Client:
TerraFirma Foundation Systems

Structural Calculations

Fleischmann Residence – Retaining Wall Repair
354 Island Aire Dr
Woodland, Washington 98674

Structural analysis and design for foundation repair and stabilization.

REVIEWED BY: Dennis Heier, PE

10/24/2023

VISTA STRUCTURAL ENGINEERING, LLC
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Helical Tieback Loading

Wall Height =	4.00	ft
Unbalanced Fill Height, H' =	4.00	ft
Max tieback spacing =	6	ft

Design Loads:

Unit Wall Load, 0.5 (60 psf/ft)(H')^2 =	480	plf
Load on tieback @ max spacing =	2880	lb
Ultimate Load (FS=2) =	5760	lb

Helical Pile Design

Design Working Load:

Q_{ult} = **5.76** kips

Q_{up} = 0

Pile Properties:

Pile Type	**HA150**	
Finishes	**Plain**	
Shaft Diameter	0	in
Batter Angle	**30**	°

Pile Compression Capacity

P_n = 63.6 Kips *(Allowable)*

P_n = **127.2** Kips *(Ultimate)* OK...

Pile Tension Capacity

P_t = 34.1 Kips *(Allowable)*

P_t = **68.2** Kips *(Ultimate)* OK...

Maximum Soil Capacity

Q_a = 32.5 kips *(Allowable)*

Q_u = **65** kips *(Ultimate)*

Torque Correlation Factor

K_t = 10

Installation Torque Reqd

$T_{install}$ = **576** ft-lb $= (Q_{ult} / K_t) \cdot 1000$ $= (17.98 / 9) \cdot 1000$ *(Ultimate)*

Maximum Rated Torque

T_a = 3250 ft-lb $= (Q_a / K_t) \cdot 1000$ $= (35.5 / 9) \cdot 1000$ *(Allowable)*

T_{ult} = **6500** ft-lb $= (Q_u / K_t) \cdot 1000$ $= (71.1 / 9) \cdot 1000$ *(Ultimate)*

OK...

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Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Lic. # : KW-06010523
Vista Structural Engineering, LLC

DESCRIPTION: Channel Whaler

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 36.0 ksi
E: Modulus : 29,000.0 ksi

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Loads on all spans...
Uniform Load on ALL spans : H = 0.480 k/ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.129** : 1	Maximum Shear Stress Ratio =	**0.093** : 1
Section used for this span	**C6x8.2**	Section used for this span	**C6x8.2**
Ma : Applied	1.200 k-ft	Va : Applied	1.440 k
Mn / Omega : Allowable	9.269 k-ft	Vn/Omega : Allowable	15.521 k
Load Combination	H Only	Load Combination	H Only
Location of maximum on span	3.000ft	Location of maximum on span	2.000 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio =	0 <360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.017 in	Ratio =	4156 >=180
Max Upward Total Deflection	-0.009 in	Ratio =	5484 >=180

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
H Only													
Dsgn. L = 2.00 ft	1	0.104	0.093		-0.96	0.96	15.48	9.27	1.00	1.00	1.44	25.92	15.52
Dsgn. L = 6.00 ft	2	0.129	0.093	1.20	-0.96	1.20	15.48	9.27	1.00	1.00	1.44	25.92	15.52
Dsgn. L = 2.00 ft	3	0.104	0.062		-0.96	0.96	15.48	9.27	1.00	1.00	0.96	25.92	15.52
+0.60H													
Dsgn. L = 2.00 ft	1	0.062	0.056		-0.58	0.58	15.48	9.27	1.00	1.00	0.86	25.92	15.52
Dsgn. L = 6.00 ft	2	0.078	0.056	0.72	-0.58	0.72	15.48	9.27	1.00	1.00	0.86	25.92	15.52
Dsgn. L = 2.00 ft	3	0.062	0.037		-0.58	0.58	15.48	9.27	1.00	1.00	0.58	25.92	15.52

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	H Only	-0.0087	0.000
H Only	2	0.0173	3.040		0.0000	0.000
	3	0.0000	3.040	H Only	-0.0088	2.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum		2.400	2.400	
Overall MINimum		1.440	1.440	
H Only		2.400	2.400	
+0.60H		1.440	1.440	