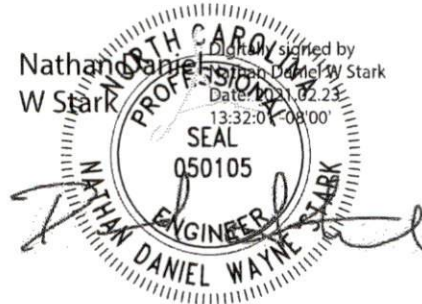**STARK FOUNDATIONS**

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STRUCTURAL CALCULATIONS

PREPARED FOR

TARHEEL BASEMENT SYSTEMS

FOR

GLOVER RESIDENCE

FOUNDATION REPAIR

955 BUNNLEVEL ERWIN ROAD
BUNNLEVEL, NORTH CAROLINA

PROJECT NUMBER: 21.056.TBS

DATE: February 23, 2021

PROJECT MANAGER: DANIEL STARK, P.E.

Nathan Daniel W Stark
Digitally signed by Nathan Daniel W Stark
Date: 2021.02.23 13:32:01 -08'00'

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February 23, 2021

Project No.: 21.056.TBS

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

RE: Foundation repair - 955 Bunnlevel Erwin Road, Bunnlevel, North Carolina

PROJECT BACKGROUND

We understand that the structure is a single-family residence and has experienced settlement at the chimney. It is our understanding that (2) 2 7/8 inch diameter push piers have been proposed to provide additional foundation support.

Image 1: Front Elevation

GEOLOGIC SETTING

The existing structure is located in Bunnlevel, North Carolina. The geologic structure in the area is comprised of sandy loam and the site is relatively flat. It is our opinion that the localized settlement is a result of improper foundation drainage and/or undersized footings. We believe that suitable support can be achieved by installing helical and/or push piers.

SUMMARY

The ultimate load requirement for the push piers is 20000 lbs, and based on the geologic setting, we expect the piers to achieve adequate capacity at approximately 8 – 25 feet. We recommend that the piers with a 2 7/8 inch shaft and be installed to a minimum depth of 8 feet and a minimum installation pressure of 2100 psi, or refusal, using a 9.62 square inch hydraulic ram.
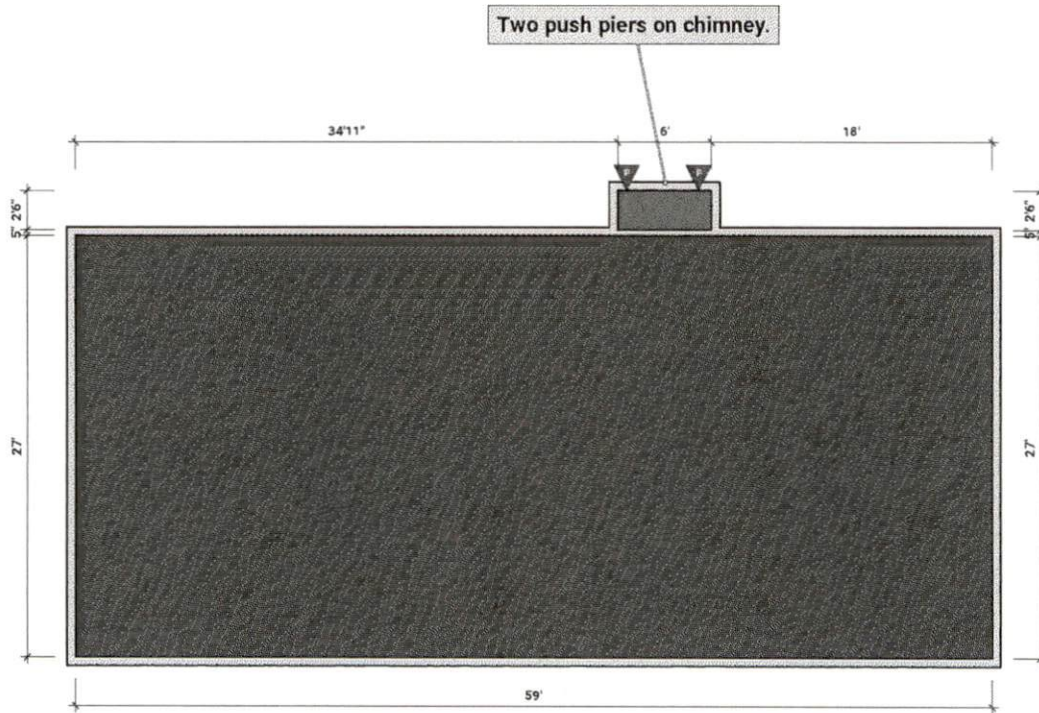
Regards,

Daniel Stark, P.E.
Stark Foundations

FLOOR LEVEL SURVEY

Two push piers on chimney.

34'11"   6'   18'

5' 2'6"

27

27

5' 2'6"

59'

Front

STARK FOUNDATIONS

PROJECT

Foundation Underpinning
955 Bunnlevel Erwin Road
Bunnlevel, North Carolina

Date: 23-Feb-21
Designed by: NDS

Project No.: 21.056.TBS

Design Criteria

Code(s):

International Building Code (IBC) 2015/2018
ASCE 7-10

Design Loads:

Dead:			Soil:		
Roof =	15	psf	Allow Lateral Bearing Pressure =	200	psf/ft
Chimney =	45	psf	Active Pressure =	60	psf/ft
Third Floor =	15	psf			
Second Floor =	15	psf			
First Floor =	15	psf			
Walls =	8	psf			
8" Foundation Wall =	100	psf			
Soil =	110	psf			

Live:

Roof (snow) =	25	psf
Third Floor =	40	psf
Second Floor =	40	psf
First Floor =	40	psf

Wind: (not applicable)

Exposure =	C		Risk Category =	II	
Wind Speed, V =	120	mph	K_{zt} =	1.0	
Gust Effect Factor, G =	0.85		K_d =	0.85	
Internal Pressure Coefficient, GC_{pi} =	-0.18		K_z =	0.98	
External Pressure Coefficient, C_p =	0.8		Height, h_z =	30	ft

Design Wind Pressure:

where: $p_w = q_z (GC_p - GC_{pi})$
           $q_z = 0.00256\, K_z\, K_{zt}\, K_d\, V^2$

Design Load Combo = D + 0.6W
$\omega = 0.6$

Therefore:

q_z = 30.7 psf
p_w = 26.4 psf
Factored Wind Pressure, p'_w = 15.8 psf (say 16 psf)

STARK FOUNDATIONS

PROJECT

Foundation Underpinning
955 Bunnlevel Erwin Road
Bunnlevel, North Carolina

Date: 23-Feb-21

Designed by: NDS

Project No.: 21.056.TBS

Push Pier Design - Worst Case

Vertical Design Loads:

    Tributary Widths:

Roof =	0	ft	------->	0	plf
Chimney Area =	275	ft²	------->	12375	lbs
Third Floor =	0	ft	------->	0	plf
Second Floor =	0	ft	------->	0	plf
First Floor =	0	ft	------->	0	plf
Walls =	0	ft	------->	0	plf
Chimney Footing Area (assume 24") =	21	ft²	------->	6300	lbs
Soil (height) =	0	ft	------->	0	plf
			$\Sigma DL =$	18675	plf

    Live:

Roof (snow) =	0	ft	------->	0	plf
Third Floor =	0	ft	------->	0	plf
Second Floor =	0	ft	------->	0	plf
First Floor =	0	ft	------->	0	plf
			$\Sigma LL =$	0	plf

    No. Piers =   2

    Pier Working Loads:

$P_{DL} =$	9338	lbs
$0.75^*P_{LL} =$	0	lbs
Working Load, $P_{TL} =$	10000	lbs
Ultimate Load, $P_{ULT} =$	20000	lbs

Pier Design:

    Pier Type: Push Pier

    Bracket: PP21617-34   Bracket Cap = 29340 lbs   Therefore ok   Reference ICC report (attached)
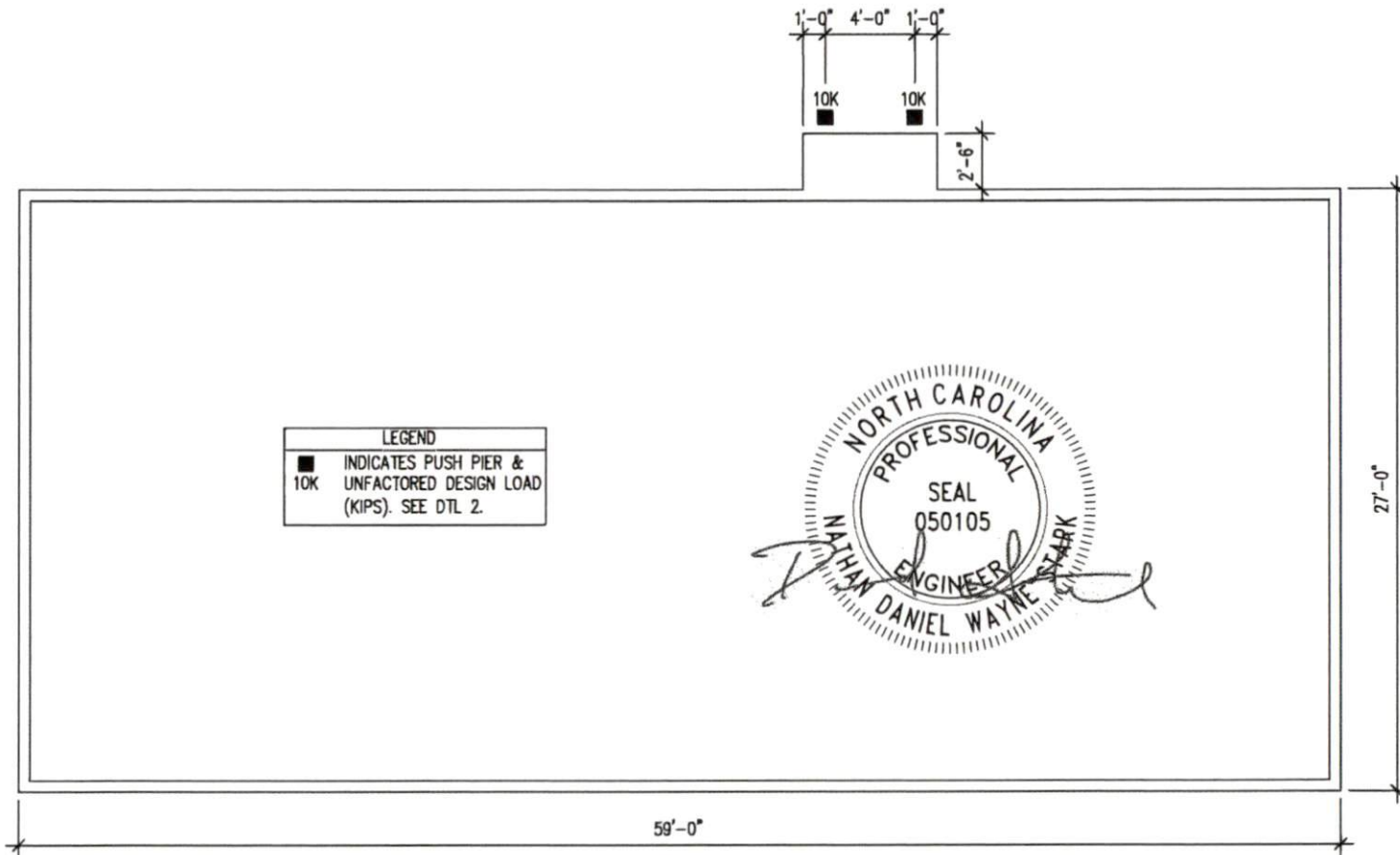
  Shaft Diameter: 2.875"

Installation Pressure, P:

    $Q_{ult} = 2 (P_{TL})$ $Q_{ult} = A_{cyl} (P)$ where A_{cyl} = working area of the dual bore
         20000   lbs   installation cylinder

                           $A_{cyl} =$ 9.62   in²

Therefore, $P_{REQ} = Q_{ult} / A_{cyl}$
         2100   psi

1'-0" 4'-0" 1'-0"

10K 10K

2'-6"

LEGEND	
■ 10K	INDICATES PUSH PIER & UNFACTORED DESIGN LOAD (KIPS). SEE DTL 2.

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27'-0"

59'-0"

1 FOUNDATION REPAIR PLAN
SCALE 1/8"=1'-0"

BACKFILL

(E) GRADE

FOOTING BEYOND

CHIP OUT POCKET IN (E) FOOTING
FLUSH WITH FDN WALL. POCKET
WIDTH TO MATCH BRACKET WIDTH

STANDARD BRACKET
(IMG P/N PP21617-34B)

3 1/2"ø X 48" GUIDE SLEEVE
(IMG P/N PP21617-48ES)

2 7/8"ø EXTENSIONS
(IMG P/N PP21617-36PTA)

2 7/8"ø STARTER (IMG P/N
PP21617-50SP) W/ 3 1/2"ø
FRICTION REDUCTION COLLAR
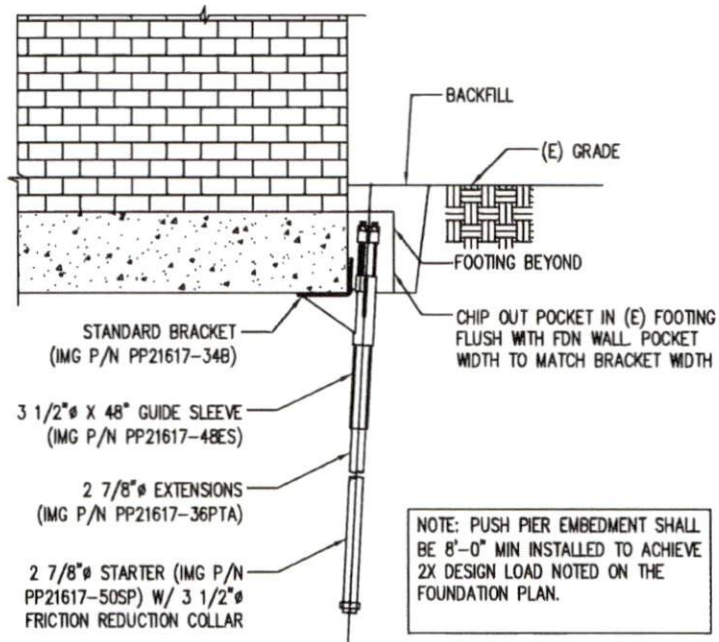
NOTE: PUSH PIER EMBEDMENT SHALL
BE 8'-0" MIN INSTALLED TO ACHIEVE
2X DESIGN LOAD NOTED ON THE
FOUNDATION PLAN.

2 PUSH PIER DETAIL — CHIMNEY
   SCALE: 3/8"=1'-0"

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