CONSTRUCTION LEADERS

LETTER OF TRANSMITTAL			
DATE:	**April 23, 2015**	PCL JOB NO:	**5515002**
ATTN:	**Chris Barker**	TRANSMITTAL NO:	**061**

To: **State of Vermont Agency of Transportation**
One National Life Drive
Montpelier, VT 05633-5001
(802) 828-0053

Re: Hartford Lateral Slide
Project No.: IM 091-2(79)
Contract ID.: 12A132 County: Windsor PCL FILE NO: 5515002-39a.1

WE ARE SENDING X Attached ____ Under separate cover via **Email & SP** the following:
____ Shop drawings ____ Prints X Plans ____ Samples ____ Specifications
____ Copy of Letter ____ Change Order X Other

COPIES	SPEC.	REVISION	DESCRIPTION
1	**204.01.b**	**2**	**Abutment SOE Walls (Abutment 2)**

TRANSMITTED for as checked below:

X For approval ____ Approved as submitted ____ Resubmit 1 Copies for approval
____ For your use ____ Approved as noted ____ Submit ____ Copies for distribution
____ As requested ____ Returned for corrections ____ Return ____ Corrected prints
____ For review and comment

Remarks:

The attached drawings & calculations have been revised to incorporate as-built conditions.

Please return an email of this approved submittal to Erich Heymann (ewheymann@pcl.com) and Jeremy Mackling (jmackling@pcl.com).

We request the review and return of this submittal within 1 day. Please advise if this request cannot be met so we can plan accordingly.

By: **Erich Heymann,** Project Engineer

COPY TO: Project Files

CONSTRUCTION LEADERS

SUBMITTAL NO. : 39a.1
Abutment SOE Walls

Item No.	Specification	Description
1	204.01.b	Abutment SOE Walls (Abutment 2)

PROJECT:
HARTFORD LATERAL SLIDE
PROJECT NO.: IM 091-2(79)
CONTRACT ID.: 12A132

OWNER:
STATE OF VERMONT AGENCY OF TRANSPORTATION

ENGINEER OF RECORD:
STATE OF VERMONT AGENCY OF TRANSPORTATION

CONTRACTOR:
PCL CIVIL CONSTRUCTORS, INC.

APRIL 23, 2015

3810 Northdale Blvd., Suite 200; Tampa, FL • (813) 264-9500 • (813) 264-6689 (fax)

PCL CONSTRUCTION

Vermont Agency of Transportation

I-91
Windsor County
Project Number: IM 091-2(79)

Hartford Lateral Slide

Calculations for Temporary Structures including:

Abutment 2 SOE Wall

Revision 01

Submitted By,

Tim Davis, P.E.
VT P.E. # 97183

André Tousignant, P.E.
VT P.E. # 100162

STATE OF VERMONT
TIMOTHY DAVIS
NO. 97183
CIVIL
LICENSED
PROFESSIONAL ENGINEER

Apr 23 2015 9:29 AM

CoSign

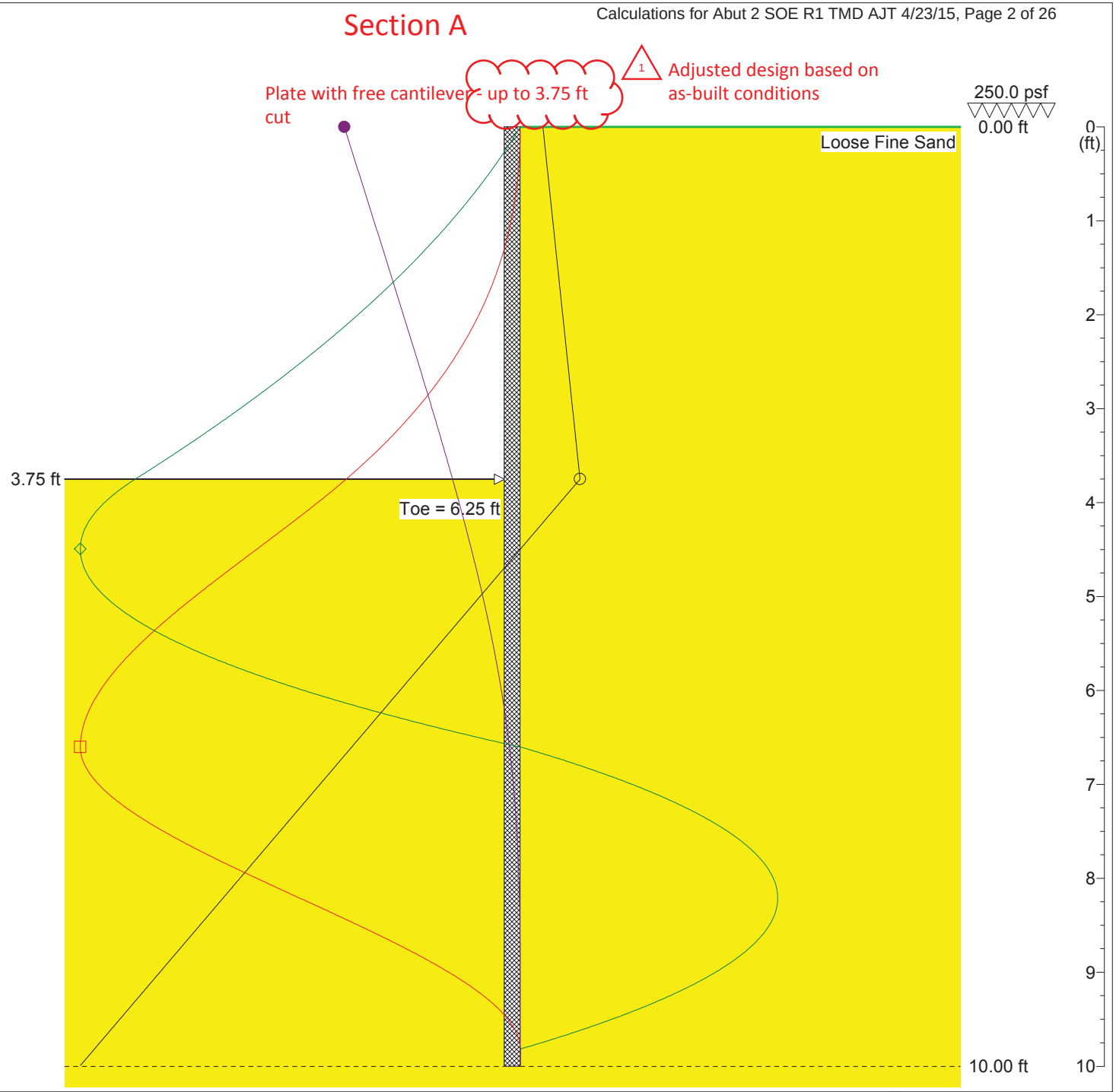
April 23, 2015

PCL Civil Constructors Inc.
3810 Northdale Blvd. Suite 200
Tampa, Florida 33624
813-264-9500

Page: 1
Date: 4.21.15

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 1.09 (K_ax1.2)
Toe: Cantilever

	Maximum	d (ft)
○	217.6 psf	3.75
□	2259.6 ftlb/ft	6.60
◇	644.3 lb/ft	4.49
●	3.2 in	0.00



PCL Civil Constructors, Inc.

SupportIT, v2.36

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Page: 2
Date: 4.21.15

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 1.09 (K_ax1.2)
Toe: Cantilever

Input Data

Depth Of Excavation = 3.75ft
Surcharge = 250.0psf

Depth Of Active Water = 20.00ft
Depth Of Passive Water = 20.00ft

Water Density = 62.43pcf
Minimum Fluid Density = 31.82pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	φ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Loose Fine Sand	109.20	65.55	0.0	0.0	30.0	0.0	0.33 (0.40)	0.00 (0.00)	3.00	0.00

( ) indicates factored value used in embedment calculation. Factor(s): K_ax1.2

Solution

Sheet

Sheet Name	E (psi)	I (in⁴/ft)	f (psi)	Z (in³/ft)	Allowed M_{max} (ftlb/ft)	b (in)	A (in²/ft)	W (lb/ft)	Upstand (ft)	Toe (ft)	Length (ft)
1" Road Plate	3.04E+07	1.00	27000.0	2.00	4166.7	12.00	12.00	41.0	0.00	6.25	10.00

Maxima

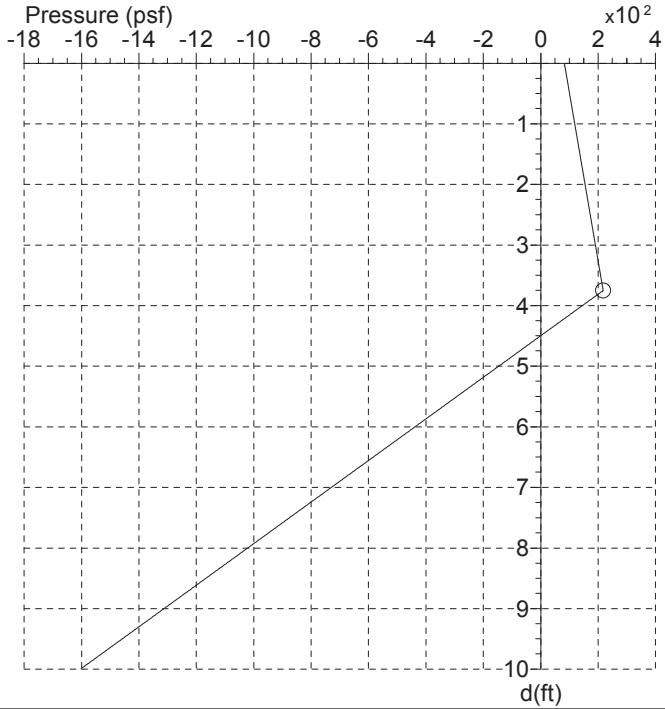
	Maximum	Depth (ft)
Pressure	217.6 psf	3.75
Bending Moment	2259.6 ftlb/ft	6.60
Deflection	3.2 in	0.00
Shear Force	644.3 lb/ft	4.49

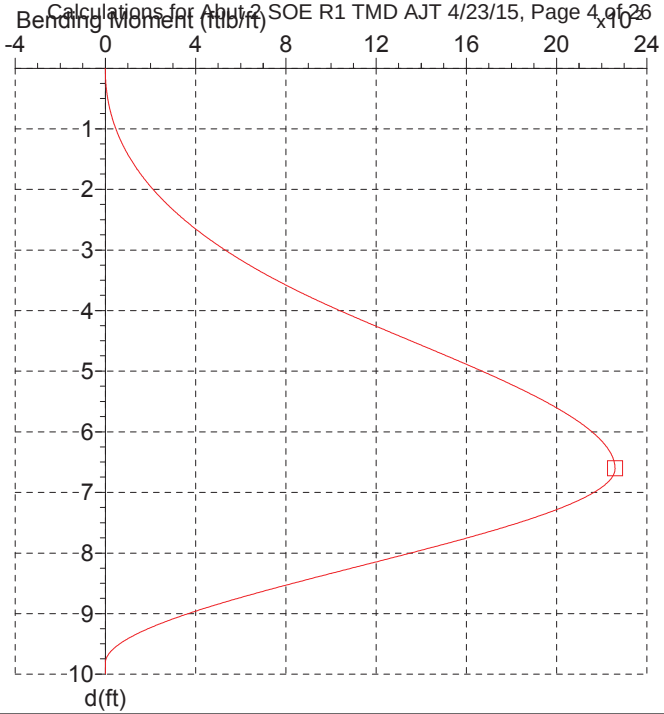
© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

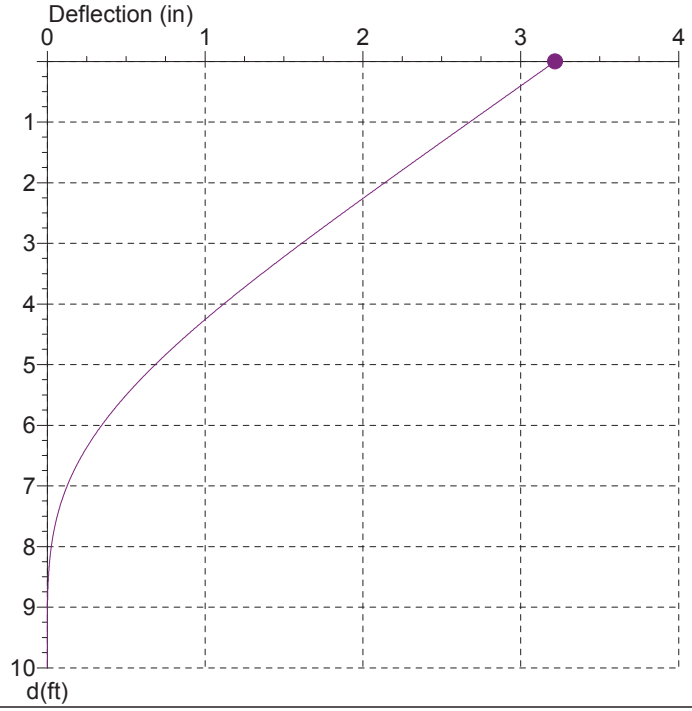
Page: 3
Date: 4.21.15

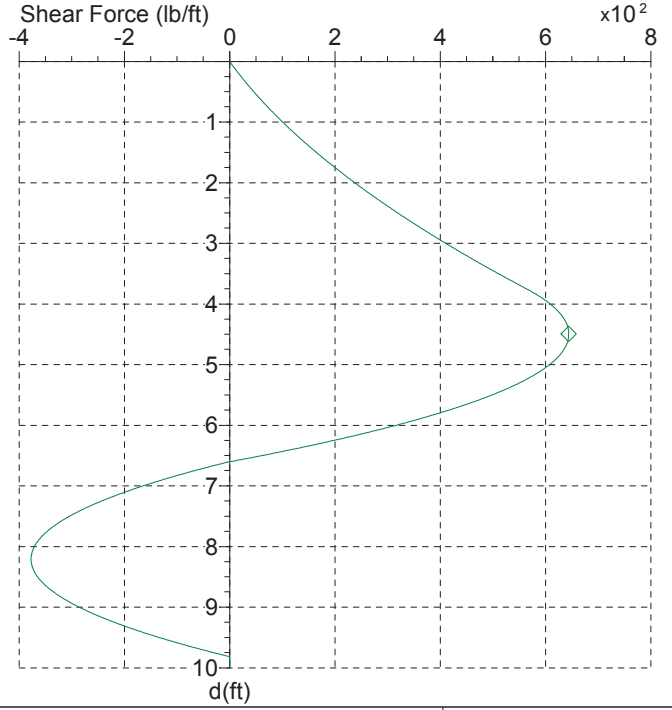
Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 1.09 (K_ax1.2)
Toe: Cantilever

	Maximum	d (ft)
○	217.6 psf	3.75
□	2259.6 ftlb/ft	6.60
◇	644.3 lb/ft	4.49
●	3.2 in	0.00









PCL Civil Constructors, Inc.

SupportIT, v2.36

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Page: 4
Date: 4.21.15

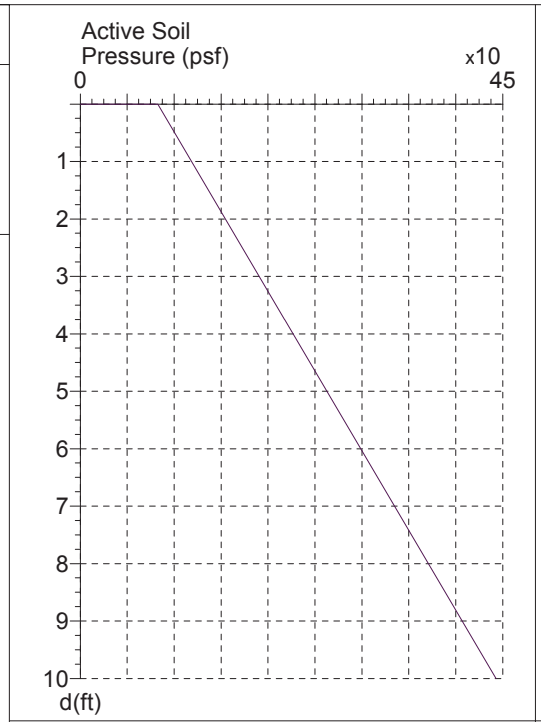
Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 1.09 (K_ax1.2)
Toe: Cantilever

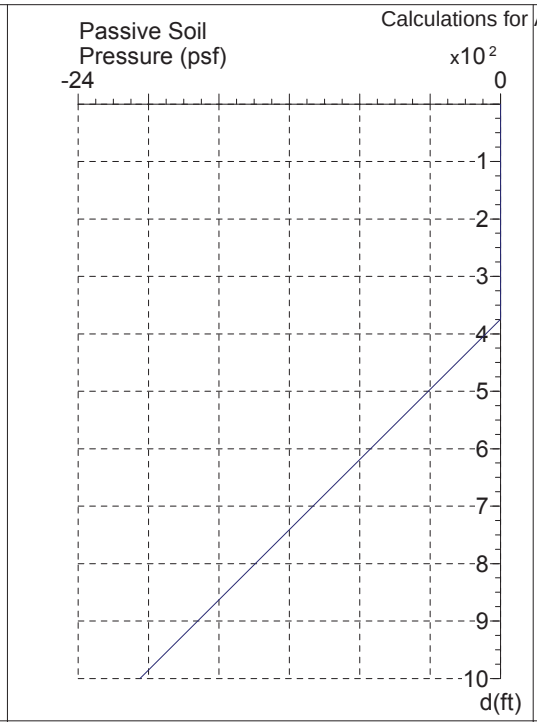
depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	82.5	0.0	3.2	0.0	3.36	203.5	690.5	1.4	481.3	6.71	-644.9	2252.7	0.2	-49.1
0.07	84.9	0.2	3.2	5.6	3.42	205.9	722.9	1.4	495.0	6.78	-666.8	2239.4	0.2	-81.1
0.14	87.3	0.7	3.1	11.3	3.49	208.3	756.2	1.4	508.8	6.85	-686.2	2222.0	0.2	-108.1
0.21	90.0	1.8	3.1	18.0	3.56	210.7	790.4	1.3	522.8	6.92	-705.7	2199.8	0.1	-133.9
0.27	92.4	3.1	3.1	24.1	3.63	213.4	830.0	1.3	538.7	6.99	-725.1	2172.8	0.1	-158.3
0.34	94.8	4.9	3.0	30.4	3.70	215.8	866.3	1.3	553.0	7.05	-747.0	2137.2	0.1	-184.3
0.41	97.2	7.1	3.0	36.8	3.77	215.2	903.5	1.2	567.5	7.12	-766.4	2101.1	0.1	-206.0
0.48	99.9	10.1	3.0	44.2	3.84	193.3	941.6	1.2	581.0	7.19	-785.8	2061.0	0.1	-226.4
0.55	102.3	13.3	2.9	50.9	3.90	173.9	980.6	1.2	593.1	7.26	-805.3	2017.3	0.1	-245.5
0.62	104.7	16.8	2.9	57.9	3.97	152.0	1025.4	1.1	605.3	7.33	-824.7	1970.0	0.1	-263.4
0.68	107.1	20.9	2.8	64.9	4.04	132.6	1065.9	1.1	614.7	7.40	-846.6	1913.1	0.1	-281.8
0.75	109.5	25.4	2.8	72.2	4.11	113.2	1107.0	1.1	622.8	7.47	-866.0	1859.4	0.1	-296.9
0.82	112.2	31.1	2.8	80.5	4.18	93.7	1148.6	1.0	629.6	7.53	-885.5	1802.9	0.1	-310.7
0.89	114.6	36.7	2.7	88.1	4.25	71.9	1196.0	1.0	635.8	7.60	-904.9	1744.0	0.1	-323.2
0.96	117.0	42.8	2.7	95.8	4.32	52.4	1238.4	1.0	639.8	7.67	-926.8	1675.1	0.0	-335.6
1.03	119.4	49.4	2.7	103.7	4.38	33.0	1281.0	0.9	642.6	7.74	-946.2	1611.7	0.0	-345.4
1.10	122.1	57.4	2.6	112.8	4.45	13.5	1323.8	0.9	644.1	7.81	-965.6	1546.7	0.0	-353.8
1.16	124.5	65.2	2.6	121.1	4.52	-5.9	1366.6	0.9	644.3	7.88	-985.1	1480.2	0.0	-360.9
1.23	126.9	73.5	2.6	129.5	4.59	-27.8	1414.8	0.9	643.1	7.95	-1004.5	1412.5	0.0	-366.7
1.30	129.3	82.3	2.5	138.0	4.66	-47.2	1457.5	0.8	640.7	8.01	-1026.4	1335.1	0.0	-371.7
1.37	131.7	91.7	2.5	146.8	4.73	-66.6	1500.0	0.8	637.0	8.08	-1045.8	1265.6	0.0	-374.8
1.44	134.5	103.1	2.4	156.8	4.79	-86.1	1542.2	0.8	632.0	8.15	-1065.2	1195.6	0.0	-376.6
1.51	136.9	113.7	2.4	165.8	4.86	-107.9	1589.2	0.7	624.8	8.22	-1084.7	1125.4	0.0	-377.1
1.58	139.3	125.0	2.4	175.0	4.93	-127.4	1630.6	0.7	617.0	8.29	-1106.6	1046.4	0.0	-376.1
1.64	141.7	136.9	2.3	184.4	5.00	-146.8	1671.3	0.7	608.0	8.36	-1126.0	976.6	0.0	-373.8
1.71	144.1	149.5	2.3	194.0	5.07	-166.3	1711.5	0.7	597.6	8.42	-1145.4	907.2	0.0	-370.3
1.78	146.8	164.4	2.3	204.9	5.14	-185.7	1750.9	0.6	586.0	8.49	-1164.9	838.6	0.0	-365.4
1.85	149.2	178.3	2.2	214.8	5.21	-207.6	1794.2	0.6	571.3	8.56	-1184.3	771.0	0.0	-359.2
1.92	151.6	192.8	2.2	224.8	5.27	-227.0	1831.8	0.6	556.9	8.63	-1206.2	696.5	0.0	-350.8
1.99	154.0	208.1	2.1	235.0	5.34	-246.4	1868.4	0.6	541.2	8.70	-1225.6	631.8	0.0	-341.9
2.05	156.7	226.1	2.1	246.7	5.41	-265.9	1903.9	0.5	524.2	8.77	-1245.0	569.0	0.0	-331.7
2.12	159.1	242.8	2.1	257.3	5.48	-287.7	1942.4	0.5	503.5	8.84	-1264.5	508.1	0.0	-320.2
2.19	161.5	260.2	2.0	268.0	5.55	-307.2	1975.3	0.5	483.8	8.90	-1283.9	449.5	0.0	-307.4
2.26	163.9	278.3	2.0	278.8	5.62	-326.6	2006.9	0.5	462.7	8.97	-1305.8	386.5	0.0	-291.4
2.33	166.3	297.2	2.0	289.9	5.68	-346.1	2037.0	0.4	440.4	9.04	-1325.2	333.5	0.0	-275.9
2.40	169.0	319.3	1.9	302.5	5.75	-365.5	2065.6	0.4	416.8	9.11	-1344.7	283.5	0.0	-259.0
2.47	171.4	339.7	1.9	313.8	5.82	-387.4	2095.9	0.4	388.6	9.18	-1364.1	236.7	0.0	-240.9
2.53	173.8	360.9	1.9	325.4	5.89	-406.8	2120.9	0.4	362.2	9.25	-1386.0	188.2	0.0	-218.9
2.60	176.2	382.9	1.8	337.0	5.96	-426.2	2144.2	0.4	334.5	9.32	-1405.4	149.1	0.0	-198.0
2.67	178.9	408.5	1.8	350.4	6.03	-445.7	2165.6	0.3	305.6	9.38	-1424.8	114.0	0.0	-175.8
2.74	181.3	432.2	1.7	362.4	6.10	-467.5	2187.4	0.3	271.4	9.45	-1444.3	83.2	0.0	-152.3
2.81	183.7	456.6	1.7	374.6	6.16	-487.0	2204.5	0.3	239.7	9.52	-1463.7	56.8	0.0	-127.6
2.88	186.1	481.9	1.7	387.0	6.23	-506.4	2219.5	0.3	206.6	9.59	-1485.6	32.8	0.0	-98.1
2.95	188.5	508.0	1.6	399.5	6.30	-525.9	2232.2	0.3	172.3	9.66	-1505.0	16.7	0.0	-70.6
3.01	191.2	538.4	1.6	413.7	6.37	-545.3	2242.7	0.3	136.7	9.73	-1524.5	5.9	0.0	-41.8
3.08	193.6	566.2	1.6	426.6	6.44	-567.2	2251.5	0.2	95.1	9.79	-1543.9	0.5	0.0	-11.6
3.15	196.0	595.0	1.5	439.6	6.51	-586.6	2256.7	0.2	56.7	9.86	-1565.8	0.0	0.0	0.0
3.22	198.4	624.6	1.5	452.8	6.58	-606.0	2259.3	0.2	17.0	9.93	-1585.2	0.0	0.0	0.0
3.29	201.1	659.0	1.5	467.8	6.64	-625.5	2258.7	0.2	-19.3	10.00	-1602.2	0.0	0.0	0.0

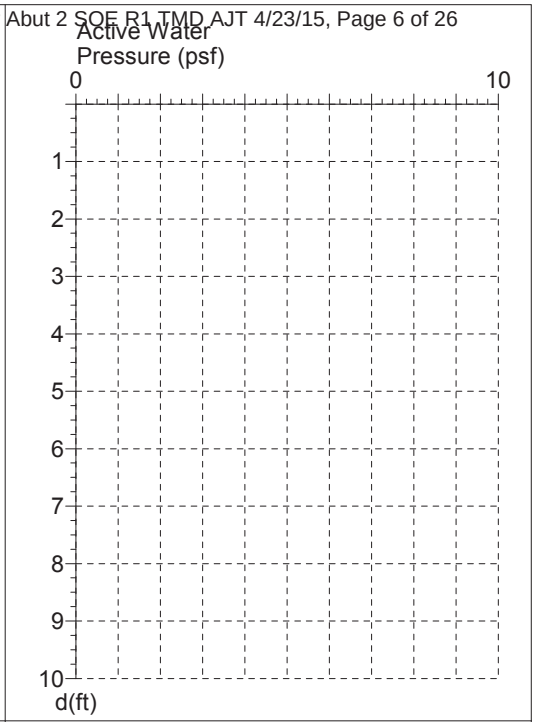
© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

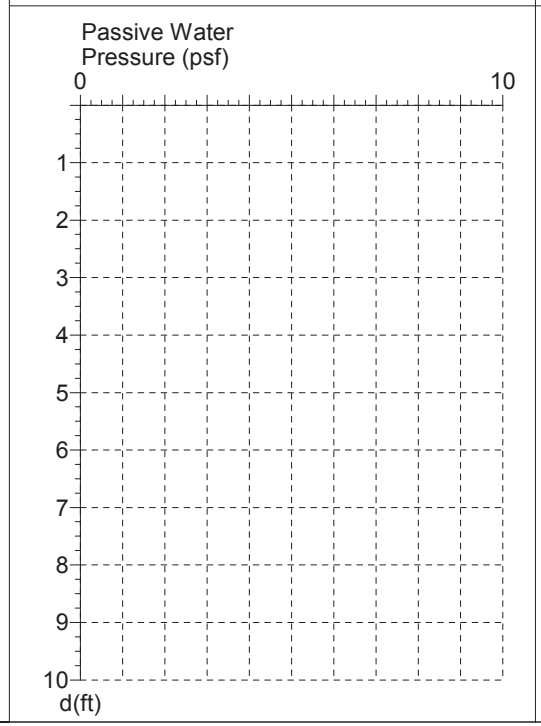
Page: 5
Date: 4.21.15

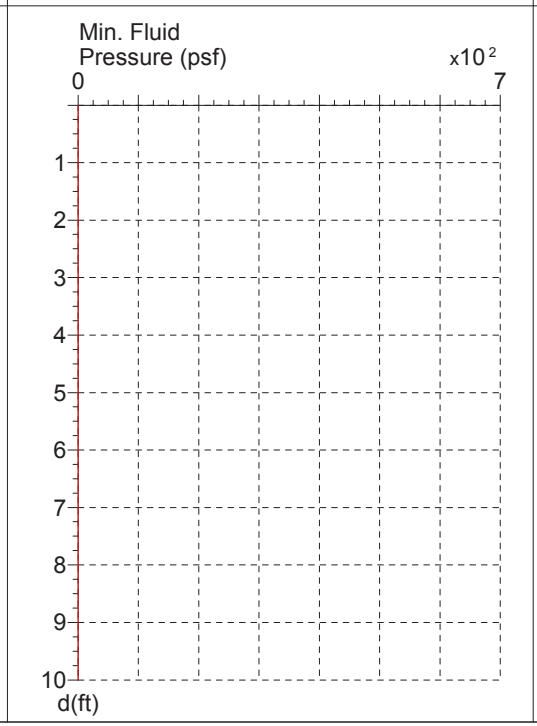
Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 1.09 (K_ax1.2)
Toe: Cantilever

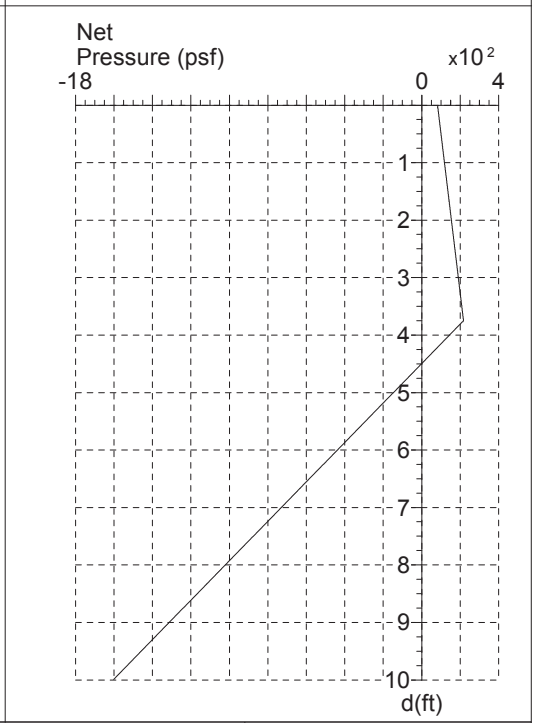












PCL Civil Constructors, Inc.

SupportIT, v2.36

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Page: 6
Date: 4.21.15

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
Toe: Cantilever

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 1.09 (K_ax1.2)
Toe: Cantilever

1. Factor(s) applied to soil parameter(s) in the 'Wall' page, and used in the embedment calculation.
   Factor(s) used: Ka x1.2

2. Maximum bending moment = 2259.6ftlb/ft and f = 27000.0psi. MINIMUM required sheet section modulus is: Z = 1.00in³/ft (= M/f). Sheet section modulus in this design is Z = 2.00in³/ft, and is satisfactory.

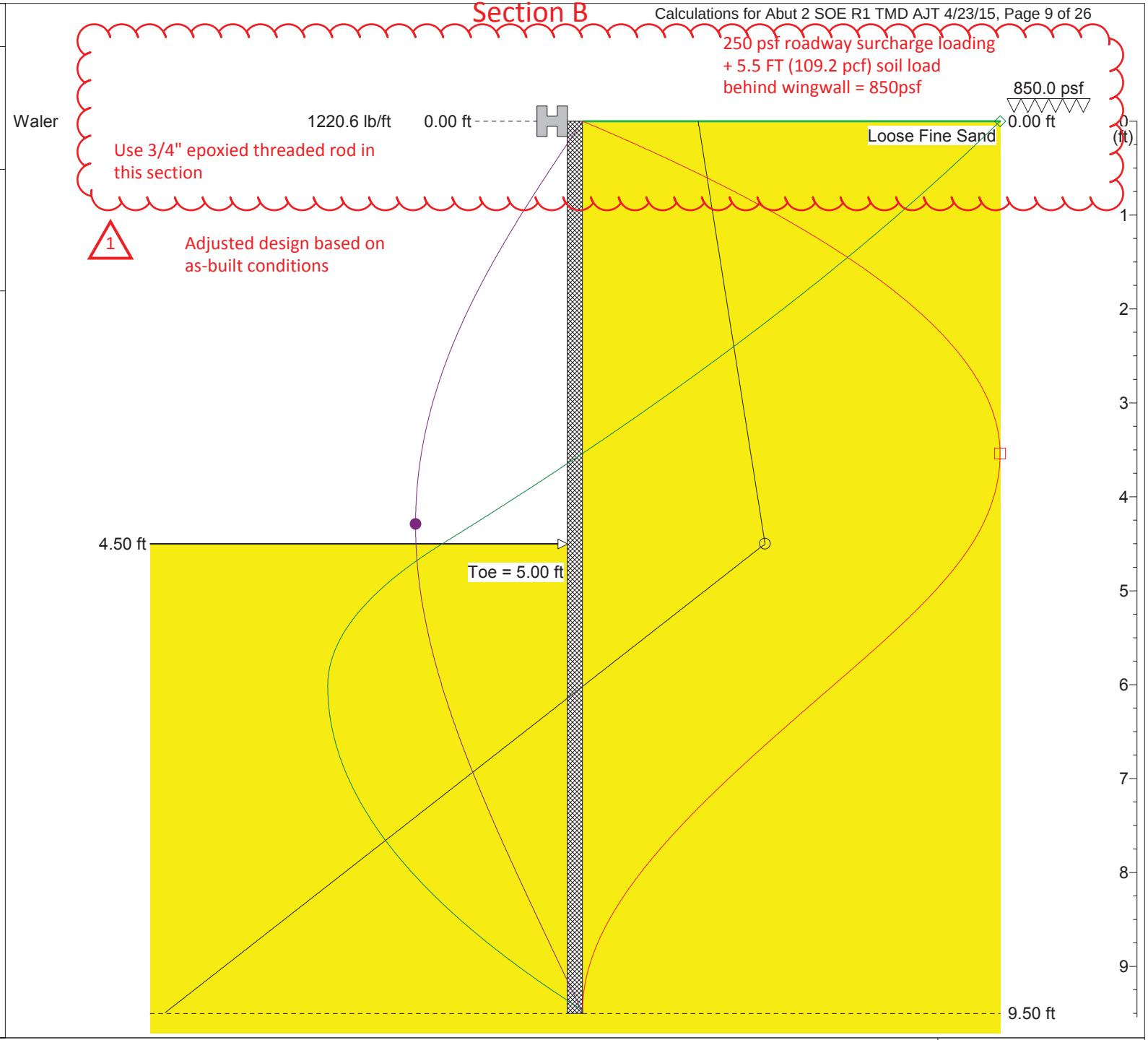
3. FOS = 1.09 (Net Pressure)
   This is the factor of safety against rotation about the toe. It is calculated using the factored soil parameters (see above).
   The FOS can be changed using 'Defined FOS' or 'Manual' in the 'Wall' page.

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Page: 1
Date: 4.21.15

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 2.62 (K_p÷1.5)
Toe: Free Earth Support

	Maximum	d (ft)
○	442.5 psf	4.50
□	2296.9 ftlb/ft	3.54
◇	1218.3 lb/ft	0.00
●	1.1 in	4.29



PCL Civil Constructors, Inc.

SupportIT, v2.36

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 2.62 (K_p÷1.5)
Toe: Free Earth Support

Input Data

Depth Of Excavation = 4.50ft
Surcharge = 850.0psf

Depth Of Active Water = 20.00ft
Depth Of Passive Water = 20.00ft

Water Density = 62.43pcf
Minimum Fluid Density = 31.82pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	φ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Loose Fine Sand	109.20	65.55	0.0	0.0	30.0	0.0	0.33	0.00	3.00 (2.00)	0.00 (0.00)

( ) indicates factored value used in embedment calculation. Factor(s): K_p÷1.5

Solution

Sheet

Sheet Name	E (psi)	I (in⁴/ft)	f (psi)	Z (in³/ft)	Allowed M_{max} (ftlb/ft)	b (in)	A (in²/ft)	W (lb/ft)	Upstand (ft)	Toe (ft)	Length (ft)
1" Road Plate	3.04E+07	1.00	27000.0	2.00	4166.7	12.00	12.00	41.0	0.00	5.00	9.50

Load Model: Area Distribution

Supports

d (ft)	Type	Load (lb/ft)
0.00	Waler	1220.6

Use 3/4" epoxied threaded rod in this section

1

Maxima

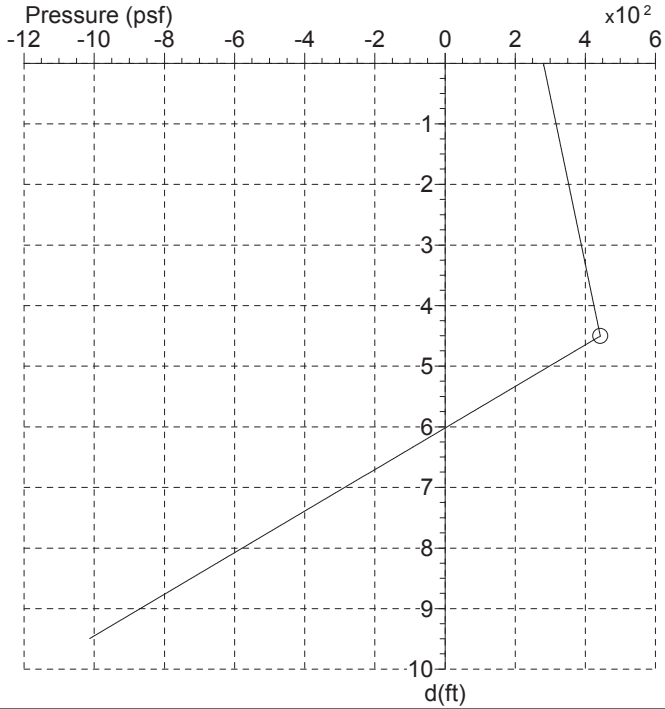
	Maximum	Depth (ft)
Pressure	442.5 psf	4.50
Bending Moment	2296.9 ftlb/ft	3.54
Deflection	1.1 in	4.29
Shear Force	1218.3 lb/ft	0.00

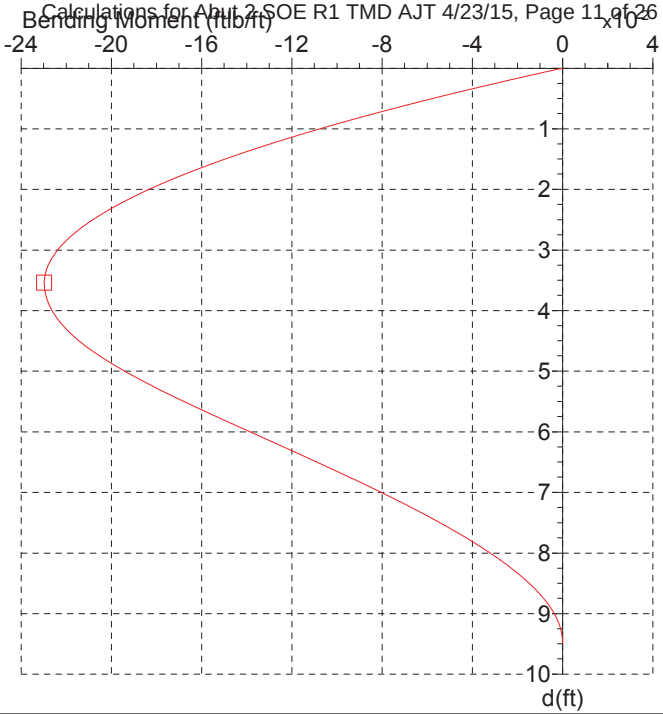
© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

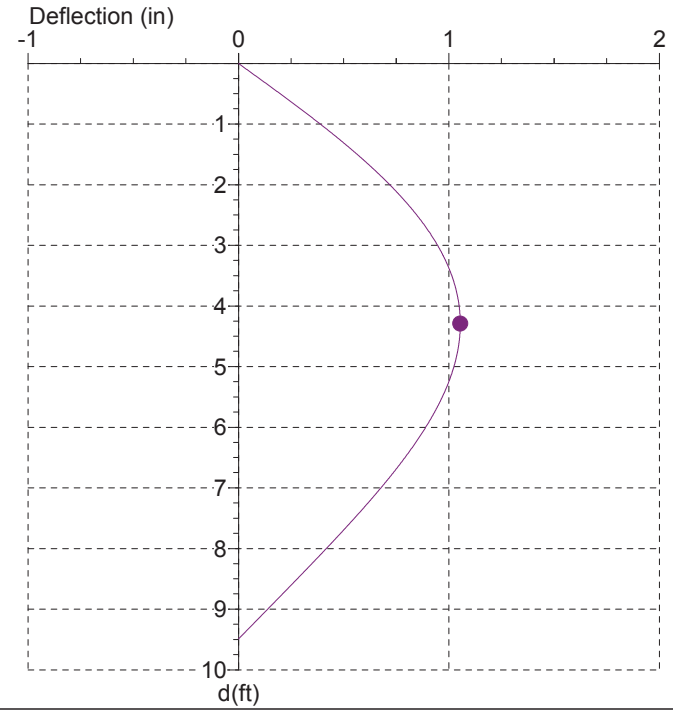
Page: 3
Date: 4.21.15

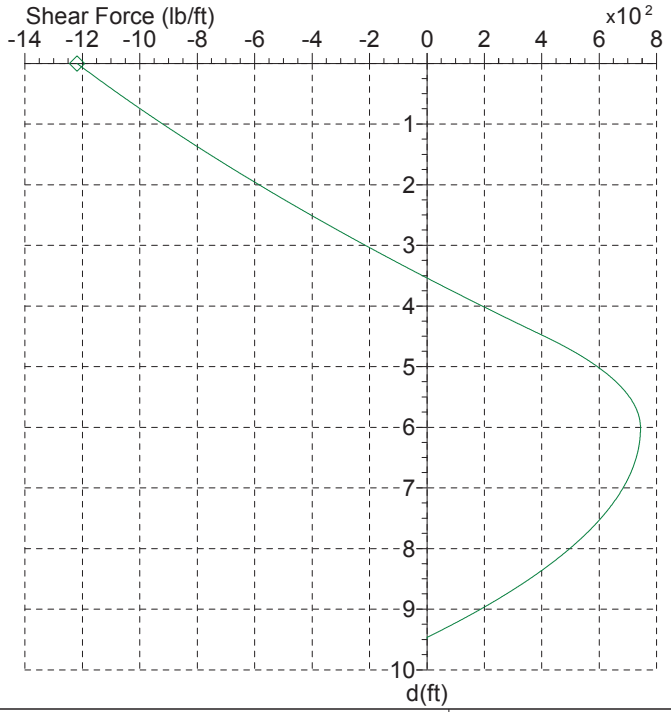
Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 2.62 (K_p÷1.5)
Toe: Free Earth Support

Maximum	d (ft)
○ 442.5 psf	4.50
□ 2296.9 ftlb/ft	3.54
◇ 1218.3 lb/ft	0.00
● 1.1 in	4.29









PCL Civil Constructors, Inc.

SupportIT, v2.36

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Page: 4
Date: 4.21.15

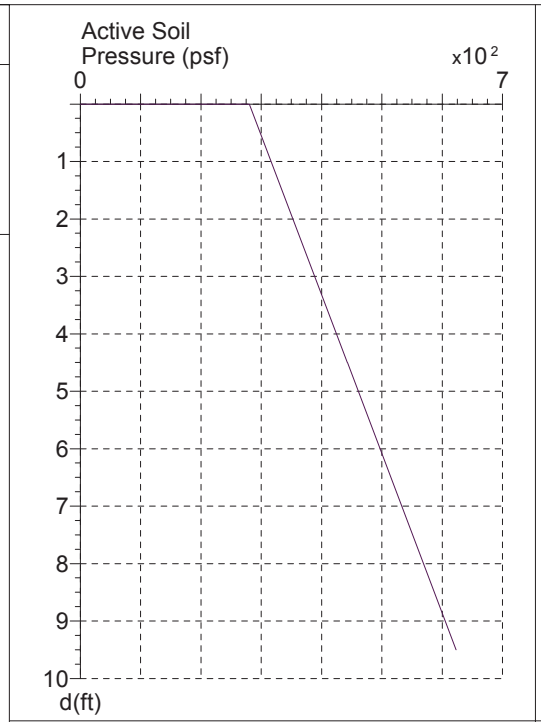
Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 2.62 (K_p÷1.5)
Toe: Free Earth Support

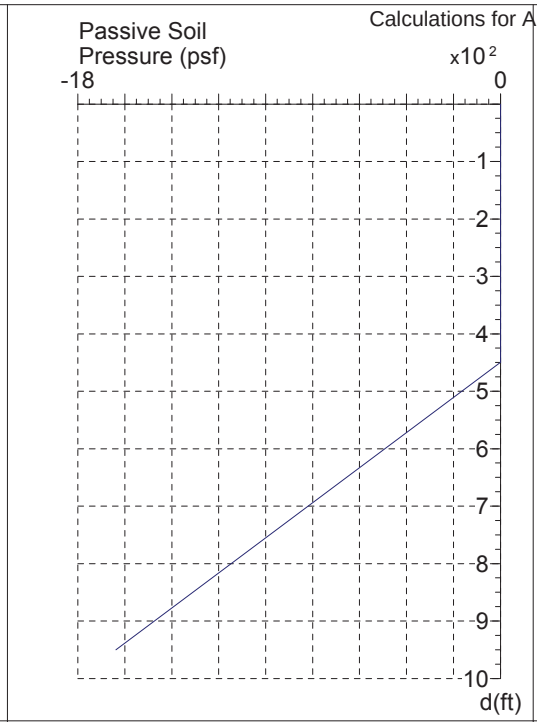
depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	280.5	0.0	0.0	-1218.3	3.19	395.5	-2271.9	1.0	-139.6	6.38	-103.4	-1161.9	0.8	735.7
0.07	282.8	-76.8	0.0	-1200.5	3.25	397.8	-2280.0	1.0	-114.5	6.44	-124.2	-1120.0	0.8	732.2
0.13	285.1	-152.5	0.1	-1182.5	3.32	400.0	-2286.6	1.0	-89.2	6.51	-142.7	-1082.9	0.8	728.5
0.20	287.6	-236.2	0.1	-1162.1	3.38	402.3	-2291.6	1.0	-63.8	6.57	-161.1	-1045.9	0.8	724.4
0.26	289.9	-309.4	0.1	-1143.8	3.45	404.9	-2295.2	1.0	-35.0	6.64	-179.6	-1009.2	0.8	719.7
0.33	292.2	-381.5	0.1	-1125.4	3.51	407.2	-2296.7	1.0	-9.3	6.70	-200.4	-968.2	0.7	713.9
0.39	294.5	-452.4	0.2	-1106.8	3.58	409.4	-2296.6	1.0	16.6	6.77	-218.8	-932.1	0.7	708.2
0.46	297.0	-530.7	0.2	-1085.7	3.64	411.7	-2295.2	1.0	42.6	6.83	-237.3	-896.2	0.7	701.9
0.52	299.3	-599.1	0.2	-1066.8	3.71	414.0	-2292.5	1.0	68.8	6.90	-255.8	-860.7	0.7	695.2
0.59	301.6	-666.2	0.2	-1047.8	3.77	416.6	-2287.8	1.0	98.4	6.96	-274.2	-825.6	0.7	688.0
0.65	303.9	-732.1	0.3	-1028.6	3.84	418.9	-2282.2	1.0	124.8	7.03	-295.0	-786.4	0.7	679.3
0.72	306.2	-796.9	0.3	-1009.3	3.90	421.1	-2275.3	1.0	151.4	7.09	-313.5	-752.1	0.7	671.0
0.78	308.7	-868.2	0.3	-987.3	3.97	423.4	-2267.0	1.0	178.2	7.16	-331.9	-718.2	0.6	662.2
0.85	311.0	-930.3	0.3	-967.7	4.03	426.0	-2256.0	1.0	208.5	7.22	-350.4	-684.8	0.6	652.9
0.91	313.3	-991.1	0.4	-947.9	4.10	428.3	-2244.8	1.1	235.5	7.29	-371.2	-647.7	0.6	641.9
0.98	315.6	-1050.7	0.4	-928.0	4.16	430.6	-2232.3	1.1	262.7	7.35	-389.6	-615.3	0.6	631.5
1.04	318.2	-1116.2	0.4	-905.4	4.23	432.8	-2218.3	1.1	290.1	7.42	-408.1	-583.5	0.6	620.7
1.11	320.4	-1173.1	0.4	-885.2	4.29	435.1	-2203.0	1.1	317.6	7.48	-426.6	-552.2	0.6	609.3
1.17	322.7	-1228.7	0.5	-864.8	4.36	437.7	-2184.0	1.1	348.7	7.55	-445.0	-521.5	0.5	597.5
1.24	325.0	-1283.0	0.5	-844.3	4.42	440.0	-2165.7	1.1	376.5	7.61	-465.8	-487.7	0.5	583.6
1.30	327.3	-1336.0	0.5	-823.6	4.49	442.3	-2145.9	1.1	404.4	7.68	-484.3	-458.3	0.5	570.6
1.37	329.9	-1394.0	0.5	-800.2	4.55	427.5	-2124.8	1.0	432.0	7.74	-502.7	-429.6	0.5	557.2
1.43	332.1	-1444.2	0.5	-779.2	4.62	406.7	-2099.3	1.0	461.7	7.81	-521.2	-401.6	0.5	543.3
1.50	334.4	-1493.1	0.6	-758.1	4.68	388.2	-2075.3	1.0	486.8	7.87	-542.0	-371.0	0.5	527.0
1.56	336.7	-1540.6	0.6	-736.8	4.75	369.8	-2050.0	1.0	510.7	7.94	-560.4	-344.5	0.4	512.1
1.63	339.0	-1586.7	0.6	-715.4	4.82	351.3	-2023.6	1.0	533.5	8.00	-578.9	-318.8	0.4	496.6
1.69	341.6	-1637.0	0.6	-691.2	4.88	332.8	-1996.0	1.0	555.0	8.07	-597.4	-294.0	0.4	480.6
1.76	343.8	-1680.3	0.6	-669.5	4.95	312.1	-1963.6	1.0	577.9	8.13	-615.8	-269.9	0.4	464.1
1.82	346.1	-1722.1	0.7	-647.6	5.01	293.6	-1933.9	1.0	597.0	8.20	-636.6	-243.9	0.4	445.0
1.89	348.4	-1762.6	0.7	-625.6	5.08	275.1	-1903.1	1.0	615.0	8.26	-655.1	-221.6	0.3	427.4
1.95	351.0	-1806.5	0.7	-600.7	5.14	256.7	-1871.5	1.0	631.7	8.33	-673.5	-200.3	0.3	409.4
2.02	353.2	-1844.0	0.7	-578.4	5.21	235.9	-1834.9	1.0	649.2	8.39	-692.0	-179.9	0.3	390.8
2.08	355.5	-1880.0	0.7	-555.9	5.27	217.4	-1801.6	1.0	663.5	8.46	-710.5	-160.5	0.3	371.8
2.15	357.8	-1914.7	0.8	-533.3	5.34	199.0	-1767.6	1.0	676.6	8.52	-731.3	-139.8	0.3	349.7
2.21	360.1	-1947.9	0.8	-510.6	5.40	180.5	-1733.0	1.0	688.5	8.59	-749.7	-122.5	0.3	329.6
2.28	362.7	-1983.5	0.8	-484.8	5.47	162.0	-1697.7	1.0	699.3	8.65	-768.2	-106.2	0.2	309.0
2.34	364.9	-2013.6	0.8	-461.8	5.53	141.3	-1657.5	1.0	710.0	8.72	-786.6	-91.0	0.2	287.9
2.41	367.2	-2042.3	0.8	-438.6	5.60	122.8	-1621.2	1.0	718.3	8.78	-807.4	-75.1	0.2	263.5
2.47	369.5	-2069.5	0.8	-415.2	5.66	104.3	-1584.5	0.9	725.5	8.85	-825.9	-62.2	0.2	241.3
2.54	372.1	-2098.3	0.9	-388.8	5.73	85.9	-1547.5	0.9	731.4	8.91	-844.4	-50.5	0.2	218.7
2.60	374.4	-2122.3	0.9	-365.2	5.79	65.1	-1505.6	0.9	736.7	8.98	-862.8	-39.9	0.1	195.5
2.67	376.6	-2144.8	0.9	-341.4	5.86	46.6	-1468.1	0.9	740.2	9.04	-881.3	-30.4	0.1	171.8
2.73	378.9	-2165.8	0.9	-317.4	5.92	28.2	-1430.4	0.9	742.5	9.11	-902.1	-21.3	0.1	144.6
2.80	381.2	-2185.3	0.9	-293.4	5.99	9.7	-1392.7	0.9	743.6	9.17	-920.5	-14.5	0.1	119.8
2.86	383.8	-2205.3	0.9	-266.1	6.05	-8.8	-1354.9	0.9	743.6	9.24	-939.0	-9.0	0.1	94.6
2.93	386.1	-2221.5	0.9	-241.7	6.12	-29.6	-1312.4	0.9	743.0	9.30	-957.5	-4.8	0.1	68.8
2.99	388.3	-2236.2	0.9	-217.2	6.18	-48.0	-1274.6	0.9	741.9	9.37	-978.2	-1.6	0.0	39.2
3.06	390.6	-2249.3	1.0	-192.5	6.25	-66.5	-1237.0	0.8	740.3	9.43	-996.7	-0.2	0.0	12.4
3.12	393.2	-2262.1	1.0	-164.6	6.31	-84.9	-1199.4	0.8	738.3	9.50	-1012.9	0.0	0.0	0.0

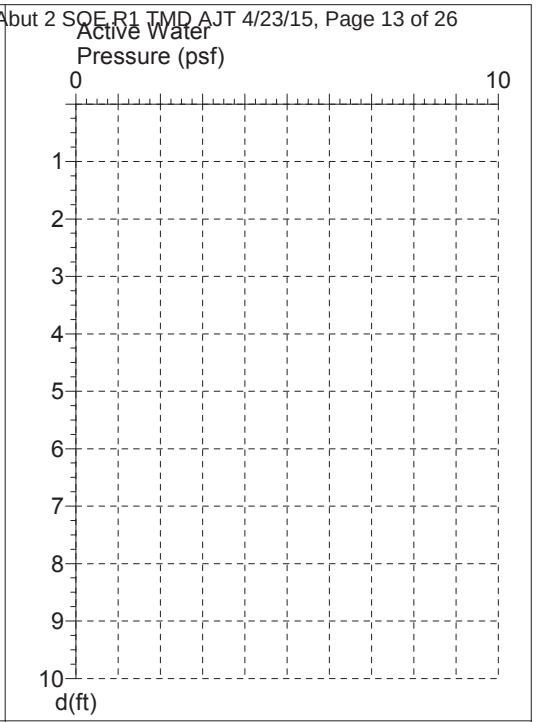
© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

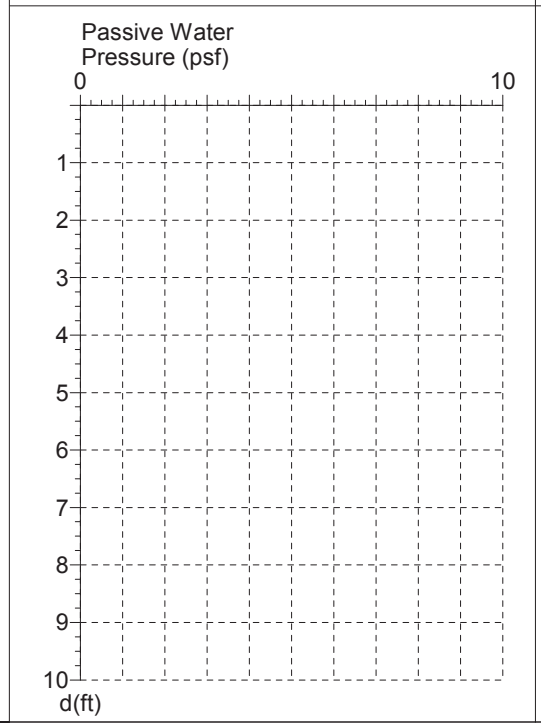
Page: 5
Date: 4.21.15

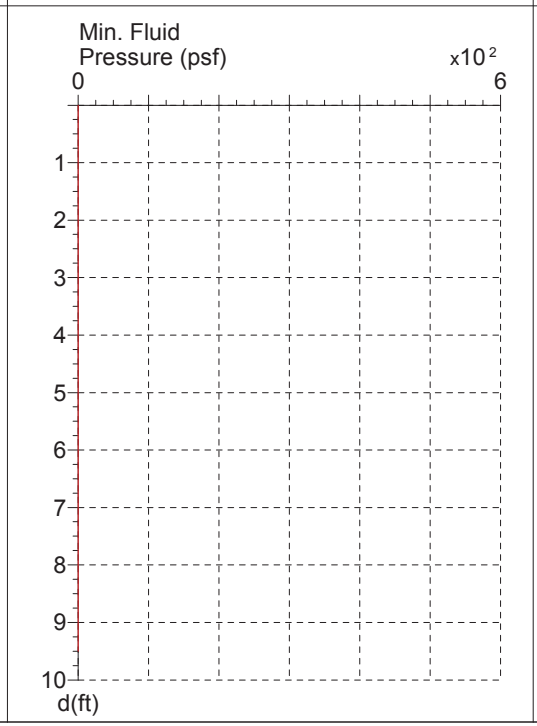
Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 2.62 ($K_p \div 1.5$)
Toe: Free Earth Support

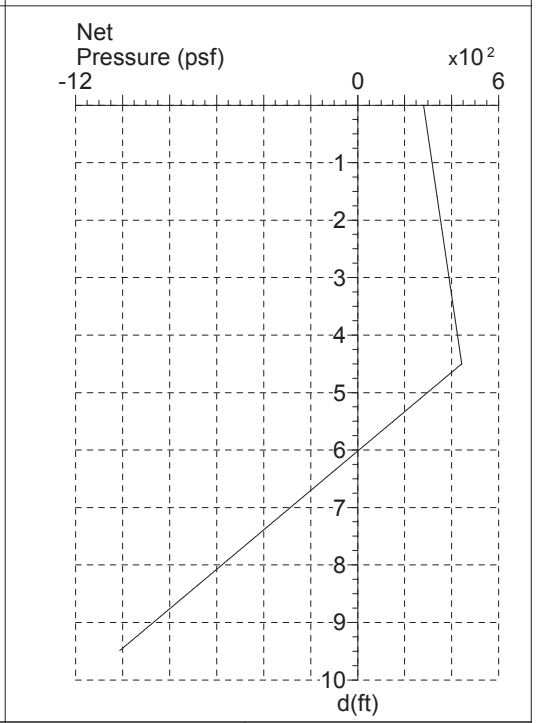












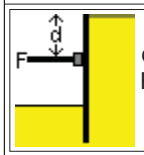
PCL Civil Constructors, Inc.

SupportIT, v2.36

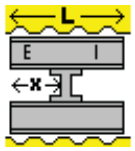
© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Page: 6
Date: 4.21.15

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
Toe: Free Earth Support



d = 0.00 ft
F = 1220.6 lb/ft



Waler/brace inadequately specified.
(Define L, E and I.)

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 2.62 (K_p÷1.5)
Toe: Free Earth Support

1. Factor(s) applied to soil parameter(s) in the 'Wall' page, and used in the embedment calculation.
   Factor(s) used: Kp ÷1.5

2. Maximum bending moment = 2296.9ftlb/ft and f = 27000.0psi. MINIMUM required sheet section modulus is: Z = 1.02in³/ft (= M/f). Sheet section modulus in this design is Z = 2.00in³/ft, and is satisfactory.

3. Frame primary axis bending moments checked. Users should manually check the axial load capacities and the effects of combined axial and bending stresses to confirm frames are suitable.

4. FOS = 2.62 (Net Pressure)
   This is the factor of safety against rotation about the lowest frame. It is calculated using the factored soil parameters (see above).
   The FOS can be changed using 'Defined FOS' or 'Manual' in the 'Wall' page.

SupportIT, v2.36
© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

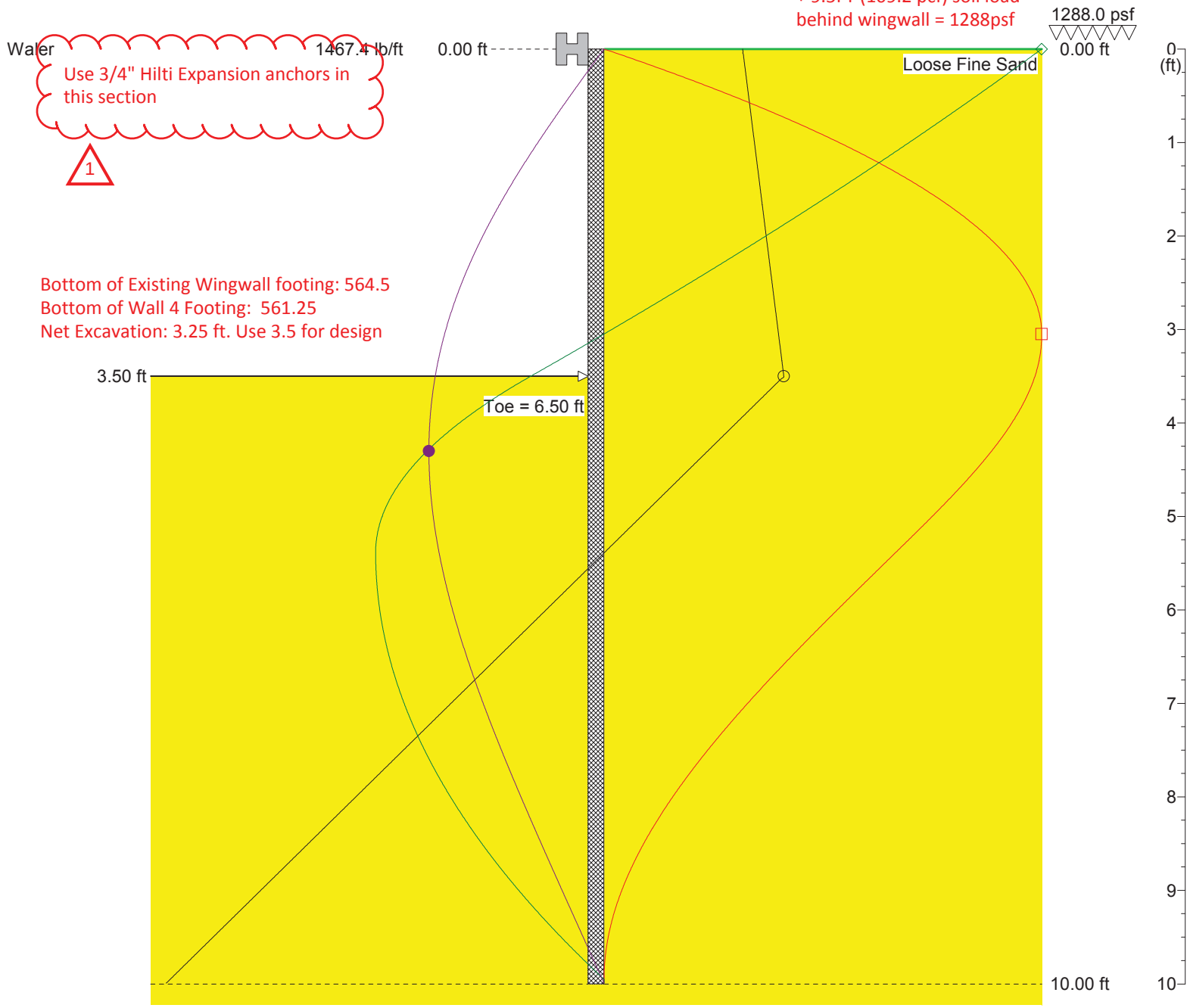
Page: 1
Date: 4.21.15

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 4.97 (K_p÷1.5)
Toe: Free Earth Support

Maximum	d (ft)
○ 551.2 psf	3.50
□ 2328.3 ftlb/ft	3.05
◇ 1463.9 lb/ft	0.00
● 1.1 in	4.30

Section C

250 psf roadway surcharge loading
+ 9.5FT (109.2 pcf) soil load
behind wingwall = 1288psf



PCL Civil Constructors, Inc.

SupportIT, v2.36

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Page: 2
Date: 4.21.15

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 4.97 (K_p÷1.5)
Toe: Free Earth Support

Input Data

Depth Of Excavation = 3.50ft
Surcharge = 1288.0psf
Depth Of Active Water = 20.00ft
Depth Of Passive Water = 20.00ft
Water Density = 62.43pcf
Minimum Fluid Density = 31.82pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	φ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Loose Fine Sand	109.20	65.55	0.0	0.0	30.0	0.0	0.33	0.00	3.00 (2.00)	0.00 (0.00)

( ) indicates factored value used in embedment calculation. Factor(s): K_p÷1.5

Solution

Sheet

Sheet Name	E (psi)	I (in⁴/ft)	f (psi)	Z (in³/ft)	Allowed M_{max} (ftlb/ft)	b (in)	A (in²/ft)	W (lb/ft)	Upstand (ft)	Toe (ft)	Length (ft)
1" Road Plate	3.04E+07	1.00	27000.0	2.00	4166.7	12.00	12.00	41.0	0.00	6.50	10.00

Load Model: Area Distribution

Supports

d (ft)	Type	Load (lb/ft)
0.00	Waler	1467.4

Use 3/4" Hilti Expansion anchors in this section

1

Maxima

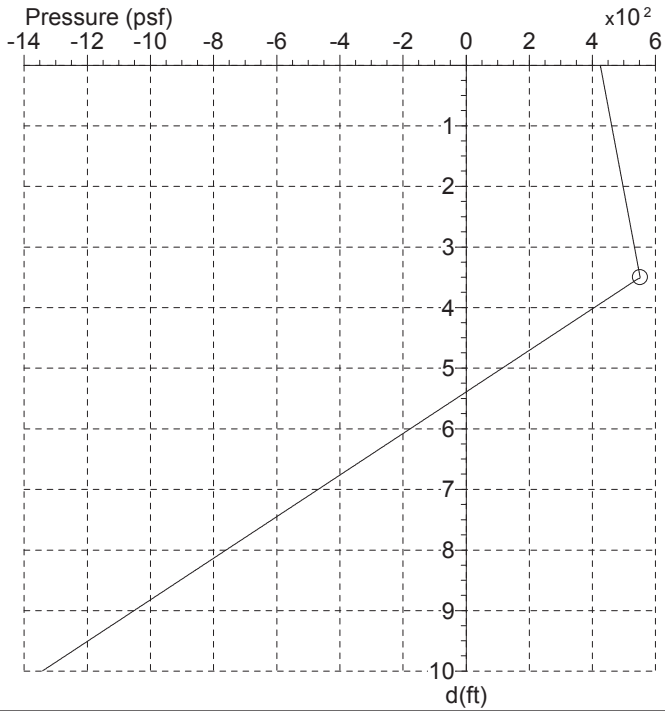
	Maximum	Depth (ft)
Pressure	551.2 psf	3.50
Bending Moment	2328.3 ftlb/ft	3.05
Deflection	1.1 in	4.30
Shear Force	1463.9 lb/ft	0.00

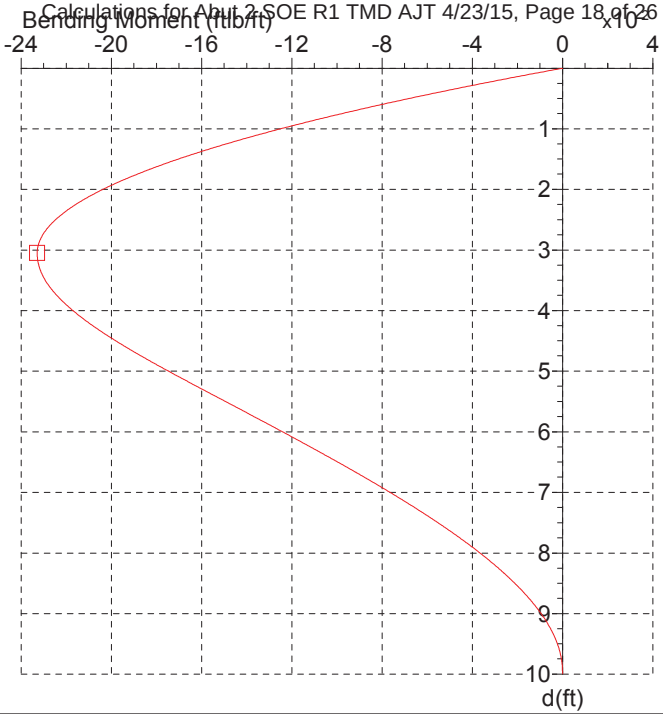
© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

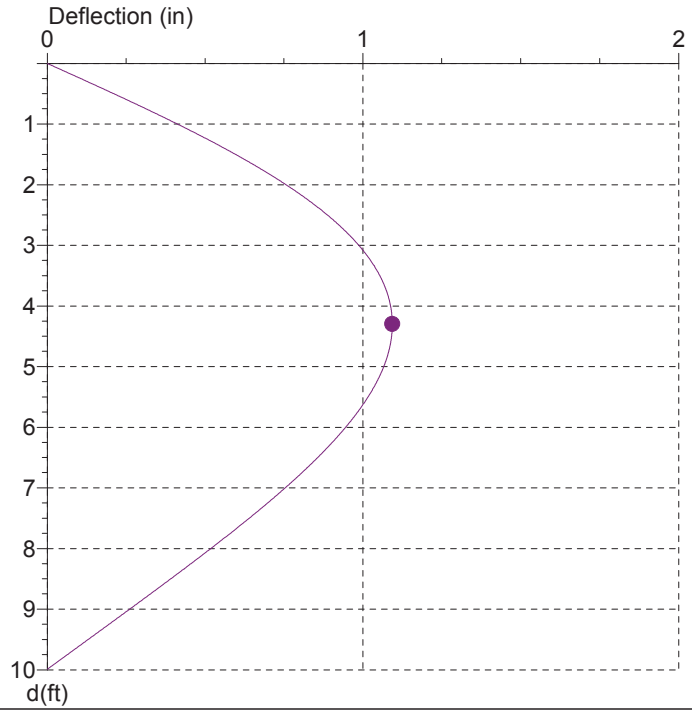
Page: 3
Date: 4.21.15

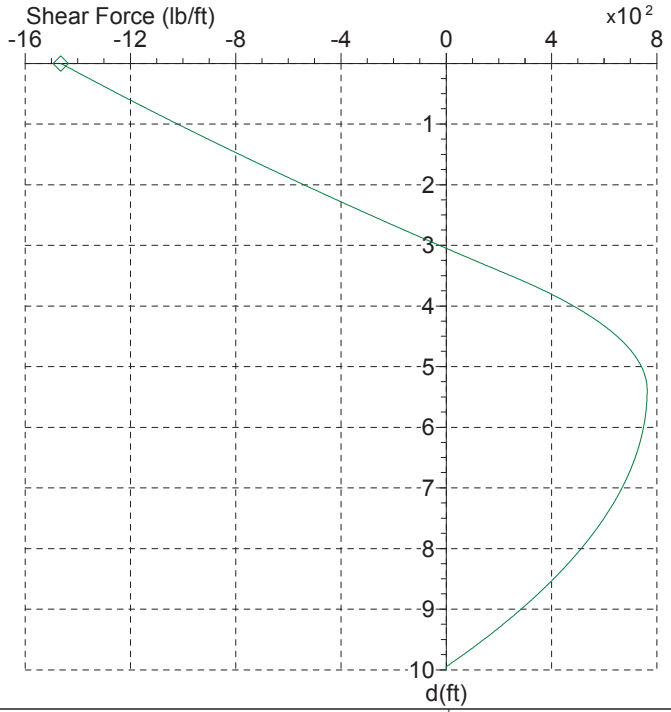
Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 4.97 ($K_p \div 1.5$)
Toe: Free Earth Support

Maximum	d (ft)
○ 551.2 psf	3.50
□ 2328.3 ftlb/ft	3.05
◇ 1463.9 lb/ft	0.00
● 1.1 in	4.30









PCL Civil Constructors, Inc.

SupportIT, v2.36

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Page: 4
Date: 4.21.15

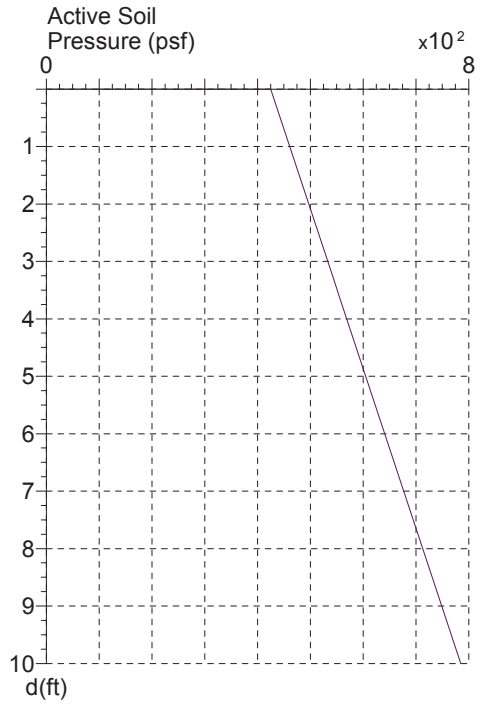
Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 4.97 (K_p÷1.5)
Toe: Free Earth Support

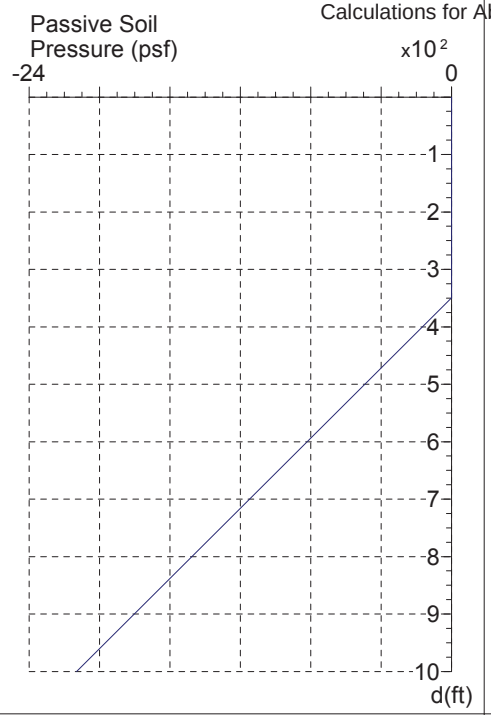
depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	425.0	0.0	0.0	-1463.9	3.36	546.1	-2311.6	1.0	167.2	6.71	-384.3	-896.6	0.8	699.6
0.07	427.4	-97.0	0.0	-1435.5	3.42	548.5	-2303.4	1.0	203.7	6.78	-406.1	-861.8	0.8	692.1
0.14	429.8	-192.1	0.1	-1406.9	3.49	550.9	-2293.7	1.1	240.4	6.85	-425.6	-831.1	0.8	685.1
0.21	432.5	-296.8	0.1	-1374.5	3.56	534.2	-2282.3	1.1	276.6	6.92	-445.0	-800.8	0.8	677.8
0.27	434.9	-387.8	0.1	-1345.6	3.63	512.3	-2267.6	1.1	315.8	6.99	-464.5	-770.9	0.8	670.2
0.34	437.4	-476.8	0.1	-1316.5	3.70	492.9	-2252.9	1.1	349.2	7.05	-486.3	-737.6	0.7	661.2
0.41	439.8	-563.9	0.2	-1287.3	3.77	473.4	-2236.7	1.1	381.3	7.12	-505.8	-708.3	0.7	652.8
0.48	442.5	-659.6	0.2	-1254.2	3.84	454.0	-2219.2	1.1	412.1	7.19	-525.2	-679.5	0.7	644.2
0.55	444.9	-742.6	0.2	-1224.6	3.90	434.5	-2200.3	1.1	441.7	7.26	-544.6	-651.0	0.7	635.2
0.62	447.3	-823.5	0.3	-1194.8	3.97	412.7	-2177.5	1.1	473.4	7.33	-564.1	-623.0	0.7	625.9
0.68	449.7	-902.5	0.3	-1164.9	4.04	393.2	-2155.9	1.1	500.1	7.40	-585.9	-591.9	0.7	615.0
0.75	452.1	-979.4	0.3	-1134.9	4.11	373.8	-2133.2	1.1	525.6	7.47	-605.4	-564.8	0.6	605.0
0.82	454.8	-1063.6	0.3	-1100.9	4.18	354.4	-2109.4	1.1	549.8	7.53	-624.8	-538.1	0.6	594.7
0.89	457.2	-1136.3	0.4	-1070.4	4.25	332.5	-2081.3	1.1	575.5	7.60	-644.2	-511.9	0.6	584.0
0.96	459.6	-1206.9	0.4	-1039.9	4.32	313.1	-2055.3	1.1	596.9	7.67	-666.1	-483.0	0.6	571.6
1.03	462.0	-1275.5	0.4	-1009.1	4.38	293.6	-2028.4	1.1	617.1	7.74	-685.6	-457.8	0.6	560.3
1.10	464.7	-1350.2	0.5	-974.4	4.45	274.2	-2000.6	1.1	635.9	7.81	-705.0	-433.1	0.6	548.6
1.16	467.1	-1414.4	0.5	-943.3	4.52	254.7	-1972.0	1.1	653.5	7.88	-724.4	-409.0	0.5	536.6
1.23	469.5	-1476.5	0.5	-912.1	4.59	232.9	-1938.9	1.1	671.7	7.95	-743.9	-385.4	0.5	524.3
1.30	471.9	-1536.6	0.5	-880.7	4.66	213.4	-1908.8	1.1	686.5	8.01	-765.7	-359.5	0.5	510.0
1.37	474.3	-1594.5	0.5	-849.1	4.73	194.0	-1878.0	1.1	700.0	8.08	-785.2	-337.1	0.5	497.0
1.44	477.0	-1657.2	0.6	-813.5	4.79	174.6	-1846.7	1.1	712.2	8.15	-804.6	-315.2	0.5	483.6
1.51	479.4	-1710.6	0.6	-781.6	4.86	152.7	-1810.8	1.1	724.3	8.22	-824.0	-294.0	0.5	469.9
1.58	481.8	-1761.9	0.6	-749.5	4.93	133.3	-1778.4	1.1	733.8	8.29	-845.9	-270.9	0.4	454.2
1.64	484.2	-1811.0	0.6	-717.3	5.00	113.8	-1745.6	1.1	741.9	8.36	-865.4	-251.0	0.4	439.8
1.71	486.6	-1858.0	0.7	-684.9	5.07	94.4	-1712.5	1.1	748.8	8.42	-884.8	-231.7	0.4	425.1
1.78	489.3	-1908.3	0.7	-648.3	5.14	74.9	-1679.1	1.1	754.4	8.49	-904.2	-213.1	0.4	410.1
1.85	491.7	-1950.6	0.7	-615.6	5.21	53.1	-1641.3	1.0	759.1	8.56	-923.7	-195.2	0.4	394.7
1.92	494.1	-1990.8	0.7	-582.8	5.27	33.6	-1607.5	1.0	761.9	8.63	-945.5	-175.8	0.4	377.1
1.99	496.5	-2028.8	0.8	-549.7	5.34	14.2	-1573.6	1.0	763.4	8.70	-965.0	-159.4	0.3	361.1
2.05	499.2	-2068.9	0.8	-512.4	5.41	-5.2	-1539.7	1.0	763.7	8.77	-984.4	-143.7	0.3	344.7
2.12	501.6	-2102.1	0.8	-479.0	5.48	-27.1	-1501.5	1.0	763.3	8.84	-1003.8	-128.7	0.3	328.0
2.19	504.0	-2133.2	0.8	-445.5	5.55	-46.5	-1467.6	1.0	762.7	8.90	-1023.3	-114.4	0.3	311.0
2.26	506.4	-2161.9	0.8	-411.8	5.62	-66.0	-1433.7	1.0	761.7	8.97	-1045.2	-99.3	0.3	291.5
2.33	508.8	-2188.5	0.8	-377.9	5.68	-85.4	-1399.9	1.0	760.5	9.04	-1064.6	-86.7	0.3	273.8
2.40	511.5	-2215.6	0.9	-339.7	5.75	-104.9	-1366.1	1.0	758.8	9.11	-1084.0	-74.9	0.2	255.7
2.47	513.9	-2237.3	0.9	-305.5	5.82	-126.7	-1328.3	1.0	756.6	9.18	-1103.5	-63.9	0.2	237.4
2.53	516.3	-2256.7	0.9	-271.1	5.89	-146.2	-1294.7	1.0	754.3	9.25	-1125.3	-52.5	0.2	216.3
2.60	518.7	-2273.8	0.9	-236.6	5.96	-165.6	-1261.2	1.0	751.7	9.32	-1144.8	-43.2	0.2	197.3
2.67	521.4	-2290.3	0.9	-197.6	6.03	-185.0	-1227.9	0.9	748.7	9.38	-1164.2	-34.8	0.2	177.9
2.74	523.8	-2302.5	0.9	-162.7	6.10	-206.9	-1190.5	0.9	745.0	9.45	-1183.6	-27.3	0.1	158.2
2.81	526.2	-2312.3	1.0	-127.7	6.16	-226.3	-1157.5	0.9	741.4	9.52	-1203.1	-20.7	0.1	138.2
2.88	528.6	-2319.8	1.0	-92.5	6.23	-245.8	-1124.6	0.9	737.4	9.59	-1224.9	-14.3	0.1	115.2
2.95	531.0	-2325.0	1.0	-57.2	6.30	-265.2	-1091.9	0.9	733.1	9.66	-1244.4	-9.6	0.1	94.5
3.01	533.7	-2328.0	1.0	-17.3	6.37	-284.7	-1059.4	0.9	728.4	9.73	-1263.8	-5.8	0.1	73.5
3.08	536.2	-2328.1	1.0	18.4	6.44	-306.5	-1023.1	0.9	722.8	9.79	-1283.3	-2.9	0.1	52.1
3.15	538.6	-2326.6	1.0	54.2	6.51	-326.0	-991.1	0.9	717.5	9.86	-1305.1	-0.8	0.0	27.7
3.22	541.0	-2323.5	1.0	90.2	6.58	-345.4	-959.3	0.8	711.9	9.93	-1324.6	0.0	0.0	5.6
3.29	543.7	-2318.1	1.0	130.9	6.64	-364.8	-927.8	0.8	705.9	10.00	-1341.6	0.0	0.0	0.0

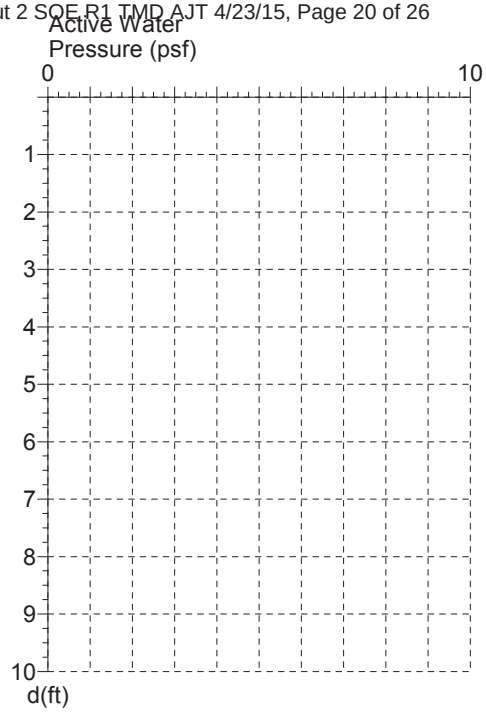
© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

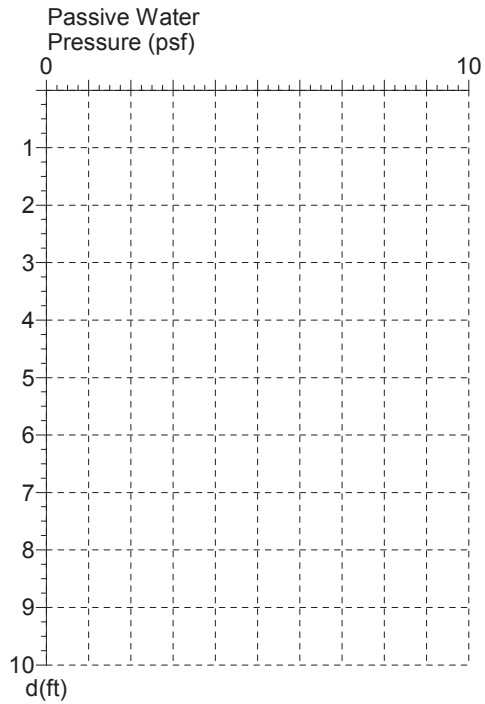
Page: 5
Date: 4.21.15

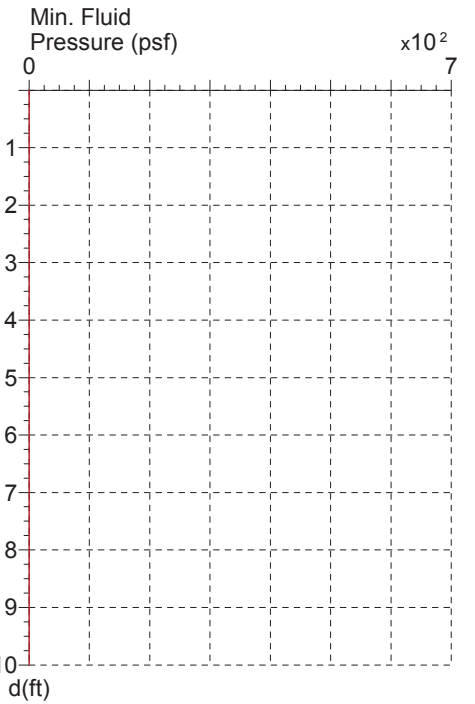
Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 4.97 ($K_p \div 1.5$)
Toe: Free Earth Support

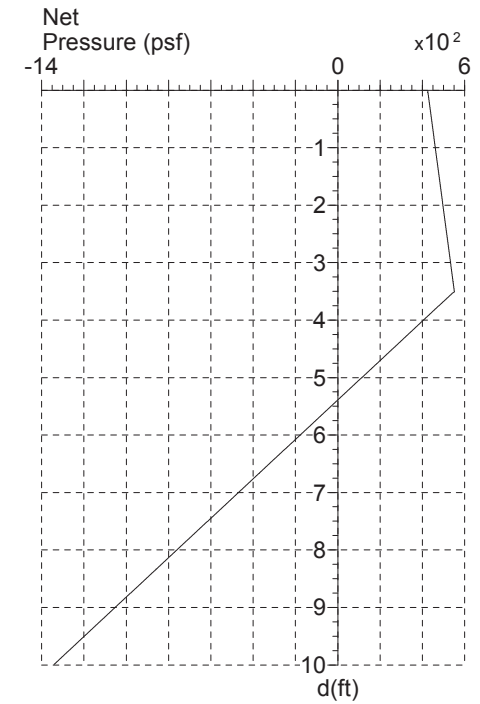












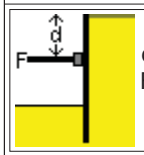
PCL Civil Constructors, Inc.

SupportIT, v2.36

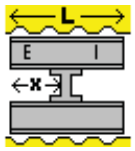
© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Page: 6
Date: 4.21.15

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
Toe: Free Earth Support



d = 0.00 ft
F = 1467.4 lb/ft



Waler/brace inadequately specified.
(Define L, E and I.)

© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

Sheet: 1" Road Plate
Works: Temporary
Pressure: Rankine
Analysis: Net Pressure
FOS: 4.97 (K_p÷1.5)
Toe: Free Earth Support

1. Factor(s) applied to soil parameter(s) in the 'Wall' page, and used in the embedment calculation.
   Factor(s) used: Kp ÷1.5

2. Maximum bending moment = 2328.3ftlb/ft and f = 27000.0psi. MINIMUM required sheet section modulus is: Z = 1.03in³/ft (= M/f). Sheet section modulus in this design is Z = 2.00in³/ft, and is satisfactory.

3. Frame primary axis bending moments checked. Users should manually check the axial load capacities and the effects of combined axial and bending stresses to confirm frames are suitable.

4. FOS = 4.97 (Net Pressure)
   This is the factor of safety against rotation about the lowest frame. It is calculated using the factored soil parameters (see above).
   The FOS can be changed using 'Defined FOS' or 'Manual' in the 'Wall' page.

SupportIT, v2.36
© 1997 - 2014, GTSoft Ltd.
Tel/Fax: +44 (0)1292 477754
Email: GTSoftLtd@aol.com
Web: www.GTSoft.org

3.3.8 KWIK Bolt 3 Expansion Anchor

Table 3 - Hilti KWIK Bolt 3 carbon steel design strength with concrete / pullout failure in uncracked concrete[1,2,3,4]

Nominal anchor diameter	Effective embed. in. (mm)	Nominal embed. in. (mm)	Tension - ϕN_n				Shear - ϕV_n			
			f'_c = 2500 psi lb (kN)	f'_c = 3000 psi lb (kN)	f'_c = 4000 psi lb (kN)	f'_c = 6000 psi lb (kN)	f'_c = 2500 psi lb (kN)	f'_c = 3000 psi lb (kN)	f'_c = 4000 psi lb (kN)	f'_c = 6000 psi lb (kN)
1/4	1-1/2 (38)	1-3/4 (44)	1,025 (4.6)	1,080 (4.8)	1,180 (5.2)	1,330 (5.9)	1,545 (6.9)	1,690 (7.5)	1,950 (8.7)	2,390 (10.6)
3/8	2 (51)	2-3/8 (60)	2,205 (9.8)	2,415 (10.7)	2,790 (12.4)	3,420 (15.2)	2,375 (10.6)	2,605 (11.6)	3,005 (13.4)	3,680 (16.4)
1/2	2 (51)	2-1/4 (57)	2,205 (9.8)	2,415 (10.7)	2,790 (12.4)	3,420 (15.2)	2,375 (10.6)	2,605 (11.6)	3,005 (13.4)	3,680 (16.4)
	3-1/4 (83)	3-1/2 (89)	4,420 (19.7)	4,840 (21.5)	5,590 (24.9)	6,845 (30.4)	9,845 (43.8)	10,785 (48.0)	12,450 (55.4)	15,250 (67.8)
5/8	3-1/8 (79)	3-1/2 (89)	4,310 (19.2)	4,720 (21.0)	5,450 (24.2)	6,675 (29.7)	9,280 (41.3)	10,165 (45.2)	11,740 (52.2)	14,380 (64.0)
	4 (102)	4-3/8 (111)	6,240 (27.8)	6,835 (30.4)	7,895 (35.1)	9,665 (43.0)	13,440 (59.8)	14,725 (65.5)	17,000 (75.6)	20,820 (92.6)
3/4	3-3/4 (95)	4-1/4 (108)	5,665 (25.2)	6,205 (27.6)	7,165 (31.9)	8,775 (39.0)	12,200 (54.3)	13,365 (59.5)	15,430 (68.6)	18,900 (84.1)
	5 (127)	5-1/2 (140)	6,880 (30.6)	7,535 (33.5)	8,705 (38.7)	10,660 (47.4)	18,785 (83.6)	20,575 (91.5)	23,760 (105.7)	29,100 (129.4)

1 See section 3.1.7.3 to convert design strength value to ASD value.

2 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

3 Apply spacing, edge distance, and concrete thickness factors in tables 6 to 10 as necessary. Compare to steel values in table 4. The lesser of the values is to be used for the design.

4 Tabular values are for normal weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: for sand-lightweight, λ_a = 0.68; for all-lightweight, λ_a = 0.60

Table 4 - Steel design strength for Hilti KWIK Bolt 3 carbon steel anchors[1,2]

Nominal anchor diameter	Nominal embedment in. (mm)	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)
1/4	1-3/4 (44)	1,590 (7.1)	1,065 (4.7)
3/8	2-3/8 (60)	4,770 (21.2)	2,905 (12.9)
1/2	2-1/4 (57)	8,745 (38.9)	4,315 (19.2)
	3-1/2 (89)		4,390 (19.5)
5/8	3-1/2 (89)	13,515 (60.1)	7,950 (35.4)
	4-3/8 (111)		
3/4	4-1/4 (108)	19,080 (84.9)	10,180 (45.3)
	5-1/2 (140)		10,785 (48.0)

1 See section 3.1.7.3 to convert design strength value to ASD value.

2 KWIK Bolt 3 carbon steel anchors are to be considered ductile steel elements.

3 Tensile $\phi N_{sa} = \phi A_{se,N} f_{uta}$ as noted in ACI 318 Appendix D.

4 Shear values determined by static shear tests with $\phi V_{sa} < \phi\ 0.60\ A_{se,V} f_{uta}$ as noted in ACI 318 Appendix D.

Waler load in Section C = 1470 lb/ft.
Assume 2.5' length supported.
Total load - 1.47*2.5 = 3.68 kips
3/4" Anchor SWL = 7.535 kips.
Spacing and edge distance factors of 1.00 and 0.59
SWL = 7.535 k (1.0)(0.59) = 4.44 kips.
4.44>3.68, OK

1

KWIK Bolt 3 Expansion Anchor 3.3.8

Table 9 - Load adjustment factors for 5/8-in. diameter KWIK Bolt 3 carbon steel anchor in uncracked concrete[1,2]

5/8-in. KB3 carbon steel uncracked concrete	Spacing factor in tension f_{AN}		Edge distance factor in tension f_{RN}		Spacing factor in shear[3] f_{AV}		Edge distance in shear ⊥ toward edge f_{RV}		Edge distance in shear ll to edge f_{RV}		Conc. thickness factor in shear[4] f_{HV}	
Embedment h_{nom}	3-1/2	4-3/8	3-1/2	4-3/8	3-1/2	4-3/8	3-1/2	4-3/8	3-1/2	4-3/8	3-1/2	4-3/8
Spacing (s) / edge distance (c_a) / concrete thickness (h) - in. (mm)	(89)	(111)	(89)	(111)	(89)	(111)	(89)	(111)	(89)	(111)	(89)	(111)
1-3/4 (44)	n/a	n/a	n/a	0.32	n/a	n/a	n/a	0.07	n/a	0.14	n/a	n/a
2 (51)	n/a	n/a	n/a	0.34	n/a	n/a	n/a	0.08	n/a	0.17	n/a	n/a
2-1/8 (54)	n/a	0.59	n/a	0.34	n/a	0.53	n/a	0.09	n/a	0.18	n/a	n/a
2-1/4 (57)	n/a	0.59	0.39	0.35	n/a	0.54	0.14	0.10	0.27	0.20	n/a	n/a
2-3/8 (60)	0.63	0.60	0.40	0.36	0.55	0.54	0.15	0.11	0.30	0.21	n/a	n/a
2-1/2 (64)	0.63	0.60	0.41	0.37	0.55	0.54	0.16	0.12	0.32	0.23	n/a	n/a
3 (76)	0.66	0.63	0.46	0.40	0.56	0.55	0.21	0.15	0.42	0.30	n/a	n/a
4 (102)	0.71	0.67	0.55	0.47	0.58	0.56	0.32	0.23	0.55	0.47	n/a	n/a
5 (127)	0.77	0.71	0.67	0.55	0.60	0.58	0.45	0.33	0.67	0.55	0.63	n/a
6 (152)	0.82	0.75	0.80	0.63	0.62	0.59	0.59	0.43	0.80	0.63	0.69	0.62
7 (178)	0.87	0.79	0.93	0.74	0.64	0.61	0.75	0.54	0.93	0.74	0.74	0.67
8 (203)	0.93	0.83	1.00	0.84	0.66	0.63	0.91	0.66	1.00	0.84	0.79	0.71
9 (229)	0.98	0.88		0.95	0.68	0.64	1.00	0.79		0.95	0.84	0.75
10 (254)	1.00	0.92		1.00	0.70	0.66		0.92		1.00	0.89	0.80
11 (279)		0.96			0.72	0.67		1.00			0.93	0.83
12 (305)		1.00			0.74	0.69					0.97	0.87
14 (356)					0.77	0.72					1.00	0.94
16 (406)					0.81	0.75						1.00
18 (457)					0.85	0.78						
20 (508)					0.89	0.82						
24 (610)					0.97	0.88						
> 30 (762)					1.00	0.97						

3.3.8

Table 10 - Load adjustment factors for 3/4-in. diameter KWIK Bolt 3 carbon steel anchor in uncracked concrete[1,2]

3/4-in. KB3 carbon steel uncracked concrete	Spacing factor in tension f_{AN}		Edge distance factor in tension f_{RN}		Spacing factor in shear[3] f_{AV}		Edge distance in shear ⊥ toward edge f_{RV}		Edge distance in shear ll to edge f_{RV}		Conc. thickness factor in shear[4] f_{HV}	
Embedment h_{nom}	4-1/4	5-1/2	4-1/4	5-1/2	4-1/4	5-1/2	4-1/4	5-1/2	4-1/4	5-1/2	4-1/4	5-1/2
Spacing (s) / edge distance (c_a) / concrete thickness (h) - in. (mm)	(108)	(140)	(108)	(140)	(108)	(140)	(108)	(140)	(108)	(140)	(108)	(140)
2-1/2 (64)	n/a	n/a	n/a	0.42	n/a	n/a	n/a	0.09	n/a	0.18	n/a	n/a
2-3/4 (70)	n/a	n/a	0.36	0.44	n/a	n/a	0.15	0.11	0.31	0.21	n/a	n/a
3 (76)	n/a	n/a	0.38	0.45	n/a	n/a	0.17	0.12	0.35	0.24	n/a	n/a
3-1/4 (83)	n/a	0.61	0.40	0.47	n/a	0.54	0.20	0.14	0.39	0.27	n/a	n/a
3-1/2 (89)	n/a	0.62	0.41	0.49	n/a	0.55	0.22	0.15	0.41	0.30	n/a	n/a
3-3/4 (95)	0.67	0.63	0.43	0.50	0.57	0.55	0.24	0.17	0.43	0.34	n/a	n/a
4 (102)	0.68	0.63	0.45	0.52	0.57	0.55	0.27	0.18	0.45	0.37	n/a	n/a
4-1/2 (114)	0.70	0.65	0.49	0.56	0.58	0.56	0.32	0.22	0.49	0.44	n/a	n/a
5 (127)	0.72	0.67	0.53	0.59	0.59	0.57	0.38	0.26	0.53	0.52	n/a	n/a
6 (152)	0.77	0.70	0.62	0.67	0.60	0.58	0.49	0.34	0.62	0.67	0.65	n/a
7 (178)	0.81	0.73	0.72	0.75	0.62	0.59	0.62	0.43	0.72	0.75	0.70	n/a
8 (203)	0.86	0.77	0.82	0.84	0.64	0.61	0.76	0.52	0.82	0.84	0.75	0.66
9 (229)	0.90	0.80	0.92	0.95	0.66	0.62	0.91	0.62	0.92	0.95	0.79	0.70
10 (254)	0.94	0.83	1.00	1.00	0.67	0.64	1.00	0.73	1.00	1.00	0.83	0.74
11 (279)	0.99	0.87			0.69	0.65		0.84			0.87	0.77
12 (305)	1.00	0.90			0.71	0.66		0.96			0.91	0.81
14 (356)		0.97			0.74	0.69		1.00			0.99	0.87
16 (406)		1.00			0.78	0.72					1.00	0.93
18 (457)					0.81	0.74						0.99
20 (508)					0.85	0.77						1.00
24 (610)					0.92	0.82						
30 (762)					1.00	0.91						
> 36 (914)						0.99						

1 Linear interpolation not permitted.

2 When combining multiple load adjustment factors (e.g. for a 4 anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.

3 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.

4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

If a reduction factor value is in a shaded cell, this indicates that this specific edge distance may not be permitted with a certain spacing (or vice versa). Check with table 5 and figure 2 of this section to calculate permissable edge distance, spacing and concrete thickness combinations. Use of Hilti KWIK Bolt 3 anchors with edge distance and spacing dimensions smaller than what is noted in this table is permitted.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 39 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for threaded rod in uncracked concrete [1,2,3,4,5,6,7,8]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension — ΦN_n or N_r				Shear — ΦV_n or V_r			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
3/8	2-3/8 (60)	2,855 (12.7)	3,125 (13.9)	3,415 (15.2)	3,620 (16.1)	3,075 (13.7)	3,370 (15.0)	3,680 (16.4)	3,900 (17.3)
	3-3/8 (86)	4,835 (21.5)	4,855 (21.6)	4,855 (21.6)	5,150 (22.9)	10,415 (46.3)	10,460 (46.5)	10,460 (46.5)	11,085 (49.3)
	4-1/2 (114)	6,475 (28.8)	6,475 (28.8)	6,475 (28.8)	6,865 (30.5)	13,945 (62.0)	13,945 (62.0)	13,945 (62.0)	14,785 (65.8)
	7-1/2 (191)	10,790 (48.0)	10,790 (48.0)	10,790 (48.0)	11,440 (50.9)	23,245 (103.4)	23,245 (103.4)	23,245 (103.4)	24,640 (109.6)
1/2	2-3/4 (70)	3,555 (15.8)	3,895 (17.3)	4,500 (20.0)	5,510 (24.5)	7,660 (34.1)	8,395 (37.3)	9,690 (43.1)	11,870 (52.8)
	4-1/2 (114)	7,445 (33.1)	8,155 (36.3)	8,635 (38.4)	9,150 (40.7)	16,035 (71.3)	17,570 (78.2)	18,595 (82.7)	19,710 (87.7)
	6 (152)	11,465 (51.0)	11,510 (51.2)	11,510 (51.2)	12,200 (54.3)	24,690 (109.8)	24,795 (110.3)	24,795 (110.3)	26,280 (116.9)
	10 (254)	19,185 (85.3)	19,185 (85.3)	19,185 (85.3)	20,335 (90.5)	41,320 (183.8)	41,320 (183.8)	41,320 (183.8)	43,800 (194.8)
5/8	3-1/8 (79)	4,310 (19.2)	4,720 (21.0)	5,450 (24.2)	6,675 (29.7)	9,280 (41.3)	10,165 (45.2)	11,740 (52.2)	14,380 (64.0)
	5-5/8 (143)	10,405 (46.3)	11,400 (50.7)	13,165 (58.6)	14,300 (63.6)	22,415 (99.7)	24,550 (109.2)	28,350 (126.1)	30,795 (137.0)
	7-1/2 (191)	16,020 (71.3)	17,550 (78.1)	17,985 (80.0)	19,065 (84.8)	34,505 (153.5)	37,800 (168.1)	38,740 (172.3)	41,065 (182.7)
	12-1/2 (318)	29,975 (133.3)	29,975 (133.3)	29,975 (133.3)	31,775 (141.3)	64,565 (287.2)	64,565 (287.2)	64,565 (287.2)	68,440 (304.4)
3/4	3-1/2 (89)	* 5,105 (22.7)	5,595 (24.9)	6,460 (28.7)	7,910 (35.2)	11,000 (48.9)	12,050 (53.6)	13,915 (61.9)	17,040 (75.8)
	6-3/4 (171)	13,680 (60.9)	14,985 (66.7)	17,305 (77.0)	20,590 (91.6)	29,460 (131.0)	32,275 (143.6)	37,265 (165.8)	44,350 (197.3)
	9 (229)	21,060 (93.7)	23,070 (102.6)	25,900 (115.2)	27,455 (122.1)	45,360 (201.8)	49,690 (221.0)	55,785 (248.1)	59,130 (263.0)
	15 (381)	43,165 (192.0)	43,165 (192.0)	43,165 (192.0)	45,755 (203.5)	92,975 (413.6)	92,975 (413.6)	92,975 (413.6)	98,550 (438.4)
7/8	3-1/2 (89)	5,105 (22.7)	5,595 (24.9)	6,460 (28.7)	7,910 (35.2)	11,000 (48.9)	12,050 (53.6)	13,915 (61.9)	17,040 (75.8)
	7-7/8 (200)	17,235 (76.7)	18,885 (84.0)	21,805 (97.0)	26,705 (118.8)	37,125 (165.1)	40,670 (180.9)	46,960 (208.9)	57,515 (255.8)
	10-1/2 (267)	26,540 (118.1)	29,070 (129.3)	33,570 (149.3)	37,365 (166.2)	57,160 (254.3)	62,615 (278.5)	72,300 (321.6)	80,485 (358.0)
	17-1/2 (445)	57,100 (254.0)	58,755 (261.4)	58,755 (261.4)	62,280 (277.0)	122,990 (547.1)	126,545 (562.9)	126,545 (562.9)	134,140 (596.7)
1	4 (102)	6,240 (27.8)	6,835 (30.4)	7,895 (35.1)	9,665 (43.0)	13,440 (59.8)	14,725 (65.5)	17,000 (75.6)	20,820 (92.6)
	9 (229)	21,060 (93.7)	23,070 (102.6)	26,640 (118.5)	32,625 (145.1)	45,360 (201.8)	49,690 (221.0)	57,375 (255.2)	70,270 (312.6)
	12 (305)	32,425 (144.2)	35,520 (158.0)	41,015 (182.4)	48,805 (217.1)	69,835 (310.6)	76,500 (340.3)	88,335 (392.9)	105,120 (467.6)
	20 (508)	69,765 (310.3)	76,425 (340.0)	76,740 (341.4)	81,345 (361.8)	150,265 (668.4)	164,605 (732.2)	165,285 (735.2)	175,205 (779.3)
1-1/4	5 (127)	8,720 (38.8)	9,555 (42.5)	11,030 (49.1)	13,510 (60.1)	18,785 (83.6)	20,575 (91.5)	23,760 (105.7)	29,100 (129.4)
	11-1/4 (286)	29,430 (130.9)	32,240 (143.4)	37,230 (165.6)	45,595 (202.8)	63,395 (282.0)	69,445 (308.9)	80,185 (356.7)	98,205 (436.8)
	15 (381)	45,315 (201.6)	49,640 (220.8)	57,320 (255.0)	70,200 (312.3)	97,600 (434.1)	106,915 (475.6)	123,455 (549.2)	151,200 (672.6)
	25 (635)	97,500 (433.7)	106,805 (475.1)	119,905 (533.4)	127,100 (565.4)	210,000 (934.1)	230,045 (1023.3)	258,260 (1148.8)	273,755 (1217.7)

1 See section 3.1.7 for explanation on development of load values.
2 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 42 - 55 as necessary. Compare to the steel values in table 41. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.80.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
6 Tabular values are for dry concrete conditions. For water saturated concrete multiply design strength (factored resistance) by 0.85.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.7.5.
8 Tabular values are for normal weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

Waler load in Section B = 1221 lb/ft.
Maximum 3' length supported.
Total load = 1.23*3 = 3.69 kips
3/4" Anchor SWL = 5.595 kips.
Spacing and edge distance factors of 1.00 and 1.00
SWL = 5.59 k (1.0)(1.0) = 5.59 kips.
5.59>3.69, OK

1

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 48 - Load adjustment factors for 3/4-in. diameter threaded rods in uncracked concrete[1,2,3]

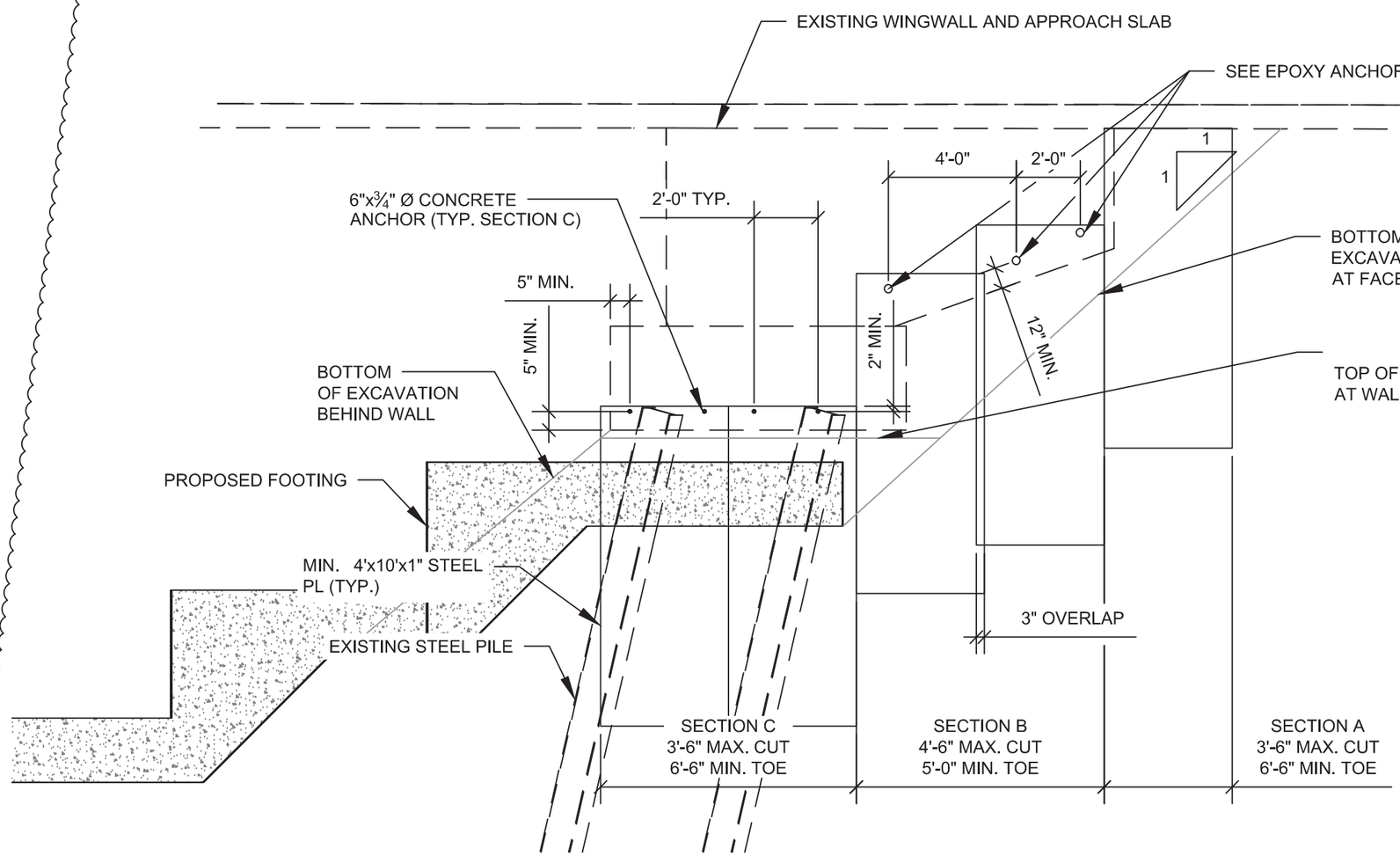
3/4-in. uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.33	0.24	0.18	0.10	n/a	n/a	n/a	n/a	0.09	0.03	0.02	0.01	0.17	0.07	0.05	0.02	n/a	n/a	n/a	n/a
3-3/4 (95)	0.59	0.59	0.57	0.54	0.49	0.30	0.22	0.13	0.57	0.54	0.53	0.52	0.27	0.11	0.07	0.03	0.49	0.22	0.14	0.07	n/a	n/a	n/a	n/a
4 (102)	0.60	0.60	0.57	0.54	0.51	0.31	0.23	0.13	0.57	0.54	0.53	0.52	0.29	0.12	0.08	0.04	0.51	0.24	0.16	0.08	n/a	n/a	n/a	n/a
5 (127)	0.62	0.62	0.59	0.56	0.60	0.34	0.25	0.15	0.59	0.55	0.54	0.52	0.41	0.17	0.11	0.05	0.60	0.33	0.22	0.11	n/a	n/a	n/a	n/a
5-1/4 (133)	0.63	0.63	0.60	0.56	0.63	0.35	0.26	0.15	0.60	0.55	0.54	0.52	0.44	0.18	0.12	0.06	0.63	0.35	0.23	0.11	0.62	n/a	n/a	n/a
6 (152)	0.65	0.65	0.61	0.57	0.69	0.38	0.28	0.16	0.61	0.56	0.55	0.53	0.54	0.22	0.14	0.07	0.72	0.38	0.29	0.14	0.66	n/a	n/a	n/a
7 (178)	0.67	0.67	0.63	0.58	0.76	0.41	0.30	0.18	0.63	0.57	0.55	0.53	0.68	0.28	0.18	0.09	0.84	0.41	0.34	0.18	0.72	n/a	n/a	n/a
8 (203)	0.69	0.69	0.65	0.59	0.83	0.45	0.33	0.19	0.65	0.58	0.56	0.54	0.83	0.34	0.22	0.11	0.96	0.45	0.37	0.21	0.77	n/a	n/a	n/a
8-1/2 (216)	0.71	0.71	0.66	0.59	0.87	0.47	0.35	0.20	0.66	0.59	0.56	0.54	0.91	0.37	0.24	0.12	1.00	0.47	0.38	0.24	0.79	0.59	n/a	n/a
9 (229)	0.72	0.72	0.67	0.60	0.90	0.49	0.36	0.21	0.67	0.59	0.57	0.54	0.99	0.40	0.26	0.13		0.49	0.39	0.26	0.81	0.60	n/a	n/a
10 (254)	0.74	0.74	0.69	0.61	0.98	0.53	0.39	0.23	0.68	0.60	0.58	0.55	1.00	0.47	0.31	0.15		0.53	0.42	0.30	0.86	0.64	n/a	n/a
10-3/4 (273)	0.76	0.76	0.70	0.62	1.00	0.57	0.42	0.25	0.70	0.61	0.58	0.55		0.53	0.34	0.17		0.57	0.44	0.32	0.89	0.66	0.57	n/a
12 (305)	0.79	0.79	0.72	0.63		0.64	0.47	0.27	0.72	0.62	0.59	0.56		0.62	0.40	0.20		0.64	0.48	0.34	0.94	0.70	0.60	n/a
14 (356)	0.84	0.84	0.76	0.66		0.74	0.55	0.32	0.76	0.64	0.61	0.57		0.78	0.51	0.25		0.74	0.55	0.37	1.00	0.75	0.65	n/a
16 (406)	0.89	0.89	0.80	0.68		0.85	0.62	0.37	0.79	0.66	0.62	0.58		0.96	0.62	0.30		0.85	0.62	0.40		0.80	0.70	n/a
16-3/4 (425)	0.91	0.91	0.81	0.69		0.89	0.65	0.38	0.81	0.67	0.63	0.58		1.00	0.67	0.33		0.89	0.65	0.41		0.82	0.71	0.56
18 (457)	0.94	0.94	0.83	0.70		0.95	0.70	0.41	0.83	0.68	0.64	0.58			0.74	0.36		0.95	0.70	0.43		0.85	0.74	0.58
20 (508)	0.99	0.99	0.87	0.72		1.00	0.78	0.46	0.87	0.70	0.65	0.59			0.87	0.42		1.00	0.78	0.47		0.90	0.78	0.61
22 (559)	1.00	1.00	0.91	0.74			0.86	0.50	0.91	0.72	0.67	0.60			1.00	0.49			0.86	0.50		0.94	0.82	0.64
24 (610)			0.94	0.77			0.93	0.55	0.94	0.74	0.68	0.61				0.56			0.93	0.55		0.99	0.85	0.67
26 (660)			0.98	0.79			1.00	0.59	0.98	0.76	0.70	0.62				0.63			1.00	0.59		1.00	0.89	0.70
28 (711)			1.00	0.81				0.64	1.00	0.78	0.71	0.63				0.70				0.64			0.92	0.73
30 (762)				0.83				0.68		0.80	0.73	0.64				0.78				0.68			0.95	0.75
36 (914)				0.90				0.82		0.86	0.77	0.67				1.00				0.82			1.00	0.82
>48 (1219)				1.00				1.00		0.99	0.86	0.73								1.00				0.95

Table 49 - Load adjustment factors for 3/4-in. diameter threaded rods in cracked concrete[1,2,3]

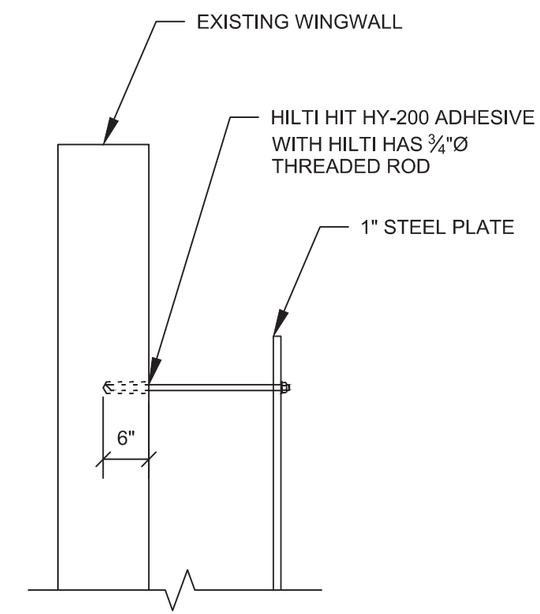
3/4-in. cracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[4] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[5] f_{HV}			
Embedment h_{ef} in. (mm) / Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.44	0.44	0.42	0.39	n/a	n/a	n/a	n/a	0.09	0.03	0.02	0.01	0.17	0.07	0.05	0.03	n/a	n/a	n/a	n/a
3-3/4 (95)	0.59	0.59	0.57	0.54	0.55	0.55	0.50	0.44	0.57	0.54	0.53	0.52	0.27	0.11	0.07	0.04	0.54	0.22	0.15	0.09	n/a	n/a	n/a	n/a
4 (102)	0.60	0.60	0.57	0.54	0.57	0.57	0.51	0.44	0.57	0.54	0.53	0.52	0.30	0.12	0.08	0.05	0.59	0.24	0.16	0.10	n/a	n/a	n/a	n/a
5 (127)	0.62	0.62	0.59	0.56	0.63	0.63	0.56	0.47	0.59	0.55	0.54	0.53	0.41	0.17	0.11	0.07	0.83	0.34	0.22	0.13	n/a	n/a	n/a	n/a
5-1/4 (133)	0.63	0.63	0.60	0.56	0.64	0.64	0.57	0.47	0.60	0.55	0.54	0.53	0.45	0.18	0.12	0.07	0.89	0.36	0.24	0.14	0.62	n/a	n/a	n/a
6 (152)	0.65	0.65	0.61	0.57	0.69	0.69	0.60	0.49	0.61	0.56	0.55	0.53	0.54	0.22	0.15	0.09	1.00	0.44	0.29	0.18	0.67	n/a	n/a	n/a
7 (178)	0.67	0.67	0.63	0.58	0.76	0.76	0.65	0.52	0.63	0.57	0.55	0.54	0.69	0.28	0.19	0.11		0.56	0.37	0.22	0.72	n/a	n/a	n/a
8 (203)	0.69	0.69	0.65	0.59	0.83	0.83	0.70	0.55	0.65	0.58	0.56	0.54	0.84	0.34	0.23	0.14		0.68	0.45	0.27	0.77	n/a	n/a	n/a
8-1/2 (216)	0.71	0.71	0.66	0.59	0.87	0.87	0.72	0.56	0.66	0.59	0.57	0.55	0.92	0.37	0.25	0.15		0.75	0.50	0.30	0.79	0.59	n/a	n/a
9 (229)	0.72	0.72	0.67	0.60	0.90	0.90	0.75	0.57	0.67	0.59	0.57	0.55	1.00	0.41	0.27	0.16		0.82	0.54	0.32	0.82	0.61	n/a	n/a
10 (254)	0.74	0.74	0.69	0.61	0.98	0.98	0.80	0.60	0.69	0.60	0.58	0.55		0.48	0.32	0.19		0.95	0.63	0.38	0.86	0.64	n/a	n/a
10-3/4 (273)	0.76	0.76	0.70	0.62	1.00	1.00	0.84	0.62	0.70	0.61	0.58	0.56		0.53	0.35	0.21		1.00	0.70	0.42	0.89	0.66	0.58	n/a
12 (305)	0.79	0.79	0.72	0.63			0.91	0.66	0.72	0.62	0.59	0.57		0.63	0.42	0.25			0.83	0.50	0.94	0.70	0.61	n/a
14 (356)	0.84	0.84	0.76	0.66			1.00	0.72	0.76	0.64	0.61	0.58		0.79	0.52	0.31			1.00	0.63	1.00	0.76	0.66	n/a
16 (406)	0.89	0.89	0.80	0.68				0.78	0.80	0.66	0.62	0.59		0.97	0.64	0.38				0.77		0.81	0.70	n/a
16-3/4 (425)	0.91	0.91	0.81	0.69				0.81	0.81	0.67	0.63	0.59		1.00	0.68	0.41				0.81		0.83	0.72	0.61
18 (457)	0.94	0.94	0.83	0.70				0.85	0.83	0.68	0.64	0.60			0.76	0.46				0.85		0.86	0.75	0.63
20 (508)	0.99	0.99	0.87	0.72				0.91	0.87	0.70	0.65	0.61			0.89	0.54				0.91		0.90	0.79	0.66
22 (559)	1.00	1.00	0.91	0.74				0.98	0.91	0.72	0.67	0.62			1.00	0.62				0.98		0.95	0.82	0.70
24 (610)			0.94	0.77				1.00	0.94	0.74	0.69	0.63				0.70				1.00		0.99	0.86	0.73
26 (660)			0.98	0.79					0.98	0.76	0.70	0.64				0.79						1.00	0.90	0.76
28 (711)			1.00	0.81					1.00	0.79	0.72	0.65				0.89							0.93	0.78
30 (762)				0.83						0.81	0.73	0.66				0.99							0.96	0.81
36 (914)				0.90						0.87	0.78	0.70				1.00							1.00	0.89
>48 (1219)				1.00						0.99	0.87	0.76												1.00

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Appendix D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

1



ELEVATION - ABUTMENT 2 SOE



ANCHOR DETAIL

GENERAL NOTES

DRAWINGS SHALL NOT BE SCALED

MATERIAL PROPERTIES
- PLATE - GR. 36, Fy = 36 KSI MIN.
- CARBON STEEL THREADED ROD AND EPOXY - PER HITLI SPECIFICATIONS

Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc.	
Rev. 1. 4/23/2015				Apr 23 2015 9:33 AM	Drawn By	AJT	04/19/15	3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	TMD/AJT	04/19/15	Submittal ABUTMENT BOTTOM SOE WALL	PCL Project / Job No. I-91 Hartford / 5515002
	I-91	Hartford	IM 091-2(79)		Check By	TMD	04/19/15	Drawing Title TYP. ABUTMENT BOT. SOE WALL	Sheet No. 01

STATE OF VERMONT TIMOTHY DAVIS NO. 97183 CIVIL LICENSED PROFESSIONAL ENGINEER

Signature Seal

CoSign

N:\District Office\Engineering\01 TIG Tampa Active Projects\5514001 - I-91 Hartford\40 Substructure\41 Sheet Walls\01 CAD Files\Abut_Walls_P_REL0C.dwg 4/22/2015 6:20 PM