



Mr. Denise Correa  
T-Mobile  
1300 Concord Terrace, Suite 200  
Sunrise, FL 33323



MORRISON HERSHFIELD

Morrison Hershfield Corporation  
1455 Lincoln Parkway, Suite 500  
Atlanta, GA 30346  
(770) 379-8500

Date: November 11, 2014

**Subject: Rigorous Structural Analysis Report**

**Carrier:** T-Mobile  
**Carrier Site ID:** 6FB1427M  
**Carrier Site Name:** SFL423 – 4\_423 – Sabal Pines Park  
**Site Address:** 5005 NW 39th Avenue, Coconut Creek, Broward County, FL 33073  
**Site Coordinates:** Latitude: 26.29327 N, Longitude: 80.17705 W  
**Tower Description:** 123.25 ft – Monopole Tower

**Morrison Hershfield Project Number:** MP0-174R10 / 7140041

Dear Ms. Correa,

Morrison Hershfield Corporation has carried out a structural analysis of the above referenced structure for the existing and proposed antenna and equipment noted in Table 2. This analysis has been performed in accordance with the 2010 Florida Building Code based upon an ultimate 3-second gust wind speed of 170 mph converted to a nominal 3-second gust wind speed of 132 mph per section 1609.3.1 as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C and Risk Category II were used in this analysis for Broward County. This analysis is subject to the assumptions noted.

Our analysis demonstrates that the existing tower and foundation **ARE in conformance (tower at 43.9% and foundation at 40.7%)** with the requirements of the above noted standards under the effects of loading described.

We at Morrison Hershfield Corporation appreciate the opportunity of providing our continuing professional services to you and T-Mobile. If you have any questions or need further assistance on this or any other projects please give us a call.

Sincerely,  
Morrison Hershfield Corporation

G. Lance Cooke, P.E. (FL License No. 68787)  
Senior Engineer

Certificate of Authorization # 8508



**INTRODUCTION**

This tower is a 123.25 ft monopole tower designed by FWT, Inc. The original tower drawings were not available. A tower mapping was performed by Dettling Enterprises, Inc., dated 03/27/2006. Tower geometry and member sizes have been obtained from the above mentioned tower mapping report and are considered to be accurate. Yield strengths of 65 ksi for the pole shaft, 60 ksi for the base plate, and 75 ksi anchor bolts have been assumed based on experience with similar towers.

This analysis has been performed in accordance with the 2010 Florida Building Code based upon an ultimate 3-second gust wind speed of 139 mph and converted to a nominal 3-second gust wind speed of 108 mph and 60 mph under service conditions per section 1609.3.1 as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C, Risk Category II and Topographic Category 1 were used in this analysis. The design spectral response accelerations of  $S_{DS} = 0.051$  and  $S_{D1} = 0.036$  for Site Soil Class D were considered in this analysis.

Seismic design factors have been considered in this analysis. The seismic spectral response acceleration at short periods ( $S_s = 0.048$ ) was determined to be less than 1.00; therefore as per ANSI/TIA-222-G Section 2.7.3 seismic effects have not been considered in this analysis.

The structural analysis was based on the following documentation:

**Table 1 – Documentation**

Document	Description	Source
Tower Geometry Mapping	Dettling Enterprises, Inc., dated 03/27/2006	Client
Appurtenance Mapping	Morrison Hershfield, dated 02/17/2014	Morrison Hershfield
Foundation Mapping	EGSci Consulting, Inc., dated 02/06/2012	Morrison Hershfield
Geotechnical Report	EGSci Consulting, Inc., dated 02/13/2012	Morrison Hershfield
Previous Structural Analysis	URS Corporation, dated 04/19/2006	Client
Proposed Loading	RFDS, Site # 6FB1427M, dated 10/20/2014 and Construction Drawings, Project # 7140041, dated 8/21/2014	Client

**1.0 ANALYSIS LOADING**

The existing and proposed antennas, transmission lines, and other equipment considered in this analysis were provided by the client and are noted in Table 2.

**Table 2 – Antenna Loads**

Elev. (ft)	QTY.	Antenna/Appurtenance Description	Carrier	QTY.	TX-Lines	Notes
		<b>***PROPOSED***</b>				
115.0	6	Cellmax CMA-BDHH/6520/E0-8 Panel Antenna	T-Mobile	1	1.584" Hybrid	1
	3	Andrew SBNHH-1D65B Panel Antenna				
	2	Nokia FXFC RRU				
	1	Nokia FRIE RRU				
	3	Nokia FRIG RRU				
	3	Nokia FRLB RRU				
	1	Raycap ASU9338TYP01				



Elev. (ft)	QTY.	Antenna/Appurtenance Description	Carrier	QTY.	TX-Lines	Notes
		***EXISTING***				
115.5	3	Cellmax CMA-B6519/E0-8/RET/TB06	T-Mobile	6	7/8"	2
	1	Low Profile Platform				
71	6	24" Dia. Flood Light	Ballpark	1	1" Conduit	3
70	1	12' Light Bar Mount				
67	5	24" Dia. Flood Light				
66	1	12' Light Bar Mount				

Notes:

- 1) Proposed loading will replace the existing loading at the same elevation. Proposed loading will utilize the existing mount.
- 2) Existing equipment shall be removed prior installation of the proposed loading. Existing coax to remain.
- 3) Conduit is external to the monopole per the available photos.

**ANALYSIS PROCEDURE**

tnxTower Version 6.1.4.1, a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is attached at the end of this report.

**2.0 ASSUMPTIONS**

The analysis provided by Morrison Hershfield is based on the theoretical capacity of the structure and is not a condition assessment of the tower. Morrison Hershfield has not performed an engineering inspection of the tower and the analysis was completed based on information supplied by the client. Morrison Hershfield has not made any independent determination of the accuracy of the information provided.

- 1) Tower and structures were built in accordance with the manufacturer's specifications and the applicable ANSI/TIA/EIA standard.
- 2) The tower and structures have been maintained in accordance with the manufacturer's specification.
- 3) The tower is assumed to be in good condition and capable of supporting its full design capacity.
- 4) The foundation was properly designed and constructed for the original design loads.
- 5) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Table 2.
- 6) All existing/proposed antennas and antenna mounts are assumed to be adequate for the existing/proposed loads. Analysis of these antennas and antenna mounts is considered to be outside of the scope of this analysis. Morrison Hershfield has not performed an analysis of the existing/proposed antennas or antenna mounts.
- 7) The existing and proposed loading for T-Mobile is per their RFDS, Site # 6FB1427M, dated 10/20/2014 and Construction Drawings, Project # 7140041, dated 8/21/2014.
- 8) All other existing loading is taken from the appurtenance mapping report by Morrison Hershfield, dated 02/17/2014.

If any assumptions are not valid or have been made in error, this analysis is invalid. Morrison Hershfield Corporation should be notified to determine the effect on the structural integrity of the tower.

**3.0 SUMMARY OF RESULTS**

The following tables summarize the location and utilized percentage of available capacity for each component of the tower. With consideration to the appropriate safety factors, 100% represents the full capacity of the component. Percentages below 100% indicate available capacity and conformance of the component. Percentages between 100% and 105% indicate an acceptable capacity. Percentages above 105% indicate an



overstressed situation requiring structural modification to ensure conformance with the applicable codes and standards.

Based on our analysis results, the **tower and foundation are within capacity** to support the loads under the current loading scenario.

**Table 3 – Tower Section Capacity**

Section No.	Elevation ft	Component Type	Size	% Capacity	Pass/Fail
L1	123.25 - 97.75	Pole	TP22.133x12.579x0.27	27.0	Pass
L2	97.75 - 47.5	Pole	TP41.082x20.7436x0.386	32.4	Pass
L3	47.5 - 0	Pole	TP58.598x38.3214x0.386	43.0	Pass
				Summary	
				Pole (L3)	43.0
				<b>RATING =</b>	<b>43.0</b>
					<b>Pass</b>

**Table 4 – Capacity of Additional Components**

Component	% Capacity	Pass/Fail
Anchor Bolts	43.9	Pass
Base Plate	21.2	Pass
Caisson Structural	40.7	Pass
Soil Lateral Capacity	35.5	Pass

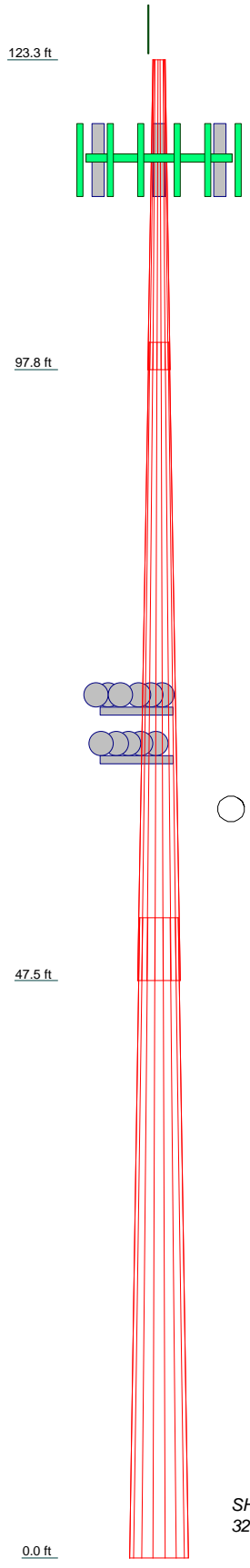
**4.0 RECOMMENDATIONS**

1. All assumptions made in this analysis should be carefully reviewed. Morrison Hershfield should be contacted for any discrepancies so that a full assessment may be made to validate the results of this analysis.

**ATTACHMENTS:** Tower Profile, Program Output, Coax Sketch, Additional Calculations, and RFDS.



Section	1	2	3	
Length (ft)	25.50	52.52	52.64	
Number of Sides	18	18	18	
Thickness (in)	0.2700	0.3860	0.3860	
Socket Length (ft)	2.27	5.14		
Top Dia (in)	12.5790	20.7436	38.3214	
Bot Dia (in)	22.1330	41.0820	58.5980	
Grade		A572-65		
Weight (K)	1.3	6.7	10.5	18.5



**DESIGNED APPURTENANCE LOADING**

TYPE	ELEVATION	TYPE	ELEVATION
Lighting Rod 5/8" x 5'	125.75	FRIG	115
Low Profile Platform (T-Mobile)	115.5	FRLB	115
(2) CMA-BDHH/6520/E0-8 w/ pipe mount (T-Mobile)	115	FRLB	115
		FRLB	115
(2) CMA-BDHH/6520/E0-8 w/ pipe mount (T-Mobile)	115	Raycap ASU9338TYP01 COVP	115
		24" Dia. Flood Light	71
(2) CMA-BDHH/6520/E0-8 w/ pipe mount (T-Mobile)	115	24" Dia. Flood Light	71
		24" Dia. Flood Light	71
SBNHH-1D65B w/ pipe mount (T-Mobile)	115	24" Dia. Flood Light	71
SBNHH-1D65B w/ pipe mount (T-Mobile)	115	24" Dia. Flood Light	71
SBNHH-1D65B w/ pipe mount (T-Mobile)	115	24" Dia. Flood Light	71
SBNHH-1D65B w/ pipe mount (T-Mobile)	115	12' Light Bar Mount	70
		24" Dia. Flood Light	67
FXFC	115	24" Dia. Flood Light	67
FXFC	115	24" Dia. Flood Light	67
FRIE	115	24" Dia. Flood Light	67
FRIG	115	24" Dia. Flood Light	67
FRIG	115	12' Light Bar Mount	66

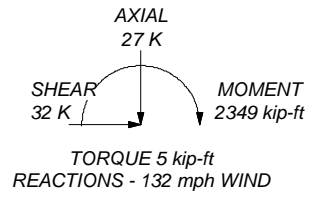
**MATERIAL STRENGTH**

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

**TOWER DESIGN NOTES**

1. Tower is located in Broward County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 132 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 43%

ALL REACTIONS ARE FACTORED



**Morrison Hershfield**  
 1455 Lincoln Parkway, Suite 500  
 Atlanta, GA 30346  
 Phone: (770) 379-8500  
 FAX: (770) 379-8501

Job:	MPO-174R10 / 7140041		
Project:	6FB1427M - SFL423-4_423 - Sabal Pines Par		
Client:	T-Mobile	Drawn by:	ABT
Code:	TIA-222-G	Date:	11/10/14
Path:		Scale:	NTS
		Dwg No.:	E-1

<b>tnxTower</b>  <b>Morrison Hershfield</b> 1455 Lincoln Parkway, Suite 500 Atlanta, GA 30346 Phone: (770) 379-8500 FAX: (770) 379-8501	<b>Job</b> MP0-174R10 / 7140041	<b>Page</b> 1 of 4
	<b>Project</b> 6FB1427M - SFL423-4_423 - Sabal Pines Park	<b>Date</b> 11:40:23 11/10/14
	<b>Client</b> T-Mobile	<b>Designed by</b> ABT

## Tower Input Data

There is a pole section.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Tower is located in Broward County, Florida.

Basic wind speed of 132 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Deflections calculated using a wind speed of 60 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Treat Feedline Bundles As Cylinder
Consider Moments - Horizontals	Assume Legs Pinned	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Diagonals	√ Assume Rigid Index Plate	Calculate Redundant Bracing Forces
Use Moment Magnification	√ Use Clear Spans For Wind Area	Ignore Redundant Members in FEA
√ Use Code Stress Ratios	Use Clear Spans For KL/r	SR Leg Bolts Resist Compression
√ Use Code Safety Factors - Guys	Retention Guys To Initial Tension	All Leg Panels Have Same Allowable
Escalate Ice	√ Bypass Mast Stability Checks	Offset Girt At Foundation
Always Use Max Kz	√ Use Azimuth Dish Coefficients	√ Consider Feedline Torque
Use Special Wind Profile	√ Project Wind Area of Appurt.	Include Angle Block Shear Check
Include Bolts In Member Capacity	Autocalc Torque Arm Areas	<b>Poles</b>
Leg Bolts Are At Top Of Section	SR Members Have Cut Ends	√ Include Shear-Torsion Interaction
Secondary Horizontal Braces Leg	Sort Capacity Reports By Component	Always Use Sub-Critical Flow
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Use Top Mounted Sockets
Add IBC .6D+W Combination	Use TIA-222-G Tension Splice Capacity	
	Exemption	

## Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	123.25-97.75	25.50	2.27	18	12.5790	22.1330	0.2700	1.0800	A572-65 (65 ksi)
L2	97.75-47.50	52.52	5.14	18	20.7436	41.0820	0.3860	1.5440	A572-65 (65 ksi)
L3	47.50-0.00	52.64		18	38.3214	58.5980	0.3860	1.5440	A572-65 (65 ksi)

## Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L1	12.7731	10.5486	201.9187	4.3697	6.3901	31.5985	404.1030	5.2753	1.7387	6.44

<b>tnxTower</b>  <b>Morrison Hershfield</b> 1455 Lincoln Parkway, Suite 500 Atlanta, GA 30346 Phone: (770) 379-8500 FAX: (770) 379-8501	<b>Job</b>	MP0-174R10 / 7140041	<b>Page</b>	2 of 4
	<b>Project</b>	6FB1427M - SFL423-4_423 - Sabal Pines Park	<b>Date</b>	11:40:23 11/10/14
	<b>Client</b>	T-Mobile	<b>Designed by</b>	ABT

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	It/Q in <sup>2</sup>	w in	w/t
	22.4744	18.7362	1131.4553	7.7614	11.2436	100.6314	2264.3994	9.3699	3.4202	12.667
L2	21.9551	24.9414	1305.9104	7.2270	10.5378	123.9267	2613.5392	12.4731	2.9715	7.698
	41.7158	49.8593	10432.4630	14.4471	20.8697	499.8867	20878.6532	24.9344	6.5511	16.972
L3	40.9212	46.4770	8450.1465	13.4671	19.4672	434.0699	16911.4119	23.2429	6.0652	15.713
	59.5020	71.3192	30532.9832	20.6653	29.7678	1025.7056	61106.1426	35.6664	9.6339	24.958

### Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
1" Conduit (Ballpark)	C	Surface Ar (CaAa)	67.00 - 6.00	1	1	0.000 0.000	1.2500		0.58

### Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>A</sub> A <sub>A</sub> ft <sup>2</sup> /ft	Weight plf
*****								
LDF5-50A(7/8") (T-Mobile)	C	No	Inside Pole	115.50 - 6.00	6	No Ice	0.00	0.33
1.584" Hybrid (T-Mobile)	A	No	Inside Pole	115.00 - 6.00	1	No Ice	0.00	0.94

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
Lighting Rod 5/8" x 5'	C	From Leg	0.50 0.00 0.00	0.0000	125.75	No Ice	0.31	0.31	0.031
*****									
Low Profile Platform (T-Mobile)	C	None		0.0000	115.50	No Ice	14.66	14.66	1.250
*****									
(2) CMA-BDHH/6520/E0-8 w/ pipe mount (T-Mobile)	A	From Leg	4.00 0.00 0.00	0.0000	115.00	No Ice	10.13	5.01	0.095
(2) CMA-BDHH/6520/E0-8 w/ pipe mount (T-Mobile)	B	From Leg	4.00 0.00 0.00	0.0000	115.00	No Ice	10.13	5.01	0.095
(2) CMA-BDHH/6520/E0-8 w/ pipe mount (T-Mobile)	C	From Leg	4.00 0.00 0.00	0.0000	115.00	No Ice	10.13	5.01	0.095
SBNHH-1D65B w/ pipe mount (T-Mobile)	A	From Leg	4.00 0.00 0.00	0.0000	115.00	No Ice	8.57	7.00	0.076
SBNHH-1D65B w/ pipe mount (T-Mobile)	B	From Leg	4.00 0.00 0.00	0.0000	115.00	No Ice	8.57	7.00	0.076





<b>tnxTower</b>  <b>Morrison Hershfield</b> 1455 Lincoln Parkway, Suite 500 Atlanta, GA 30346 Phone: (770) 379-8500 FAX: (770) 379-8501	<b>Job</b>	MP0-174R10 / 7140041	<b>Page</b>	4 of 4
	<b>Project</b>	6FB1427M - SFL423-4_423 - Sabal Pines Park	<b>Date</b>	11:40:23 11/10/14
	<b>Client</b>	T-Mobile	<b>Designed by</b>	ABT

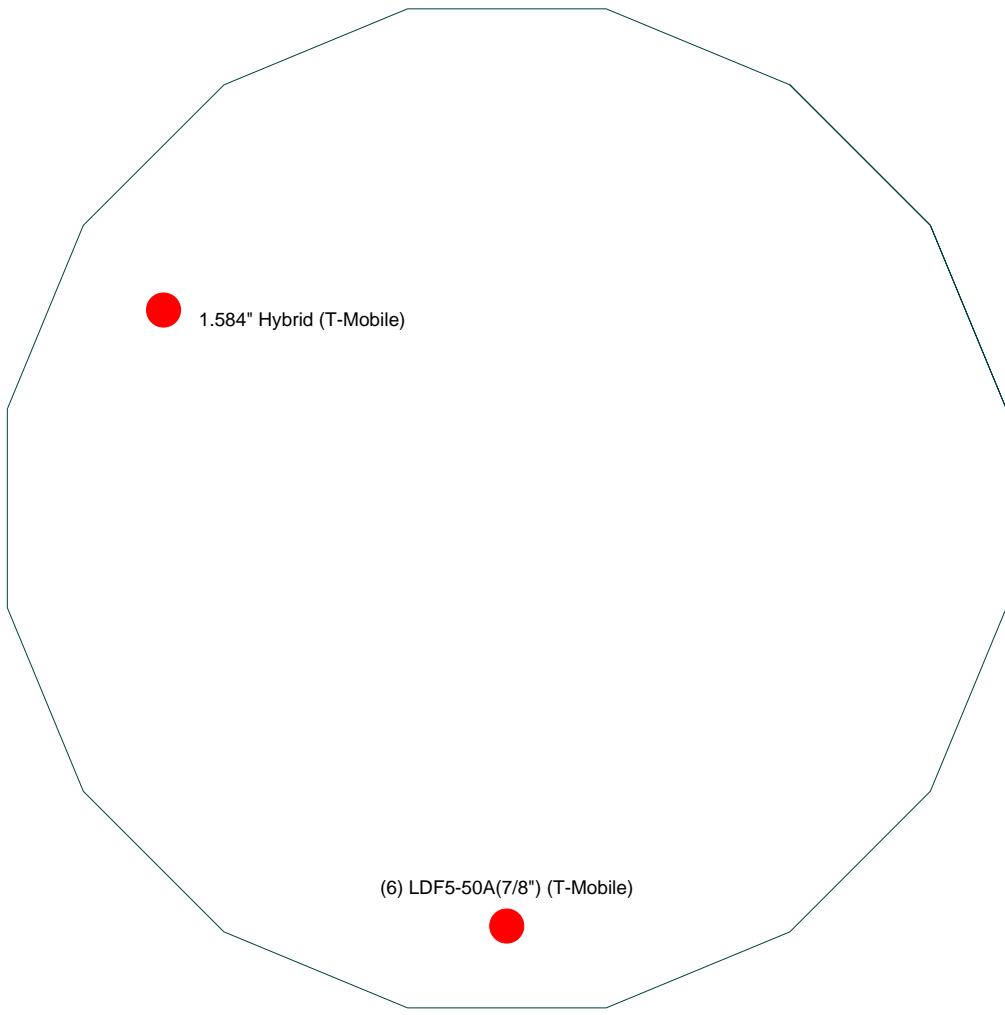
Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft <sup>2</sup>	Weight K
24" Dia. Flood Light	A	Paraboloid w/Shroud (HP)	From Face	1.50 3.50 0.00	30.0000		71.00	2.00	No Ice 3.14	0.070
24" Dia. Flood Light	A	Paraboloid w/Shroud (HP)	From Face	1.50 1.50 0.00	30.0000		71.00	2.00	No Ice 3.14	0.070
24" Dia. Flood Light	A	Paraboloid w/Shroud (HP)	From Face	1.50 -1.50 0.00	-30.0000		71.00	2.00	No Ice 3.14	0.070
24" Dia. Flood Light	A	Paraboloid w/Shroud (HP)	From Face	1.50 -3.50 0.00	-30.0000		71.00	2.00	No Ice 3.14	0.070
24" Dia. Flood Light	A	Paraboloid w/Shroud (HP)	From Face	1.50 -5.50 0.00	-30.0000		71.00	2.00	No Ice 3.14	0.070
24" Dia. Flood Light	A	Paraboloid w/Shroud (HP)	From Face	1.50 4.50 0.00	30.0000		67.00	2.00	No Ice 3.14	0.070
24" Dia. Flood Light	A	Paraboloid w/Shroud (HP)	From Face	1.50 2.00 0.00	30.0000		67.00	2.00	No Ice 3.14	0.070
24" Dia. Flood Light	A	Paraboloid w/Shroud (HP)	From Face	1.50 0.00 0.00	-30.0000		67.00	2.00	No Ice 3.14	0.070
24" Dia. Flood Light	A	Paraboloid w/Shroud (HP)	From Face	1.50 -2.00 0.00	-30.0000		67.00	2.00	No Ice 3.14	0.070
24" Dia. Flood Light	A	Paraboloid w/Shroud (HP)	From Face	1.50 -4.50 0.00	-30.0000		67.00	2.00	No Ice 3.14	0.070


### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	% Capacity	Pass Fail
L1	123.25 - 97.75	Pole	TP22.133x12.579x0.27	27.0	Pass
L2	97.75 - 47.5	Pole	TP41.082x20.7436x0.386	32.4	Pass
L3	47.5 - 0	Pole	TP58.598x38.3214x0.386	43.0	Pass
				Summary	
				Pole (L3)	43.0
				<b>RATING =</b>	<b>43.0</b>
					<b>Pass</b>

# Feed Line Plan

Round Flat App In Face App Out Face



 Consulting Engineers	<b>Morrison Hershfield</b>		Job: <b>MP0-174R10 / 7140041</b>
	1455 Lincoln Parkway, Suite 500		Project: <b>6FB1427M - SFL423-4 423 - Sabal Pines Par</b>
	Atlanta, GA 30346	Phone: (770) 379-8500	Client: T-Mobile
	FAX: (770) 379-8501		Drawn by: ABT
		Date: 11/10/14	App'd:
		Code: TIA-222-G	Scale: NTS
		Path:	Dwg No. E-7



# MORRISON HERSHFIELD

Project:	<u>MP0-174R10 / 7140041</u>	Client:	<u>T-Mobile</u>
Site Name:	<u>SFL423-4_423 - Sabal Pines Park</u>	Site ID:	<u>6FB1427M</u>
Des. By:	<u>ABT</u>	Ck. By:	<u>LC</u>
Date:	<u>11/10/2014</u>	page:	<u>1</u> OF <u>1</u>

## Base Plate & Anchor Rod Analysis Summary

<b>Base Reactions:</b>		
Mu:	2349	ft-kips
Axial, Pu:	27	kips
Shear, Vu:	32	kips
Eta Factor, $\eta$	0.5	TIA G (Fig. 4-4)
<b>Anchor Rod Data:</b>		
Number of Anchor Rods:	16	EA
Anchor Rod Diam:	2.25	in
Anchor Strength (Fu):	100	ksi
Anchor Yield (Fy):	75	ksi
Bolt Circle:	64.97	in
<b>Base Plate Data:</b>		
Base Plate Diam:	71.337	in
Base Plate Thickness:	2.625	in
Base Plate Grade (Fy):	60	ksi
<b>Stiffener Data:</b>		
Is Stiffened?	NO	
Stiffener Configuration:	N/A	
Stiffener Height:		in
Stiffener Width:		in
Notch:		in
Stiffener Grade:		ksi
Weld Type:		
Weld Electrode:		
Groove Depth:		in
Groove Angle:		in
Horz. Fillet Weld Size:		in
Vert. Fillet Weld Size:		in
<b>Pole Data:</b>		
Pole Base Diameter:	58.598	in
Pole Shell Thickness:	0.385	in
Pole Number of Sides:	18	
Pole Grade (Fy):	65	ksi
Pole Strength (Fu):	80	Ksi
<b>Analysis Results:</b>		
Anchor Rod Capacity	43.9%	PASS
Base Plate Capacity	21.2%	PASS
Stiffener Weld Capacity	n/a	
Stiffener Structural Capacity	n/a	

\*\*\*\*\*  
\* PIER FOUNDATIONS ANALYSIS AND DESIGN - (C) 1995, POWER LINE SYSTEMS, INC.\*  
\*\*\*\*\*

\*\*\* ANALYSIS IDENTIFICATION : MP0-174R10 / 7140041  
NOTES : 6FB1427M - SFL423-4\_423 - Sabal Pines Park

\*\*\* PIER PROPERTIES CONCRETE STRENGTH (ksi) = 3.00 STEEL STRENGTH (ksi) = 60.00  
DIAMETER (ft) = 7.500 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 0.50

*** SOIL PROPERTIES	LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
	1	C	3.75	0.00	100.0	0.0		
	2	S	0.25	3.75	100.0		3.000	30.00
	3	S	0.60	4.00	103.0		3.000	30.00
	4	S	1.40	4.60	40.6		3.000	30.00
	5	S	2.00	6.00	40.6		3.000	30.00
	6	S	5.00	8.00	40.6		3.000	30.00
	7	S	5.00	13.00	31.6		2.770	28.00
	8	S	5.00	18.00	40.6		3.120	30.97
	9	S	5.00	23.00	47.6		3.390	32.98
	10	S	3.00	28.00	58.6		4.020	36.98

\*\*\* DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 2349.0 VERTICAL (k) = 27.0 SHEAR (k) = 32.0  
ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 3.75

\*\*\* CALCULATED PIER LENGTH (ft) = 31.000

\*\*\* CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
C	0.50	3.75	100.0	0.0		0.00	2.38
S	4.25	0.25	100.0		3.000	6.54	4.38
S	4.50	0.60	103.0		3.000	17.45	4.81
S	5.10	1.40	40.6		3.000	46.33	5.81
S	6.50	2.00	40.6		3.000	75.50	7.52
S	8.50	5.00	40.6		3.000	236.70	11.12
S	13.50	5.00	31.6		2.770	274.80	16.07
S	18.50	4.47	40.6		3.120	329.61	20.80
S	22.97	0.53	40.6		3.120	-43.27	23.23
S	23.50	5.00	47.6		3.390	-489.24	26.08
S	28.50	2.50	58.6		4.020	-333.55	29.77

\*\*\* SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR			WITHOUT ADDITIONAL SAFETY FACTOR		
	SHEAR (k)	MOMENT (ft-k)		SHEAR (k)	MOMENT (ft-k)	
0.00	120.9	8839.1		32.2	2357.1	
3.10	120.9	9213.8		32.2	2457.0	
6.20	60.9	9532.8		16.2	2542.1	
9.30	-58.2	9543.8		-15.5	2545.0	
12.40	-203.7	9144.6		-54.3	2438.6	
15.50	-365.7	8263.0		-97.5	2203.5	
18.60	-543.2	6860.3		-144.9	1829.4	
21.70	-766.9	4836.7		-204.5	1289.8	
24.80	-704.3	2359.3		-187.8	629.1	
27.90	-397.1	643.1		-105.9	171.5	
31.00	0.0	0.0		0.0	0.0	

\*\*\* TOTAL REINFORCEMENT PCT = 0.32 REINFORCEMENT AREA (in^2) = 20.36  
\*\*\* USABLE AXIAL CAP. (k) = 27.0 USABLE MOMENT CAP. (ft-k) = 3447.2

\*\*\* US Standard Re-Bars (Select one of the following):

102 BARS #4 (AREA = 0.20 in^2 DIA = 0.500 in) AT SPACING (in) = 2.46
66 BARS #5 (AREA = 0.31 in^2 DIA = 0.625 in) AT SPACING (in) = 3.81
47 BARS #6 (AREA = 0.44 in^2 DIA = 0.750 in) AT SPACING (in) = 5.35
34 BARS #7 (AREA = 0.60 in^2 DIA = 0.875 in) AT SPACING (in) = 7.39
26 BARS #8 (AREA = 0.79 in^2 DIA = 1.000 in) AT SPACING (in) = 9.67
21 BARS #9 (AREA = 1.00 in^2 DIA = 1.128 in) AT SPACING (in) = 11.97
17 BARS #10 (AREA = 1.27 in^2 DIA = 1.270 in) AT SPACING (in) = 14.78
14 BARS #11 (AREA = 1.56 in^2 DIA = 1.410 in) AT SPACING (in) = 17.95
10 BARS #14 (AREA = 2.25 in^2 DIA = 1.693 in) AT SPACING (in) = 25.13

\*\*\* PRESSURE UNDER CAISSON DUE TO DESIGN AXIAL LOAD (psf) = 611.2



MORRISON HERSHFIELD

Project: MP0-174R10 / 7140041 Client MetroPCS  
Site Name: SFL423-4\_423 - Sabal Pines Park Site ID: 6FB1427M  
Des. By: ABT Ck. By: LC  
Date: 11/10/2014 page: 1 OF 1

**Moment Capacity of Drilled Concrete Shaft Summary**

<b>Maximum Shaft Superimposed Forces:</b>		
M:	2545.0	ft-kips
Axial, P:	27.0	kips
Code Rev	G	
<b>Pier Properties:</b>		
Pier Diameter:	7.5	ft
Clear Cover to Tie:	4.30	in
Horz. Tie Bar Size:	5	
Vertical Bar Size:	11	
Number of Bars:	24	
<b>Material Properties:</b>		
Concrete Comp. Strength, f'c:	3000	psi
Reinforcement Yield Strength, Fy:	60	ksi
Reinforcing Modulus of Elasticity, E:	29000	ksi
Limiting Compressive Strain:	0.003	
Analysis ACI Code:	2008	
Seismic Design Category:	B	
<b>Analysis Results:</b>		
Drilled Shaft Flexure:	40.7%	Pass