FLEXRACK by Qcells

Prepared For:

Horton Electrical Services

37 Hunters Lane

SFDC ID# 18662	1x70 FTS - Structural Calculations 41°34’44.32”N, 72°54’17.09”W – Southington, CT 06489

STATE OF CONNECTICUT
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FLEXRACK by Qcells

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Rev 0

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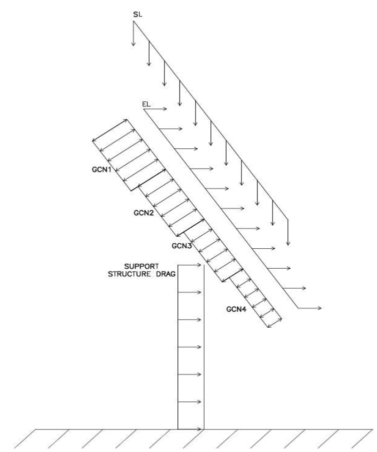
Customer:	Horton Electrical Services
SFDC ID #:	18662
Project/Location:	37 Hunters Lane, Southington, CT 06489
Date/Engineer:	06/05/24 - John Diamond

Solar Flexrack Loading Analysis

Configuration Data

Configuration 1:	1x70 FTS	Configuration 2:	1x35 FTS
Horiz. Length (N-S):	258.08 ft	Horiz. Length (N-S):	129.73 ft
Array Surface Area:	2018.55 ft²	Array Surface Area:	1014.70 ft²
Number of Posts:	13	Number of Posts:	7



Design Data Summary

Module Length:	7.82 ft
Solar Panel Dead Load:	**2.56 psf**
Max Stow Wind Speed:	110 mph
Max Operation:	35 mph
Snow Load:	30 psf
Ground Clearance:	24.00 in
Exposure Category:	C
Building Classification:	I

Snow Load Parameters

Flat Roof Snow Load, P_f:	Pf=0.7*Ce*Ct*I*Pg
Sloped Roof Snow Load, P_s:	Ps = Pf*Cs
Snow Exposure Category, Ce:	0.9
Snow Thermal Factor, Ct:	1.2
Snow Importance Factor, I:	0.8
P_f:	**30.00 psf**
Snow Density:	17.9 pcf
Snow Height:	20.11 in

Snow Load Design

Tilt Angle	C_s	P_s psf
0 - 15	1.00	**30.00**
20	1.00	**30.00**
25	1.00	**30.00**
30	1.00	**30.00**
35	1.00	**30.00**
40	1.00	**30.00**
45	1.00	**30.00**
50	1.00	**30.00**
55	1.00	**30.00**

Wind Load Parameters

Exposure Coefficient, Kz:	1.00	Wind Load: $qh = 0.00256*kz*kzt*kd*V^2$	Natural Frequency(Torsion)	1 Hz	Support Structure Drag, p = qh*G*Cf
Topographic Factor, Kzt:	1.00	qh_{Vult} 26.33 psf	Damping Ratio(Torsion)	>20 %	G: 0.85
Wind Directionality Factor, Kd:	0.85	qh_{35} 4.44 psf	Natural Frequency(Heaving)	3 Hz	Cf: 2
			Damping Ratio(Heaving)	4 %	pult: **44.76 psf**
Elevation Factor, Ke:	1				

Seismic Load Parameters / Design

S_S:	0.196	S_{DS}: $S_{DS} = (2/3) \times F_a \times S_S$		Site Class:	D	This Base Shear Value represents the seismic effect of the panel weight on the rack. This Base Shear includes 20% of the design snow load when the flat roof snow load exceeds 30 psf per ASCE. A separate term in the Risa load combination accounts for the remaining Dead Load caused by member self-weight.
S_1:	0.055	S_{DS}:	0.209	Seismic Design Category:	B	
Site Coefficient, F_a:	1.600	S_{D1}: $S_{D1} = (2/3) \times F_V \times S_S$				
Site Coefficient, F_V:	2.400	S_{D1}:	0.088	Seismic Response Coefficient, Cs:	0.105	
Response Modification Coefficent, R:	2	Cu =	1.7	Panel Seismic Load,V = Cs x (Panel DL)		
Importance Factor, I_e:	1	TL =	6	V =	**0.268 psf**	

Loading analysis and design in accordance with wind and snow load information obtained from ASCE 7-16 Minimum Design Loads for Building and Other Structures
GCN Coefficients determined based on CPP wind tunnel testing (CPP Project No. 14093)
Damping Ratio and Natural Frequency determined by CPP review of full-scale pluck tests carried out by Solar FlexRack (CPP Report No. CPP14575)

CPP Wind Tunnel Application:

Static net gust normal coefficients (GCN and GCM values) and Dynamic Amplification Factors (DAF) are determined by CPP wind tunnel report based on project specific inputs.For the purpose of analyzing the primary structure, several wind load cases are considered each with their own associated GCN (or GCM) coefficients and Dynamic Amplification Factors.GCM Half Tracker and Cantilever coefficients are used to apply loads and perform structural analysis on the Torque Tube. GCM Purlin coefficients are used to apply loads and perform structural analysis on the purlin hat channels. GCN Post coefficients are used to apply loads and perform structural analysis on the posts, and also to determine the loads for foundation design. Static and dynamic pressures are applied simultaneously with Dead, Snow, and Seismic Loads in accordance with ASCE 7 at stow(0°) and full tracker tilt(55°) to verify the structural capacity of primary structural members on the tracker.

Workbook 2.7.6

Tilt = 0°

GCM_HalfTracker (Min)													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	-0.100	GCN1	-0.54	-0.68	-0.73	-0.80	-0.80	-0.75	-0.78	-0.86	-0.81	-0.74
			GCN2	-0.26	-0.30	-0.33	-0.35	-0.33	-0.33	-0.33	-0.34	-0.34	-0.34
			GCN3	0.28	0.29	0.29	0.30	0.32	0.30	0.31	0.34	0.32	0.30
			GCN4	0.04	0.05	0.10	0.08	0.08	0.13	0.13	0.10	0.09	0.08
		-0.040	GCN1	-0.20	-0.25	-0.25	-0.23	-0.27	-0.31	-0.33	-0.35	-0.31	-0.27
			GCN2	-0.14	-0.15	-0.16	-0.15	-0.15	-0.18	-0.18	-0.18	-0.17	-0.16
			GCN3	0.13	0.14	0.15	0.14	0.16	0.17	0.17	0.17	0.16	0.15
			GCN4	0.02	0.03	0.03	0.03	0.03	0.05	0.05	0.04	0.04	0.04
	Downforce	-0.007	GCN1	-0.09	-0.02	-0.03	-0.04	-0.03	-0.04	-0.05	-0.07	-0.05	-0.03
			GCN2	-0.11	0.00	-0.01	-0.02	0.00	0.00	-0.01	-0.03	-0.02	-0.01
			GCN3	-0.10	0.01	0.01	0.00	0.01	0.03	0.02	0.00	0.00	0.00
			GCN4	-0.06	0.02	0.01	0.02	0.03	0.06	0.05	0.04	0.03	0.02
		-0.007	GCN1	-0.09	-0.02	-0.03	-0.03	-0.03	-0.04	-0.05	-0.07	-0.06	-0.04
			GCN2	-0.12	0.00	0.00	-0.01	0.00	0.00	0.00	-0.02	-0.02	-0.02
			GCN3	-0.11	0.01	0.01	0.01	0.02	0.04	0.03	0.01	0.01	0.00
			GCN4	-0.07	0.02	0.02	0.02	0.02	0.06	0.06	0.06	0.04	0.02

Tilt = 0°

GCM_HalfTracker (Max)													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	0.006	GCN1	-0.08	0.02	0.02	0.01	0.02	0.06	0.05	0.03	0.02	0.01
			GCN2	-0.12	0.01	0.01	0.00	0.01	0.04	0.03	0.01	0.00	-0.01
			GCN3	-0.13	0.01	0.00	-0.01	-0.01	0.00	-0.01	-0.03	-0.02	-0.01
			GCN4	-0.10	-0.01	-0.02	-0.03	-0.03	-0.05	-0.05	-0.06	-0.05	-0.03
		0.005	GCN1	-0.08	0.01	0.01	0.01	0.02	0.05	0.05	0.04	0.03	0.01
			GCN2	-0.12	0.01	0.01	0.00	0.02	0.03	0.03	0.02	0.01	0.00
			GCN3	-0.12	0.01	0.00	-0.01	0.00	0.00	0.00	-0.02	-0.01	-0.01
			GCN4	-0.08	0.00	-0.01	-0.02	-0.02	-0.04	-0.04	-0.06	-0.04	-0.02
	Downforce	0.102	GCN1	0.07	0.11	0.16	0.14	0.09	0.16	0.15	0.12	0.11	0.10
			GCN2	0.32	0.32	0.31	0.31	0.34	0.32	0.32	0.34	0.31	0.28
			GCN3	-0.32	-0.38	-0.38	-0.36	-0.31	-0.35	-0.35	-0.36	-0.35	-0.35
			GCN4	-0.58	-0.78	-0.78	-0.76	-0.65	-0.70	-0.73	-0.83	-0.80	-0.76
		0.041	GCN1	0.00	-0.04	-0.03	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01	-0.02
			GCN2	0.16	0.17	0.16	0.08	0.09	0.11	0.10	0.07	0.06	0.06
			GCN3	-0.39	-0.30	-0.23	-0.22	-0.19	-0.14	-0.14	-0.15	-0.15	-0.15
			GCN4	-0.67	-0.49	-0.33	-0.34	-0.31	-0.26	-0.25	-0.25	-0.27	-0.27

Tilt = 55°

GCM_HalfTracker (Min)													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	-0.044	GCN1	-1.22	-1.27	-1.27	-1.23	-1.25	-1.39	-1.36	-1.28	-1.28	-1.27
			GCN2	-1.13	-1.24	-1.22	-1.18	-1.20	-1.31	-1.28	-1.20	-1.21	-1.21
			GCN3	-0.82	-0.96	-0.96	-0.94	-0.95	-1.02	-1.00	-0.96	-0.96	-0.97
			GCN4	-0.76	-0.89	-0.86	-0.84	-0.85	-0.93	-0.91	-0.86	-0.87	-0.89
		-0.036	GCN1	-2.12	-0.89	-0.53	-0.53	-0.35	-0.30	-0.31	-0.36	-0.34	-0.32
			GCN2	-1.76	-0.96	-0.51	-0.46	-0.35	-0.24	-0.25	-0.31	-0.30	-0.30
			GCN3	-1.13	-0.62	-0.44	-0.35	-0.22	-0.14	-0.15	-0.19	-0.19	-0.18
			GCN4	-0.89	-0.35	-0.39	-0.35	-0.13	-0.07	-0.10	-0.16	-0.16	-0.16
	Downforce	-0.068	GCN1	0.73	0.74	0.74	0.71	0.69	0.78	0.76	0.68	0.68	0.68
			GCN2	1.01	1.06	1.07	1.02	1.00	1.12	1.09	0.98	0.98	0.97
			GCN3	1.20	1.26	1.28	1.23	1.21	1.32	1.29	1.18	1.17	1.16
			GCN4	1.30	1.36	1.37	1.32	1.30	1.43	1.40	1.28	1.26	1.23
		-0.023	GCN1	0.87	0.53	0.35	0.20	0.09	0.10	0.11	0.11	0.11	0.11
			GCN2	1.08	0.70	0.46	0.26	0.16	0.18	0.18	0.16	0.15	0.15
			GCN3	1.34	0.82	0.54	0.32	0.22	0.24	0.22	0.18	0.16	0.15
			GCN4	1.46	0.84	0.56	0.36	0.28	0.27	0.25	0.19	0.17	0.14

Tilt = 55°

GCM_HalfTracker (Max)													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	0.028	GCN1	-0.10	-0.01	0.01	0.01	0.01	-0.05	-0.03	0.03	0.01	-0.02
			GCN2	-0.15	-0.10	-0.08	-0.07	-0.07	-0.16	-0.14	-0.07	-0.09	-0.11
			GCN3	-0.16	-0.19	-0.20	-0.18	-0.18	-0.27	-0.26	-0.23	-0.24	-0.24
			GCN4	-0.18	-0.23	-0.25	-0.23	-0.22	-0.31	-0.31	-0.31	-0.31	-0.30
		0.005	GCN1	-0.07	0.04	0.02	0.00	0.02	0.05	0.05	0.03	0.02	0.01
			GCN2	-0.12	0.05	0.02	0.00	0.02	0.05	0.04	0.02	0.01	0.00
			GCN3	-0.13	0.04	0.01	-0.01	0.01	0.02	0.01	-0.01	-0.01	-0.01
			GCN4	-0.11	0.02	0.00	-0.02	-0.01	-0.01	-0.02	-0.06	-0.04	-0.02
	Downforce	0.020	GCN1	0.89	0.66	0.58	0.49	0.44	0.41	0.39	0.34	0.31	0.27
			GCN2	1.02	0.64	0.52	0.45	0.40	0.37	0.35	0.30	0.28	0.26
			GCN3	1.04	0.56	0.40	0.33	0.31	0.28	0.26	0.21	0.20	0.20
			GCN4	1.02	0.43	0.28	0.22	0.19	0.17	0.15	0.11	0.11	0.12
		0.017	GCN1	0.91	0.69	0.58	0.51	0.44	0.40	0.38	0.33	0.27	0.22
			GCN2	1.13	0.72	0.54	0.44	0.37	0.32	0.31	0.27	0.24	0.20
			GCN3	1.23	0.71	0.46	0.33	0.26	0.19	0.19	0.18	0.16	0.15
			GCN4	1.22	0.60	0.32	0.21	0.15	0.09	0.09	0.09	0.09	0.09

Tilt = 0°

GCM_Cantilever (Min)													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	-0.101	GCN1	-0.77	-0.28	-0.16	-0.16	-0.17	-0.09	-0.15	-0.10	-0.06	-0.05
			GCN2	-0.35	-0.21	-0.16	-0.14	-0.14	-0.11	-0.13	-0.11	-0.10	-0.10
			GCN3	0.18	0.14	0.13	0.11	0.11	0.11	0.11	0.11	0.12	0.12
			GCN4	-0.01	-0.01	0.00	-0.02	0.00	0.02	0.00	0.02	0.00	-0.01
		-0.100	GCN1	-0.77	-0.30	-0.17	-0.15	-0.16	-0.07	-0.14	-0.12	-0.08	-0.08
			GCN2	-0.35	-0.21	-0.15	-0.13	-0.13	-0.10	-0.13	-0.12	-0.11	-0.11
			GCN3	0.17	0.12	0.12	0.11	0.10	0.11	0.11	0.11	0.12	0.13
			GCN4	-0.01	-0.01	-0.01	-0.01	0.01	0.02	0.00	0.01	0.00	-0.01
	Downforce	-0.123	GCN1	0.01	0.00	0.02	-0.01	0.01	0.00	0.00	0.01	0.00	-0.02
			GCN2	0.20	0.13	0.16	0.14	0.11	0.10	0.11	0.10	0.10	0.10
			GCN3	-0.45	-0.23	-0.18	-0.16	-0.13	-0.09	-0.13	-0.12	-0.11	-0.11
			GCN4	-0.94	-0.25	-0.15	-0.17	-0.06	0.02	-0.11	-0.07	-0.05	-0.07
		-0.111	GCN1	-0.02	-0.02	-0.01	-0.01	0.01	0.01	0.00	0.01	0.00	-0.02
			GCN2	0.17	0.11	0.12	0.10	0.10	0.11	0.11	0.09	0.09	0.09
			GCN3	-0.41	-0.24	-0.16	-0.15	-0.15	-0.12	-0.13	-0.13	-0.13	-0.14
			GCN4	-0.87	-0.33	-0.16	-0.16	-0.20	-0.09	-0.11	-0.12	-0.13	-0.16

Tilt = 0°

GCM_Cantilever (Max)													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	0.056	GCN1	-0.05	-0.49	-0.49	-0.55	-0.53	-0.46	-0.34	-0.43	-0.41	-0.39
			GCN2	-0.20	-0.26	-0.29	-0.29	-0.26	-0.27	-0.24	-0.25	-0.25	-0.26
			GCN3	0.31	0.29	0.26	0.27	0.30	0.28	0.32	0.34	0.32	0.29
			GCN4	0.09	0.08	0.08	0.09	0.07	0.09	0.07	0.09	0.08	0.07
		0.037	GCN1	-0.05	0.00	-0.01	-0.01	0.00	0.00	-0.02	-0.02	-0.01	-0.01
			GCN2	-0.04	0.01	0.00	-0.01	0.01	0.01	-0.02	-0.02	-0.01	-0.01
			GCN3	-0.03	0.02	0.00	0.00	0.01	0.01	-0.01	-0.02	-0.01	-0.01
			GCN4	-0.03	0.01	0.00	0.00	0.01	0.01	-0.01	-0.01	-0.01	-0.01
	Downforce	0.074	GCN1	0.09	0.09	0.11	0.12	0.08	0.12	0.09	0.10	0.09	0.08
			GCN2	0.35	0.31	0.28	0.29	0.32	0.30	0.31	0.31	0.29	0.27
			GCN3	-0.21	-0.30	-0.32	-0.30	-0.26	-0.29	-0.28	-0.30	-0.30	-0.31
			GCN4	0.07	-0.50	-0.51	-0.48	-0.35	-0.37	-0.36	-0.49	-0.54	-0.56
		0.058	GCN1	0.06	0.03	0.02	0.01	0.02	0.02	0.01	0.02	0.01	0.01
			GCN2	0.28	0.15	0.12	0.11	0.12	0.11	0.12	0.11	0.10	0.09
			GCN3	-0.21	-0.13	-0.13	-0.13	-0.14	-0.10	-0.12	-0.12	-0.12	-0.12
			GCN4	0.03	-0.08	-0.09	-0.11	-0.15	-0.04	-0.09	-0.11	-0.10	-0.09

Tilt = 55°

GCM_Cantilever (Min)													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	-0.952	GCN1	-2.51	-0.97	-0.54	-0.54	-0.31	-0.19	-0.42	-0.35	-0.30	-0.30
			GCN2	-2.15	-1.09	-0.60	-0.50	-0.36	-0.21	-0.44	-0.35	-0.30	-0.31
			GCN3	-1.40	-0.77	-0.63	-0.43	-0.28	-0.17	-0.39	-0.30	-0.23	-0.22
			GCN4	-1.23	-0.50	-0.69	-0.44	-0.20	-0.13	-0.35	-0.29	-0.21	-0.19
		-0.877	GCN1	-2.28	-0.88	-0.47	-0.45	-0.26	-0.16	-0.35	-0.29	-0.25	-0.26
			GCN2	-2.01	-1.00	-0.54	-0.42	-0.31	-0.18	-0.37	-0.30	-0.25	-0.26
			GCN3	-1.33	-0.69	-0.56	-0.37	-0.23	-0.13	-0.32	-0.25	-0.19	-0.19
			GCN4	-1.13	-0.44	-0.61	-0.40	-0.17	-0.10	-0.29	-0.25	-0.19	-0.17
	Downforce	-0.159	GCN1	-0.23	-0.03	-0.03	-0.04	-0.01	0.00	-0.05	-0.03	-0.02	-0.02
			GCN2	-0.34	0.01	-0.02	-0.03	0.00	0.01	-0.06	-0.04	-0.01	-0.02
			GCN3	-0.34	0.01	-0.01	-0.02	0.00	0.01	-0.05	-0.03	-0.01	-0.01
			GCN4	-0.20	0.00	0.00	-0.02	0.01	0.02	-0.03	-0.02	0.00	0.00
		-0.138	GCN1	-0.21	-0.01	-0.03	-0.05	-0.02	0.01	-0.04	-0.03	-0.01	-0.01
			GCN2	-0.32	0.03	-0.01	-0.03	-0.01	0.02	-0.05	-0.03	-0.01	-0.01
			GCN3	-0.31	0.03	0.00	-0.02	0.00	0.03	-0.04	-0.03	0.00	0.00
			GCN4	-0.19	0.01	0.01	-0.01	0.01	0.03	-0.02	-0.02	0.00	0.00

Tilt = 55°

GCM_Cantilever (Max)													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	0.085	GCN1	0.02	0.04	0.02	-0.01	0.00	0.01	-0.02	-0.01	0.00	0.00
			GCN2	0.02	0.06	0.03	0.00	0.01	0.03	-0.03	-0.01	0.01	0.00
			GCN3	-0.01	0.05	0.03	0.00	0.01	0.03	-0.03	-0.01	0.01	0.00
			GCN4	-0.06	0.05	0.03	0.01	0.01	0.03	-0.02	-0.01	0.01	0.01
		0.075	GCN1	0.01	0.04	0.00	-0.02	0.00	0.01	-0.04	-0.03	-0.01	-0.02
			GCN2	0.01	0.05	0.01	-0.01	0.01	0.02	-0.05	-0.03	-0.01	-0.01
			GCN3	-0.01	0.05	0.01	-0.01	0.01	0.03	-0.04	-0.02	0.00	-0.01
			GCN4	-0.05	0.04	0.02	0.00	0.02	0.03	-0.02	-0.01	0.00	0.00
	Downforce	0.783	GCN1	1.32	0.81	0.57	0.42	0.40	0.31	0.32	0.27	0.28	0.28
			GCN2	1.71	1.01	0.67	0.50	0.43	0.32	0.36	0.29	0.31	0.31
			GCN3	1.96	1.08	0.74	0.53	0.43	0.31	0.32	0.27	0.29	0.29
			GCN4	2.06	1.07	0.70	0.49	0.37	0.26	0.28	0.21	0.22	0.23
		0.680	GCN1	1.17	0.70	0.46	0.28	0.29	0.27	0.23	0.19	0.20	0.19
			GCN2	1.51	0.87	0.54	0.33	0.33	0.27	0.25	0.19	0.20	0.20
			GCN3	1.72	0.97	0.59	0.38	0.34	0.25	0.20	0.15	0.16	0.17
			GCN4	1.75	0.92	0.56	0.35	0.30	0.21	0.16	0.11	0.13	0.13

Tilt = 0°

GCN_Post													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	-0.295	GCN1	-0.73	-0.45	-0.26	-0.26	-0.23	-0.17	-0.17	-0.24	-0.22	-0.19
			GCN2	-0.37	-0.31	-0.18	-0.18	-0.17	-0.13	-0.16	-0.17	-0.16	-0.15
			GCN3	-0.01	0.06	0.10	0.05	0.08	0.11	0.05	0.07	0.08	0.07
			GCN4	-0.07	-0.05	-0.03	-0.02	-0.03	-0.02	-0.02	-0.03	-0.03	-0.03
		-0.310	GCN1	-0.48	-0.56	-0.76	-1.00	-0.93	-0.51	-0.44	-0.55	-0.56	-0.57
			GCN2	-0.27	-0.29	-0.36	-0.41	-0.39	-0.31	-0.31	-0.30	-0.31	-0.32
			GCN3	0.21	0.21	0.25	0.23	0.23	0.27	0.27	0.25	0.26	0.27
			GCN4	0.01	0.00	-0.01	-0.05	0.00	0.06	0.01	0.05	0.01	-0.03
		-0.296	GCN1	-0.81	-0.46	-0.23	-0.19	-0.15	-0.09	-0.10	-0.12	-0.13	-0.13
			GCN2	-0.39	-0.30	-0.17	-0.15	-0.12	-0.09	-0.12	-0.12	-0.11	-0.11
			GCN3	0.07	0.07	0.12	0.08	0.09	0.10	0.10	0.09	0.10	0.11
			GCN4	-0.04	-0.06	-0.03	-0.01	0.00	-0.02	-0.02	-0.01	-0.02	-0.02
		-0.110	GCN1	-0.31	-0.21	-0.23	-0.24	-0.22	-0.22	-0.22	-0.18	-0.11	-0.09
			GCN2	-0.21	-0.10	-0.14	-0.14	-0.16	-0.15	-0.15	-0.12	-0.09	-0.08
			GCN3	-0.08	0.02	-0.01	0.01	0.02	-0.02	-0.07	-0.01	0.00	-0.01
			GCN4	-0.08	0.02	-0.02	-0.05	-0.03	-0.02	-0.05	-0.03	-0.02	-0.03
		-0.167	GCN1	-0.39	-0.29	-0.36	-0.42	-0.30	-0.13	-0.14	-0.16	-0.13	-0.11
			GCN2	-0.25	-0.19	-0.21	-0.21	-0.18	-0.11	-0.13	-0.12	-0.11	-0.10
			GCN3	-0.03	0.07	0.03	-0.01	0.04	0.07	0.01	0.04	0.03	0.01
			GCN4	-0.08	-0.01	-0.03	-0.06	-0.06	-0.01	-0.01	-0.03	-0.03	-0.03
	Downforce	0.108	GCN1	0.05	0.05	0.05	0.04	0.03	0.02	0.02	0.03	0.03	0.03
			GCN2	0.18	0.16	0.15	0.14	0.15	0.14	0.15	0.14	0.13	0.13
			GCN3	-0.04	-0.08	-0.13	-0.12	-0.13	-0.12	-0.14	-0.13	-0.12	-0.12
			GCN4	0.28	0.04	-0.08	-0.07	-0.09	-0.07	-0.13	-0.13	-0.11	-0.10
		0.116	GCN1	0.07	0.08	0.15	0.17	0.11	0.12	0.09	0.10	0.09	0.08
			GCN2	0.28	0.28	0.31	0.35	0.35	0.29	0.30	0.30	0.29	0.26
			GCN3	-0.27	-0.31	-0.27	-0.20	-0.19	-0.28	-0.28	-0.29	-0.30	-0.30
			GCN4	-0.41	-0.55	-0.19	0.17	0.10	-0.34	-0.35	-0.48	-0.51	-0.53
		0.114	GCN1	0.06	0.05	0.04	0.03	0.03	0.03	0.02	0.03	0.03	0.03
			GCN2	0.19	0.17	0.15	0.13	0.15	0.14	0.15	0.14	0.13	0.12
			GCN3	-0.04	-0.07	-0.11	-0.12	-0.14	-0.13	-0.12	-0.13	-0.13	-0.12
			GCN4	0.26	0.12	-0.05	-0.07	-0.13	-0.10	-0.09	-0.12	-0.12	-0.11
		0.091	GCN1	0.03	0.03	0.03	0.03	0.04	0.06	0.05	0.04	0.03	0.02
			GCN2	0.14	0.14	0.14	0.13	0.16	0.20	0.20	0.16	0.13	0.12
			GCN3	-0.11	-0.11	-0.12	-0.12	-0.13	-0.07	-0.07	-0.11	-0.13	-0.13
			GCN4	-0.06	-0.07	-0.08	-0.08	-0.09	0.21	0.14	-0.06	-0.12	-0.11
		0.095	GCN1	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.06	0.05	0.03
			GCN2	0.15	0.14	0.14	0.13	0.15	0.15	0.18	0.20	0.17	0.13
			GCN3	-0.11	-0.11	-0.12	-0.12	-0.14	-0.12	-0.08	-0.06	-0.09	-0.11
			GCN4	-0.06	-0.07	-0.08	-0.08	-0.13	-0.09	0.04	0.18	0.08	-0.08

Tilt = 55°

GCN_Post													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	-1.754	GCN1	-2.52	-1.05	-0.57	-0.55	-0.31	-0.19	-0.42	-0.35	-0.30	-0.30
			GCN2	-2.26	-1.19	-0.57	-0.50	-0.37	-0.21	-0.44	-0.35	-0.31	-0.31
			GCN3	-1.51	-0.85	-0.54	-0.43	-0.28	-0.17	-0.39	-0.30	-0.24	-0.23
			GCN4	-1.27	-0.55	-0.55	-0.45	-0.20	-0.13	-0.35	-0.29	-0.21	-0.19
		-1.244	GCN1	-1.31	-1.23	-1.19	-1.17	-1.15	-1.18	-1.70	-1.44	-1.30	-1.22
			GCN2	-1.26	-1.22	-1.17	-1.15	-1.12	-1.15	-1.66	-1.38	-1.26	-1.19
			GCN3	-0.98	-0.99	-0.96	-0.95	-0.94	-0.94	-1.40	-1.16	-1.06	-1.00
			GCN4	-0.90	-0.92	-0.87	-0.85	-0.83	-0.85	-1.18	-0.99	-0.94	-0.90
		-1.620	GCN1	-2.30	-0.95	-0.50	-0.46	-0.26	-0.16	-0.35	-0.29	-0.25	-0.26
			GCN2	-2.11	-1.08	-0.50	-0.44	-0.31	-0.18	-0.37	-0.29	-0.25	-0.26
			GCN3	-1.42	-0.76	-0.48	-0.37	-0.23	-0.13	-0.32	-0.25	-0.19	-0.19
			GCN4	-1.17	-0.48	-0.48	-0.40	-0.17	-0.10	-0.29	-0.25	-0.19	-0.17
		-0.590	GCN1	-1.04	-0.65	-0.50	-0.46	-0.45	-0.65	-0.79	-0.45	-0.33	-0.31
			GCN2	-1.00	-0.65	-0.52	-0.48	-0.46	-0.60	-0.74	-0.46	-0.34	-0.31
			GCN3	-0.70	-0.41	-0.34	-0.34	-0.34	-0.40	-0.54	-0.34	-0.24	-0.21
			GCN4	-0.70	-0.45	-0.37	-0.36	-0.36	-0.42	-0.47	-0.32	-0.25	-0.22
		-0.646	GCN1	-1.32	-0.83	-0.76	-0.81	-0.63	-0.35	-0.53	-0.36	-0.31	-0.31
			GCN2	-1.29	-0.79	-0.74	-0.78	-0.61	-0.35	-0.49	-0.37	-0.32	-0.32
			GCN3	-1.06	-0.55	-0.50	-0.58	-0.41	-0.19	-0.34	-0.25	-0.21	-0.21
			GCN4	-0.93	-0.55	-0.50	-0.52	-0.39	-0.23	-0.31	-0.26	-0.23	-0.21
	Downforce	1.687	GCN1	1.35	0.84	0.57	0.43	0.40	0.31	0.33	0.28	0.28	0.28
			GCN2	1.76	1.05	0.67	0.51	0.44	0.33	0.36	0.30	0.31	0.31
			GCN3	1.98	1.13	0.72	0.54	0.43	0.32	0.32	0.27	0.29	0.29
			GCN4	2.10	1.15	0.70	0.50	0.37	0.27	0.28	0.22	0.23	0.23
		1.169	GCN1	0.72	0.75	0.81	0.82	0.77	0.80	0.76	0.70	0.67	0.67
			GCN2	0.98	1.05	1.13	1.14	1.09	1.10	1.03	0.97	0.95	0.94
			GCN3	1.15	1.22	1.33	1.35	1.29	1.27	1.20	1.15	1.11	1.11
			GCN4	1.22	1.29	1.39	1.42	1.35	1.32	1.27	1.20	1.16	1.15
		1.470	GCN1	1.20	0.73	0.45	0.28	0.29	0.27	0.23	0.19	0.19	0.19
			GCN2	1.54	0.91	0.53	0.34	0.33	0.27	0.25	0.19	0.20	0.20
			GCN3	1.74	1.01	0.59	0.38	0.34	0.25	0.20	0.15	0.17	0.17
			GCN4	1.79	0.99	0.55	0.35	0.30	0.21	0.16	0.11	0.13	0.13
		0.422	GCN1	0.92	0.59	0.43	0.36	0.33	0.52	0.45	0.26	0.19	0.17
			GCN2	1.16	0.69	0.48	0.38	0.33	0.54	0.46	0.26	0.20	0.18
			GCN3	1.28	0.74	0.49	0.35	0.29	0.42	0.36	0.21	0.17	0.15
			GCN4	1.29	0.70	0.42	0.28	0.21	0.29	0.27	0.15	0.12	0.12
		0.681	GCN1	0.98	0.68	0.66	0.70	0.49	0.24	0.26	0.23	0.23	0.22
			GCN2	1.26	0.82	0.74	0.77	0.51	0.24	0.27	0.23	0.23	0.22
			GCN3	1.41	0.91	0.77	0.76	0.46	0.21	0.21	0.19	0.19	0.19
			GCN4	1.42	0.86	0.71	0.68	0.38	0.16	0.15	0.13	0.14	0.14

Tilt = 0°

GCM_Purlin (Min)

Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	-0.143	GCN1	-0.45	-0.53	-0.56	-0.61	-0.60	-0.54	-0.86	-0.72	-0.55	-0.53
			GCN2	-0.25	-0.28	-0.30	-0.31	-0.30	-0.31	-0.35	-0.33	-0.31	-0.31
			GCN3	0.27	0.29	0.28	0.28	0.31	0.29	0.33	0.34	0.31	0.29
			GCN4	0.04	0.05	0.07	0.06	0.06	0.09	0.10	0.09	0.07	0.06
		-0.141	GCN1	-0.50	-0.53	-0.61	-0.84	-1.05	-0.52	-0.47	-0.55	-0.56	-0.57
			GCN2	-0.27	-0.29	-0.32	-0.37	-0.39	-0.31	-0.31	-0.30	-0.31	-0.32
			GCN3	0.20	0.22	0.27	0.28	0.28	0.27	0.26	0.25	0.26	0.27
			GCN4	0.01	0.01	0.00	0.01	0.10	0.06	0.02	0.05	0.01	-0.03
		-0.137	GCN1	-0.81	-0.37	-0.22	-0.21	-0.17	-0.11	-0.12	-0.11	-0.11	-0.12
			GCN2	-0.37	-0.26	-0.17	-0.16	-0.13	-0.11	-0.13	-0.12	-0.11	-0.11
			GCN3	0.12	0.13	0.13	0.09	0.09	0.11	0.10	0.09	0.10	0.11
			GCN4	0.00	-0.05	-0.03	-0.01	0.00	-0.01	-0.01	0.00	-0.01	-0.02
		-0.073	GCN1	-0.32	-0.17	-0.15	-0.16	-0.18	-0.10	-0.47	-0.28	-0.16	-0.14
			GCN2	-0.20	-0.13	-0.13	-0.13	-0.14	-0.12	-0.21	-0.17	-0.14	-0.13
			GCN3	0.19	0.12	0.12	0.13	0.15	0.12	0.15	0.14	0.13	0.12
			GCN4	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.01
		-0.064	GCN1	-0.13	-0.17	-0.16	-0.16	-0.23	-0.45	-0.16	-0.18	-0.17	-0.16
			GCN2	-0.12	-0.14	-0.14	-0.13	-0.15	-0.20	-0.15	-0.15	-0.14	-0.14
			GCN3	0.13	0.14	0.14	0.14	0.16	0.17	0.16	0.17	0.16	0.15
			GCN4	0.02	0.02	0.03	0.02	0.03	0.06	0.02	0.03	0.03	0.03
	Downforce	-0.040	GCN1	0.03	0.04	0.05	0.04	0.03	0.02	0.02	0.03	0.03	0.03
			GCN2	0.15	0.14	0.15	0.14	0.15	0.14	0.15	0.14	0.13	0.13
			GCN3	-0.06	-0.11	-0.13	-0.12	-0.12	-0.12	-0.14	-0.13	-0.12	-0.12
			GCN4	0.27	-0.07	-0.09	-0.07	-0.08	-0.07	-0.13	-0.13	-0.11	-0.10
		-0.040	GCN1	0.02	0.01	0.01	0.00	0.02	0.01	0.01	0.01	-0.01	-0.02
			GCN2	0.21	0.14	0.16	0.14	0.12	0.13	0.12	0.10	0.10	0.10
			GCN3	-0.36	-0.20	-0.17	-0.15	-0.11	-0.06	-0.12	-0.11	-0.11	-0.11
			GCN4	-0.60	-0.20	-0.16	-0.14	0.03	0.45	-0.08	-0.06	-0.06	-0.08
		-0.031	GCN1	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
			GCN2	0.16	0.16	0.15	0.14	0.16	0.15	0.17	0.16	0.14	0.13
			GCN3	-0.09	-0.13	-0.13	-0.13	-0.15	-0.13	-0.13	-0.14	-0.14	-0.13
			GCN4	0.10	-0.10	-0.09	-0.10	-0.16	-0.12	-0.10	-0.13	-0.14	-0.14
		-0.038	GCN1	0.04	0.02	0.02	0.01	0.02	0.03	0.03	0.02	0.01	0.01
			GCN2	0.22	0.13	0.12	0.11	0.12	0.12	0.16	0.12	0.10	0.09
			GCN3	-0.23	-0.13	-0.12	-0.13	-0.13	-0.09	-0.08	-0.11	-0.11	-0.12
			GCN4	-0.25	-0.10	-0.09	-0.11	-0.13	0.03	0.18	-0.07	-0.09	-0.09
		-0.027	GCN1	0.04	0.02	0.02	0.01	0.03	0.03	0.02	0.02	0.01	0.01
			GCN2	0.22	0.13	0.12	0.11	0.13	0.14	0.13	0.10	0.10	0.09
			GCN3	-0.23	-0.13	-0.12	-0.12	-0.12	-0.07	-0.11	-0.12	-0.12	-0.12
			GCN4	-0.25	-0.10	-0.08	-0.10	-0.06	0.35	-0.06	-0.11	-0.10	-0.10

GCM_Purlin (Max)

Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	0.024	GCN1	-0.16	-0.49	-0.52	-0.54	-0.52	-0.44	-0.35	-0.43	-0.41	-0.39
			GCN2	-0.20	-0.26	-0.28	-0.28	-0.26	-0.26	-0.24	-0.25	-0.26	-0.26
			GCN3	0.28	0.28	0.26	0.27	0.30	0.28	0.32	0.33	0.31	0.29
			GCN4	0.07	0.07	0.09	0.09	0.07	0.09	0.08	0.08	0.08	0.07
		0.027	GCN1	-0.47	-0.23	-0.28	-0.32	-0.14	0.34	-0.42	-0.29	-0.24	-0.26
			GCN2	-0.27	-0.18	-0.20	-0.22	-0.20	-0.15	-0.27	-0.21	-0.19	-0.20
			GCN3	0.16	0.12	0.17	0.17	0.17	0.18	0.18	0.14	0.15	0.16
			GCN4	0.01	0.00	-0.01	-0.02	0.01	0.00	-0.01	0.00	-0.02	-0.02
		0.022	GCN1	-0.07	0.00	-0.01	-0.01	0.00	0.01	-0.03	-0.02	-0.01	-0.01
			GCN2	-0.10	0.01	0.00	-0.01	0.01	0.01	-0.03	-0.02	-0.01	-0.01
			GCN3	-0.12	0.01	0.00	0.00	0.01	0.02	-0.02	-0.01	-0.01	-0.01
			GCN4	-0.09	0.01	0.00	0.00	0.01	0.01	-0.01	-0.01	0.00	0.00
		0.022	GCN1	-0.31	-0.16	-0.12	-0.11	-0.12	0.02	0.06	-0.10	-0.10	-0.10
			GCN2	-0.19	-0.12	-0.11	-0.11	-0.11	-0.08	-0.10	-0.12	-0.11	-0.11
			GCN3	0.18	0.11	0.11	0.11	0.13	0.13	0.17	0.15	0.13	0.12
			GCN4	0.01	0.01	0.01	0.01	0.03	0.02	0.02	0.02	0.01	0.01
		0.022	GCN1	-0.32	-0.16	-0.12	-0.11	-0.06	0.28	-0.13	-0.13	-0.11	-0.10
			GCN2	-0.20	-0.13	-0.11	-0.11	-0.11	-0.08	-0.13	-0.13	-0.12	-0.11
			GCN3	0.18	0.11	0.11	0.12	0.14	0.14	0.15	0.14	0.13	0.12
			GCN4	0.01	0.01	0.01	0.02	0.03	0.01	0.02	0.02	0.01	0.01
	Downforce	0.170	GCN1	0.02	-0.03	-0.02	0.00	0.01	-0.01	-0.01	0.00	-0.01	-0.01
			GCN2	0.14	0.16	0.18	0.13	0.11	0.12	0.09	0.09	0.10	0.09
			GCN3	-0.47	-0.29	-0.21	-0.19	-0.15	-0.11	-0.12	-0.12	-0.11	-0.11
			GCN4	-0.97	-0.37	-0.24	-0.24	-0.15	-0.05	-0.08	-0.10	-0.09	-0.09
		0.154	GCN1	0.07	0.10	0.17	0.16	0.08	0.12	0.10	0.10	0.09	0.09
			GCN2	0.31	0.32	0.31	0.31	0.33	0.31	0.32	0.32	0.30	0.27
			GCN3	-0.29	-0.34	-0.40	-0.39	-0.29	-0.30	-0.30	-0.31	-0.31	-0.32
			GCN4	-0.46	-0.59	-0.90	-0.91	-0.39	-0.37	-0.40	-0.52	-0.55	-0.56
		0.152	GCN1	0.02	-0.02	-0.02	-0.01	0.01	0.01	0.00	0.01	-0.01	-0.02
			GCN2	0.19	0.12	0.12	0.10	0.10	0.11	0.11	0.09	0.09	0.09
			GCN3	-0.42	-0.24	-0.16	-0.16	-0.15	-0.12	-0.14	-0.13	-0.13	-0.14
			GCN4	-0.89	-0.33	-0.17	-0.18	-0.20	-0.10	-0.11	-0.12	-0.14	-0.17
		0.068	GCN1	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01
			GCN2	0.21	0.13	0.12	0.12	0.13	0.11	0.13	0.11	0.10	0.10
			GCN3	-0.25	-0.15	-0.13	-0.14	-0.15	-0.12	-0.20	-0.15	-0.13	-0.13
			GCN4	-0.33	-0.14	-0.11	-0.14	-0.19	-0.09	-0.42	-0.25	-0.14	-0.13
		0.067	GCN1	0.03	0.03	0.03	0.03	0.05	0.02	0.03	0.03	0.03	0.03
			GCN2	0.15	0.16	0.15	0.14	0.15	0.15	0.17	0.16	0.15	0.13
			GCN3	-0.14	-0.14	-0.15	-0.17	-0.21	-0.14	-0.14	-0.14	-0.14	-0.14
			GCN4	-0.10	-0.13	-0.13	-0.24	-0.47	-0.14	-0.11	-0.14	-0.14	-0.14

Tilt = 55°

GCM_Purlin (Min)													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	-0.298	GCN1	-2.36	-0.82	-0.44	-0.37	-0.27	-0.16	-0.32	-0.25	-0.21	-0.22
			GCN2	-1.31	-0.80	-0.47	-0.37	-0.28	-0.18	-0.32	-0.25	-0.22	-0.23
			GCN3	-0.79	-0.49	-0.45	-0.37	-0.23	-0.12	-0.29	-0.21	-0.17	-0.18
			GCN4	-0.65	-0.25	-0.40	-0.45	-0.24	-0.09	-0.24	-0.17	-0.15	-0.17
		-0.089	GCN1	-1.68	-0.86	-0.91	-0.86	-0.36	-0.36	-0.57	-0.37	-0.32	-0.32
			GCN2	-1.67	-0.86	-0.78	-0.74	-0.38	-0.34	-0.53	-0.38	-0.33	-0.33
			GCN3	-1.33	-0.72	-0.44	-0.35	-0.28	-0.20	-0.39	-0.27	-0.22	-0.22
			GCN4	-1.02	-0.59	-0.40	-0.31	-0.28	-0.22	-0.34	-0.26	-0.22	-0.21
		-0.278	GCN1	-2.19	-0.76	-0.40	-0.32	-0.21	-0.13	-0.28	-0.22	-0.18	-0.19
			GCN2	-1.24	-0.74	-0.43	-0.32	-0.23	-0.14	-0.28	-0.22	-0.19	-0.19
			GCN3	-0.74	-0.44	-0.40	-0.33	-0.19	-0.08	-0.26	-0.18	-0.15	-0.15
			GCN4	-0.60	-0.22	-0.35	-0.40	-0.22	-0.07	-0.21	-0.14	-0.12	-0.14
		-0.117	GCN1	-1.24	-0.76	-0.54	-0.45	-0.39	-0.43	-0.84	-0.35	-0.31	-0.31
			GCN2	-1.21	-0.72	-0.55	-0.48	-0.40	-0.38	-0.60	-0.36	-0.31	-0.32
			GCN3	-0.98	-0.50	-0.37	-0.36	-0.27	-0.19	-0.30	-0.25	-0.21	-0.20
			GCN4	-0.87	-0.49	-0.38	-0.35	-0.29	-0.23	-0.29	-0.25	-0.22	-0.21
		-0.079	GCN1	-1.51	-0.76	-0.79	-0.75	-0.30	-0.30	-0.49	-0.32	-0.27	-0.27
			GCN2	-1.51	-0.76	-0.69	-0.65	-0.32	-0.28	-0.45	-0.33	-0.28	-0.28
			GCN3	-1.20	-0.63	-0.38	-0.31	-0.24	-0.15	-0.33	-0.23	-0.19	-0.18
			GCN4	-0.92	-0.52	-0.35	-0.27	-0.23	-0.18	-0.30	-0.22	-0.19	-0.18
	Downforce	-0.157	GCN1	0.88	0.65	0.45	0.32	0.27	0.25	0.23	0.22	0.22	0.22
			GCN2	1.12	0.83	0.54	0.36	0.29	0.27	0.27	0.23	0.24	0.24
			GCN3	1.58	0.92	0.59	0.39	0.29	0.27	0.25	0.21	0.22	0.22
			GCN4	1.81	0.93	0.58	0.37	0.26	0.23	0.21	0.18	0.18	0.18
		-0.088	GCN1	0.70	0.72	0.72	0.69	0.69	0.77	0.75	0.68	0.67	0.66
			GCN2	0.95	1.00	1.01	0.97	0.99	1.13	1.03	0.96	0.94	0.93
			GCN3	1.12	1.18	1.19	1.15	1.18	1.37	1.20	1.13	1.10	1.09
			GCN4	1.19	1.24	1.24	1.20	1.25	1.53	1.27	1.19	1.15	1.14
		-0.121	GCN1	0.80	0.54	0.36	0.23	0.16	0.18	0.20	0.18	0.16	0.15
			GCN2	1.03	0.70	0.44	0.26	0.18	0.21	0.22	0.18	0.17	0.16
			GCN3	1.38	0.80	0.49	0.29	0.20	0.21	0.19	0.15	0.14	0.14
			GCN4	1.54	0.78	0.46	0.27	0.20	0.19	0.16	0.12	0.12	0.11
		-0.041	GCN1	0.79	0.50	0.35	0.23	0.15	0.17	0.14	0.18	0.17	0.15
			GCN2	0.96	0.64	0.42	0.25	0.17	0.20	0.22	0.18	0.17	0.16
			GCN3	1.16	0.73	0.47	0.28	0.20	0.21	0.23	0.15	0.15	0.14
			GCN4	1.25	0.72	0.44	0.26	0.19	0.20	0.26	0.13	0.12	0.11
		-0.063	GCN1	0.93	0.64	0.27	0.12	0.30	0.26	0.22	0.19	0.19	0.18
			GCN2	1.20	0.78	0.43	0.28	0.34	0.28	0.23	0.19	0.19	0.19
			GCN3	1.37	0.86	0.55	0.41	0.34	0.25	0.18	0.15	0.16	0.16
			GCN4	1.39	0.82	0.63	0.52	0.30	0.20	0.14	0.11	0.12	0.13

GCM_Purlin (Max)													
Zone	Load Type	Coefficient	Chord Divisions	Spans									
	Uplift	0.079	GCN1	-1.74	-0.77	-0.42	-0.35	-0.26	-0.16	-0.31	-0.24	-0.20	-0.21
			GCN2	-1.13	-0.73	-0.45	-0.35	-0.27	-0.17	-0.31	-0.24	-0.21	-0.22
			GCN3	-0.80	-0.44	-0.42	-0.35	-0.22	-0.11	-0.29	-0.20	-0.17	-0.18
			GCN4	-0.79	-0.22	-0.38	-0.43	-0.24	-0.09	-0.24	-0.16	-0.14	-0.16
		0.056	GCN1	-0.51	-0.18	-0.10	-0.01	0.11	-0.06	-0.23	-0.18	-0.13	-0.11
			GCN2	-0.52	-0.22	-0.15	-0.10	-0.01	-0.10	-0.27	-0.23	-0.18	-0.16
			GCN3	-0.29	-0.22	-0.19	-0.21	-0.21	-0.15	-0.26	-0.26	-0.23	-0.22
			GCN4	-0.33	-0.21	-0.19	-0.26	-0.35	-0.15	-0.23	-0.24	-0.23	-0.21
		0.074	GCN1	-1.62	-0.72	-0.38	-0.31	-0.21	-0.13	-0.27	-0.21	-0.18	-0.18
			GCN2	-1.09	-0.68	-0.41	-0.31	-0.22	-0.14	-0.28	-0.21	-0.18	-0.19
			GCN3	-0.77	-0.40	-0.37	-0.31	-0.19	-0.08	-0.25	-0.17	-0.14	-0.15
			GCN4	-0.73	-0.20	-0.33	-0.38	-0.21	-0.07	-0.21	-0.14	-0.12	-0.14
		0.040	GCN1	-1.83	-0.74	-0.45	-0.41	-0.25	-0.19	-0.23	-0.23	-0.25	-0.25
			GCN2	-1.55	-0.82	-0.45	-0.40	-0.30	-0.20	-0.33	-0.26	-0.25	-0.25
			GCN3	-0.99	-0.58	-0.42	-0.33	-0.22	-0.15	-0.35	-0.25	-0.19	-0.18
			GCN4	-0.79	-0.39	-0.43	-0.35	-0.17	-0.12	-0.44	-0.29	-0.18	-0.17
		0.047	GCN1	-1.76	-0.73	-0.33	-0.24	-0.24	-0.13	-0.27	-0.21	-0.18	-0.19
			GCN2	-1.08	-0.69	-0.40	-0.29	-0.25	-0.15	-0.28	-0.21	-0.19	-0.19
			GCN3	-0.76	-0.41	-0.41	-0.34	-0.20	-0.09	-0.26	-0.18	-0.15	-0.16
			GCN4	-0.65	-0.20	-0.46	-0.53	-0.22	-0.07	-0.21	-0.14	-0.13	-0.14
	Downforce	0.080	GCN1	0.99	0.99	0.79	0.46	0.39	0.36	0.40	0.32	0.29	0.28
			GCN2	1.25	0.91	0.70	0.48	0.40	0.37	0.41	0.33	0.30	0.29
			GCN3	1.37	0.76	0.55	0.44	0.35	0.32	0.37	0.30	0.27	0.25
			GCN4	1.42	0.62	0.41	0.36	0.26	0.24	0.32	0.22	0.19	0.18
		0.075	GCN1	0.99	0.68	0.79	0.74	0.38	0.35	0.39	0.31	0.29	0.28
			GCN2	1.26	0.79	0.73	0.62	0.39	0.36	0.41	0.33	0.30	0.29
			GCN3	1.37	0.81	0.56	0.42	0.35	0.32	0.37	0.29	0.27	0.26
			GCN4	1.42	0.76	0.40	0.23	0.26	0.24	0.31	0.22	0.19	0.18
		0.069	GCN1	0.81	0.78	0.59	0.30	0.22	0.18	0.16	0.14	0.14	0.13
			GCN2	1.02	0.71	0.50	0.30	0.22	0.16	0.15	0.13	0.13	0.13
			GCN3	1.11	0.59	0.37	0.26	0.18	0.13	0.11	0.11	0.11	0.11
			GCN4	1.11	0.46	0.24	0.20	0.12	0.09	0.08	0.08	0.08	0.08
		0.070	GCN1	0.88	0.57	0.42	0.35	0.29	0.30	0.44	0.22	0.18	0.16
			GCN2	1.11	0.66	0.46	0.36	0.29	0.27	0.38	0.22	0.19	0.17
			GCN3	1.23	0.71	0.46	0.33	0.25	0.20	0.23	0.17	0.16	0.14
			GCN4	1.23	0.67	0.40	0.26	0.17	0.13	0.12	0.12	0.11	0.11
		0.071	GCN1	0.81	0.52	0.63	0.58	0.22	0.17	0.16	0.13	0.13	0.13
			GCN2	1.02	0.59	0.52	0.44	0.21	0.16	0.14	0.13	0.13	0.13
			GCN3	1.12	0.61	0.37	0.25	0.18	0.12	0.11	0.11	0.11	0.11
			GCN4	1.12	0.57	0.25	0.11	0.12	0.09	0.08	0.08	0.08	0.08

Model Settings

Number of Reported Sections	20
Number of Internal Sections	200
Member Area Load Mesh Size (in^2)	1
Consider Shear Deformation	Yes
Consider Torsional Warping	Yes
Approximate Mesh Size (in)	12
Transfer Forces Between Intersecting Wood Walls	Yes
Increase Wood Wall Nailing Capacity for Wind Loads	Yes
Include P-Delta for Walls	Yes
Optimize Masonry and Wood Walls	Yes
Maximum Number of Iterations	3
Single	No
Multiple (Optimum)	Yes
Maximum	No

Global Axis corresponding to vertical direction	Y
Convert Existing Data	Yes
Default Global Plane for z-axis	XZ
Plate Local Axis Orientation	Nodal

Hot Rolled Steel	AISC 15th (360-16): ASD
Stiffness Adjustment	Yes (Iterative)
Notional Annex	None
Connections	AISC 15th (360-16): ASD
Cold Formed Steel	AISI S100-16: ASD
Stiffness Adjustment	Yes (Iterative)
Wood	None
Temperature	< 100F
Concrete	None
Masonry	None
Aluminum	None
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	None
Stiffness Adjustment	Yes (Iterative)

Compression Stress Block	Rectangular Stress Block
Analyze using Cracked Sections	Yes
Leave room for horizontal rebar splices (2*d bar spacing)	Yes
List forces which were ignored for design in the Detail Report	Yes

Column Min Steel	1
Column Max Steel	8
Rebar Material Spec	ASTM A615
Warn if beam-column framing arrangement is not understood	No
Number of Shear Regions	4
Region 2 & 3 Spacing Increase Increment (in)	4

Code	ASCE 7-16
Risk Category	I or II
Drift Cat	Other

Model Settings (Continued)

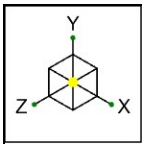
Base Elevation (ft)	
Include the weight of the structure in base shear calcs	Yes
S_1 (g)	0.055
SD_1 (g)	0.088
SD_S (g)	0.214
T_L (sec)	6
T Z (sec)	
T X (sec)	
C_tZ	0.02
C_tX	0.02
C_tExp. Z	0.75
C_tExp. X	0.75
R Z	2
R X	2
Ω_0Z	2
Ω_0X	2
C_dZ	2
C_dX	2
ρ Z	1
ρ X	1

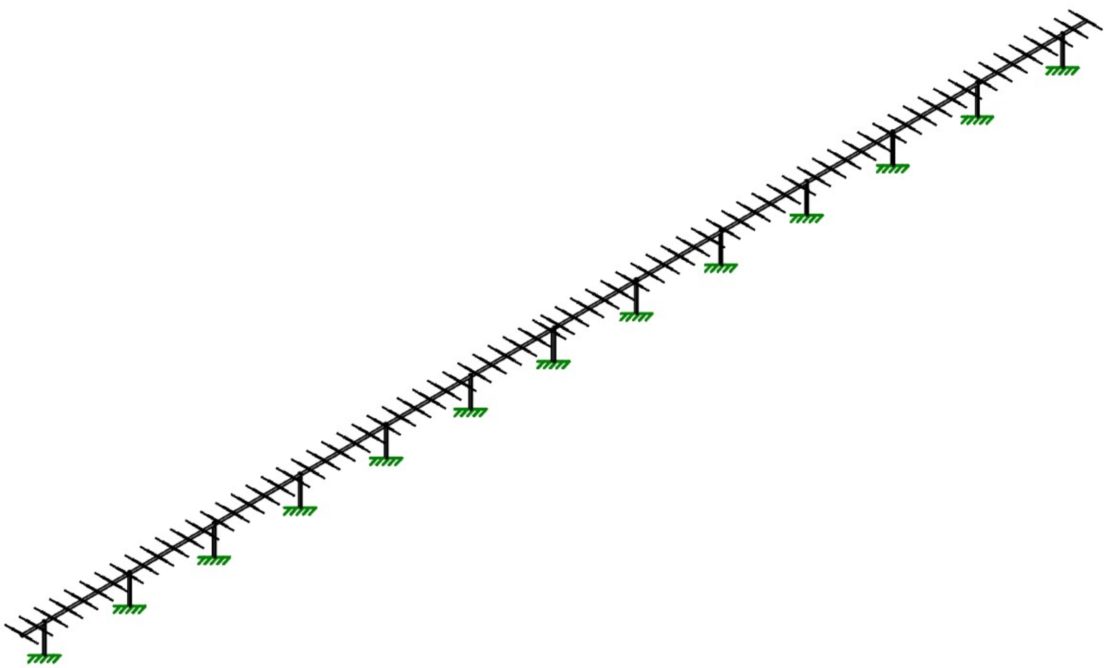
Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Nodal	Distributed	Area(Member)
1	Self Weight	DL - Dead Load		-1		1		
2	Solar Panels	DL - Dead Load						2
3	Snow	SL - Snow Load						2
4	Seismic X	ELX - Earthquake Load X	0.107			1		2
5	Seismic Z	ELZ - Earthquake Load Z			0.107	1		2
6	Wind Uplift - Static	OL1 - Other Load 1 generic						80
7	Wind Downforce - Static	OL2 - Other Load 2 generic						80
8	Wind Uplift - Dynamic	WL+X - Wind Load +X						80
9	Wind Downforce - Dynamic	WL-X - Wind Load -X						80
10	Support Structure Drag	OL3 - Other Load 3 generic						1
11	BLC 2 Transient Area Loads	Transient Area Loads					552	
12	BLC 3 Transient Area Loads	Transient Area Loads					552	
13	BLC 4 Transient Area Loads	Transient Area Loads					552	
14	BLC 5 Transient Area Loads	Transient Area Loads					552	
15	BLC 6 Transient Area Loads	Transient Area Loads					1879	
16	BLC 7 Transient Area Loads	Transient Area Loads					1881	
17	BLC 8 Transient Area Loads	Transient Area Loads					1885	
18	BLC 9 Transient Area Loads	Transient Area Loads					1873	
19	BLC 10 Transient Area Loads	Transient Area Loads					260	

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1		Yes	Y	DL	1						
2	IBC 16-10	Yes	Y	DL	1	SL	1				
3	IBC 16-12 (A)	Yes	Y	DL	1	WL+X	0.6	OL3	0.6		
4	IBC 16-12 (B)	Yes	Y	DL	1	WL-X	0.6	OL3	0.6		
5	IBC 16-13 (A) (static wind)	Yes	Y	DL	1	OL1	0.45	SL	0.75	OL3	0.45
6	IBC 16-13 (B) (static wind)	Yes	Y	DL	1	OL2	0.45	SL	0.75	OL3	0.45
7	Total WL + 0.25 SL	Yes	Y	DL	1	WL+X	0.45	SL	0.25		
8	Total WL + 0.25 SL	Yes	Y	DL	1	WL-X	0.45	SL	0.25		
9	IBC 16-15 (A)	Yes	Y	DL	0.6	WL+X	0.6	OL3	0.6		
10	IBC 16-15 (B)	Yes	Y	DL	0.6	WL-X	0.6	OL3	0.6		
11	Seismic										
12	IBC 16-12 C (A)	Yes	Y	DL	1	ELX	0.7			SDS*DL	0.14
13	IBC 16-12 C (B)	Yes	Y	DL	1	ELX	-0.7			SDS*DL	0.14
14	IBC 16-12 (D) (A)	Yes	Y	DL	1	ELZ	0.7			SDS*DL	0.14
15	IBC 16-12 (D) (B)	Yes	Y	DL	1	ELZ	-0.7			SDS*DL	0.14
16	IBC 16-14 (A) (A)	Yes	Y	DL	1	ELX	0.525	SL	0.75	SDS*DL	0.105
17	IBC 16-14 (A) (B)	Yes	Y	DL	1	ELX	-0.525	SL	0.75	SDS*DL	0.105
18	IBC 16-14 (B) (A)	Yes	Y	DL	1	ELZ	0.525	SL	0.75	SDS*DL	0.105
19	IBC 16-14 (B) (B)	Yes	Y	DL	1	ELZ	-0.525	SL	0.75	SDS*DL	0.105
20	IBC 16-16 (A) (A)	Yes	Y	DL	0.6	ELX	0.7			SDS*DL	-0.14
21	IBC 16-16 (A) (B)	Yes	Y	DL	0.6	ELX	-0.7			SDS*DL	-0.14
22	IBC 16-16 (B) (A)	Yes	Y	DL	0.6	ELZ	0.7			SDS*DL	-0.14
23	IBC 16-16 (B) (B)	Yes	Y	DL	0.6	ELZ	-0.7			SDS*DL	-0.14





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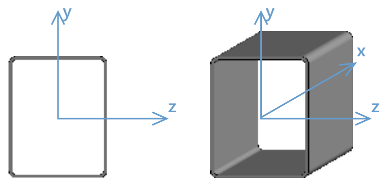
	JRD		Jun 24, 2024 at 03:46 PM
			24_0528 1x70 FTS TSM-54…

Detail Report: Tube 2

Load Combination: LC 2: IBC 16-10 **Code check:** 0.887 (axial/bending)



Input Data

Shape:	5X4X0.134	**I Node:**	GB
Member Type:	Beam	**J Node:**	VX72E
Length (in):	1541.985	**I Release:**	Fixed
Material Type:	Hot Rolled Steel	**J Release:**	Fixed
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	191	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): ASD	**T/C Only:**	Both Way

Material Properties

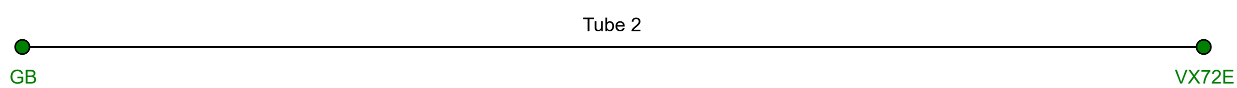
Material:	A500 Gr. 60	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	70
E (ksi):	29000	**Density (k/ft^3):**	0.49	**R_t:**	1.2
G (ksi):	11154	**F_y (ksi):**	60		
Nu:	0.3	**R_y:**	1.5		

Shape Properties

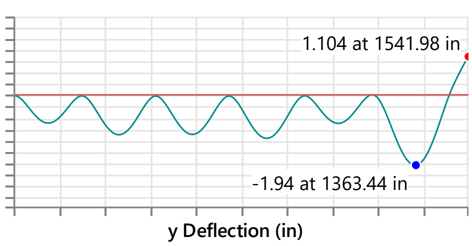
d (in):	5	**I_{yy} (in^4):**	6.17	**J (in^4):**	10.861
b_f (in):	4	**I_{zz} (in^4):**	8.714		
t (in):	0.134	**Area (in^2):**	2.34		

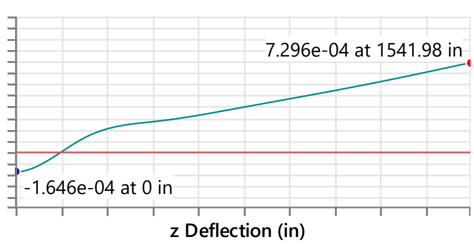
Design Properties

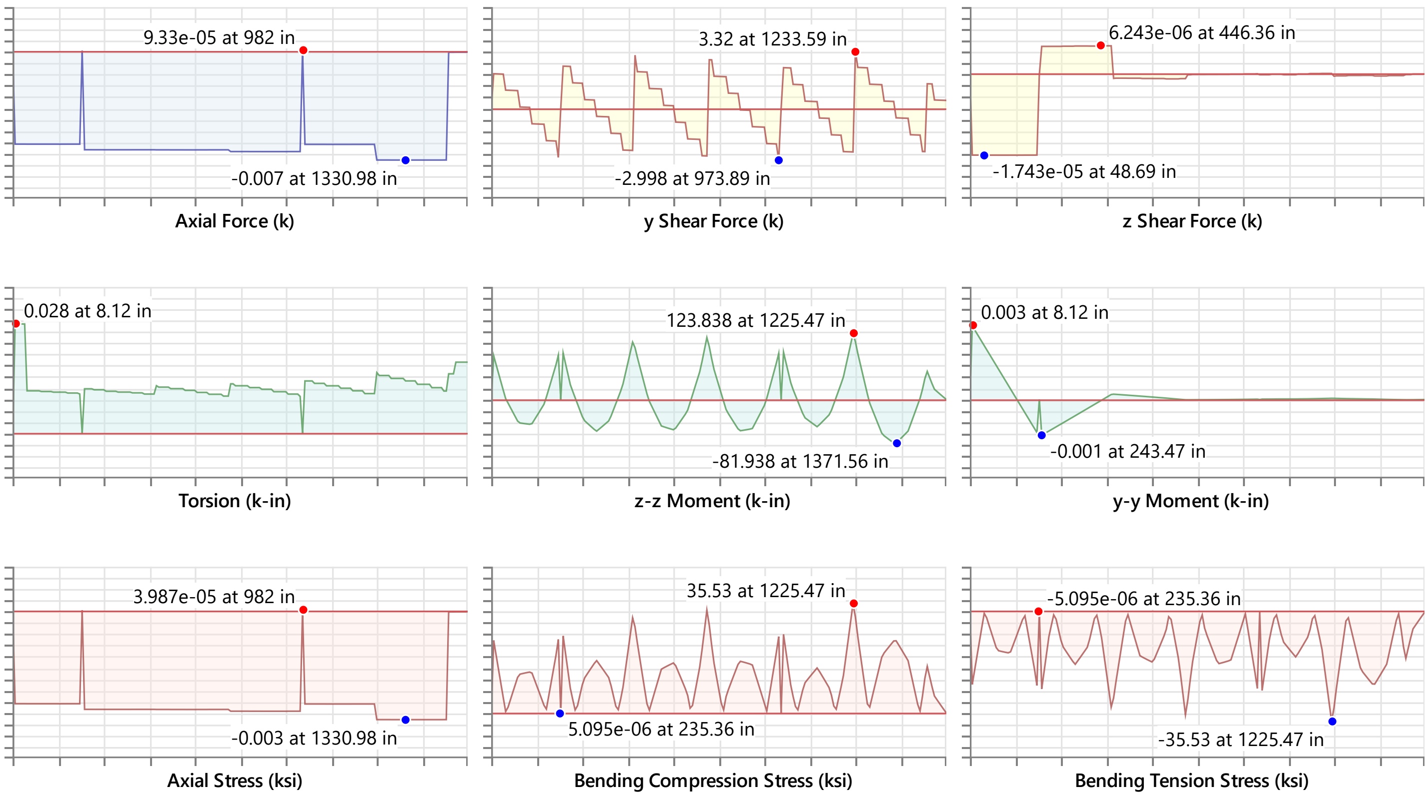
$L_{b\ y\text{-}y}$ (in):	245	**$K_{y\text{-}y}$:**	1	**Seismic DR:**	None
$L_{b\ z\text{-}z}$ (in):	245	**$K_{z\text{-}z}$:**	1	**Max Defl Ratio:**	L/528
$L_{comp\ top}$:	Lbyy	**y sway:**	No	**Max Defl Location:**	1363.439
$L_{comp\ bot}$ (in):	245	**z sway:**	No	**Span:**	1
L_{torque} (in):	1541.985	**Function:**	Lateral	**τ_b:**	1



Diagrams:





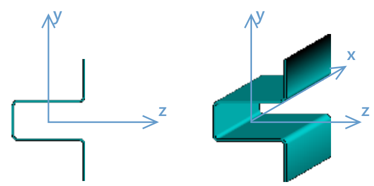


AISC 15th (360-16): ASD Code Check

Limit State	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	-	-	-	-
Applied Loading - Shear + Torsion	-	-	-	-
Axial Tension Analysis	0.006 k	84.078 k	-	-
Axial Compression Analysis	0 k	15.45 k	-	-
Flexural Analysis (Strong Axis)	123.838 k-in	139.548 k-in	-	-
Flexural Analysis (Weak Axis)	4.446e-5 k-in	106.058 k-in	-	-
Shear Analysis (Major Axis y)	3.323 k	26.564 k	**0.125**	**PASS**
Shear Analysis (Minor Axis z)	0.003 k	20.787 k	**0.000142**	**PASS**
Bending & Axial Interaction Check (UC Bending Max)	-	-	**0.887**	**PASS**
Torsional Analysis	0.01 k-in	108.481 k-in	**9.309e-5**	**PASS**

Detail Report: VP 70

Load Combination: LC 6: IBC 16-13 (B) (static wind) **Code check:** 0.974 (axial/bending)



Input Data

Shape:	V-HU-2.25X0.074X1.25	**I Node:**	V70B
Member Type:	Beam	**J Node:**	V70C
Length (in):	55.118	**I Release:**	Fixed
Material Type:	Cold Formed Steel	**J Release:**	Fixed
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	191	**J Offset:**	N/A
Design Code:	AISI S100-16: ASD	**T/C Only:**	Both Way

Material Properties

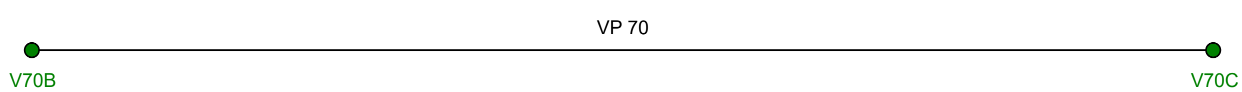
Material:	A653 Grade 60	**Nu:**	0.3	**F_y (ksi):**	60
E (ksi):	29500	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	70
G (ksi):	11346	**Density (k/ft^3):**	0.49		

Shape Properties

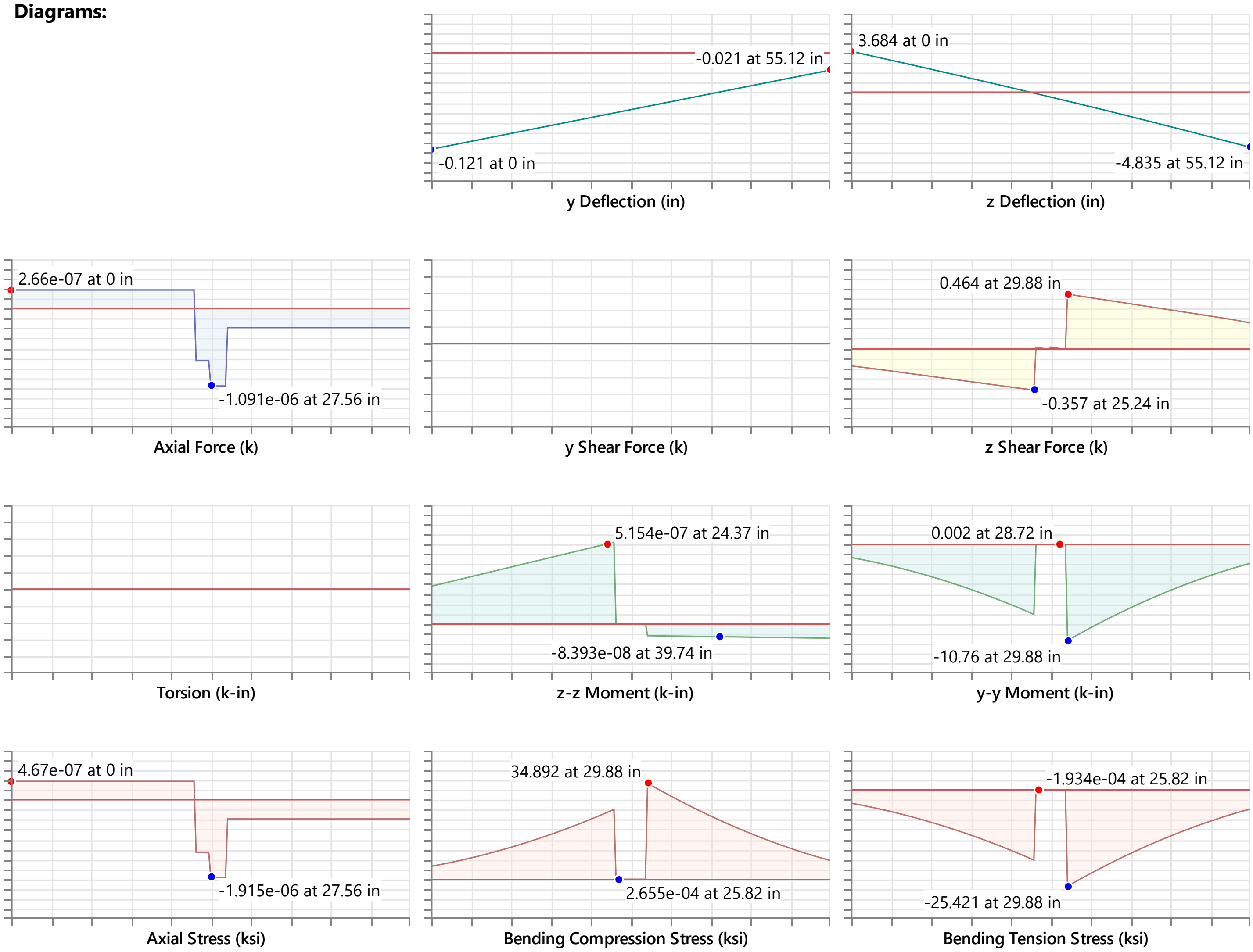
D (in):	2.25	**C_w (in^6):**	0.27	**$S_{et,z}$ (in^3):**	0.187
B (in):	1.25	**r_o (in):**	1.852	**$S_{f,z}$ (in^3):**	0.218
t (in):	0.074	**X_c (in):**	1.265	**$S_{fy,z}$ (in^3):**	0.218
R (in):	0.112	**m (in):**	0.162	**$S_{e,y}$ (in^3):**	0.308
d (in):	1.25	**j (in):**	1.566	**$S_{et,y}$ (in^3):**	0.308
I_{yy} (in^4):	0.401	**r_z (in):**	0.831	**$S_{f,y}$ (in^3):**	0.308
I_{zz} (in^4):	0.393	**r_y (in):**	0.839	**$S_{fy,y}$ (in^3):**	0.423
Area (in^2):	0.57	**x_0 (in):**	-1.426		
J (in^4):	0.001	**$S_{e,z}$ (in^3):**	0.341		

Design Properties

$L_{b\ y\text{-}y}$ (in):	55.118	**$C_{m\ z\text{-}z}$:**	0.6	**a:**	N/A
$L_{b\ z\text{-}z}$ (in):	55.118	**$K_{y\text{-}y}$:**	1	**Function:**	Lateral
$L_{comp\ top}$:	Lbyy	**$K_{z\text{-}z}$:**	1	**Max Defl Ratio:**	L/10000
$L_{comp\ bot}$ (in):	55.118	**R:**	N/A	**Max Defl Location:**	0
C_b:	1	**y sway:**	No	**Span:**	N/A
$C_{m\ y\text{-}y}$:	0.85	**z sway:**	No		



Diagrams:

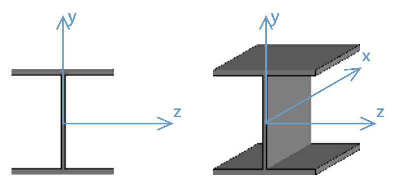


AISI S100-16: ASD Code Check

Limit State	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	-	-	-	-
Applied Loading - Shear + Torsion	-	-	-	-
Axial Tension Analysis	2.66e-7 k	20.467 k	-	-
Axial Compression Analysis	0 k	4.488 k	-	-
Flexural Analysis (Strong Axis)	7.752e-8 k-in	6.714 k-in	-	-
Flexural Analysis (Weak Axis)	10.76 k-in	11.08 k-in	-	-
Shear Analysis (Major Axis y)	0 k	1.462 k	**0**	**PASS**
Shear Analysis (Minor Axis z)	0.464 k	6.254 k	**0.074**	**PASS**
Bending & Axial Interaction Check (UC Bending Max)	-	-	**0.974**	**PASS**

Detail Report: DP1

Load Combination: LC 9: IBC 16-15 (A) **Code check:** 0.308 (axial/bending)



Input Data

Shape:	W6X20_MO_35	**I Node:**	D1
Member Type:	Column	**J Node:**	D2
Length (in):	78	**I Release:**	Fixed
Material Type:	Hot Rolled Steel	**J Release:**	Fixed
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	191	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): ASD	**T/C Only:**	Both Way

Material Properties

Material:	A992	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	65
E (ksi):	29000	**Density (k/ft^3):**	0.49	**R_t:**	1.1
G (ksi):	11154	**F_y (ksi):**	50		
Nu:	0.3	**R_y:**	1.1		

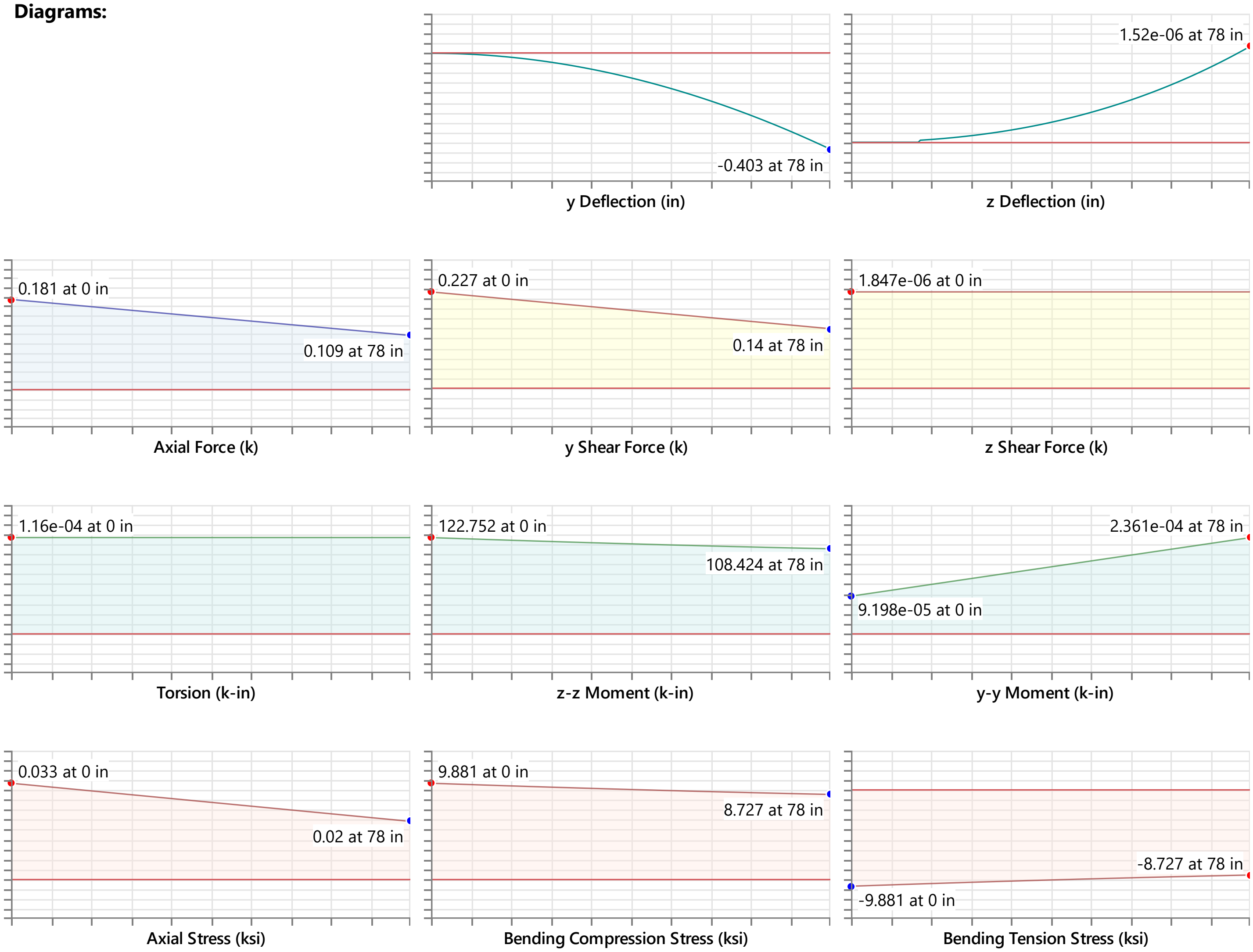
Shape Properties

d (in):	6.171	**Area (in^2):**	5.412	**r_T (in):**	1.645
b_f (in):	5.991	**Z_{yy} (in^3):**	6.126	**J (in^4):**	0.199
t_f (in):	0.336	**Z_{zz} (in^3):**	13.802	**k_{det} (in):**	0
t_w (in):	0.231	**C_w (in^6):**	102.544	**k_{des} (in):**	0
I_{yy} (in^4):	12.052	**W_{no} (in^2):**	8.739		
I_{zz} (in^4):	38.334	**S_w (in^4):**	4.398		

Design Properties

$L_{b\ y\text{-}y}$ (in):	78	**$K_{y\text{-}y}$:**	1	**Seismic DR:**	None
$L_{b\ z\text{-}z}$ (in):	78	**$K_{z\text{-}z}$:**	1	**Max Defl Ratio:**	L/193
$L_{comp\ top}$:	Lbyy	**y sway:**	No	**Max Defl Location:**	78
$L_{comp\ bot}$ (in):	78	**z sway:**	No	**Span:**	N/A
L_{torque} (in):	78	**Function:**	Lateral	**τ_b:**	1

Diagrams:

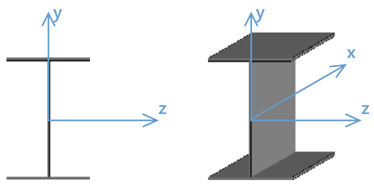


AISC 15th (360-16): ASD Code Check

Limit State	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	-	-	-	-
Applied Loading - Shear + Torsion	-	-	-	-
Axial Tension Analysis	0 k	162.047 k	-	-
Axial Compression Analysis	0.181 k	132.704 k	-	-
Flexural Analysis (Strong Axis)	122.752 k-in	399.39 k-in	-	-
Flexural Analysis (Weak Axis)	0.001 k-in	183.419 k-in	-	-
Shear Analysis (Major Axis y)	0.227 k	28.51 k	**0.008**	**PASS**
Shear Analysis (Minor Axis z)	6.148e-5 k	72.322 k	**8.501e-7**	**PASS**
Bending & Axial Interaction Check (UC Bending Max)	-	-	**0.308**	**PASS**

Detail Report: Idler Post 2

Load Combination: LC 6: IBC 16-13 (B) (static wind) **Code check:** 0.425 (axial/bending)



Input Data

Shape:	W6X7_MO_35	**I Node:**	N784
Member Type:	Column	**J Node:**	N785
Length (in):	87.513	**I Release:**	Fixed
Material Type:	Hot Rolled Steel	**J Release:**	AllPIN
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	191	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): ASD	**T/C Only:**	Both Way

Material Properties

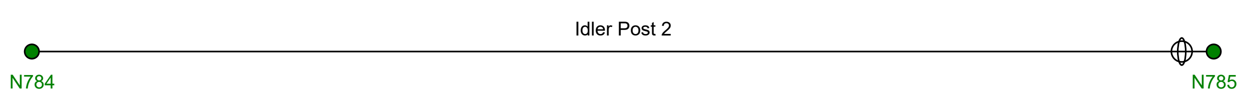
Material:	A992	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	65
E (ksi):	29000	**Density (k/ft^3):**	0.49	**R_t:**	1.1
G (ksi):	11154	**F_y (ksi):**	50		
Nu:	0.3	**R_y:**	1.1		

Shape Properties

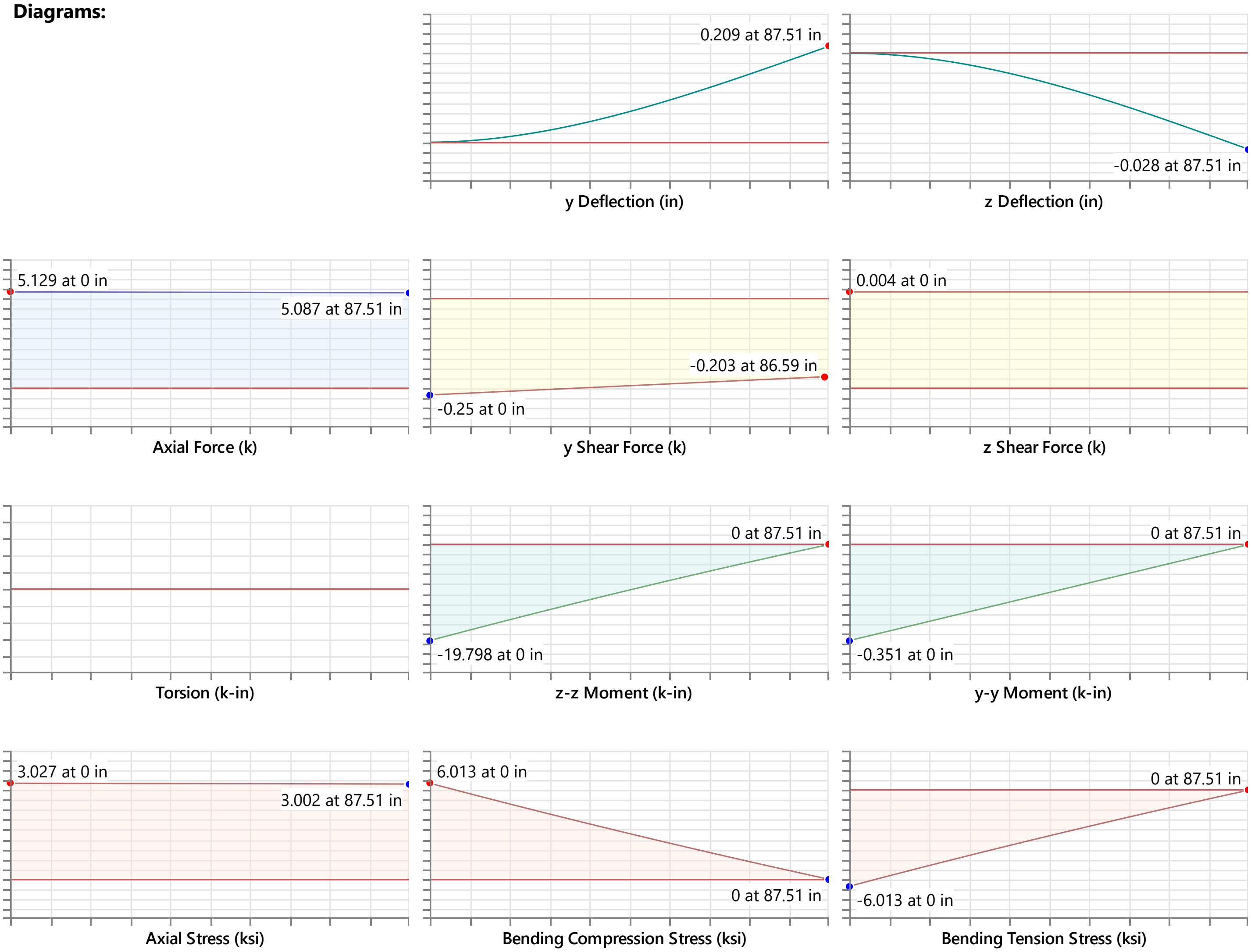
d (in):	5.743	**Area (in^2):**	1.695	**r_T (in):**	1.043
b_f (in):	3.911	**Z_{yy} (in^3):**	1.064	**J (in^4):**	0.012
t_f (in):	0.136	**Z_{zz} (in^3):**	3.954	**k_{det} (in):**	0
t_w (in):	0.1	**C_w (in^6):**	10.661	**k_{des} (in):**	0
I_{yy} (in^4):	1.358	**W_{no} (in^2):**	5.482		
I_{zz} (in^4):	10.323	**S_w (in^4):**	0.729		

Design Properties

$L_{b\ y\text{-}y}$ (in):	87.513	**$K_{y\text{-}y}$:**	1	**Seismic DR:**	None
$L_{b\ z\text{-}z}$ (in):	87.513	**$K_{z\text{-}z}$:**	1	**Max Defl Ratio:**	L/419
$L_{comp\ top}$:	Lbyy	**y sway:**	No	**Max Defl Location:**	87.513
$L_{comp\ bot}$ (in):	87.513	**z sway:**	No	**Span:**	N/A
L_{torque} (in):	87.513	**Function:**	Lateral	**τ_b:**	1

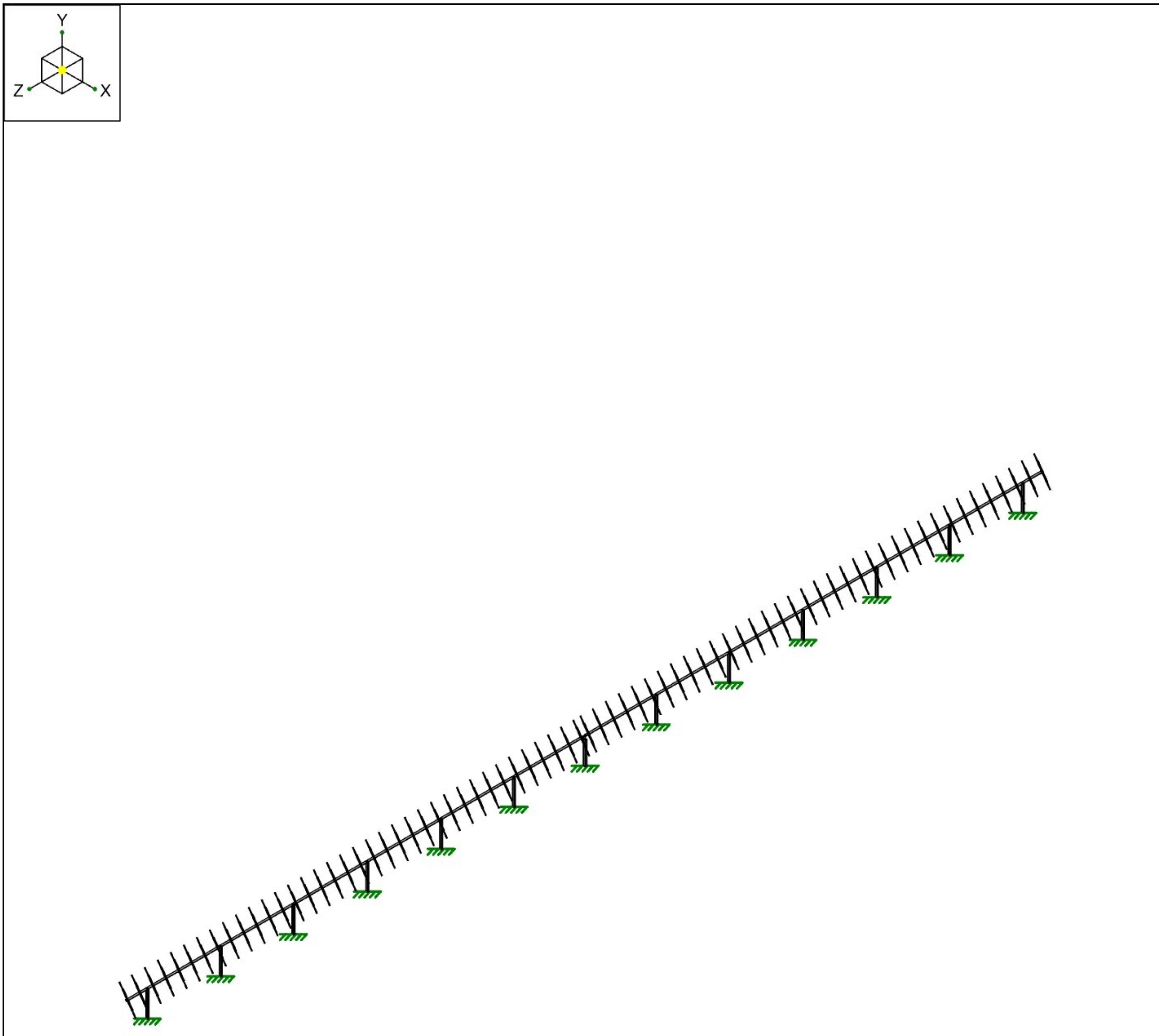


Diagrams:



AISC 15th (360-16): ASD Code Check

Limit State	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	-	-	-	-
Applied Loading - Shear + Torsion	-	-	-	-
Axial Tension Analysis	0 k	50.737 k	-	-
Axial Compression Analysis	5.129 k	24.82 k	-	-
Flexural Analysis (Strong Axis)	19.798 k-in	85.278 k-in	-	-
Flexural Analysis (Weak Axis)	0.351 k-in	25.796 k-in	-	-
Shear Analysis (Major Axis y)	0.25 k	10.317 k	**0.024**	**PASS**
Shear Analysis (Minor Axis z)	0.004 k	19.11 k	**0.0002099**	**PASS**
Bending & Axial Interaction Check (UC Bending Max)	-	-	**0.425**	**PASS**



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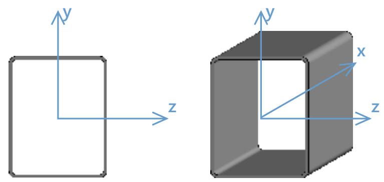
	JRD		Jun 24, 2024 at 03:55 PM
			24_0528 1x70 FTS TSM-54…

Detail Report: Tube 1

Load Combination: LC 2: IBC 16-10 **Code check:** 0.912 (axial/bending)



Input Data

Shape:	5X4X0.134	**I Node:**	GA
Member Type:	Beam	**J Node:**	VX1E
Length (in):	1541.985	**I Release:**	Fixed
Material Type:	Hot Rolled Steel	**J Release:**	Fixed
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	191	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): ASD	**T/C Only:**	Both Way

Material Properties

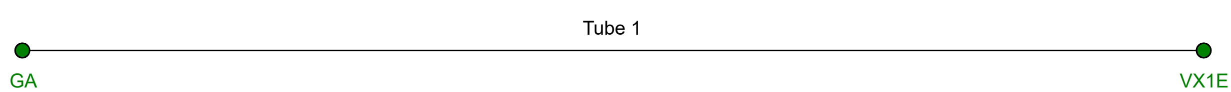
Material:	A500 Gr. 60	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	70
E (ksi):	29000	**Density (k/ft^3):**	0.49	**R_t:**	1.2
G (ksi):	11154	**F_y (ksi):**	60		
Nu:	0.3	**R_y:**	1.5		

Shape Properties

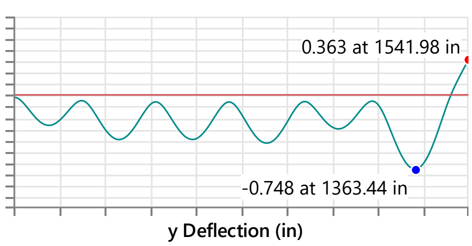
d (in):	5	**I_{yy} (in^4):**	6.17	**J (in^4):**	10.861
b_f (in):	4	**I_{zz} (in^4):**	8.714		
t (in):	0.134	**Area (in^2):**	2.34		

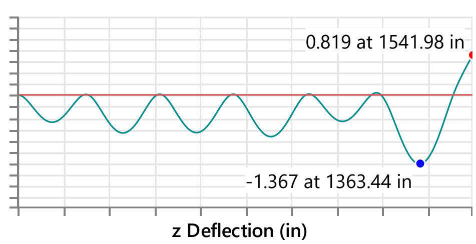
Design Properties

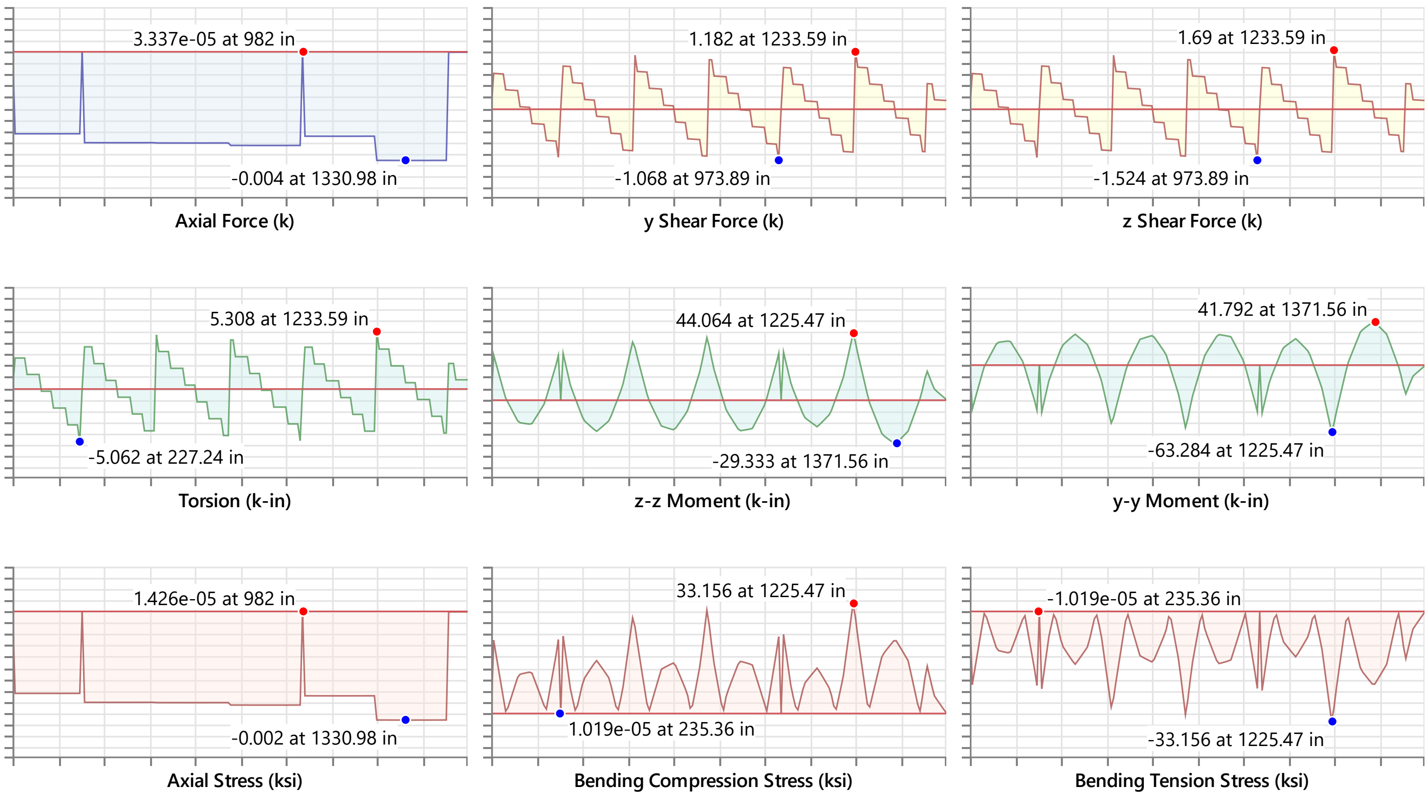
$L_{b\ y\text{-}y}$ (in):	245	**$K_{y\text{-}y}$:**	1	**Seismic DR:**	None
$L_{b\ z\text{-}z}$ (in):	245	**$K_{z\text{-}z}$:**	1	**Max Defl Ratio:**	L/1445
$L_{comp\ top}$:	Lbyy	**y sway:**	No	**Max Defl Location:**	1363.439
$L_{comp\ bot}$ (in):	245	**z sway:**	No	**Span:**	1
L_{torque} (in):	1541.985	**Function:**	Lateral	**τ_b:**	1



Diagrams:





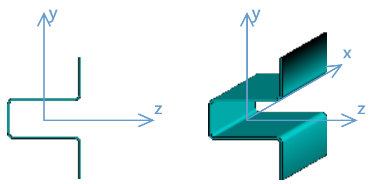


AISC 15th (360-16): ASD Code Check

Limit State	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	-	-	-	-
Applied Loading - Shear + Torsion	-	-	-	-
Axial Tension Analysis	0.003 k	84.078 k	-	-
Axial Compression Analysis	0 k	15.45 k	-	-
Flexural Analysis (Strong Axis)	44.064 k-in	139.548 k-in	-	-
Flexural Analysis (Weak Axis)	63.284 k-in	106.058 k-in	-	-
Shear Analysis (Major Axis y)	2.479 k	26.564 k	**0.093**	**PASS**
Shear Analysis (Minor Axis z)	2.705 k	20.787 k	**0.13**	**PASS**
Bending & Axial Interaction Check (UC Bending Max)	-	-	**0.912**	**PASS**
Torsional Analysis	4.069 k-in	108.481 k-in	**0.038**	**PASS**

Detail Report: VP 3

Load Combination: LC 2: IBC 16-10 **Code check:** 0.387 (axial/bending)



Input Data

Shape:	V-HU-2.25X0.074X1.25	**I Node:**	V3B
Member Type:	Beam	**J Node:**	V3C
Length (in):	55.118	**I Release:**	Fixed
Material Type:	Cold Formed Steel	**J Release:**	Fixed
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	191	**J Offset:**	N/A
Design Code:	AISI S100-16: ASD	**T/C Only:**	Both Way

Material Properties

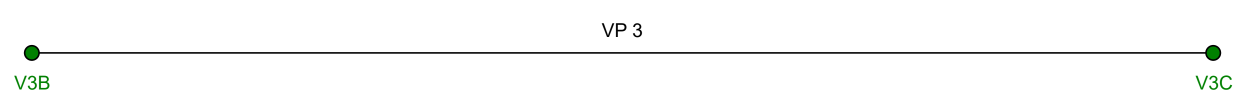
Material:	A653 Grade 60	**Nu:**	0.3	**F_y (ksi):**	60
E (ksi):	29500	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	70
G (ksi):	11346	**Density (k/ft^3):**	0.49		

Shape Properties

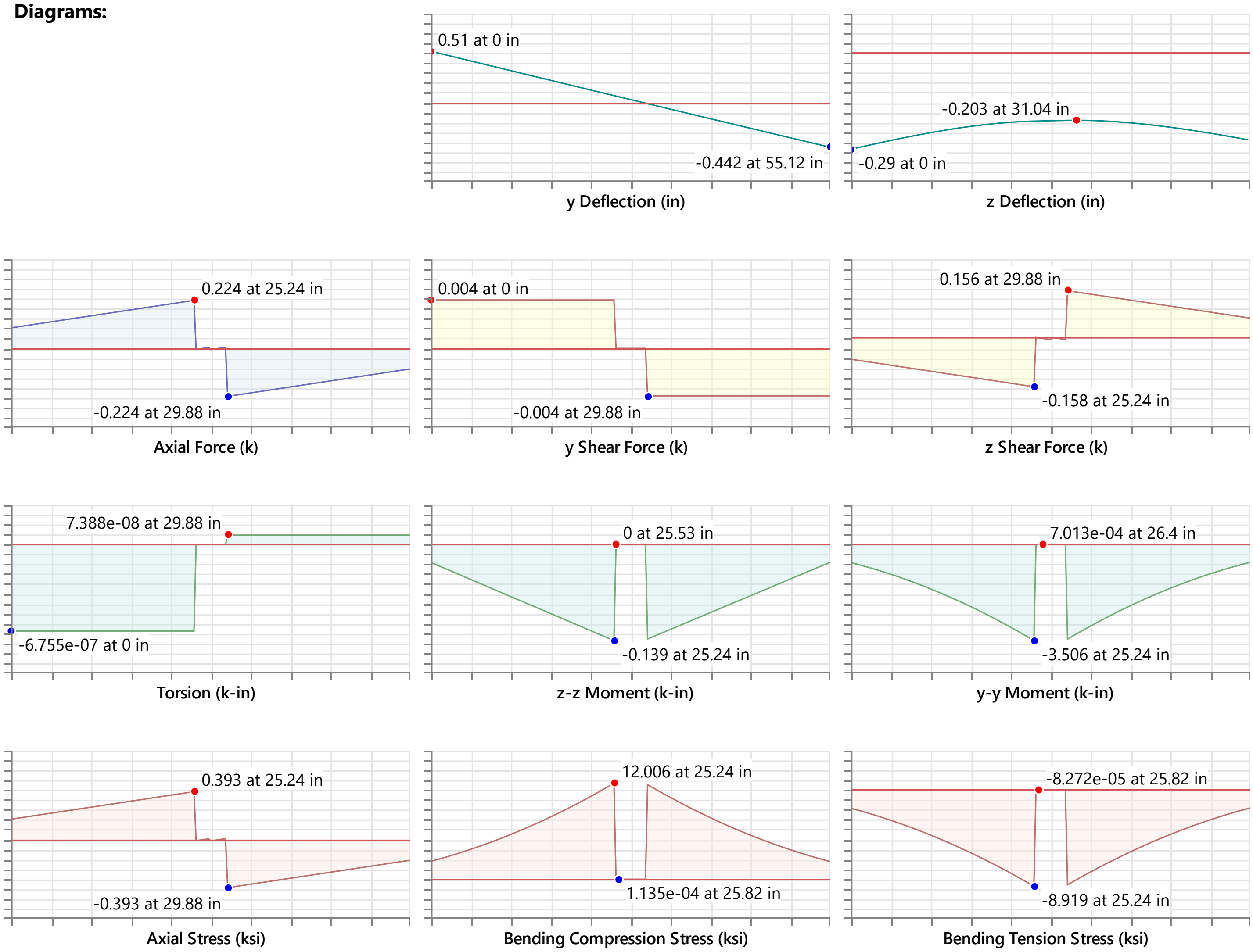
D (in):	2.25	**C_w (in^6):**	0.27	**$S_{et,z}$ (in^3):**	0.187
B (in):	1.25	**r_o (in):**	1.852	**$S_{f,z}$ (in^3):**	0.218
t (in):	0.074	**X_c (in):**	1.265	**$S_{fy,z}$ (in^3):**	0.218
R (in):	0.112	**m (in):**	0.162	**$S_{e,y}$ (in^3):**	0.308
d (in):	1.25	**j (in):**	1.566	**$S_{et,y}$ (in^3):**	0.308
I_{yy} (in^4):	0.401	**r_z (in):**	0.831	**$S_{f,y}$ (in^3):**	0.308
I_{zz} (in^4):	0.393	**r_y (in):**	0.839	**$S_{fy,y}$ (in^3):**	0.423
Area (in^2):	0.57	**x_0 (in):**	-1.426		
J (in^4):	0.001	**$S_{e,z}$ (in^3):**	0.341		

Design Properties

$L_{b\ y\text{-}y}$ (in):	55.118	**$C_{m\ z\text{-}z}$:**	0.991	**a:**	N/A
$L_{b\ z\text{-}z}$ (in):	55.118	**$K_{y\text{-}y}$:**	1	**Function:**	Lateral
$L_{comp\ top}$:	Lbyy	**$K_{z\text{-}z}$:**	1	**Max Defl Ratio:**	L/10000
$L_{comp\ bot}$ (in):	55.118	**R:**	N/A	**Max Defl Location:**	0
C_b:	1	**y sway:**	No	**Span:**	N/A
$C_{m\ y\text{-}y}$:	0.85	**z sway:**	No		



Diagrams:

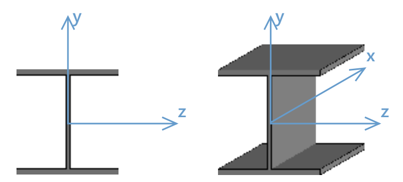


AISI S100-16: ASD Code Check

Limit State	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	-	-	-	-
Applied Loading - Shear + Torsion	-	-	-	-
Axial Tension Analysis	0 k	20.467 k	-	-
Axial Compression Analysis	0.224 k	4.488 k	-	-
Flexural Analysis (Strong Axis)	0.139 k-in	6.714 k-in	-	-
Flexural Analysis (Weak Axis)	3.506 k-in	11.079 k-in	-	-
Shear Analysis (Major Axis y)	0.004 k	1.462 k	**0.003**	**PASS**
Shear Analysis (Minor Axis z)	0.158 k	6.254 k	**0.025**	**PASS**
Bending & Axial Interaction Check (UC Bending Max)	-	-	**0.387**	**PASS**

Detail Report: DP1

Load Combination: LC 15: IBC 16-12 (D) (B) **Code check:** 0.119 (axial/bending)



Input Data

Shape:	W6X20_MO_35	**I Node:**	D1
Member Type:	Column	**J Node:**	D2
Length (in):	78	**I Release:**	Fixed
Material Type:	Hot Rolled Steel	**J Release:**	Fixed
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	191	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): ASD	**T/C Only:**	Both Way

Material Properties

Material:	A992	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	65
E (ksi):	29000	**Density (k/ft^3):**	0.49	**R_t:**	1.1
G (ksi):	11154	**F_y (ksi):**	50		
Nu:	0.3	**R_y:**	1.1		

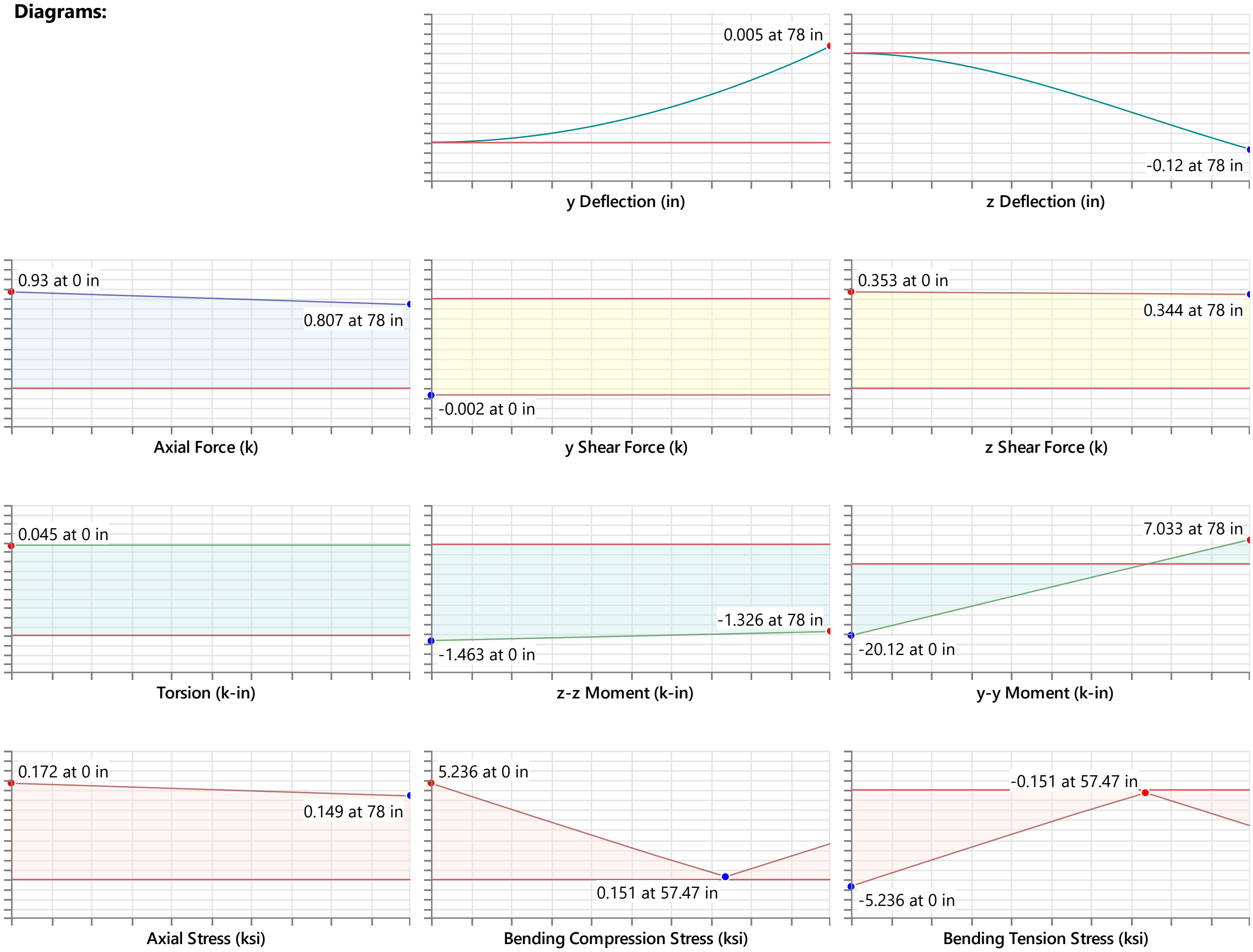
Shape Properties

d (in):	6.171	**Area (in^2):**	5.412	**r_T (in):**	1.645
b_f (in):	5.991	**Z_{yy} (in^3):**	6.126	**J (in^4):**	0.199
t_f (in):	0.336	**Z_{zz} (in^3):**	13.802	**k_{det} (in):**	0
t_w (in):	0.231	**C_w (in^6):**	102.544	**k_{des} (in):**	0
I_{yy} (in^4):	12.052	**W_{no} (in^2):**	8.739		
I_{zz} (in^4):	38.334	**S_w (in^4):**	4.398		

Design Properties

$L_{b\ y\text{-}y}$ (in):	78	**$K_{y\text{-}y}$:**	1	**Seismic DR:**	None
$L_{b\ z\text{-}z}$ (in):	78	**$K_{z\text{-}z}$:**	1	**Max Defl Ratio:**	L/647
$L_{comp\ top}$:	Lbyy	**y sway:**	No	**Max Defl Location:**	78
$L_{comp\ bot}$ (in):	78	**z sway:**	No	**Span:**	N/A
L_{torque} (in):	78	**Function:**	Lateral	**τ_b:**	1

Diagrams:

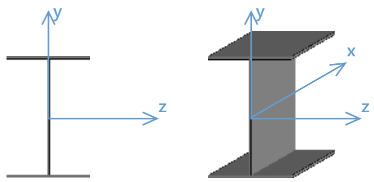


AISC 15th (360-16): ASD Code Check

Limit State	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	-	-	-	-
Applied Loading - Shear + Torsion	-	-	-	-
Axial Tension Analysis	0 k	162.047 k	-	-
Axial Compression Analysis	0.93 k	132.704 k	-	-
Flexural Analysis (Strong Axis)	1.463 k-in	399.39 k-in	-	-
Flexural Analysis (Weak Axis)	20.593 k-in	183.419 k-in	-	-
Shear Analysis (Major Axis y)	0.05 k	28.51 k	**0.002**	**PASS**
Shear Analysis (Minor Axis z)	0.498 k	72.322 k	**0.007**	**PASS**
Bending & Axial Interaction Check (UC Bending Max)	-	-	**0.119**	**PASS**

Detail Report: Idler Post 8

Load Combination: LC 3: IBC 16-12 (A) **Code check:** 0.551 (axial/bending)



Input Data

Shape:	W6X7_MO_35	**I Node:**	N900
Member Type:	Column	**J Node:**	N901
Length (in):	87.513	**I Release:**	Fixed
Material Type:	Hot Rolled Steel	**J Release:**	Custom
Design Rule:	Typical	**I Offset:**	N/A
Internal Sections:	191	**J Offset:**	N/A
Design Code:	AISC 15th (360-16): ASD	**T/C Only:**	Both Way

Material Properties

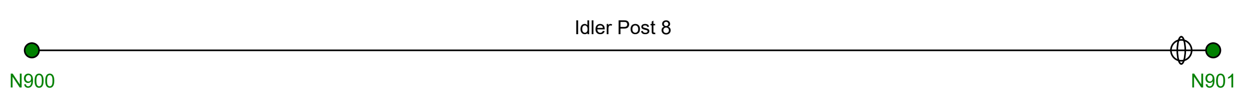
Material:	A992	**Therm. Coeff. (/1E5 F):**	0.65	**F_u (ksi):**	65
E (ksi):	29000	**Density (k/ft^3):**	0.49	**R_t:**	1.1
G (ksi):	11154	**F_y (ksi):**	50		
Nu:	0.3	**R_y:**	1.1		

Shape Properties

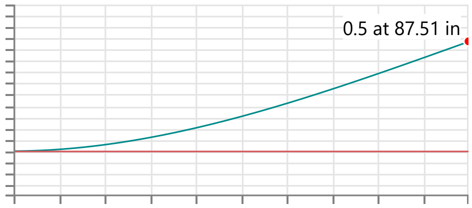
d (in):	5.743	**Area (in^2):**	1.695	**r_T (in):**	1.043
b_f (in):	3.911	**Z_{yy} (in^3):**	1.064	**J (in^4):**	0.012
t_f (in):	0.136	**Z_{zz} (in^3):**	3.954	**k_{det} (in):**	0
t_w (in):	0.1	**C_w (in^6):**	10.661	**k_{des} (in):**	0
I_{yy} (in^4):	1.358	**W_{no} (in^2):**	5.482		
I_{zz} (in^4):	10.323	**S_w (in^4):**	0.729		

Design Properties

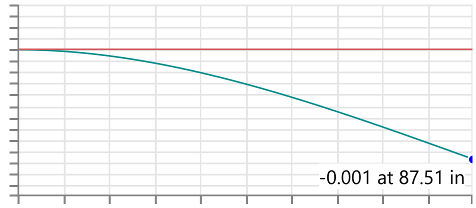
$L_{b\ y\text{-}y}$ (in):	87.513	**$K_{y\text{-}y}$:**	1	**Seismic DR:**	None
$L_{b\ z\text{-}z}$ (in):	87.513	**$K_{z\text{-}z}$:**	1	**Max Defl Ratio:**	L/175
$L_{comp\ top}$:	Lbyy	**y sway:**	No	**Max Defl Location:**	87.513
$L_{comp\ bot}$ (in):	87.513	**z sway:**	No	**Span:**	N/A
L_{torque} (in):	87.513	**Function:**	Lateral	**τ_b:**	1



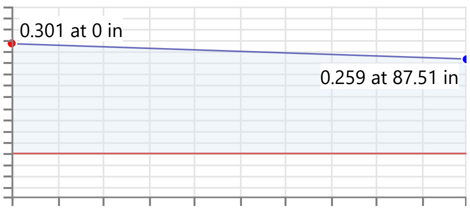
Diagrams:



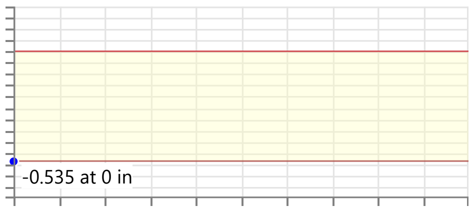
y Deflection (in)



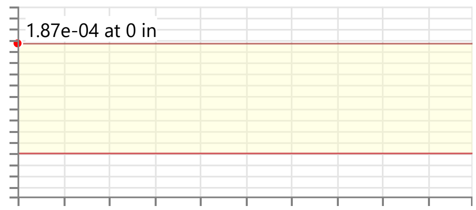
z Deflection (in)



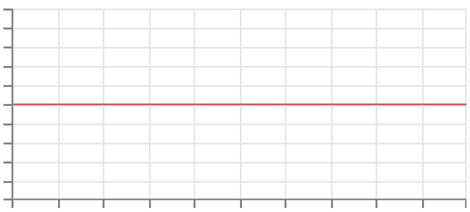
Axial Force (k)

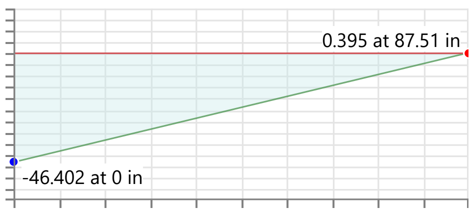


y Shear Force (k)

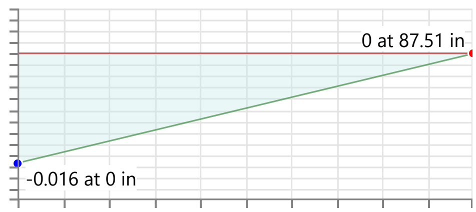


z Shear Force (k)

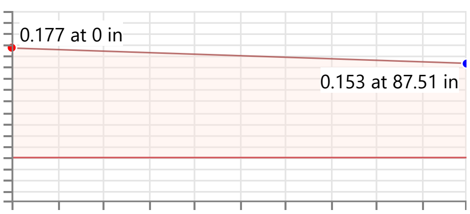

Torsion (k-in)



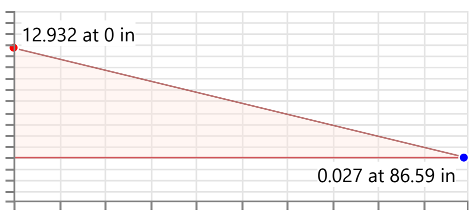
z-z Moment (k-in)



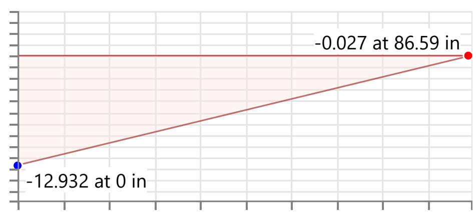
y-y Moment (k-in)



Axial Stress (ksi)



Bending Compression Stress (ksi)



Bending Tension Stress (ksi)

AISC 15th (360-16): ASD Code Check

Limit State	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	-	-	-	-
Applied Loading - Shear + Torsion	-	-	-	-
Axial Tension Analysis	0 k	50.737 k	-	-
Axial Compression Analysis	0.301 k	24.82 k	-	-
Flexural Analysis (Strong Axis)	46.402 k-in	85.278 k-in	-	-
Flexural Analysis (Weak Axis)	0.016 k-in	25.796 k-in	-	-
Shear Analysis (Major Axis y)	0.535 k	10.317 k	**0.052**	**PASS**
Shear Analysis (Minor Axis z)	0.000187 k	19.11 k	**9.784e-6**	**PASS**
Bending & Axial Interaction Check (UC Bending Max)	-	-	**0.551**	**PASS**

FLEXRACK
37 HUNTERS LANE FOUNDATION CALCULATIONS

General Design Basis

Foundation design was derived in part from a review by Flexrack's (FR) in-house professional geotechnical foundation engineer of published soil and geologic mapping, noting local geohazards known to exist in proximity of the site. Foundation design parameters were developed based on applying experience and generally accepted geotechnical foundation engineering principles and practices to an independent review and evaluation of the field and laboratory data (borehole logs and laboratory index, strength, and settlement data) appended to a geotechnical evaluation report prepared by Others. While due consideration was given to the opinions and interpretations expressed by the consultant who prepared the report, FR formulated its own professional opinions surrounding the gathered data and assumes full responsibility for its independent interpretation and evaluation of the provided field and laboratory information, and its application of this information to the design of foundations to support FR's unique racking system.

Axial Design Basis

Experience and available field and laboratory strength information were used to develop a multilayer geologic model which was used to evaluate the response of a W6x20 and a W6x7 to the design axial load. The governing axial loads considered and the corresponding ASCE 7 basic load combinations (as applicable) are shown in Table 1.

Table 1: Design Axial Loads

Section	Load	ASCE 7 Basic Load Combination
W6x20	Axial Down: 5,272 lb.	D + S
	Axial Up: N/A lb.	N/A
	Axial (Frost): 10,193 lb.	N/A
W6x7	Axial Down: 5,607 lb.	D + S
	Axial Up: 450 lb.	0.6D + 0.6W
	Axial (Frost): 8,086 lb.	N/A

The subsurface investigation program included five boreholes. In each borehole, measurements of Standard penetration resistance with depth (following ASTM D1586) were made. Individual and averaged penetration resistance values are plotted with depth on Figure 1, attached to these calculations for reference. Under a total stress analysis, an averaged unit frictional resistance for each layer was estimated from empirical correlations contained in published literature. From the available geotechnical information, a 2.5-foot frost depth was considered, and frost action forces were calculated using an averaged tangential frost stress (adfreeze bond) of 13.9 pounds per square inch (psi) across the upper 30 inches of subsurface material. Classical soil mechanics were applied to the subsurface materials below 30 inches.

Axial Calculations

From the available geotechnical information and the multilayer analysis, an averaged allowable unit frictional resistance ($f_{s,\,all}$) of 450 pounds per square foot (psf) was considered for the subsurface materials to a depth of 5 feet, 370 psf to a depth of 10 feet, and 800 psf thereafter to a depth of 15 feet below ground surface. These values include a minimum safety factor of 2.0. In the calculation of axial capacity, post tip resistance was not considered. From this information, the minimum axial embedment depth requirement for a given section was computed from the following relationship:

$$d_{e,axial} = \frac{P_{max,axial}}{\sum_1^n f_{s,all,i}\; x\; A_{s,i}} + \; 2.5\; ft.$$

Where:

$d_{e,\ axial}$ = minimum axial embedment depth requirement
$P_{max,\ axial}$ = maximum axial load (lb.)
$f_{s,all,i}$ = allowable side unit frictional resistance applied over the i^{th} layer
$A_{s,i}$ = section unit surface area (ft.^{2}/ft.) across the ith layer
n = total number of layers
h_i = thickness of i^{th} layer

In the calculation of drive post (W6x20) axial capacity, the contribution to axial resistance from the upper 30 inches of subsurface material was neglected. The axial calculation is as follows.

Layer 1: 0 ft. – 5 ft. $P_1 = f_{s,i} x\ A_{s,i} x\ h_i =\ 450$ lb./ft^2 x 2.04 ft.^{2}/ft. x 2.5 ft. = 2,292 lb.

∴ $P_{max,\ axial} - P_1$ = 10,193 lb. – 2,292 lb. = 7,901 lb.

Where P_1 = load transfer to i^{th} layer

Layer 2: 0 ft. – 3 ft. $P_2 = f_{s,i} x\ A_{s,i} x\ h_i =\ 370$ lb./ft^2 x 2.04 ft.^{2}/ft. x 5.0 ft. = 3,769 lb.

∴ $P_{net,\ axial} - P_2$ = 7,901 lb. – 3,769 lb. = 4,133 lb.

Layer 3 3 ft. – 8 ft.: $d_{e,axial} = \frac{P_{net,axial}}{f_{s,i}A_{s,i}} = \frac{4{,}133\ lb.}{800\frac{lb.}{ft^2} x\ 2.04\ \frac{ft^2}{ft}}$ = 2.5 ft.

Where $P_{net,\ axial}$ = remaining net load to be transferred to soil.

∴ $d_{e,\ axial}$ = 2.5 ft. + 2.5 ft. + 5.0 ft. + 2.5 ft. = 12 ft. 6 in.

In the calculation of idler post (W6x7) axial capacity, the contribution to axial resistance from the upper 30 inches of subsurface material was neglected. The axial calculation is as follows.

Layer 1: 0 ft. – 5 ft. $P_1 = f_{s,i} x\ A_{s,i} x\ h_i =\ 450$ lb./ft^2 x 1.62 ft.^{2}/ft. x 2.5 ft. = 1,818 lb.

∴ $P_{max,\ axial} - P_1$ = 8,086 lb. – 1,818 lb. = 6,268 lb.

Where P_1 = load transfer to i^{th} layer

Layer 2: 0 ft. – 3 ft. $P_2 = f_{s,i} x\ A_{s,i} x\ h_i =\ 370$ lb./ft^2 x 1.62 ft.^{2}/ft. x 5.0 ft. = 2,990 lb.

∴ $P_{net,\ axial} - P_2$ = 6,268 lb. – 2,990 lb. = 3,278 lb.

Layer 3 3 ft. – 8 ft.: $d_{e,axial} = \frac{P_{net,axial}}{f_{s,i}A_{s,i}} = \frac{3{,}278\ lb.}{800\frac{lb.}{ft^2} x\ 1.62\ \frac{ft^2}{ft}}$ = 2.5 ft.

Where $P_{net,\ axial}$ = remaining net load to be transferred to soil.

∴ $d_{e,\ axial}$ = 2.5 ft. + 2.5 ft. + 5.0 ft. + 2.5 ft. = 12 ft. 6 in.

Lateral Design Basis

Experience and the averaged records of penetration resistance and undrained strength with depth and the site-specific subsurface conditions were used to develop a model in LPILE to evaluate the lateral response of the driven W6x20 and W6x7 to the design loads. The design loads (ASCE 7) considered are shown in Table 2.

Table 2: Loads Used in the Lateral Analysis (ASCE 7)

SECTION	AXIAL (D +S)	LATERAL LOADS			
		STRONG AXIS SHEAR (0.6D + 0.6W)	STRONG AXIS MOMENT (0.6D + 0.6W)	WEAK AXIS SHEAR (D + 0.7E) (N/A)	WEAK AXIS MOMENT (D + 0.7E)
W6x20	5,272 lb.* (down)	318 lb.**	-122,774 lb. in.**	372 lb.*	20,125 lb.-in.**
W6x7	5,607 lb.* (down)	532 lb.**	-46,614 lb.-in.**	50 lb.	1,726 lb.-in.**

*0 deg. slew ** 55 deg. slew

In order to account for the loss of the upper 12 inches of subsurface material, the design loads were developed by extending the structural modeling 12 inches below ground surface. In the application of lateral loading to the post, FR conservatively applied the largest loads from select load cases regardless of whether the loads occurred together. Further, in the estimation of the post response to the design axial and lateral loads, the contribution to lateral resistance from the upper 30 inches of subsurface material was reduced using a p-y modification factor of 0.7. The input parameters used in the multilayer model are shown in Table 3.

Table 3: Modeled Subsurface Conditions

LAYER	DEPTH	p-y RELATIONSHIP	UNIT WEIGHT γ	COHESION C_u	ANGLE OF SHEARING RESISTANCE ϕ	STRAIN AT 50 % STRESS ε_{50}	LATERAL SUBGRADE MODULUS k
1	0 – 5 ft.	Sand	125 pcf	--	33°	--	0*
2	5 – 10 ft.		63 pcf	--	33°	--	0*
3	10 – 15 ft.		68 pcf	--	44°	--	0*

*LPILE Default Value

Lateral Calculations

Finite difference numerical methods (LPILE) were applied to calculate the response of the W6x20 and W6x7 posts to the design axial and lateral loads. The result of these calculations is contained in Table 4 below. The design loads were applied to each section modeled at the ground surface. In order to account for section loss at the design life, the posts were modeled in LPILE assuming the reduced section dimensions.

Table 4: Lateral Analysis of W6x20 and W6x7 Post

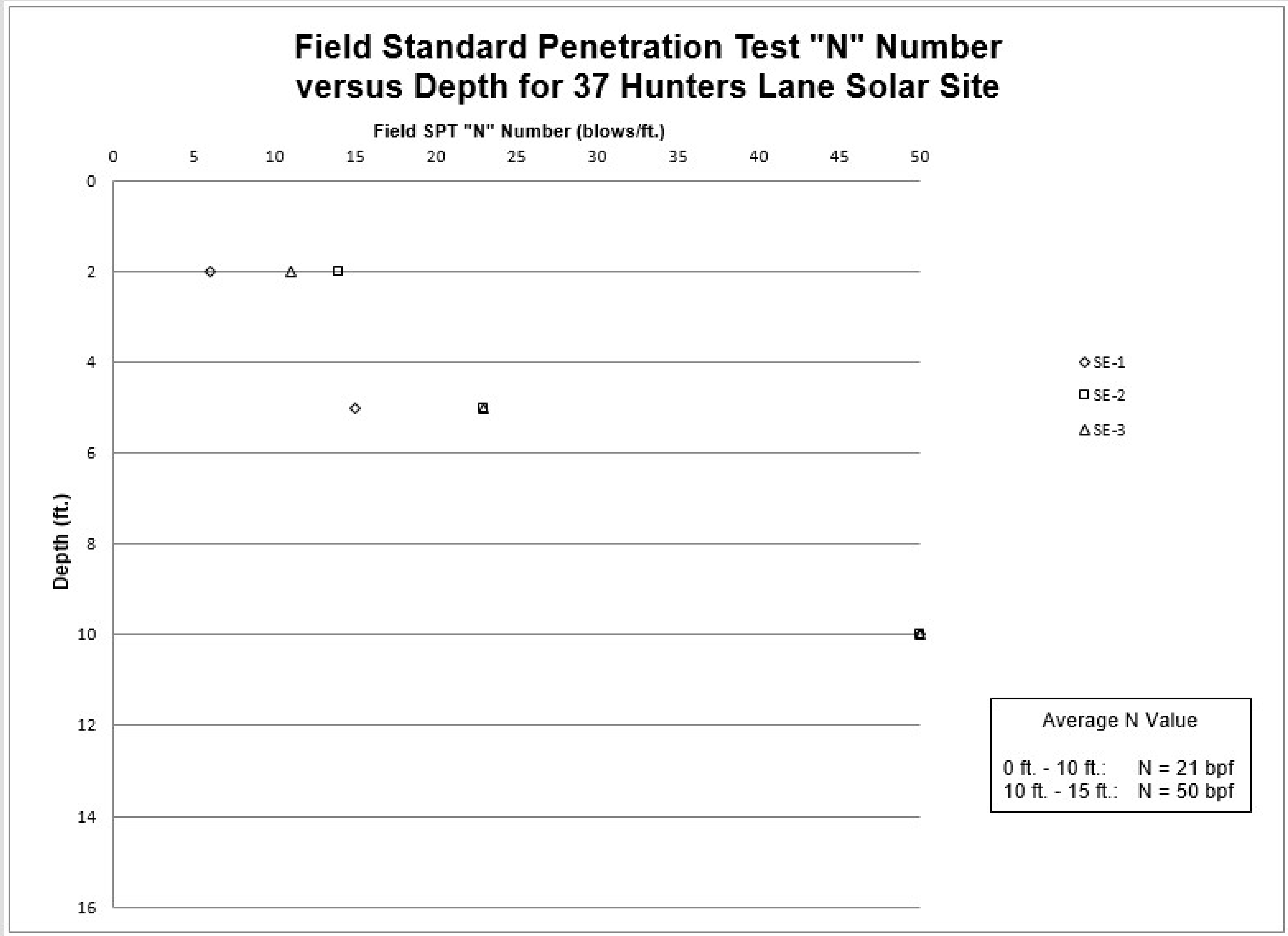
SECTION	MIN EMBEDMENT DEPTH	DEFLECTION AT GRADE (STRONG AXIS)	DEFLECTION AT GRADE (WEAK AXIS)	MAXIMUM MOMENT (STRONG AXIS)	MAXIMUM MOMENT (WEAK AXIS)
W6x20	10 ft. 6 in.	0.21 in.	0.08 in.	125,789 lb.-in.	24,245 lb.-in.
W6x7	8 ft. 6 in.	0.24 in.	0.02 in.	53,924 lb.-in.	2,080 lb.-in.

LPILE outputs are attached to these design calculations for reference.

Conclusion

From a comparison of the minimum embedment depth requirements to satisfy axial and lateral stability, axial stability governed the design of W6x20 and W6x7 posts. **The minimum design embedment depth required for a W6x20 to resist the design axial and lateral loads is 12 ft. 6 in. and the minimum embedment depth required for the W6x7 post to resist the design axial and lateral loads is 12 ft. 6 in.**

FIGURES



PROJECT	37 HUNTERS LANE SOLAR SITE
TITLE	PENETRATION RESISTANCE WITH DEPTH
CLIENT	HORTON ELECTRICAL SERVICE

DESIGNED BY	FR	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	FR	2024		1	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LPILE OUTPUTS

W6X20 DRIVE POST

```
================================================================================

                    LPile for Windows, Version 2019-11.007

                Analysis of Individual Piles and Drilled Shafts
               Subjected to Lateral Loading Using the p-y Method
                         © 1985-2019 by Ensoft, Inc.
                             All Rights Reserved

================================================================================

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--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:
\Quoting\Horton Electrical Services\2024\Tritec Portfolio - Various, CT\37 Hunters
Lane - Southington, CT 06489\Geotech\Design\LPILE\

Name of input data file:
37 Hunters Lane_W6x20_Avg_SA-Z1.lp11d

Name of output report file:
37 Hunters Lane_W6x20_Avg_SA-Z1.lp11o

Name of plot output file:
37 Hunters Lane_W6x20_Avg_SA-Z1.lp11p

Name of runtime message file:
37 Hunters Lane_W6x20_Avg_SA-Z1.lp11r


--------------------------------------------------------------------------------
                            Date and Time of Analysis
--------------------------------------------------------------------------------
```

Date: November 4, 2024 Time: 13:40:26

Problem Title

Project Name: 37 Hunters Lane Solar

Location: Southington, CT

Client: Horton Electric

Engineer: K. Dy

Description: Lateral analysis of W6x20 post (strong axis)-Z1

Program Options and Settings

Computational Options:
 - Conventional Analysis
Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:
 - Maximum number of iterations allowed = 500
 - Deflection tolerance for convergence = 1.0000E-05 in
 - Maximum allowable deflection = 100.0000 in
 - Number of pile increments = 50

Loading Type and Number of Cycles of Loading:
 - Static loading specified

- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Input of side resistance moment along pile not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

```
Number of pile sections defined                          =            1
Total length of pile                                      =       12.500 ft
Depth of ground surface below top of pile                 =       0.0000 ft
```

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	5.9910
2	12.500	5.9910

Input Structural Properties for Pile Sections:

Pile Section No. 1:

```
   Section 1 is an elastic pile
   Cross-sectional Shape                                  = Strong H-Pile
```

```
   Length of section                                      =    12.500000 ft
   Flange Width                                           =     5.991000 in
   Section Depth                                          =     6.171000 in
   Flange Thickness                                       =     0.336000 in
   Web Thickness                                          =     0.231000 in
   Section Area                                           =     5.296221 sq. in
   Moment of Inertia                                      =    37.506972 in^4
   Elastic Modulus                                        =    29000000. psi



--------------------------------------------------------------------------------
                       Ground Slope and Pile Batter Angles
--------------------------------------------------------------------------------

Ground Slope Angle                                        =        0.000 degrees
                                                          =        0.000 radians

Pile Batter Angle                                         =        0.000 degrees
                                                          =        0.000 radians


--------------------------------------------------------------------------------
                       Soil and Rock Layering Information
--------------------------------------------------------------------------------

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer              =       0.0000 ft
   Distance from top of pile to bottom of layer           =     5.000000 ft
   Effective unit weight at top of layer                  =   125.000000 pcf
   Effective unit weight at bottom of layer               =   125.000000 pcf
   Friction angle at top of layer                         =    33.000000 deg.
   Friction angle at bottom of layer                      =    33.000000 deg.
   Subgrade k at top of layer                             =       0.0000 pci
   Subgrade k at bottom of layer                          =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer              =     5.000000 ft
   Distance from top of pile to bottom of layer           =    10.000000 ft
   Effective unit weight at top of layer                  =    63.000000 pcf
   Effective unit weight at bottom of layer               =    63.000000 pcf
   Friction angle at top of layer                         =    33.000000 deg.
   Friction angle at bottom of layer                      =    33.000000 deg.
```

```
   Subgrade k at top of layer                           =       0.0000 pci
   Subgrade k at bottom of layer                        =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer            =    10.000000 ft
   Distance from top of pile to bottom of layer         =    15.000000 ft
   Effective unit weight at top of layer                =    68.000000 pcf
   Effective unit weight at bottom of layer             =    68.000000 pcf
   Friction angle at top of layer                       =    40.000000 deg.
   Friction angle at bottom of layer                    =    40.000000 deg.
   Subgrade k at top of layer                           =       0.0000 pci
   Subgrade k at bottom of layer                        =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

 (Depth of the lowest soil layer extends 2.500 ft below the pile tip)



--------------------------------------------------------------------------------
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------

Layer         Soil Type          Layer      Effective    Angle of
Layer           Name             Depth       Unit Wt.    Friction         kpy
 Num.     (p-y Curve Type)        ft           pcf          deg.          pci
-----   -------------------   ----------   ----------   ----------   ----------
  1            Sand                 0.00     125.0000      33.0000      default
          (Reese, et al.)         5.0000     125.0000      33.0000      default
  2            Sand               5.0000      63.0000      33.0000      default
          (Reese, et al.)        10.0000      63.0000      33.0000      default
  3            Sand              10.0000      68.0000      40.0000      default
          (Reese, et al.)        15.0000      68.0000      40.0000      default


--------------------------------------------------------------------------------
                    p-y Modification Factors for Group Action
--------------------------------------------------------------------------------

Distribution of p-y modifiers with depth defined using 2 points

Point      Depth X         p-mult         y-mult
 No.          ft
-----     ----------     ----------     ----------
  1          2.500         0.7000         1.0000
  2         15.000         1.0000         1.0000
```

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

```
Load    Load         Condition              Condition          Axial Thrust
Compute Top y     Run Analysis
 No.    Type            1                       2                Force, lbs
vs. Pile Length
-----   ----   --------------------   -----------------------   ----------------
---------------    ------------
   1     1     V =   318.000000 lbs   M =      122774. in-lbs             5272.
    No               Yes
```

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	13887.
2	5.0000	4.9999	Yes	No	13887.	66264.
3	10.0000	8.3210	Yes	No	80150.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 318.0 lbs
Applied moment at pile head = 122774.0 in-lbs
Axial thrust load on pile head = 5272.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2077	122774.	318.0000	-0.00679	10801.	1.09E+09	0.00	0.00	0.00
0.2500	0.1878	123833.	298.6166	-0.00645	10885.	1.09E+09	-12.9223	206.4158	0.00
0.5000	0.1690	124770.	238.7759	-0.00611	10960.	1.09E+09	-26.9715	478.8489	0.00
0.7500	0.1512	125458.	139.4758	-0.00576	11015.	1.09E+09			

```
-39.2285   778.4611       0.00
    1.0000     0.1344    125789.      6.9546   -0.00541     11042.   1.09E+09
-49.1190      1096.       0.00
    1.2500     0.1187    125671.  -149.9874   -0.00507     11032.   1.09E+09
-55.5090      1403.       0.00
    1.5000     0.1040    125049.  -322.5157   -0.00472     10982.   1.09E+09
-59.5099      1716.       0.00
    1.7500    0.09037    123886.  -507.2203   -0.00438     10890.   1.09E+09
-63.6265      2112.       0.00
    2.0000    0.07774    122144.  -696.6551   -0.00404     10750.   1.09E+09
-62.6634      2418.       0.00
    2.2500    0.06613    119834.  -892.4565   -0.00371     10566.   1.09E+09
-67.8709      3079.       0.00
    2.5000    0.05551    116907.      -1069.   -0.00338     10332.   1.09E+09
-49.5930      2680.       0.00
    2.7500    0.04586    113528.      -1222.   -0.00306     10062.   1.09E+09
-52.9123      3461.       0.00
    3.0000    0.03715    109669.      -1384.   -0.00275      9754.   1.09E+09
-55.0125      4442.       0.00
    3.2500    0.02934    105310.      -1550.   -0.00246      9406.   1.09E+09
-55.6661      5691.       0.00
    3.5000    0.02241    100445.      -1716.   -0.00217      9017.   1.09E+09
-54.6254      7312.       0.00
    3.7500    0.01631     95084.      -1875.   -0.00190      8589.   1.09E+09
-51.5928      9491.       0.00
    4.0000    0.01099     89255.      -2012.   -0.00165      8124.   1.09E+09
-39.6466     10820.       0.00
    4.2500    0.00641     83065.      -2109.   -0.00141      7629.   1.09E+09
-24.7835     11590.       0.00
    4.5000    0.00252     76648.      -2161.   -0.00119      7117.   1.09E+09
-10.4118     12371.       0.00
    4.7500  -7.31E-04     70134.      -2172.  -9.89E-04      6597.   1.09E+09
3.2077     13163.       0.00
    5.0000   -0.00341     63646.      -2152.  -8.04E-04      6079.   1.09E+09
10.0574      8857.       0.00
    5.2500   -0.00556     57246.      -2111.  -6.37E-04      5567.   1.09E+09
17.3577      9373.       0.00
    5.5000   -0.00723     50999.      -2049.  -4.88E-04      5068.   1.09E+09
23.8531      9896.       0.00
    5.7500   -0.00848     44965.      -1969.  -3.56E-04      4587.   1.09E+09
29.4871     10427.       0.00
    6.0000   -0.00937     39194.      -1874.  -2.40E-04      4126.   1.09E+09
34.2271     10964.       0.00
    6.2500   -0.00992     33730.      -1765.  -1.39E-04      3689.   1.09E+09
38.0626     11508.       0.00
    6.5000   -0.01020     28607.      -1647.  -5.32E-05      3280.   1.09E+09
41.0026     12059.       0.00
    6.7500   -0.01024     23851.      -1521.   1.92E-05      2900.   1.09E+09
43.0737     12617.       0.00
    7.0000   -0.01009     19482.      -1390.   7.89E-05      2551.   1.09E+09
```

```
44.3169     13183.        0.00
    7.2500   -0.00977     15512.     -1256.   1.27E-04      2234.   1.09E+09
44.7852     13755.        0.00
    7.5000   -0.00932     11943.     -1122.   1.65E-04      1949.   1.09E+09
44.5413     14334.        0.00
    7.7500   -0.00878      8775.  -989.5956   1.94E-04      1696.   1.09E+09
43.6544     14920.        0.00
    8.0000   -0.00816      5999.  -860.8163   2.14E-04      1475.   1.09E+09
42.1985     15513.        0.00
    8.2500   -0.00749      3603.  -737.1445   2.27E-04      1283.   1.09E+09
40.2494     16114.        0.00
    8.5000   -0.00680      1569.  -619.9455   2.34E-04      1121.   1.09E+09
37.8833     16721.        0.00
    8.7500   -0.00609 -123.7208  -510.3590   2.36E-04      1005.   1.09E+09
35.1744     17335.        0.00
    9.0000   -0.00538     -1500.  -409.3071   2.34E-04      1115.   1.09E+09
32.1936     17956.        0.00
    9.2500   -0.00468     -2587.  -317.5061   2.28E-04      1202.   1.09E+09
29.0071     18584.        0.00
    9.5000   -0.00401     -3413.  -235.4820   2.20E-04      1268.   1.09E+09
25.6756     19219.        0.00
    9.7500   -0.00336     -4007.  -163.5890   2.10E-04      1315.   1.09E+09
22.2530     19861.        0.00
   10.0000   -0.00275     -4401.   -85.7137   1.98E-04      1347.   1.09E+09
29.6639     32386.        0.00
   10.2500   -0.00217     -4527.    10.6666   1.86E-04      1357.   1.09E+09
34.5896     47800.        0.00
   10.5000   -0.00163     -4343.   102.7627   1.74E-04      1342.   1.09E+09
26.8078     49297.        0.00
   10.7500   -0.00113     -3916.   171.6268   1.62E-04      1308.   1.09E+09
19.1016     50811.        0.00
   11.0000   -6.57E-04     -3318.   217.4634   1.52E-04      1260.   1.09E+09
11.4561     52340.        0.00
   11.2500   -2.13E-04     -2616.   240.3842   1.44E-04      1204.   1.09E+09
3.8244     53884.        0.00
   11.5000    2.09E-04     -1880.   240.3227   1.38E-04      1146.   1.09E+09
-3.8654     55445.        0.00
   11.7500    6.16E-04     -1179.   216.9717   1.34E-04      1090.   1.09E+09
-11.7020     57021.        0.00
   12.0000    0.00101 -582.6186   169.7479   1.31E-04      1042.   1.09E+09
-19.7805     58614.        0.00
   12.2500    0.00140 -164.4537    97.7907   1.30E-04      1009.   1.09E+09
-28.1909     60222.        0.00
   12.5000    0.00179      0.00       0.00   1.30E-04   995.4267   1.09E+09
-37.0029     30923.        0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 1:
```

```
Pile-head deflection              =     0.20766662 inches
Computed slope at pile head       =    -0.00678833 radians
Maximum bending moment            =        125789. inch-lbs
Maximum shear force               =         -2172. lbs
Depth of maximum bending moment   =     1.00000000 feet below pile head
Depth of maximum shear force      =     4.75000000 feet below pile head
Number of iterations              =             10
Number of zero deflection points =               2


--------------------------------------------------------------------------------
            Summary of Pile-head Responses for Conventional Analyses
--------------------------------------------------------------------------------

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians


Load Load                Load                  Axial    Pile-head  Pile-head  Max
Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation    in
Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians      lbs
     in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ----------
---------- ----------
  1  V, lb   318.0000  M, in-lb     122774.      5272.     0.2077   -0.00679
-2172.    125789.


Maximum pile-head deflection = 0.2076666216 inches
Maximum pile-head rotation   = -0.0067883251 radians = -0.388942 deg.

The analysis ended normally.
```

```
================================================================================

                    LPile for Windows, Version 2019-11.007

                Analysis of Individual Piles and Drilled Shafts
               Subjected to Lateral Loading Using the p-y Method
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--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:
\Quoting\Horton Electrical Services\2024\Tritec Portfolio - Various, CT\37 Hunters
Lane - Southington, CT 06489\Geotech\Design\LPILE\

Name of input data file:
37 Hunters Lane_W6x20_Avg_WA-Z1.lp11d

Name of output report file:
37 Hunters Lane_W6x20_Avg_WA-Z1.lp11o

Name of plot output file:
37 Hunters Lane_W6x20_Avg_WA-Z1.lp11p

Name of runtime message file:
37 Hunters Lane_W6x20_Avg_WA-Z1.lp11r


--------------------------------------------------------------------------------
                            Date and Time of Analysis
--------------------------------------------------------------------------------
```

Date: November 4, 2024 Time: 13:41:21

Problem Title

Project Name: 37 Hunters Lane Solar

Location: Southington, CT

Client: Horton Electric

Engineer: K. Dy

Description: Lateral analysis of W6x20 post (weak axis)-Z1

Program Options and Settings

Computational Options:
- Conventional Analysis

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	50

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Input of side resistance moment along pile not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

```
Number of pile sections defined                          =            1
Total length of pile                                     =       12.500 ft
Depth of ground surface below top of pile                =       0.0000 ft
```

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	6.1710
2	12.500	6.1710

Input Structural Properties for Pile Sections:

Pile Section No. 1:

```
   Section 1 is an elastic pile
   Cross-sectional Shape                                 =   Weak H-Pile
```

```
   Length of section                                      =    12.500000 ft
   Flange Width                                           =     5.991000 in
   Section Depth                                          =     6.171000 in
   Flange Thickness                                       =     0.336000 in
   Web Thickness                                          =     0.231000 in
   Section Area                                           =     5.296221 sq. in
   Moment of Inertia                                      =    12.047298 in^4
   Elastic Modulus                                        =    29000000. psi



--------------------------------------------------------------------------------
                       Ground Slope and Pile Batter Angles
--------------------------------------------------------------------------------

Ground Slope Angle                                        =        0.000 degrees
                                                          =        0.000 radians

Pile Batter Angle                                         =        0.000 degrees
                                                          =        0.000 radians


--------------------------------------------------------------------------------
                       Soil and Rock Layering Information
--------------------------------------------------------------------------------

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer              =       0.0000 ft
   Distance from top of pile to bottom of layer           =     5.000000 ft
   Effective unit weight at top of layer                  =   125.000000 pcf
   Effective unit weight at bottom of layer               =   125.000000 pcf
   Friction angle at top of layer                         =    33.000000 deg.
   Friction angle at bottom of layer                      =    33.000000 deg.
   Subgrade k at top of layer                             =       0.0000 pci
   Subgrade k at bottom of layer                          =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer              =     5.000000 ft
   Distance from top of pile to bottom of layer           =    10.000000 ft
   Effective unit weight at top of layer                  =    63.000000 pcf
   Effective unit weight at bottom of layer               =    63.000000 pcf
   Friction angle at top of layer                         =    33.000000 deg.
   Friction angle at bottom of layer                      =    33.000000 deg.
```

```
   Subgrade k at top of layer                              =       0.0000 pci
   Subgrade k at bottom of layer                           =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer               =    10.000000 ft
   Distance from top of pile to bottom of layer            =    15.000000 ft
   Effective unit weight at top of layer                   =    68.000000 pcf
   Effective unit weight at bottom of layer                =    68.000000 pcf
   Friction angle at top of layer                          =    40.000000 deg.
   Friction angle at bottom of layer                       =    40.000000 deg.
   Subgrade k at top of layer                              =       0.0000 pci
   Subgrade k at bottom of layer                           =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

 (Depth of the lowest soil layer extends 2.500 ft below the pile tip)
```

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	kpy pci
1	Sand	0.00	125.0000	33.0000	default
	(Reese, et al.)	5.0000	125.0000	33.0000	default
2	Sand	5.0000	63.0000	33.0000	default
	(Reese, et al.)	10.0000	63.0000	33.0000	default
3	Sand	10.0000	68.0000	40.0000	default
	(Reese, et al.)	15.0000	68.0000	40.0000	default

----

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult
1	2.500	0.7000	1.0000
2	15.000	1.0000	1.0000

```
--------------------------------------------------------------------------------
                               Static Loading Type
--------------------------------------------------------------------------------

Static loading criteria were used when computing p-y curves for all analyses.



--------------------------------------------------------------------------------
                Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------

Number of loads specified = 1

Load    Load         Condition              Condition           Axial Thrust
Compute Top y     Run Analysis
 No.    Type            1                       2                 Force, lbs
vs. Pile Length
-----   ----   --------------------   -----------------------   ----------------
---------------    ------------
   1     1     V =   372.000000 lbs   M =       20125. in-lbs             5272.
    No                Yes

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with
specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.



--------------------------------------------------------------------------------
     Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
--------------------------------------------------------------------------------

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:
-------------------
Moment-curvature properties were derived from elastic section properties
```

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	13982.
2	5.0000	4.9999	Yes	No	13982.	67381.
3	10.0000	8.3560	Yes	No	81364.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 372.0 lbs
Applied moment at pile head = 20125.0 in-lbs
Axial thrust load on pile head = 5272.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.07528	20125.	372.0000	-0.00313	6150.	3.49E+08	0.00	0.00	0.00
0.2500	0.06613	21289.	357.9578	-0.00296	6448.	3.49E+08	-9.3615	424.6794	0.00
0.5000	0.05753	22366.	314.8464	-0.00277	6724.	3.49E+08	-19.3795	1010.	0.00
0.7500	0.04951	23266.	243.9007	-0.00257	6954.	3.49E+08			

```
-27.9177      1691.       0.00
    1.0000    0.04209     23911.   150.7415   -0.00237      7119.   3.49E+08
-34.1883      2437.       0.00
    1.2500    0.03529     24245.    42.9040   -0.00216      7205.   3.49E+08
-37.7034      3205.       0.00
    1.5000    0.02911     24237.   -70.1559   -0.00196      7203.   3.49E+08
-37.6699      3882.       0.00
    1.7500    0.02355     23886.  -180.1666   -0.00175      7113.   3.49E+08
-35.6707      4543.       0.00
    2.0000    0.01861     23211.  -278.9584   -0.00155      6940.   3.49E+08
-30.1905      4866.       0.00
    2.2500    0.01427     22261.  -366.2989   -0.00135      6697.   3.49E+08
-28.0364      5894.       0.00
    2.5000    0.01050     21056.  -435.7311   -0.00117      6388.   3.49E+08
-18.2517      5214.       0.00
    2.7500    0.00728     19684.  -488.7013  -9.91E-04      6037.   3.49E+08
-17.0618      7035.       0.00
    3.0000    0.00456     18155.  -532.1772  -8.29E-04      5645.   3.49E+08
-11.9221      7851.       0.00
    3.2500    0.00230     16517.  -559.9408  -6.80E-04      5226.   3.49E+08
-6.5870      8576.       0.00
    3.5000   4.78E-04     14817.  -572.0462  -5.45E-04      4790.   3.49E+08
-1.4833      9313.       0.00
    3.7500  -9.67E-04     13102.  -569.4075  -4.25E-04      4351.   3.49E+08
3.2424     10061.       0.00
    4.0000   -0.00207     11414.  -553.3238  -3.20E-04      3919.   3.49E+08
7.4800     10820.       0.00
    4.2500   -0.00289      9792.  -525.3735  -2.29E-04      3503.   3.49E+08
11.1535     11590.       0.00
    4.5000   -0.00345      8269.  -487.3168  -1.51E-04      3113.   3.49E+08
14.2177     12371.       0.00
    4.7500   -0.00380      6873.  -441.0095  -8.64E-05      2756.   3.49E+08
16.6539     13163.       0.00
    5.0000   -0.00397      5626.  -398.4646  -3.28E-05      2436.   3.49E+08
11.7094      8857.       0.00
    5.2500   -0.00399      4483.  -362.1915   1.07E-05      2144.   3.49E+08
12.4726      9373.       0.00
    5.5000   -0.00390      3452.  -324.1732   4.47E-05      1880.   3.49E+08
12.8730      9896.       0.00
    5.7500   -0.00372      2537.  -285.4510   7.04E-05      1645.   3.49E+08
12.9418     10427.       0.00
    6.0000   -0.00348      1738.  -246.9627   8.88E-05      1440.   3.49E+08
12.7170     10964.       0.00
    6.2500   -0.00319      1052.  -209.5263   1.01E-04      1265.   3.49E+08
12.2406     11508.       0.00
    6.5000   -0.00288   477.1823  -173.8294   1.07E-04      1118.   3.49E+08
11.5573     12059.       0.00
    6.7500   -0.00255     5.9718  -140.4253   1.09E-04   996.9562   3.49E+08
10.7121     12617.       0.00
    7.0000   -0.00222  -368.8304  -109.7331   1.08E-04      1090.   3.49E+08
```

```
9.7493     13183.       0.00
    7.2500   -0.00190  -655.8384   -82.0429   1.03E-04      1163.   3.49E+08
8.7108     13755.       0.00
    7.5000   -0.00160  -864.3599   -57.5240   9.69E-05      1217.   3.49E+08
7.6351     14334.       0.00
    7.7500   -0.00132    -1004.   -36.2364   8.89E-05      1253.   3.49E+08
6.5566     14920.       0.00
    8.0000   -0.00106    -1085.   -18.1442   7.99E-05      1273.   3.49E+08
5.5049     15513.       0.00
    8.2500  -8.39E-04    -1115.    -3.1294   7.05E-05      1281.   3.49E+08
4.5049     16114.       0.00
    8.5000  -6.42E-04    -1106.     8.9921   6.10E-05      1279.   3.49E+08
3.5761     16721.       0.00
    8.7500  -4.73E-04    -1063.    18.4558   5.16E-05      1268.   3.49E+08
2.7331     17335.       0.00
    9.0000  -3.32E-04  -996.4954    25.5341   4.28E-05      1251.   3.49E+08
1.9857     17956.       0.00
    9.2500  -2.16E-04  -911.5664    30.5218   3.46E-05      1229.   3.49E+08
1.3394     18584.       0.00
    9.5000  -1.24E-04  -814.4594    33.7237   2.72E-05      1204.   3.49E+08
0.7953     19219.       0.00
    9.7500  -5.30E-05  -710.0843    35.4434   2.06E-05      1177.   3.49E+08
0.3512     19861.       0.00
   10.0000  -2.44E-07  -602.4521    35.9741   1.50E-05      1150.   3.49E+08
0.00263     32386.       0.00
   10.2500   3.70E-05  -494.7144    35.0929   1.03E-05      1122.   3.49E+08
-0.5901     47800.       0.00
   10.5000   6.16E-05  -392.2208    32.6899   6.50E-06      1096.   3.49E+08
-1.0118     49297.       0.00
   10.7500   7.60E-05  -298.7803    29.2412   3.53E-06      1072.   3.49E+08
-1.2873     50811.       0.00
   11.0000   8.27E-05  -216.8854    25.1447   1.31E-06      1051.   3.49E+08
-1.4436     52340.       0.00
   11.2500   8.39E-05  -147.9535    20.7190  -2.52E-07      1033.   3.49E+08
-1.5069     53884.       0.00
   11.5000   8.12E-05   -92.5635    16.2067  -1.28E-06      1019.   3.49E+08
-1.5013     55445.       0.00
   11.7500   7.62E-05   -50.6728    11.7825  -1.90E-06      1008.   3.49E+08
-1.4481     57021.       0.00
   12.0000   6.98E-05   -21.8082     7.5637  -2.21E-06      1001.   3.49E+08
-1.3644     58614.       0.00
   12.2500   6.29E-05    -5.2205     3.6224  -2.33E-06   996.7638   3.49E+08
-1.2631     60222.       0.00
   12.5000   5.59E-05       0.00       0.00  -2.35E-06   995.4267   3.49E+08
-1.1519     30923.       0.00
```

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.07527533 inches
Computed slope at pile head      =    -0.00313458 radians
Maximum bending moment           =         24245. inch-lbs
Maximum shear force              =  -572.04622548 lbs
Depth of maximum bending moment  =     1.25000000 feet below pile head
Depth of maximum shear force     =     3.50000000 feet below pile head
Number of iterations             =             10
Number of zero deflection points =              2


--------------------------------------------------------------------------------
            Summary of Pile-head Responses for Conventional Analyses
--------------------------------------------------------------------------------

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians


Load Load                Load                  Axial    Pile-head  Pile-head  Max
Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation    in
Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians      lbs
     in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ----------
---------- ----------
  1  V, lb   372.0000  M, in-lb      20125.      5272.    0.07528   -0.00313
-572.0462     24245.


Maximum pile-head deflection = 0.0752753310 inches
Maximum pile-head rotation   = -0.0031345810 radians = -0.179598 deg.

The analysis ended normally.
```

W6X7 IDLER POST

```
==============================================================================

                     LPile for Windows, Version 2019-11.007

                   Analysis of Individual Piles and Drilled Shafts
                  Subjected to Lateral Loading Using the p-y Method
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------------------------------------------------------------------------------
                             Files Used for Analysis
------------------------------------------------------------------------------

Path to file locations:
\Quoting\Horton Electrical Services\2024\Tritec Portfolio - Various, CT\37 Hunters
Lane - Southington, CT 06489\Geotech\Design\LPILE\Z2\

Name of input data file:
37 Hunters Lane_W6x7_Avg_SA-Z2.lp11d

Name of output report file:
37 Hunters Lane_W6x7_Avg_SA-Z2.lp11o

Name of plot output file:
37 Hunters Lane_W6x7_Avg_SA-Z2.lp11p

Name of runtime message file:
37 Hunters Lane_W6x7_Avg_SA-Z2.lp11r



------------------------------------------------------------------------------
                            Date and Time of Analysis
------------------------------------------------------------------------------
```

Date: November 4, 2024   Time: 13:46:52

Problem Title

Project Name: 37 Hunters Lane Solar

Location: Southington, CT

Client: Horton Electric

Engineer: K. Dy

Description: Lateral analysis of W6x7 post (strong axis)-Z2

Program Options and Settings

Computational Options:
 - Conventional Analysis

Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	50

Loading Type and Number of Cycles of Loading:
 - Static loading specified

- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Input of side resistance moment along pile not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

```
Number of pile sections defined                        =            1
Total length of pile                                   =       12.500 ft
Depth of ground surface below top of pile              =       0.0000 ft
```

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	3.9110
2	12.500	3.9110

Input Structural Properties for Pile Sections:

Pile Section No. 1:

```
   Section 1 is an elastic pile
   Cross-sectional Shape                               = Strong H-Pile
```

```
   Length of section                                      =    12.500000 ft
   Flange Width                                           =     3.911000 in
   Section Depth                                          =     5.743000 in
   Flange Thickness                                       =     0.136000 in
   Web Thickness                                          =     0.100000 in
   Section Area                                           =     1.610892 sq. in
   Moment of Inertia                                      =     9.727275 in^4
   Elastic Modulus                                        =    29000000. psi



--------------------------------------------------------------------------------
                      Ground Slope and Pile Batter Angles
--------------------------------------------------------------------------------

Ground Slope Angle                                        =        0.000 degrees
                                                          =        0.000 radians

Pile Batter Angle                                         =        0.000 degrees
                                                          =        0.000 radians


--------------------------------------------------------------------------------
                      Soil and Rock Layering Information
--------------------------------------------------------------------------------

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer              =       0.0000 ft
   Distance from top of pile to bottom of layer           =     5.000000 ft
   Effective unit weight at top of layer                  =   125.000000 pcf
   Effective unit weight at bottom of layer               =   125.000000 pcf
   Friction angle at top of layer                         =    33.000000 deg.
   Friction angle at bottom of layer                      =    33.000000 deg.
   Subgrade k at top of layer                             =       0.0000 pci
   Subgrade k at bottom of layer                          =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer              =     5.000000 ft
   Distance from top of pile to bottom of layer           =    10.000000 ft
   Effective unit weight at top of layer                  =    63.000000 pcf
   Effective unit weight at bottom of layer               =    63.000000 pcf
   Friction angle at top of layer                         =    33.000000 deg.
   Friction angle at bottom of layer                      =    33.000000 deg.
```

```
   Subgrade k at top of layer                              =       0.0000 pci
   Subgrade k at bottom of layer                           =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer               =    10.000000 ft
   Distance from top of pile to bottom of layer            =    15.000000 ft
   Effective unit weight at top of layer                   =    68.000000 pcf
   Effective unit weight at bottom of layer                =    68.000000 pcf
   Friction angle at top of layer                          =    40.000000 deg.
   Friction angle at bottom of layer                       =    40.000000 deg.
   Subgrade k at top of layer                              =       0.0000 pci
   Subgrade k at bottom of layer                           =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

 (Depth of the lowest soil layer extends 2.500 ft below the pile tip)



--------------------------------------------------------------------------------
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------

Layer         Soil Type         Layer      Effective    Angle of
Layer           Name            Depth       Unit Wt.    Friction         kpy
 Num.    (p-y Curve Type)        ft           pcf         deg.           pci
-----   --------------------   ----------   ----------   ----------   ----------
  1            Sand                 0.00     125.0000      33.0000     default
         (Reese, et al.)          5.0000     125.0000      33.0000     default
  2            Sand               5.0000      63.0000      33.0000     default
         (Reese, et al.)         10.0000      63.0000      33.0000     default
  3            Sand              10.0000      68.0000      40.0000     default
         (Reese, et al.)         15.0000      68.0000      40.0000     default


--------------------------------------------------------------------------------
                    p-y Modification Factors for Group Action
--------------------------------------------------------------------------------

Distribution of p-y modifiers with depth defined using 2 points

Point      Depth X        p-mult        y-mult
 No.          ft
-----     ----------     ----------     ----------
  1          2.500         0.7000         1.0000
  2         15.000         1.0000         1.0000
```

```
--------------------------------------------------------------------------------
                               Static Loading Type
--------------------------------------------------------------------------------

Static loading criteria were used when computing p-y curves for all analyses.



--------------------------------------------------------------------------------
                Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------

Number of loads specified = 1

Load    Load         Condition              Condition           Axial Thrust
Compute Top y     Run Analysis
 No.    Type            1                       2                 Force, lbs
vs. Pile Length
-----   ----   --------------------   ----------------------   ----------------
---------------    ------------
   1     1     V =   532.000000 lbs   M =       46614. in-lbs            5607.
    No               Yes

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with
specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.



--------------------------------------------------------------------------------
     Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
--------------------------------------------------------------------------------

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:
-------------------
Moment-curvature properties were derived from elastic section properties
```

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	12902.
2	5.0000	4.9999	Yes	No	12902.	46926.
3	10.0000	7.6142	Yes	No	59828.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 532.0 lbs
Applied moment at pile head = 46614.0 in-lbs
Axial thrust load on pile head = 5607.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2437	46614.	532.0000	-0.00939	12852.	2.82E+08	0.00	0.00	0.00
0.2500	0.2162	48364.	517.4470	-0.00889	13203.	2.82E+08	-9.7020	134.6116	0.00
0.5000	0.1903	50018.	472.2221	-0.00836	13536.	2.82E+08	-20.4479	322.2897	0.00
0.7500	0.1660	51478.	396.7139	-0.00782	13830.	2.82E+08			

-29.8909	540.0431	0.00				
1.0000	0.1434	52661.	295.2623	-0.00727	14067.	2.82E+08
-37.7435	789.6139	0.00				
1.2500	0.1224	53495.	172.8217	-0.00670	14235.	2.82E+08
-43.8835	1075.	0.00				
1.5000	0.1032	53924.	30.5432	-0.00613	14321.	2.82E+08
-50.9688	1482.	0.00				
1.7500	0.08563	53884.	-133.3207	-0.00556	14313.	2.82E+08
-58.2738	2042.	0.00				
2.0000	0.06981	53311.	-318.4009	-0.00499	14198.	2.82E+08
-65.1130	2798.	0.00				
2.2500	0.05569	52142.	-521.7393	-0.00443	13963.	2.82E+08
-70.4460	3795.	0.00				
2.5000	0.04323	50329.	-704.5041	-0.00388	13599.	2.82E+08
-51.3972	3566.	0.00				
2.7500	0.03238	48045.	-859.5246	-0.00336	13139.	2.82E+08
-51.9499	4813.	0.00				
3.0000	0.02307	45285.	-1013.	-0.00287	12584.	2.82E+08
-50.1848	6527.	0.00				
3.2500	0.01519	42065.	-1153.	-0.00240	11937.	2.82E+08
-43.4333	8576.	0.00				
3.5000	0.00866	38447.	-1259.	-0.00197	11210.	2.82E+08
-26.8899	9313.	0.00				
3.7500	0.00336	34580.	-1316.	-0.00158	10432.	2.82E+08
-11.2598	10061.	0.00				
4.0000	-8.44E-04	30605.	-1328.	-0.00124	9633.	2.82E+08
3.0433	10820.	0.00				
4.2500	-0.00407	26652.	-1300.	-9.33E-04	8839.	2.82E+08
15.7181	11590.	0.00				
4.5000	-0.00644	22836.	-1237.	-6.70E-04	8072.	2.82E+08
26.5686	12371.	0.00				
4.7500	-0.00809	19255.	-1144.	-4.46E-04	7352.	2.82E+08
35.4908	13163.	0.00				
5.0000	-0.00912	15990.	-1050.	-2.59E-04	6695.	2.82E+08
26.9248	8857.	0.00				
5.2500	-0.00964	12965.	-964.3313	-1.05E-04	6087.	2.82E+08
30.1229	9373.	0.00				
5.5000	-0.00975	10208.	-870.9074	1.84E-05	5533.	2.82E+08
32.1597	9896.	0.00				
5.7500	-0.00953	7738.	-772.9802	1.14E-04	5036.	2.82E+08
33.1251	10427.	0.00				
6.0000	-0.00907	5566.	-673.5932	1.85E-04	4600.	2.82E+08
33.1329	10964.	0.00				
6.2500	-0.00842	3691.	-575.4245	2.34E-04	4223.	2.82E+08
32.3130	11508.	0.00				
6.5000	-0.00766	2106.	-480.7479	2.65E-04	3904.	2.82E+08
30.8048	12059.	0.00				
6.7500	-0.00684	797.2985	-391.4147	2.80E-04	3641.	2.82E+08
28.7507	12617.	0.00				
7.0000	-0.00598	-252.3491	-308.8520	2.83E-04	3531.	2.82E+08

```
26.2911     13183.       0.00
    7.2500   -0.00514     -1065.  -234.0771   2.76E-04      3695.   2.82E+08
23.5589     13755.       0.00
    7.5000   -0.00433     -1666.  -167.7235   2.61E-04      3816.   2.82E+08
20.6768     14334.       0.00
    7.7500   -0.00357     -2080.  -110.0769   2.41E-04      3899.   2.82E+08
17.7543     14920.       0.00
    8.0000   -0.00288     -2335.   -61.1172   2.18E-04      3950.   2.82E+08
14.8855     15513.       0.00
    8.2500   -0.00226     -2455.   -20.5664   1.93E-04      3974.   2.82E+08
12.1484     16114.       0.00
    8.5000   -0.00172     -2465.    12.0637   1.66E-04      3976.   2.82E+08
9.6049     16721.       0.00
    8.7500   -0.00126     -2388.    37.4220   1.41E-04      3961.   2.82E+08
7.3006     17335.       0.00
    9.0000  -8.80E-04     -2245.    56.2716   1.16E-04      3932.   2.82E+08
5.2658     17956.       0.00
    9.2500  -5.68E-04     -2054.    69.4458   9.31E-05      3894.   2.82E+08
3.5170     18584.       0.00
    9.5000  -3.21E-04     -1831.    77.8080   7.24E-05      3849.   2.82E+08
2.0578     19219.       0.00
    9.7500  -1.33E-04     -1590.    82.2167   5.42E-05      3800.   2.82E+08
0.8813     19861.       0.00
   10.0000   4.26E-06     -1340.    83.4697   3.87E-05      3750.   2.82E+08
-0.04599     32386.       0.00
   10.2500   9.89E-05     -1090.    81.0370   2.57E-05      3700.   2.82E+08
-1.5758     47800.       0.00
   10.5000   1.59E-04  -854.3791    74.7603   1.54E-05      3652.   2.82E+08
-2.6088     49297.       0.00
   10.7500   1.91E-04  -642.0205    65.9857   7.45E-06      3610.   2.82E+08
-3.2410     50811.       0.00
   11.0000   2.03E-04  -458.7158    55.7994   1.60E-06      3573.   2.82E+08
-3.5499     52340.       0.00
   11.2500   2.01E-04  -307.2781    45.0603  -2.47E-06      3542.   2.82E+08
-3.6094     53884.       0.00
   11.5000   1.89E-04  -188.2705    34.4168  -5.11E-06      3519.   2.82E+08
-3.4863     55445.       0.00
   11.7500   1.70E-04  -100.6055    24.3319  -6.64E-06      3501.   2.82E+08
-3.2370     57021.       0.00
   12.0000   1.49E-04   -42.0555    15.1166  -7.40E-06      3489.   2.82E+08
-2.9066     58614.       0.00
   12.2500   1.26E-04    -9.6571     6.9662  -7.68E-06      3483.   2.82E+08
-2.5270     60222.       0.00
   12.5000   1.03E-04       0.00       0.00  -7.73E-06      3481.   2.82E+08
-2.1171     30923.       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 1:
```

```
Pile-head deflection               =     0.24365118 inches
Computed slope at pile head        =    -0.00939072 radians
Maximum bending moment             =         53924. inch-lbs
Maximum shear force                =         -1328. lbs
Depth of maximum bending moment    =     1.50000000 feet below pile head
Depth of maximum shear force       =     4.00000000 feet below pile head
Number of iterations               =             10
Number of zero deflection points =                2


--------------------------------------------------------------------------------
            Summary of Pile-head Responses for Conventional Analyses
--------------------------------------------------------------------------------

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians


Load Load                Load                 Axial    Pile-head  Pile-head  Max
Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation    in
Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians      lbs
     in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ----------
---------- ----------
  1  V, lb   532.0000  M, in-lb      46614.      5607.     0.2437   -0.00939
-1328.     53924.


Maximum pile-head deflection = 0.2436511821 inches
Maximum pile-head rotation   = -0.0093907243 radians = -0.538049 deg.

The analysis ended normally.
```

```
================================================================================

                     LPile for Windows, Version 2019-11.007

                 Analysis of Individual Piles and Drilled Shafts
                Subjected to Lateral Loading Using the p-y Method
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--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:
\Quoting\Horton Electrical Services\2024\Tritec Portfolio - Various, CT\37 Hunters
Lane - Southington, CT 06489\Geotech\Design\LPILE\Z2\

Name of input data file:
37 Hunters Lane_W6x7_Avg_WA-Z2.lp11d

Name of output report file:
37 Hunters Lane_W6x7_Avg_WA-Z2.lp11o

Name of plot output file:
37 Hunters Lane_W6x7_Avg_WA-Z2.lp11p

Name of runtime message file:
37 Hunters Lane_W6x7_Avg_WA-Z2.lp11r


--------------------------------------------------------------------------------
                            Date and Time of Analysis
--------------------------------------------------------------------------------
```

Date: November 4, 2024   Time: 13:49:33

Problem Title

Project Name: 37 Hunters Lane Solar

Location: Southington, CT

Client: Horton Electric

Engineer: K. Dy

Description: Lateral analysis of W6x7 post (weak axis)-Z2

Program Options and Settings

Computational Options:
 - Conventional Analysis

Engineering Units Used for Data Input and Computations:
 - US Customary System Units (pounds, feet, inches)

Analysis Control Options:
 - Maximum number of iterations allowed = 500
 - Deflection tolerance for convergence = 1.0000E-05 in
 - Maximum allowable deflection = 100.0000 in
 - Number of pile increments = 50

Loading Type and Number of Cycles of Loading:
 - Static loading specified

- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Input of side resistance moment along pile not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 12.500 ft
Depth of ground surface below top of pile = 0.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	5.7430
2	12.500	5.7430

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile
Cross-sectional Shape = Weak H-Pile

```
   Length of section                                       =    12.500000 ft
   Flange Width                                            =     3.911000 in
   Section Depth                                           =     5.743000 in
   Flange Thickness                                        =     0.136000 in
   Web Thickness                                           =     0.100000 in
   Section Area                                            =     1.610892 sq. in
   Moment of Inertia                                       =     1.356429 in^4
   Elastic Modulus                                         =    29000000. psi



--------------------------------------------------------------------------------
                      Ground Slope and Pile Batter Angles
--------------------------------------------------------------------------------

Ground Slope Angle                                         =        0.000 degrees
                                                           =        0.000 radians

Pile Batter Angle                                          =        0.000 degrees
                                                           =        0.000 radians


--------------------------------------------------------------------------------
                      Soil and Rock Layering Information
--------------------------------------------------------------------------------

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer               =       0.0000 ft
   Distance from top of pile to bottom of layer            =     5.000000 ft
   Effective unit weight at top of layer                   =   125.000000 pcf
   Effective unit weight at bottom of layer                =   125.000000 pcf
   Friction angle at top of layer                          =    33.000000 deg.
   Friction angle at bottom of layer                       =    33.000000 deg.
   Subgrade k at top of layer                              =       0.0000 pci
   Subgrade k at bottom of layer                           =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer               =     5.000000 ft
   Distance from top of pile to bottom of layer            =    10.000000 ft
   Effective unit weight at top of layer                   =    63.000000 pcf
   Effective unit weight at bottom of layer                =    63.000000 pcf
   Friction angle at top of layer                          =    33.000000 deg.
   Friction angle at bottom of layer                       =    33.000000 deg.
```

```
   Subgrade k at top of layer                              =       0.0000 pci
   Subgrade k at bottom of layer                           =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer               =    10.000000 ft
   Distance from top of pile to bottom of layer            =    15.000000 ft
   Effective unit weight at top of layer                   =    68.000000 pcf
   Effective unit weight at bottom of layer                =    68.000000 pcf
   Friction angle at top of layer                          =    40.000000 deg.
   Friction angle at bottom of layer                       =    40.000000 deg.
   Subgrade k at top of layer                              =       0.0000 pci
   Subgrade k at bottom of layer                           =       0.0000 pci

   NOTE: Default values for subgrade k will be computed for this layer.

 (Depth of the lowest soil layer extends 2.500 ft below the pile tip)
```

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	kpy pci
1	Sand	0.00	125.0000	33.0000	default
	(Reese, et al.)	5.0000	125.0000	33.0000	default
2	Sand	5.0000	63.0000	33.0000	default
	(Reese, et al.)	10.0000	63.0000	33.0000	default
3	Sand	10.0000	68.0000	40.0000	default
	(Reese, et al.)	15.0000	68.0000	40.0000	default

----

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult
1	2.500	0.7000	1.0000
2	15.000	1.0000	1.0000

```
--------------------------------------------------------------------------------
                               Static Loading Type
--------------------------------------------------------------------------------

Static loading criteria were used when computing p-y curves for all analyses.



--------------------------------------------------------------------------------
                Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------

Number of loads specified = 1

Load    Load         Condition              Condition           Axial Thrust
Compute Top y     Run Analysis
 No.    Type            1                       2                 Force, lbs
vs. Pile Length
-----   ----   --------------------   ----------------------   ----------------
---------------    ------------
   1     1     V =    50.000000 lbs   M =        1726. in-lbs            5607.
    No                Yes

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with
specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.



--------------------------------------------------------------------------------
     Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
--------------------------------------------------------------------------------

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:
-------------------
Moment-curvature properties were derived from elastic section properties
```

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	13758.
2	5.0000	5.0000	Yes	No	13758.	64569.
3	10.0000	8.2665	Yes	No	78327.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 50.0 lbs
Applied moment at pile head = 1726.0 in-lbs
Axial thrust load on pile head = 5607.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.02013	1726.	50.0000	-0.00142	7135.	3.93E+07	0.00	0.00	0.00
0.2500	0.01606	1899.	42.6201	-0.00128	7500.	3.93E+07	-4.9199	918.8370	0.00
0.5000	0.01244	2025.	23.8139	-0.00113	7767.	3.93E+07	-7.6175	1838.	0.00
0.7500	0.00927	2080.	-0.3900	-9.76E-04	7883.	3.93E+07			

```
-8.5184      2757.       0.00
    1.0000    0.00658      2055.   -25.2631  -8.18E-04      7832.   3.93E+07
-8.0636      3675.       0.00
    1.2500    0.00436      1956.   -47.3814  -6.65E-04      7621.   3.93E+07
-6.6819      4594.       0.00
    1.5000    0.00259      1793.   -64.5492  -5.22E-04      7277.   3.93E+07
-4.7634      5513.       0.00
    1.7500    0.00123      1586.   -75.6537  -3.93E-04      6838.   3.93E+07
-2.6396      6432.       0.00
    2.0000   2.33E-04      1353.   -80.4700  -2.81E-04      6344.   3.93E+07
-0.5713      7351.       0.00
    2.2500  -4.55E-04      1113.   -79.4439  -1.87E-04      5836.   3.93E+07
1.2553      8270.       0.00
    2.5000  -8.89E-04   882.3401   -74.7009  -1.11E-04      5349.   3.93E+07
1.9068      6432.       0.00
    2.7500   -0.00112   668.1192   -67.8396  -5.19E-05      4895.   3.93E+07
2.6675      7136.       0.00
    3.0000   -0.00120   477.0485   -59.1252  -8.22E-06      4491.   3.93E+07
3.1421      7851.       0.00
    3.2500   -0.00117   313.6445   -49.3915   2.19E-05      4145.   3.93E+07
3.3471      8576.       0.00
    3.5000   -0.00107   179.9619   -39.3922   4.08E-05      3862.   3.93E+07
3.3191      9313.       0.00
    3.7500  -9.26E-04    75.9202   -29.7538   5.05E-05      3641.   3.93E+07
3.1066     10061.       0.00
    4.0000  -7.66E-04    -0.2599   -20.9493   5.34E-05      3481.   3.93E+07
2.7631     10820.       0.00
    4.2500  -6.06E-04   -51.5721   -13.2933   5.14E-05      3590.   3.93E+07
2.3410     11590.       0.00
    4.5000  -4.58E-04   -81.7495    -6.9515   4.63E-05      3654.   3.93E+07
1.8869     12371.       0.00
    4.7500  -3.28E-04   -94.8396    -1.9627   3.96E-05      3681.   3.93E+07
1.4389     13163.       0.00
    5.0000  -2.20E-04   -94.8580     1.1698   3.24E-05      3681.   3.93E+07
0.6494      8857.       0.00
    5.2500  -1.34E-04   -88.9098     2.7707   2.54E-05      3669.   3.93E+07
0.4178      9373.       0.00
    5.5000  -6.78E-05   -79.0870     3.7331   1.90E-05      3648.   3.93E+07
0.2238      9896.       0.00
    5.7500  -2.00E-05   -67.1489     4.1731   1.34E-05      3623.   3.93E+07
0.06959     10427.       0.00
    6.0000   1.24E-05   -54.4983     4.2094   8.74E-06      3596.   3.93E+07
-0.04540     10964.       0.00
    6.2500   3.24E-05   -42.1865     3.9548   5.05E-06      3570.   3.93E+07
-0.1243     11508.       0.00
    6.5000   4.27E-05   -30.9392     3.5108   2.26E-06      3546.   3.93E+07
-0.1717     12059.       0.00
    6.7500   4.60E-05   -21.1979     2.9631   2.74E-07      3526.   3.93E+07
-0.1934     12617.       0.00
    7.0000   4.44E-05   -13.1696     2.3807  -1.04E-06      3509.   3.93E+07
```

```
-0.1950     13183.       0.00
    7.2500   3.98E-05    -6.8790     1.8148  -1.80E-06      3495.   3.93E+07
-0.1823     13755.       0.00
    7.5000   3.36E-05    -2.2200     1.3009  -2.15E-06      3485.   3.93E+07
-0.1604     14334.       0.00
    7.7500   2.69E-05     0.9987     0.8600  -2.19E-06      3483.   3.93E+07
-0.1336     14920.       0.00
    8.0000   2.04E-05     3.0138     0.5014  -2.04E-06      3487.   3.93E+07
-0.1054     15513.       0.00
    8.2500   1.46E-05     4.0760     0.2255  -1.77E-06      3489.   3.93E+07
-0.07848     16114.       0.00
    8.5000   9.76E-06     4.4266    0.02619  -1.45E-06      3490.   3.93E+07
-0.05441     16721.       0.00
    8.7500   5.93E-06     4.2818    -0.1068  -1.12E-06      3490.   3.93E+07
-0.03425     17335.       0.00
    9.0000   3.07E-06     3.8232    -0.1858  -8.06E-07      3489.   3.93E+07
-0.01839     17956.       0.00
    9.2500   1.09E-06     3.1943    -0.2235  -5.39E-07      3487.   3.93E+07
-0.00676     18584.       0.00
    9.5000  -1.59E-07     2.5004    -0.2321  -3.21E-07      3486.   3.93E+07
0.00102     19219.       0.00
    9.7500  -8.37E-07     1.8125    -0.2223  -1.57E-07      3485.   3.93E+07
0.00554     19861.       0.00
   10.0000  -1.10E-06     1.1721    -0.1961  -4.31E-08      3483.   3.93E+07
0.01188     32386.       0.00
   10.2500  -1.10E-06     0.6372    -0.1521   2.59E-08      3482.   3.93E+07
0.01745     47800.       0.00
   10.5000  -9.45E-07     0.2585    -0.1027   6.01E-08      3481.   3.93E+07
0.01553     49297.       0.00
   10.7500  -7.35E-07    0.01918   -0.06070   7.07E-08      3481.   3.93E+07
0.01245     50811.       0.00
   11.0000  -5.21E-07    -0.1081   -0.02839   6.73E-08      3481.   3.93E+07
0.00909     52340.       0.00
   11.2500  -3.31E-07    -0.1534   -0.00583   5.73E-08      3481.   3.93E+07
0.00595     53884.       0.00
   11.5000  -1.77E-07    -0.1450    0.00801   4.59E-08      3481.   3.93E+07
0.00327     55445.       0.00
   11.7500  -5.60E-08    -0.1069    0.01452   3.63E-08      3481.   3.93E+07
0.00106     57021.       0.00
   12.0000   4.07E-08   -0.05910    0.01492   3.00E-08      3481.   3.93E+07
-7.95E-04     58614.       0.00
   12.2500   1.24E-07   -0.01837    0.01000   2.70E-08      3481.   3.93E+07
-0.00249     60222.       0.00
   12.5000   2.03E-07       0.00       0.00   2.63E-08      3481.   3.93E+07
-0.00418     30923.       0.00

* The above values of total stress are combined axial and bending stresses.


Output Summary for Load Case No. 1:
```

```
Pile-head deflection              =     0.02012607 inches
Computed slope at pile head       =    -0.00141997 radians
Maximum bending moment            =          2080. inch-lbs
Maximum shear force               =   -80.46995593 lbs
Depth of maximum bending moment   =     0.75000000 feet below pile head
Depth of maximum shear force      =     2.00000000 feet below pile head
Number of iterations              =              6
Number of zero deflection points =              4


--------------------------------------------------------------------------------
            Summary of Pile-head Responses for Conventional Analyses
--------------------------------------------------------------------------------

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians


Load Load                Load                 Axial    Pile-head  Pile-head  Max
Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation    in
Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians      lbs
     in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ----------
---------- ----------
  1  V, lb    50.0000  M, in-lb       1726.      5607.    0.02013   -0.00142
-80.4700      2080.


Maximum pile-head deflection = 0.0201260701 inches
Maximum pile-head rotation   = -0.0014199681 radians = -0.081358 deg.

The analysis ended normally.
```

FLEXRACK

37 HUNTERS LANE CORROSION CALCULATIONS

Basis of Buried Metal Corrosion Evaluation

In the development of a methodology to evaluate the corrosion hazard of a ground-mount solar site, FR has reviewed methodologies applicable to buried metal advocated by various industry corrosion experts including the American Water Works Association (AWWA), the National Association of Corrosion Engineers (NACE), the American Association of State Highway Transportation Officials (AASHTO), and the Federal Highway Administration (FHWA). Each of these entities routinely uses buried metal in the construction and maintenance of infrastructure.

Each of the above entities generally classifies a corrosion hazard based on measured geochemical and electrochemical properties using a numerical ranking scheme which results in a qualitative ranking ranging from “mildly/moderately corrosive” to “highly corrosive.” Some of the readily measurable geochemical and electrochemical properties commonly considered in the evaluation of corrosion potential include:

- apparent minimum electrical resistivity,
- soil pH,
- water-soluble chlorides,
- water-soluble sulfates,
- oxidation-reduction (redox) potential, and,
- gravimetric water content.

Owing to the relatively light steel sections which commonly serve as foundations for FR solar projects; corrosion hazard evaluation guidelines and associated metal loss rates developed by FHWA and adopted by AASHTO from research conducted on buried galvanized steel reinforcement strips were adopted internally by FR for application to its solar projects. These guidelines can be found in Technical Publication No. FHWA-NHI-00-044. For the subject site, the soil chemistry data contained in Table 1 was available and was considered.

Table 1: Laboratory Corrosion Suite Results

LOCATION	DEPTH (ft.)	pH	SULFATES (mg/kg)	SULFIDES (µg/kg)	CHLORIDES (mg/kg)	REDOX (mV)	MIN SOIL RESISTIVITY (Ω-cm)
Bulk	Bulk	6.4	10	NR	12	NR	27,773

NR = Not Reported

Based on the measured soil parameters, a moderately corrosive environment to buried steel was considered by FR. Other metrics suggest a mildly corrosive to non-corrosive environment.

Buried Metal Loss Calculations

From FR’s review of FHWA guidelines developed from the above-described studies, for galvanized steel in moderately corrosive environments, the suggested zinc metal loss rate is 0.58 mil/yr. for the first 2 years and 0.16 mil/yr. thereafter until depletion, and the loss rate for unprotected carbon steel is 0.47 mil/yr. To account for increasingly corrosive environments (on a qualitative basis), the FHWA suggests an incremental 25 percent increase be applied to these metal loss rates for corresponding incremental increases in corrosion potential. Accordingly, given the available information, the above metal loss rates were increased by 25 percent.

Using the factored loss rates for zinc metal, a 3-mil hot-dipped galvanic coating will be depleted in approximately 10 years, after which time, consumption of the carbon steel will begin (both sides). The estimated stress utilization ratio in the corroded sections for a design event occurring at year 35 for the subject post shapes are included within the Structural Report. This analysis accounts for minor terrain irregularities.

The stress utilization ratio is the ratio of the applied stress to the available stress capacity (compression and flexure) of a given steel section. A stress utilization ratio of 1.00 indicates that the applied stress in the section has reached its allowable limit. A stress utilization ratio exceeding 1.00 indicates the section is overstressed. The controlling state of stress in the section arising from the design event occurring at year 35 for the subject post shapes result from the controlling ASCE 7 basic load combination is shown in the Structural Report.

Basis of Atmospheric Corrosion Evaluation

In the adoption of a methodology to evaluate the long-term corrosion hazard to the portions of the rack and foundation exposed to the atmosphere, FR applied International Organization for Standardization (ISO) guidelines. These guidelines can be found in ISO publications ISO 8044-2020, ISO 9223-2012, ISO 9224-2012, ISO 9225-2012, ISO 9226-2012, and ISO 11303-2002. Computations used to evaluate metal loss with time consider mainly averaged annual climatic conditions and specific exposure to suspended atmospheric salts (excluding direct saltwater spray and/or road-deicing solutions), and exposure to atmospheric sulfur compounds (urban and industrial air pollution).

Atmospheric Metal Loss Calculations

Pursuant to ISO 9223, the zinc metal loss rate in the first year may be calculated using the following relationship:

$$\boldsymbol{r_{corr}} = 0.0129P_d^{0.44}e^{0.46RH+f_{Zn}} + 0.0175S_d^{0.57}e^{0.008RH+0.085T}$$

Where

r_{corr}	is first-year corrosion rate of zinc metal (μ/yr.)
T	is the average annual ambient temperature (°C)
RH	is the average annual relative humidity (%)
P_d	is the average annual sulfur dioxide (SO_2 deposition rate ($^{mg}/_{m^2 d}$)
S_d	is the average annual chloride ion (Cl^-)deposition rate ($^{mg}/_{m^2 d}$)
f_{Zn}	is a temperature factor = -0.071(T-10) for T > 10 °C

The proportion of the variance (R^2) in the dependent variable that is predictable (from the independent variable) is 0.82. An R^2 of 1.0 indicates that the regression predictions perfectly fit the data.

In the estimation of the atmospheric corrosion potential to exposed metal, field testing on galvanized steel coupons was not available to estimate the first-year metal loss and so a cursory review of available geographic, physiographic, and climatic information was undertaken. The region is mapped by the Köppen climate classification as a humid, subtropical climate. From a brief review of the past 10 years of wind direction information from local meteorological stations, the prevailing direction appears to be from a westerly direction. The nearest mapped point-sources of industrial fossil fuel emissions appear to include the Wallingford gas power plant located approximately 11 miles south, the Kleen Energy Systems Project gas power plant located approximately 16 miles east, and the Middletown oil power plant located approximately 17 miles east. A US Environmental Protection Agency monitored point-source of sulfur dioxide emissions was not identified. The nearest mapped source of urban emissions appear to be the city of Hartford, located approximately 20 miles northeast of the site. The project site location is inland and rural in nature, and a source of direct salt spray was not apparent. Soil chemistry results indicate a low concentration of chloride ions. According to United States Geological Survey (USGS) quadrangles, the area of interest sits at an elevation of approximately 300 feet above mean sea level. According to the US Department of Agriculture Natural Resources Conservation Service (NRCS), the average annual precipitation ranges between 40 and 50 inches and the area is reported to be excessively drained. The extreme-event (100 year) air freezing index is mapped by the National Oceanic and Atmospheric Administration to be up to 940 degree-Fahrenheit days.

Available National Atmospheric Deposition Program (NADP) mapping was reviewed for annual chloride and sulfur deposition rates for the subject site. An average annual sulfur dioxide (SO_2) deposition rate of 2.82 milligrams per square meter per day ($^{mg}/_{m^2}/_d$) and an average annual chloride (Cl^-) deposition rate of 1.64 $^{mg}/_{m^2}/_d$ were considered in the analysis. From available meteorological data, an average annual air temperature of 11.4 Celsius degrees, and an average annual relative humidity of 67.2 percent were considered. FR also considered the estimated ISO corrosivity mapping from the Whole Building Design Group (WBDG), which indicated a Corrosivity Category of C3. As the NADP mapped values indicated a C2 environment from analysis, FR considered the lower bound zinc loss rate values from ISO. From this information and the relationship above, a first-year zinc metal loss rate on the order of 0.028 mil/yr. was utilized in the analysis. These calculations assume that the panels are installed and provide the rack with some shelter from direct meteoric water.

Pursuant to ISO 9224-2012, from the first-year metal loss rate, the total future metal loss can be computed beyond year 20 using the following relationship:

$$D = r_{corr}(20^b + b(20^{b-1})(t - 20))$$

Where

D	is the total metal loss (µ)
r_{corr}	is the first-year corrosion rate of zinc metal (µ/yr.)
t	is the exposure time (yr.)
b	is the metal-environment-specific time component (dimensionless, usually < 1)

It is understood that zinc coating performance up to year 35 (t > 20 yr.) is desired. Given this extended exposure time and uncertainties involved with estimations of metal loss made beyond year 20, the short-term b-factor in the above expression was increased from the suggested t < 20 yr. value (0.813) by two standard deviations to achieve a 95 percent confidence interval in the statistical data.

Using the above long-term loss relationship for zinc metal, up to 0.60 mil of zinc electroplating will be lost by year 35. The minimum thickness of zinc electroplating associated with G90 protection is 0.76 mil. Following depletion of the zinc electroplating, bare carbon steel will be consumed at a rate of 0.79 mil/yr. Zinc metal loss is plotted with time on Figure 1 attached to this letter.

Conclusions

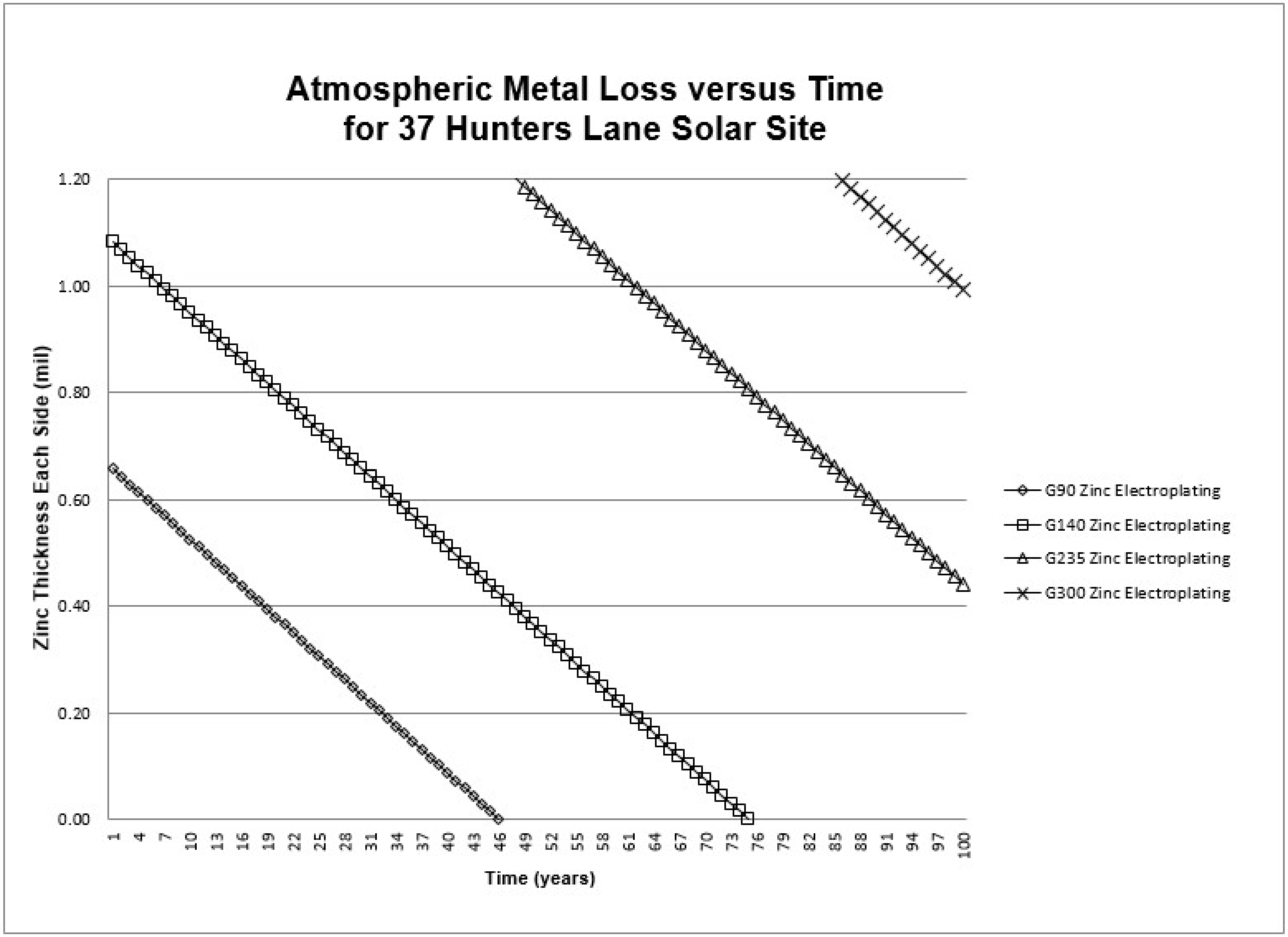
From the buried metal loss calculations and the estimated utilization ratios shown in the Structural Report, it is not unreasonable to conclude that galvanized steel post foundations at the subject solar site will perform in a satisfactory manner during a design event occurring up to at least year 35.

From the atmospheric metal loss calculations, a G-90 galvanic coating may be expected to provide corrosion protection up to year 35 and the racking members may be expected to perform in a satisfactory manner during a design event occurring up to year 35.

Limitations

The above analyses were based on best practices as adopted internally by FR. Other methodologies or practices by other engineering professionals may yield different results. The analyses were based upon a reasonable effort to identify corrosion hazards to buried metal and to metal exposed to the conditions at the subject site. A more comprehensive approach to estimate metal loss rates could include field testing of buried hot-dipped zinc-coated steel coupons and unburied electroplated zinc-coated steel coupons in general accordance with ISO 9225. Direct atmospheric gas sampling and analysis in accordance with ISO 9226 could also be considered. The above analyses are provided at the customer's request for informational purposes in lieu of these options, and FR's Standard Warranty as agreed to by contract remains in full-effect and is unchanged.

FIGURES



PROJECT	37 HUNTERS LANE SOLAR SITE
TITLE	ATMOSPHERIC METAL LOSS VERSUS TIME
CLIENT	HORTON ELECTRICAL SERVICE

FLEXRACK by qcells

DESIGNED BY	FR	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	FR	2024	-	1	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		