31 OK	-15.59	-43.76	.00	.31

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w18x35

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .108 = .108* OK
2 EMBED		.000 + .304 = .304* OK

PROJECT: Sullivan  
 PILE ID: P27 - 5.36'

STEEL SECTION ID:	w8x21	MIN.ANC.LEN. (LD.ZONE) (ft) =	.00
STEEL YIELD STRESS Fy (ksi) =	50.00	NO LOAD ZONE OFFSET (ft) =	5.00
SPACING BETWEEN PILES (ft) =	4.00	NO LOAD ZONE ANGLE (deg) =	60.00
BASE HOLE DIAMETER (in) =	16.00	NO LOAD ZONE MX.PROJ. (ft) =	20.00
DEPTH OF EXCAVATION (ft) =	5.36	SKIN FRICT. ON PILE (ksf) =	1.00
ADDED DEPTH TO FIX. PT. (ft) =	.00	PILE TIP BEAR. CAP. (ksf) =	20.00
NO. OF TIE BACK ANCHORS =	0	PILE TIP EMBEDMENT (ft) =	10.00
ITERATIVE METHOD USED	YES	PASSIVE TRIB.WIDTH FACTOR =	2.00
SHEAR SURCHARGE LOAD (kips) =	.00	SUB-GRADE MOD.WIDTH FACT. =	1.00
MOMENT SURCHARGE LD. (k-ft) =	.00	ALLOW. OVER-STRESS FACTOR =	1.00

S O I L L O A D S U M M A R Y A B O V E E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
1	ACTIVE	.00	5.36	.00	.19	4.00	2.01
						TOTAL FORCE =	2.01

S O I L L O A D S U M M A R Y B E L O W E X C A V A T I O N

LOAD NO.	SOIL LOAD TYPE	START DEPTH (feet)	END DEPTH (feet)	START PRESS. (ksf)	END PRESS. (ksf)	TRIBUTARY WIDTH (feet)	EQUIV. FORCES (kips)
2	ACTIVE	5.36	15.36	.19	.54	1.33	4.83
3	PASSIVE	7.36	10.00	-.30	-.70	2.67	-3.52
4	PASSIVE	10.00	15.36	-.70	-2.31	2.67	-21.49
F.S. associated with Passive Pressure =				1.50	TOTAL FORCE =		-20.18

S O I L S U B G R A D E M O D U L U S I N P U T S U M M A R Y

ZONE NO.	START DEPTH (feet)	ENDING DEPTH (feet)	START MODULUS (kcf)	ENDING MODULUS (kcf)	TRIBUTARY WIDTH (feet)
1	5.36	55.36	400.00	400.00	1.33

PROJECT: Sullivan  
 PILE ID: P27 - 5.36'

AXIAL PILE LOADS			AXIAL PILE CAPACITY ( OK )		
APPLIED LOAD (kips)	TIE BACK LOAD (kips)	TOTAL LOAD (kips)	SKIN FRICTION (kips)	END BEARING (kips)	TOTAL CAPACITY (kips)
.00	.00	.00	41.89	27.93	69.81

MINIMUM DEPTH OF EMBEDMENT REQUIRED FOR STABILITY OF THE CANTILEVER PILE  
 MINIMUM DEPTH OF PILE EMBEDMENT BELOW DREDGE LINE (F.S.= 1) = 7.21 (ft)

A X I A L , S H E A R , M O M E N T & D E F L E C T . S U M M A R Y

SEGMENT	LENGTH	AXIAL	SHEAR CHK	M O M E N T S (k-ft)			DEFL.
No. type	(feet)	(kips)	(kips)	(top)	(interior)	(bot)	(inch)
1 CANT.	5.36	.00	2.01 OK	.00	-.45	-3.59	.56
2 EMBED	10.00	.00	2.91 OK	-3.59	-10.97	.00	.24

A.I.S.C. CODE COMBINED STRESS CHECK - STEEL PILE SECTION: w8x21

SEGMENT	STABILITY CRITERIA	STRESS CRITERIA
No.type	( 1.6-1a ) (Cm = 1)	( 1.6-1b or 1.6-2 * )
1 CANT.		.000 + .079 = .079* OK
2 EMBED		.000 + .241 = .241* OK