ENGINEER OF RECORD TO PROVIDE CONTINOUS SPECIAL INSPECTION PER THE ESR REPORT PER APPLICANT. THEN PROVIDE CITY INSPECTOR REPORT AND FINAL LETTER AT TIME OF FINAL INSPECTION.

APPROVED TO PROCEEDSUBJECT TO SPECIAL INSPECTION REPORT 8/5/2022 DL

WOLDEN
STRUCTURAL
ENGINEERING, LLC
Practical Structural Engineering Solutions

Tim Wolden, PE, SE
34930 Hwy 53
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(503) 368-7962 office
(503) 368-7963 fax
tim@woldense.com

July 12, 2022

THE APPROVED CONSTRUCTION PLANS AND ALL ENGINEERING DOCUMENTS MUST BE POSTED ON THE JOB AT ALL INSPECTIONS IN A VISIBLE AND READILY ACCESSIBLE LOCATION.

Ken Marquardt
Ram Jack West
PO Box 11701
Eugene, OR 97440

Re: Foundation Assessment and Repair Recommendations for the Ross Family Residence at 110 9th Street SW in Puyallup, Washington

Dear Ken:

I prepared a foundation repair/stabilization plan for the left front corner of the Ross Family Residence at 110 9th Street SW in Puyallup, Washington per your offices' recent request. The purpose of the repair plan was to provide the necessary information needed to stabilize the southeast corner of the house. This settled portion of the foundation will be able to be supported and stabilized with two helical piers and foundation brackets to be installed under the foundation at the cracked corner stemwall of the home.

The single-story residence is mostly a rectangular shaped wood-framed structure that is about 31 feet wide from north to south and 45-feet deep. There is a covered entry deck at the front or east side of the home and two side entries at the south. The house was built on this flat residential lot in 1915 based on available online information. The greatest amount of settlement occurs at the left front or southeast corner which has settled up to 2¼-inches relative to the front right front corner of the house. It is my opinion that the settlement is due to undersized footings under the house or downspout drainage at the corner causing weak bearing conditions.

View from the Southeast Corner of Residence – Greatest Settlement at this Corner

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View from South looking at the South Wall – Add Pier near Vent Hole

I recommend that the southeast corner be supported on two (2) helical piers; one at the front or east side and one at the south side wall shown above. These piers will use the standard foundation bracket (4038) or the modified RD 3177 brackets. In addition to the brackets, I have shown the use of 6x6 steel angles placed on top of the brackets to ensure that the lifting force is applied uniformly along the wall in order to support the cracked corner and to prevent more cracking as it is unlikely the footings are reinforced.

These piers will allow this structure to be lifted enough to ensure the load of the home is on the piers as this is only a stabilization project. The piers will ensure that this portion of the foundation is stabilized against future settlement. Once the piers are installed and loaded, I recommend that the crack be sealed with a non-shrink cement grout (hydraulic cement) to seal it against pest infiltration or spalling from freezing water in the crack. The locations of the piers are shown in the attached repair plan.

Cracked Foundation at the Southeast Corner - Two Piers and Angles under this Corner

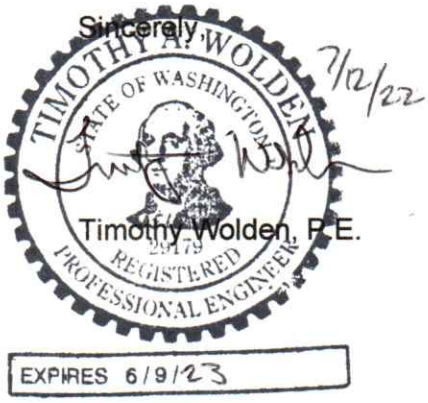
The pipe pier shafts will be supported for their full length against buckling. They will be installed in gravelly glacial till or clayey marine sediment soil, typical in the Puget Sound Region, which has no acidic conditions that would deteriorate the steel piers.

I anticipate that a hard bearing layer is probably present about 10 to 15 feet below the footings based on this being mostly a dense compacted soil. I have calculated that the pressure used to drive the piers should be at least 7,500 pounds of equivalent torque capacity under the foundation of the home. I used a snow loading of 25 psf at the roof and 40 psf live floor loading, with dead loading consistent with the materials used.

In conclusion, I found that the southeast corner of the Ross Family residence at 110 9th Street SW in Puyallup, Washington has experienced up to 2¼-inches of settlement and the cracked foundation for this single-story residence should be stabilized to prevent increased settlement or damage to the foundation. Please refer to my attached repair plan for repair/stabilization recommendations possible with two hydraulically driven helical piers with foundation brackets placed under the footings of the home and steel angles placed on top of the brackets.

I have enjoyed working with you on this project. If you have any additional questions, comments, or concerns please feel free to call.

Sincerely,



Timothy Wolden, P.E.

City of Puyallup
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Job No.: 22006.123 | Page: 1 of: 3
By: TAW | Date: 7/12/22
Project: FOUNDATION STABILIZATION @ 110 9th ST SW

TIMOTHY A. WOLDEN
STATE OF WASHINGTON
29179
REGISTERED
PROFESSIONAL ENGINEER
7/12/22
EXPIRES 6/9/23

City of Puyallup
Development & Permitting Services
ISSUED PERMIT
Building | Planning | Engineering | Public Works | Fire | Traffic

First Floor
1219 Sq ft

-2 1/2 | -1 3/4 | -1 3/4 | -1 1/4 | -1 1/4 | -1 1/4 | -1 1/2 | -1 3/4 | -2 | -1 3/4 | -1 1/4 | -2 | -2 | -2 1/4 | -2 | -1/4 | -1/2 | -1/2

23' | 8' | 12' | 10' | 45' | 23'

SEAL CRACK @ CORNER W/ NON SHRINK CEMENT PATCHING COMPOUND

INSTALL HELICAL PIER W/ 4038 BRACKET & L6x6x3/8 (2 LOCATIONS)

USE 4' L6x6 @ THIS BRACKET TO REACH CORNER

NOTCH CUT IF MORE THAN 3"

Gas

3' OK HERE

CRACKED CORNER STEMWALL

REMOVE & RESET FENCE POST

ENTRY CANOPY

N

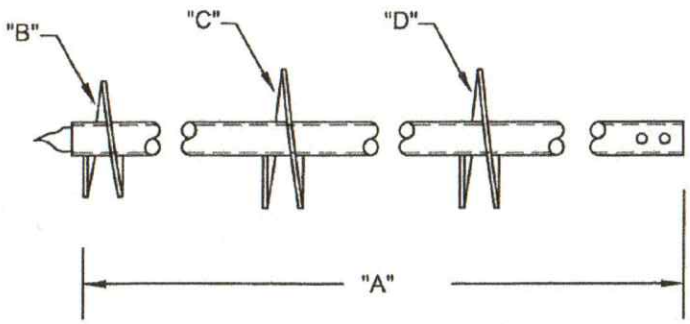
FOUNDATION STABILIZATION
FOR ROSS @ 110 9th ST. SW, PUYALLUP

L6x6x3/8 x 4' @ SOUTH
L6x6x3/8 x 3' @ EAST
4038 OR RD.3177 BRACKETS
2 7/8" ϕ HELICAL PIERS

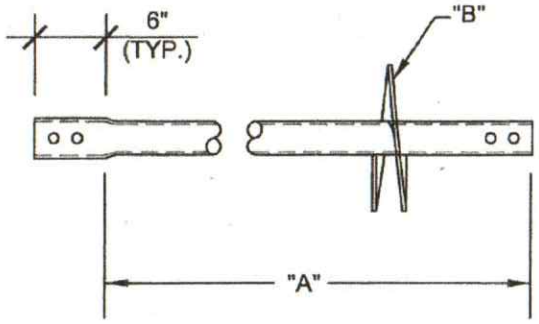
INSTALL 2 PIERS TO 7500# EQUIV. TORQUE CAPACITY

PRRRSF20221108

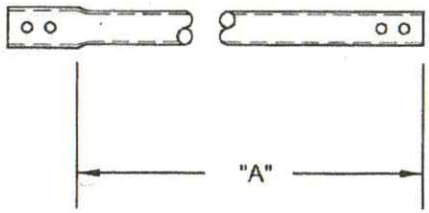
2.875"Ø HELICAL PILES AND ANCHORS - UPSET CONNECTION



LEAD SECTION



HELIX EXTENSION



EXTENSION

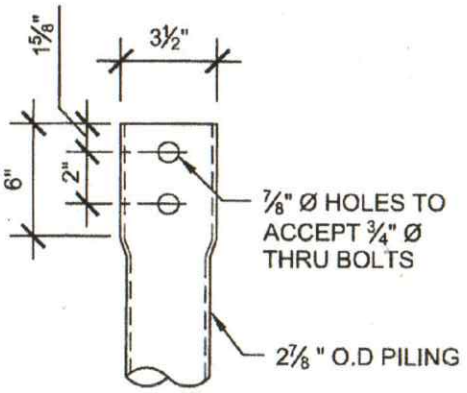
LEAD SECTION TABLE				
CAT. #	"A"	"B"	"C"	"D"
6125	5'-0	8"		
6140	5'-0	8"	10"	
6142	5'-0	10"	12"	
6143	7'-0	10"	12"	
6147	7'-0	8"	10"	12"
6148	7'-0	10"	12"	14"
6188	10'-0	10"	12"	14"

* MULTI-HELIX ARE SPACED 3 DIAMETERS OF THE LOWEST HELIX.

HELIX EXTENSIONS		
CAT #	"A"	"B"
8605-8	5'-0	8"
8605-10	5'-0	10"
8605-12	5'-0	12"
8607-10	7'-0	10"

EXTENSIONS	
CAT #	"A"
8605	5'-0
8607	7'-0
8610	10'-0

MECHANICAL TORQUE RATING - 6,000 FT-LB
ULTIMATE CAPACITY (TENS/COMP) - 54.0 KIP*
ALLOWABLE CAPACITY (TENS/COMP) - 27.0 KIP*
*BASED ON A TORQUE FACTOR (Kt) = 9



CONNECTION DETAIL

NOTES:

1. POLYETHYLENE POLYMER THERMOPLASTIC COATING PER ICC-ES AC 228.(GALVANIZED AND UNCOATED PILES AVAILABLE UPON REQUEST)
2. LEAD AND EXTENSION SECTION LENGTHS ARE NOMINAL.
3. SHAFT MATERIAL IS 2⅞" O.D., 0.217" WALL, MINIMUM Fy=65 KSI AND Fu=80 KSI, ASTM - A500.
4. HELIX BLADE MATERIAL IS HOT ROLLED, MINIMUM Fy=50 KSI AND Fu=80 KSI CARBON STEEL. PLATE THICKNESS IS AVAILABLE IN ⅜" AND ½" THICKNESSES.
5. NOMINAL SPACING BETWEEN HELICAL PLATES IS THREE TIMES THE DIAMETER OF THE LOWEST HELIX.
6. MANUFACTURER TO HAVE IN EFFECT INDUSTRY RECOGNIZED WRITTEN QUALITY CONTROL AND ASSURANCE FOR ALL MATERIALS AND MANUFACTURING PROCESSES.
7. MANUFACTURER SHALL BE ISO CERTIFIED.
8. ALL WELDING IS TO BE DONE BY WELDERS CERTIFIED UNDER SECTION 5 OF THE AWS CODE D1.1.
9. ALL COUPLING BOLTS TO BE ¾"Ø, SAE J429 GRADE 8 BOLTS.(SAE J429 GRADE 5 IF GALVANIZED).

RAMJACK

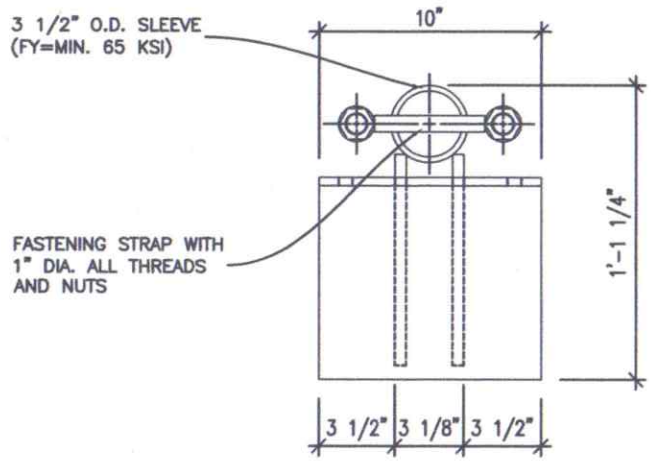
DWG. NO. : 2875.03	CATALOG NO. : SEE TABLES		REV. 1
SCALE 3/4"= 1'-0	DRAWN BY SA	DATE: 07/11/14	SHEET 1 OF 1

2/3

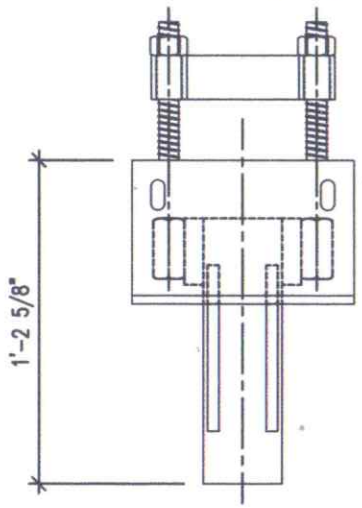
PRRRSF20221108

NOTES: UNLESS OTHERWISE SPECIFIED

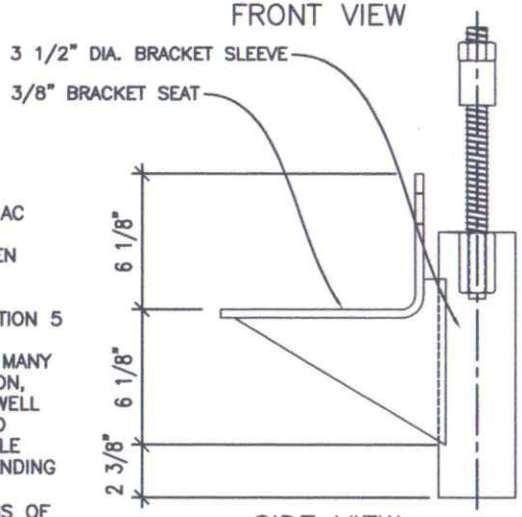
Rev No	Revision note	Date	Signature	Checked



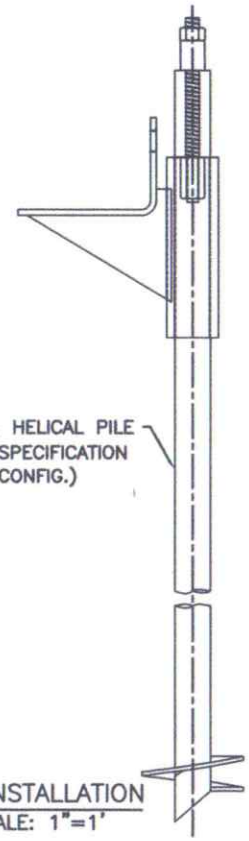
TOP VIEW



FRONT VIEW



SIDE VIEW



TYP. INSTALLATION
SCALE: 1"=1'

City of Puyallup
Development & Permitting Services
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NOTES:

1. POLYETHYLENE COPOLYMER THERMOPLASTIC COATING PER ICC-ES AC 228
3. MANUFACTURER TO HAVE IN EFFECT INDUSTRY RECOGNIZED WRITTEN QUALITY CONTROL FOR ALL MATERIALS AND MANUFACTURING PROCESSES.
4. ALL WELDING IS TO BE DONE BY WELDERS CERTIFIED UNDER SECTION 5 OF THE AWS CODE D1.1.
5. THE CAPACITY OF THE UNDERPINNING SYSTEM IS A FUNCTION OF MANY INDIVIDUAL ELEMENTS, INCLUDING THE CAPACITY OF THE FOUNDATION, BRACKET, PIER SHAFT, HELICAL PLATE, AND BEARING STRATA, AS WELL AS THE STRENGTH OF THE FOUNDATION BRACKET CONNECTION AND THE QUALITY OF THE INSTALLATION OF THE PILE. YOUR ACHIEVABLE CAPACITY COULD BE HIGHER OR LOWER THAN THOSE LISTED DEPENDING ON THE ABOVE FACTORS.
6. RAM JACK ESR-1854 FOR ALLOWABLE VALUES AND/OR CONDITIONS OF USE CONCERNING MATERIAL PRESENTED IN THIS DOCUMENT.

RAMJACK®

UNLESS OTHERWISE SPECIFIED
* DIMENSIONS ARE IN INCHES
* TOLERANCES: ANGLE ±1°
3 PLACE DECIMALS ± .010
2 PLACE DECIMALS ± .02
* REMOVE ALL BURRS AND SHARP EDGES
* PARENTHETICAL INFO FOR REF ONLY

HOLE TOLERANCES

.013 THRU .125 +.004 −.001	.126 THRU .250 +.004 −.001	.251 THRU .500 +.006 −.001
.501 THRU .750 +.008 −.001	.751 THRU 1.000 +.010 −.001	1.001 THRU 2.000 +.012 −.001

FILE NAME	RD.3177 PILE BKT.	FSCM NO	
SIZE	A-SIZE TITLE BLOCK	SHEET	1
DRAWN	09-10-19	SCALE	1 1/2"=1'
CHECK	DARIN WILLIS		
APPR.	DARIN WILLIS		
ISSUED			
REV			
CONTRACT NO			

RD.3177 HELICAL PILE BRACKET

DWG NO

3/3

WOLDEN STRUCTURAL ENGINEERING, LLC
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Job No.: 22006.123 | Page: 1 of 2
By: TAW | Date: 7/12/22
Project: FOUNDATION STABILIZATION FOR PESS

Determine loading on Piers

$w_{roof} = \left(\frac{23}{2} + 2\right)(25 + 15)\ psf = 540\ plf$ (SL, DL)

$w_{wall} = 8 \times 12\ psf = 96\ plf$

$w_{floor} = \frac{12}{2}(40 + 15)\ psf = 330\ plf$ (LL, DL)

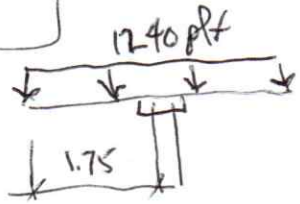
$w_{Ftg} = (8 \times 18 + 10 \times 12)\frac{150}{144} = 275\ plf$ (Stem, Ftg)

$w_{TOTAL} = 1240\ plf$

Use 4038 BRACKETS
(W) L6x6x3/8 Extension
& 2 7/8" ø HELICAL PIERS
6' MAX TRIBUTARY LOAD

Install @ 6' max spacing
so $P_{max} = 6 \times 1240\ plf$
$= 7500^{\#}$ CAPACITY

Check L6x6x3/8 x 48" @ load wall



$M = \frac{wl^2}{2} = \frac{1.24(1.75)^2}{2}12 = 23\ k\text{-}in$ $S_{req'd} = \frac{23}{.6 \times 36 ksi} = 1.06\ in^3$

$S_{L6x6x3/8} = 3.53\ in^3 > 1.06\ in^3$ OK

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GREATER THAN 7500# REQ. 2/2

USE →

TABLE 1—FOUNDATION STRENGTH RATINGS OF BRACKETS[3]

PRODUCT NUMBER	DESCRIPTION	PILING DIAMETER (inch)	ALLOWABLE CAPACITY (kips)		
			Compression	Tension	Lateral
4021.1	Side load bracket	$2^7/_8$	33.65[1,5]	See Table 3A	Note 6
4021.55	Side load bracket	$3^1/_2$	55.12 [1,5]	See Table 3A	Note 6
4038.1	Side load bracket	$2^7/_8$	19.70[1,5]	See Table 3A	Note 6
4039.1	Side load bracket	$2^7/_8$	32.07[1,5]	See Table 3A	Note 6
4075.1	New construction	$2^7/_8$	See Table 3B	See Table 3C	1.49[2,5]
4077.1	New construction	4½	See Table 3B	See Table 3C	2.984[2,5]
4079.1	New construction	$2^7/_8$	See Table 3B	See Table 3C	1.49[2,5]
4076	New construction	3½ (upset)	See Table 3B	See Table 3C	2.03[2,5]
		3½ (threaded)	See Table 3B	See Table 3C	2.79[2,5]
4093.1	Slab bracket	$2^7/_8$	See Table 5	N/A	N/A
4550.2875.1	Tieback assembly	$2^7/_8$	27.9 @ 20° angle (tension only)[4,5]		
			27.6 @ 30° angle (tension only)[4,5]		

For **SI:** 1 inch = 25.4 mm, 1 kip (1000 lbf) = 4.48 kN.

[1]Load capacity is based on full scale load tests per AC358 with an installed 5'-0" unbraced pile length having a maximum of one coupling per 2018, 2015, 2012 and 2009 IBC Section 1810.2.1 and 2006 IBC 1808.2.9.2. A 4-foot-long guide sleeve must be installed at the top of the shaft as required in Figures 3, 5 and 7. Side load bracket must be concentrically loaded. Side load bracket plate must be fully engaged with bottom of concrete foundation. Only localized limit states such as mechanical strength of steel components and concrete bearing have been evaluated.

[2]Lateral load capacity is based on lateral load tests performed in firm clay soil per Section 4.1.1 of this report. For any other soil condition, the lateral capacity of the pile must be determined by a registered design professional. The bracket must be installed with minimum embedment of 3 inches when measured from the bottom of the concrete foundation to the bottom of the bracket plate. Minimum width of footing must be 12 inches.

[3]The capacities listed in Table 1 assume the structure is sidesway braced per 2018, 2015, 2012 and 2009 IBC Section 1810.2.2 and 2006 IBC Section 1808.2.5.

[4]Tieback assemblies must be installed in accordance with Section 4.2.5 of this report. Only localized limit states such as mechanical strength of steel components and concrete bearing have been evaluated. The tieback assembly must be installed to support a minimum 6-inch-thick concrete wall. Two through bolts are required for connection between bracket sleeve and helical shaft. Bolts must be $^3/_4$-inch diameter complying with ASTM A325 and installed snug-tight with threads excluded.

[5]The tabulated values are based on installation with normal-weight concrete having a minimum compressive strength of 2500 psi (17.23 MPa).

[6]The lateral load capacity of the side-load brackets must be designed by a registered design professional in accordance with Chapter 18 of the IBC.

N/A = not applicable.

TABLE 2—MECHANICAL PROPERTIES AFTER CORROSION LOSS IN STEEL THICKNESS OF 2.875-INCH- , 3.5-INCH-, AND 4.5-INCH-DIAMETER HELICAL SHAFTS[1]

MECHANICAL PROPERTIES	SHAFT DIAMETER (inch)		
	2.875	3.5	4.5
Steel Yield Strength, F_y (ksi)	65	65	65
Steel Ultimate Strength, F_u (ksi)	80	76	76
Modulus of Elasticity, E (ksi)	29,000	29,000	29,000
Nominal Wall Thickness (inch)	0.217	0.254	0.237
Design Wall Thickness (inch)	0.1758	0.2102	0.1944
Outside Diameter (inch)	2.8490	3.4740	4.474
Inside Diameter (inch)	2.4974	3.0536	4.085
Cross Sectional Area (inch^2)	1.48	2.16	2.61
Moment of Inertia, I (inch^4)	1.32	2.88	6.00
Radius of Gyration, r (inch)	0.95	1.16	1.51
Section Modulus, S (inch^3)	0.93	1.66	2.68
Plastic Section Modulus, Z(inch^3)	1.26	2.24	3.56

For **SI:** 1 inch = 25.4 mm; 1 ksi = 6.89 MPa, 1 ft-lbf =1.36 N-m; 1 lbf =4.45 N.

[1]Dimensional properties are based on powder coated steel losing 0.026-inch steel thickness as indicated in Section 3.9 of AC358 for a 50-year service life.