COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF	)	
NEW CINGULAR WIRELESS PCS, LLC,	)	
A DELAWARE LIMITED LIABILITY COMPANY,	)	
D/B/A AT&T MOBILITY	)	
FOR ISSUANCE OF A CERTIFICATE OF PUBLIC	)	CASE NO.: 2019-00152
CONVENIENCE AND NECESSITY TO CONSTRUCT	)	
A WIRELESS COMMUNICATIONS FACILITY	)	
IN THE COMMONWEALTH OF KENTUCKY	)	
IN THE COUNTY OF BREATHITT	)	

SITE NAME: QUICKSAND CREEK

* * * * * * *

SECOND RESPONSE TO NOTICE OF FILING DEFICIENCY

New Cingular Wireless PCS, LLC, a Delaware Limited Liability Company, d/b/a AT&T Mobility ("Applicant"), by counsel and in further response to the Commission's letter dated July 11, 2019 requesting additional information to cure a deficiency in the within matter, states as follows:

1. Applicant submits the within information and documentation to complete its Response to the Commission's requests to address deficiencies, which deficiencies were previously addressed, in part, in Applicant's Response filed July 17, 2019.

2. In response to the filing requirement pursuant to 807 KAR 5:001: Section 1(1)(d), a geotechnical report, signed and sealed by a professional engineer registered in Kentucky, that includes boring logs and foundation design recommendations is attached as **EXHIBIT G-1** hereto. Findings prepared by a land surveyor as to the proximity of the proposed site to flood hazard areas are contained in the original Application, as part of **EXHIBIT B** (see Sheet B-1)**.**

3. The tower and foundation design plans and a description of the standard according to which the tower was designed signed and sealed by a professional engineer registered in Kentucky, pursuant to 807 KAR 5:001: Section 1(1)(j), have been updated in accordance with the findings reported in **EXHIBIT G-1**, and revised and updated plans are attached as **EXHIBIT C-1.**

WHEREFORE, Applicant respectfully request that the PSC accept the foregoing information for filing, and having met the requirements of KRS §§ 278.020(1), 278.650, and 278.665 and all applicable rules and regulations of the PSC, lift the abeyance entered as of August 13, 2019 and proceed to grant a Certificate of Public Convenience and Necessity to construct and operate the WCF at the location set forth in the subject application.

Respectfully submitted,

David A. Pike
Pike Legal Group, PLLC
1578 Highway 44 East, Suite 6
P. O. Box 369
Shepherdsville, KY 40165-0369
Telephone: (502) 955-4400
Telefax: (502) 543-4410
Email: dpike@pikelegal.com
Attorney for New Cingular Wireless PCS, LLC
d/b/a AT&T Mobility

EXHIBIT C-1

TOWER AND FOUNDATION DESIGN

Sabre Industries™
INNOVATION DELIVERED

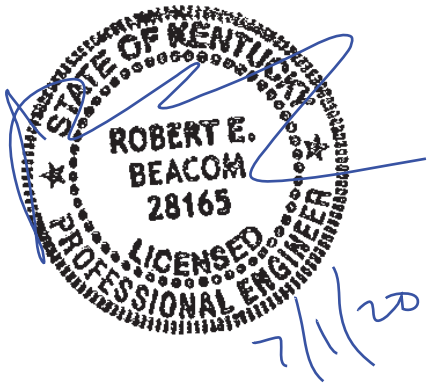
Structural Design Report

305' S3TL Series HD1 Self-Supporting Tower
Site: Quicksand Creek, KY
Site Number: 13800701

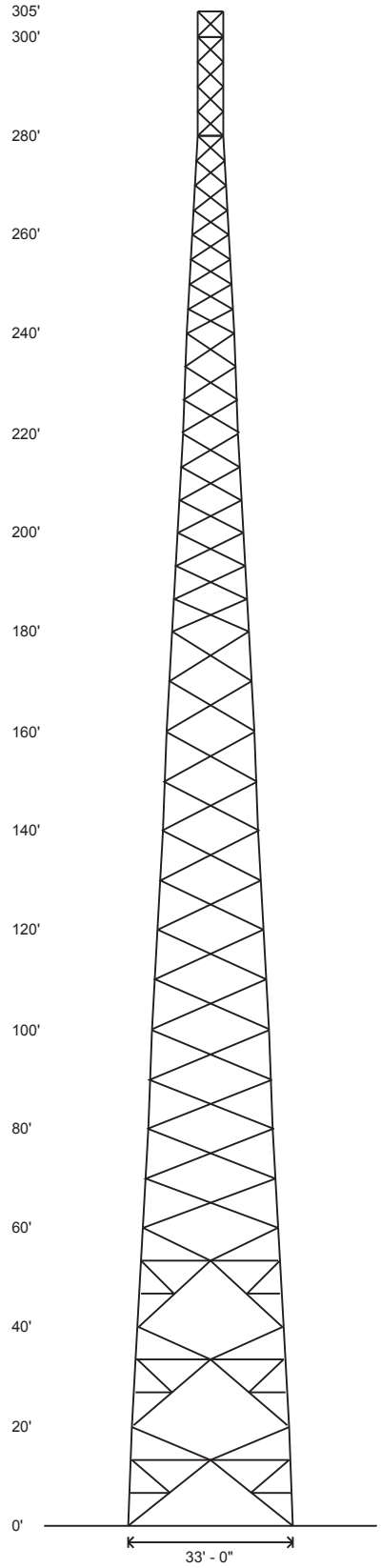
Prepared for: AT&T
by: Sabre Industries ™

Job Number: 431371
Revision B

July 1, 2020



Legs	A			B	5.563 OD X .500		C	D	E	F	G
Diagonals	H	I	H	J	H	K	L	L 2 1/2 X 2 1/2 X 3/16	L 2 X 2 X 3/16	L 2 X 2 X 1/8	P
Horizontals	J	M	J	M	N	NONE			O	NONE	
Internals	N	M	K	M	K	NONE					
Sub-Diagonals	L	M	L	M	L	NONE					
Sub-Horizontals	L	M	Q	M	R	NONE					
Brace Bolts	(2) 3/4"		(2) 3/4"		(2) 5/8"	(1) 3/4"		11'	7'	5'	
Top Face Width	31'		29'		27'	25'	23'	21'	19'	17'	15'	13'	9'		
Panel Count/Height	S	T	S	T	S	T	12 @ 10'			9 @ 6.6667'		13 @ 5'			
Section Weight	7748		6656		6083	5406	5253	5013	4654	4518	3274	3145	2699	2211	1768	1375	865	U



Designed Appurtenance Loading

Elev	Description	Tx-Line
312.5	(1) 15' Lightning Rod	
300	(1) 278 sq. ft. EPA 6000# (no Ice)	(18) 1 5/8"
288	(1) 208 sq. ft. EPA 4000# (no Ice)	(18) 1 5/8"
276	(1) 208 sq. ft. EPA 4000# (no Ice)	(18) 1 5/8"
264	(1) 208 sq. ft. EPA 4000# (no Ice)	(18) 1 5/8"

Design Criteria - ANSI/TIA-222-G

ASCE 7-16 Ultimate Wind Speed (No Ice)	105 mph
Wind Speed (Ice)	30 mph
Design Ice Thickness	1.50 in
Structure Class	II
Risk Category	II
Exposure Category	B
Topographic Category	1

Base Reactions

Total Foundation		Individual Footing	
Shear (kips)	76.72	Shear (kips)	47.72
Axial (kips)	286.98	Compression (kips)	543
Moment (ft-kips)	14419	Uplift (kips)	458
Torsion (ft-kips)	-34.26		

Notes

1) All legs are A500 (50 ksi Min. Yield).
2) All braces are A572 Grade 50.
3) All brace bolts are A325-X.
4) The tower model is S3TL Series HD1.
5) Transmission lines are to be attached to standard 12 hole waveguide ladders with stackable hangers.
6) Azimuths are relative (not based on true north).
7) Foundation loads shown are maximums.
8) All unequal angles are oriented with the short leg vertical.
9) Weights shown are estimates. Final weights may vary.
10) This tower design and, if applicable, the foundation design(s) shown on the following page(s) also meet or exceed the requirements of the 2012 International Building Code.
11) Tower Rating: 99.87%

Sabre Industries
INNOVATION DELIVERED

Sabre Industries
7101 Southbridge Drive
P.O. Box 658
Sioux City, IA 51102-0658
Phone: (712) 258-6690
Fax: (712) 279-0814

Job:	**431371B**
Customer:	AT&T
Site Name:	Quicksand Creek, KY 13800701
Description:	305' S3TL
Date:	7/1/2020 By: REB

Material List

Display	Value
A	10.75 OD X .500
B	8.625 OD X .322
C	5.563 OD X .375
D	4.500 OD X .337
E	3.500 OD X .300
F	2.875 OD X .203
G	2.375 OD X .154
H	L 5 X 3 1/2 X 1/4 (SLV)
I	L 4 X 4 X 5/16
J	L 4 X 4 X 1/4
K	L 3 X 3 X 1/4

Display	Value
L	L 3 X 3 X 3/16
M	NONE
N	L 3 1/2 X 3 1/2 X 1/4
O	L 2 X 2 X 3/16
P	L 2 X 2 X 1/8
Q	L 2 1/2 X 2 1/2 X 1/4
R	L 2 1/2 X 2 1/2 X 3/16
S	1 @ 13.333'
T	1 @ 6.667'
U	249

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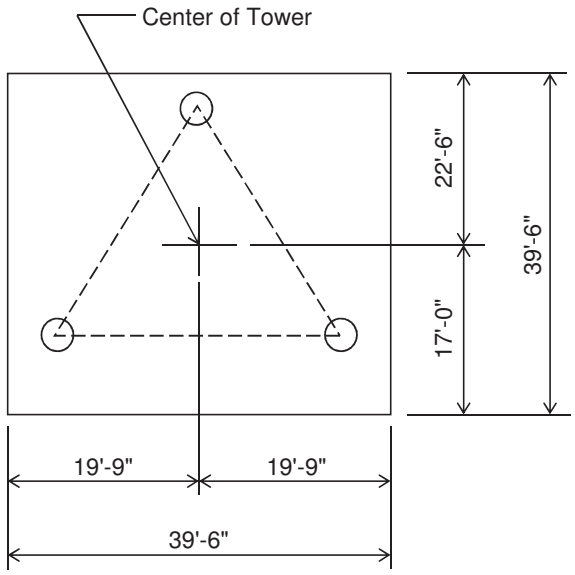
Sabre Industries™
Towers and Poles

No.: 431371

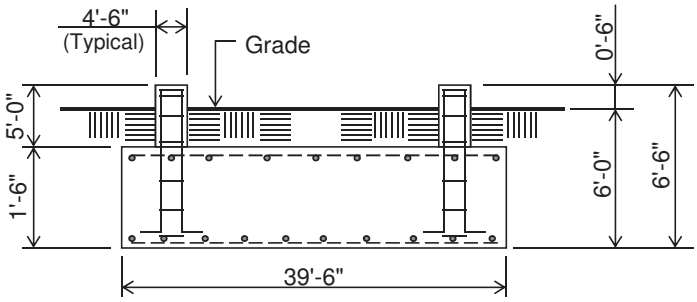
Date: 7/1/20
By: REB
Revision B

Customer: AT&T
Site: Quicksand Creek, KY 13800701

305 ft. Model S3TL Series HD1 Self Supporting Tower



PLAN VIEW



ELEVATION VIEW

(95.5 cu. yds.)
(1 REQD.; NOT TO SCALE)

CAUTION: Center of tower is not in center of slab.

Notes:

1) Concrete shall have a minimum 28-day compressive strength of 4,500 psi, in accordance with ACI 318-11.

2) Rebar to conform to ASTM specification A615 Grade 60.

3) All rebar to have a minimum of 3" concrete cover.

4) All exposed concrete corners to be chamfered 3/4".

5) The foundation design is based on the geotechnical report by Delta Oaks Group project no. GEO20-06535-08, dated: 6/26/20.

6) See the geotechnical report for compaction requirements, if specified.

7) The foundation is based on the following factored loads:
   Factored download (kips) = 115.01
   Factored overturn (kip-ft) = 14,534.55
   Factored shear (kips) = 77.67

8) 4.5' of soil cover is required over the entire area of the foundation slab.

9) The bottom anchor bolt template shall be positioned as closely as possible to the bottom of the anchor bolts.

Rebar Schedule per Mat and per Pier	
Pier	(28) #6 vertical rebar w/ hooks at bottom w/ #4 rebar ties, two (2) within top 5" of pier then 12" C/C
Mat	(73) #9 horizontal rebar evenly spaced each way top and bottom. (292 total)
Anchor Bolts per Leg	
(6) 1.5" dia. x 78" F1554-105 on a 15.5" B.C. w/ 9.5" max. projection above concrete.	

7101 Southbridge Dr - P.O. Box 658 - Sioux City, IA 51102-0658 - Phone 712.258.6690 - Fax 712.258.8250

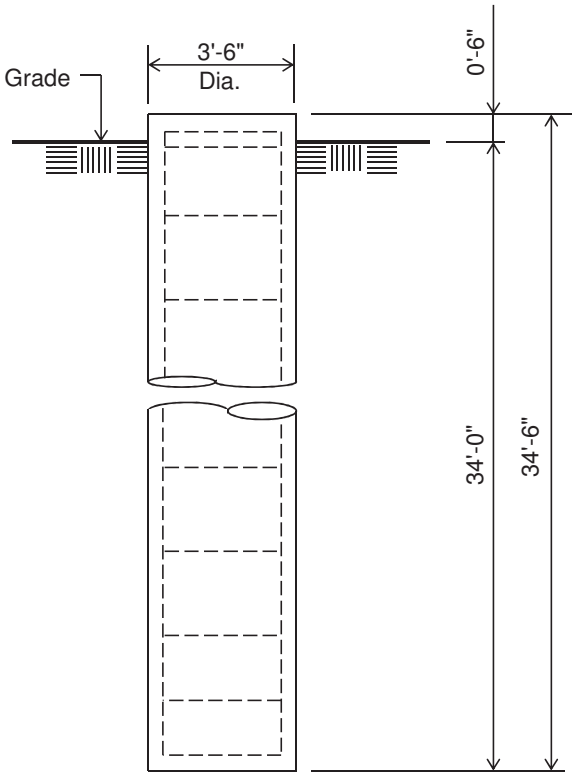
Sabre Industries™
Towers and Poles

No.: 431371

Date: 7/1/20
By: REB
Revision B

Customer: AT&T
Site: Quicksand Creek, KY 13800701

305 ft. Model S3TL Series HD1 Self Supporting Tower



ELEVATION VIEW
(12.3 cu. yds.)
(3 REQUIRED; NOT TO SCALE)

Notes:

1) Concrete shall have a minimum 28-day compressive strength of 4,500 psi, in accordance with ACI 318-11.

2) Rebar to conform to ASTM specification A615 Grade 60.

3) All rebar to have a minimum of 3" concrete cover.

4) All exposed concrete corners to be chamfered 3/4".

5) The foundation design is based on the geotechnical report by Delta Oaks Group project no. GEO20-06535-08, dated: 6/26/20.

6) See the geotechnical report for drilled pier installation requirements, if specified.

7) The foundation is based on the following factored loads:
   Factored uplift (kips) = 462.00
   Factored download (kips) = 547.00
   Factored shear (kips) = 48.00

8) The bottom anchor bolt template shall be positioned as closely as possible to the bottom of the anchor bolts.

Rebar Schedule per Pier	
Pier	(14) #10 vertical rebar w/ #4 rebar ties, two (2) within top 5" of pier then 11" C/C
Anchor Bolts per Leg	
(6) 1.5" dia. x 78" F1554-105 on a 15.5" B.C. w/ 9.5" max. projection above concrete.	

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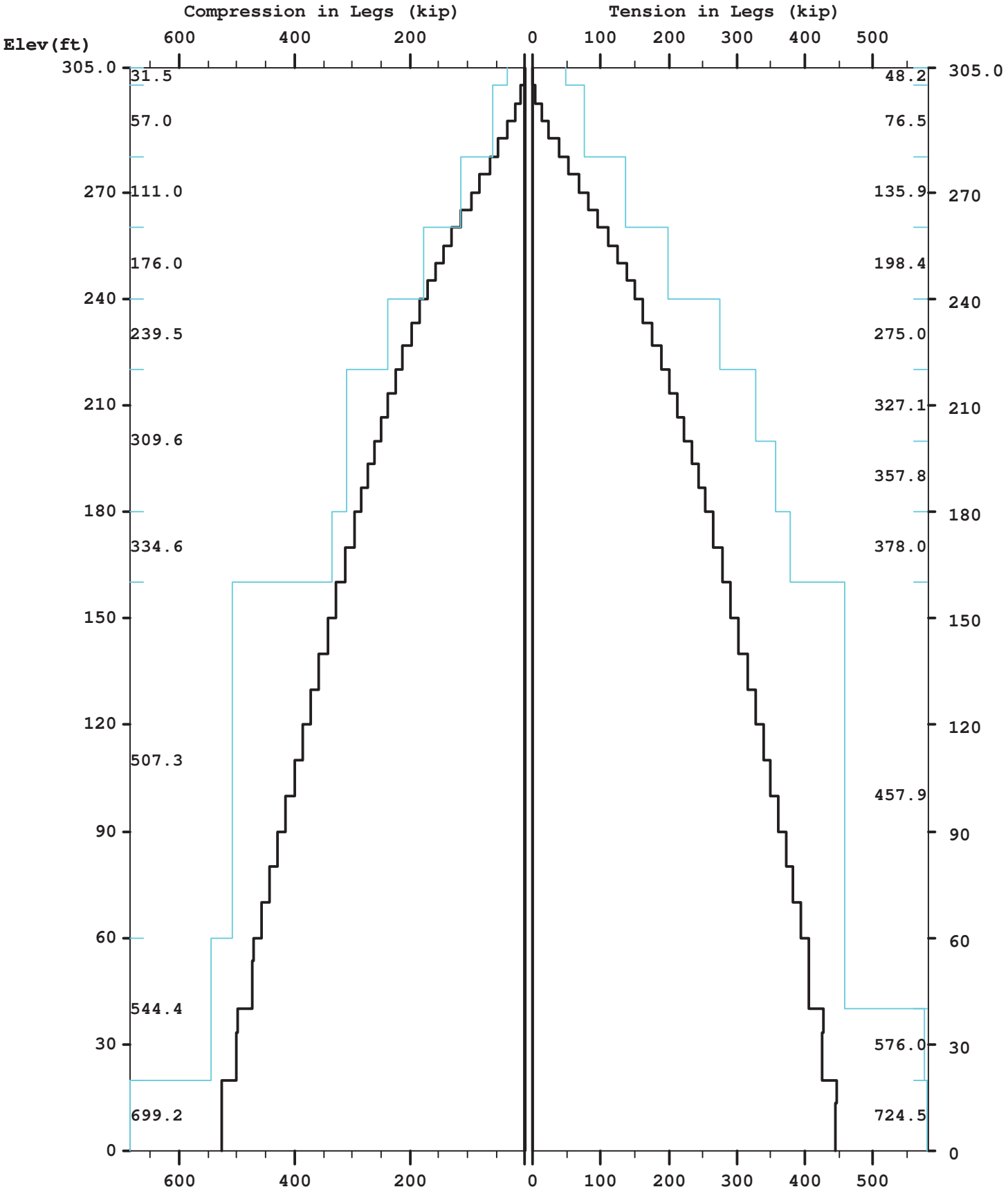
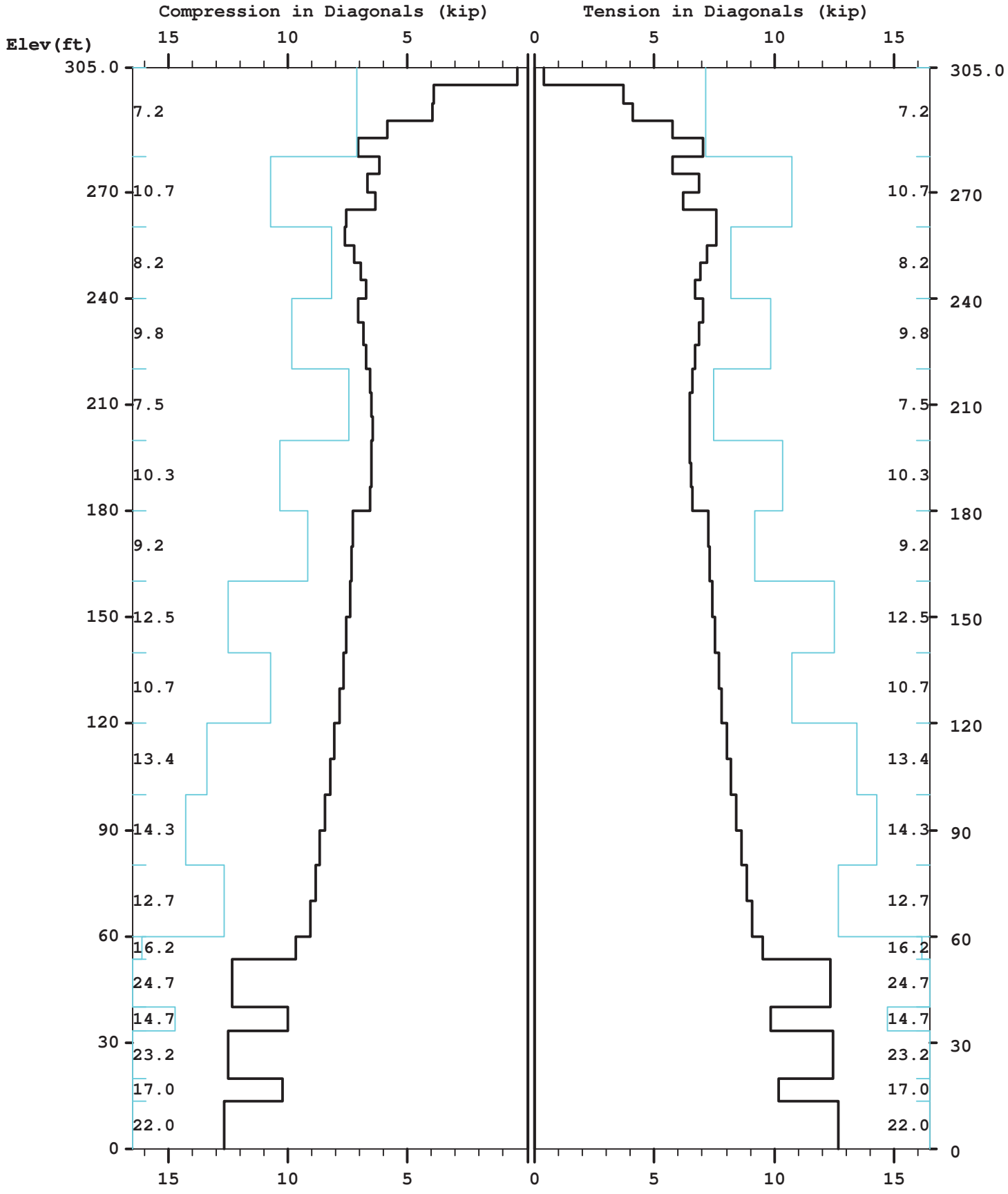
Maximum

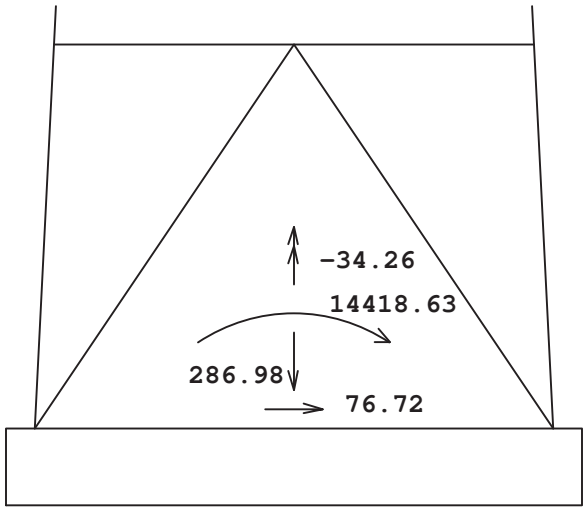

Compression in Legs (kip)
Tension in Legs (kip)
Elev(ft)
600
400
200
0
100
200
300
400
500
305.0
270
240
210
180
150
120
90
60
30
0
31.5
57.0
111.0
176.0
239.5
309.6
334.6
507.3
544.4
699.2
48.2
76.5
135.9
198.4
275.0
327.1
357.8
378.0
457.9
576.0
724.5

Maximum

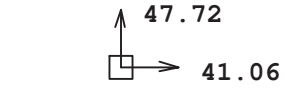

Compression in Diagonals (kip)
Tension in Diagonals (kip)
Elev(ft)
15
10
5
0
5
10
15
305.0
270
240
210
180
150
120
90
60
30
0
7.2
10.7
8.2
9.8
7.5
10.3
9.2
12.5
10.7
13.4
14.3
12.7
16.2
24.7
14.7
23.2
17.0
22.0

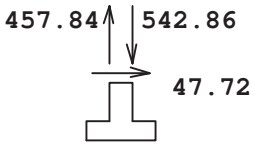
Maximum

TOTAL FOUNDATION LOADS (kip, ft-kip)



INDIVIDUAL FOOTING LOADS (kip)





Latticed Tower Analysis (Unguyed) (c)2015 Guymast Inc. 416-736-7453
Processed under license at:

Sabre Towers and Poles on: 1 jul 2020 at: 12:00:45

MAST GEOMETRY (ft)

PANEL TYPE	NO.OF LEGS	ELEV.AT BOTTOM	ELEV.AT TOP	F.W..AT BOTTOM	F.W..AT TOP	TYPICAL PANEL HEIGHT
X	3	300.00	305.00	5.00	5.00	5.00
X	3	295.00	300.00	5.00	5.00	5.00
X	3	280.00	295.00	5.00	5.00	5.00
X	3	275.00	280.00	5.50	5.00	5.00
X	3	260.00	275.00	7.00	5.50	5.00
X	3	240.00	260.00	9.00	7.00	5.00
X	3	220.00	240.00	11.00	9.00	6.67
X	3	200.00	220.00	13.00	11.00	6.67
X	3	180.00	200.00	15.00	13.00	6.67
X	3	160.00	180.00	17.00	15.00	10.00
X	3	140.00	160.00	19.00	17.00	10.00
X	3	120.00	140.00	21.00	19.00	10.00
X	3	100.00	120.00	23.00	21.00	10.00
X	3	80.00	100.00	25.00	23.00	10.00
X	3	60.00	80.00	27.00	25.00	10.00
V	3	53.33	60.00	27.67	27.00	6.67
A	3	40.00	53.33	29.00	27.67	13.33
V	3	33.33	40.00	29.67	29.00	6.67
A	3	20.00	33.33	31.00	29.67	13.33
V	3	13.33	20.00	31.67	31.00	6.67
A	3	0.00	13.33	33.00	31.67	13.33

MEMBER PROPERTIES

MEMBER TYPE	BOTTOM ELEV ft	TOP ELEV ft	X-SECTN AREA in.sq	RADIUS OF GYRAT in	ELASTIC MODULUS ksi	THERMAL EXPANSN /deg
LE	300.00	305.00	1.075	0.787	29000.	0.0000117
LE	280.00	300.00	1.704	0.787	29000.	0.0000117
LE	260.00	280.00	3.016	0.787	29000.	0.0000117
LE	240.00	260.00	4.407	0.787	29000.	0.0000117
LE	220.00	240.00	6.111	0.787	29000.	0.0000117
LE	180.00	220.00	7.952	0.787	29000.	0.0000117
LE	160.00	180.00	8.399	0.787	29000.	0.0000117
LE	20.00	160.00	12.763	0.787	29000.	0.0000117
LE	0.00	20.00	16.101	0.787	29000.	0.0000117
DI	280.00	305.00	0.484	0.626	29000.	0.0000117
DI	240.00	280.00	0.715	0.626	29000.	0.0000117
DI	200.00	240.00	0.902	0.626	29000.	0.0000117
DI	180.00	200.00	1.090	0.626	29000.	0.0000117
DI	160.00	180.00	1.438	0.626	29000.	0.0000117
DI	120.00	160.00	1.688	0.626	29000.	0.0000117
DI	53.33	120.00	1.938	0.626	29000.	0.0000117
DI	40.00	53.33	2.062	0.626	29000.	0.0000117
DI	33.33	40.00	1.938	0.626	29000.	0.0000117
DI	20.00	33.33	2.062	0.626	29000.	0.0000117
DI	13.33	20.00	2.402	0.626	29000.	0.0000117
DI	0.00	13.33	2.062	0.626	29000.	0.0000117
HO	295.00	305.00	0.484	0.626	29000.	0.0000117
HO	275.00	280.00	0.715	0.626	29000.	0.0000117
HO	40.00	53.33	1.688	0.626	29000.	0.0000117
HO	20.00	33.33	1.938	0.626	29000.	0.0000117
HO	0.00	13.33	1.938	0.626	29000.	0.0000117
BR	40.00	53.33	1.438	0.000	29000.	0.0000117
BR	20.00	33.33	1.438	0.000	29000.	0.0000117
BR	0.00	13.33	1.688	0.000	29000.	0.0000117

FACTORED MEMBER RESISTANCES

BOTTOM ELEV ft	TOP ELEV ft	LEGS COMP kip	LEGS TENS kip	DIAGONALS COMP kip	DIAGONALS TENS kip	HORIZONTALS COMP kip	HORIZONTALS TENS kip	INT BRACING COMP kip	INT BRACING TENS kip
300.0	305.0	31.48	48.15	7.16	7.16	5.82	5.82	0.00	0.00
295.0	300.0	57.04	76.50	7.16	7.16	5.82	5.82	0.00	0.00
280.0	295.0	57.04	76.50	7.16	7.16	0.00	0.00	0.00	0.00
275.0	280.0	110.98	135.90	10.74	10.74	8.46	8.46	0.00	0.00
260.0	275.0	110.98	135.90	10.74	10.74	0.00	0.00	0.00	0.00
240.0	260.0	175.98	198.45	8.19	8.19	0.00	0.00	0.00	0.00
220.0	240.0	239.46	274.95	9.84	9.84	0.00	0.00	0.00	0.00
200.0	220.0	309.64	327.10	7.46	7.46	0.00	0.00	0.00	0.00
180.0	200.0	309.64	357.75	10.34	10.34	0.00	0.00	0.00	0.00
160.0	180.0	334.65	378.00	9.19	9.19	0.00	0.00	0.00	0.00
140.0	160.0	507.33	457.90	12.53	12.53	0.00	0.00	0.00	0.00
120.0	140.0	507.33	457.90	10.73	10.73	0.00	0.00	0.00	0.00
100.0	120.0	507.33	457.90	13.43	13.43	0.00	0.00	0.00	0.00
80.0	100.0	507.33	457.90	14.31	14.31	0.00	0.00	0.00	0.00
60.0	80.0	507.33	457.90	12.68	12.68	0.00	0.00	0.00	0.00
53.3	60.0	544.40	457.90	16.16	16.16	0.00	0.00	0.00	0.00
40.0	53.3	544.40	457.90	24.72	24.72	11.36	11.36	7.41	7.41
33.3	40.0	544.40	576.00	14.73	14.73	0.00	0.00	0.00	0.00
20.0	33.3	544.40	576.00	23.19	23.19	13.98	13.98	6.59	6.59
13.3	20.0	699.22	724.50	16.98	16.98	0.00	0.00	0.00	0.00
0.0	13.3	699.22	724.50	22.03	22.03	12.58	12.58	9.00	9.00

==========

* Only 3 condition(s) shown in full
* Some wind loads may have been derived from full-scale wind tunnel testing

==========

LOADING CONDITION A ==========

105 mph Ultimate wind with no ice. Wind Azimuth: 0♦

MAST LOADING
============

LOAD TYPE	ELEV ft	APPLY..LOAD..AT RADIUS ft	APPLY..LOAD..AT AZI	LOAD AZI	.....FORCES..... HORIZ kip	.....FORCES..... DOWN kip	.....MOMENTS..... VERTICAL ft-kip	.....MOMENTS..... TORSNAL ft-kip
C	312.5	0.00	0.0	0.0	0.20	0.15	0.00	0.00
C	300.0	0.00	0.0	0.0	7.30	7.20	0.00	0.00
C	288.0	0.00	0.0	0.0	5.40	4.80	0.00	0.00
C	276.0	0.00	0.0	0.0	5.33	4.80	0.00	0.00
C	264.0	0.00	0.0	0.0	5.27	4.80	0.00	0.00
D	305.0	0.00	180.0	0.0	0.05	0.04	0.00	0.00
D	300.0	0.00	180.0	0.0	0.05	0.04	0.00	0.00
D	300.0	0.00	42.0	0.0	0.10	0.07	0.06	0.07
D	290.0	0.00	42.0	0.0	0.10	0.07	0.06	0.07
D	290.0	0.00	63.7	0.0	0.11	0.08	0.06	0.08
D	285.0	0.00	63.7	0.0	0.11	0.08	0.06	0.08
D	285.0	0.00	76.5	0.0	0.12	0.09	0.06	0.09
D	280.0	0.00	76.5	0.0	0.12	0.09	0.06	0.09
D	280.0	0.00	78.4	0.0	0.13	0.13	0.06	0.08
D	275.0	0.00	78.4	0.0	0.13	0.13	0.06	0.08
D	275.0	0.00	93.9	0.0	0.14	0.15	0.05	0.05
D	265.0	0.00	96.1	0.0	0.15	0.15	0.05	0.05
D	265.0	0.00	60.6	0.0	0.15	0.17	0.01	0.04
D	260.0	0.00	60.6	0.0	0.15	0.17	0.01	0.04
D	260.0	0.00	330.1	0.0	0.16	0.19	0.01	0.04
D	240.0	0.00	330.1	0.0	0.16	0.20	0.01	0.04
D	240.0	0.00	330.1	0.0	0.16	0.22	0.01	0.03
D	220.0	0.00	330.1	0.0	0.17	0.22	0.01	0.04
D	220.0	0.00	330.1	0.0	0.17	0.25	0.01	0.03
D	200.0	0.00	330.1	0.0	0.17	0.25	0.01	0.03
D	200.0	0.00	330.0	0.0	0.18	0.26	0.01	0.03
D	180.0	0.00	330.0	0.0	0.18	0.27	0.01	0.03
D	180.0	0.00	330.0	0.0	0.17	0.27	0.01	0.03
D	160.0	0.00	330.0	0.0	0.17	0.28	0.01	0.03
D	160.0	0.00	330.0	0.0	0.17	0.34	0.01	0.03
D	100.0	0.00	330.0	0.0	0.18	0.38	0.01	0.03
D	100.0	0.00	330.0	0.0	0.18	0.38	0.01	0.03
D	60.0	0.00	330.0	0.0	0.17	0.40	0.01	0.03

D	60.0	0.00	330.0	0.0	0.15	0.37	0.01	0.02
D	53.3	0.00	330.0	0.0	0.15	0.37	0.01	0.02
D	53.3	0.00	330.0	0.0	0.17	0.45	0.01	0.02
D	40.0	0.00	330.0	0.0	0.17	0.45	0.01	0.02
D	40.0	0.00	330.0	0.0	0.14	0.38	0.01	0.02
D	33.3	0.00	330.0	0.0	0.14	0.38	0.01	0.02
D	33.3	0.00	330.0	0.0	0.16	0.47	0.01	0.02
D	20.0	0.00	330.0	0.0	0.16	0.47	0.01	0.02
D	20.0	0.00	330.0	0.0	0.14	0.45	0.01	0.02
D	13.3	0.00	330.0	0.0	0.14	0.45	0.01	0.02
D	13.3	0.00	330.0	0.0	0.16	0.52	0.01	0.02
D	0.0	0.00	330.0	0.0	0.16	0.52	0.01	0.02

LOADING CONDITION M

105 mph Ultimate wind with no ice. Wind Azimuth: 0◆

MAST LOADING

LOAD TYPE	ELEV ft	APPLY..LOAD..AT RADIUS ft	AZI	LOAD AZI	.....FORCES..... HORIZ kip	DOWN kip	.....MOMENTS..... VERTICAL ft-kip	TORSNAL ft-kip
C	312.5	0.00	0.0	0.0	0.20	0.12	0.00	0.00
C	300.0	0.00	0.0	0.0	7.30	5.40	0.00	0.00
C	288.0	0.00	0.0	0.0	5.40	3.60	0.00	0.00
C	276.0	0.00	0.0	0.0	5.33	3.60	0.00	0.00
C	264.0	0.00	0.0	0.0	5.27	3.60	0.00	0.00
D	305.0	0.00	180.0	0.0	0.05	0.03	0.00	0.00
D	300.0	0.00	180.0	0.0	0.05	0.03	0.00	0.00
D	300.0	0.00	42.0	0.0	0.10	0.06	0.04	0.07
D	290.0	0.00	42.0	0.0	0.10	0.05	0.04	0.07
D	290.0	0.00	63.7	0.0	0.11	0.06	0.04	0.08
D	280.0	0.00	76.5	0.0	0.12	0.07	0.05	0.09
D	280.0	0.00	78.4	0.0	0.13	0.10	0.05	0.08
D	275.0	0.00	78.4	0.0	0.13	0.10	0.05	0.08
D	275.0	0.00	93.9	0.0	0.14	0.11	0.04	0.05
D	265.0	0.00	96.1	0.0	0.15	0.11	0.04	0.05
D	265.0	0.00	60.6	0.0	0.15	0.13	0.01	0.04
D	260.0	0.00	60.6	0.0	0.15	0.13	0.01	0.04
D	260.0	0.00	330.1	0.0	0.16	0.14	0.01	0.04
D	240.0	0.00	330.1	0.0	0.16	0.15	0.01	0.04
D	240.0	0.00	330.1	0.0	0.16	0.16	0.01	0.03
D	220.0	0.00	330.1	0.0	0.17	0.17	0.01	0.04
D	220.0	0.00	330.1	0.0	0.17	0.19	0.01	0.03
D	200.0	0.00	330.1	0.0	0.17	0.19	0.01	0.03
D	200.0	0.00	330.0	0.0	0.18	0.20	0.01	0.03
D	180.0	0.00	330.0	0.0	0.18	0.20	0.01	0.03
D	180.0	0.00	330.0	0.0	0.17	0.21	0.01	0.03
D	160.0	0.00	330.0	0.0	0.17	0.21	0.01	0.03
D	160.0	0.00	330.0	0.0	0.17	0.26	0.01	0.03
D	100.0	0.00	330.0	0.0	0.18	0.28	0.01	0.03
D	100.0	0.00	330.0	0.0	0.18	0.29	0.01	0.03
D	60.0	0.00	330.0	0.0	0.17	0.30	0.01	0.03
D	60.0	0.00	330.0	0.0	0.15	0.28	0.01	0.02
D	53.3	0.00	330.0	0.0	0.15	0.28	0.01	0.02
D	53.3	0.00	330.0	0.0	0.17	0.33	0.01	0.02
D	40.0	0.00	330.0	0.0	0.17	0.33	0.01	0.02
D	40.0	0.00	330.0	0.0	0.14	0.28	0.01	0.02
D	33.3	0.00	330.0	0.0	0.14	0.28	0.01	0.02
D	33.3	0.00	330.0	0.0	0.16	0.35	0.01	0.02
D	20.0	0.00	330.0	0.0	0.16	0.35	0.01	0.02
D	20.0	0.00	330.0	0.0	0.14	0.34	0.01	0.02
D	13.3	0.00	330.0	0.0	0.14	0.34	0.01	0.02
D	13.3	0.00	330.0	0.0	0.16	0.39	0.01	0.02
D	0.0	0.00	330.0	0.0	0.16	0.39	0.01	0.02

LOADING CONDITION Y

30 mph wind with 1.5 ice. Wind Azimuth: 0◆

MAST LOADING

LOAD TYPE	ELEV ft	APPLY..LOAD..AT RADIUS ft	AZI	LOAD AZI	......FORCES...... HORIZ kip	DOWN kip	......MOMENTS...... VERTICAL ft-kip	TORSNAL ft-kip
C	312.5	0.00	0.0	0.0	0.04	0.30	0.00	0.00
C	300.0	0.00	0.0	0.0	1.10	18.42	0.00	0.00
C	288.0	0.00	0.0	0.0	1.33	12.25	0.00	0.00
C	276.0	0.00	0.0	0.0	1.31	12.22	0.00	0.00
C	264.0	0.00	0.0	0.0	1.29	12.19	0.00	0.00
D	305.0	0.00	180.0	0.0	0.01	0.18	0.00	0.00
D	300.0	0.00	180.0	0.0	0.01	0.18	0.00	0.00
D	300.0	0.00	42.0	0.0	0.01	0.30	0.22	0.01
D	295.0	0.00	42.0	0.0	0.01	0.30	0.22	0.01
D	295.0	0.00	42.0	0.0	0.01	0.26	0.22	0.01
D	290.0	0.00	42.0	0.0	0.01	0.26	0.22	0.01
D	290.0	0.00	68.8	0.0	0.01	0.32	0.21	0.01
D	285.0	0.00	68.8	0.0	0.01	0.32	0.21	0.01
D	285.0	0.00	86.1	0.0	0.01	0.36	0.22	0.01
D	280.0	0.00	86.1	0.0	0.01	0.36	0.22	0.01
D	280.0	0.00	85.9	0.0	0.02	0.45	0.21	0.01
D	275.0	0.00	85.9	0.0	0.02	0.45	0.21	0.01
D	275.0	0.00	92.4	0.0	0.02	0.49	0.14	0.00
D	265.0	0.00	94.6	0.0	0.02	0.50	0.14	0.00
D	265.0	0.00	49.0	0.0	0.02	0.55	0.02	0.00
D	260.0	0.00	49.0	0.0	0.02	0.55	0.02	0.00
D	260.0	0.00	330.1	0.0	0.02	0.59	0.02	0.00
D	240.0	0.00	330.1	0.0	0.02	0.61	0.02	0.00
D	240.0	0.00	330.1	0.0	0.02	0.64	0.02	0.00
D	220.0	0.00	330.1	0.0	0.02	0.65	0.02	0.00
D	220.0	0.00	330.1	0.0	0.02	0.68	0.02	0.00
D	200.0	0.00	330.1	0.0	0.02	0.70	0.02	0.00
D	200.0	0.00	330.0	0.0	0.02	0.73	0.02	0.00
D	180.0	0.00	330.0	0.0	0.02	0.75	0.02	0.00
D	180.0	0.00	330.0	0.0	0.02	0.73	0.02	0.00
D	160.0	0.00	330.0	0.0	0.02	0.74	0.02	0.00
D	160.0	0.00	330.0	0.0	0.02	0.83	0.02	0.00
D	60.0	0.00	330.0	0.0	0.02	0.93	0.02	0.00
D	60.0	0.00	330.0	0.0	0.02	0.84	0.02	0.00
D	53.3	0.00	330.0	0.0	0.02	0.84	0.02	0.00
D	53.3	0.00	330.0	0.0	0.02	1.07	0.02	0.00
D	40.0	0.00	330.0	0.0	0.02	1.07	0.02	0.00
D	40.0	0.00	330.0	0.0	0.02	0.83	0.02	0.00
D	33.3	0.00	330.0	0.0	0.02	0.83	0.02	0.00
D	33.3	0.00	330.0	0.0	0.02	1.08	0.02	0.00
D	20.0	0.00	330.0	0.0	0.02	1.08	0.02	0.00
D	20.0	0.00	330.0	0.0	0.01	0.73	0.01	0.00
D	13.3	0.00	330.0	0.0	0.01	0.73	0.01	0.00
D	13.3	0.00	330.0	0.0	0.02	1.04	0.02	0.00
D	0.0	0.00	330.0	0.0	0.02	1.04	0.02	0.00

MAXIMUM TENSION IN MAST MEMBERS (kip)

ELEV ft	LEGS	DIAG	HORIZ	BRACE
305.0	----------	----------	0.10 A	0.00 A
	0.10 U	0.41 R		
300.0	----------	----------	1.16 K	0.00 A
	3.43 M	3.70 N		
295.0	----------	----------	0.24 A	0.00 A
	12.75 M	4.11 H		
290.0	----------	----------	0.10 S	0.00 A
	23.74 M	5.76 N		
285.0	----------	----------	0.28 A	0.00 A
	39.14 M	7.06 H		
280.0	----------	----------	0.60 A	0.00 A
	53.06 M	5.77 M		
275.0	----------	----------	0.22 A	0.00 A
	67.40 M	6.85 H		
270.0	----------	----------	0.14 A	0.00 A
	81.45 M	6.22 N		
265.0	----------	----------	0.15 A	0.00 A
	94.97 M	7.59 N		
260.0	----------	----------	0.15 A	0.00 A
	110.54 M	7.56 N		

ELEV ft	LEGS	DIAG	HORIZ	BRACE
255.0			0.10 A	0.00 A
	124.52 M	7.22 N		
250.0			0.16 A	0.00 A
	137.80 M	6.92 N		
245.0			0.10 A	0.00 A
	149.71 M	6.72 T		
240.0			0.14 A	0.00 A
	162.76 M	7.05 N		
233.3			0.10 A	0.00 A
	176.42 M	6.85 T		
226.7			0.13 A	0.00 A
	189.29 M	6.67 N		
220.0			0.09 A	0.00 A
	201.22 M	6.59 T		
213.3			0.08 A	0.00 A
	212.57 M	6.50 N		
206.7			0.08 A	0.00 A
	223.29 M	6.49 T		
200.0			0.07 A	0.00 A
	233.60 M	6.48 N		
193.3			0.14 A	0.00 A
	243.45 M	6.52 T		
186.7			0.06 A	0.00 A
	253.10 M	6.58 N		
180.0			0.09 A	0.00 A
	264.51 M	7.27 T		
170.0			0.13 A	0.00 A
	277.97 M	7.31 T		
160.0			0.07 A	0.00 A
	290.77 M	7.40 T		
150.0			0.07 A	0.00 A
	303.15 M	7.52 T		
140.0			0.07 A	0.00 A
	315.15 M	7.67 N		
130.0			0.06 A	0.00 A
	326.93 M	7.83 T		
120.0			0.06 A	0.00 A
	338.44 M	8.02 V		
110.0			0.06 A	0.00 A
	349.79 M	8.22 P		
100.0			0.05 A	0.00 A
	360.93 M	8.43 V		
90.0			0.05 A	0.00 A
	371.92 M	8.63 P		
80.0			0.02 O	0.00 A
	382.76 M	8.85 P		
70.0			0.07 S	0.00 A
	393.46 M	9.06 P		
60.0			0.22 A	0.00 A
	406.03 M	9.51 P		
53.3			0.60 U	0.00 P
	404.97 M	12.32 P		
40.0			0.21 A	0.00 A
	426.52 M	9.85 P		
33.3			0.55 U	0.00 M
	425.43 M	12.47 P		
20.0			0.09 A	0.00 M
	446.30 M	10.16 P		
13.3			0.56 U	0.00 B
	445.04 M	12.67 P		
0.0			0.00 A	0.00 A

MAXIMUM COMPRESSION IN MAST MEMBERS (kip)

ELEV ft	LEGS	DIAG	HORIZ	BRACE
305.0			-0.09 S	0.00 A
	-0.24 a	-0.43 G		
300.0			-0.97 Q	0.00 A
	-7.66 G	-3.94 B		
295.0			-0.16 S	0.00 A
	-17.80 G	-3.98 N		
290.0			-0.12 A	0.00 A

	-30.54	G	-5.86	B		
285.0					-0.19 S	0.00 A
	-47.57	G	-7.10	H		
280.0					-0.58 S	0.00 A
	-62.10	G	-6.22	G		
275.0					-0.15 S	0.00 A
	-79.99	G	-6.71	N		
270.0					-0.12 S	0.00 A
	-94.25	G	-6.38	H		
265.0					-0.10 S	0.00 A
	-110.84	G	-7.61	H		
260.0					-0.13 S	0.00 A
	-127.63	G	-7.61	B		
255.0					-0.07 S	0.00 A
	-142.41	G	-7.23	N		
250.0					-0.13 S	0.00 A
	-156.39	G	-6.97	H		
245.0					-0.08 S	0.00 A
	-169.11	G	-6.73	N		
240.0					-0.12 S	0.00 A
	-183.04	G	-7.11	H		
233.3					-0.08 S	0.00 A
	-197.89	G	-6.85	N		
226.7					-0.11 S	0.00 A
	-211.86	G	-6.72	H		
220.0					-0.07 S	0.00 A
	-225.06	G	-6.59	B		
213.3					-0.07 S	0.00 A
	-237.64	G	-6.54	H		
206.7					-0.06 S	0.00 A
	-249.69	G	-6.50	B		
200.0					-0.06 S	0.00 A
	-261.31	G	-6.52	B		
193.3					-0.12 S	0.00 A
	-272.55	G	-6.55	B		
186.7					-0.05 S	0.00 A
	-283.62	G	-6.60	H		
180.0					-0.07 S	0.00 A
	-296.79	G	-7.31	G		
170.0					-0.11 S	0.00 A
	-312.45	G	-7.35	H		
160.0					-0.06 S	0.00 A
	-327.65	G	-7.44	B		
150.0					-0.06 S	0.00 A
	-342.68	G	-7.57	H		
140.0					-0.05 S	0.00 A
	-357.39	G	-7.72	G		
130.0					-0.05 S	0.00 A
	-371.92	G	-7.88	B		
120.0					-0.05 S	0.00 A
	-386.25	G	-8.08	G		
110.0					-0.05 S	0.00 A
	-400.46	G	-8.27	G		
100.0					-0.04 S	0.00 A
	-414.54	G	-8.49	G		
90.0					-0.04 S	0.00 A
	-428.54	G	-8.68	J		
80.0					-0.02 I	0.00 A
	-442.44	G	-8.88	D		
70.0					-0.08 A	0.00 A
	-456.23	G	-9.09	J		
60.0					-0.18 S	0.00 A
	-471.54	G	-9.69	G		
53.3					-0.74 C	0.00 P
	-472.94	G	-12.38	D		
40.0					-0.17 S	0.00 A
	-498.58	G	-10.02	G		
33.3					-0.70 C	0.00 S
	-500.04	G	-12.54	D		
20.0					-0.07 S	0.00 S
	-525.30	G	-10.24	G		
13.3					-0.72 C	0.00 T
	-526.98	G	-12.71	D		
0.0					0.00 A	0.00 A

FORCE/RESISTANCE RATIO IN LEGS
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-- LEG COMPRESSION - ---- LEG TENSION ---

431371B

MAST ELEV ft	MAX COMP	COMP RESIST	FORCE/ RESIST RATIO	MAX TENS	TENS RESIST	FORCE/ RESIST RATIO
305.00						
	0.24	31.48	0.01	0.10	48.15	0.00
300.00						
	7.66	57.04	0.13	3.43	76.50	0.04
295.00						
	17.80	57.04	0.31	12.75	76.50	0.17
290.00						
	30.54	57.04	0.54	23.74	76.50	0.31
285.00						
	47.57	57.04	0.83	39.14	76.50	0.51
280.00						
	62.10	110.98	0.56	53.06	135.90	0.39
275.00						
	79.99	110.98	0.72	67.40	135.90	0.50
270.00						
	94.25	110.98	0.85	81.45	135.90	0.60
265.00						
	110.84	110.98	1.00	94.97	135.90	0.70
260.00						
	127.63	175.98	0.73	110.54	198.45	0.56
255.00						
	142.41	175.98	0.81	124.52	198.45	0.63
250.00						
	156.39	175.98	0.89	137.80	198.45	0.69
245.00						
	169.11	175.98	0.96	149.71	198.45	0.75
240.00						
	183.04	239.46	0.76	162.76	274.95	0.59
233.33						
	197.89	239.46	0.83	176.42	274.95	0.64
226.67						
	211.86	239.46	0.88	189.29	274.95	0.69
220.00						
	225.06	309.64	0.73	201.22	327.10	0.62
213.33						
	237.64	309.64	0.77	212.57	327.10	0.65
206.67						
	249.69	309.64	0.81	223.29	327.10	0.68
200.00						
	261.31	309.64	0.84	233.60	357.75	0.65
193.33						
	272.55	309.64	0.88	243.45	357.75	0.68
186.67						
	283.62	309.64	0.92	253.10	357.75	0.71
180.00						
	296.79	334.65	0.89	264.51	378.00	0.70
170.00						
	312.45	334.65	0.93	277.97	378.00	0.74
160.00						
	327.65	507.33	0.65	290.77	457.90	0.63
150.00						
	342.68	507.33	0.68	303.15	457.90	0.66
140.00						
	357.39	507.33	0.70	315.15	457.90	0.69
130.00						
	371.92	507.33	0.73	326.93	457.90	0.71
120.00						
	386.25	507.33	0.76	338.44	457.90	0.74
110.00						
	400.46	507.33	0.79	349.79	457.90	0.76
100.00						
	414.54	507.33	0.82	360.93	457.90	0.79
90.00						
	428.54	507.33	0.84	371.92	457.90	0.81
80.00						
	442.44	507.33	0.87	382.76	457.90	0.84
70.00						
	456.23	507.33	0.90	393.46	457.90	0.86
60.00						
	471.54	544.40	0.87	406.03	457.90	0.89
53.33						
	472.94	544.40	0.87	404.97	457.90	0.88
40.00						
	498.58	544.40	0.92	426.52	576.00	0.74
33.33						
	500.04	544.40	0.92	425.43	576.00	0.74

20.00						
	525.30	699.22	0.75	446.30	724.50	0.62
13.33						
	526.98	699.22	0.75	445.04	724.50	0.61
0.00						

FORCE/RESISTANCE RATIO IN DIAGONALS

MAST ELEV ft	- DIAG COMPRESSION - MAX COMP	COMP RESIST	FORCE/ RESIST RATIO	--- DIAG TENSION -- MAX TENS	TENS RESIST	FORCE/ RESIST RATIO
305.00						
	0.43	7.16	0.06	0.41	7.16	0.06
300.00						
	3.94	7.16	0.55	3.70	7.16	0.52
295.00						
	3.98	7.16	0.56	4.11	7.16	0.57
290.00						
	5.86	7.16	0.82	5.76	7.16	0.80
285.00						
	7.10	7.16	0.99	7.06	7.16	0.99
280.00						
	6.22	10.74	0.58	5.77	10.74	0.54
275.00						
	6.71	10.74	0.63	6.85	10.74	0.64
270.00						
	6.38	10.74	0.59	6.22	10.74	0.58
265.00						
	7.61	10.74	0.71	7.59	10.74	0.71
260.00						
	7.61	8.19	0.93	7.56	8.19	0.92
255.00						
	7.23	8.19	0.88	7.22	8.19	0.88
250.00						
	6.97	8.19	0.85	6.92	8.19	0.85
245.00						
	6.73	8.19	0.82	6.72	8.19	0.82
240.00						
	7.11	9.84	0.72	7.05	9.84	0.72
233.33						
	6.85	9.84	0.70	6.85	9.84	0.70
226.67						
	6.72	9.84	0.68	6.67	9.84	0.68
220.00						
	6.59	7.46	0.88	6.59	7.46	0.88
213.33						
	6.54	7.46	0.88	6.50	7.46	0.87
206.67						
	6.50	7.46	0.87	6.49	7.46	0.87
200.00						
	6.52	10.34	0.63	6.48	10.34	0.63
193.33						
	6.55	10.34	0.63	6.52	10.34	0.63
186.67						
	6.60	10.34	0.64	6.58	10.34	0.64
180.00						
	7.31	9.19	0.80	7.27	9.19	0.79
170.00						
	7.35	9.19	0.80	7.31	9.19	0.80
160.00						
	7.44	12.53	0.59	7.40	12.53	0.59
150.00						
	7.57	12.53	0.60	7.52	12.53	0.60
140.00						
	7.72	10.73	0.72	7.67	10.73	0.71
130.00						
	7.88	10.73	0.73	7.83	10.73	0.73
120.00						
	8.08	13.43	0.60	8.02	13.43	0.60
110.00						
	8.27	13.43	0.62	8.22	13.43	0.61
100.00						
	8.49	14.31	0.59	8.43	14.31	0.59
90.00						
	8.68	14.31	0.61	8.63	14.31	0.60
80.00						
	8.88	12.68	0.70	8.85	12.68	0.70

```
 70.00 ------------------------------------------------
          9.09   12.68    0.72    9.06   12.68    0.71
 60.00 ------------------------------------------------
          9.69   16.16    0.60    9.51   16.16    0.59
 53.33 ------------------------------------------------
         12.38   24.72    0.50   12.32   24.72    0.50
 40.00 ------------------------------------------------
         10.02   14.73    0.68    9.85   14.73    0.67
 33.33 ------------------------------------------------
         12.54   23.19    0.54   12.47   23.19    0.54
 20.00 ------------------------------------------------
         10.24   16.98    0.60   10.16   16.98    0.60
 13.33 ------------------------------------------------
         12.71   22.03    0.58   12.67   22.03    0.58
  0.00 ------------------------------------------------
```

MAXIMUM INDIVIDUAL FOUNDATION LOADS: (kip)

LOAD---COMPONENTS				TOTAL
NORTH	EAST	DOWN	UPLIFT	SHEAR
47.72 G	41.06 K	542.86 G	-457.84 M	47.72 G

MAXIMUM TOTAL LOADS ON FOUNDATION : (kip & kip-ft)

HORIZONTAL			DOWN	OVERTURNING			TORSION
NORTH	EAST	TOTAL @ 0.0		NORTH	EAST	TOTAL @ 0.0	
76.7 G	-73.0 P	76.7 G	287.0 h	14418.6 G	-13817.9 D	14418.6 G	-34.3 R

Latticed Tower Analysis (Unguyed) (c)2015 Guymast Inc. 416-736-7453
Processed under license at:

Sabre Towers and Poles on: 1 jul 2020 at: 12:01:44

********** Service Load Condition **********

* Only 1 condition(s) shown in full
* Some wind loads may have been derived from full-scale wind tunnel testing

LOADING CONDITION A

60 mph wind with no ice. Wind Azimuth: 0

MAST LOADING

LOAD TYPE	ELEV ft	APPLY..LOAD..AT RADIUS ft	AZI	LOAD AZI	.....FORCES..... HORIZ kip	DOWN kip	.....MOMENTS..... VERTICAL ft-kip	TORSNAL ft-kip
C	312.5	0.00	0.0	0.0	0.07	0.13	0.00	0.00
C	300.0	0.00	0.0	0.0	2.50	6.00	0.00	0.00
C	288.0	0.00	0.0	0.0	1.85	4.00	0.00	0.00
C	276.0	0.00	0.0	0.0	1.83	4.00	0.00	0.00
C	264.0	0.00	0.0	0.0	1.81	4.00	0.00	0.00
D	305.0	0.00	180.0	0.0	0.02	0.03	0.00	0.00

D	300.0	0.00	180.0	0.0	0.02	0.03	0.00	0.00
D	300.0	0.00	42.0	0.0	0.04	0.06	0.05	0.02
D	290.0	0.00	42.0	0.0	0.03	0.06	0.05	0.02
D	290.0	0.00	63.7	0.0	0.04	0.07	0.05	0.03
D	280.0	0.00	76.5	0.0	0.04	0.08	0.05	0.03
D	280.0	0.00	78.4	0.0	0.05	0.11	0.05	0.03
D	275.0	0.00	78.4	0.0	0.05	0.11	0.05	0.03
D	275.0	0.00	93.9	0.0	0.05	0.12	0.04	0.02
D	265.0	0.00	96.1	0.0	0.05	0.12	0.04	0.02
D	265.0	0.00	60.6	0.0	0.05	0.14	0.01	0.01
D	260.0	0.00	60.6	0.0	0.05	0.14	0.01	0.01
D	260.0	0.00	330.1	0.0	0.05	0.16	0.01	0.01
D	240.0	0.00	330.1	0.0	0.06	0.16	0.01	0.01
D	240.0	0.00	330.1	0.0	0.06	0.18	0.01	0.01
D	220.0	0.00	330.1	0.0	0.06	0.19	0.01	0.01
D	220.0	0.00	330.1	0.0	0.06	0.21	0.01	0.01
D	200.0	0.00	330.1	0.0	0.06	0.21	0.01	0.01
D	200.0	0.00	330.0	0.0	0.06	0.22	0.01	0.01
D	180.0	0.00	330.0	0.0	0.06	0.22	0.01	0.01
D	180.0	0.00	330.0	0.0	0.06	0.23	0.01	0.01
D	160.0	0.00	330.0	0.0	0.06	0.23	0.01	0.01
D	160.0	0.00	330.0	0.0	0.06	0.29	0.01	0.01
D	100.0	0.00	330.0	0.0	0.06	0.31	0.01	0.01
D	100.0	0.00	330.0	0.0	0.06	0.32	0.01	0.01
D	60.0	0.00	330.0	0.0	0.06	0.33	0.01	0.01
D	60.0	0.00	330.0	0.0	0.05	0.31	0.01	0.01
D	53.3	0.00	330.0	0.0	0.05	0.31	0.01	0.01
D	53.3	0.00	330.0	0.0	0.06	0.37	0.01	0.01
D	40.0	0.00	330.0	0.0	0.06	0.37	0.01	0.01
D	40.0	0.00	330.0	0.0	0.05	0.31	0.01	0.01
D	33.3	0.00	330.0	0.0	0.05	0.31	0.01	0.01
D	33.3	0.00	330.0	0.0	0.06	0.39	0.01	0.01
D	13.3	0.00	330.0	0.0	0.05	0.38	0.01	0.01
D	13.3	0.00	330.0	0.0	0.06	0.44	0.01	0.01
D	0.0	0.00	330.0	0.0	0.06	0.44	0.01	0.01

MAXIMUM MAST DISPLACEMENTS:

ELEV	------DEFLECTIONS (ft)-----			--TILTS (DEG)---		TWIST
ft	NORTH	EAST	DOWN	NORTH	EAST	DEG
305.0	1.505 G	-1.448 D	0.022 G	0.706 G	-0.680 D	0.042 L
300.0	1.444 G	-1.389 D	0.022 G	0.706 G	-0.680 D	0.042 L
295.0	1.381 G	-1.329 D	0.021 G	0.703 G	-0.676 D	0.041 L
290.0	1.320 G	-1.270 D	0.020 G	0.692 G	-0.666 D	0.040 L
285.0	1.258 G	-1.210 D	0.020 G	0.674 G	-0.648 D	0.039 L
280.0	1.199 G	-1.154 D	0.019 G	0.644 G	-0.619 D	0.037 L
275.0	1.143 G	-1.100 D	0.019 G	0.623 G	-0.600 D	0.035 L
270.0	1.089 G	-1.048 D	0.018 G	0.599 G	-0.577 D	0.033 L
265.0	1.037 G	-0.998 D	0.017 G	0.573 G	-0.552 D	0.032 L
260.0	0.987 G	-0.949 D	0.017 G	0.545 G	-0.524 D	0.030 L
255.0	0.939 G	-0.904 D	0.016 G	0.524 G	-0.505 D	0.029 L
250.0	0.893 G	-0.859 D	0.016 G	0.502 G	-0.483 D	0.028 L
245.0	0.850 G	-0.817 D	0.015 G	0.479 G	-0.462 D	0.026 L
240.0	0.808 G	-0.777 D	0.015 G	0.456 G	-0.439 D	0.025 L
233.3	0.755 G	-0.726 D	0.014 G	0.433 G	-0.417 D	0.024 L
226.7	0.705 G	-0.678 D	0.014 G	0.410 G	-0.395 D	0.022 L
220.0	0.657 G	-0.632 D	0.013 G	0.387 G	-0.372 D	0.021 L
213.3	0.612 G	-0.589 D	0.013 G	0.369 G	-0.355 D	0.020 L
206.7	0.569 G	-0.547 D	0.013 G	0.351 G	-0.338 D	0.019 L
200.0	0.528 G	-0.508 D	0.012 G	0.334 G	-0.321 D	0.017 L
193.3	0.489 G	-0.470 D	0.012 G	0.316 G	-0.304 D	0.016 L
186.7	0.453 G	-0.436 D	0.011 G	0.299 G	-0.287 D	0.015 L
180.0	0.418 G	-0.402 D	0.011 G	0.281 G	-0.270 D	0.014 L
170.0	0.370 G	-0.356 D	0.010 G	0.256 G	-0.246 D	0.013 L
160.0	0.327 G	-0.314 D	0.010 G	0.232 G	-0.223 D	0.012 L
150.0	0.287 G	-0.276 D	0.009 G	0.216 G	-0.207 D	0.011 L
140.0	0.250 G	-0.240 D	0.009 G	0.200 G	-0.192 D	0.010 L
130.0	0.215 G	-0.206 D	0.008 G	0.184 G	-0.177 D	0.009 L
120.0	0.183 G	-0.176 D	0.008 G	0.169 G	-0.163 D	0.008 L
110.0	0.154 G	-0.147 D	0.007 G	0.154 G	-0.148 D	0.008 L
100.0	0.127 G	-0.122 D	0.007 G	0.139 G	-0.133 D	0.007 L
90.0	0.103 G	-0.099 D	0.006 G	0.124 G	-0.119 D	0.006 L
80.0	0.081 G	-0.078 D	0.005 G	0.109 G	-0.105 D	0.005 L
70.0	0.061 G	-0.058 D	0.005 G	0.094 G	-0.091 D	0.005 L
60.0	0.042 G	-0.040 D	0.004 G	0.079 G	-0.076 D	0.004 L
53.3	0.034 G	-0.032 D	0.004 G	0.070 G	-0.067 D	0.003 L
40.0	0.019 G	-0.018 D	0.003 K	0.050 G	-0.048 D	0.002 L

33.3	0.013 G	-0.013 D	0.002 H	0.041 G	-0.040 D	0.002 L
20.0	0.005 G	-0.005 D	0.001 J	0.022 G	-0.021 D	0.001 L
13.3	0.002 G	-0.002 D	0.001 J	0.015 G	-0.014 D	0.001 L
0.0	0.000 A	0.000 A	0.000 A	0.000 A	0.000 A	0.000 A

MAXIMUM TENSION IN MAST MEMBERS (kip)
==========

ELEV ft	LEGS	DIAG	HORIZ	BRACE
305.0	----------	----------	0.04 A	0.00 A
	0.00 A	0.14 H		
300.0	----------	----------	0.45 K	0.00 A
	0.00 A	1.20 H		
295.0	----------	----------	0.11 A	0.00 A
	2.82 A	1.45 H		
290.0	----------	----------	0.03 G	0.00 A
	6.10 A	1.96 B		
285.0	----------	----------	0.12 A	0.00 A
	10.94 A	2.42 H		
280.0	----------	----------	0.21 A	0.00 A
	15.60 A	1.86 A		
275.0	----------	----------	0.10 A	0.00 A
	19.44 A	2.39 H		
270.0	----------	----------	0.05 A	0.00 A
	24.24 A	2.08 B		
265.0	----------	----------	0.07 A	0.00 A
	27.94 A	2.59 H		
260.0	----------	----------	0.06 A	0.00 A
	32.91 A	2.57 B		
255.0	----------	----------	0.04 A	0.00 A
	37.50 A	2.47 H		
250.0	----------	----------	0.06 A	0.00 A
	41.87 A	2.36 B		
245.0	----------	----------	0.04 A	0.00 A
	45.75 A	2.30 H		
240.0	----------	----------	0.06 A	0.00 A
	50.00 A	2.40 B		
233.3	----------	----------	0.04 A	0.00 A
	54.39 A	2.35 H		
226.7	----------	----------	0.05 A	0.00 A
	58.53 A	2.28 B		
220.0	----------	----------	0.03 A	0.00 A
	62.32 A	2.26 H		
213.3	----------	----------	0.03 A	0.00 A
	65.91 A	2.22 B		
206.7	----------	----------	0.03 A	0.00 A
	69.28 A	2.23 H		
200.0	----------	----------	0.03 A	0.00 A
	72.50 A	2.22 B		
193.3	----------	----------	0.05 A	0.00 A
	75.56 A	2.24 B		
186.7	----------	----------	0.02 A	0.00 A
	78.54 A	2.26 B		
180.0	----------	----------	0.03 A	0.00 A
	82.06 A	2.50 B		
170.0	----------	----------	0.05 A	0.00 A
	86.19 A	2.52 B		
160.0	----------	----------	0.03 A	0.00 A
	90.03 A	2.56 B		
150.0	----------	----------	0.03 A	0.00 A
	93.68 A	2.60 B		
140.0	----------	----------	0.03 A	0.00 A
	97.18 A	2.66 B		
130.0	----------	----------	0.03 A	0.00 A
	100.60 A	2.72 B		
120.0	----------	----------	0.02 A	0.00 A
	103.92 A	2.79 J		
110.0	----------	----------	0.02 A	0.00 A
	107.19 A	2.87 D		
100.0	----------	----------	0.02 A	0.00 A
	110.36 A	2.94 J		
90.0	----------	----------	0.02 A	0.00 A
	113.48 A	3.01 D		
80.0	----------	----------	0.01 C	0.00 A
	116.53 A	3.10 D		
70.0	----------	----------	0.02 G	0.00 A
	119.54 A	3.17 D		

60.0	----------	0.09 A	0.00 A
	123.36 A 3.31 D		
53.3	----------	0.18 I	0.00 K
	122.19 A 4.31 D		
40.0	----------	0.09 A	0.00 A
	128.95 A 3.43 D		
33.3	----------	0.17 I	0.00 A
	127.73 A 4.36 D		
20.0	----------	0.04 A	0.00 A
	134.17 A 3.55 J		
13.3	----------	0.17 I	0.00 B
	132.78 A 4.44 D		
0.0	----------	0.00 A	0.00 A

MAXIMUM COMPRESSION IN MAST MEMBERS (kip)

ELEV ft	LEGS	DIAG	HORIZ	BRACE
305.0	----------		-0.03 G	0.00 A
	-0.11 C	-0.15 G		
300.0	----------		-0.28 E	0.00 A
	-3.81 G	-1.43 B		
295.0	----------		-0.02 G	0.00 A
	-7.52 G	-1.34 B		
290.0	----------		-0.05 A	0.00 A
	-12.37 G	-2.05 B		
285.0	----------		-0.03 G	0.00 A
	-18.66 G	-2.46 B		
280.0	----------		-0.19 G	0.00 A
	-23.78 G	-2.25 G		
275.0	----------		-0.03 G	0.00 A
	-30.88 G	-2.26 B		
270.0	----------		-0.03 G	0.00 A
	-35.80 G	-2.24 H		
265.0	----------		-0.02 G	0.00 A
	-42.29 G	-2.61 B		
260.0	----------		-0.03 G	0.00 A
	-48.34 G	-2.62 H		
255.0	----------		-0.02 G	0.00 A
	-53.57 G	-2.48 B		
250.0	----------		-0.04 G	0.00 A
	-58.51 G	-2.40 H		
245.0	----------		-0.02 G	0.00 A
	-63.04 G	-2.31 B		
240.0	----------		-0.03 G	0.00 A
	-68.00 G	-2.45 H		
233.3	----------		-0.02 G	0.00 A
	-73.35 G	-2.36 B		
226.7	----------		-0.03 G	0.00 A
	-78.37 G	-2.32 H		
220.0	----------		-0.02 G	0.00 A
	-83.18 G	-2.27 B		
213.3	----------		-0.02 G	0.00 A
	-87.77 G	-2.26 H		
206.7	----------		-0.02 G	0.00 A
	-92.20 G	-2.24 B		
200.0	----------		-0.02 G	0.00 A
	-96.47 G	-2.26 H		
193.3	----------		-0.03 G	0.00 A
	-100.64 G	-2.27 B		
186.7	----------		-0.01 G	0.00 A
	-104.75 G	-2.29 B		
180.0	----------		-0.02 G	0.00 A
	-109.66 G	-2.54 B		
170.0	----------		-0.03 G	0.00 A
	-115.53 G	-2.56 B		
160.0	----------		-0.02 G	0.00 A
	-121.31 G	-2.60 B		
150.0	----------		-0.02 G	0.00 A
	-127.09 G	-2.65 B		
140.0	----------		-0.01 G	0.00 A
	-132.79 G	-2.70 B		
130.0	----------		-0.01 G	0.00 A

	-138.44 G	-2.77 B		
120.0	----------		-0.01 G	0.00 A
	-144.04 G	-2.83 D		
110.0	----------		-0.01 G	0.00 A
	-149.60 G	-2.91 J		
100.0	----------		-0.01 G	0.00 A
	-155.14 G	-2.99 D		
90.0	----------		-0.01 G	0.00 A
	-160.67 G	-3.06 J		
80.0	----------		-0.01 I	0.00 A
	-166.17 G	-3.13 D		
70.0	----------		-0.03 A	0.00 A
	-171.63 G	-3.20 J		
60.0	----------		-0.05 G	0.00 A
	-177.50 G	-3.42 G		
53.3	----------		-0.28 C	0.00 D
	-178.67 G	-4.37 D		
40.0	----------		-0.04 G	0.00 A
	-188.34 G	-3.54 G		
33.3	----------		-0.27 C	0.00 G
	-189.55 G	-4.42 J		
20.0	----------		-0.02 G	0.00 G
	-199.16 G	-3.61 D		
13.3	----------		-0.29 C	0.00 K
	-200.56 G	-4.49 D		
0.0	----------		0.00 A	0.00 A

MAXIMUM INDIVIDUAL FOUNDATION LOADS: (kip)
==========

----------LOAD---COMPONENTS----------				TOTAL
NORTH	EAST	DOWN	UPLIFT	SHEAR
17.66 G	15.21 K	206.68 G	-136.63 A	17.66 G

MAXIMUM TOTAL LOADS ON FOUNDATION : (kip & kip-ft)
==========

------HORIZONTAL-----			DOWN	---------OVERTURNING---------			TORSION
NORTH	EAST	TOTAL @ 0.0		NORTH	EAST	TOTAL @ 0.0	
26.7 G	-25.4 D	26.7 G	95.8 A	4993.7 G	-4787.5 D	4993.7 G	11.7 L

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MAT FOUNDATION DESIGN BY SABRE TOWERS & POLES

Tower Description	305' S3TL Series HD1
Customer	AT&T
Project Number	431371
Date	7/1/2020
Engineer	REB

Overall Loads:			
Factored Moment (ft-kips)	14534.55		
Factored Axial (kips)	292.21		
Factored Shear (kips)	77.67		
Individual Leg Loads:		Tower eccentric from mat (ft)=	2.75
Factored Uplift (kips)	462.00		
Factored Download (kips)	547.00		
Factored Shear (kips)	48.00		
Width of Tower (ft)	33	Allowable Bearing Pressure (ksf)	**11.31**
Ultimate Bearing Pressure	22.62	Safety Factor	**2.00**
Bearing Φs	0.75		
Bearing Design Strength (ksf)	16.965	Max. Factored Net Bearing Pressure (ksf)	2.33
Water Table Below Grade (ft)	**999**		
Width of Mat (ft)	39.5	Minimum Mat Width (ft)	39.50
Thickness of Mat (ft)	1.5		
Depth to Bottom of Slab (ft)	6		
Bolt Circle Diameter (in)	15.5		
Top of Concrete to Top of Bottom Threads (in)	65.125		
Diameter of Pier (ft)	4.5	Minimum Pier Diameter (ft)	2.63
Ht. of Pier Above Ground (ft)	0.5	Equivalent Square b (ft)	3.99
Ht. of Pier Below Ground (ft)	4.5		
Quantity of Bars in Mat	73		
Bar Diameter in Mat (in)	1.128		
Area of Bars in Mat (in^2)	72.95		
Spacing of Bars in Mat (in)	6.48	Recommended Spacing (in)	6 to 12
Quantity of Bars Pier	28		
Bar Diameter in Pier (in)	0.75		
Tie Bar Diameter in Pier (in)	0.5		
Spacing of Ties (in)	12		
Area of Bars in Pier (in^2)	12.37	Minimum Pier A_s (in^2)	11.45
Spacing of Bars in Pier (in)	5.18	Recommended Spacing (in)	5 to 12
f'c (ksi)	4.5		
fy (ksi)	60		
Unit Wt. of Soil (kcf)	0.11		
Unit Wt. of Concrete (kcf)	0.15		
Volume of Concrete (yd^3)	95.52		

MAT FOUNDATION DESIGN BY SABRE TOWERS & POLES (CONTINUED)

Two-Way Shear:

Average d (in)	13.872		
ϕv_c (ksi)	0.228	v_u (ksi)	0.220
$\phi v_c = \phi(2 + 4/\beta_c)f'_c{}^{1/2}$	0.342		
$\phi v_c = \phi(\alpha_s d/b_o+2)f'_c{}^{1/2}$	0.285		
$\phi v_c = \phi 4f'_c{}^{1/2}$	0.228		
Shear perimeter, b_o (in)	184.61		
β_c	1		

Stability:

Overturning Design Strength (ft-k)	21434.3	Factored Overturning Moment (ft-k)	15039.4

One-Way Shear:

ϕV_c (kips)	749.8	V_u (kips)	497.3

Pier Design:

Design Tensile Strength (kips)	668.0	Tu (kips)	462.0
ϕV_n (kips)	158.7	V_u (kips)	48.0
$\phi V_c = \phi 2(1+N_u/(500A_g))f'_c{}^{1/2}b_w d$	158.7		
V_s (kips)	0.0	*** V_s max = 4 $f'_c{}^{1/2}b_w d$ (kips)	626.0
Maximum Spacing (in)	8.67	(Only if Shear Ties are Required)	
Actual Hook Development (in)	12.74	Req'd Hook Development l_{dh} (in)	8.69
		*** Ref. ACI 11.5.5 & 11.5.6.3	

Anchor Bolt Pull-Out:

$\phi P_c = \phi\lambda(2/3)f'_c{}^{1/2}(2.8A_{SLOPE} + 4A_{FLAT})$	345.0	P_u (kips)	462.0
Pier Rebar Development Length (in)	46.75	Required Length of Development (in)	18.56

Flexure in Slab:

ϕM_n (ft-kips)	4157.6	M_u (ft-kips)	4123.9
a (in)	2.41		
Steel Ratio	0.01109		
β_1	0.825		
Maximum Steel Ratio (ρ_t)	0.0197		
Minimum Steel Ratio	0.0018		
Rebar Development in Pad (in)	110.61	Required Development in Pad (in)	12.27

Condition	1 is OK, 0 Fails
Minimum Mat Width	1
Maximum Soil Bearing Pressure	1
Pier Area of Steel	1
Pier Shear	1
Two-Way Shear	1
Overturning	1
Anchor Bolt Pull-Out	1
Flexure	1
Steel Ratio	1
Length of Development in Pad	1
Interaction Diagram	1
One-Way Shear	1
Hook Development	1
Minimum Mat Depth	1

DRILLED STRAIGHT PIER DESIGN BY SABRE TOWERS & POLES

Tower Description 305' S3TL Series HD1
Customer Name AT&T
Job Number 431371
Date 7/1/2020
Engineer REB

Factored Uplift (kips)	462		
Factored Download (kips)	547		
Factored Shear (kips)	48		
Ultimate Bearing Pressure	**53.51**		
Bearing Φs	0.75		
Bearing Design Strength (ksf)	40.1325		
Water Table Below Grade (ft)	**999**		
Bolt Circle Diameter (in)	15.5		
Top of Concrete to Top of Bottom Threads (in)	65.125		
Pier Diameter (ft)	3.5	Minimum Pier Diameter (ft)	2.63
Ht. Above Ground (ft)	0.5		
Pier Length Below Ground (ft)	34		
Quantity of Bars	14		
Bar Diameter (in)	1.27		
Area of Bars (in^2)	17.73	Minimum Area of Steel (in^2)	6.93
Spacing of Bars (in)	7.57		
Tie Bar Diameter (in)	0.5		
Spacing of Ties (in)	11		
f'c (ksi)	4.5		
fy (ksi)	60		
Unit Wt. of Concrete (kcf)	0.15		
Download Friction Φs	0.75		
Uplift Friction Φs	0.75		
Volume of Concrete (yd^3)	12.29		
Skin Friction Factor for Uplift	1	Length to Ignore Download (ft)	
Ignore Bottom Length in Download?	☐	**0**	

Depth at Bottom of Layer (ft)	Ult. Skin Friction (ksf)	(Ult. Skin Friction)*(Uplift Factor)	γ (kcf)
3	**0.00**	**0.00**	**0.11**
4	**1.09**	**1.09**	**0.11**
6.5	**1.87**	**1.87**	**0.11**
9	**2.40**	**2.40**	**0.11**
14	**2.19**	**2.19**	**0.11**
19	**2.40**	**2.40**	**0.11**
24	**1.15**	**0.86**	**0.11**
29	**1.42**	**1.06**	**0.11**
34	**1.69**	**1.27**	**0.11**
38	**1.97**	**1.47**	**0.11**

DRILLED STRAIGHT PIER DESIGN BY SABRE TOWERS & POLES (CONTINUED)

Download:			
Factored Net Weight of Concrete (kips)	16.6		
Bearing Design Strength (kips)	386.1		
Skin Friction Design Strength (kips)	461.9		
Download Design Strength (kips)	848.1	Factored Net Download (kips)	563.6
Uplift:			
Nominal Skin Friction (kips)	557.1		
Wc, Weight of Concrete (kips)	49.8		
W_R, Soil Resistance (kips)	1912.8		
ΦsWr+0.9Wc (kips)	1479.4		
Uplift Design Strength (kips)	462.6	Factored Uplift (kips)	462.0
Tension:			
Design Tensile Strength (kips)	957.7	Tu (kips)	462.0
Shear:			
ϕV_n (kips)	114.8	V_u (kips)	48.0
$\phi V_c=\phi 2(1+N_u/(500A_g))f'_c{}^{1/2}b_w d$ (kips)	53.6		
V_s (kips)	72.0	*** V_s max = 4 $f'_c{}^{1/2}b_w d$ (kips)	378.7
Maximum Spacing (in)	11.15	(Only if Shear Ties are Required)	
		*** Ref. ACI 11.5.5 & 11.5.6.3	
Anchor Bolt Pull-Out:			
$\phi P_c=\phi\lambda(2/3)f'_c{}^{1/2}(2.8A_{SLOPE}+ 4A_{FLAT})$	208.8	P_u (kips)	462.0
Rebar Development Length (in)	53.01	Required Length of Development (in)	27.40

Condition	1 is OK, 0 Fails
Download	1
Uplift	1
Area of Steel	1
Shear	1
Anchor Bolt Pull-Out	1
Interaction Diagram	1

EXHIBIT G-1

GEOTECHNICAL REPORT

GEOTECHNICAL INVESTIGATION REPORT

June 26, 2020

Prepared For:

MasTec Network Solutions

Quicksand Creek
13800701
Proposed 305-Foot Self-Supporting Tower
2630 Highway 1098, Jackson (Breathitt County), Kentucky 41339
Latitude N 37º 31' 39.3" Longitude W 83º 17' 58.1"

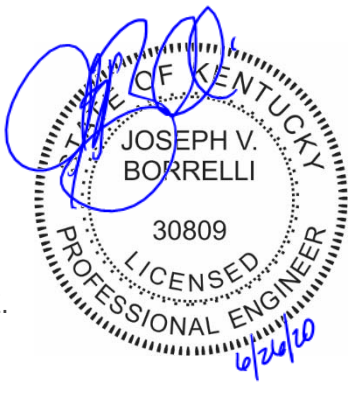
Delta Oaks Group Project GEO20-06535-08
Revision 0

Performed By:

Justin Brosseau, E.I.

Reviewed By:

Joseph V. Borrelli, Jr., P.E.



INTRODUCTION

This geotechnical investigation report has been completed for the proposed 305-foot self-supporting tower located at 2630 Highway 1098 in Jackson (Breathitt County), Kentucky. The purpose of this investigation was to provide engineering recommendations and subsurface condition data at the proposed tower location. A geotechnical engineering interpretation of the collected information was completed and utilized to suggest design parameters regarding the adequacy of the structure's proposed foundation capacity under various loading conditions. This report provides the scope of the geotechnical investigation; geologic material identification; results of the geotechnical laboratory testing; and design parameter recommendations for use in the design of the telecommunication facility's foundation and site development.

SITE CONDITION SUMMARY

The proposed tower and compound are located on a heavily wooded hill exhibiting a gradually sloping topography from the northwest to southeast across the tower compound and subject property.

REFERENCES

- Civil Drawings, prepared by Power of Design, dated January 3, 2020
- TIA Standard (TIA-222-G), dated August 2005

SUBSURFACE FIELD INVESTIGATION SUMMARY

The subsurface field investigation was conducted through the advancement of one mechanical soil test boring to the auger refusal depth of 38.8 feet bgs. Samples were obtained at selected intervals in accordance with ASTM D 1586. The sampling was conducted at the staked centerline of the proposed tower. Soil samples were transported to our laboratory and classified by a geotechnical engineer in accordance with ASTM D 2487. A detailed breakdown of the material encountered in our subsurface field investigation can be found in the boring log presented in the Appendix of this report.

A boring plan portraying the spatial location of the boring in relation to the proposed tower, tower compound and immediate surrounding area can be found in the Appendix.

SUBSURFACE CONDITION SUMMARY

The following provides a general overview of the site's subsurface conditions based on the data obtained during our field investigation.

FILL

Fill material was not encountered during the subsurface field investigation.

SOIL

The residual soil encountered in the subsurface field investigation began at the existing ground surface in the boring and consisted of clayey silt, silt, sandy silt, silty sand, and poorly graded sand. The materials ranged from a dense to very dense relative density and a stiff to very hard cohesion.

Auger advancement refusal was encountered during the subsurface field investigation at a depth of 38.8 feet bgs.

ROCK

Rock was not encountered during the subsurface field investigation.

SUBSURFACE WATER

At the time of drilling, subsurface water was not encountered during the subsurface investigation. However, subsurface water elevations can fluctuate throughout the year due to variations in climate, hydraulic parameters, nearby construction activity and other factors.

FROST PENETRATION

The frost penetration depth for Breathitt County, Kentucky is 30 inches (2.5 feet).

CORROSIVITY

Soil resistivity was performed in accordance with ASTM G187 with a test result of 25,500 ohms-cm.

FOUNDATION DESIGN SUMMARY

In consideration of the provided tower parameters and the determined soil characteristics, Delta Oaks Group recommends utilizing a shallow foundation and/or drilled shaft foundation for the proposed structure. The strength parameters presented in the following sections can be utilized for design of the foundation.

GENERAL SUBSURFACE STRENGTH PARAMETERS

Boring	Depth (bgs)	USCS	Moist/Buoyant Unit Weight (pcf)	Phi Angle (degrees)	Cohesion (psf)
B-1	0.0 – 1.5	CL - ML	110	0	1,000
	1.5 – 4.0	CL – ML	115	0	2,000
	4.0 – 6.5	ML	120	0	3,500
	6.5 – 9.0	ML	130	0	6,000
	9.0 – 14.0	ML	125	0	4,500
	14.0 – 19.0	ML	130	0	6,000
	19.0 – 34.0	SM	130	40	0
	34.0 – 38.8	SP	130	40	0

- The unit weight provided assumes overburden soil was compacted to a minimum of 95% of the maximum dry density as obtained by the standard Proctor method (ASTM D 698) and maintained a moisture content within 3 percent of optimum
- The values provided for phi angle and cohesion should be considered ultimate.

SUBSURFACE STRENGTH PARAMETERS – SHALLOW FOUNDATION

Boring	Dimensions (feet)	Depth (feet bgs)	Net Ultimate Bearing Capacity (psf)
B-1	5.0 x 5.0	3.0	13,820
		4.0	25,040
		5.0	25,910
		6.0	26,770
	10.0 x 10.0	3.0	13,080
		4.0	23,320
		5.0	23,750
		6.0	24,180
	15.0 x 15.0	3.0	12,830
		4.0	22,740
		5.0	23,030
		6.0	23,320
	20.0 x 20.0	3.0	12,710
		4.0	22,450
		5.0	22,670
		6.0	22,880
	25.0 x 25.0	3.0	12,630
		4.0	22,280
		5.0	22,450
		6.0	22,620

- Delta Oaks Group recommends the foundation bear a minimum of 3.0 feet bgs.
- A sliding friction factor of 0.30 can be utilized along the base of the proposed foundation.
- The bearing capacity can be increased by 1/3 for transient loading.
- An Ultimate Passive Pressure Graph with a reduction due to frost penetration to a depth of 2.5 feet bgs is presented on the following page.
- Delta Oaks Group recommends an appropriate factor of safety be utilized for the design of the foundation.

ULTIMATE PASSIVE PRESSURE VS. DEPTH - TOWER FOUNDATION

Soil Layers (feet)		Moist Unit Weight	Phi Angle	Cohesion	PV	KP	Ph
Top	0.0	110	0	1000	0.00	1.00	1000.00
Bottom	1.5	110	0	1000	165.00	1.00	1082.50
Top	1.5	115	0	2000	165.00	1.00	2082.50
Bottom	2.5	115	0	2000	280.00	1.00	2140.00
Top	2.5	115	0	2000	280.00	1.00	4280.00
Bottom	4.0	115	0	2000	452.50	1.00	4452.50
Top	4.0	120	0	3500	452.50	1.00	7452.50
Bottom	6.5	120	0	3500	752.50	1.00	7752.50
Top	6.5	130	0	6000	752.50	1.00	12752.50
Bottom	9.0	130	0	6000	1077.50	1.00	13077.50
Top	9.0	125	0	4500	1077.50	1.00	10077.50
Bottom	10.0	125	0	4500	1202.50	1.00	10202.50

SUBSURFACE STRENGTH PARAMETERS - DRILLED SHAFT FOUNDATION

Boring	Depth (bgs)	Net Ultimate Bearing Capacity (psf)	Ultimate Skin Friction - Compression (psf)	Ultimate Skin Friction - Uplift (psf)
B-1	0.0 – 3.0	-	-	-
	3.0 – 4.0	44,540	1,090	1,090
	4.0 – 6.5	41,500	1,870	1,870
	6.5 – 9.0	40,250	2,400	2,400
	9.0 – 14.0	46,340	2,190	2,190
	14.0 – 19.0	39,950	2,400	2,400
	19.0 – 24.0	43,550	1,150	860
	24.0 – 29.0	52,140	1,420	1,060
	29.0 – 34.0	53,610	1,690	1,270
	34.0 – 38.8	53,510	1,970	1,470

- The top 3.0 feet of soil should be ignored due to the frost penetration and the potential soil disturbance during construction.
- The bearing capacity can be increased by 1/3 for transient loading.
- The values presented assume the concrete is cast-in-place against earth walls and any casing utilized during construction of the foundation was removed.
- Delta Oaks Group recommends an appropriate factor of safety be utilized for the design of the foundation.

SUBSURFACE STRENGTH PARAMETERS – SUPPORT STRUCTURE FOUNDATION

Boring	Depth (bgs)	Net Ultimate Bearing Capacity (psf)	Minimum Design Footing Width (ft)	Modulus of Subgrade Reaction (pci)
B-1	2.5	12,970	2.0	400
	3.0	13,490		
	4.0	15,000		700

- Delta Oaks Group recommends utilizing a slab on grade in conjunction with continuous perimeter footings that bear on residual soil or properly compacted structural fill placed in accordance with the recommendations provided in the *CONSTRUCTION* section of this report.
- The slab on grade should be properly reinforced to prevent concrete cracking and shrinkage.
- The foundation should bear a minimum of 2.5 feet bgs.
- A sliding friction factor of 0.30 can be utilized along the base of the proposed foundation.
- An Ultimate Passive Pressure Graph is presented on the following page. An appropriate reduction should be considered in accordance with local building code frost penetration depth.
- Delta Oaks Group recommends an appropriate factor of safety be utilized for the design of the foundation.

ULTIMATE PASSIVE PRESSURE VS. DEPTH – SUPPORT STRUCTURE FOUNDATION

Soil Layers (feet)		Moist Unit Weight	Phi Angle	Cohesion	PV	KP	Ph
Top	0.0	110	0	1000	0.00	1.00	1000.00
Bottom	1.5	110	0	1000	165.00	1.00	1082.50
Top	1.5	115	0	2000	165.00	1.00	2082.50
Bottom	2.5	115	0	2000	280.00	1.00	2140.00
Top	2.5	115	0	2000	280.00	1.00	4280.00
Bottom	4.0	115	0	2000	452.50	1.00	4452.50
Top	4.0	120	0	3500	452.50	1.00	7452.50
Bottom	6.5	120	0	3500	752.50	1.00	7752.50
Top	6.5	130	0	6000	752.50	1.00	12752.50
Bottom	9.0	130	0	6000	1077.50	1.00	13077.50
Top	9.0	125	0	4500	1077.50	1.00	10077.50
Bottom	10.0	125	0	4500	1202.50	1.00	10202.50

CONSTRUCTION

SITE DEVELOPMENT

The proposed access road and tower compound should be evaluated by a Geotechnical Engineer, or their representative, after the removal or "cutting" of the areas to design elevation but prior to the placement of any structural fill material to verify the presence of unsuitable or weak material. Unsuitable or weak materials should be undercut to a suitable base material as determined by a Geotechnical Engineer, or their representative. Backfill of any undercut area(s) should be conducted in accordance with the recommendations provided in the *STRUCTURAL FILL PLACEMENT* section of this report.

Excavations should be sloped or shored in accordance and compliance with OSHA 29 CFR Part 1926, Excavation Trench Safety Standards as well as any additional local, state and federal regulations.

STRUCTURAL FILL PLACEMENT

Structural fill materials should be verified, prior to utilization, to have a minimum unit weight of 110 pcf (pounds per cubic foot) when compacted to a minimum of 95% of its maximum dry density and within plus or minus 3 percentage points of optimum moisture. Materials utilized should not contain more than 5 percent by weight of organic matter, waste, debris or any otherwise deleterious materials. The Liquid Limit should be no greater than 40 with a Plasticity Index no greater than 20. Structural fill material should contain a maximum particle size of 4 inches with 20 percent or less of the material having a particle size between 2 and 4 inches. Backfill should be placed in thin horizontal lifts not to exceed 8 inches (loose) in large grading areas and 4 inches (loose) where small handheld or walk-behind compaction equipment will be utilized. The potential suitability of on-site materials to be utilized as fill should be evaluated by a Geotechnical Engineer, or their representative just prior to construction.

During construction structural fill placement should be monitored and tested. This should include at minimum, visual observation as well as a sufficient amount of in-place field density tests by a Geotechnical Engineer, or their representative. Materials should be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D 698 (standard Proctor method). Moisture contents should be maintained to within plus or minus 3 percentage points of the optimum moisture content.

SHALLOW FOUNDATIONS

Foundation excavation(s) should be evaluated by a Geotechnical Engineer, or their representative, prior to reinforcing steel and concrete placement. This evaluation should include visual observation to verify a level bearing surface; vertical side-walls with no protrusions, sloughing or caving; and the exposed bearing surface is free of deleterious material, loose soil and standing water. Excavation dimensions should be verified and testing performed on the exposed bearing surface to verify compliance with design recommendations. Bearing testing should be conducted in accordance with ASTM STP399 (Dynamic Cone Penetrometer). A 6-inch layer of compacted crushed stone should be installed prior to reinforcing steel and concrete placement. If subsurface water is encountered during excavation dewatering methods such as sump pumps or well points may be required.

DRILLED SHAFT FOUNDATIONS

Drilled shaft foundations (caissons) are typically installed utilizing an earth auger to reach the design depth of the foundation. Specialized roller bits or core bits can be utilized to penetrate boulders or rock. The equipment utilized should have cutting teeth to result in an excavation with little or no soil smeared or caked on the excavation sides with spiral-like corrugated walls. The drilled shaft design diameter should be maintained throughout the excavation with a plumbness tolerance of 2 percent of the length and an eccentricity tolerance of 3 inches from plan location. A removable steel casing can be installed in the shaft to prevent caving of the excavation sides due to soil relaxation. Upon completion of the drilling and casing placement, loose soils and subsurface water greater than 3-inches in depth should be removed from the bottom of the excavation for the "dry" installation method. The drilled shaft installation should be evaluated by a Geotechnical Engineer, or their representative, to verify suitable end bearing conditions, design diameter and bottom cleanliness. The evaluation should be conducted immediately prior to as well as during concrete placement operations.

The drilled shaft should be concreted as soon as reasonably practical after excavation to reduce the deterioration of the supporting soils to prevent potential caving and water intrusion. A concrete mix design with a slump of 6 to 8 inches employed in conjunction with the design concrete compressive strength should be utilized for placement. Super plasticizer may be required to obtain the recommended slump range. During placement, the concrete may fall freely through the open area in the reinforcing steel cage provided it does not strike the reinforcing steel and/or the casing prior to reaching the bottom of the excavation. The removable steel casing should be extracted as concrete is placed. During steel casing removal a head of concrete should be maintained above the bottom of the casing to prevent soil and water intrusion into the concrete below the bottom of the casing.

If subsurface water is anticipated and/or weak soil layers are encountered drilled shafts are typically installed utilizing the "wet" method by excavating beneath a drilling mud slurry. The drilling mud slurry is added to the drilled shaft excavation after groundwater has been encountered and/or the sides of the excavation are observed to be caving or sloughing. Additional inspection by a Geotechnical Engineer, or their representative, during the "wet" method should consist of verifying maintenance of sufficient slurry head, monitoring the specific gravity, pH and sand content of the drilling slurry, and monitoring any changes in the depth of the excavation between initial approval and just prior to concreting.

Concrete placement utilizing the "wet" method is conducted through a tremie pipe at the bottom of the excavation with the drilling mud slurry level maintained at a minimum of 5 feet or one shaft diameter, whichever is greater, above the ground water elevation. The bottom of the tremie should be set one tremie pipe diameter above the excavation. A closure flap at the bottom of the tremie or a sliding plug introduced into the tremie before the concrete is recommended to reduce the potential contamination of the concrete by the drilling mud slurry. The bottom of the tremie must be maintained in the concrete during placement. Additional concrete should be placed through the tremie causing the slurry to overflow from the excavation in order to reduce the potential for the development of "slurry pockets" remaining in the drilled shaft.

QUALIFICATIONS

The design parameters and conclusions provided in this report have been determined in accordance with generally accepted geotechnical engineering practices and are considered applicable to a rational degree of engineering certainty based on the data available at the time of report preparation and our practice in this geographic region. All recommendations and supporting calculations were prepared based on the data available at the time of report preparation and knowledge of typical geotechnical parameters in the applicable geographic region.

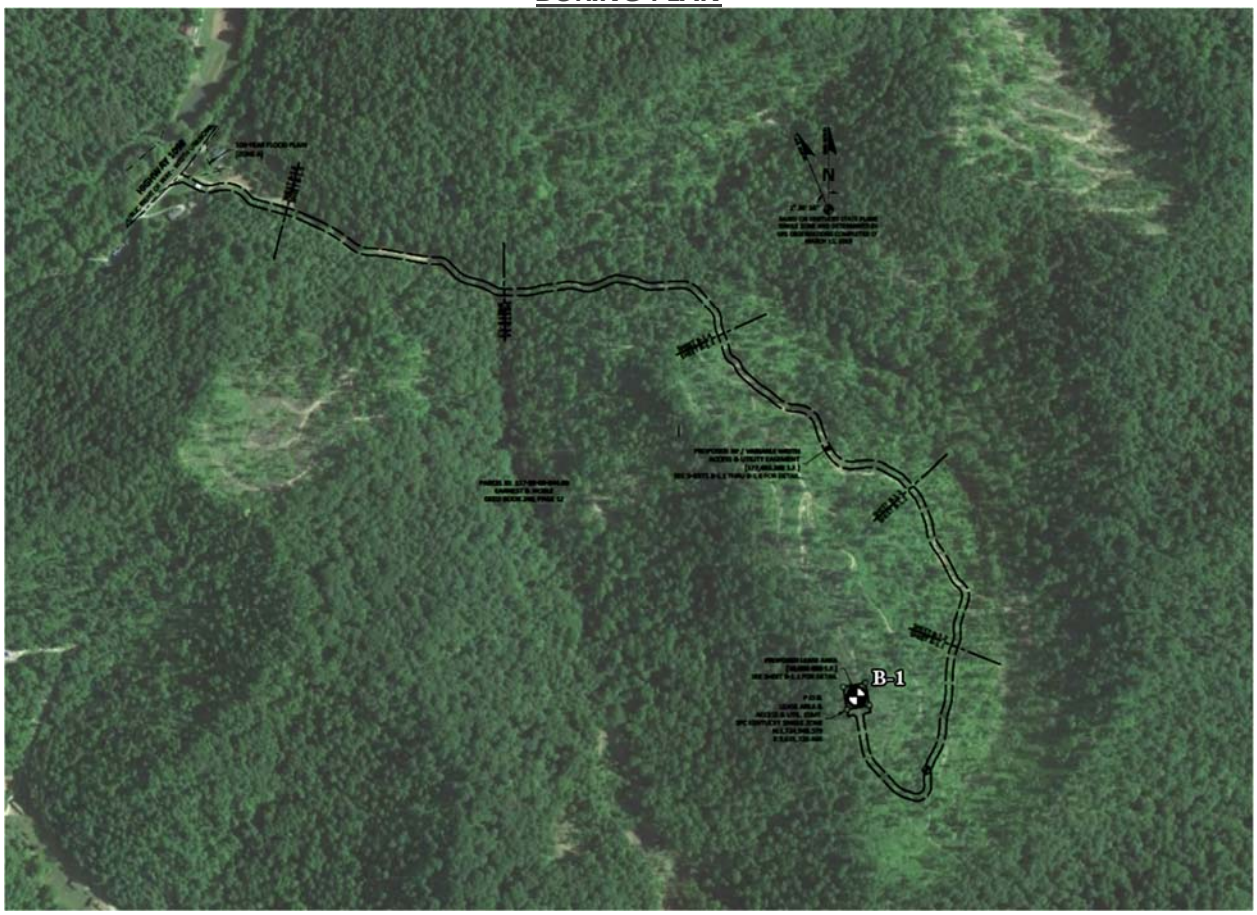
The subsurface conditions used in the determination of the design recommendations contained in this report are based on interpretation of subsurface data obtained at specific boring locations. Irrespective of the thoroughness of the subsurface investigation, the potential exists that conditions between borings will differ from those at the specific boring locations, that conditions are not as anticipated during the original analysis, or that the construction process has altered the soil conditions. That potential is significantly increased in locations where existing fill materials are encountered. Additionally, the nature and extent of these variations may not be evident until the commencement of construction. Therefore, a geotechnical engineer, or their representative, should observe construction practices to confirm that the site conditions do not differ from those conditions anticipated in design. If such variations are encountered, Delta Oaks Group should be contacted immediately in order to provide revisions and/or additional site exploration as necessary

Samples obtained during our subsurface field investigation will be retained by Delta Oaks Group for a period of 30 days unless otherwise instructed by MasTec Network Solutions. No warranty, expressed or implied, is presented.

Delta Oaks Group appreciates the opportunity to be of service for this Geotechnical Investigation Report. Please do not hesitate to contact Delta Oaks Group with any questions or should you require additional service on this project.

APPENDIX

BORING PLAN



PROJECT NAME Quicksand Creek

CLIENT MasTec

PROJECT NUMBER GEO20-06535-08

Boring No.: B-1 PAGE 1 OF 1

PROJECT LOCATION 2630 Highway 1098, Jackson, KY 41339

DATE DRILLED : 6/19/2020

DRILLING METHOD : Hollow Stem Auger

GROUND ELEVATION : 1294

BORING DEPTH (ft) : 38.8

GROUND WATER LEVELS:

AT TIME OF DRILLING : --- Not Encountered

AT END OF DRILLING : --- Not Encountered

AFTER DRILLING : --- Not Encountered

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE	MATERIAL CLASSIFICATION	Pocket Penetrometer (tsf)	BLOWS 1st	BLOWS 2nd	BLOWS 3rd	N VALUE
0	CLAYEY SILT (CL - ML), stiff, orange, with sand, trace organics, moist		CL-ML		4 6	4 6	5 9	9 15
5	SILT (ML), very stiff, light tan, trace clay and sand, decomposed shale, moist		ML		4	10	16	26
	SANDY SILT (ML), very hard, light tan, trace clay, decomposed shale, moist		ML		14	27	50/3"	100
10	-- Hard				14	17	18	35
15	-- Very hard				17	26	32	58
20	SILTY SAND (SM), very dense, light tan, trace clay, decomposed shale, moist		SM		20	27	25	52
25	-- Dense				18	22	27	49
30	-- Very dense				23	27	36	63
35	POORLY GRADED SAND (SP), very dense, black, with gravel, decomposed shale, moist		SP		33	41	50/4"	100
40	Refusal at 38.8 feet. Bottom of borehole at 38.8 feet.							
45								
50