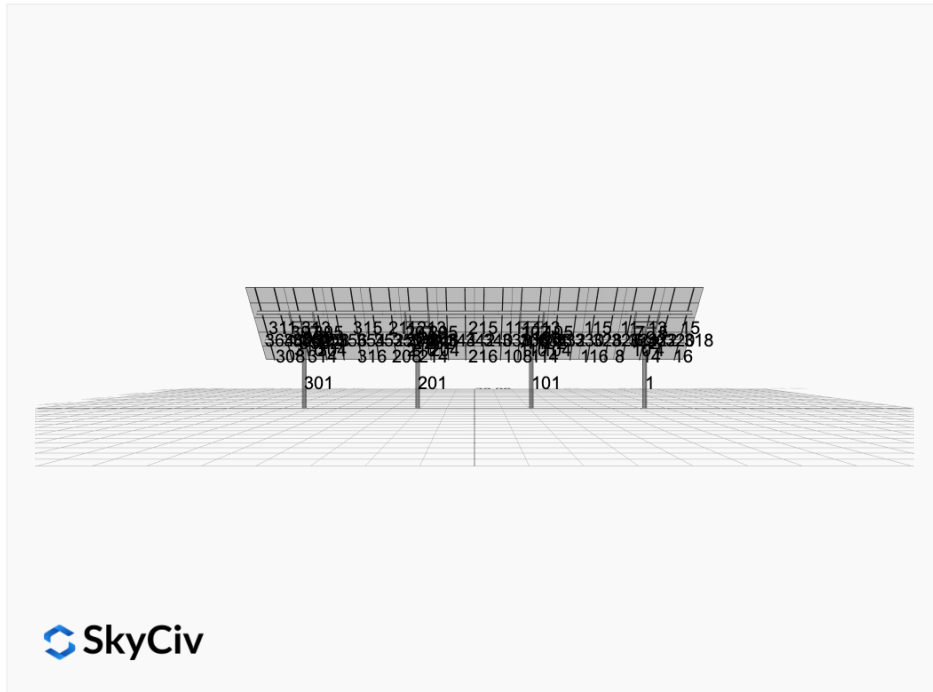


Project Details



Project Name: Tejada Holdings -v2 **Date:** Thu Oct 23 2025
Location: 2231 S Hwy 191, Moab, UT 84532, USA **Number of Modules:** 60
Unique ID: 4P-19.75-8TOP-HD-45-L-5Hx12W-6JHB **Number of Poles:** 4
Dealer: _____ **Date Sold:** _____



Array Dimensions N/S	18.81 ft
Array Dimensions E/W	76.12 ft
Winter Tilt Angle (Degrees)	40
Front Edge Clearance	8

MT Solar Bill of Materials (4P-19.75-8TOP-HD-45-L-5Hx12W-6JHB)

Part	Short Description	BOM Qty
MTS-PC-8	8IN Pole Cap Assembly	4
MTS-HF-HD	H-Frame Assembly-HD	4
MTS-HD-Wing-45	45IN HD Wing	4
MTS-HD-Splice-90	90IN HD Splice	6
MTS-HD-Splice-57	57IN HD Splice	6
MTS-CLAMP-ANGLE-4PK	Angle Clamp	12

Rail Bill of Materials

Part	Qty
Rails (226in Long)	24x
Rail Attachment	96x
Module Mid Clamp	96x
Module End Clamp	48x
Ground Lug	12x

Site Details:



Site Address: 2231 S Hwy 191, Moab, UT 84532, USA

Array Specifications

Duty Classification:	HD
Module Width:	44.65 in
Module Length:	75.12 in
Number of Rows:	5
Number of Columns:	12
Total Number of Modules:	60
Winter Tilt Angle:	40
Front Edge Clearance:	8
Total Array Height at Tilt:	20.09 ft
Total Frame Length:	74.25 ft
Module Info/Notes:	FBM445M7G-BB
Array Dimensions N/S:	18.81 ft
Array Dimensions E/W:	76.12 ft
Rail Length:	225.75 in
Rail Spacing:	3.17 ft

Support Specifications

Pole Size:	8in Pipe Sch 40
Pole Length above Grade:	14.05 ft
Number of Poles:	4
Pole Spacing:	19.75 ft

Foundation Specifications

Foundation Type:	rectangular
Foundation Dimensions:	48x48 in
Foundation Depth (below grade):	7.5 ft
Foundation Volume:	120.00 ft ³

Site Info

Risk Category:	I
Exposure:	B
Soil Classification:	sand
Site Location:	2231 S Hwy 191, Moab, UT 84532, USA
Wind Speed:	103 mph

Snow Load:

21 psf

Design Disclaimer

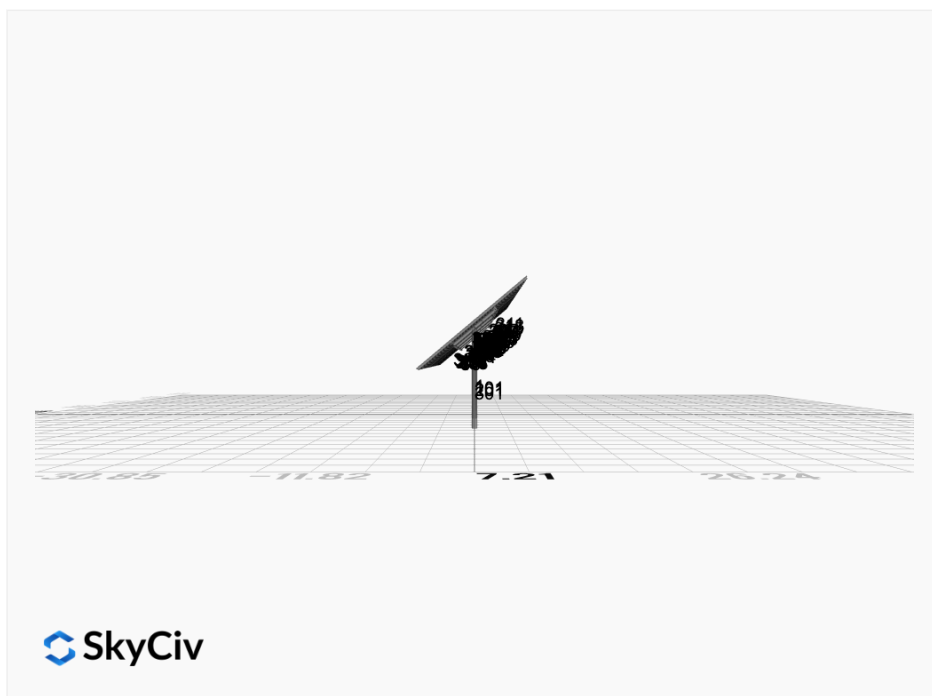
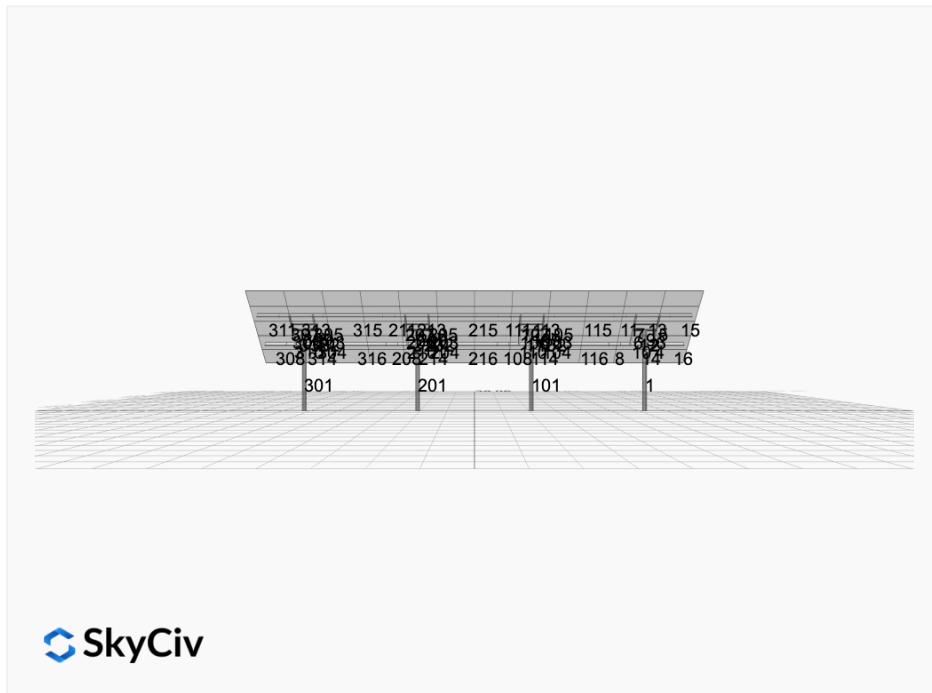
This software should be used for preliminary designs and should not be used as a final design unless reviewed, verified and designed by a qualified structural engineer.

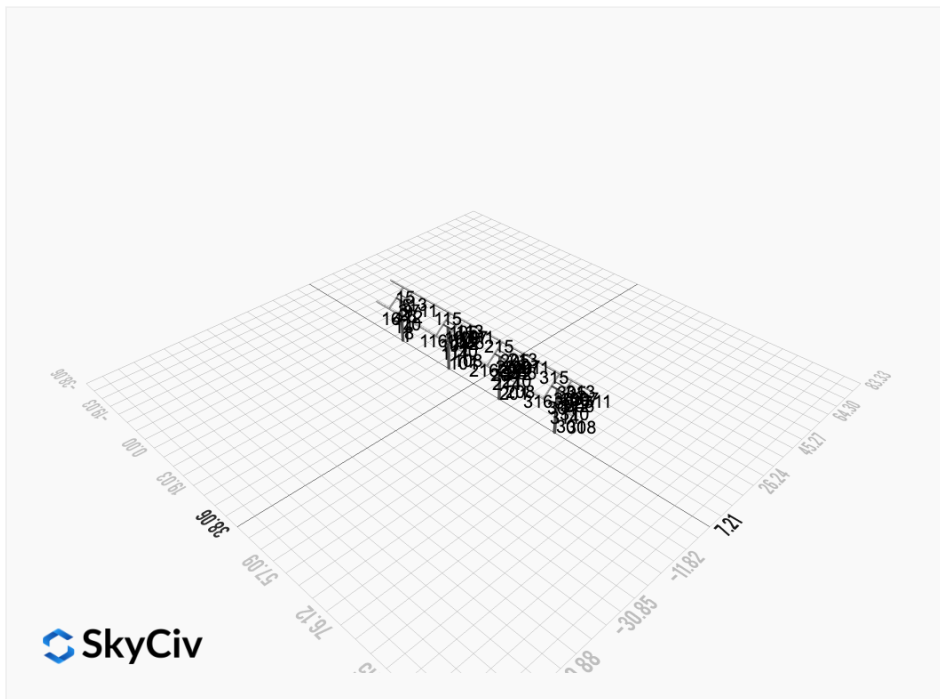
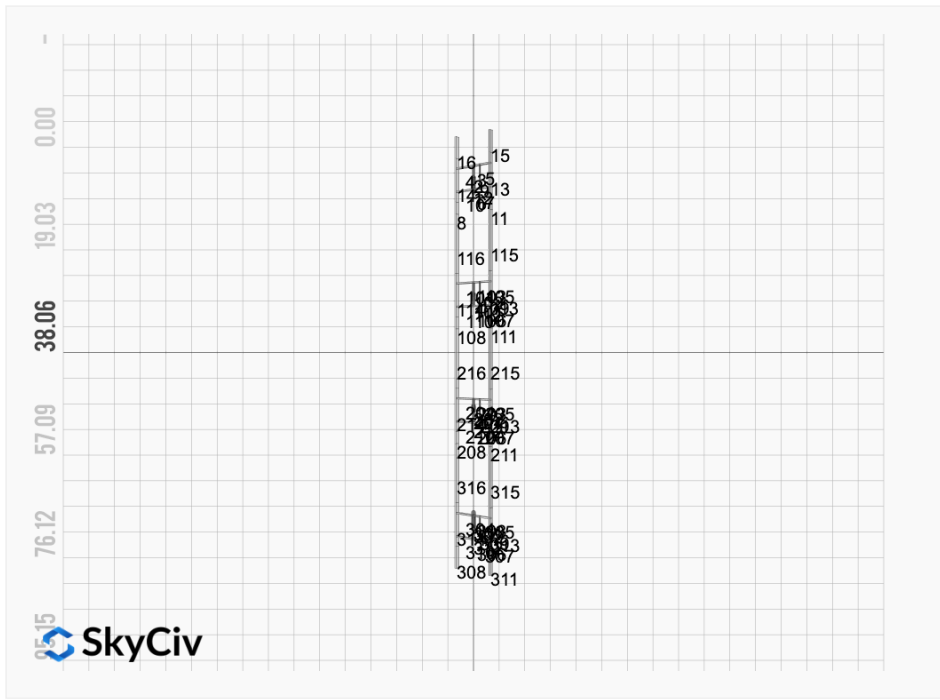
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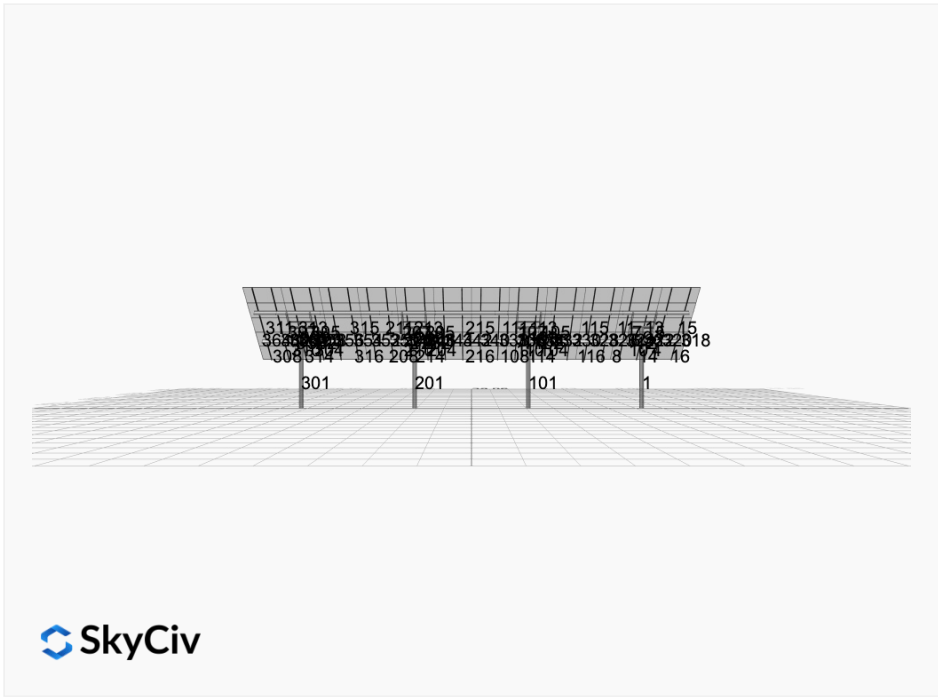
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Design Notes:

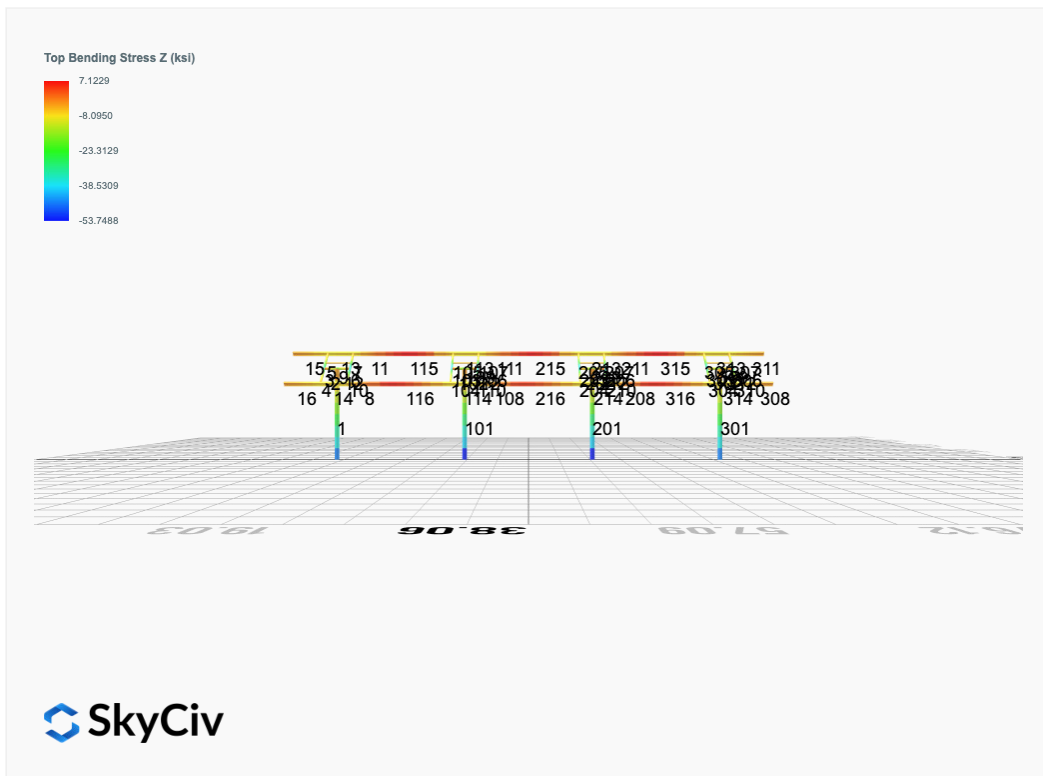
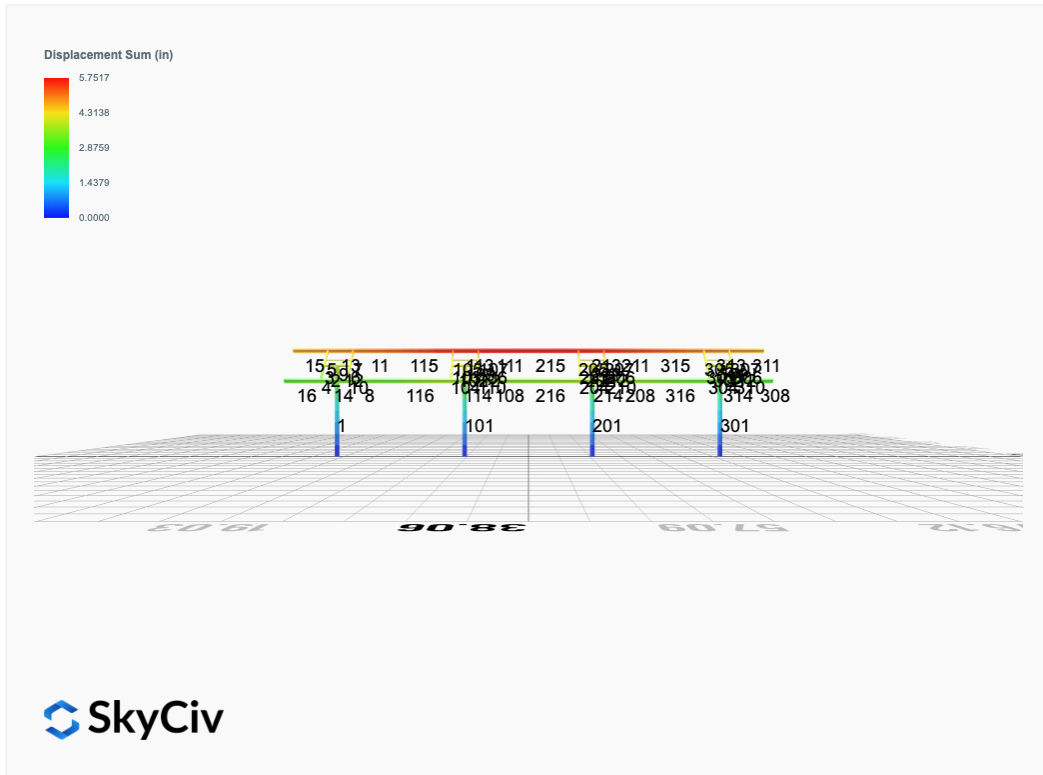
- Deflection checks are set to L/1 due to manufacturer structural design intent
- Foundation Soil Parameters used in this Autodesigner are all estimates, proper geotechnical reports are required to confirm soil profiles
- Wind speeds, snow loads and other site specific results are based on ASCE 7-16
- Steel frame design checks are based on AISC 360-16 LRFD
- Design / analysis of fixings and connections are not carried out by this module.
- Impacts of eccentrically applied, partial or pattern loading are not considered by this module.
- Foundation Design and Sizing is approximate only



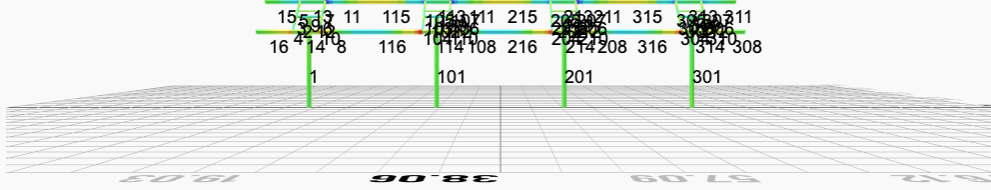
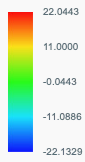




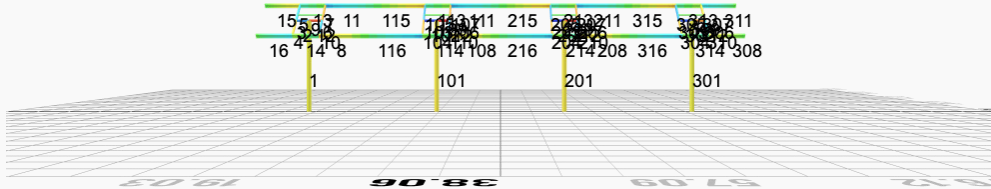
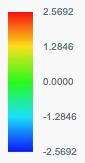
FEM Results (Envelope Worst Case)



Top Bending Stress Y (ksi)



Shear Stress Y (ksi)



Reaction Forces for Foundation 1 (Node ID#1), (kip, kip-ft)

LRFD Load Combination Results

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 1. 1.4D	0.0110	3.3922	0.0380	0.1699	-0.0208	-0.1068
ULS: 2. 1.2D + 1.6L + 0.5(S or Lr or R)	0.0132	3.7692	0.0456	0.2038	-0.0251	-0.1368
ULS: 2. 1.2D + 1.6L + 0.5(S or Lr or R)	0.0095	2.9076	0.0326	0.1455	-0.0178	-0.0926
ULS: 3. 1.2D + 1.6(S or Lr or R) + L	0.0214	5.6647	0.0744	0.3327	-0.0415	-0.2271
ULS: 5. 1.2D + E + L + 0.2S	0.0110	3.2523	0.0378	0.1688	-0.0207	-0.1106
ULS: 7. 0.9D + 1.0E	0.0071	2.1807	0.0244	0.1090	-0.0133	-0.0707
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case A only	-4.5072	9.0704	0.2103	0.9081	-0.6831	67.4482
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case B only	-4.5072	9.0704	0.2103	0.9081	-0.6831	67.4482
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case A only	3.6062	-0.4513	-0.0776	-0.3215	0.4661	-50.3264
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case B only	3.0871	0.1759	-0.0763	-0.3158	0.4673	-53.7504
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case A only	-4.5100	8.2085	0.1966	0.8466	-0.6730	67.1867
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case B only	-4.5100	8.2085	0.1966	0.8466	-0.6730	67.1867
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case A only	3.6018	-1.3127	-0.0901	-0.3776	0.4715	-50.0714
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case B only	3.0826	-0.6854	-0.0889	-0.3719	0.4726	-53.4604
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case A only	-2.2385	8.3151	0.1563	0.6832	-0.3690	33.4483
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case B only	-2.2385	8.3151	0.1563	0.6832	-0.3690	33.4483
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case A only	1.8194	3.5538	0.0116	0.0647	0.2089	-25.8163
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case B only	1.5599	3.8673	0.0123	0.0676	0.2095	-27.5680
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case A only	-2.2490	5.5574	0.1135	0.4910	-0.3409	33.1030
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case B only	-2.2490	5.5574	0.1135	0.4910	-0.3409	33.1030
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case A only	1.8064	0.7971	-0.0294	-0.1189	0.2294	-25.3322
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case B only	1.5468	1.1107	-0.0288	-0.1159	0.2298	-27.0271
ULS: 6. 0.9D + 1.0W_Wind downforce Case A only	-4.5117	7.4813	0.1879	0.8079	-0.6664	66.9568
ULS: 6. 0.9D + 1.0W_Wind downforce Case B only	-4.5117	7.4813	0.1879	0.8079	-0.6664	66.9568
ULS: 6. 0.9D + 1.0W_Wind uplift Case A only	3.5990	-2.0394	-0.0980	-0.4125	0.4747	-49.8758
ULS: 6. 0.9D + 1.0W_Wind uplift Case B only	3.0797	-1.4121	-0.0967	-0.4069	0.4757	-53.2355

ASD Load Combination Results

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 1. D	0.0079	2.4230	0.0271	0.1211	-0.0148	-0.0781
ULS: 2. D + L	0.0079	2.4230	0.0271	0.1211	-0.0148	-0.0781
ULS: 3. D + (S or Lr or R)	0.0154	4.1462	0.0532	0.2378	-0.0295	-0.1663
ULS: 3. D + (S or Lr or R)	0.0079	2.4230	0.0271	0.1211	-0.0148	-0.0781
ULS: 4. D + 0.75L + 0.75(S or Lr or R)	0.0136	3.7154	0.0467	0.2085	-0.0258	-0.1450
ULS: 4. D + 0.75L + 0.75(S or Lr or R)	0.0079	2.4230	0.0271	0.1211	-0.0148	-0.0781
ULS: 5b. D + 0.7E	0.0079	2.4230	0.0271	0.1211	-0.0148	-0.0781
ULS: 6b. D + 0.75L + 0.75(0.7)E + 0.75S	0.0136	3.7154	0.0467	0.2085	-0.0258	-0.1450
ULS: 8. 0.6D + 0.7E	0.0048	1.4538	0.0163	0.0726	-0.0088	-0.0480
ULS: 5a. D + 0.6W_Wind downforce Case A only	-2.7023	5.6028	0.1243	0.5361	-0.4028	39.7634
ULS: 5a. D + 0.6W_Wind downforce Case B only	-2.7023	5.6028	0.1243	0.5361	-0.4028	39.7634
ULS: 5a. D + 0.6W_Wind uplift Case A only	2.1638	-0.1094	-0.0469	-0.1948	0.2806	-30.2341
ULS: 5a. D + 0.6W_Wind uplift Case B only	1.8523	0.2669	-0.0462	-0.1913	0.2812	-32.2562
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case A only	-2.0193	6.1003	0.1197	0.5204	-0.3174	29.8174
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case B only	-2.0193	6.1003	0.1197	0.5204	-0.3174	29.8174
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case A only	1.6311	1.8158	-0.0094	-0.0307	0.1978	-22.9755
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case B only	1.3975	2.0980	-0.0088	-0.0280	0.1982	-24.5157

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case A only	-2.0244	4.8077	0.0997	0.4310	-0.3046	29.6856
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case B only	-2.0244	4.8077	0.0997	0.4310	-0.3046	29.6856
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case A only	1.6250	0.5236	-0.0286	-0.1166	0.2075	-22.7630
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case B only	1.3914	0.8059	-0.0280	-0.1139	0.2079	-24.2796
ULS: 7. 0.6D + 0.6W_Wind downforce Case A only	-2.7049	4.6334	0.1130	0.4858	-0.3952	39.5986
ULS: 7. 0.6D + 0.6W_Wind downforce Case B only	-2.7049	4.6334	0.1130	0.4858	-0.3952	39.5986
ULS: 7. 0.6D + 0.6W_Wind uplift Case A only	2.1603	-1.0785	-0.0576	-0.2421	0.2855	-30.0633
ULS: 7. 0.6D + 0.6W_Wind uplift Case B only	1.8487	-0.7021	-0.0568	-0.2386	0.2860	-32.0622

Worst Case Reactions (LRFD)

Note: Downforce / downwind wind load cases are assumed to govern.

Result	Value (kip, kip-ft)
Axial	9.0704
Shear X	-4.5117
Shear Z	0.2103
Moment X	0.9081
Moment Y (Twist)	0.6831
Moment Z	67.4482

Worst Case Reactions (ASD)

Note: Downforce / downwind wind load cases are assumed to govern.

Result	Value (kip, kip-ft)
Axial	6.1003
Shear X	-2.7049
Shear Z	0.1243
Moment X	0.5361
Moment Y (Twist)	0.4028
Moment Z	39.7634

Reaction Forces for Foundation 2 (Node ID#101), (kip, kip-ft)

LRFD Load Combination Results

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 1. 1.4D	-0.0110	3.7746	-0.0007	-0.0032	0.0005	0.1901
ULS: 2. 1.2D + 1.6L + 0.5(S or Lr or R)	-0.0132	4.2270	-0.0008	-0.0038	0.0006	0.2200
ULS: 2. 1.2D + 1.6L + 0.5(S or Lr or R)	-0.0095	3.2354	-0.0006	-0.0027	0.0005	0.1613
ULS: 3. 1.2D + 1.6(S or Lr or R) + L	-0.0214	6.4086	-0.0012	-0.0059	0.0008	0.3590
ULS: 5. 1.2D + E + L + 0.2S	-0.0110	3.6320	-0.0007	-0.0031	0.0005	0.1844
ULS: 7. 0.9D + 1.0E	-0.0071	2.4265	-0.0004	-0.0021	0.0004	0.1191
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case A only	-5.0414	10.3053	0.0395	0.1660	-0.2001	75.2887
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case B only	-5.0414	10.3053	0.0395	0.1660	-0.2001	75.2887
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case A only	4.0039	-0.6219	-0.0279	-0.1176	0.1382	-55.4598
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case B only	3.3744	0.1198	-0.0342	-0.1443	0.1663	-58.8474
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case A only	-5.0386	9.3141	0.0392	0.1650	-0.1981	74.8724
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case B only	-5.0386	9.3141	0.0392	0.1650	-0.1981	74.8724
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case A only	4.0083	-1.6138	-0.0274	-0.1152	0.1366	-55.2722
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case B only	3.3789	-0.8721	-0.0336	-0.1417	0.1644	-58.6201
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case A only	-2.5358	9.4480	0.0187	0.0781	-0.0988	37.7615
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case B only	-2.5358	9.4480	0.0187	0.0781	-0.0988	37.7615
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case A only	1.9857	3.9848	-0.0156	-0.0661	0.0730	-28.0560
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case B only	1.6708	4.3557	-0.0188	-0.0798	0.0874	-29.7926
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case A only	-2.5253	6.2753	0.0186	0.0781	-0.0957	37.0027
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case B only	-2.5253	6.2753	0.0186	0.0781	-0.0957	37.0027
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case A only	1.9987	0.8111	-0.0144	-0.0606	0.0702	-27.8451
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case B only	1.6840	1.1820	-0.0175	-0.0739	0.0842	-29.5171
ULS: 6. 0.9D + 1.0W_Wind downforce Case A only	-5.0369	8.5055	0.0390	0.1643	-0.1966	74.5420
ULS: 6. 0.9D + 1.0W_Wind downforce Case B only	-5.0369	8.5055	0.0390	0.1643	-0.1966	74.5420
ULS: 6. 0.9D + 1.0W_Wind uplift Case A only	4.0111	-2.4228	-0.0270	-0.1136	0.1355	-55.1160
ULS: 6. 0.9D + 1.0W_Wind uplift Case B only	3.3817	-1.6811	-0.0332	-0.1399	0.1631	-58.4312

ASD Load Combination Results

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 1. D	-0.0079	2.6961	-0.0005	-0.0023	0.0004	0.1330
ULS: 2. D + L	-0.0079	2.6961	-0.0005	-0.0023	0.0004	0.1330
ULS: 3. D + (S or Lr or R)	-0.0154	4.6794	-0.0009	-0.0044	0.0007	0.2507
ULS: 3. D + (S or Lr or R)	-0.0079	2.6961	-0.0005	-0.0023	0.0004	0.1330
ULS: 4. D + 0.75L + 0.75(S or Lr or R)	-0.0135	4.1836	-0.0008	-0.0039	0.0006	0.2202
ULS: 4. D + 0.75L + 0.75(S or Lr or R)	-0.0079	2.6961	-0.0005	-0.0023	0.0004	0.1330
ULS: 5b. D + 0.7E	-0.0079	2.6961	-0.0005	-0.0023	0.0004	0.1330
ULS: 6b. D + 0.75L + 0.75(0.7)E + 0.75S	-0.0135	4.1836	-0.0008	-0.0039	0.0006	0.2202
ULS: 8. 0.6D + 0.7E	-0.0048	1.6177	-0.0003	-0.0014	0.0003	0.0782
ULS: 5a. D + 0.6W_Wind downforce Case A only	-3.0269	6.3441	0.0226	0.0949	-0.1151	44.3520
ULS: 5a. D + 0.6W_Wind downforce Case B only	-3.0269	6.3441	0.0226	0.0949	-0.1151	44.3520
ULS: 5a. D + 0.6W_Wind uplift Case A only	2.4023	-0.2131	-0.0168	-0.0710	0.0833	-33.3234
ULS: 5a. D + 0.6W_Wind uplift Case B only	2.0246	0.2319	-0.0206	-0.0869	0.1000	-35.3173
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case A only	-2.2775	6.9195	0.0166	0.0695	-0.0866	33.4807
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case B only	-2.2775	6.9195	0.0166	0.0695	-0.0866	33.4807
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case A only	1.7934	2.0019	-0.0134	-0.0568	0.0643	-25.1209
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case B only	1.5102	2.3357	-0.0163	-0.0689	0.0769	-26.6425
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case A only	-2.2725	5.4322	0.0166	0.0698	-0.0854	33.1612
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case B only	-2.2725	5.4322	0.0166	0.0698	-0.0854	33.1612
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case A only	1.7995	0.5143	-0.0129	-0.0542	0.0630	-25.0379
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case B only	1.5163	0.8481	-0.0157	-0.0662	0.0755	-26.5327
ULS: 7. 0.6D + 0.6W_Wind downforce Case A only	-3.0242	5.2658	0.0225	0.0947	-0.1141	44.0740
ULS: 7. 0.6D + 0.6W_Wind downforce Case B only	-3.0242	5.2658	0.0225	0.0947	-0.1141	44.0740
ULS: 7. 0.6D + 0.6W_Wind uplift Case A only	2.4058	-1.2917	-0.0165	-0.0693	0.0823	-33.2176
ULS: 7. 0.6D + 0.6W_Wind uplift Case B only	2.0282	-0.8467	-0.0202	-0.0851	0.0988	-35.1855

Worst Case Reactions (LRFD)

Note: Downforce / downwind wind load cases are assumed to govern.

Result	Value (kip, kip-ft)
Axial	10.3053
Shear X	-5.0414
Shear Z	0.0395
Moment X	0.1660
Moment Y (Twist)	0.2001
Moment Z	75.2887

Worst Case Reactions (ASD)

Note: Downforce / downwind wind load cases are assumed to govern.

Result	Value (kip, kip-ft)
Axial	6.9195
Shear X	-3.0269
Shear Z	0.0226
Moment X	0.0949
Moment Y (Twist)	0.1151
Moment Z	44.3520

Reaction Forces for Foundation 3 (Node ID#201), (kip, kip-ft)

LRFD Load Combination Results

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 1. 1.4D	-0.0110	3.7746	0.0007	0.0032	-0.0004	0.1901
ULS: 2. 1.2D + 1.6L + 0.5(S or Lr or R)	-0.0132	4.2270	0.0008	0.0038	-0.0005	0.2200
ULS: 2. 1.2D + 1.6L + 0.5(S or Lr or R)	-0.0095	3.2354	0.0006	0.0028	-0.0004	0.1613
ULS: 3. 1.2D + 1.6(S or Lr or R) + L	-0.0214	6.4086	0.0012	0.0060	-0.0006	0.3590
ULS: 5. 1.2D + E + L + 0.2S	-0.0110	3.6320	0.0007	0.0032	-0.0005	0.1844
ULS: 7. 0.9D + 1.0E	-0.0071	2.4265	0.0004	0.0021	-0.0003	0.1191
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case A only	-5.0414	10.3054	-0.0395	-0.1663	0.2001	75.2891

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case B only	-5.0414	10.3054	-0.0395	-0.1663	0.2001	75.2891
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case A only	4.0040	-0.6219	0.0279	0.1178	-0.1381	-55.4600
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case B only	3.3744	0.1198	0.0342	0.1447	-0.1660	-58.8477
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case A only	-5.0386	9.3141	-0.0392	-0.1652	0.1980	74.8727
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case B only	-5.0386	9.3141	-0.0392	-0.1652	0.1980	74.8727
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case A only	4.0084	-1.6138	0.0274	0.1153	-0.1365	-55.2724
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case B only	3.3789	-0.8721	0.0336	0.1420	-0.1642	-58.6203
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case A only	-2.5358	9.4480	-0.0187	-0.0782	0.0990	37.7617
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case B only	-2.5358	9.4480	-0.0187	-0.0782	0.0990	37.7617
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case A only	1.9857	3.9848	0.0156	0.0663	-0.0728	-28.0561
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case B only	1.6708	4.3557	0.0188	0.0801	-0.0871	-29.7928
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case A only	-2.5253	6.2753	-0.0186	-0.0782	0.0957	37.0028
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case B only	-2.5253	6.2753	-0.0186	-0.0782	0.0957	37.0028
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case A only	1.9987	0.8111	0.0144	0.0607	-0.0702	-27.8452
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case B only	1.6840	1.1820	0.0175	0.0741	-0.0840	-29.5172
ULS: 6. 0.9D + 1.0W_Wind downforce Case A only	-5.0369	8.5055	-0.0390	-0.1644	0.1966	74.5422
ULS: 6. 0.9D + 1.0W_Wind downforce Case B only	-5.0369	8.5055	-0.0390	-0.1644	0.1966	74.5422
ULS: 6. 0.9D + 1.0W_Wind uplift Case A only	4.0112	-2.4228	0.0270	0.1137	-0.1354	-55.1162
ULS: 6. 0.9D + 1.0W_Wind uplift Case B only	3.3818	-1.6811	0.0332	0.1402	-0.1629	-58.4315

ASD Load Combination Results

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 1. D	-0.0079	2.6961	0.0005	0.0023	-0.0004	0.1330
ULS: 2. D + L	-0.0079	2.6961	0.0005	0.0023	-0.0004	0.1330
ULS: 3. D + (S or Lr or R)	-0.0154	4.6794	0.0009	0.0044	-0.0006	0.2507
ULS: 3. D + (S or Lr or R)	-0.0079	2.6961	0.0005	0.0023	-0.0004	0.1330
ULS: 4. D + 0.75L + 0.75(S or Lr or R)	-0.0135	4.1836	0.0008	0.0039	-0.0005	0.2202
ULS: 4. D + 0.75L + 0.75(S or Lr or R)	-0.0079	2.6961	0.0005	0.0023	-0.0004	0.1330
ULS: 5b. D + 0.7E	-0.0079	2.6961	0.0005	0.0023	-0.0004	0.1330
ULS: 6b. D + 0.75L + 0.75(0.7)E + 0.75S	-0.0135	4.1836	0.0008	0.0039	-0.0005	0.2202
ULS: 8. 0.6D + 0.7E	-0.0048	1.6177	0.0003	0.0014	-0.0002	0.0782
ULS: 5a. D + 0.6W_Wind downforce Case A only	-3.0269	6.3441	-0.0226	-0.0950	0.1151	44.3521
ULS: 5a. D + 0.6W_Wind downforce Case B only	-3.0269	6.3441	-0.0226	-0.0950	0.1151	44.3521
ULS: 5a. D + 0.6W_Wind uplift Case A only	2.4023	-0.2131	0.0168	0.0711	-0.0832	-33.3235
ULS: 5a. D + 0.6W_Wind uplift Case B only	2.0246	0.2319	0.0206	0.0871	-0.0998	-35.3174
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case A only	-2.2775	6.9195	-0.0166	-0.0696	0.0867	33.4808
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case B only	-2.2775	6.9195	-0.0166	-0.0696	0.0867	33.4808
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case A only	1.7935	2.0019	0.0134	0.0569	-0.0642	-25.1210
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case B only	1.5102	2.3357	0.0163	0.0691	-0.0768	-26.6426
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case A only	-2.2725	5.4323	-0.0166	-0.0698	0.0854	33.1613
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case B only	-2.2725	5.4323	-0.0166	-0.0698	0.0854	33.1613
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case A only	1.7995	0.5143	0.0129	0.0543	-0.0630	-25.0380
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case B only	1.5163	0.8481	0.0157	0.0663	-0.0754	-26.5328
ULS: 7. 0.6D + 0.6W_Wind downforce Case A only	-3.0243	5.2658	-0.0225	-0.0947	0.1141	44.0741
ULS: 7. 0.6D + 0.6W_Wind downforce Case B only	-3.0243	5.2658	-0.0225	-0.0947	0.1141	44.0741
ULS: 7. 0.6D + 0.6W_Wind uplift Case A only	2.4058	-1.2917	0.0165	0.0694	-0.0823	-33.2176
ULS: 7. 0.6D + 0.6W_Wind uplift Case B only	2.0282	-0.8467	0.0202	0.0852	-0.0987	-35.1856

Worst Case Reactions (LRFD)

Worst Case Reactions (ASD)

Note: Downforce / downwind wind load cases are assumed to govern.

Note: Downforce / downwind wind load cases are assumed to govern.

Result	Value (kip, kip-ft)
Axial	10.3054
Shear X	-5.0414
Shear Z	-0.0395
Moment X	-0.1663
Moment Y (Twist)	0.2001
Moment Z	75.2891

Result	Value (kip, kip-ft)
Axial	6.9195
Shear X	-3.0269
Shear Z	-0.0226
Moment X	-0.0950
Moment Y (Twist)	0.1151
Moment Z	44.3521

Reaction Forces for Foundation 4 (Node ID#301), (kip, kip-ft)

LRFD Load Combination Results

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 1. 1.4D	0.0110	3.3922	-0.0380	-0.1698	0.0209	-0.1067
ULS: 2. 1.2D + 1.6L + 0.5(S or Lr or R)	0.0132	3.7692	-0.0456	-0.2038	0.0252	-0.1368
ULS: 2. 1.2D + 1.6L + 0.5(S or Lr or R)	0.0095	2.9076	-0.0326	-0.1455	0.0178	-0.0926
ULS: 3. 1.2D + 1.6(S or Lr or R) + L	0.0214	5.6647	-0.0744	-0.3327	0.0416	-0.2270
ULS: 5. 1.2D + E + L + 0.2S	0.0110	3.2523	-0.0378	-0.1687	0.0208	-0.1105
ULS: 7. 0.9D + 1.0E	0.0071	2.1807	-0.0244	-0.1090	0.0133	-0.0707
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case A only	-4.5072	9.0704	-0.2103	-0.9083	0.6831	67.4493
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case B only	-4.5072	9.0704	-0.2103	-0.9083	0.6831	67.4493
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case A only	3.6062	-0.4513	0.0776	0.3216	-0.4660	-50.3270
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case B only	3.0870	0.1759	0.0763	0.3162	-0.4670	-53.7513
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case A only	-4.5100	8.2085	-0.1966	-0.8468	0.6729	67.1876
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind downforce Case B only	-4.5100	8.2085	-0.1966	-0.8468	0.6729	67.1876
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case A only	3.6018	-1.3127	0.0901	0.3777	-0.4714	-50.0719
ULS: 4. 1.2D + W + L + 0.5(S or Lr or R)_Wind uplift Case B only	3.0825	-0.6854	0.0889	0.3723	-0.4724	-53.4612
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case A only	-2.2385	8.3151	-0.1563	-0.6833	0.3691	33.4489
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case B only	-2.2385	8.3151	-0.1563	-0.6833	0.3691	33.4489
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case A only	1.8194	3.5538	-0.0116	-0.0646	-0.2088	-25.8166
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case B only	1.5599	3.8674	-0.0123	-0.0674	-0.2093	-27.5684
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case A only	-2.2490	5.5574	-0.1135	-0.4910	0.3409	33.1035
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind downforce Case B only	-2.2490	5.5574	-0.1135	-0.4910	0.3409	33.1035
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case A only	1.8064	0.7971	0.0294	0.1190	-0.2293	-25.3325
ULS: 3. 1.2D + 1.6(S or Lr or R) + 0.5W_Wind uplift Case B only	1.5467	1.1108	0.0288	0.1161	-0.2297	-27.0275
ULS: 6. 0.9D + 1.0W_Wind downforce Case A only	-4.5117	7.4813	-0.1879	-0.8080	0.6664	66.9575
ULS: 6. 0.9D + 1.0W_Wind downforce Case B only	-4.5117	7.4813	-0.1879	-0.8080	0.6664	66.9575
ULS: 6. 0.9D + 1.0W_Wind uplift Case A only	3.5990	-2.0394	0.0980	0.4126	-0.4746	-49.8762
ULS: 6. 0.9D + 1.0W_Wind uplift Case B only	3.0797	-1.4121	0.0967	0.4071	-0.4755	-53.2362

ASD Load Combination Results

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 1. D	0.0079	2.4230	-0.0271	-0.1211	0.0148	-0.0781
ULS: 2. D + L	0.0079	2.4230	-0.0271	-0.1211	0.0148	-0.0781
ULS: 3. D + (S or Lr or R)	0.0154	4.1462	-0.0532	-0.2377	0.0296	-0.1662
ULS: 3. D + (S or Lr or R)	0.0079	2.4230	-0.0271	-0.1211	0.0148	-0.0781
ULS: 4. D + 0.75L + 0.75(S or Lr or R)	0.0135	3.7154	-0.0467	-0.2085	0.0259	-0.1449
ULS: 4. D + 0.75L + 0.75(S or Lr or R)	0.0079	2.4230	-0.0271	-0.1211	0.0148	-0.0781
ULS: 5b. D + 0.7E	0.0079	2.4230	-0.0271	-0.1211	0.0148	-0.0781
ULS: 6b. D + 0.75L + 0.75(0.7)E + 0.75S	0.0135	3.7154	-0.0467	-0.2085	0.0259	-0.1449

Name	Fx	Fy	Fz	Mx	My	Mz
ULS: 8. 0.6D + 0.7E	0.0048	1.4538	-0.0163	-0.0726	0.0089	-0.0480
ULS: 5a. D + 0.6W_Wind downforce Case A only	-2.7023	5.6028	-0.1243	-0.5361	0.4027	39.7639
ULS: 5a. D + 0.6W_Wind downforce Case B only	-2.7023	5.6028	-0.1243	-0.5361	0.4027	39.7639
ULS: 5a. D + 0.6W_Wind uplift Case A only	2.1638	-0.1094	0.0469	0.1948	-0.2806	-30.2344
ULS: 5a. D + 0.6W_Wind uplift Case B only	1.8522	0.2669	0.0462	0.1914	-0.2810	-32.2566
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case A only	-2.0193	6.1003	-0.1197	-0.5205	0.3174	29.8178
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case B only	-2.0193	6.1003	-0.1197	-0.5205	0.3174	29.8178
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case A only	1.6311	1.8158	0.0094	0.0308	-0.1977	-22.9757
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case B only	1.3975	2.0980	0.0088	0.0282	-0.1981	-24.5160
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case A only	-2.0244	4.8077	-0.0997	-0.4310	0.3046	29.6859
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind downforce Case B only	-2.0244	4.8077	-0.0997	-0.4310	0.3046	29.6859
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case A only	1.6250	0.5236	0.0286	0.1166	-0.2074	-22.7632
ULS: 6a. D + 0.75L + 0.75(0.6)W + 0.75(S or Lr or R)_Wind uplift Case B only	1.3914	0.8059	0.0280	0.1140	-0.2077	-24.2799
ULS: 7. 0.6D + 0.6W_Wind downforce Case A only	-2.7049	4.6334	-0.1130	-0.4858	0.3952	39.5989
ULS: 7. 0.6D + 0.6W_Wind downforce Case B only	-2.7049	4.6334	-0.1130	-0.4858	0.3952	39.5989
ULS: 7. 0.6D + 0.6W_Wind uplift Case A only	2.1603	-1.0785	0.0576	0.2421	-0.2855	-30.0635
ULS: 7. 0.6D + 0.6W_Wind uplift Case B only	1.8487	-0.7021	0.0568	0.2387	-0.2859	-32.0624

Worst Case Reactions (LRFD)

Note: Downforce / downwind wind load cases are assumed to govern.

Result	Value (kip, kip-ft)
Axial	9.0704
Shear X	-4.5117
Shear Z	-0.2103
Moment X	-0.9083
Moment Y (Twist)	0.6831
Moment Z	67.4493

Worst Case Reactions (ASD)

Note: Downforce / downwind wind load cases are assumed to govern.

Result	Value (kip, kip-ft)
Axial	6.1003
Shear X	-2.7049
Shear Z	-0.1243
Moment X	-0.5361
Moment Y (Twist)	0.4027
Moment Z	39.7639

Project Details

Design Code: AISC 360-16 LRFD
 Provision: LRFD
 Country: United States
 User Name: sales@mtsolar.us
 Project Name: Tejada Holdings -v2
 Unit System: imperial



Design Input Information

Design Factors			
Φ_t	Φ_c	Φ_b	Φ_v
0.9	0.9	0.9	0.9

Design Materials			
ID	E (ksi)	F_y (ksi)	F_u (ksi)
1	29000	50	65

Section Dimensions

ID	Name	d (in)	t_w (in)				
2	2in Pipe Sch 80	2.38	0.22				
5	4in Pipe Sch 80	4.50	0.34				
9	8in Pipe Sch 40	8.63	0.32				

ID	Name	d (in)	b (in)	t_w (in)	t_b (in)	r (in)	
16	HSS5x3x3/16	5.00	3.00	0.17	0.17	0.17	

ID	Name	d (in)	t_w (in)	b_t (in)	b_b (in)	t_t (in)	t_b (in)	r (in)
19	W8x10	7.89	0.17	3.94	3.94	0.20	0.20	0.30

Section Properties								
ID	Name	A (in ²)	J (in ⁴)	I_{y0} (in ⁴)	I_{z0} (in ⁴)	I_w (in ⁶)	S_{y0} (in ³)	S_{z0} (in ³)

9	66.48	58.89	3.82	3.82	19.94	19.94
10	116.10	111.33	15.79	11.10	42.08	23.28
11	133.20	123.95	32.87	6.12	40.24	43.62
12	198.33	196.72	21.95	21.95	59.50	59.50
13	133.20	85.85	24.17	6.12	40.24	43.62
14	133.20	85.85	24.72	6.12	40.24	43.62
15	133.20	52.83	32.87	6.12	40.24	43.62
16	133.20	52.83	32.87	6.12	40.24	43.62
101	377.97	341.42	83.29	83.29	113.39	113.39
102	198.33	196.72	21.95	21.95	59.50	59.50
103	116.10	115.41	15.79	11.10	42.08	23.28
104	116.10	111.33	15.79	11.10	42.08	23.28
105	116.10	114.23	15.79	11.10	42.08	23.28
106	116.10	115.41	15.79	11.10	42.08	23.28
107	116.10	114.23	15.79	11.10	42.08	23.28
108	133.20	123.95	32.87	6.12	40.24	43.62
109	66.48	58.89	3.82	3.82	19.94	19.94
110	116.10	111.33	15.79	11.10	42.08	23.28
111	133.20	123.95	32.87	6.12	40.24	43.62
112	198.33	196.72	21.95	21.95	59.50	59.50
113	133.20	85.85	23.65	6.12	40.24	43.62
114	133.20	85.85	23.85	6.12	40.24	43.62
115	133.20	69.16	16.89	6.12	40.24	43.62
116	133.20	69.16	16.65	6.12	40.24	43.62
201	377.97	341.42	83.29	83.29	113.39	113.39
202	198.33	196.72	21.95	21.95	59.50	59.50
203	116.10	115.41	15.79	11.10	42.08	23.28
204	116.10	111.33	15.79	11.10	42.08	23.28
205	116.10	114.23	15.79	11.10	42.08	23.28
206	116.10	115.41	15.79	11.10	42.08	23.28
207	116.10	114.23	15.79	11.10	42.08	23.28
208	133.20	123.95	32.87	6.12	40.24	43.62
209	66.48	58.89	3.82	3.82	19.94	19.94
210	116.10	111.33	15.79	11.10	42.08	23.28
211	133.20	123.95	32.87	6.12	40.24	43.62
212	198.33	196.72	21.95	21.95	59.50	59.50
213	133.20	85.85	23.68	6.12	40.24	43.62
214	133.20	85.85	23.84	6.12	40.24	43.62
215	133.20	69.16	15.74	6.12	40.24	43.62
216	133.20	69.16	16.78	6.12	40.24	43.62
301	377.97	341.42	83.29	83.29	113.39	113.39
302	198.33	196.72	21.95	21.95	59.50	59.50
303	116.10	115.41	15.79	11.10	42.08	23.28
304	116.10	111.33	15.79	11.10	42.08	23.28
305	116.10	114.23	15.79	11.10	42.08	23.28
306	116.10	115.41	15.79	11.10	42.08	23.28
307	116.10	114.23	15.79	11.10	42.08	23.28
308	133.20	52.83	32.87	6.12	40.24	43.62
309	66.48	58.89	3.82	3.82	19.94	19.94
310	116.10	111.33	15.79	11.10	42.08	23.28
311	133.20	52.83	32.87	6.12	40.24	43.62

312	198.33	196.72	21.95	21.95	59.50	59.50
313	133.20	85.85	24.17	6.12	40.24	43.62
314	133.20	85.85	24.74	6.12	40.24	43.62
315	133.20	69.16	17.30	6.12	40.24	43.62
316	133.20	69.16	16.68	6.12	40.24	43.62

Design Ratio

Member ID	P	M _z	M _y	V _y	V _z	(P,M _z ,M _y)	Worst LC	KL/r	δ	Status
1	0.027	0.810	0.025	0.040	0.002	0.834	#13	0.186	Not Required	Pass
2	0.002	0.283	0.187	0.065	0.036	0.470	#13	0.035	Not Required	Pass
3	0.006	0.530	0.032	0.052	0.005	0.554	#13	0.045	Not Required	Pass
4	0.006	0.500	0.100	0.050	0.022	0.558	#13	0.080	Not Required	Pass
5	0.006	0.328	0.095	0.053	0.024	0.340	#13	0.074	Not Required	Pass
6	0.008	0.630	0.058	0.064	0.012	0.670	#13	0.045	Not Required	Pass
7	0.008	0.391	0.136	0.063	0.034	0.410	#13	0.074	Not Required	Pass
8	0.002	0.071	0.122	0.039	0.013	0.127	#24	0.095	Not Required	Pass
9	0.009	0.057	0.053	0.002	0.001	0.112	#13	0.204	Not Required	Pass
10	0.008	0.576	0.132	0.058	0.028	0.606	#13	0.080	Not Required	Pass
11	0.002	0.068	0.124	0.043	0.013	0.130	#24	0.095	Not Required	Pass
12	0.002	0.376	0.218	0.079	0.041	0.594	#13	0.053	Not Required	Pass
13	0.004	0.191	0.311	0.055	0.017	0.404	#21	0.286	Not Required	Pass
14	0.006	0.176	0.309	0.050	0.017	0.383	#21	0.190	Not Required	Pass
15	0.000	0.059	0.105	0.026	0.008	0.151	#21	Not Required	Not Required	Pass
16	0.000	0.056	0.105	0.024	0.008	0.149	#21	Not Required	Not Required	Pass
101	0.030	0.904	0.005	0.044	0.000	0.921	#13	0.186	Not Required	Pass
102	0.002	0.366	0.223	0.082	0.041	0.589	#13	0.035	Not Required	Pass
103	0.008	0.639	0.051	0.064	0.008	0.675	#13	0.045	Not Required	Pass
104	0.008	0.617	0.135	0.062	0.029	0.685	#13	0.080	Not Required	Pass
105	0.008	0.396	0.138	0.063	0.035	0.420	#13	0.074	Not Required	Pass
106	0.008	0.664	0.051	0.067	0.008	0.694	#13	0.045	Not Required	Pass
107	0.008	0.412	0.130	0.066	0.033	0.435	#13	0.074	Not Required	Pass
108	0.003	0.053	0.113	0.040	0.013	0.138	#21	0.095	Not Required	Pass
109	0.011	0.054	0.046	0.001	0.000	0.102	#13	0.204	Not Required	Pass
110	0.008	0.627	0.125	0.063	0.027	0.678	#13	0.080	Not Required	Pass
111	0.002	0.068	0.115	0.042	0.013	0.135	#21	0.095	Not Required	Pass
112	0.002	0.383	0.232	0.083	0.044	0.616	#13	0.035	Not Required	Pass
113	0.005	0.179	0.320	0.054	0.017	0.446	#21	0.286	Not Required	Pass
114	0.008	0.196	0.318	0.052	0.017	0.455	#21	0.286	Not Required	Pass
115	0.003	0.266	0.167	0.041	0.013	0.370	#21	0.473	Not Required	Pass
116	0.003	0.243	0.168	0.041	0.013	0.359	#21	0.473	Not Required	Pass
201	0.030	0.904	0.005	0.044	0.000	0.921	#13	0.186	Not Required	Pass
202	0.002	0.383	0.232	0.083	0.044	0.616	#13	0.035	Not Required	Pass
203	0.008	0.664	0.051	0.067	0.008	0.694	#13	0.045	Not Required	Pass
204	0.008	0.627	0.125	0.063	0.027	0.678	#13	0.080	Not Required	Pass
205	0.008	0.412	0.130	0.066	0.033	0.435	#13	0.074	Not Required	Pass
206	0.008	0.639	0.051	0.064	0.008	0.675	#13	0.045	Not Required	Pass
207	0.008	0.396	0.138	0.063	0.035	0.420	#13	0.074	Not Required	Pass
208	0.002	0.060	0.130	0.041	0.013	0.151	#21	0.095	Not Required	Pass
209	0.011	0.054	0.046	0.001	0.000	0.102	#13	0.204	Not Required	Pass
210	0.008	0.617	0.135	0.062	0.029	0.685	#13	0.080	Not Required	Pass

211	0.002	0.076	0.131	0.041	0.013	0.145	#21	0.095	Not Required	Pass
212	0.002	0.366	0.223	0.082	0.041	0.589	#13	0.035	Not Required	Pass
213	0.005	0.179	0.320	0.054	0.017	0.446	#21	0.286	Not Required	Pass
214	0.008	0.196	0.318	0.052	0.017	0.455	#21	0.286	Not Required	Pass
215	0.004	0.257	0.167	0.042	0.013	0.359	#13	0.473	Not Required	Pass
216	0.004	0.218	0.168	0.040	0.013	0.338	#21	0.473	Not Required	Pass
301	0.027	0.810	0.025	0.040	0.002	0.834	#13	0.186	Not Required	Pass
302	0.002	0.376	0.218	0.079	0.041	0.594	#13	0.053	Not Required	Pass
303	0.008	0.630	0.058	0.064	0.012	0.670	#13	0.045	Not Required	Pass
304	0.008	0.576	0.132	0.058	0.028	0.606	#13	0.080	Not Required	Pass
305	0.008	0.391	0.136	0.063	0.034	0.410	#13	0.074	Not Required	Pass
306	0.006	0.530	0.032	0.052	0.005	0.554	#13	0.045	Not Required	Pass
307	0.006	0.328	0.095	0.053	0.024	0.340	#13	0.074	Not Required	Pass
308	0.000	0.056	0.105	0.024	0.008	0.149	#21	Not Required	Not Required	Pass
309	0.009	0.057	0.053	0.002	0.001	0.112	#13	0.204	Not Required	Pass
310	0.006	0.500	0.100	0.050	0.022	0.558	#13	0.080	Not Required	Pass
311	0.000	0.059	0.105	0.026	0.008	0.151	#21	Not Required	Not Required	Pass
312	0.002	0.283	0.187	0.065	0.036	0.470	#13	0.035	Not Required	Pass
313	0.004	0.191	0.311	0.055	0.017	0.404	#21	0.190	Not Required	Pass
314	0.006	0.176	0.309	0.050	0.017	0.383	#21	0.286	Not Required	Pass
315	0.003	0.263	0.167	0.043	0.013	0.369	#21	0.473	Not Required	Pass
316	0.003	0.247	0.167	0.039	0.013	0.361	#21	0.473	Not Required	Pass

Definitions

Φ_t	Safety factor for tensile
Φ_c	Safety factor for compression
Φ_b	Safety factor for flexure
Φ_v	Safety factor for shear
E	Modulus of elasticity
F_y	Specified minimum yield stress
F_u	Specified minimum tensile strength
A	Cross-sectional area
J	Torsional constant
I_{yp}	Moment of inertia about the Y axes
I_{zp}	Moment of inertia about the Z axes
I_w	Warping constant
S_{yp}	Plastic section modulus about the Y axis
S_{zp}	Plastic section modulus about the Z axis
KL	Effective length
C_b	Buckling modification factor (from all load combinations)
L_b	Length between braced points
LST	Limited slenderness for tension
LSC	Limited slenderness for compression
LD	Limited deflection
P_n	Nominal axial strength (tension/compression)
M_n	Nominal flexural strength (about Z/Y axis)
V_n	Nominal shear strength (along Z/Y axis)
P	Design ratio in case of axial force
M_z	Design ratio in case of bending about Z axis
M_y	Design ratio in case of bending about Y axis
V_y	Design ratio in case of shear along Y axis
V_z	Design ratio in case of shear along Z axis
(P, M_z, M_y)	Design ratio in case of axial force and bending action
KL/r	Design ratio in case of section slenderness
δ	Design ratio in case of member deflection
OK	Capacity is provided
NG	Capacity is not provided

IBC 2018 Pile Design



Input	Description
Region	American Standard
Concrete design code	American Concrete Institute (ACI 318:2019)

Cross-section

Input	Description	Value
Shape	Cross-sectional shape	Square
b	Section width	48 in
D	Section depth	48 in

Material Properties

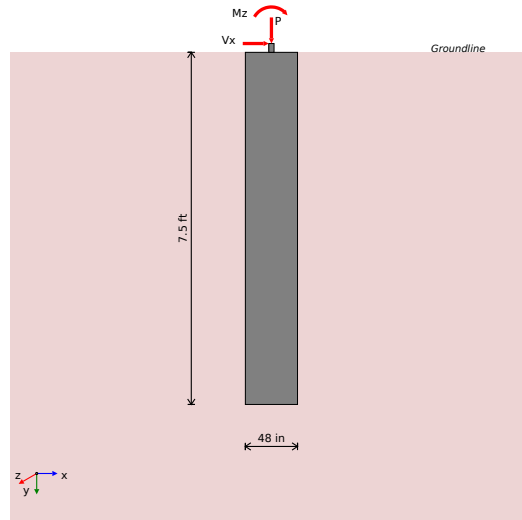
Input	Description	Value
f'_{ck}	Concrete compressive strength	2.5 ksi
f_{yk}	Yield strength of steel	60 ksi
d_b	Rebar diameter	#5 (0.625) in
cover	Concrete cover	3 in

Soil Parameters (IBC 1806)

Input	Description	Value
Soil type	Sand, silty sand, clayey sand, silty gravel & clayey gravel	
q_a	Allowable bearing pressure	2000 psf
R	Allowable lateral pressure	150 psf/ft

Loading

Load	ASD	LRFD
P	6.1 kip	9.07 kip
V _x	-2.705 kip	-4.512 kip
V _z	-0.124 kip	-0.21 kip
M _x	-0.536 kip-ft	-0.908 kip-ft
M _z	39.76 kip-ft	67.45 kip-ft



Required depth to resist lateral loads (ASD)

Allowable lateral pressure

$$R = 150 \text{ psf/ft}$$

Point of application of lateral load:

$$H = h_1 + h_2 + h_e = 0 + 0 + 0 = 0 \text{ ft}$$

Considering x-direction:

Lateral force per section length

$$H_o = \frac{V_x}{1.57 \times D} = \frac{-2.705}{1.57 \times 48} = -0.431 \frac{\text{kip}}{\text{ft}}$$

Moment per section length

$$M_o = \frac{M_z + (V_z \times H)}{1.57 \times D} = \frac{39.76 + (-2.705 \times 0)}{1.57 \times 48} = 6.332 \frac{\text{kip-ft}}{\text{ft}}$$

Required depth of embedment in earth:

$$L_z^3 - \left(9 \times \frac{H_o \times L_z}{R}\right) - \left(12 \times \frac{M_o}{R}\right) = 0$$

Solving the cubic equation:

$$L_{e,z} = 6.898 \text{ ft}$$

Considering z-direction:

Lateral force per section length

$$H_o = \frac{V_z}{1.57 \times b} = \frac{-0.124}{1.57 \times 48} = -0.02 \frac{\text{kip}}{\text{ft}}$$

Moment per section length

$$M_o = \frac{M_z + (V_z \times H)}{1.57 \times b} = \frac{-0.536 + (-0.124 \times 0)}{1.57 \times 48} = -0.085 \frac{\text{kip-ft}}{\text{ft}}$$

Required depth of embedment in earth:

$$L_z^3 - \left(9 \times \frac{H_o \times L_z}{R}\right) - \left(12 \times \frac{M_o}{R}\right) = 0$$

Solving the cubic equation:

$$L_{e,z} = -1.69 \text{ ft}$$

Minimum embedded depth

Depth of pile required

$$L_{e,req} = \text{MAX}[L_{e,x}, L_{e,z}] = \text{MAX}[6.898, -1.69] = 6.898 \text{ ft}$$

Actual embedded length

$$L_e = L - h_2 - h_e = 7.5 - 0 - 0 = 7.5 \text{ ft}$$

Utilisation

$$\text{Ratio} = \frac{L_{e,req}}{L_e} = \frac{6.898}{7.5} = 0.92$$

UTILITY: 0.92

REFERENCES

CALCULATIONS

RESULTS

End-bearing Capacity (ASD)

Allowable bearing pressure
Unit weight of concrete

$q_a = 2000 \text{ psf}$
 $w_c = 0.15 \text{ kip/ft}^3$

Cross-sectional area:

$$A = b \times D = 48 \times 48 = 16 \text{ ft}^2$$

End-bearing pressure:

$$q = \frac{P}{A} = \frac{6.1}{16} = 381.3 \text{ psf}$$

Utilisation

$$\text{Ratio} = \frac{q}{q_a} = \frac{381.3}{2000} = 0.191$$

UTILITY: 0.19

Lateral Soil Pressure (ASD)

Allowable lateral pressure

$R = 150 \text{ psf/ft}$

Length to least lateral dimension ratio:

$$\frac{L}{\text{MIN}[b, D]} = \frac{7.5}{\text{MIN}[4, 4]} = 1.875$$

L/D ratio ≤ 10 . This pile is classified as a short pile.

Considering x-direction:

Distance from resting surface to pivot point:

$$a = \frac{(4 \times M_o \times L_e) + (3 \times H_o \times L_e^2)}{R}$$

$$(6 \times M_o) + (4 \times H_o \times L_e)$$

$$a = \frac{(4 \times 6.332 \times 7.5) + (3 \times 0.431 \times 7.5^2)}{(6 \times 6.332) + (4 \times 0.431 \times 7.5)} = 5.159 \text{ ft}$$

Earth pressure against the pile at a distance a/2 from the resting surface:

$$p = \frac{0.75 \times [(4 \times M_o) + (3 \times H_o \times L_e)]^2}{L_e^2 \times [(3 \times M_o) + (2 \times H_o \times L_e)]}$$

$$p = \frac{0.75 \times [(4 \times 6.332) + (3 \times -0.431 \times 7.5)]^2}{7.5^2 \times [(3 \times 6.332) + (2 \times -0.431 \times 7.5)]} = 0.26 \frac{\text{kip}}{\text{ft}^2}$$

Allowable lateral soil pressure at a depth of a/2:

$$p_a = R \times \frac{a}{2} = 0.15 \times \frac{5.159}{2} = 0.387 \frac{\text{kip}}{\text{ft}^2}$$

Utilisation - pressure at a depth of a/2

$$\text{Ratio} = \frac{p}{p_a} = \frac{0.26}{0.387} = 0.672$$

UTILITY: 0.67

Earth pressure against the pile at distance L_e:

$$s = \frac{6 \times [(2 \times M_o) + (H_o \times L_e)]}{L_e^2} = \frac{6 \times [(2 \times 6.332) + (-0.431 \times 7.5)]}{7.5^2} = 1.006 \frac{\text{kip}}{\text{ft}^2}$$

Allowable lateral soil pressure at a depth of L_e:

$$p_s = R \times L_e = 0.15 \times 7.5 = 1.125 \frac{\text{kip}}{\text{ft}^2}$$

Utilisation - pressure at a depth of L_e

$$\text{Ratio} = \frac{s}{p_s} = \frac{1.006}{1.125} = 0.894$$

UTILITY: 0.89

Considering z-direction:

Distance from resting surface to pivot point:

$$a = \frac{(4 \times M_o \times L_e) + (3 \times H_o \times L_e^2)}{(6 \times M_o) + (4 \times H_o \times L_e)}$$

$$a = \frac{(4 \times 0.085 \times 7.5) + (3 \times 0.02 \times 7.5^2)}{(6 \times 0.085) + (4 \times 0.02 \times 7.5)} = 5.336 \text{ ft}$$

Earth pressure against the pile at a distance a/2 from the resting surface:

$$p = \frac{0.75 \times [(4 \times M_o) + (3 \times H_o \times L_e)]^2}{L_e^2 \times [(3 \times M_o) + (2 \times H_o \times L_e)]}$$

$$p = \frac{0.75 \times [(4 \times -0.085) + (3 \times -0.02 \times 7.5)]^2}{7.5^2 \times [(3 \times -0.085) + (2 \times -0.02 \times 7.5)]} = -0.015 \frac{\text{kip}}{\text{ft}^2}$$

Allowable lateral soil pressure at a depth of a/2:

$$p_a = R \times \frac{a}{2} = 0.15 \times \frac{5.336}{2} = 0.4 \frac{\text{kip}}{\text{ft}^2}$$

Utilisation - pressure at a depth of a/2

$$\text{Ratio} = \frac{p}{p_a} = \frac{-0.015}{0.4} = -0.037$$

UTILITY: 0.04

Earth pressure against the pile at distance L_e:

$$s = \frac{6 \times [(2 \times M_o) + (H_o \times L_e)]}{L_e^2} = \frac{6 \times [(2 \times -0.085) + (-0.02 \times 7.5)]}{7.5^2} = -0.034 \frac{\text{kip}}{\text{ft}^2}$$

Allowable lateral soil pressure at a depth of L_e:

$$p_s = R \times L_e = 0.15 \times 7.5 = 1.125 \frac{\text{kip}}{\text{ft}^2}$$

Utilisation - pressure at a depth of L_e

$$Ratio = \frac{s}{p_s} = \frac{-0.034}{1.125} = -0.03$$

UTILITY: 0.03

REFERENCES

CALCULATIONS

RESULTS

Shear force and bending moment (LRFD)

Considering x-direction:

Lateral force per section length

$$H_o = \frac{V_z}{1.57 \times D} = \frac{-4.512}{1.57 \times 48} = -0.718 \frac{kip}{ft}$$

Moment per section length

$$M_o = \frac{M_z + (V_z \times H)}{1.57 \times D} = \frac{67.45 + (-4.512 \times 0)}{1.57 \times 48} = 10.74 \frac{kip-ft}{ft}$$

Distance from resting surface to pivot point:

$$a = \frac{(4 \times M_o \times L_e) + (3 \times H_o \times L_e^2)}{(6 \times M_o) + (4 \times H_o \times L_e)}$$

$$a = \frac{(4 \times 10.74 \times 7.5) + (3 \times 0.718 \times 7.5^2)}{(6 \times 10.74) + (4 \times 0.718 \times 7.5)} = 5.157 ft$$

Max shear force located at depth a:

$$E = \frac{M_o}{H_o} = \frac{10.74}{-0.718} = 14.95 ft$$

$$V_{max,x} = (H_o \times D) \times [1 - [3 \times \left(\frac{4 \times E}{L_e} + 3\right) \times \left(\frac{a}{L_e}\right)^2] + [4 \times \left(\frac{3 \times E}{L_e} + 2\right) \times \left(\frac{a}{L_e}\right)^3]$$

$$V_{max,x} = (-0.718 \times 48) \times [1 - [3 \times \left(\frac{4 \times 14.95}{7.5} + 3\right) \times \left(\frac{5.157}{7.5}\right)^2] + [4 \times \left(\frac{3 \times 14.95}{7.5} + 2\right) \times \left(\frac{5.157}{7.5}\right)^3]$$

$$V_{max,x} = 12.03 kip$$

Max bending moment located at a depth of a/2:

$$M_{max,x} = (H_o \times D \times L_e) \times \left[\left(\frac{E}{L_e} + \frac{a}{2 \times L_e}\right) - \left[\left(\frac{4 \times E}{L_e} + 3\right) \times \left(\frac{a}{2 \times L_e}\right)^3 \right] + \left[\left(\frac{3 \times E}{L_e} + 2\right) \times \left(\frac{a}{2 \times L_e}\right)^4 \right] \right]$$

$$M_{max,x} = (-0.718 \times 48 \times 7.5) \times \left[\left(\frac{14.95}{7.5} + \frac{5.157}{2 \times 7.5}\right) - \left[\left(\frac{4 \times 14.95}{7.5} + 3\right) \times \left(\frac{5.157}{2 \times 7.5}\right)^3 \right] + \left[\left(\frac{3 \times 14.95}{7.5} + 2\right) \times \left(\frac{5.157}{2 \times 7.5}\right)^4 \right] \right]$$

$$M_{max,x} = 43.16 kip-ft$$

Considering z-direction:

Lateral force per section length

$$H_o = \frac{V_z}{1.57 \times b} = \frac{-0.21}{1.57 \times 48} = -0.033 \frac{kip}{ft}$$

Moment per section length

$$M_o = \frac{M_z + (V_z \times H)}{1.57 \times b} = \frac{-0.908 + (-0.21 \times 0)}{1.57 \times 48} = -0.145 \frac{kip-ft}{ft}$$

Distance from resting surface to pivot point:

$$a = \frac{(4 \times M_o \times L_e) + (3 \times H_o \times L_e^2)}{(6 \times M_o) + (4 \times H_o \times L_e)}$$

$$a = \frac{(4 \times 0.145 \times 7.5) + (3 \times 0.033 \times 7.5^2)}{(6 \times 0.145) + (4 \times 0.033 \times 7.5)} = 5.335 ft$$

Max shear force located at depth a:

$$E = \frac{M_o}{H_o} = \frac{-0.145}{-0.033} = 4.319 ft$$

$$V_{max,z} = (H_o \times b) \times [1 - [3 \times \left(\frac{4 \times E}{L_e} + 3\right) \times \left(\frac{a}{L_e}\right)^2] + [4 \times \left(\frac{3 \times E}{L_e} + 2\right) \times \left(\frac{a}{L_e}\right)^3]$$

$$V_{max,z} = (-0.033 \times 48) \times [1 - [3 \times \left(\frac{4 \times 4.319}{7.5} + 3\right) \times \left(\frac{2.335}{7.5}\right)] + [4 \times \left(\frac{3 \times 4.319}{7.5} + 2\right) \times \left(\frac{2.335}{7.5}\right)]$$

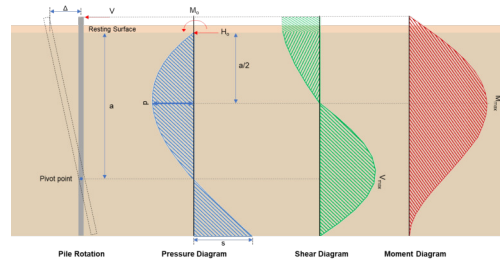
$$V_{max,z} = 0.226 \text{ kip}$$

Max bending moment located at a depth of $a/2$:

$$M_{max,z} = (H_0 \times b \times L_e) \times \left[\left(\frac{E}{L_e} + \frac{a}{2 \times L_e} \right) - \left[\left(\frac{4 \times E}{L_e} + 3 \right) \times \left(\frac{a}{2 \times L_e} \right)^3 \right] + \left[\left(\frac{3 \times E}{L_e} + 2 \right) \times \left(\frac{a}{2 \times L_e} \right)^4 \right] \right]$$

$$M_{max,z} = (-0.033 \times 48 \times 7.5) \times \left[\left(\frac{4.319}{7.5} + \frac{5.335}{2 \times 7.5} \right) - \left[\left(\frac{4 \times 4.319}{7.5} + 3 \right) \times \left(\frac{5.335}{2 \times 7.5} \right)^3 \right] + \left[\left(\frac{3 \times 4.319}{7.5} + 2 \right) \times \left(\frac{5.335}{2 \times 7.5} \right)^4 \right] \right]$$

$$M_{max,z} = 0.756 \text{ kip-ft}$$



Minimum Reinforcement Check (LRFD)

Gross area of concrete:

$$A_g = b \times D = 48 \times 48 = 2304 \text{ in}^2$$

Main Reinforcement

22.4.2.2 Required reinforcement:

$$A_{st,req} = \frac{P - (0.85 \times f'_{ck} \times A_g)}{f_y - (0.85 \times f'_{ck})} = \frac{9.07 - (0.85 \times 2.5 \times 2304)}{60 - (0.85 \times 2.5)} = -84.44 \text{ in}^2$$

10.6.1.1 Maximum reinforcement:

$$A_{st,max} = 0.08 \times A_g = 0.08 \times 2304 = 184.3 \text{ in}^2$$

7.6.1.1 Minimum reinforcement:

$$A_{st,min} = 0.0018 \times A_g = 0.0018 \times 2304 = 4.147 \text{ in}^2$$

Governing minimum reinforcement area:

$$(0.0018 \times A_g) \leq A_{st,req} \leq (0.08 \times A_g)$$

$$A_{min} = 4.147 \text{ in}^2$$

Minimum number of reinforcements:

$$A_{bar} = 0.307 \text{ in}^2$$

$$n_{min} = \frac{A_{min}}{A_{bar}} = \frac{4.147}{0.307} = 14$$

25.2.3 Minimum spacing:

$$s_{rebar} = \text{MAX}[1.5, 1.5 \times d_b] = \text{MAX}[1.5, (1.5 \times 0.625)] = 1.5 \text{ in}$$

Use: $n = 16$ pcs at 1.5 in minimum spacing

Total reinforcement area:

$$A_{st} = 16 \times 0.307 = 4.909 \text{ in}^2$$

Shear Reinforcement

25.7.2.2 For main reinforcement ≤ 1.41 in: Use #3(0.375 in)

Maximum spacing of shear Reinforcements:

$$s = \text{MIN}[16 \times d_b, 48 \times d_{b,ties}, \text{MIN}(b, D)] = \text{MIN}[(16 \times 0.625), (48 \times 0.375), \text{MIN}(48, 48)] = 10 \text{ in}$$

Detailing Summary

Main reinforcement

#5 (0.625 in) - 16pcs at 1.5 in min. spacing

Axial Compression Strength (LRFD)

22.4.2.2 Allowable axial compressive strength:

$$\phi P_N = \phi \times 0.8 \times [(0.85 \times f'_{ck} \times [A_g - A_{st}]) + (f_{yk} \times A_{st})]$$

$$\phi P_N = 0.65 \times 0.8 \times [(0.85 \times 2.5 \times [2304 - 4.909]) + (60 \times 4.909)] = 2694 \text{ kip}$$

Utilisation

$$\text{Ratio} = \frac{P}{\phi P_N} = \frac{9.07}{2694} = 0.003$$

UTILITY: 0.00

Shear Strength LRFD)

Effective shear width	$b_w = 48 \text{ in}$
Effective shear depth	$d = 44.31 \text{ in}$
Shear reinforcement area	$A_v = 0.221 \text{ in}^2$
Shear reinforcement spacing	$s = 10 \text{ in}$
Concrete type factor (Normal concrete)	$\lambda = 1$
Strength reduction factor for shear	$\phi = 0.75$
Maximum shear in the x-direction	$V_{max,x} = 12.03 \text{ kip}$
Maximum shear in the z-direction	$V_{max,z} = 0.226 \text{ kip}$

22.5.5.1.1 Max shear strength of concrete:

$$V_{c,max} = 5 \times \lambda \times \sqrt{f'_{ck}} \times b_w \times d = 5 \times 1 \times \sqrt{2.5} \times 48 \times 44.31 = 531.8 \text{ kip}$$

Table 22.5.5.1 Shear strength of concrete:

$$V_{c,a} = \left(2 \times \lambda \times \sqrt{f'_{ck}} + \text{MIN} \left[\frac{P}{6 \times A_g}, (0.05 \times f'_{ck}) \right] \right) \times (b_w \times d)$$

$$V_{c,a} = \left(2 \times 1 \times \sqrt{2.5} + \text{MIN} \left[\frac{9.07}{6 \times 2304}, (0.05 \times 2.5) \right] \right) \times (48 \times 44.31) = 214.1 \text{ kip}$$

Governing shear strength of concrete:

$$V_c = \text{MIN}[V_{c,max}, V_{c,a}] = \text{MIN}[531.8, 214.1] = 214.1 \text{ kip}$$

22.5.1.2 Shear strength of steel (a):

$$V_{s,a} = 8 \times \sqrt{f'_{ck}} \times b_w \times d = 8 \times \sqrt{2.5} \times 48 \times 44.31 = 850.8 \text{ kip}$$

22.5.8.5.3 Shear strength of steel (b):

$$V_{s,b} = \frac{A_v \times f_{yk} \times d}{s} = \frac{0.221 \times 60 \times 44.31}{10} = 58.73 \text{ kip}$$

Governing shear strength of steel:

$$V_s = \text{MIN}[V_{s,a}, V_{s,b}] = \text{MIN}[850.8, 58.73] = 58.73 \text{ kip}$$

22.5.1.1 Allowable shear strength:

$$\phi V_n = \phi \times (V_c + V_s) = 0.75 \times (214.1 + 58.73) = 204.6 \text{ kip}$$

$$V_{max} = \text{MAX}[12.03, 0.226] = 12.03 \text{ kip}$$

Utilisation

$$\text{Ratio} = \frac{V_{max}}{\phi V_n} = \frac{12.03}{204.6} = 0.059$$

UTILITY: 0.06

Flexural Strength (LRFD)

Concrete type factor (Normal concrete)	$\lambda = 1$
Strength reduction factor for flexure	$\phi = 0.65$
Modulus of steel reinforcement	$E_s = 200 \text{e}3 \text{ ksi}$
Maximum concrete strain	$\epsilon_c = 0.0030$
Yield strain of steel f_y/E_s	$\epsilon_y = 0.0003$
Section width	$b = 48 \text{ in}$
Distance to the compression rebar	$d_s = 3.688 \text{ in}$
Distance to the tension rebar	$d = 44.31 \text{ in}$
Total bar area	$A_s = 4.909 \text{ in}^2$
Maximum applied axial load	$P = 9.07 \text{ kip}$
Maximum moment in the x-direction	$M_{max,x} = 43.16 \text{ kip-ft}$
Maximum moment in the z-direction	$M_{max,z} = 0.756 \text{ kip-ft}$

Compressive force due to concrete:

$$\beta_1 = 0.85$$

$$C_{rc} = 0.85 \times \beta_1 \times f'_c \times b \times c$$

Compressive force due to bars in compression:

$$C_{rs} = f_1 \times A_{sc}$$

$$\epsilon_1 = (c - d_s) \times \frac{\epsilon_c}{c}$$

$$f_1 = E_s \times \epsilon_1 \quad (\epsilon_1 < \epsilon_{sy}), \quad f_1 = f_y \quad (\epsilon_1 \geq \epsilon_{sy})$$

Tensile force due to bars in tension:

$$T_{rs} = f_2 \times A_{st}$$

$$\epsilon_2 = (d - c) \times \frac{\epsilon_{cu}}{c}$$

$$f_2 = E_s \times \epsilon_2 \quad (\epsilon_2 < \epsilon_{sy}), \quad f_2 = \phi_s \times f_y \quad (\epsilon_2 \geq \epsilon_{sy})$$

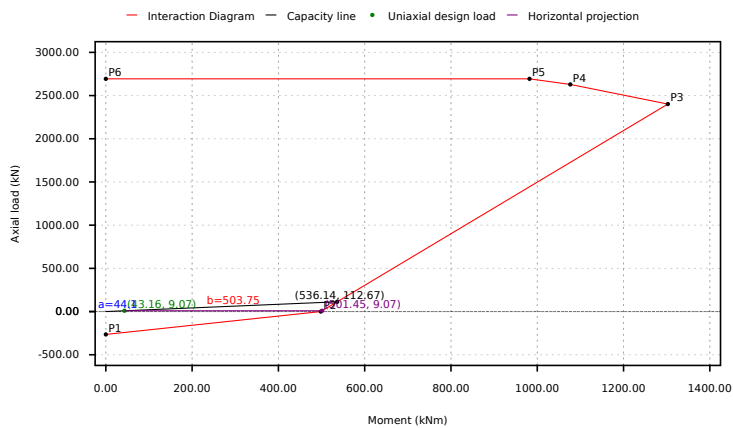
Interaction Diagram Summary

Point	Case	M _r	P _r
P1	Pure Tension	0	-265.1
P2	Pure Bending	498.4	0
P3	Balanced Failure	1303	2402
P4	Decompression	1077	2629
P5	Compression Limit	982	2694
P6	Pure Compression	0	2694

Uniaxial Bending Check

$$M_f = \text{MAX}[43.16, 0.756] = 43.16 \text{ kip-ft}$$

Interaction Diagram



Segment	Signed Distance
P1 - P2	221.8
P2 - P3	434.6
P3 - P4	2581
P4 - P5	2745
P5 - P6	2685
Status	PASS: Point lies inside the curve

Utilisation

$$\text{Ratio} = \frac{a}{a+b} = \frac{44.1}{44.1 + 503.8} = 0.08$$

UTILITY: 0.08

Biaxial Bending Check

Maximum moment in the x-direction

$$M_{max,x} = 43.16 \text{ kip-ft}$$

Maximum moment in the z-direction

$$M_{max,z} = 0.756 \text{ kip-ft}$$

Nominal uniaxial moment strength about the x-axis

$$M_{nox} = 501.4 \text{ kip-ft}$$

Nominal uniaxial moment strength about the z-axis

$$M_{noz} = 501.4 \text{ kip-ft}$$

Interaction exponent

$$\alpha = 1$$

Bresler (1960)

According to Bresler (method B):

$$\left(\frac{M_{max,x}}{M_{nox}}\right)^\alpha + \left(\frac{M_{max,z}}{M_{noz}}\right)^\alpha = 1.0$$

$$\left(\frac{43.16}{501.4}\right)^1 + \left(\frac{0.756}{501.4}\right)^1 = 0.088$$

UTILITY: 0.09

REFERENCES

CALCULATIONS

RESULTS

Results Summary

Result Name	Results
PILE DETAILS	
Length of the pile	7.50 ft
Dimensions	48 x 48 in
Main bar reinforcement	#5-16pcs at 1.5 in min.
Shear reinforcement	#3 at 10 in max.
UTILISATIONS	
Required depth	0.92
End-bearing capacity	0.19
P _a	0.67
P _s	0.89
Axial compression strength	0.00
Shear strength	0.06
Uniaxial bending strength	0.08
Biaxial bending strength	0.09