



YCH–Yolo Housing Migrant Center Foundation Repair

Dixon, CA

Structural Calculations

RSE Project: 25916

Client:

Yolo County Housing

147 W. Main St.
Woodland, CA 95695

Project Address:

31150 County Road 105
Dixon, CA 95620
[38.48587°, -121.67791°]

Seal:



Codes:

2025 California Building Code (CBC)
ASCE7-22 Minimum Design Loads for Buildings & Other Structures

Description: Foundation Repair for an (E) Single Story Wood Framed Residential Building

Risk Category: II, Residential

Live Loads: Roof: 20 psf

Lateral Loads: Wind: 93 mph Exposure: C
Seismic: $S_{DS} = 0.810 g$ IE = 1.00 Seismic Design Category = D

AHJ: City of Dixon

Foundation: Values based on Geotech report by Mid Pacific Engineering, Inc. Dated: December 23rd, 2025,
Allowable Bearing Pressure: Dead + Live: 1500 psf
Dead + Live + Lateral: 2000 psf

Calculation Index:

BD Submittal: 03/27/2026

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Section 1.1: Structural Materials

Concrete

ACI 318-19

Item	f'c (psi)	w/c Ratio	Finish
Foundations	3,000	0.55	N/A
(Designed for f'c=2500 psi, no special inspection required)			
Slab on Grade	4,000	0.50	Patterned SAD
All Mixes Use Type II Cement			

Reinforcing Steel

ACI 318-19

Item	Fy (ksi)	Reference	Finish
Standard Rebar	60	A 615	Black

Section 1.2: Seismic Criteria

Rd 105, Dixon, CA 95620, USA
 Latitude, Longitude: 38.474245, -121.6751569

Print

Date	3/24/2026, 2:18:00 PM
Design Code Reference Document	ASCE7-22
Risk Category	II
Site Class	Default

Type	Value	Description (Data)
S _S	0.88	The MCE _R spectral response acceleration at 0.2 seconds for Site Class BC, in units of g.
S ₁	0.29	The MCE _R spectral response acceleration at 1 second for Site Class BC, in units of g.
S _{MS}	1.21	S _{MS} = 1.5 x S _{DS} , the Risk-Targeted Maximum Considered Earthquake (MCE _R) spectral response acceleration for short periods (of the two-period spectrum) and the user-specified Site Class.
S _{M1}	0.76	S _{M1} = 1.5 x S _{D1} , the MCE _R spectral response acceleration for 1 second (of the two-period spectrum) and the user-specified Site Class.
S _{DS}	0.81	The design spectral response acceleration for short periods (of the two-period spectrum) and the user-specified Site Class, in units of g.
S _{D1}	0.51	The design spectral response acceleration for 1 second (of the two-period spectrum) and the user-specified Site Class, in units of g.

Type	Value	Description (Data Contd.)
SDC	D	Seismic design category
PGA _M	0.43	PGA _M , the Geometric-Mean Maximum Considered Earthquake (MCE _G) peak ground acceleration for the user-specified Site Class, in units of g
T _S	0.631	T _S = S _{D1} /S _{DS} , in seconds, for construction of the two-period design spectrum
T ₀	0.126	T ₀ = 0.2 x T _S , in seconds, for construction of the two-period design response spectrum
T _L	8	T _L , the long-period transition period, in seconds, for construction of the two-period design response spectrum

Section 1.3: Wind Criteria

Address: 31150 County Road 105
 Dixon, California
 95620

Standard: ASCE/SEI 7-22

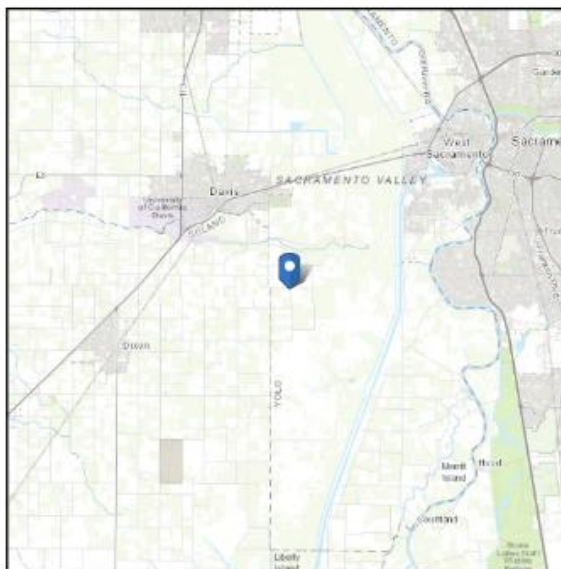
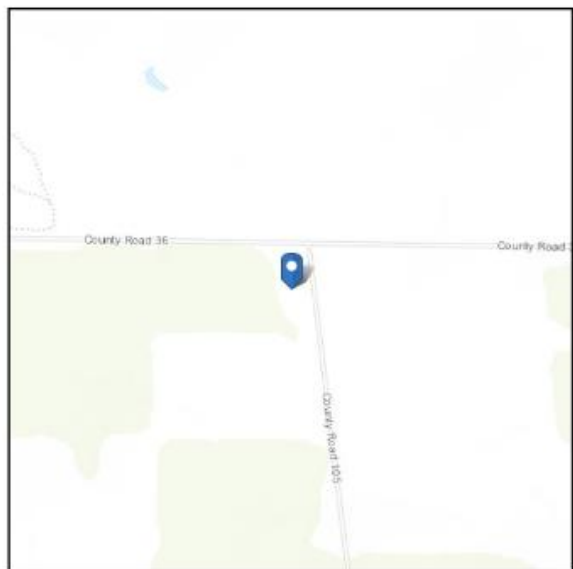
Risk Category: II

Soil Class: Default

Latitude: 38.485868

Longitude: -121.677906

Elevation: 26.23547333953512 ft (NAVD 88)



Wind

Results:

Wind Speed	93 Vmph
10-year MRI	65 Vmph
25-year MRI	71 Vmph
50-year MRI	75 Vmph
100-year MRI	80 Vmph
300-year MRI	88 Vmph
700-year MRI	93 Vmph
1,700-year MRI	100 Vmph
3,000-year MRI	104 Vmph
10,000-year MRI	113 Vmph
100,000-year MRI	130 Vmph
1,000,000-year MRI	148 Vmph



Figure showing Radius of 2600 ft surrounding site is categorized under Exposure C



Section 1.4: Loads

ROOF LOADS	Decking	Rafters	Beams	Lateral
Roofing -Composition shingles	4.0	4.0	4.0	4.0
Roof Sheathing - 15/32" Plywood	1.7	1.7	1.7	1.7
Future Solar Allowance	4.0	4.0	4.0	4.0
Insulation	1.5	1.5	1.5	1.5
Trusses @ 24" oc		4.0	4.0	4.0
Beams			1.0	1.0
Ceiling		3.0	3.0	3.0
Mechanical & Electrical		1.5	1.5	1.5
Misc.		1.2	1.2	1.2
Partitions				4.0
Dead Load		20.9	21.9	25.9
Slope Adj Factor 4.0: 12 1.05		22.0	23.1	27.3
Live Load (Reducible for Area)		20.0	20.0	20.0
Total Load		54.0	55.1	47.3

WALL LOADS	Wall Type	psf
Cement Plaster Siding Exterior Stud Wall	2x6 Studs w/ Cement Plaster Siding	14.0

Cement Plaster Siding Exterior Stud Wall:

Fiber Cement Siding:	5.0	psf
1/2" Ply	1.7	psf
2x4@ 16"	1.1	psf
5/8" Gyp	2.8	psf
Misc	3.4	psf
	14.0	psf



Section 2.1.2: Load Calculation Along Pier Lines:

Load Along Gridline A & C:

Existing Roof Dead Load = 22 psf
Existing Roof Live Load = 20 psf
Roof Load trib. Width = 15.667 ft
Total Roof Dead Load = 22 psf x 15.667 ft = **345 plf**
Total Roof Live Load = 20 psf x 15.667 ft = **314 plf**

Existing Wall Dead Load = 14 psf
Height of Wall = 9.0 ft
Total Wall Load = 14 psf x 9.0 ft = **126 plf**

Total Dead Load = 345 plf + 126 plf = **471 plf**
Total Roof Live Load = **314 plf**

Load Along Gridline 1 & 8:

Existing Roof Dead Load = 22 psf
Existing Roof Live Load = 20 psf
Roof Load trib. Width = 3.5 ft
Total Roof Dead Load = 22 psf x 3.5 ft = **77 plf**
Total Roof Live Load = 20 psf x 3.5 ft = **70 plf**

Existing Wall Dead Load = 14 psf
Height of Wall = 9.0 ft
Total Wall Load = 14 psf x 9.0 ft = **126 plf**

Total Dead Load = 77 plf + 126 plf = **203 plf**
Total Roof Live Load = **70 plf**



Section 2.1.3: Pier Load Along Gridline A:

Pier A-1:

Load from Gridline A:

$$DL = 471 \text{ plf} \times 7.75 \text{ ft} = 3651 \text{ lbs}$$

$$RL = 314 \text{ plf} \times 7.75 \text{ ft} = 2434 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline A} &= (3651 \text{ lbs} + 2434 \text{ lbs})/2 \\ &= 6085 \text{ lbs}/2 \\ &= 3043 \text{ lbs} \end{aligned}$$

Load from Gridline 1:

$$DL = 203 \text{ plf} \times 9.5 \text{ ft} = 1929 \text{ lbs}$$

$$RL = 70 \text{ plf} \times 9.5 \text{ ft} = 665 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline 1} &= (1929 \text{ lbs} + 665 \text{ lbs})/2 \\ &= 2594 \text{ lbs}/2 \\ &= 1297 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \text{Total Load on Pier A-1} &= 3043 \text{ lbs} + 1297 \text{ lbs} \\ &= \mathbf{4340 \text{ lbs}} \end{aligned}$$

Pier A-2 & A-3:

Load from Gridline A:

$$DL = 471 \text{ plf} \times 7.75 \text{ ft} = 3651 \text{ lbs}$$

$$RL = 314 \text{ plf} \times 7.75 \text{ ft} = 2434 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline A} &= (3651 \text{ lbs} + 2434 \text{ lbs})/2 \\ &= 6085 \text{ lbs}/2 \\ &= 3043 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \text{Total Load on Pier A-2 \& A-3} &= 3043 \text{ lbs} + 3043 \text{ lbs} \\ &= \mathbf{6086 \text{ lbs}} \end{aligned}$$

Pier A-4:

Load from Gridline A:

$$DL = 471 \text{ plf} \times 8.5 \text{ ft} = 4004 \text{ lbs}$$

$$RL = 314 \text{ plf} \times 8.5 \text{ ft} = 2669 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline A} &= (4004 \text{ lbs} + 2669 \text{ lbs})/2 \\ &= 6673 \text{ lbs}/2 \\ &= 3337 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \text{Total Load on Pier A-4} &= 3337 \text{ lbs} + 3043 \text{ lbs} \\ &= \mathbf{6380 \text{ lbs}} \end{aligned}$$

Pier A-5:

Load from Gridline A:

$$DL = 471 \text{ plf} \times 8.5 \text{ ft} = 4004 \text{ lbs}$$

$$RL = 314 \text{ plf} \times 8.5 \text{ ft} = 2669 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline A} &= (4004 \text{ lbs} + 2669 \text{ lbs})/2 \\ &= 6673 \text{ lbs}/2 \\ &= 3337 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \text{Total Load on Pier A-5} &= 3337 \text{ lbs} + 3337 \text{ lbs} \\ &= \mathbf{6674 \text{ lbs}} \end{aligned}$$



Pier A-6:

Load from Gridline A:

$$DL = 471 \text{ plf} \times 7.75 \text{ ft} = 3651 \text{ lbs}$$

$$RL = 314 \text{ plf} \times 7.75 \text{ ft} = 2434 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline A} &= (3651 \text{ lbs} + 2434 \text{ lbs})/2 \\ &= 6085 \text{ lbs}/2 \\ &= 3043 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \text{Total Load on Pier A-6} &= 3043 \text{ lbs} + 3337 \text{ lbs} \\ &= \mathbf{6380 \text{ lbs}} \end{aligned}$$

Pier A-7 & A-8:

Load from Gridline A:

$$DL = 471 \text{ plf} \times 7.75 \text{ ft} = 3651 \text{ lbs}$$

$$RL = 314 \text{ plf} \times 7.75 \text{ ft} = 2434 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline A} &= (3651 \text{ lbs} + 2434 \text{ lbs})/2 \\ &= 6085 \text{ lbs}/2 \\ &= 3043 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \text{Total Load on Pier A-7 \& A-8} &= 3043 \text{ lbs} + 3043 \text{ lbs} \\ &= \mathbf{6086 \text{ lbs}} \end{aligned}$$

Pier A-9:

Load from Gridline A:

$$DL = 471 \text{ plf} \times 7.75 \text{ ft} = 3651 \text{ lbs}$$

$$RL = 314 \text{ plf} \times 7.75 \text{ ft} = 2434 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline A} &= (3651 \text{ lbs} + 2434 \text{ lbs})/2 \\ &= 6085 \text{ lbs}/2 \\ &= 3043 \text{ lbs} \end{aligned}$$

Load from Gridline 8:

$$DL = 203 \text{ plf} \times 9.5 \text{ ft} = 1929 \text{ lbs}$$

$$RL = 70 \text{ plf} \times 9.5 \text{ ft} = 665 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline 8} &= (1929 \text{ lbs} + 665 \text{ lbs})/2 \\ &= 2594 \text{ lbs}/2 \\ &= 1297 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \text{Total Load on Pier A-9} &= 3043 \text{ lbs} + 1297 \text{ lbs} \\ &= \mathbf{4340 \text{ lbs}} \end{aligned}$$



Section 2.1.4: Pier Load Along Gridline C:

Pier C-1:

Load from Gridline C:

DL = 471 plf x 6.0 ft = 2826 lbs

RL = 314 plf x 6.0 ft = 1884 lbs

Load on Pier from Gridline C = (2826 lbs + 1884 lbs)/2
= 4710 lbs/2
= 2355 lbs

Load from Gridline 1:

DL = 203 plf x 9.5 ft = 1929 lbs

RL = 70 plf x 9.5 ft = 665 lbs

Load on Pier from Gridline 1 = (1929 lbs + 665 lbs)/2
= 2594 lbs/2
= 1297 lbs

Total Load on Pier C-1 = 2355 lbs + 1297 lbs
= **3652 lbs**

Pier C-2:

Load from Gridline C:

DL = 471 plf x 6.0 ft = 2826 lbs

RL = 314 plf x 6.0 ft = 1884 lbs

Load on Pier from Gridline C = (2826 lbs + 1884 lbs)/2
= 4710 lbs/2
= 2355 lbs

Total Load on Pier C-2 = 2355 lbs + 2355 lbs
= **4710 lbs**

Pier C-3:

Load from Gridline C:

DL = 471 plf x 6.5 ft = 3062 lbs

RL = 314 plf x 6.5 ft = 2041 lbs

Load on Pier from Gridline C = (3062 lbs + 2041 lbs)/2
= 5103 lbs/2
= 2552 lbs

Total Load on Pier C-3 = 2552 lbs + 2355 lbs
= **4907 lbs**

Pier C-4:

Load from Gridline C:

DL = 471 plf x 6.75 ft = 3180 lbs

RL = 314 plf x 6.75 ft = 2120 lbs

Load on Pier from Gridline C = (3180 lbs + 2120 lbs)/2
= 5300 lbs/2
= 2650 lbs

Total Load on Pier C-4 = 2650 lbs + 2552 lbs
= **5202 lbs**



Pier C-5, C-6 & C-7:

Load from Gridline C:

DL = 471 plf x 6.75 ft = 3180 lbs

RL = 314 plf x 6.75 ft = 2120 lbs

Load on Pier from Gridline C = (3180 lbs + 2120 lbs)/2 = 5300 lbs/2

= 2650 lbs

Total Load on Pier C-5, C-6 & C-7 = 2650 lbs + 2650 lbs

= **5300 lbs**

Pier C-8:

Load from Gridline C:

DL = 471 plf x 6.5 ft = 3062 lbs

RL = 314 plf x 6.5 ft = 2041 lbs

Load on Pier from Gridline C = (3062 lbs + 2041 lbs)/2 = 5103 lbs/2

= 2552 lbs

Total Load on Pier C-8 = 2552 lbs + 2650 lbs

= **5202 lbs**

Pier C-9:

Load from Gridline C:

DL = 471 plf x 6.0 ft = 2826 lbs

RL = 314 plf x 6.0 ft = 1884 lbs

Load on Pier from Gridline C = (2826 lbs + 1884 lbs)/2 = 4710 lbs/2

= 2355 lbs

Total Load on Pier C-9 = 2355 lbs + 2552 lbs

= **4907 lbs**

Pier C-10:

Load from Gridline C:

DL = 471 plf x 6.0 ft = 2826 lbs

RL = 314 plf x 6.0 ft = 1884 lbs

Load on Pier from Gridline C = (2826 lbs + 1884 lbs)/2 = 4710 lbs/2

= 2355 lbs

Total Load on Pier C-10 = 2355 lbs + 2355 lbs

= **4710 lbs**

Pier C-11:

Load from Gridline C:

DL = 471 plf x 6.0 ft = 2826 lbs

RL = 314 plf x 6.0 ft = 1884 lbs

Load on Pier from Gridline C = (2826 lbs + 1884 lbs)/2 = 4710 lbs/2

= 2355 lbs



Load from Gridline 8:

DL = 203 plf x 9.5 ft = 1929 lbs

RL = 70 plf x 9.5 ft = 665 lbs

Load on Pier from Gridline 1 = (1929 lbs + 665 lbs)/2

= 2594 lbs/2

= 1297 lbs

Total Load on Pier C-11 = 2355 lbs + 1297 lbs

= **3652 lbs**



Section 2.1.5: Pier Load Along Gridline 1 & Gridline 8:

Pier 1-1 & 8-1:

Load from Gridline 1: (Between A-1 & 1-1) & (Between A-9 & 8-1)

$$DL = 471 \text{ plf} \times 9.5 \text{ ft} = 1929 \text{ lbs}$$

$$RL = 314 \text{ plf} \times 9.5 \text{ ft} = 665 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline C} &= (1929 \text{ lbs} + 665 \text{ lbs})/2 \\ &= 2594 \text{ lbs}/2 \\ &= 1297 \text{ lbs} \end{aligned}$$

Load from Gridline 1: (Between 1-1 & 1-2) & (Between 8-1 & 8-2)

$$DL = 203 \text{ plf} \times 9.0 \text{ ft} = 1827 \text{ lbs}$$

$$RL = 70 \text{ plf} \times 9.0 \text{ ft} = 630 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline 1} &= (1827 \text{ lbs} + 630 \text{ lbs})/2 \\ &= 2457 \text{ lbs}/2 \\ &= 1229 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \text{Total Load on Pier 1-1 \& 8-1} &= 1297 \text{ lbs} + 1229 \text{ lbs} \\ &= \mathbf{2626 \text{ lbs}} \end{aligned}$$

Pier 1-2 & 8-2:

Load from Gridline C:

$$DL = 471 \text{ plf} \times 9.5 \text{ ft} = 1929 \text{ lbs}$$

$$RL = 314 \text{ plf} \times 9.5 \text{ ft} = 665 \text{ lbs}$$

$$\begin{aligned} \text{Load on Pier from Gridline C} &= (1929 \text{ lbs} + 665 \text{ lbs})/2 \\ &= 2594 \text{ lbs}/2 \\ &= 1297 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \text{Total Load on Pier 1-2 \& 8-2} &= 1297 \text{ lbs} + 1229 \text{ lbs} \\ &= \mathbf{2626 \text{ lbs}} \end{aligned}$$

Section 3.1: Helical Pile Size & Pile Configuration Selection:

Max Pier Load = 6674 lbs (From Pier A-5, Refer Section 2.1.3, Pg. 8)

Let's use SQ150 Helical Pile,

STANDARD HELICAL PILE CONFIGURATIONS

SHAFT			TORQUE/CAPACITY			STANDARD HELIX CONFIGURATIONS					
PRODUCT CODE	O.D. (inches)	WALL THICKNESS (inches)	MAX TORQUE (ft*lbs)	TORQUE INSTALLATION FACTOR k_t	ULTIMATE CAPACITY $k_t * T_{max}$ (BY TORQUE) (kip)	SINGLE HELIX (inches)	DOUBLE HELIX (inches)	TRIPLE HELIX (inches)	FLIGHTED EXTENSION SINGLE HELIX (inches)	FLIGHTED EXTENSION DOUBLE HELIX (inches)	HELIX THICKNESS (inches)
SQ150	1.50	NA	7,000	10	70	8, 10, 12	8/10, 10/12	8/10/12, 10/12/14	14	14/14	0.375
SQ175	1.75	NA	11,000	10	110	8, 10, 12	8/10, 10/12	8/10/12, 10/12/14	14	14/14	0.5
278203	2.875	0.203	8,300	9	75	8, 10, 12	8/10, 10/12	8/10/12, 10/12/14	14	14/14	0.375, 0.5
278276	2.875	0.276	10,000	9	90	8, 10, 12	8/10, 10/12	8/10/12, 10/12/14	14	14/14	0.5

Demand Force = 6674 lbs = 6.674 Kips

Pile Capacity = 70.0 Kips/3 = **23.333 Kips** (Using Factor of Safety = 3.0)

D/C = 6.674/23.333

= 0.29 < 1.0 **OK**

MAXIMUM TORQUE NOT TO EXCEED 7,000 FT-LBS. ULTIMATE CAPACITY IS 70 KIPS BASED ON A CAPACITY TO TORQUE RATIO OF $k_t = 10$ FT-1

1 1/2" ROUND CORNER SQUARE SHAFT HELICAL PILE LEADS & EXTENSIONS
ICC-ES AC358 - REPORT #ESR-3750

NOTES:

- PILE SHAFT TO MEET OR EXCEED REQUIREMENTS OF ASTM A29-15/A576-90B, 90 KSI.
- PLATE STEEL TO MEET OR EXCEED REQUIREMENTS OF ASTM A572, GRADE 50.
- ALL HELICES ARE FORMED BY PRESS DIE. LEADING EDGE OF HELICES ARE TAPERED TO IMPROVE INSTALLATION CAPABILITIES.
- HELIX SPACING IS THREE (3) TIMES THE DIAMETER OF THE LOWER HELIX. SPACING OF LEADING HELIX ON FLIGHTED EXTENSIONS IS THREE (3) TIMES THE DIAMETER OF THE LAST HELIX ON THE PRECEDING SHAFT.
- STANDARD HELIX DIAMETERS ARE 8", 10", 12", & 14". STANDARD HELIX THICKNESS IS 3/8" OR 1/2".
- ALL WELDING TO BE PERFORMED BY CERTIFIED WELDER IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELDING CODE - STEEL.
- HOT DIP GALVANIZING PER ASTM A153/ASTM A123. BARE STEEL IS ALSO AVAILABLE.
- (1) 3/4" DIAMETER X 3" LONG GALVANIZED HEAVY HEX BOLT ASTM A325 AND (1) 3/4" GALVANIZED HEAVY HEX JAM NUT (GRADE A).
- HELICAL PILE ASSEMBLIES MANUFACTURED IN ACCORDANCE WITH ICC-ES AC358 (IDEAL REPORT #ESR-3750) ACCEPTANCE CRITERIA FOR HELICAL FOUNDATION SYSTEMS AND DEVICES.

IDEAL PART # ABBREVIATIONS:
 SQ = ROUND CORNER SQUARE SHAFT
 150 = SHAFT DIAMETER
 EXT = EXTENSION
 FE = FLIGHTED EXTENSION
 SH, DH, TH, QH = SINGLE, DOUBLE, TRIPLE, OR QUAD, HELIX
 [L] = SHAFT LENGTH IN FEET (EXAMPLE: 7' = 7)
 [D] = HELIX DIAMETER(S) IN INCHES (EXAMPLE: 10" = 10)
 X = X (SEPARATES HELIX DIAMETER(S) AND HELIX THICKNESS)
 [T] = HELIX THICKNESS (EXAMPLE: 3/8" = 38)
 G = GALVANIZED

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CHECKED DSS	4/21/2020		
IDEAL MANUFACTURING, INC. 999 PICTURE PARKWAY WEBSTER, NY 14580 800-789-4811 WWW.IDL-GRP.COM		SIZE B	DWG NO SQ150
NOT TO SCALE ALL UNITS IN INCHES U.N.O.		REV 0	SHEET 1 OF 1

Geotechnical Recommendation:

Based on the soil profiles encountered, it is our recommendation that the piles/piers should be embedded to a minimum 15 ft below the bottom of the existing footing or design capacity of each pile/pier, whichever deeper, if underpinning method is selected. The designed capacity should be calculated by a licensed Structural Engineer and should include an appropriate factor of safety. In order to minimize the bending moment to the piers, piers should be installed at the location having as small as possible eccentricity to the wall center line.

Use SQ150 Helical Pile w/ Triple Helix Configuration w/ min 15ft pile depth below bottom of (E) footing as per Geotechnical Recommendation