

APPENDIX C
ADDITIONAL CALCULATIONS

Project Name: Cumorah Hill
 Project Number: # 50108.12262
 Client Site Number: -

Engineer: JRM
 Check: AMA
 Date: 07/21/14

Input:

Foundation:

Pier Shape: **Square**
 d: **2.50** ft - length of side of pier
 L: **2.67** ft - pier length
 l: **0.00** ft - pier extension above grade
 B: **6.00** ft - width of pad
 t: **3.00** ft - thickness of pad
 γ_c : **150.00** pcf - unit weight of concrete
 γ_w : **62.40** pcf - unit weight of water

Code: **TIA-G**

Loads:

P: **113.00** kip - maximum axial reaction
 V: **1.35** kip - maximum shear reaction
 ϕ_p : **0.6** - strength reduction factor for bearing
 ϕ_L : **0.75** - strength reduction factor for lateral

Soil:

t_1 : **2.67** ft - thickness of soil layer (from t/ pad)
 γ_1 : **106.00** pcf - effective unit weight of soil
 ϕ_1 : **30.00** deg - friction angle of soil layer
 t_2 : ft - thickness of soil layer
 γ_2 : pcf - effective unit weight of soil
 ϕ_2 : deg - friction angle of soil layer
 t_3 : ft - thickness of soil layer
 γ_3 : pcf - effective unit weight of soil
 ϕ_3 : deg - friction angle of soil layer
 t_4 : ft - thickness of soil layer
 γ_4 : pcf - effective unit weight of soil
 ϕ_4 : deg - friction angle of soil layer
 t_5 : ft - thickness of soil layer
 γ_5 : pcf - effective unit weight of soil
 ϕ_5 : deg - friction angle of soil layer
 q_{ult} : **17.53** ksf - ultimate end bearing capacity
 FS: **2.00** - factor of safety for bearing
 Net? **Yes**
 f_s : **0.00** ksf - ultimate skin friction on sides of pad
 μ : **0.40** - friction factor along base of foundation
 F_{lat} : **318** psf - ultimate lateral resistance per foot
 D_w : **99.00** ft - depth to water table

Bearing Capacity:

Foundation is Adequate in Bearing 30.4%

q_{max} : **3.20** ksf
 q_{all} : **10.52** ksf

Lateral Capacity:

Foundation is Adequate in Lateral 2.6%

V: **1.35** kip
 V_{all} : **51.13** kip

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Concrete pad:

f'_c : 3000.00 psi - concrete compressive strength
 f_y : 60.00 ksi - yield strength of reinforcing steel
cover: 3.00 in - clear cover to reinforcement
R/F: 6 - bar size for flexural reinforcement
Qty. of R/F: 5 - quantity of reinforcing bars
 A_s : 2.2 in² - quantity of reinforcing bars
 α : 40.00 - 40 for interior columns
 β : 1.00 - ratio of long side to short side (pier)
 β : 0.85 - concrete strength ratio
 ϵ_c : 0.003 - maximum concrete strain (typically 0.003)
 ϕ_v : 0.75 - strength reduction factor for shear per ACI318
 ϕ_f : 0.9 - strength reduction factor for flexure per ACI318

Shear Capacity:

V_u : 28.53 kip - ultimate punching shear
 ϕV_c : 1319.50 kip - punching shear resistance
 V_u : kip - ultimate one-way shear
 ϕV_c : 190.77 kip - one-way shear resistance

Flexural Capacity:

Foundation is Adequate in Flexure 9.4%

M_{max} : 29.13 kip-ft
 $\phi_f M_n$: 308.29 kip-ft

Deadman Anchor Analysis: C - Proposed Inner

Project Name: Cumurah Hill
 Job #: # 50108.12262
 Client: Central Communications
 Analysis by: JRM
 Checked by: AMA
 Code: TIA - G

Anchor Block is Adequate for Uplift	72.4%
Anchor Block is Adequate for Lateral	79.2%
Anchor Shaft is Adequate	61.5%

Loads

U_{max} : 26.57 kips - maximum uplift reaction
 H_{max} : 35.07 kips - maximum horizontal reaction

Capacity

U_{all} : 36.71 kips - allowable uplift
 H_{all} : 44.31 kips - allowable horizontal

Foundation Input

Guy Path: C
 Anchor Ring: Proposed Inner

W_b : 4.00 ft - width of anchor block
 L_b : 9.00 ft - length of anchor block
 T_b : 4.00 ft - thickness of anchor block
 d : 2.00 ft - depth from t/ grade to t/ anchor block
 b : 6.00 ft - depth from t/ grade to b/ anchor block

Ultimate Soil Properties

D_w : 99.00 ft - depth from t/ grade to water table

Geotechnical Firm: Tower Engineering Professionals
 Report: 50108.1905
 Date: 7/9/2014
 Notes: Frost Depth: 0"
Boring B-2

Layer	Begin (ft)	End (ft)	ϕ Friction Angle (deg)	C Ult. Cohesion (psf)	γ Eff. Unit Weight (pcf)	f_s Ult. Skin Friction (ksf)	μ Friction Factor
1	0.00	1.00	30.00	0.00	100.00	0.00	0.00
2	1.00	2.00	30.00	0.00	100.00	0.11	0.36
3	2.00	4.00	30.00	0.00	106.00	0.11	0.36
4	4.00	6.00	33.00	0.00	113.00	0.24	0.40
5							
6							

Analysis Criteria

Uplift:	F_{s_sides} =	3.35	Yes	Horizontal	F_{s_sides} =	4.42	Yes
	F_{s_front} =	6.24	Yes		F_{s_top} =	0.00	No
	F_{s_back} =	0.00	No		F_{s_bottom} =	0.00	No
					$F_{\perp} \cdot \mu$ =	6.07	Yes

Deadman Anchor Analysis: B - Outer

Project Name: Cumorah Hill
 Job #: # 50108.12262
 Client: Central Communications
 Analysis by: JRM
 Checked by: AMA
 Code: TIA - G

Anchor Block is Adequate for Uplift	49.8%
Anchor Block is Adequate for Lateral	52.2%
Anchor Shaft is Adequate	93.8%

Loads

U_{max} : 23.99 kips - maximum uplift reaction
 H_{max} : 22.87 kips - maximum horizontal reaction

Capacity

U_{all} : 48.21 kips - allowable uplift
 H_{all} : 43.86 kips - allowable horizontal

Foundation Input

Guy Path: B
 Anchor Ring: Outer

W_b : 4.50 ft - width of anchor block
 L_b : 12.50 ft - length of anchor block
 T_b : 2.25 ft - thickness of anchor block
 d : 3.17 ft - depth from t/ grade to t/ anchor block
 b : 5.42 ft - depth from t/ grade to b/ anchor block

Ultimate Soil Properties

D_w : 99.00 ft - depth from t/ grade to water table

Geotechnical Firm: Tower Engineering Professionals
 Report: 50108.19050
 Date: 7/9/2014
 Notes: Frost Depth: 0"
Boring B-4

Layer	Begin (ft)	End (ft)	ϕ Friction Angle (deg)	C Ult. Cohesion (psf)	γ Eff. Unit Weight (pcf)	f_s Ult. Skin Friction (ksf)	μ Friction Factor
1	0.00	1.00	30.00	0.00	106.00	0.00	0.00
2	1.00	4.00	30.00	0.00	106.00	0.11	0.36
3	4.00	6.00	33.00	0.00	114.00	0.24	0.40
4							
5							
6							

Analysis Criteria

Uplift:	F_{s_sides} =	2.80	Yes	Horizontal	F_{s_sides} =	2.67	Yes
	F_{s_front} =	5.37	Yes		F_{s_top} =	0.00	No
	F_{s_back} =	0.00	No		F_{s_bottom} =	0.00	No
					$F_{\perp} \cdot \mu$ =	13.58	Yes

June 04, 2014

Mr. Lawrence Wilson
Columbia County
263 NW Lake City Avenue
Lake City, FL 32055
(386) 623-3616



Tower Engineering Professionals
5811 Memorial Hwy, Suite 204
Tampa, FL 33615
(910) 622-0111
cthompson@tepgroup.net

Subject: Foundation Mapping Report

Client Designation: Columbia County Site Name: Cumorah Hill
Columbia County Site Number: Unknown

Engineering Firm Designation: TEP Project Number: 50108-19050

Site Data: Near 1077 SW Cumorah Hill Street
Fort White, Columbia County, FL 32038
Latitude N 29° 57' 15.0", Longitude W 82° 39' 36.9"
300 Foot – Guyed Tower

Dear Mr. Wilson,

Tower Engineering Professionals (TEP) is pleased to submit this "Foundation Mapping Report" to Columbia County for the above referenced site. The onsite investigation was performed by Chris Thompson and Trevor Kamm of Tower Engineering Professionals, Inc. during the June 03, 2014 site visit.

The foundation mapping was to include location of all tower foundation(s)/anchors relative to the tower base and magnetic north, depth below grade and measurement of all external tower foundation/anchor dimensions. For self-support and guyed towers, the tower legs were named by letter according to the magnetic azimuth defined by a line from the center of tower to the leg, with the "A" leg being the leg closest to magnetic north, followed clockwise by "B" and "C".

We at Tower Engineering Professionals, Inc. appreciate the opportunity of providing our continuing professional services to you and Columbia County. If you have any questions or need further assistance on this or any other projects please give us a call.

Sincerely,

Christopher Thompson, P.E.
Tower Engineering Professionals, Inc.

DATA COLLECTION PROCEDURES:

TEP field technicians perform all data collection by physical excavation of the foundation in question. Experienced excavators are hired and met on location by TEP field technicians who closely direct all aspects of the excavation. Non-caisson tower masts are uncovered from exposed portions outward with a minimum disturbance of the tower foundation and surrounding soil. Once the foundation is exposed, the TEP field technician will physically measure, record and photograph all relevant dimensions and foundation condition. Upon completion of recording the relevant data, the exposed foundation is covered and the site is restored as close as possible to the way it appeared prior to the excavation. Dead man anchors are uncovered by digging to the side and behind of where the anchor rod enters grade. This is done to prevent damage to the anchor rod and to minimize disturbing the soil above and in front of the anchor as much as possible. (TEP will unearth the entire anchor rod for inspection purposes upon request.) Once the edge of the dead man anchor is exposed, the TEP field technician will physically measure and record the depth below grade, thickness and length of the exposed area. The width of the dead man anchor is measured from the anchor rod to the edge. The anchor rod is assumed to be centered widthwise on the anchor foundation. Photographs of all relevant dimensions and the foundation's condition are then taken. Upon completion of recording the relevant data, the exposed foundation is covered and the site is restored as close as possible to the way it appeared prior to the excavation. Excavation is deemed to be the most accurate method for mapping a non-caisson foundation with the added benefit of discovering the material condition of the concrete anchor.





Mast



Mast



Mast



Anchor 'A'



Anchor 'A'



Anchor 'A'





Anchor 'B'



Anchor 'B'



Anchor 'B'



Anchor 'C'

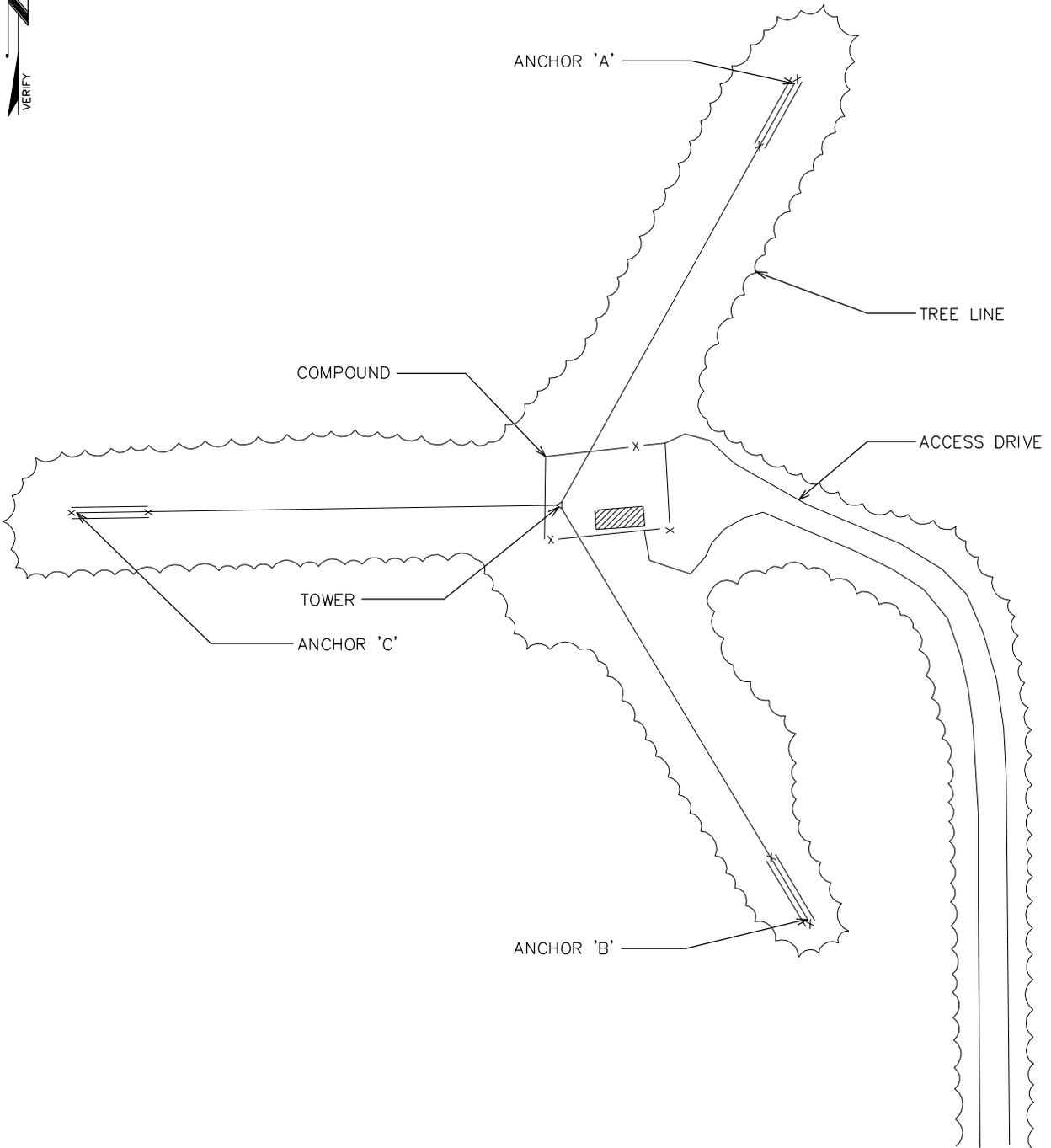


Anchor 'C'



Anchor 'C'





SITE PLAN

SCALE: N.T.S.

PREPARED BY:



TOWER ENGINEERING PROFESSIONALS
5811 MEMORIAL HWY, SUITE 204
TAMPA, FL 33615
(910) 622-0111
www.tepgroup.net

PREPARED FOR:

COLUMBIA COUNTY

263 NW LAKE CITY AVENUE
LAKE CITY, FL 32055

PROJECT INFORMATION:

CUMORAH HILL

1077 SW CUMORAH HILL STREET
FORT WHITE, FL 32038
(COLUMBIA COUNTY)

REVISION: 0

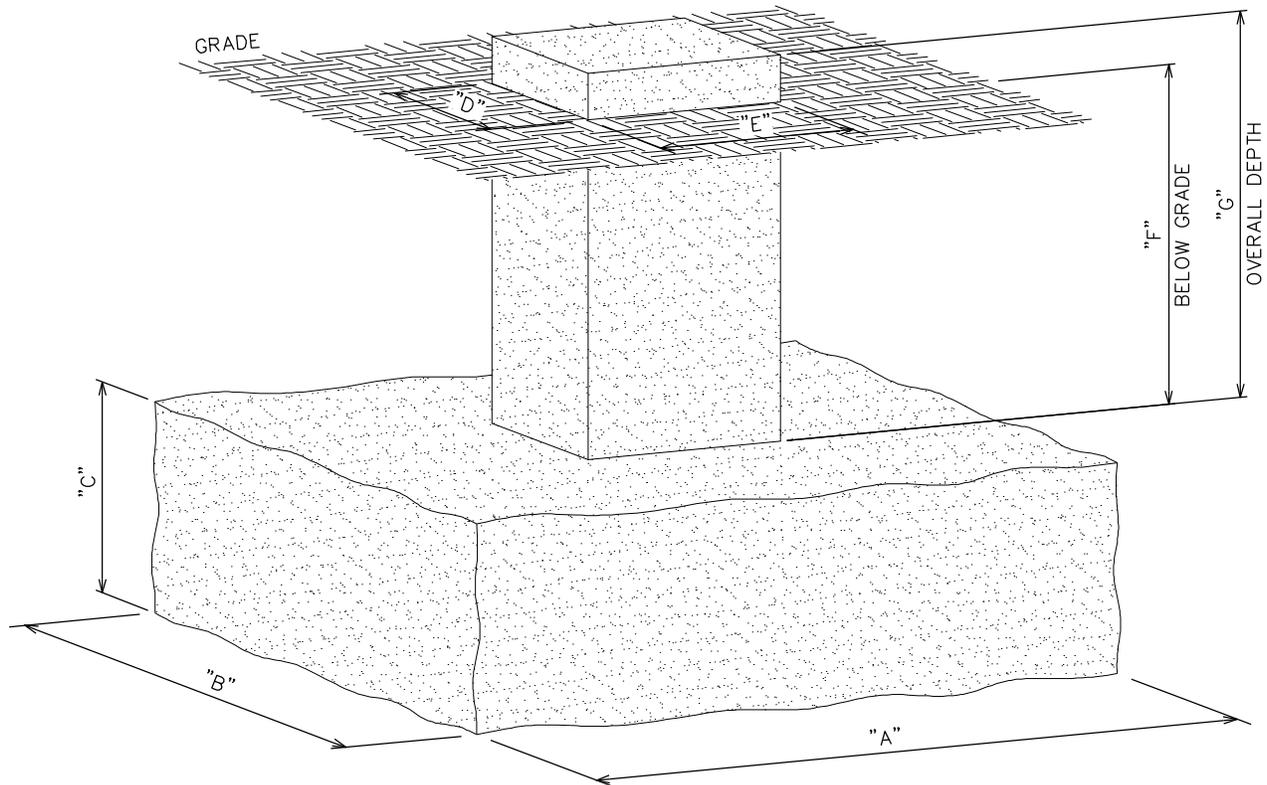
TEP JOB #: 50108-19050

SHEET NUMBER:

F-1

FOUNDATION DIMENSIONS

"A"	"B"	"C"	"D"	"E"	"F"	"G"
6'-0"	6'-0"	3'-0"	2'-6"	2'-6"	2'-8"	2'-8"



MAST FOUNDATION

SCALE: N.T.S.

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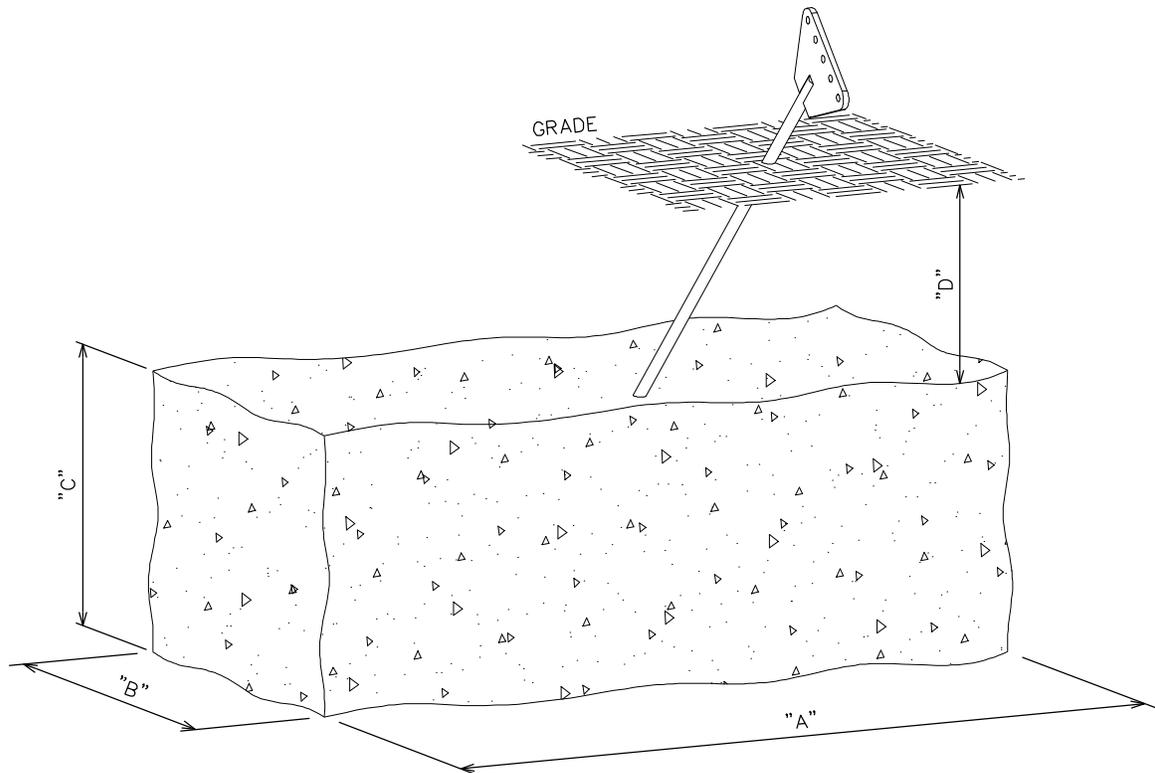
SHEET NUMBER:

F-2

FOUNDATION DIMENSIONS

TOWER LEG	AZIMUTH	RADIUS	REL. ELEV.	"A"	"B"	"C"	"D"
"A" LEG	35°	240'-6"	-0'-6"	9'-0"	6'-0"	2'-9"	2'-3"
"B" LEG	155°	240'-6"	+0'-6"	12'-6"	4'-6"	2'-3"	3'-2"
"C" LEG	275°	240'-6"	+1'-0"	12'-0"	5'-0"	2'-9"	2'-9"

* DENOTES THAT THESE FOUNDATIONS WERE NOT EXCAVATED DUE TO FIELD CONDITIONS. ANCHOR FOUNDATION DIMENSIONS ARE GIVEN BASED ANCHORS THAT COULD BE MAPPED.



ANCHOR FOUNDATION

SCALE: N.T.S.

PREPARED BY:



PREPARED FOR:

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REVISION: 0

TEP JOB #: 50108-19050

SHEET NUMBER:

F-3