861-E N Dean Road
Auburn, AL 36830
P: 360.566.7343

STRUCTURAL CALCULATIONS

PREPARED FOR

TARHEEL BASEMENT SYSTEMS

FOR

WATKINS RESIDENCE

FOUNDATION REPAIR

6156 OLD US 4521

LILLINGTON, NORTH CAROLINA

PROJECT NUMBER: 24.077.TBS

DATE: October 16, 2024

PROJECT MANAGER: Shane Adams, P.E.

COA: C-4876

Digitally signed by Shane Adams
Date: 2024.10.16 09:20:33-04'00'

861-E N Dean Road
Auburn, AL 36830
P: 360.566.7343

October 16, 2024

Project No.:24.077.TBS

Tarheel Basement Systems
2910 Griffith Road
Winston-Salem, North Carolina 27103

RE: Foundation Repair - 6156 Old US 4521, Lillington, North Carolina

PROJECT BACKGROUND

We understand the structure is a single-family residence and has experienced settlement at the back elevation of the detached structure. A recent field sketch (attached) indicates the approximate locations of repair. It is our understanding (1) 2 7/8 inch diameter helical piers has been proposed to provide additional foundation support.

Image 1: Front Elevation

GEOLOGIC SETTING

The existing structure is located in Lillington, North Carolina. Based on the information provided by the USDA Web Soil Survey, the general site condition in the area is comprised of sandy loam and the site is relatively flat.

SUMMARY

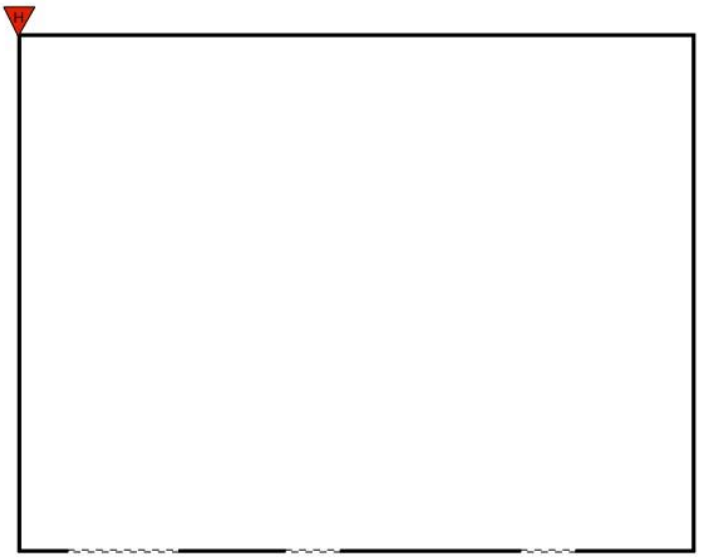
The ultimate load requirement for the helical piers is 14000 lbs and based on the geologic setting, we expect the piers to achieve adequate capacity at approximately 8 – 25 feet. We recommend the piers with a 2 7/8 inch shaft and 10 inch diameter helix plate be installed to a minimum depth of 8 feet and a minimum installation torque of 1600 ft−lbs, or refusal.

Regards,

Shane Adams

Shane Adams, P.E.
Stark Foundations

FIELD SKETCH



FRONT Back Building (Sewing Studio)

STARK FOUNDATIONS

PROJECT

Foundation Repair
6156 Old US 4521
Lillington, North Carolina

Date: 16-Oct-24
Designed by: MSY

Project No.: 24.077.TBS

Design Criteria

Code(s):

2018 North Carolina State Building Code — ASCE 7-10
International Building Code (IBC) 2015
International Residential Code (IRC) 2015

Design Loads:

Dead:

Roof =	15	psf
Chimney =	45	psf
Third Floor =	15	psf
Second Floor =	15	psf
First Floor =	15	psf
Walls =	45	psf
8" Foundation Wall =	100	psf
Soil =	110	psf

Soil:

Allow Lateral Bearing Pressure =	100	psf/ft
Active Pressure =	60	psf/ft

Live:

Roof (Snow) =	15	psf	
Roof Live Load =	20	psf	governs
Third Floor =	40	psf	
Second Floor =	40	psf	
First Floor =	40	psf	

Wind: (not applicable)

Exposure =	C		Risk Category =	II	
Wind Speed, V =	115	mph	K_{zt} =	1	
Gust Factor, G =	0.85		K_d =	0.85	
Int. Pressure Coefficient, GC_{pi} =	-0.18		K_z =	1	
Ext. Pressure Coefficient, Cp =	0.8		Height, h_z =	30	ft

Design Wind Pressure:

Design Load Combo = D + 0.6W

where: $p_w = q_z (GCp - GC_{pi})$ — ω = 0.6

$q_z = 0.00256 K_z K_{zt} K_d V^2$

Therefore:

q_z = 28.8 psf

p_w = 24.7 psf

Factored Wind Pressure, p'_w = 14.8 psf (say 15 psf)

STARK FOUNDATIONS

PROJECT

Foundation Repair
6156 Old US 4521
Lillington, North Carolina

Date: 16-Oct-24
Designed by: MSY

Project No.: 24.077.TBS

Helical Pier Design - Worst Case

Vertical Design Loads:

Tributary Widths:

Dead:

Roof =	15	ft	------->	225	plf
Third Floor =	0	ft	------->	0	plf
Second Floor =	0	ft	------->	0	plf
First Floor =	6	ft	------->	90	plf
Walls =	8	ft	------->	360	plf
Foundation Wall (height) =	3	ft	------->	300	plf
Soil (height) =	2	ft	------->	220	plf
			ΣDL =	1195	plf

Live:

Roof (live) =	15	ft	------->	300	plf
Third Floor =	0	ft	------->	0	plf
Second Floor =	0	ft	------->	0	plf
First Floor =	6	ft	------->	240	plf
			ΣLL =	540	plf

Max Pier Spacing or Trib = 4 ft

Pier Working Loads:

P_{DL} =	4780	lbs
0.75*P_{LL} =	1620	lbs
Working Load, P_{TL} =	7000	lbs
Ultimate Load, P_{ULT} =	14000	lbs

Pier Design:

Pier Type: Helical Pier

Bracket: FP3BA Bracket Cap = 27000 lbs Therefore OK

Shaft Diameter: 2.875"

Installation Torque, T:

Q_{ult} = 2 (P_{TL}) $Q_{ult} = K_t$ (T)

14000 lbs

where K_t = helix torque factor (ft^{-1}) according to the following table:

Shaft Dia.	K_t
2.375"	10
2.875"	9
3.5"	7
4.5"	6

Therefore, T = Q_{ult} / K_t Allowable T_{SHAFT} = 7898 ft-lbs Therefore OK

1556 ft-lbs

STARK
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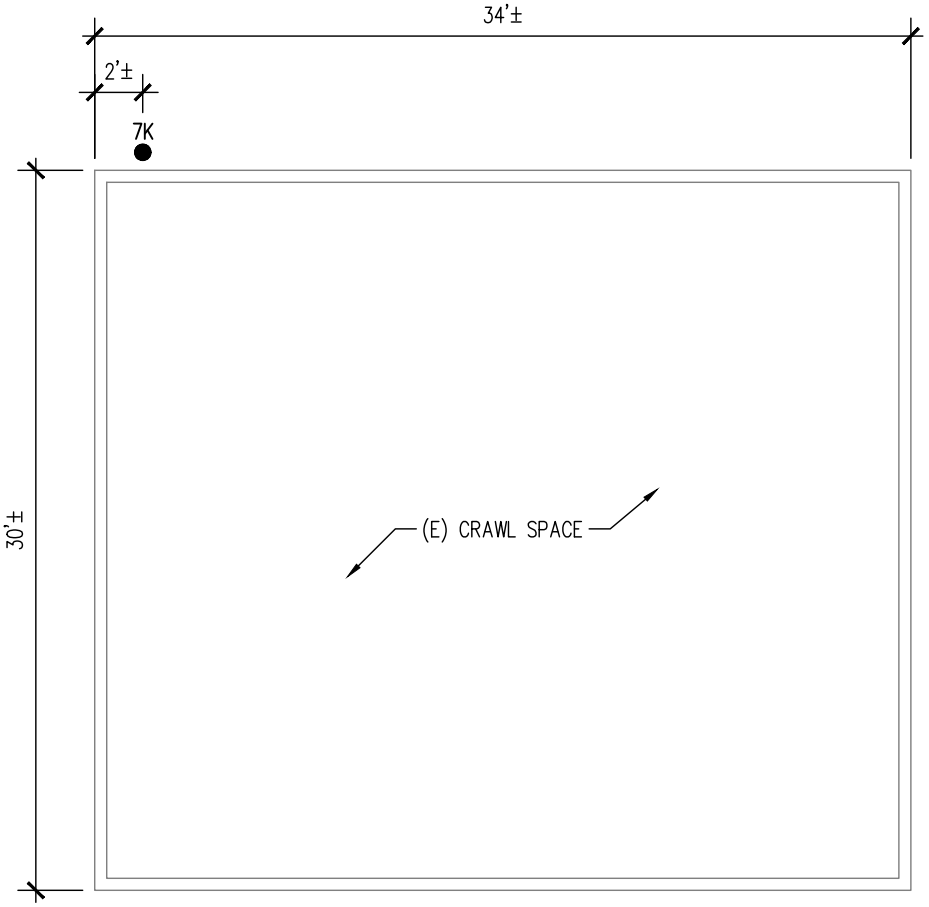

FRONT OF DETACHED STRUCTURE

1 FOUNDATION REPAIR PLAN

SCALE: 1/8"=1'-0"

LEGEND	
● 10K	INDICATES HELICAL PIER & UNFACTORED DESIGN LOAD (KIPS) SEE DETAIL 1/S2.0

PLAN NOTES:

1. DO NOT INSTALL PIERS UNDER WINDOWS OR OPENINGS, UNLESS NOTED OTHERWISE.
2. PIERS CAN BE ADJUSTED A DISTANCE OF 1'-0"± AS LONG AS THE SPAN BETWEEN THE ADJUSTED PIER AND ADJACENT PIER DOES NOT EXCEED THE MAXIMUM RECOMMENDED SPACING. WHEN THE DISTANCE EXCEEDS THE MAXIMUM RECOMMENDED SPACING, CONSULT WITH THE ENGINEER OF RECORD FOR FURTHER DIRECTION.
3. HELICAL PIERS SHALL BE INSTALLED TO A MINIMUM 2.0X THE DESIGN LOAD, PER THE TORQUE CORRELATION METHOD, AS NOTED ON THE FOUNDATION REPAIR PLAN TO achieve AN ULTIMATE AXIAL LOAD OF 14,000 LBS MINIMUM. PIER EMBEDMENT SHALL BE 8'-0" MIN.

STAMP

NORTH CAROLINA PROFESSIONAL SEAL 054665 ENGINEER SHANE C. ADAMS

Digitally signed by Shane Adams
10/15/2024 9:20:16 AM

PROJECT

FOUNDATION REPAIR
WATKINS RESIDENCE
6156 OLD US 4521
LILLINGTON, NC

CLIENT

TAR HEEL
BASEMENT SYSTEMS
3333 AIR PARK ROAD
FUQUAY-VARINA, NC

FRONT ELEVATION

NO	REVISIONS	BY	DATE

ISSUED:	10.14.24	PROJ NO.:	24.077.TBR
DRAWN BY:	MSY	CHECKED BY:	SA

SHEET TITLE

FDN REPAIR PLAN

SHEET NUMBER

S1.0

STARK
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AUBURN, AL 36830
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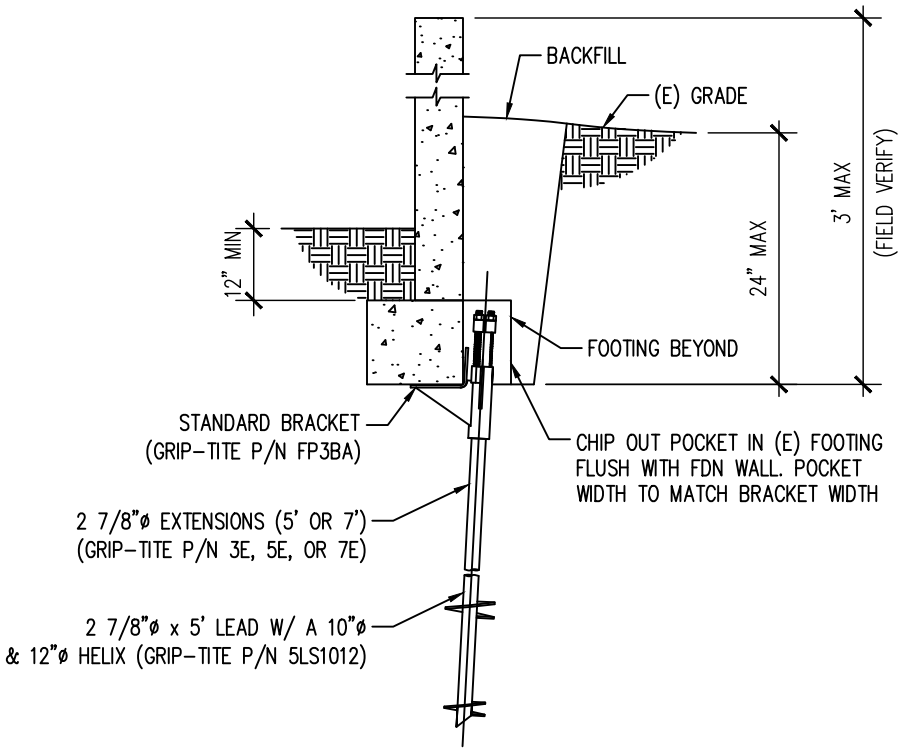

1 HELICAL PIER DETAIL
SCALE: 3/8"=1'-0"

STAMP

NORTH CAROLINA PROFESSIONAL SEAL 054665 ENGINEER SHANE C. ADAMS

Digitally signed by Shane Adams
10/15/2024 10:20:13 AM

PROJECT

FOUNDATION REPAIR
WATKINS RESIDENCE
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LILLINGTON, NC

CLIENT

TAR HEEL
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3333 AIR PARK ROAD
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FRONT ELEVATION

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DRAWN BY:	MSY	CHECKED BY:	SA

SHEET TITLE

DETAILS

SHEET NUMBER

S2.0