ANDERSON
ENGINEERING COMPANY INC.
CIVIL ENGINEERING ENVIRONMENTAL CONSULTING LAND SURVEYING

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March 2, 2021

Rocky Schutjer
RAGE Development LLC
2181 Hugo Avenue
Salt Lake City, UT 84117

Subject: **Structural Analysis**
T-Mobile Site: SL01743A Prom RMP Glassman Way
Site Address: 4700 South Glassman Way
Ogden, Utah 84403

Dear Mr. Schutjer,

T-Mobile site SL01743A Prom RMP Glassman Way, is a three-sector site located at the 64 foot level on a 68-foot steel utility monopole. The purpose of this report is to summarize the structural analysis of the utility monopole and attached antenna mounting system, and to verify the monopole is suitable for the proposed loading configuration.

Analysis Results

Steel Monopole with Proposed Equipment Configuration: OVERCAPACITY

Upgraded Guyed Steel Monopole with Proposed Equipment Configuration: ACCEPTABLE 84%

The existing steel utility monopole is overcapacity and needs to be upgraded with four guy wires in order to be structurally sufficient to support the loading from the proposed equipment. Details of the proposed guy wire upgrade are included in the attached drawings and Section 4.2. Assumptions requiring field verification are included in Section 5.1.

Calculations for the antenna mount and supporting structural elements, in accordance with the TIA-222-H Standard, the National Electric Safety Code, and ASCE 7-16, are included with this letter. Please contact us at (801) 972-6222 should you have any questions or need additional information.

Sincerely,
ANDERSON Engineering Co., Inc.

Steven D. Anderson, P.E.
Principal

Reviewed by:
ANDERSON Engineering Co., Inc.

Ryan D. Eddy, P. E.
Portfolio Manager

STRUCTURAL ANALYSIS REPORT

PURPOSE

The purpose of this structural analysis is to evaluate the effects of the proposed changes to the existing utility pole and document the assumptions made as part of the analysis. The analysis, in compliance with TIA-222-H Section 15.3, evaluates the design loads acting on the antenna mount and supporting structural system. T-Mobile is proposing to make the changes shown in Table 3.1.

DESIGN CRITERIA

1 Source of Data

Anderson Engineering (Anderson) has collected sufficient up-to-date information in the evaluation to accurately represent the existing monopole. Information as described below has been used in this analysis.

1.1 Previous Structural Analysis

No previous structural analyses were provided.

1.2 Installation Documents, Material Lists, and Fabrication Drawings

No installation documents, material lists, or fabrication drawings concerning the structure were provided.

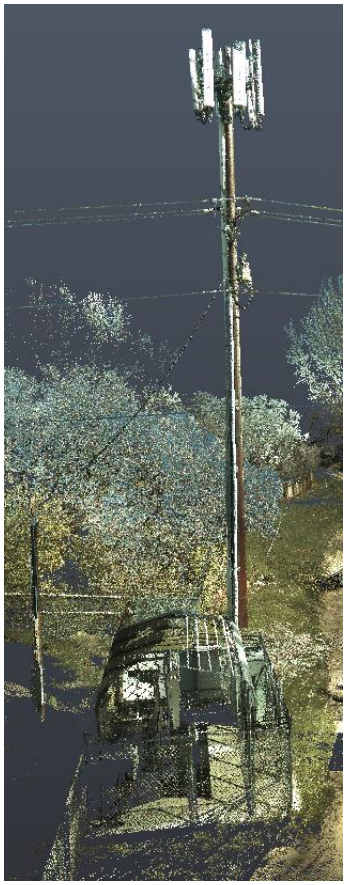
1.3 Geotechnical Reports/Foundation Data

GSH Geotechnical, Inc. (September 17, 2020) The study included drilled borings and provided soil parameters for the site, and embedded pole capacities. A copy of this report is included in the Appendix.

1.4 As-built Drawings or the Original Installation and/or Subsequent Modifications

No drawings or information about the original installation were provided. It is assumed no subsequent structural modifications have taken place on the structure since the original installation.

1.5 Monopole Mapping



Tower mapping was completed from the ground using a LIDAR field scanner during a site visit on April 19, 2019. The monopole mapping provided information on monopole equipment, including the elevation, dimensions, spacing, and orientation of the equipment. Additionally, photographs and measurements at the base of the monopole were taken during the site visit.

Mapping of the structural components and appurtenances was based on measurements collected during the site visit and from the scan data.

A label on the monopole states that the pole is rated as a “class 1 wood equivalent pole.”

2 Assumptions

The original monopole drawings were not available for reference; thus, a definitive capacity for the monopole or foundation cannot be defined. Conservative assumptions have been used to determine if the monopole has sufficient strength to support the proposed modifications. Consequently, additional capacity may be available with a more refined structural model based on additional data. Details of the assumed values are included on the calculation sheet in the appendix.

Structural calculations are based on known data derived from gathered information as described above. Conservative assumptions, where data gaps exist, have been used in this study to determine if the existing mount and structure have sufficient structural strength to support the proposed equipment configuration. This analysis is contingent on key assumptions that must be verified during installation of new equipment. If any of the assumptions as shown below appear to be invalid, our office should be notified immediately to determine how the unlike condition affects the capacity of the monopole.

2.1 Existing Monopole

- This report does not constitute a maintenance and condition assessment. No certifications regarding maintenance and condition are expressed or implied.
- The monopole material properties are as shown on the tnx report in the appendix.
- The steel wall thickness at the base is a minimum of 0.1875 inches. This is consistent with a measurement at the base as well as similar Class 1 steel poles.
- The monopole and components have been adequately maintained in accordance with TIA and NESC standards and the manufacturer’s specifications.
- All monopole components are in a condition that allows each member to carry its full design capacity.

- No modifications to the monopole have taken place.
- Maximum seismic base shear is less than the maximum wind base shear.

2.2 Foundation

- The foundation was designed and installed to meet the capacity of the monopole.
- The foundation has been adequately designed, installed, and maintained according to original design documents.
- The depth setting of the pole is nine feet (10% the height of the pole plus two feet) into soils as described in the geotechnical investigation.

2.3 Antenna Mount

- Connections and welds, at a minimum, meet the capacity of the primary structural members.
- The antennas and components will be installed and maintained in accordance with TIA standards and manufacturer's specifications.
- The existing antenna mount is connected to the monopole with a Commscope MC-RM1030-3 Ring Mount that has been modified with angle iron at the top and bottom of the mount to adapt the mount to fit the 8-inch diameter pole.

2.4 Appurtenances

- RRUs will be mounted to the existing antenna mount mast at the top of the monopole.
- The antennas and RRUs will be installed in accordance with the manufacturer's recommendations.
- The mount supporting the equipment configuration specified in this report will be replaced with a Commscope MC-K10S-9-96 Monopole Co-Location T-Frame Kit as specified in the mount analysis completed previously.
- All new coax will be installed adjacent to the existing coax on the monopole.

3 Analysis Criteria

1. The monopole is in Weber County, Utah
2. The monopole is evaluated based on an Exposure B, 103 mph nominal 3-sec gust in accordance with the ASCE 7-16 and the TIA-222-H Standard.
3. Additional wind forces on wires are calculated and applied based on the 2017 NESC code.
4. Roughness B
5. Risk Category: II Other Structure
6. For all new equipment, the weight and dimensions have been estimated based on the proposed equipment.

3.1 Proposed Changes

A table of the current equipment on the tower is included on the tnxTower Material Take Off Summary drawing in the Appendix.

Table 3.1 summarizes the proposed T-Mobile equipment changes on the utility pole. No additional changes to the existing equipment have been analyzed.

Table 3.1 Proposed Equipment Changes[a]

Status	Sector	Type	Model	Quantity
REMOVE	ALPHA	ANTENNA	CMA-BDHH/6521/E0-6/TB05 (Quad)	1
ADD	ALPHA	ANTENNA	Ericsson - AIR6449 B41 (Massive MIMO)	1
REMAIN	ALPHA	ANTENNA	RFS APXVAARR24 43-U-NA20	1
REMAIN	ALPHA	ANTENNA	ERICSSON AIR32 KRD901146-1 B66A/B2A	1
REMOVE	ALPHA	TMA	GENERIC TWIN STYLE 1A – PCS (At Antenna)	1
REMAIN	ALPHA	RRU	ERICSSON 4449 B71+B85 (At Antenna)	1
NEW	ALPHA	RRU	ERICSSON 4415 B66A (At Antenna)	1
REMAIN	ALPHA	CABLE	Fiber Jumper - 10 ft.	6
ADD	ALPHA	CABLE	Fiber Jumper - 10 ft.	6
REMAIN	ALPHA	CABLE	Jumper 10 Ft. Sureflex 4.3-10 to 4.3-10	4
ADD	ALPHA	CABLE	Jumper 10 Ft. Sureflex 4.3-10 to 4.3-10	4
REMOVE	ALPHA	CABLE	Coax Jumper – 10 ft.	2
REMOVE	ALPHA	CABLE	7/8" Coax - 85 ft	2
DISCONNECT	ALPHA	CABLE	7/8" Coax - 85 ft	2
REMOVE	BETA	ANTENNA	CMA-BDHH/6521/E0-6/TB05 (Quad)	1
ADD	BETA	ANTENNA	Ericsson - AIR6449 B41 (Massive MIMO)	1
REMAIN	BETA	ANTENNA	RFS APXVAARR24 43-U-NA20	1
REMAIN	BETA	ANTENNA	ERICSSON AIR32 KRD901146-1 B66A/B2A	1
REMOVE	BETA	TMA	GENERIC TWIN STYLE 1A - PCS (At Antenna)	1
REMAIN	BETA	RRU	ERICSSON 4449 B71+B85 (At Antenna)	1
NEW	BETA	RRU	ERICSSON 4415 B66A (At Antenna)	1
REMAIN	BETA	CABLE	Fiber Jumper - 10 ft.	6
ADD	BETA	CABLE	Fiber Jumper - 10 ft.	6
REMAIN	BETA	CABLE	Jumper 10 Ft. Sureflex 4.3-10 to 4.3-10	4
ADD	BETA	CABLE	Jumper 10 Ft. Sureflex 4.3-10 to 4.3-10	4
REMOVE	BETA	CABLE	Coax Jumper – 10 ft.	2
REMOVE	BETA	CABLE	7/8" Coax - 85 ft	2
DISCONNECT	BETA	CABLE	7/8" Coax - 85 ft	2
REMOVE	GAMMA	ANTENNA	CMA-BDHH/6521/E0-6/TB05 (Quad)	1
ADD	GAMMA	ANTENNA	Ericsson - AIR6449 B41 (Massive MIMO)	1

Status	Sector	Type	Model	Quantity
REMAIN	GAMMA	ANTENNA	RFS APXVAARR24 43-U-NA20	1
REMAIN	GAMMA	ANTENNA	ERICSSON AIR32 KRD901146-1 B66A/B2A	1
REMOVE	GAMMA	TMA	GENERIC TWIN STYLE 1A – PCS (At Antenna)	1
NEW	GAMMA	RRU	ERICSSON 4449 B71+B85 (At Antenna)	1
NEW	GAMMA	RRU	ERICSSON 4415 B66A (At Antenna)	1
REMAIN	GAMMA	CABLE	Fiber Jumper - 10 ft.	6
ADD	GAMMA	CABLE	Fiber Jumper - 10 ft.	6
REMAIN	GAMMA	CABLE	Jumper 10 Ft. Sureflex 4.3-10 to 4.3-10	4
ADD	GAMMA	CABLE	Jumper 10 Ft. Sureflex 4.3-10 to 4.3-10	4
REMOVE	GAMMA	CABLE	Coax Jumper – 10 ft.	2
REMOVE	GAMMA	CABLE	7/8" Coax - 85 ft	2
DISCONNECT	GAMMA	CABLE	7/8" Coax - 85 ft	2
REMAIN	SITE	ENCLOSURE	RBS 6102	1
REMAIN	SITE	ENCLOSURE	Ancillary Equipment (Ericsson)	1
REMAIN	SITE	ENCLOSURE	RBS 3106	1
ADD	SITE	ENCLOSURE	ENCLOSURE 6160	1
ADD	SITE	EQUIPMENT	B160	1
NEW	SITE	HCS	ERICSSON 6X12 HCS 6AWG 30m	2
NEW	SITE	HCS	ERICSSON 6X24 HCS 6AWG 30m	1
REMAIN	SITE	RADIO	RUS01 B2 G1900	3
REMAIN	SITE	RADIO	RUS01 B2 U1900	3
REMAIN	SITE	RADIO	RUS01 B4	6

Notes:

[a] Proposed equipment lists compiled data found on the drawings and RFDS data sheet provided by T-Mobile. Copies of these document are found in the appendix.

4 Analysis

4.1 Results

The steel utility pole was modeled and analyzed using tnx Tower version 8.0.7.4. Additional loads were calculated based on the 2017 National Electric Safety Code and applied as forces in the tnx model. Output information for the analysis is included in the appendix.

The foundation embedment depth and type were assumed based on standard embedment for Class 1 steel poles. Soil properties and foundation capacities were based on parameters from the GSH Geotechnical Investigation.

Based on the information known about the pole (as detailed in this report), the analysis shows that the pole does not have sufficient strength in its current configuration with the addition of the above-described equipment. However, with the tower upgrades installed as discussed is Section 4.2, the pole with the proposed equipment configuration is rated at 84% of utilized capacity.

4.2 Pole Upgrades

To reinforce the foundation and the pole, it is recommended that four 5/8" 1x7 EHS guy wires be installed approximately 46 feet up the pole. The guy pull-offs should be two Maclean Power UCB30 Pole Bands with two opposing guy wires connected per band. Install guy anchors at a radius of 29 feet at the locations detailed in the drawings. A guy anchor has been selected based on soil parameters and anticipated holding capacity. Install anchors as per manufacturer recommendation to ensure a minimum capacity of at least 25,000 lbs per anchor.

Anchors to be protected from the road using jersey barriers or other equivalent protection. Guy wires should be insulated and installed according to the requirements established by the National Electric Safety Code and Rocky Mountain Power.

With the upgrades installed, as detailed above and in the attached drawings, the utility pole will support the proposed equipment. The percent of rated capacity for each of the following components of the system are as follows: pole is at 52%, guy wires are at 70%, foundation loads are at approximately 84%, and guy anchors are at approximately 70%.

5 Conclusions and Recommendations

The existing utility pole will not support the new equipment in its proposed configuration and tower modifications will be required to support the new equipment. The utility pole with the installed upgrades discussed in Section 4.2 will support the proposed equipment.

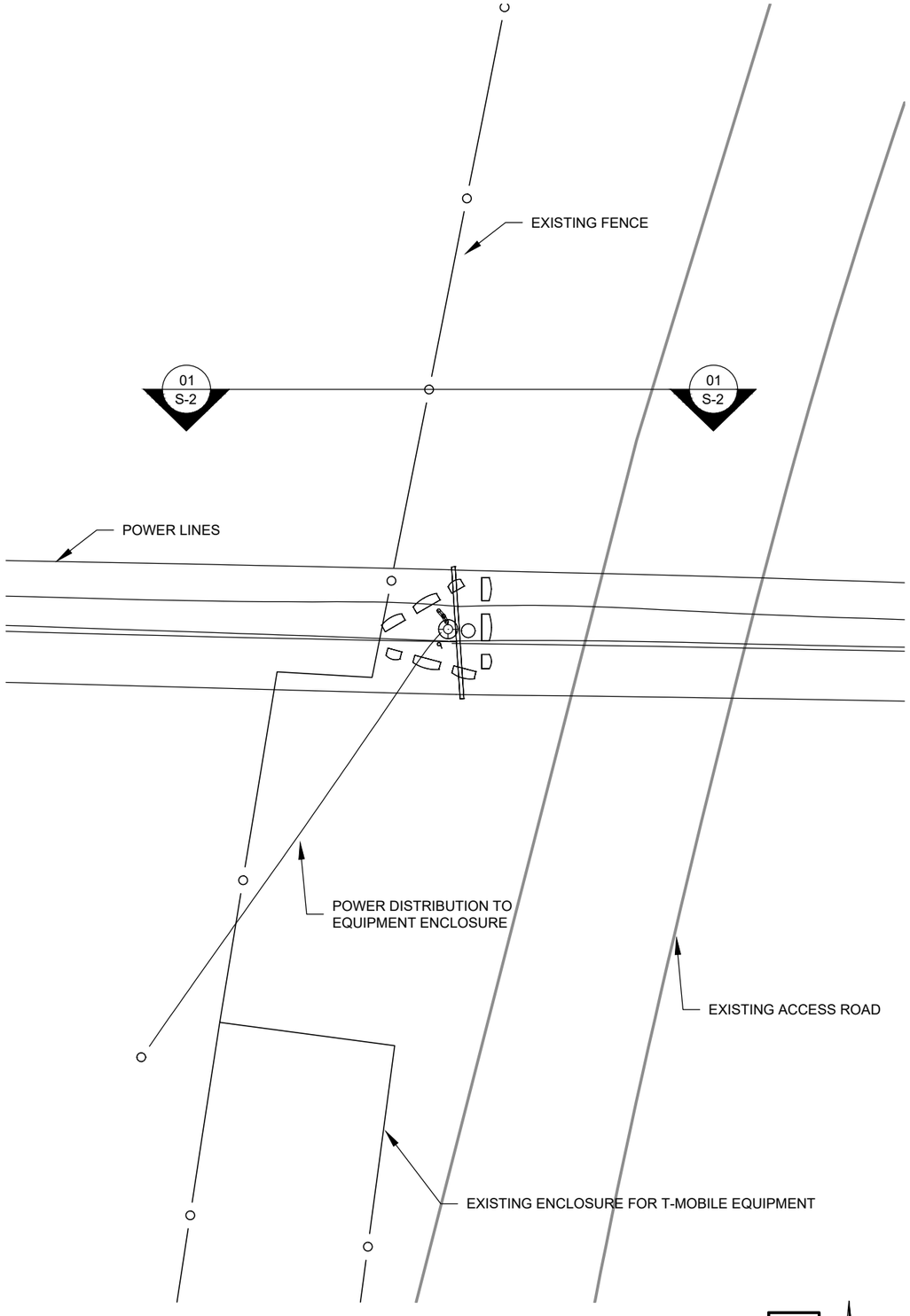
While not necessary, it is recommended that obsolete equipment (in addition to the equipment shown above to be removed) also be removed from the monopole to lower stress demands and ultimately increase the life of the monopole.

5.1 Assumptions Requiring Field Verification

Assumptions detailed in Section 2 of this report should be verified by the contractor prior to construction.

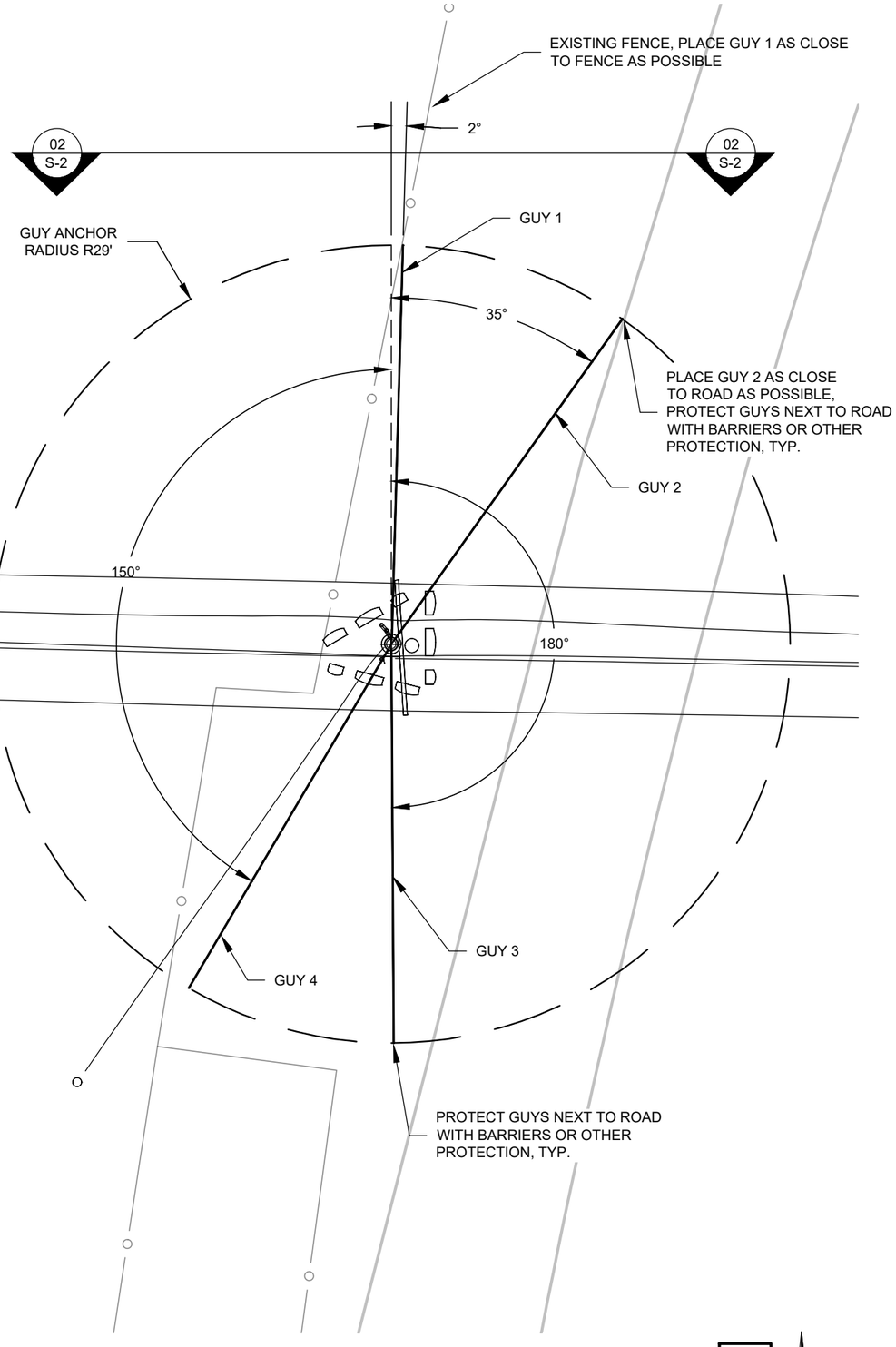
6 Appendices

SL01743A Prom RMP Glassman Upgrade Drawings
SL01743A Prom RMP Glassman Calculations
SL01743A Prom RMP Glassman tnx Tower Material Take-Off
SL01743A Prom RMP Glassman tnx Tower Report
SL01743A Prom RMP Glassman RFDS
SL01743A Prom RMP Glassman ASCE Design Hazards Report
Geotechnical Investigation GSH Geotechnical, Inc. (September 17, 2020)



PLAN VIEW – EXISTING 1

SCALE - 1" = 10'



PLAN VIEW – PROPOSED 2

SCALE - 1" = 10'

DATE:	2-MAR-21
DRAWN BY:	MBD
CHECKED BY:	RDE
FILE:	SL01743A

REVISIONS

DATE	DESCRIPTION	INITIAL

T-Mobile
121 WEST ELECTION RD
SUITE 330
DRAPER, UT 84020
801-816-4422
FAX 801-816-4420

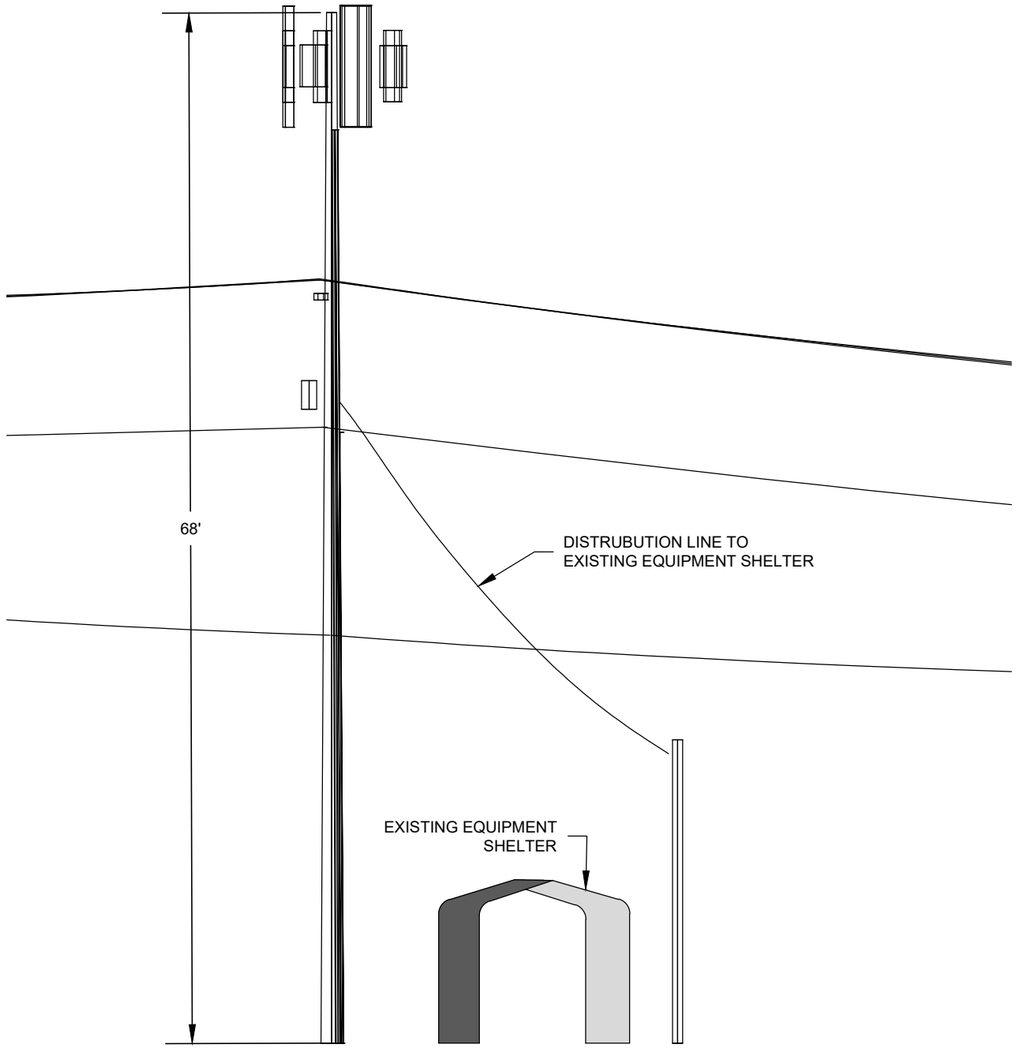
PROFESSIONAL STRUCTURAL ENGINEER
No. 168426-2203
STEVEN D. ANDERSON
STATE OF UTAH
3/2/2021

RAGE
DEVELOPMENT LLC

ANDERSON
ENGINEERING COMPANY INC.
801-972-6222

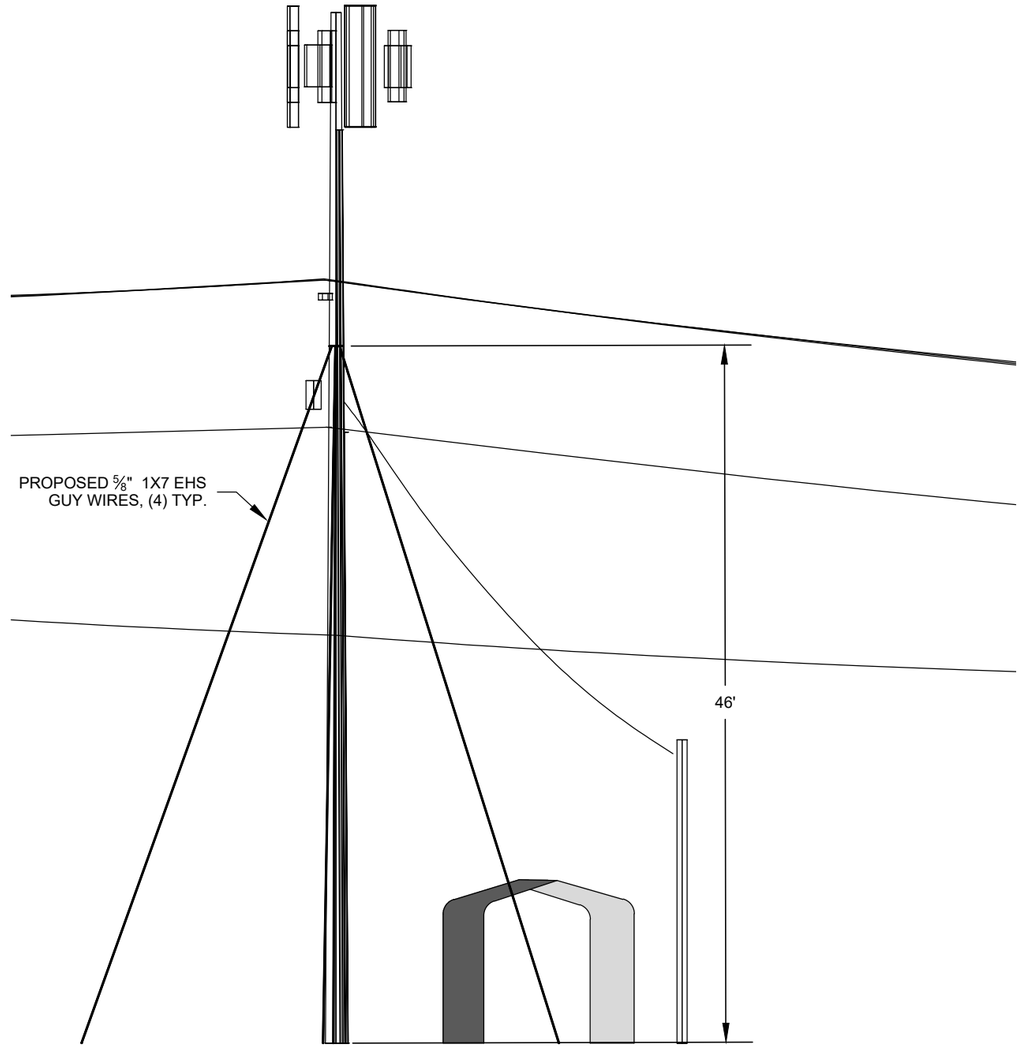
SITE NUMBER:
SL01743A
SITE NAME: RMP GLASSMAN WAY
CITY, STATE: OGDEN, UT
SHEET: UTILITY POLE PLAN VIEW

S-1



NORTH ELEVATION VIEW – EXISTING 1

SCALE - 1" = 10'



NORTH ELEVATION VIEW – PROPOSED 2

SCALE - 1" = 10'

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DATE:	2-MAR-21
DRAWN BY:	MBD
CHECKED BY:	RDE
FILE:	SL01743A

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STATE OF UTAH

RAGE
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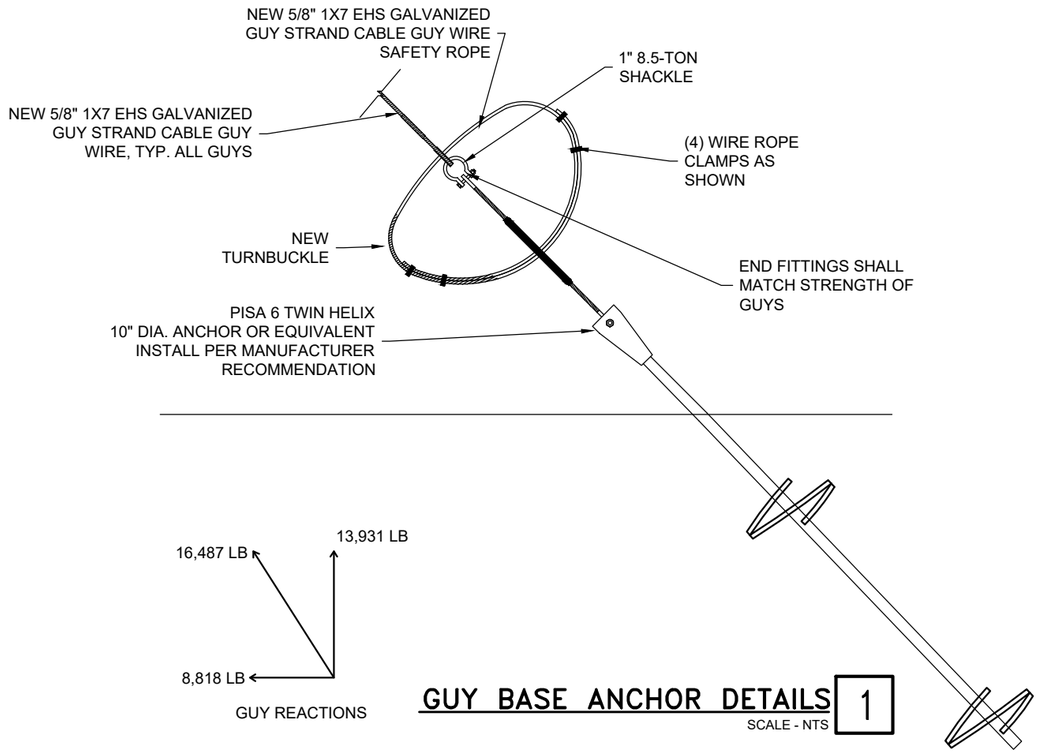
ANDERSON
ENGINEERING COMPANY INC.
801-972-6222

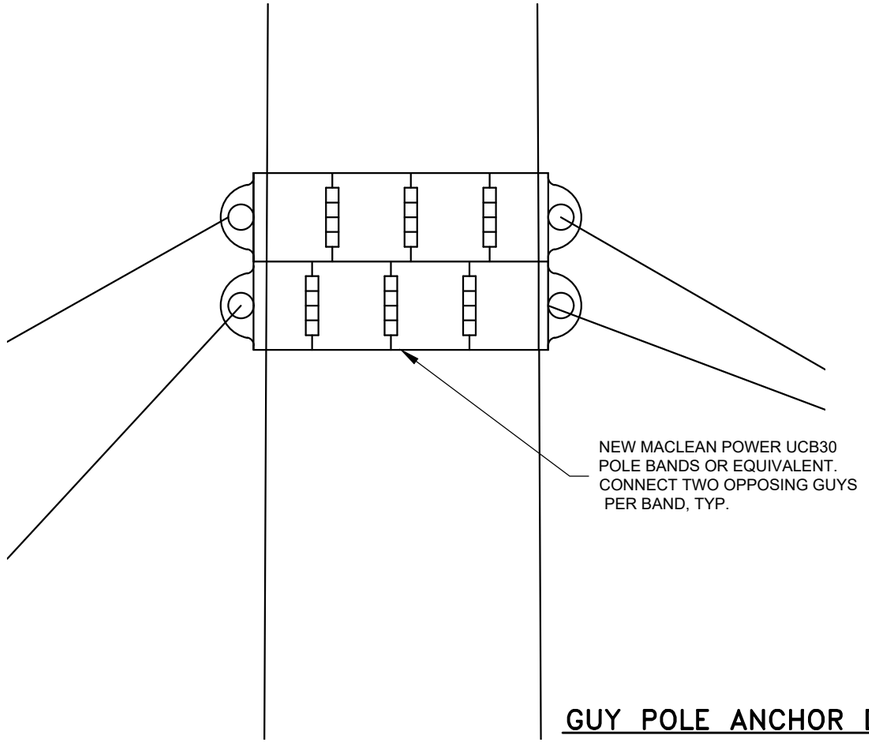
SITE NUMBER:
SL01743A
SITE NAME: RMP GLASSMAN WAY
CITY, STATE: OGDEN, UT
SHEET: UTILITY POLE ELEVATIONS

S-2



GUY BASE ANCHOR DETAILS 1

SCALE - NTS



GUY POLE ANCHOR DETAILS 2

SCALE - NTS

GENERAL NOTES:

1. ADHERE TO ALL OSHA AND NESC SAFETY STANDARDS & WARNINGS FOR GUYED UTILITY POLES.
2. CONTRACTOR RESPONSIBLE FOR RETROFIT TO HAVE EXTENSIVE EXPERIENCE WITH GUYED UTILITY POLE ERECTION & MODIFICATION.
3. ALL NEW METAL CONNECTIONS AND WIRE ROPE TO BE PROTECTED FOR CORROSION RESISTANCE.
4. ALL CONNECTIONS AT WIRE ROPE GROUND ANCHORAGE AND AT TOWER TO WIRE ROPE, TO BE RATED FOR AN ULTIMATE/BREAKING FORCE OF 1.5 TIMES CAPACITY OF THE NEW CABLE.
5. PROVIDE LOCK WASHERS FOR ALL NEW BOLTED CONNECTIONS.
6. CONTRACTOR TO NOTIFY CONTRACT REPRESENTATIVE IF ANY EXISTING MEMBER, CONNECTION OR GUY SHOWS ABNORMAL SIGNS OF STRESS, WEAR, OR IMPROPER INSTALLATION.
7. PROVIDE TEMPORARY SUPPORT AT BASE OF TOWER DURING CONSTRUCTION. SUBMIT TEMPORARY SUPPORT PLAN TO CONTRACT REPRESENTATIVE FOR REVIEW.
8. ALL GUY WIRES MATERIALS, CONNECTORS, AND OTHER ASSOCIATED EQUIPMENT SHALL MEET THE REQUIREMENTS AND BE INSTALLED IN ACCORDANCE WITH TIA-222-H AND NESC.
9. STEEL GUY ANCHORAGES IN DIRECT CONTACT WITH THE SOIL SHALL AS A MINIMUM, HAVE CORROSION CONTROL IN ACCORDANCE WITH TIA-222 (5.6.2)
10. INSTALLATION SHALL BE IN ACCORDANCE WITH DESIGN DOCUMENTS, INSTALLATION DOCUMENTS AND THE ANSI/TIA-322, ANSI/ASSE A100.48 AND NESC STANDARDS.
11. GROUND AND INSULATE GUY WIRES IN ACCORDANCE WITH ROCKY MOUNTAIN POWER REQUIREMENTS AND NESC.
12. PROVIDE REQUIRED CLEARANCES FROM DISTRIBUTION LINES TO GUY WIRES PER ROCKY MOUNTAIN POWER AND NESC GUIDELINES.
13. FIELD VERIFY DIMENSIONS AND GUY ANCHORAGE POINTS PRIOR TO STARTING CONSTRUCTION.
14. INSTALL ANCHOR AS PER MANUFACTURER RECOMMENDATION TO ENSURE A MINIMUM CAPACITY OF AT LEAST 25,000 LBS.

DATE:	2-MAR-21
DRAWN BY:	MBD
CHECKED BY:	RDE
FILE:	SL01743A

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ANDERSON ENGINEERING COMPANY INC.
801-972-6222

SITE NUMBER:
SL01743A
SITE NAME: RMP GLASSMAN WAY
CITY, STATE: OGDEN, UT
SHEET: GUY ANCHOR DETAILS

S-3

UTILITY POLE DESIGN

ANDERSON ENGINEERING

For determing the design loads for wires and appurtenances on utility poles based on NESC 2017.

JOB DETAIL

Job Name	SL01743A Prom RMP Glassman Way	Orginator	MD/ SCA
Location	4700 S Glassman Way	Check	SDA
	Ogden, Utah 84403		

CALCULATION REFERENCE

Code: NESC 2017; IBC 2018; ASCE 7-16; TIA 222-H

Nominal design wind speed	V_{asd}=	90	mph	*NESC 2017, Figure 250-2*
Loading District		Medium Loading Zone		*NESC 2017, Figure 250-1*
Radial ice thickness	i=	0.25	in	*NESC 2017, Table 250-1*
Concurrent ice wind speed	V_i=	40	mph	*NESC 2017, Figure 250-3*

Eqipment Input Data

Wire Conductors

Location 1 - Communciation Space

Span	S_{c1}=	203	ft	*measured from scan data*
Measured diameter	DIA_{c1}=	0.8	in	*measured from scan data*
Height	H_{c1}=	26	ft	*height above ground level*
Angle	Φ_{c1}=	0	°	*measured from scan data*
Selected cable diameter	DIA_{cs1}=	0.85	in	*for calculating design tension*
Weight	W_{c1}=	0.5	lbs/ft	*#N/A*
Assumed cable design tension	DT_{c1}=	2300	lbs	*#N/A*
Vertical Force on Pole	Fy_{c1}=	101.5	lbf	

Location 2

Span	S_{c2}=	203	ft	*measured from scan data*
Measured diameter	DIA_{c2}=	0.8	in	*measured from scan data*
Height	H_{c2}=	40	ft	*height above ground level*
Angle	Φ_{c2}=	0	°	*measured from scan data*
Selected cable diameter	DIA_{cs2}=	0.783	in	*for calculating design tension*
Weight	W_{c2}=	0.546	lbs/ft	*397 ACSR (assumption based on diameter)*
Assumed cable design tension	DT_{c2}=	8150	lbs	*397 ACSR (assumption based on diameter)*
Vertical Force on Pole	Fy_{c2}=	110.8	lbf	

Location 3

Span	S_{c3}=	44	ft	
Diameter of Wire	DIA_{c3}=	0.6	in	*measured from scan data*
Weight per Linear Foot of Wire	q=	0.546	lb/ft	*estimated based on wire diameter*
Distance Between Poles	L=	38.33	ft	*measured from scan data*
Sag of Wire	h=	2	ft	*estimated from scan data*
Horizontal Reaction Force	R_x=	50.14	lbf	
Height Difference	d=	23.5	ft	*measured from scan data*
Vertical Reaction Force	R_y=	41.20	lbf	
Area of Wire	A_W=	2.20	ft^2	
Wind Force on Wire	W_W=	43.7	lbf	

Location 4

Span	S_{c4}=	230	ft	*measured from scan data*
Measured diameter	DIA_{c4}=	1	in	*measured from scan data*
Height	H_{c4}=	50	ft	*height above ground level*
Angle	Φ_{c4}=	0	°	
Selected cable diameter	DIA_{cs4}=	0.783	in	*for calculating design tension*
Weight	W_{c4}=	0.546	lbs/ft	*397 ACSR (assumption based on diameter)*
Assumed cable design tension	DT_{c4}=	8150	lbs	*397 ACSR (assumption based on diameter)*
Vertical Force on Pole	Fy_{c4}=	125.6	lbf	

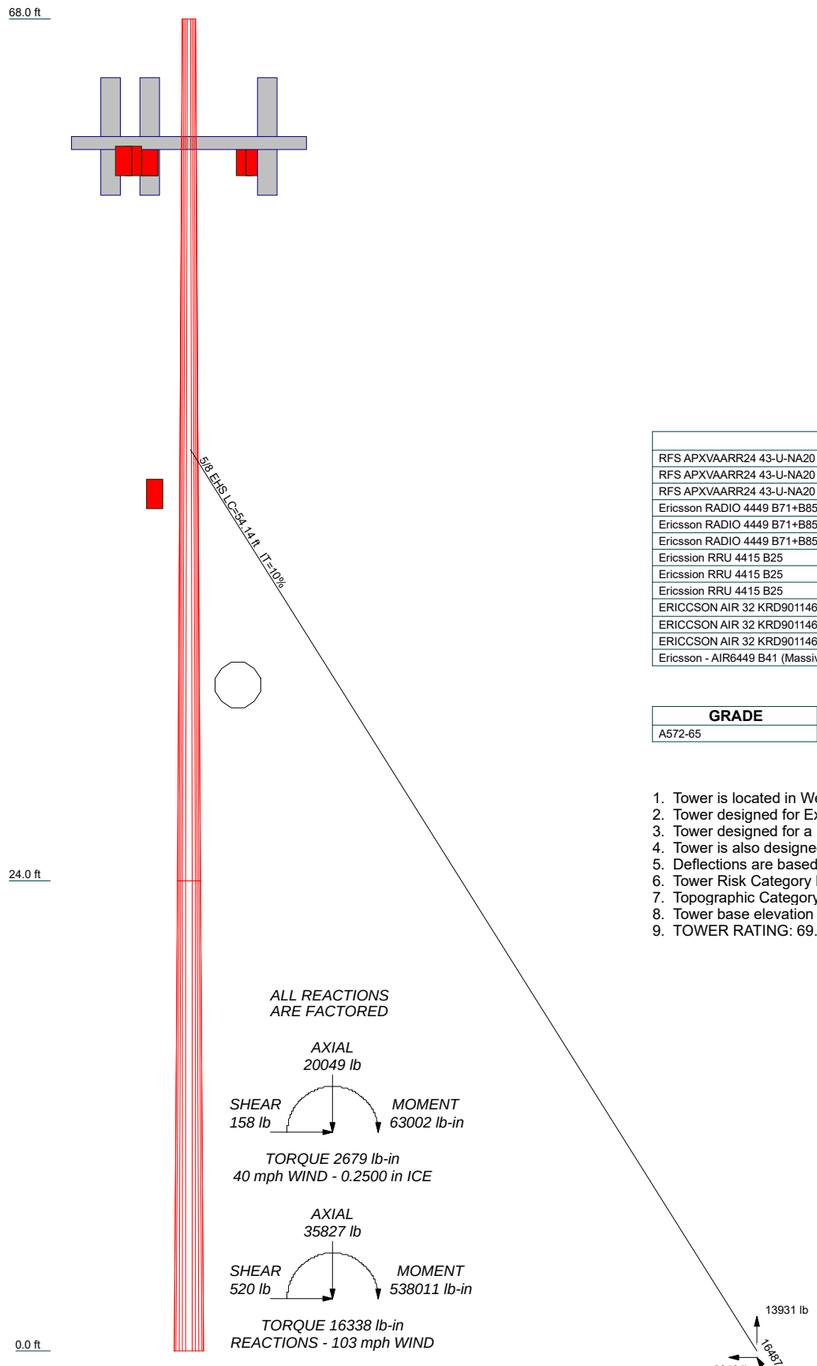
Extreme Wind Loading NESC Rule 250C

Overload Capacity Factor Wind	OCF_W=	0.87		*NESC 2017 Table 253-1 (Extreme)*
	kv=	1.43		*NESC Table 250-3*
Es	E_s=	0.34		*NESC Table 250-3*
Bs	B_s=	0.92		*NESC Table 250-3*
Gust Response Factor	G_{rf}=	0.91		*NESC Table 250-3*
Importance Factor	I=	1		*1 for utilities*
Shape Factor (Drag Coefficient)	C_d=	1		*1 for round structures*
Velocity Pressure Exposure Coefficient	K_{zpole}=	1.05		*NESC Table 250-3*
Extreme Wind Loading	W_{XPole}=	19.9	lb/ft^2	*NESC 250C*
tnx Appurt. Wind Loading	q_{tnx}=	19.0	lb/ft^2	*from tnx report, > NESC pressures*
Velocity Pressure Correction	q_{tnx}'=	0.9	lb/ft^2	*to calculate user applied force for appurtenances*

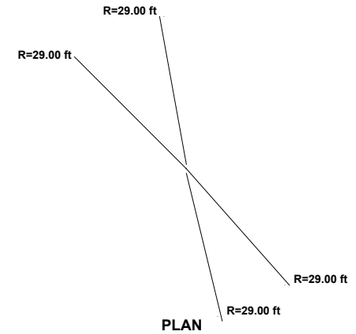
Extreme Wind Loading for Wires

Overload Capacity Factor for Traverse Wire Wind	OCF_{TW}=	0.87		*NESC Table 253-1 (Extreme)*
Overland capacity factor for tension	OCF_{T}=	1		*NESC Table 253-1 (Extreme)*
Height to Wire Conductors	H_c=	50	ft	*from scan data*
Ew	E_w=	0.33		*NESC Table 250-3*
Wind Span	WS=	203	ft	*from scan data*
Bw	B_s=	0.58		*NESC Table 250-3*
Gust Response Factor	G_{rf}=	0.80		*NESC Table 250-3*
Velocity Pressure Exposure Coefficient	K_{zwires}=	1.01		*NESC Table 250-3*
Extreme Wind Loading	W_{WIRES}=	16.71	lb/ft^2	*NESC 250C*
Radial Ice Thickness	Ice=	0.00	inches	*no ice is considered with extreme wind*
Area of Wires	A_{wires}=	13.25	ft^2	
Force on Wires	Fwires=	221.3	lbf	*user applied force in tnx*

Section	Length (ft)	Number of Sides	Thickness (in)	Top Dia (in)	Bot Dia (in)	Grade	Weight (lb)
1	44.00	12	0.1875	8.0000	14.0000	A572-65	977.4
2	24.00	12	0.1875	14.0000	17.0000		755.0
							1732.4



ALL REACTIONS ARE FACTORED



PLAN

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	64	Ericsson - AIR6449 B41 (Massive MIMO)	64 - 60
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	64 - 60	Ericsson - AIR6449 B41 (Massive MIMO)	64 - 60
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	64 - 60	Commscope MC-K10S-9-96 (1 of 3)	64 - 60
Ericsson RADIO 4449 B71+B85	64 - 60	Commscope MC-K10S-9-96 (2 of 3)	64 - 60
Ericsson RADIO 4449 B71+B85	64 - 60	Commscope MC-K10S-9-96 (3 of 3)	64 - 60
Ericsson RADIO 4449 B71+B85	64 - 60	Location 4 (3 Powerlines-1)	50
Ericssion RRU 4415 B25	64 - 60	Location 4 (3 Powerlines-2)	50
Ericssion RRU 4415 B25	64 - 60	Location 4 (3 Powerlines-3)	50
Ericssion RRU 4415 B25	64 - 60	Utility Pole Crossarms	49
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	64 - 60	Utility Pole Transformer	43
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	64 - 60	Location 3 (1 Wire)	41
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	64 - 60	Location 2 (1 Wire)	40
Ericsson - AIR6449 B41 (Massive MIMO)	64 - 60	Location 1 (1 Wire)	26

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Weber County, Utah.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 103 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 40 mph basic wind with 0.25 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. Tower base elevation above sea level: 4723.00 ft.
9. TOWER RATING: 69.1%

Anderson Engineering
2053 N. Hillcrest Rd.
Saratoga Springs, UT 84045
Phone: 801-972-6222
FAX: 801-972-6235

Job:	***SL01743A Prom RMP Glasmann Way***		
Project:	***T-Mobile***		
Client: RAGE Development	Drawn by: JHALL	App'd:	
Code: TIA-222-H	Date: 02/26/21	Scale: NTS	
Path:		Dwg No. E-1	

Tower Input Data

The tower is a monopole.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

- Tower is located in Weber County, Utah.
- Tower base elevation above sea level: 4698.00 ft.
- Basic wind speed of 103 mph.
- Risk Category II.
- Exposure Category B.
- Simplified Topographic Factor Procedure for wind speed-up calculations is used.
- Topographic Category: 1.
- Crest Height: 0.00 ft.
- Nominal ice thickness of 0.2500 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 40 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 60 mph.
- Tower base elevation above sea level: 4723.00 ft..
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.
- Safety factor used in guy design is 1.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

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	68.00-24.00	44.00	0.00	12	8.0000	14.0000	0.1875	0.7500	A572-65 (65 ksi)
L2	24.00-0.00	24.00		12	14.0000	17.0000	0.1875	0.7500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	8.2161	4.7168	36.7463	2.7969	4.1440	8.8673	74.4579	2.3215	1.6415	8.755
	14.4277	8.3393	203.0766	4.9449	7.2520	28.0028	411.4883	4.1043	3.2495	17.331
L2	14.4277	8.3393	203.0766	4.9449	7.2520	28.0028	411.4883	4.1043	3.2495	17.331
	17.5336	10.1505	366.2183	6.0189	8.8060	41.5874	742.0575	4.9958	4.0535	21.619

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 68.00-24.00				1	1	1			
L2 24.00-0.00				1	1	1			

Guy Data

Guy Elevation ft	Guy Grade		Guy Size	Initial Tension lb	%	Guy Modulus ksi	Guy Weight plf	L_u ft	Anchor Radius ft	Anchor Azimuth Adj. °	Anchor Elevation ft	End Fitting Efficiency %
46	EHS	A	5/8	4240.00	10%	21000	0.813	54.09	29.00	0.0000	0.00	95%
		B	5/8	4240.00	10%	21000	0.813	54.09	29.00	-55.0000	0.00	95%
		C	5/8	4240.00	10%	21000	0.813	54.09	29.00	4.0000	0.00	95%
		D	5/8	4240.00	10%	21000	0.813	54.09	29.00	-59.0000	0.00	95%

Guy Data *(cont'd)*

Guy Elevation ft	Mount Type	Torque-Arm Spread ft	Torque-Arm Leg Angle °	Torque-Arm Style	Torque-Arm Grade	Torque-Arm Type	Torque-Arm Size
46	Corner						

Guy Data *(cont'd)*

Guy Elevation ft	Diagonal Grade	Diagonal Type	Upper Diagonal Size	Lower Diagonal Size	Is Strap.	Pull-Off Grade	Pull-Off Type	Pull-Off Size
46.00	A572-50 (50 ksi)	Solid Round			No	A572-50 (50 ksi)	Solid Round	5/8

Guy Data *(cont'd)*

Guy Elevation ft	Cable Weight A lb	Cable Weight B lb	Cable Weight C lb	Cable Weight D lb	Tower Intercept A ft	Tower Intercept B ft	Tower Intercept C ft	Tower Intercept D ft
46	242.18	242.18	242.18	242.18	1.51 2.1 sec/pulse	1.51 2.1 sec/pulse	1.51 2.1 sec/pulse	1.51 2.1 sec/pulse

Guy Data *(cont'd)*

Guy Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Torque Arm K_x	Torque Arm K_y	Pull Off K_x	Pull Off K_y	Diagonal K_x	Diagonal K_y
46	No	No			1	1	1	1

Guy Data *(cont'd)*

Guy Elevation ft	Torque-Arm Bolt Size in	Torque-Arm Number	Torque-Arm Net Width Deduct in	Torque-Arm U	Pull Off Bolt Size in	Pull Off Number	Pull Off Net Width Deduct in	Pull Off U	Diagonal Bolt Size in	Diagonal Number	Diagonal Net Width Deduct in	Diagonal U
46	0.6250 A325N	0	0.0000	0.75	0.0000 A325N	0	0.0000	0.75	0.6250 A325N	0	0.0000	0.75

Guy Insulator Data

Guy Elevation ft	#	Length in	Diameter in	Weight lb		Equivalent Unit Weight plf	Equivalent Diameter in	Equivalent Diameter w/Ice in
46	2	12.0000	3.0000	100.00	A	4.477	0.6758	1.1893
					B	4.477	0.6758	1.1893
					C	4.477	0.6758	1.1893
					D	4.477	0.6758	1.1893

Guy Pressures

Guy Elevation ft	Guy Location	z ft	q_z psf	q_z Ice psf	Ice Thickness in
46	A	23.00	15	2	0.2599
	B	23.00	15	2	0.2599
	C	23.00	15	2	0.2599
	D	23.00	15	2	0.2599

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
COAX LINES	C	No	Surface Ar (CaAa)	68.00 - 61.00	6	6	0.000 0.000	1.0900		0.33
5" Rigid Conduit	C	No	Surface Ar	61.00 - 0.00	1	1	0.000	5.0000		7.50

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
3 1/2" Rigid Conduit	C	No	(CaAa) Surface Ar (CaAa)	40.00 - 0.00	1	1	0.000 0.000 0.000	3.5000		5.25

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
ERICSSON 6X12	C	No	No	Inside Pole	68.00 - 0.00	3	No Ice	0.00	2.65
HCS 6AWG 30M							1/2" Ice	0.00	2.65
6x24	C	No	No	Inside Pole	68.00 - 0.00	1	No Ice	0.00	2.65
							1/2" Ice	0.00	2.65

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	68.00-24.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	28.678	0.000	841.76
		D	0.000	0.000	0.000	0.000	0.00
L2	24.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	20.400	0.000	560.40
		D	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	68.00-24.00	A	0.258	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	33.005	0.000	936.03
		D		0.000	0.000	0.000	0.000	0.00
L2	24.00-0.00	A	0.225	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	22.562	0.000	619.50
		D		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L1	68.00-24.00	5.0266	0.0000	5.1404	0.0000
L2	24.00-0.00	6.0252	0.0000	6.3159	0.0000

Note: For pole sections, center of pressure calculations do not consider feed line shielding.

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	2	COAX LINES	61.00 - 68.00	1.0000	1.0000
L1	3	5" Rigid Conduit	24.00 - 61.00	1.0000	1.0000
L1	4	3 1/2" Rigid Conduit	24.00 - 40.00	1.0000	1.0000
L2	3	5" Rigid Conduit	0.00 - 24.00	1.0000	1.0000
L2	4	3 1/2" Rigid Conduit	0.00 - 24.00	1.0000	1.0000

User Defined Loads

Description	Elevation	Offset From Centroid	Azimuth Angle		Weight	F_x	F_z	Wind Force	C_AA_C
	ft	ft	°		lb	lb	lb	lb	ft^2
Location 1 (1 Wire)	26.00	0.00	0.0000	No Ice	100.00	0.00	0.00	221.00	**13.19**
				Ice	0.00	0.00	0.00	**0.00**	0.00
				Service	100.00	0.00	0.00	221.00	**43.43**
Location 2 (1 Wire)	40.00	0.00	0.0000	No Ice	110.80	0.00	0.00	221.00	**12.14**
				Ice	0.00	0.00	0.00	**0.00**	0.00
				Service	110.00	0.00	0.00	221.00	**39.97**
Location 3 (1 Wire)	41.00	0.00	35.0000	No Ice	41.20	0.00	50.14	45.50	**2.48**
				Ice	0.00	0.00	0.00	**0.00**	0.00
				Service	41.00	0.00	0.00	45.00	**8.08**
Location 4 (3 Powerlines-1)	50.00	0.00	0.0000	No Ice	125.60	0.00	0.00	221.00	**11.39**
				Ice	0.00	0.00	0.00	**0.00**	0.00
				Service	125.60	0.00	0.00	221.00	**37.50**
Location 4 (3 Powerlines-2)	50.00	0.00	0.0000	No Ice	125.60	0.00	0.00	221.00	**11.39**
				Ice	0.00	0.00	0.00	**0.00**	0.00
				Service	125.60	0.00	0.00	221.00	**37.50**
Location 4 (3 Powerlines-3)	50.00	0.00	0.0000	No Ice	125.60	0.00	0.00	221.00	**11.39**
				Ice	0.00	0.00	0.00	**0.00**	0.00
				Service	125.60	0.00	0.00	221.00	**37.50**

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	A	From Face	3.00 -2.00 0.00	0.0000	64.00	No Ice 1/2" Ice	20.24 20.89	10.55 11.88	153.55 284.64
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	B	From Face	3.00 -2.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	20.24 20.89	10.55 11.88	153.55 284.64
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	C	From Face	3.00 -2.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	20.24 20.89	10.55 11.88	153.55 284.64
Ericsson RADIO 4449 B71+B85	A	From Face	2.50 -2.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	3.99 5.04	3.79 4.97	111.46 156.30
Ericsson RADIO 4449 B71+B85	B	From Face	2.50 -2.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	3.99 5.04	3.79 4.97	111.46 156.30
Ericsson RADIO 4449 B71+B85	C	From Face	2.50 -2.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	3.99 5.04	3.79 4.97	111.46 156.30
Ericssion RRU 4415 B25	A	From Face	3.00 -2.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	1.84 2.01	0.82 0.94	46.00 60.07
Ericssion RRU 4415 B25	B	From Face	3.00 -2.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	1.84 2.01	0.82 0.94	46.00 60.07
Ericssion RRU 4415 B25	C	From Face	3.00 -2.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	1.84 2.01	0.82 0.94	46.00 60.07
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	A	From Face	3.00 -4.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	6.51 6.89	4.71 5.07	172.00 217.82
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	B	From Face	3.00 -4.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	6.51 6.89	4.71 5.07	172.00 217.82
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	C	From Face	3.00 -4.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	6.51 6.89	4.71 5.07	172.00 217.82
Ericsson - AIR6449 B41 (Massive MIMO)	A	From Face	3.00 4.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	7.39 8.44	4.79 6.05	94.50 159.35
Ericsson - AIR6449 B41 (Massive MIMO)	B	From Face	3.00 4.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	7.39 8.44	4.79 6.05	94.50 159.35
Ericsson - AIR6449 B41 (Massive MIMO)	C	From Face	3.00 4.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	7.39 8.44	4.79 6.05	94.50 159.35
Commscope MC-K10S-9-96 (1 of 3)	C	From Face	0.00 0.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	3.30 4.20	3.30 4.20	358.00 420.00
Utility Pole Transformer	A	From Face	1.25 0.00 0.00	0.0000	43.00	No Ice 1/2" Ice	0.92 1.45	0.92 1.45	200.00 218.30
Utility Pole Crossarms	A	From Face	0.00 0.00 0.00	0.0000	49.00	No Ice 1/2" Ice	3.50 4.19	0.10 0.14	50.00 81.77
Commscope MC-K10S-9-96 (2 of 3)	B	From Face	0.00 0.00 0.00	0.0000	60.00 - 64.00	No Ice 1/2" Ice	3.30 4.20	3.30 4.20	358.00 420.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
Commscope MC-K10S-9-96	A	From Face	0.00 0.00	0.0000	60.00 - 64.00	No Ice	3.30	3.30	358.00
(3 of 3)			0.00			1/2" Ice	4.20	4.20	420.00

Tower Pressures - No Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 68.00-24.00	44.75	0.785	17	41.514	A	0.000	41.514	41.514	100.00	0.000	0.000
					B	0.000	41.514		100.00	0.000	0.000
					C	0.000	41.514		100.00	28.678	0.000
					D	0.000	41.514		100.00	0.000	0.000
L2 24.00-0.00	11.61	0.7	15	31.961	A	0.000	31.961	31.961	100.00	0.000	0.000
					B	0.000	31.961		100.00	0.000	0.000
					C	0.000	31.961		100.00	20.400	0.000
					D	0.000	31.961		100.00	0.000	0.000

Tower Pressure - With Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 68.00-24.00	44.75	0.785	3	0.2577	43.404	A	0.000	43.404	43.404	100.00	0.000	0.000
						B	0.000	43.404		100.00	0.000	0.000
						C	0.000	43.404		100.00	33.005	0.000
						D	0.000	43.404		100.00	0.000	0.000
L2 24.00-0.00	11.61	0.7	2	0.2252	32.862	A	0.000	32.862	32.862	100.00	0.000	0.000
						B	0.000	32.862		100.00	0.000	0.000
						C	0.000	32.862		100.00	22.562	0.000
						D	0.000	32.862		100.00	0.000	0.000

Tower Pressure - Service

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 68.00-24.00	44.75	0.785	5	41.514	A	0.000	41.514	41.514	100.00	0.000	0.000
					B	0.000	41.514		100.00	0.000	0.000
					C	0.000	41.514		100.00	28.678	0.000
					D	0.000	41.514		100.00	0.000	0.000
L2 24.00-0.00	11.61	0.7	5	31.961	A	0.000	31.961	31.961	100.00	0.000	0.000
					B	0.000	31.961		100.00	0.000	0.000
					C	0.000	31.961		100.00	20.400	0.000
					D	0.000	31.961		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1	841.76	977.40	A	1	0.95	17	1	1	41.514	1504.52	34.19	D
68.00-24.00			B	1	1.2		1	1	41.514			
			C	1	0.95		1	1	41.514			
			D	1	1.2		1	1	41.514			
L2 24.00-0.00	560.40	755.01	A	1	0.95	15	1	1	31.961	1070.17	44.59	D
			B	1	1.2		1	1	31.961			
			C	1	0.95		1	1	31.961			
			D	1	1.2		1	1	31.961			
Sum Weight:	1402.16	1732.40								2574.69		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1	841.76	977.40	A	1	1.2	17	1	1	41.514	1322.68	30.06	D
68.00-24.00			B	1	1.2		1	1	41.514			
			C	1	1.2		1	1	41.514			
			D	1	1.2		1	1	41.514			
L2 24.00-0.00	560.40	755.01	A	1	1.2	15	1	1	31.961	945.00	39.37	D
			B	1	1.2		1	1	31.961			
			C	1	1.2		1	1	31.961			
			D	1	1.2		1	1	31.961			
Sum Weight:	1402.16	1732.40								2267.67		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1	936.03	1137.26	A	1	1.2	3	1	1	43.404	243.48	5.53	D
68.00-24.00			B	1	1.2		1	1	43.404			
			C	1	1.2		1	1	43.404			
			D	1	1.2		1	1	43.404			
L2 24.00-0.00	619.50	861.44	A	1	1.2	2	1	1	32.862	170.96	7.12	D
			B	1	1.2		1	1	32.862			
			C	1	1.2		1	1	32.862			
			D	1	1.2		1	1	32.862			
Sum Weight:	1555.54	1998.70								414.44		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1	936.03	1137.26	A	1	1.2	3	1	1	43.404	212.61	4.83	D
68.00-24.00			B	1	1.2		1	1	43.404			
			C	1	1.2		1	1	43.404			
			D	1	1.2		1	1	43.404			
L2 24.00-0.00	619.50	861.44	A	1	1.2	2	1	1	32.862	150.08	6.25	D
			B	1	1.2		1	1	32.862			
			C	1	1.2		1	1	32.862			
			D	1	1.2		1	1	32.862			
Sum Weight:	1555.54	1998.70								362.70		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1	841.76	977.40	A	1	1.133	5	1	1	41.514	456.79	10.38	D
68.00-24.00			B	1	1.2		1	1	41.514			
			C	1	1.133		1	1	41.514			
			D	1	1.2		1	1	41.514			
L2 24.00-0.00	560.40	755.01	A	1	1.029	5	1	1	31.961	324.92	13.54	D
			B	1	1.2		1	1	31.961			
			C	1	1.029		1	1	31.961			
			D	1	1.2		1	1	31.961			
Sum Weight:	1402.16	1732.40								781.71		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1	841.76	977.40	A	1	1.2	5	1	1	41.514	401.58	9.13	D
68.00-24.00			B	1	1.2		1	1	41.514			
			C	1	1.2		1	1	41.514			
			D	1	1.2		1	1	41.514			
L2 24.00-0.00	560.40	755.01	A	1	1.2	5	1	1	31.961	286.92	11.95	D
			B	1	1.2		1	1	31.961			
			C	1	1.2		1	1	31.961			
			D	1	1.2		1	1	31.961			
Sum Weight:	1402.16	1732.40								688.50		

Discrete Appurtenance Pressures - No Ice $G_H = 1.100$

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	270.0000	153.55	-3.36	2.00	64.00	0.870	19	20.24	10.55
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	0.0000	153.55	-2.00	-3.37	62.00	0.862	19	20.24	10.55
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	90.0000	153.55	3.37	-2.00	62.00	0.862	19	20.24	10.55
Ericsson RADIO 4449 B71+B85	270.0000	111.46	-2.87	2.00	62.00	0.862	19	3.99	3.79
Ericsson RADIO 4449 B71+B85	0.0000	111.46	-2.00	-2.87	62.00	0.862	19	3.99	3.79
Ericsson RADIO 4449 B71+B85	90.0000	111.46	2.87	-2.00	62.00	0.862	19	3.99	3.79
Ericssion RRU 4415 B25	270.0000	46.00	-3.37	2.00	62.00	0.862	19	1.84	0.82
Ericssion RRU 4415 B25	0.0000	46.00	-2.00	-3.37	62.00	0.862	19	1.84	0.82
Ericssion RRU 4415 B25	90.0000	46.00	3.37	-2.00	62.00	0.862	19	1.84	0.82
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	270.0000	172.00	-3.37	4.00	62.00	0.862	19	6.51	4.71
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	0.0000	172.00	-4.00	-3.37	62.00	0.862	19	6.51	4.71
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	90.0000	172.00	3.37	-4.00	62.00	0.862	19	6.51	4.71
Ericsson - AIR6449 B41 (Massive MIMO)	270.0000	94.50	-3.37	-4.00	62.00	0.862	19	7.39	4.79
Ericsson - AIR6449 B41 (Massive MIMO)	0.0000	94.50	4.00	-3.37	62.00	0.862	19	7.39	4.79
Ericsson - AIR6449 B41 (Massive MIMO)	90.0000	94.50	3.37	4.00	62.00	0.862	19	7.39	4.79
Commscope MC-K10S-9-96 (1 of 3)	90.0000	358.00	0.37	0.00	62.00	0.862	19	3.30	3.30
Utility Pole Transformer	270.0000	200.00	-1.73	0.00	43.00	0.776	17	0.92	0.92
Utility Pole Crossarms	270.0000	50.00	-0.44	0.00	49.00	0.806	18	3.50	0.10
Commscope MC-K10S-9-96 (2 of 3)	0.0000	358.00	0.00	-0.37	62.00	0.862	19	3.30	3.30

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
Commscope MC-K10S-9-96 (3 of 3)	270.0000	358.00	-0.37	0.00	62.00	0.862	19	3.30	3.30
	Sum Weight:	3056.53							

Discrete Appurtenance Pressures - With Ice $G_H = 1.100$

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2	t_z in
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	270.0000	223.58	-3.36	2.00	64.00	0.870	3	20.59	11.26	0.2671
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	0.0000	223.36	-2.00	-3.37	62.00	0.862	3	20.59	11.26	0.2663
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	90.0000	223.36	3.37	-2.00	62.00	0.862	3	20.59	11.26	0.2663
Ericsson RADIO 4449 B71+B85	270.0000	135.34	-2.87	2.00	62.00	0.862	3	4.55	4.42	0.2663
Ericsson RADIO 4449 B71+B85	0.0000	135.34	-2.00	-2.87	62.00	0.862	3	4.55	4.42	0.2663
Ericsson RADIO 4449 B71+B85	90.0000	135.34	2.87	-2.00	62.00	0.862	3	4.55	4.42	0.2663
Ericssion RRU 4415 B25	270.0000	53.50	-3.37	2.00	62.00	0.862	3	1.93	0.89	0.2663
Ericssion RRU 4415 B25	0.0000	53.50	-2.00	-3.37	62.00	0.862	3	1.93	0.89	0.2663
Ericssion RRU 4415 B25	90.0000	53.50	3.37	-2.00	62.00	0.862	3	1.93	0.89	0.2663
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	270.0000	196.40	-3.37	4.00	62.00	0.862	3	6.71	4.90	0.2663
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	0.0000	196.40	-4.00	-3.37	62.00	0.862	3	6.71	4.90	0.2663
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	90.0000	196.40	3.37	-4.00	62.00	0.862	3	6.71	4.90	0.2663
Ericsson - AIR6449 B41 (Massive MIMO)	270.0000	129.04	-3.37	-4.00	62.00	0.862	3	7.95	5.46	0.2663
Ericsson - AIR6449 B41 (Massive MIMO)	0.0000	129.04	4.00	-3.37	62.00	0.862	3	7.95	5.46	0.2663
Ericsson - AIR6449 B41 (Massive MIMO)	90.0000	129.04	3.37	4.00	62.00	0.862	3	7.95	5.46	0.2663
Commscope MC-K10S-9-96 (1 of 3)	90.0000	391.02	0.37	0.00	62.00	0.862	3	3.78	3.78	0.2663
Utility Pole Transformer	270.0000	209.40	-1.73	0.00	43.00	0.776	3	1.19	1.19	0.2567
Utility Pole Crossarms	270.0000	66.52	-0.44	0.00	49.00	0.806	3	3.86	0.12	0.2601
Commscope MC-K10S-9-96 (2 of 3)	0.0000	391.02	0.00	-0.37	62.00	0.862	3	3.78	3.78	0.2663
Commscope MC-K10S-9-96 (3 of 3)	270.0000	391.02	-0.37	0.00	62.00	0.862	3	3.78	3.78	0.2663
	Sum Weight:	3662.10								

Discrete Appurtenance Pressures - Service $G_H = 1.100$

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	270.0000	153.55	-3.36	2.00	64.00	0.870	6	20.24	10.55
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	0.0000	153.55	-2.00	-3.37	62.00	0.862	6	20.24	10.55
RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	90.0000	153.55	3.37	-2.00	62.00	0.862	6	20.24	10.55
Ericsson RADIO 4449 B71+B85	270.0000	111.46	-2.87	2.00	62.00	0.862	6	3.99	3.79
Ericsson RADIO 4449 B71+B85	0.0000	111.46	-2.00	-2.87	62.00	0.862	6	3.99	3.79
Ericsson RADIO 4449 B71+B85	90.0000	111.46	2.87	-2.00	62.00	0.862	6	3.99	3.79
Ericssion RRU 4415 B25	270.0000	46.00	-3.37	2.00	62.00	0.862	6	1.84	0.82
Ericssion RRU 4415 B25	0.0000	46.00	-2.00	-3.37	62.00	0.862	6	1.84	0.82
Ericssion RRU 4415 B25	90.0000	46.00	3.37	-2.00	62.00	0.862	6	1.84	0.82
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	270.0000	172.00	-3.37	4.00	62.00	0.862	6	6.51	4.71
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	0.0000	172.00	-4.00	-3.37	62.00	0.862	6	6.51	4.71
ERICCSON AIR 32 KRD901146-1 B66A/B2A (OCTA)	90.0000	172.00	3.37	-4.00	62.00	0.862	6	6.51	4.71
Ericsson - AIR6449 B41 (Massive MIMO)	270.0000	94.50	-3.37	-4.00	62.00	0.862	6	7.39	4.79
Ericsson - AIR6449 B41 (Massive MIMO)	0.0000	94.50	4.00	-3.37	62.00	0.862	6	7.39	4.79
Ericsson - AIR6449 B41 (Massive MIMO)	90.0000	94.50	3.37	4.00	62.00	0.862	6	7.39	4.79
Commscope MC-K10S-9-96 (1 of 3)	90.0000	358.00	0.37	0.00	62.00	0.862	6	3.30	3.30
Utility Pole Transformer	270.0000	200.00	-1.73	0.00	43.00	0.776	5	0.92	0.92
Utility Pole Crossarms	270.0000	50.00	-0.44	0.00	49.00	0.806	5	3.50	0.10
Commscope MC-K10S-9-96 (2 of 3)	0.0000	358.00	0.00	-0.37	62.00	0.862	6	3.30	3.30
Commscope MC-K10S-9-96 (3 of 3)	270.0000	358.00	-0.37	0.00	62.00	0.862	6	3.30	3.30
	Sum Weight:	3056.53							

Force Totals (Does not include forces on guys)

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Torques lb-in
Leg Weight	1732.40			
Bracing Weight	0.00			
Total Member Self-Weight	1732.40			
Guy Weight	968.73			
Total Weight	7788.62			
Wind 0 deg - No Ice		0.00	-5374.51	5329.65
Wind 45 deg - No Ice		3844.88	-3568.58	-11067.99

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Torques lb-in
Wind 90 deg - No Ice		4412.18	50.14	-16308.20
Wind 135 deg - No Ice		3844.88	3668.86	-11995.29
Wind 180 deg - No Ice		0.00	5474.79	-5329.65
Wind 225 deg - No Ice		-3844.88	3668.86	11067.99
Wind 270 deg - No Ice		-4412.18	50.14	16308.20
Wind 315 deg - No Ice		-3844.88	-3568.58	11995.29
Member Ice	266.29			
Guy Ice	60.80			
Total Weight Ice	8245.87			
Wind 0 deg - Ice		0.00	-691.70	947.60
Wind 45 deg - Ice		486.42	-452.52	-1765.91
Wind 90 deg - Ice		570.97	0.00	-2683.84
Wind 135 deg - Ice		486.42	452.52	-2029.61
Wind 180 deg - Ice		0.00	691.70	-947.60
Wind 225 deg - Ice		-486.42	452.52	1765.91
Wind 270 deg - Ice		-570.97	0.00	2683.84
Wind 315 deg - Ice		-486.42	-452.52	2029.61
Total Weight	7787.62			
Wind 0 deg - Service		0.00	-2447.70	1618.16
Wind 45 deg - Service		1733.54	-1664.87	-3360.41
Wind 90 deg - Service		2196.03	0.00	-4951.42
Wind 135 deg - Service		1733.54	1664.87	-3641.95
Wind 180 deg - Service		0.00	2447.70	-1618.16
Wind 225 deg - Service		-1733.54	1664.87	3360.41
Wind 270 deg - Service		-2196.03	0.00	4951.42
Wind 315 deg - Service		-1733.54	-1664.87	3641.95

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice+1.0 Guy
3	1.2 Dead+1.0 Wind 45 deg - No Ice+1.0 Guy
4	1.2 Dead+1.0 Wind 90 deg - No Ice+1.0 Guy
5	1.2 Dead+1.0 Wind 135 deg - No Ice+1.0 Guy
6	1.2 Dead+1.0 Wind 180 deg - No Ice+1.0 Guy
7	1.2 Dead+1.0 Wind 225 deg - No Ice+1.0 Guy
8	1.2 Dead+1.0 Wind 270 deg - No Ice+1.0 Guy
9	1.2 Dead+1.0 Wind 315 deg - No Ice+1.0 Guy
10	1.2 Dead+1.0 Ice+1.0 Temp+Guy
11	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy
12	1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp+1.0 Guy
13	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy
14	1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp+1.0 Guy
15	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy
16	1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp+1.0 Guy
17	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp+1.0 Guy
18	1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp+1.0 Guy
19	Dead+Wind 0 deg - Service+Guy
20	Dead+Wind 45 deg - Service+Guy
21	Dead+Wind 90 deg - Service+Guy
22	Dead+Wind 135 deg - Service+Guy
23	Dead+Wind 180 deg - Service+Guy

Comb. No.	Description
24	Dead+Wind 225 deg - Service+Guy
25	Dead+Wind 270 deg - Service+Guy
26	Dead+Wind 315 deg - Service+Guy

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-in	Minor Axis Moment lb-in
L1	68 - 24	Pole	Max Tension	5	0.06	-3.12	-4.32
			Max. Compression	3	-34250.89	-387820.30	237930.47
			Max. Mx	8	-4755.23	509411.39	22056.00
			Max. My	2	-4814.13	1293.89	503547.90
			Max. Vy	8	-3210.11	509411.39	22056.00
			Max. Vx	2	-3152.10	1293.89	503547.90
			Max. Torque	7			-17712.94
		Guy A	Bottom Tension	4	15254.53		
			Top Tension	4	15459.21		
			Top Cable Vert	4	13148.01		
			Top Cable Norm	4	8129.51		
			Top Cable Tan	4	167.57		
			Bot Cable Vert	4	-12887.82		
			Bot Cable Norm	4	8158.54		
			Bot Cable Tan	4	207.77		
		Guy B	Bottom Tension	7	16489.18		
			Top Tension	7	16693.58		
			Top Cable Vert	7	14188.12		
			Top Cable Norm	7	8793.30		
			Top Cable Tan	7	225.17		
			Bot Cable Vert	7	-13930.68		
			Bot Cable Norm	7	8817.88		
			Bot Cable Tan	7	272.48		
		Guy C	Bottom Tension	8	15240.71		
			Top Tension	8	15445.33		
			Top Cable Vert	8	13135.71		
			Top Cable Norm	8	8122.85		
			Top Cable Tan	8	175.46		
			Bot Cable Vert	8	-12876.61		
			Bot Cable Norm	8	8150.11		
			Bot Cable Tan	8	218.79		
		Guy D	Bottom Tension	3	16279.57		
			Top Tension	3	16483.93		
			Top Cable Vert	3	14010.41		
			Top Cable Norm	3	8681.98		
			Top Cable Tan	3	226.81		
			Bot Cable Vert	3	-13754.34		
			Bot Cable Norm	3	8704.36		
			Bot Cable Tan	3	276.85		
L2	24 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	3	-35826.72	-484673.59	233553.13
			Max. Mx	3	-35826.72	-484673.59	233553.13
			Max. My	8	-33061.45	318701.97	-247159.01
			Max. Vy	2	470.71	-148676.03	121179.92
			Max. Vx	9	880.12	161225.36	-16553.38
			Max. Torque	4			16342.57

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Mast	Max. Vert	3	35826.89	-403.34	200.67
	Max. H_x	7	35339.40	351.20	-384.12
	Max. H_z	2	27197.04	-288.38	281.79
	Max. M_x	3	233552.10	-403.34	200.67
	Max. M_z	3	484674.09	-403.34	200.67
	Max. Torsion	4	16338.24	59.54	107.23
	Min. Vert	10	19712.30	-38.98	-114.25
	Min. H_x	3	35826.89	-403.34	200.67
	Min. H_z	6	25529.50	202.55	-476.59
	Min. M_x	8	-247159.97	-113.06	-293.68
	Min. M_z	7	-465797.20	351.20	-384.12
	Min. Torsion	8	-15806.47	-113.06	-293.68
Guy D @ 29 ft Elev 0 ft Azimuth 167 deg	Max. Vert	7	-396.81	100.51	284.89
	Max. H_x	3	-13754.34	1721.66	8536.89
	Max. H_z	3	-13754.34	1721.66	8536.89
	Min. Vert	3	-13754.34	1721.66	8536.89
	Min. H_x	6	-414.81	78.13	292.58
	Min. H_z	7	-396.81	100.51	284.89
Guy C @ 29 ft Elev 0 ft Azimuth 139 deg	Max. Vert	4	-393.50	173.03	240.84
	Max. H_x	8	-12876.61	5518.70	6001.35
	Max. H_z	8	-12876.61	5518.70	6001.35
	Min. Vert	8	-12876.61	5518.70	6001.35
	Min. H_x	4	-393.50	173.03	240.84
	Min. H_z	4	-393.50	173.03	240.84
Guy B @ 29 ft Elev 0 ft Azimuth -9 deg	Max. Vert	3	-268.30	-63.09	-210.26
	Max. H_x	2	-307.48	-44.64	-230.90
	Max. H_z	3	-268.30	-63.09	-210.26
	Min. Vert	7	-13930.68	-1149.73	-8746.85
	Min. H_x	7	-13930.68	-1149.73	-8746.85
	Min. H_z	7	-13930.68	-1149.73	-8746.85
Guy A @ 29 ft Elev 0 ft Azimuth -45 deg	Max. Vert	8	-268.67	-135.25	-169.26
	Max. H_x	8	-268.67	-135.25	-169.26
	Max. H_z	8	-268.67	-135.25	-169.26
	Min. Vert	4	-12887.82	-5915.87	-5622.05
	Min. H_x	4	-12887.82	-5915.87	-5622.05
	Min. H_z	4	-12887.82	-5915.87	-5622.05

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x lb-in	Overturning Moment, M_z lb-in	Torque lb-in
Dead Only	21143.59	29.04	76.90	17887.92	-11595.54	-0.89
1.2 Dead+1.0 Wind 0 deg - No Ice+1.0 Guy	27197.04	288.38	-281.79	-60943.07	-258341.02	5651.96
1.2 Dead+1.0 Wind 45 deg - No	35826.89	403.34	-200.67	-233552.10	-484674.09	-10540.78

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	lb-in	lb-in	lb-in
Ice+1.0 Guy						
1.2 Dead+1.0 Wind 90 deg - No Ice+1.0 Guy	32143.34	-59.54	-107.23	-215404.22	-310620.62	-16338.24
1.2 Dead+1.0 Wind 135 deg - No Ice+1.0 Guy	24583.60	191.72	96.53	-107601.57	-107843.10	-12171.72
1.2 Dead+1.0 Wind 180 deg - No Ice+1.0 Guy	25529.50	-202.55	476.59	87157.41	204630.54	-5068.18
1.2 Dead+1.0 Wind 225 deg - No Ice+1.0 Guy	35339.40	-351.20	384.12	243162.01	465797.20	11123.25
1.2 Dead+1.0 Wind 270 deg - No Ice+1.0 Guy	33061.47	113.06	293.68	247159.97	318701.21	15806.47
1.2 Dead+1.0 Wind 315 deg - No Ice+1.0 Guy	25955.09	-146.76	121.19	166277.62	111467.12	11631.96
1.2 Dead+1.0 Ice+1.0 Temp+Guy	19712.30	38.98	114.25	25961.30	-16032.38	-2.57
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy	19806.82	75.38	82.96	26465.80	-45289.09	946.48
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp+1.0 Guy	20049.34	94.22	79.66	5812.49	-62733.59	-1756.54
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy	19953.69	24.84	79.24	-2473.01	-42292.60	-2678.94
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp+1.0 Guy	19750.55	44.56	94.29	1800.83	-22260.87	-2029.30
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy	19761.19	2.70	145.95	25180.33	12686.64	-944.02
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp+1.0 Guy	19995.24	-16.49	148.26	45118.62	30490.72	1758.16
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp+1.0 Guy	19945.26	52.28	149.37	54000.60	10641.99	2664.89
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp+1.0 Guy	19764.16	32.87	135.03	50343.94	-9590.63	2016.26
Dead+Wind 0 deg - Service+Guy	21710.04	135.88	-156.66	-35483.25	-100278.18	1663.74
Dead+Wind 45 deg - Service+Guy	23357.18	322.47	-146.20	-92351.37	-204887.52	-3294.80
Dead+Wind 90 deg - Service+Guy	22568.46	204.52	-27.66	-71135.20	-162727.06	-4969.97
Dead+Wind 135 deg - Service+Guy	21350.24	169.77	136.75	-12766.42	-68707.14	-3670.38
Dead+Wind 180 deg - Service+Guy	21475.61	-74.00	308.23	68393.22	73427.27	-1571.42
Dead+Wind 225 deg - Service+Guy	23032.47	-263.92	290.38	118223.90	179506.36	3377.59
Dead+Wind 270 deg - Service+Guy	22905.93	-154.78	179.04	104999.85	148311.21	4875.21
Dead+Wind 315 deg - Service+Guy	21485.25	-114.21	18.89	49511.86	47833.01	3585.35

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
1	0.00	-7788.62	0.00	-0.06	7788.62	-0.52	0.007%
2	21.21	-9153.38	-5547.68	-21.09	9153.37	5547.60	0.001%
3	4018.60	-9153.12	-3719.42	-4018.50	9153.10	3719.36	0.001%
4	4632.25	-9151.86	27.87	-4632.10	9151.85	-27.95	0.002%
5	3971.73	-9151.91	3774.34	-3971.47	9151.90	-3774.45	0.003%

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
6	-21.21	-9151.82	5647.96	21.08	9151.82	-5647.88	0.001%
7	-4018.60	-9152.08	3819.70	4018.51	9152.07	-3819.66	0.001%
8	-4632.25	-9153.34	72.41	4632.06	9153.32	-72.33	0.002%
9	-3971.73	-9153.29	-3674.06	3971.64	9153.29	3674.09	0.001%
10	0.00	-9609.84	0.00	0.25	9609.84	-0.49	0.006%
11	5.63	-9610.05	-737.66	-5.28	9610.05	737.46	0.004%
12	532.52	-9609.98	-492.55	-532.25	9609.98	492.40	0.003%
13	629.38	-9609.65	-5.91	-629.16	9609.64	5.79	0.003%
14	520.09	-9609.66	480.51	-519.37	9609.65	-480.87	0.008%
15	-5.63	-9609.64	737.66	4.88	9609.63	-737.27	0.009%
16	-532.52	-9609.71	492.55	532.28	9609.70	-492.43	0.003%
17	-629.38	-9610.04	5.91	629.16	9610.04	-5.81	0.003%
18	-520.09	-9610.03	-480.51	519.42	9610.02	480.80	0.008%
19	6.44	-7788.86	-2500.27	-6.23	7788.85	2500.15	0.003%
20	1786.28	-7788.78	-1710.67	-1786.17	7788.77	1710.60	0.002%
21	2262.85	-7788.40	-6.76	-2262.66	7788.39	6.66	0.003%
22	1772.05	-7788.41	1696.90	-1771.78	7788.41	-1697.03	0.004%
23	-6.44	-7788.38	2500.27	6.07	7788.38	-2500.07	0.005%
24	-1786.28	-7788.47	1710.67	1786.19	7788.46	-1710.62	0.001%
25	-2262.85	-7788.85	6.76	2262.76	7788.84	-6.72	0.001%
26	-1772.05	-7788.83	-1696.90	1771.63	7788.83	1697.08	0.006%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00005383
2	Yes	14	0.00000001	0.00005402
3	Yes	16	0.00000001	0.00005246
4	Yes	15	0.00000001	0.00008329
5	Yes	12	0.00000001	0.00008342
6	Yes	13	0.00000001	0.00005027
7	Yes	16	0.00000001	0.00004632
8	Yes	15	0.00000001	0.00009033
9	Yes	14	0.00000001	0.00003811
10	Yes	7	0.00000001	0.00004442
11	Yes	10	0.00000001	0.00004930
12	Yes	11	0.00000001	0.00006474
13	Yes	11	0.00000001	0.00004731
14	Yes	9	0.00000001	0.00007409
15	Yes	9	0.00000001	0.00007937
16	Yes	11	0.00000001	0.00005288
17	Yes	11	0.00000001	0.00004490
18	Yes	9	0.00000001	0.00006746
19	Yes	11	0.00000001	0.00004881
20	Yes	13	0.00000001	0.00005453
21	Yes	12	0.00000001	0.00007036
22	Yes	10	0.00000001	0.00003675
23	Yes	10	0.00000001	0.00005731
24	Yes	13	0.00000001	0.00004018
25	Yes	13	0.00000001	0.00003755
26	Yes	10	0.00000001	0.00006432

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	68 - 24	9.022	20	1.3036	0.0694
L2	24 - 0	0.901	20	0.3647	0.0130

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
64.00	RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	20	8.095	1.2104	0.0630	16291
62.00	RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	20	7.635	1.1639	0.0600	13576
60.00	RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	20	7.178	1.1175	0.0570	10182
50.00	Location 4 (3 Powerlines-1)	20	4.987	0.8897	0.0427	4525
49.00	Utility Pole Crossarms	20	4.780	0.8675	0.0414	4287
46.00	Guy	20	4.177	0.8014	0.0373	3702
43.00	Utility Pole Transformer	20	3.603	0.7365	0.0334	3258
41.00	Location 3 (1 Wire)	20	3.238	0.6940	0.0309	3016
40.00	Location 2 (1 Wire)	20	3.062	0.6730	0.0297	2908
26.00	Location 1 (1 Wire)	20	1.093	0.4000	0.0150	1962

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	68 - 24	27.129	3	3.9765	0.2379
L2	24 - 0	2.374	3	1.0161	0.0417

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
64.00	RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	3	24.284	3.6753	0.2201	5188
62.00	RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	3	22.870	3.5253	0.2095	4323
60.00	RFS APXVAARR24 43-U-NA20 (OCTA) W/ PIPE MOUNT	3	21.468	3.3758	0.1989	3242
50.00	Location 4 (3 Powerlines-1)	3	14.753	2.6445	0.1479	1440
49.00	Utility Pole Crossarms	3	14.120	2.5734	0.1430	1364
46.00	Guy	3	12.276	2.3631	0.1287	1177
43.00	Utility Pole Transformer	3	10.524	2.1578	0.1148	1036
41.00	Location 3 (1 Wire)	3	9.413	2.0240	0.1060	959

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
40.00	Location 2 (1 Wire)	3	8.876	1.9581	0.1016	924
26.00	Location 1 (1 Wire)	3	2.939	1.1205	0.0499	623

Guy Design Data

Section No.	Elevation ft	Size	Initial Tension lb	Breaking Load lb	Actual T_u lb	Allowable ϕT_n lb	Required S.F.	Actual S.F.
L1	46.00 (A) (6)	5/8 EHS	4240.00	40280.06	15459.20	24168.00	1.000	1.563 ✔
	46.00 (B) (5)	5/8 EHS	4240.00	40280.06	16693.60	24168.00	1.000	1.448 ✔
	46.00 (C) (4)	5/8 EHS	4240.00	40280.06	15445.30	24168.00	1.000	1.565 ✔
	46.00 (D) (3)	5/8 EHS	4240.00	40280.06	16483.90	24168.00	1.000	1.466 ✔

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
L1	68 - 24 (1)	TP14x8x0.1875	44.00	22.00	68.2	6.5280	-32628.20	245428.00	0.133
L2	24 - 0 (2)	TP17x14x0.1875	24.00	46.00	111.6	8.3393	-34288.10	151183.00	0.227

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} lb-in	ϕM_{nx} lb-in	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} lb-in	ϕM_{ny} lb-in	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	68 - 24 (1)	TP14x8x0.1875	484436.00	1260160.00	0.384	0.00	1260160.00	0.000
L2	24 - 0 (2)	TP17x14x0.1875	454988.00	2064090.00	0.220	0.00	2064090.00	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u lb	ϕV_n lb	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u lb-in	ϕT_n lb-in	Ratio $\frac{T_u}{\phi T_n}$
L1	68 - 24 (1)	TP14x8x0.1875	472.43	117746.00	0.004	16155.10	1307580.00	0.012
L2	24 - 0 (2)	TP17x14x0.1875	346.43	147944.00	0.002	14252.60	2133830.00	0.007

Section No.	Elevation ft	Size	Actual V_u lb	ϕV_n lb	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u lb-in	ϕT_n lb-in	Ratio $\frac{T_u}{\phi T_n}$

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	68 - 24 (1)	0.133	0.384	0.000	0.004	0.012	0.518 ✔	1.000	4.8.2 ✔
L2	24 - 0 (2)	0.227	0.220	0.000	0.002	0.007	0.447 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
L1	68 - 24	Pole	TP14x8x0.1875	1	-32628.20	245428.00	51.8	Pass
L2	24 - 0	Pole	TP17x14x0.1875	2	-34288.10	151183.00	44.7	Pass
L1	68 - 24	Guy A@46	5/8	6	15459.20	24168.00	64.0	Pass
L1	68 - 24	Guy B@46 (-55 deg)	5/8	5	16693.60	24168.00	69.1	Pass
L1	68 - 24	Guy C@46 (4 deg)	5/8	4	15445.30	24168.00	63.9	Pass
L1	68 - 24	Guy D@46 (-59 deg)	5/8	3	16483.90	24168.00	68.2	Pass
							Summary	
						Pole (L1)	51.8	Pass
						Guy A (L1)	64.0	Pass
						Guy B (L1)	69.1	Pass
						Guy C (L1)	63.9	Pass
						Guy D (L1)	68.2	Pass
						RATING =	**69.1**	**Pass**

RAN Template:	A&L Template:
67D5A997DB Hybrid	67D5997DB_2xAIR+1OP

SL01743A_Anchor_4

Print Name: Standard (4)
PORs: Anchor_Phase 1

Section 1 - Site Information

Site ID: SL01743A
Status: Final
Version: 4
Project Type: Anchor
Approved: 10/21/2020 12:53:52 PM
Approved By: Abhishek.Sinha11@T-Mobile.com
Last Modified: 10/21/2020 12:53:52 PM
Last Modified By: Abhishek.Sinha11@T-Mobile.com

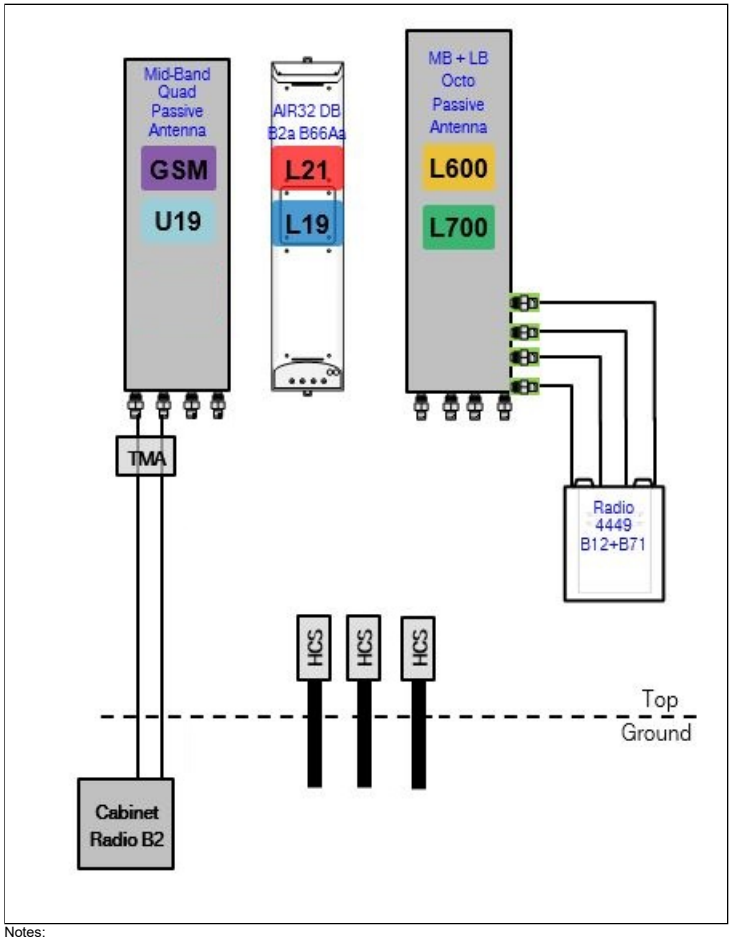
Site Name: Prom RMP Glasmann Way
Site Class: Utility Pole
Site Type: Structure Non Building
Plan Year: 2019
Market: SALT LAKE CITY UT
Vendor: Ericsson
Landlord: PacifiCorp (OR)

Latitude: 41.17605923
Longitude: -111.95667700
Address: 4700 S Glassman Way
City, State: Ogden, UT
Region: WEST

RAN Template: 67D5A997DB Hybrid			AL Template: 67D5997DB_2xAIR+1OP	
Sector Count: 3	**Antenna Count:** 9	**Coax Line Count:** 6	**TMA Count:** 0	**RRU Count:** 6

Section 2 - Existing Template Images

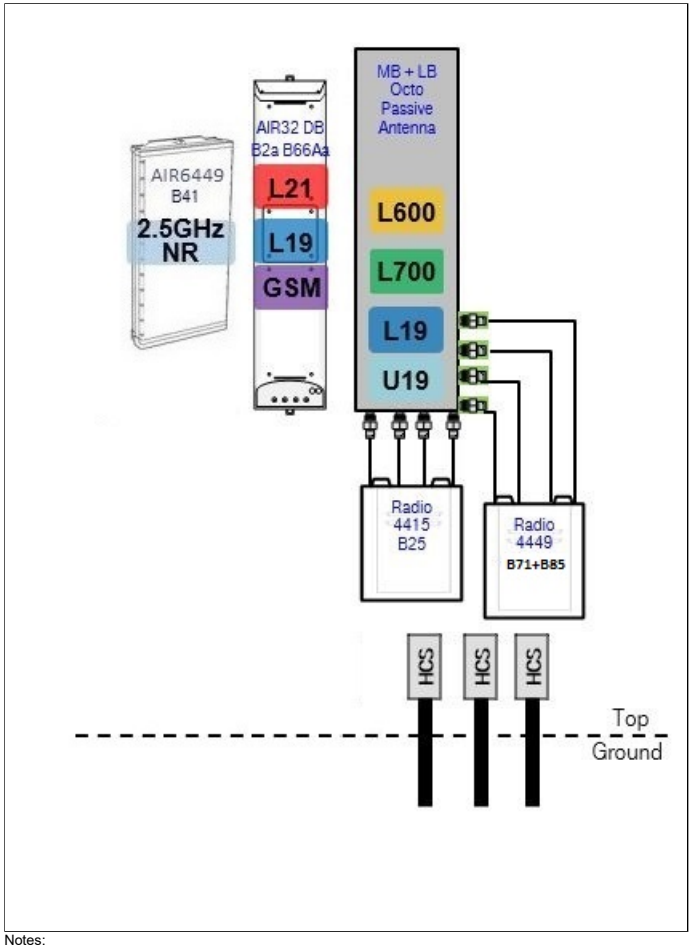
67D94DB_1xAIR+1QP+1OP.JPG



Notes:

Section 3 - Proposed Template Images

67D5997DB_2xAIR+1OP_3 HCS_With AIR6449.JPG



Notes:

Section 4 - Siteplan Images

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RAN Template:	A&L Template:
67D5A997DB Hybrid	67D5997DB_2xAIR+1OP

SL01743A_Anchor_4

Print Name: Standard (4)
PORs: Anchor_Phase 1

Section 5 - RAN Equipment

Existing RAN Equipment

Template: 67D94DB Hybrid (evolved from 4A)

Enclosure	1	2	3
Enclosure Type	RBS 6102	Ancillary Equipment (Ericsson)	RBS 3106
Baseband	DUW30 [U1900] DUG20 [G1900] BB 5216 [L2100, L1900] BB 6630 [N600, L700, L600]		DUW30 [U2100 (DECOMMISSIONED)]
Hybrid Cable System		Ericsson 6x12 HCS 6AWG 30m **(x 3)**	
Multiplexer	XMU		
Radio	RUS01 B2 **(x 3)** [G1900] RUS01 B2 **(x 3)** [U1900] RUS01 B4 **(x 6)**		RU22 **(x 6)**

Proposed RAN Equipment

Template: 67D5A997DB Hybrid

Enclosure	1	2	3	4	5
Enclosure Type	RBS 6102	Ancillary Equipment (Ericsson)	Enclosure 6160	B160	RBS 3106
Baseband	DUW30 [U1900] DUG20 [G1900] BB 6630 [N600, L700, L600] BB 5216 [L1900, L2100]		BB 6648 [N2500] BB 6630 [L2500]		DUW30 [U2100 (DECOMMISSIONED)]
Hybrid Cable System		Ericsson 6x12 HCS 6AWG 30m **(x 3)** PSU 4813			
Multiplexer	XMU				
Radio	RUS01 B2 **(x 3)** [G1900] RUS01 B2 **(x 3)** [U1900] RUS01 B4 **(x 6)**				RU22 **(x 6)**

RAN Scope of Work:

04/29/2020 - Remove 6 coax lines to make space for 6x12 HCS in the conduit.

RAN Template:	A&L Template:
67D5A997DB Hybrid	67D5997DB_2xAIR+1OP

SL01743A_Anchor_4

Print Name: Standard (4)
PORs: Anchor_Phase 1

Section 6 - A&L Equipment

Existing Template: 67D94DB_1xAIR+1QP+1OP
Proposed Template: 67D5997DB_2xAIR+1OP

Sector 1 (Existing) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	CellMax - CMA-BDHH/6521/E0-6/TB05 (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	330		330				330			
M. Tilt	4		4				4			
Height	64		64				64			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	U1900 G1900		N600 L700 L600	N600 L700 L600			L2100	L2100	L1900	L1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.		U2100								
E. Tilt	2		4	4			2	2	2	2
Cables	7/8" Coax - 85 ft. **(x2)** Coax Jumper - 10 ft. **(x2)**	7/8" Coax - 85 ft. **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**			Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.
TMAs	Generic Twin Style 1A - PCS (AtAntenna)									
Diplexers / Combiners										
Radio			Radio 4449 B71+B85 (At Antenna)							
Sector Equipment										

Unconnected Equipment:

Scope of Work:

We were failing at 147% we are planning to do a MOD. L1900-Capacity is pending. For L700 RRUS11 B12 were installed on the ground and LNX antennas. Leased for 18 coax lines.
Remove 6 coax lines to help structural.

RAN Template:	A&L Template:
67D5A997DB Hybrid	67D5997DB_2xAIR+1OP

SL01743A_Anchor_4

Print Name: Standard (4)
PORs: Anchor_Phase 1

Sector 1 (Proposed) view from behind

Coverage Type	A - Outdoor Macro										
Antenna	1		2				3				
Antenna Model	Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				
Azimuth	330		330				330				
M. Tilt	4		4				4				
Height	64		64				64				
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	
Active Tech.	N2500 L2500	N2500 L2500	N600 L700 L600	N600 L700 L600	L1900 U1900	L1900 U1900	L2100	L2100	L1900 G1900	L1900 G1900	
Dark Tech.											
Restricted Tech.											
Decomm. Tech.							U2100				
E. Tilt	2	2	4	4	2	2	2	2	2	2	
Cables	Fiber Jumper - 10 ft. **(x2)**	Fiber Jumper - 10 ft. **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	
TMAs											
Diplexers / Combiners											
Radio			Radio 4449 B71+B85 (At Antenna)		Radio 4415 B25 (At Antenna)						
Sector Equipment											

Unconnected Equipment:

Cable: 7/8" Coax - 85 ft. | Cable: 7/8" Coax - 85 ft.

Scope of Work:

RAN Template:	A&L Template:
67D5A997DB Hybrid	67D5997DB_2xAIR+1OP

SL01743A_Anchor_4

Print Name: Standard (4)
PORs: Anchor_Phase 1

Sector 2 (Existing) view from behind

Coverage Type	A - Outdoor Macro										
Antenna	1		2				3				
Antenna Model	CellMax - CMA-BDHH/6521/E0-6/TB05 (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				
Azimuth	90		90				90				
M. Tilt	-3		-3				-3				
Height	64		64				64				
Ports	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	
Active Tech.	U1900 G1900		N600 L700 L600	N600 L700 L600			L2100	L2100	L1900	L1900	
Dark Tech.											
Restricted Tech.											
Decomm. Tech.		U2100									
E. Tilt	2		4	4			2	2	2	2	
Cables	7/8" Coax - 85 ft. **(x2)** Coax Jumper - 10 ft. **(x2)**	7/8" Coax - 85 ft. **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**			Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	
TMAs	Generic Twin Style 1A - PCS (AtAntenna)										
Diplexers / Combiners											
Radio			Radio 4449 B71+B85 (At Antenna)								
Sector Equipment											

Unconnected Equipment:

Scope of Work:

We were failing at 147% we are planning to do a MOD. L1900-Capacity is pending. For L700 RRUS11 B12 were installed on the ground and LNX antennas. Leased for 18 coax lines.
Remove 6 coax lines to help structural.

RAN Template:	A&L Template:
67D5A997DB Hybrid	67D5997DB_2xAIR+1OP

SL01743A_Anchor_4

Print Name: Standard (4)
PORs: Anchor_Phase 1

Sector 2 (Proposed) view from behind

Coverage Type	A - Outdoor Macro										
Antenna	1		2				3				
Antenna Model	Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				
Azimuth	90		90				90				
M. Tilt	-3		-3				-3				
Height	64		64				64				
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	
Active Tech.	N2500 L2500	N2500 L2500	N600 L700 L600	N600 L700 L600	L1900 U1900	L1900 U1900	L2100	L2100	L1900 G1900	L1900 G1900	
Dark Tech.											
Restricted Tech.											
Decomm. Tech.							U2100				
E. Tilt	2	2	4	4	2	2	2	2	2	2	
Cables	Fiber Jumper - 10 ft. **(x2)**	Fiber Jumper - 10 ft. **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	
TMAs											
Diplexers / Combiners											
Radio			Radio 4449 B71+B85 (At Antenna)		Radio 4415 B25 (At Antenna)						
Sector Equipment											

Unconnected Equipment:

Cable: 7/8" Coax - 85 ft. | Cable: 7/8" Coax - 85 ft.

Scope of Work:

RAN Template:	A&L Template:
67D5A997DB Hybrid	67D5997DB_2xAIR+1OP

SL01743A_Anchor_4

Print Name: Standard (4)
PORs: Anchor_Phase 1

Sector 3 (Existing) view from behind

Coverage Type	A - Outdoor Macro										
Antenna	1		2				3				
Antenna Model	CellMax - CMA-BDHH/6521/E0-6/TB05 (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				
Azimuth	195		195				195				
M. Tilt	2		2				2				
Height	64		64				64				
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	
Active Tech.	U1900 G1900		N600 L700 L600	N600 L700 L600			L2100	L2100	L1900	L1900	
Dark Tech.											
Restricted Tech.											
Decomm. Tech.		U2100									
E. Tilt	2		4	4			2	2	2	2	
Cables	7/8" Coax - 85 ft. **(x2)** Coax Jumper - 10 ft. **(x2)**	7/8" Coax - 85 ft. **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**			Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	
TMAs	Generic Twin Style 1A - PCS (AtAntenna)										
Diplexers / Combiners											
Radio			Radio 4449 B71+B85 (At Antenna)								
Sector Equipment											

Unconnected Equipment:

Scope of Work:

We were failing at 147% we are planning to do a MOD. L1900-Capacity is pending. For L700 RRUS11 B12 were installed on the ground and LNX antennas. Leased for 18 coax lines.
Remove 6 coax lines to help structural.

RAN Template:	A&L Template:
67D5A997DB Hybrid	67D5997DB_2xAIR+1OP

SL01743A_Anchor_4

Print Name: Standard (4)
PORs: Anchor_Phase 1

Sector 3 (Proposed) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	195		195				195			
M. Tilt	2		2				2			
Height	64		64				64			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	N2500 L2500	N2500 L2500	N600 L700 L600	N600 L700 L600	L1900 U1900	L1900 U1900	L2100	L2100	L1900 G1900	L1900 G1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.							U2100			
E. Tilt	2	2	4	4	2	2	2	2	2	2
Cables	Fiber Jumper - 10 ft. **(x2)**	Fiber Jumper - 10 ft. **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft. JUMPER 10 FT SUREFLEX 4.3-10 TO 4.3-10 **(x2)**	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.	Fiber Jumper - 10 ft.
TMAs										
Diplexers / Combiners										
Radio			Radio 4449 B71+B85 (At Antenna)		Radio 4415 B25 (At Antenna)					
Sector Equipment										

Unconnected Equipment:

Cable: 7/8" Coax - 85 ft. Cable: 7/8" Coax - 85 ft.

Scope of Work:

RAN Template:	A&L Template:
67D5A997DB Hybrid	67D5997DB_2xAIR+1OP

SL01743A_Anchor_4

Print Name: Standard (4)
PORs: Anchor_Phase 1

Section 7 - Power Systems Equipment

Existing Power Systems Equipment

----- This section is intentionally blank. -----

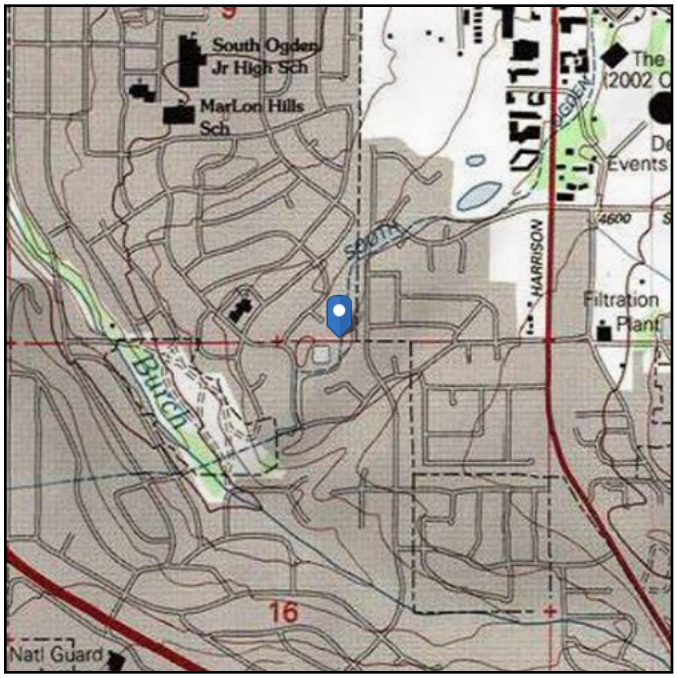
Proposed Power Systems Equipment

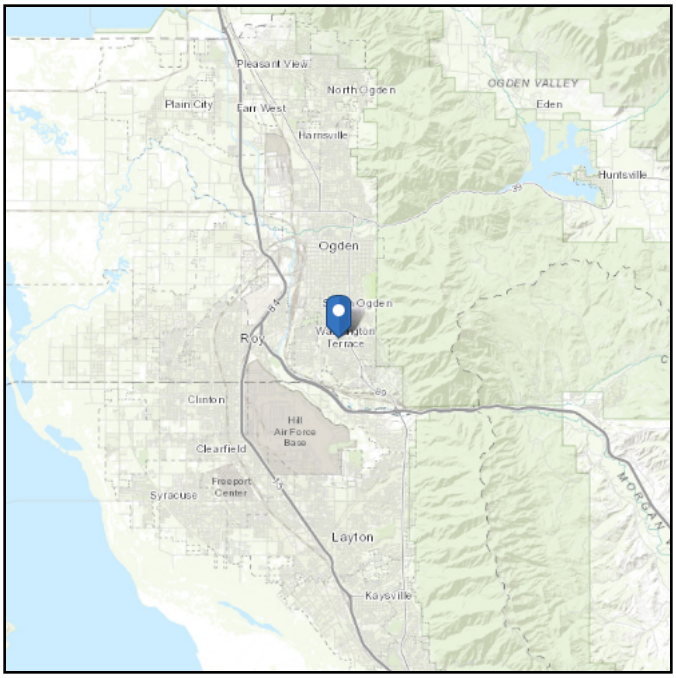
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class:

Elevation: 4697.53 ft (NAVD 88)
Latitude: 41.176069
Longitude: -111.956727





Wind

Results:

Wind Speed:	103 Vmph
10-year MRI	74 Vmph
25-year MRI	80 Vmph
50-year MRI	84 Vmph
100-year MRI	89 Vmph
Data Source:	ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4
Date Accessed:	Mon Jul 15 2019

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

Mountainous terrain, gorges, ocean promontories, and special wind regions should be examined for unusual wind conditions.

Ice

Results:

Ice Thickness:	0.25 in.
Concurrent Temperature:	15 F
Gust Speed:	40 mph
Data Source:	Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8
Date Accessed:	Mon Jul 15 2019

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 500-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Snow

Results:

Elevation:	4697.5 ft
Data Source:	ASCE/SEI 7-16, Table 7.2-8
Date Accessed:	Mon Jul 15 2019

In "Case Study" areas, site-specific case studies are required to establish ground snow loads. Extreme local variations in ground snow loads in these areas preclude mapping at this scale.

Ground snow load determination for such sites shall be based on an extreme value statistical analysis of data available in the vicinity of the site using a value with a 2 percent annual probability of being exceeded (50-year mean recurrence interval).

Values provided are ground snow loads. In areas designated "case study required," extreme local variations in ground snow loads preclude mapping at this scale. Site-specific case studies are required to establish ground snow loads at elevations not covered.

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.

REPORT
UPDATED GEOTECHNICAL STUDY
OGDEN TOWER SITE
APPROXIMATELY 4700 SOUTH GLASMANN WAY
OGDEN, UTAH

Submitted To:

Anderson Engineering Company, Inc.
2053 North Hillcrest Road
Saratoga Springs, Utah 84045

Submitted By:

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123

September 17, 2020

Job No. 2554-002-20

September 17, 2020
Job No. 2554-002-20

Mr. Ryan D. Eddy
Anderson Engineering Company, Inc.
2053 North Hillcrest Road
Saratoga Springs, Utah 84045

Mr. Eddy:

Re: Report
Updated Geotechnical Study
Ogden Tower Site
Approximately 4700 South Glasmann Way
Ogden, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our updated geotechnical study performed at the site of the Ogden Tower Site located at approximately 4700 South Glasmann Way in Ogden, Utah. The general location of the site with respect to existing roadways and features, as of 2020, is presented on Figure 1, Vicinity Map. A plan view of the site with existing features and proposed development is presented on Figure 2, Site Plan. The approximate location of the boring drilled in conjunction with this study is also presented on Figure 2.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of this study were planned in discussions between Mr. Ryan D. Eddy of Anderson Engineering Company, Inc. and Mr. Robert Gifford of GSH Geotechnical, Inc. (GSH).

In general, the objectives of this study were to:

1. Define and evaluate the subsurface soil and groundwater conditions.

2. Provide recommendations, parameters, foundations, and pavement information to be utilized in the design and construction of the proposed facility.

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the drilling, logging, and sampling of 1 boring to a depth of 31.0 feet.

2. A laboratory testing program.

3. An office program consisting of the correlation of available data, engineering analyses, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of the Professional Services Agreement No. 20-0723 dated July 13, 2020.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration boring, projected groundwater conditions, and the layout and design data discussed in Section 2, Proposed Construction, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The project consists of retrofitting the existing tower with additional equipment. The foundation of the tower must be confirmed as adequate or redesigned to support the additional loads. The existing tower extends 68 feet above ground and is 17 inches in diameter. The depth and diameter of the existing foundation is unknown and must be confirmed prior to proper assessment of the foundation capacity. The retrofitted tower loads are anticipated to be approximately 20 kips (axial) and 8 kips (shear).

3. SITE INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions at the site, 1 boring was completed near the existing tower location to a depth of approximately 31.0 feet below the

surface with a track-mounted drill rig equipped with hollow-stem augers. The approximate location of the boring drilled in conjunction with this study is presented on Figure 2. Additionally, an excavation, to a depth of 2.0 feet, was conducted at the base of the existing tower. The purpose of the excavation was to determine the type and size of the existing foundation. Photographic documentation of the excavation is presented in Attachment 1, Foundation Exploration.

The field portion of our study was performed under the direction of an experienced member of our geotechnical staff. During the course of drilling operations, samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications have been supplemented by subsequent inspection and testing in our laboratory. A detailed graphical representation of the subsurface conditions encountered at Boring B-1 is presented on Figure 3, Boring Log. Soils were classified in accordance with the nomenclature described on Figure 4, Key to Boring Log (USCS).

A 3.0-inch outside diameter, 2.42-inch inside diameter (Dames & Moore), and a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) were utilized at select locations and depths. The blow counts recorded on the boring log were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of exploration operations, 1.25-inch diameter slotted PVC pipe was installed in the boring to provide a means of monitoring the groundwater fluctuations. The boring was backfilled with auger cuttings.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was performed. The program included moisture, density, partial gradation, direct shear, and chemical tests. The following paragraphs describe the tests and summarize the test data.

3.2.2 Moisture and Density Tests

To provide index parameters and to correlate other test data, moisture and density tests were performed on selected samples. The results of these tests are presented on the boring log, Figure 3.

3.2.3 Partial Gradation Tests

To aid in classifying the granular soils, moisture and partial gradation tests were performed. Results of the tests are tabulated on the following page and on the boring log, Figure 3.

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve	Moisture Content Percent	Soil Classification
B-1	25.0	35.9	22.9	SM
B-1	30.0	51.6	26.9	SM*

*Sample contained clay layers.

3.2.4 Direct Shear Test

Direct shear tests were performed on 2 in situ samples of the natural sand soils. During the direct shear test, the sample was loaded and saturated within 30 seconds after the load was applied. The results of the direct shear test are tabulated below:

Boring No.	Sample Depth (ft)	Unified Soils Classification	Moisture Content (percent)	Apparent Cohesion (psf)	Internal Friction Angle (degrees)
B-1	2.5	SM	11.2	0	43
B-1	5.0	SM	10.5	275	39

3.2.5 Chemical Tests

To determine if the site soils will react detrimentally with concrete, chemical tests were performed on a representative sample of the near-surface soil encountered at the site. The results of the chemical tests are tabulated below:

Boring No.	Depth (feet)	Soil Classification	pH	Total Water-Soluble Sulfate (mg/kg-dry)
B-1	2.5	SM	8.03	70.7

4. SITE CONDITIONS

4.1 SURFACE

The site consists of the existing utility tower located at approximately 4700 South Glasmann Way in Ogden, Utah. Site vegetation consists of sparse weeds and grasses throughout the immediate vicinity. The topography is relatively flat with a total relief of less than approximately 1 foot.

The site is bounded to the northwest by single-family residential structures in a forested area; to the east and southeast by a gravel access roadway with single-family residential structures beyond; and southwest by a reservoir.

4.2 SUBSURFACE SOIL AND GROUNDWATER

The following paragraphs provide generalized descriptions of the subsurface profiles and soil conditions encountered within the boring conducted during this study. As previously noted, soil conditions may vary in unexplored locations.

Boring B-1 consists primarily of silty fine sand to the maximum depth explored of 31.0 feet. The sand soils encountered are loose to medium dense, slightly moist to saturated, and brown in color. Layers of sandy clay and clayey sand up to 2 inches thick were encountered between 24.5 and 31.0 feet beneath the ground surface.

The natural sand and gravel soils are anticipated to exhibit relatively high strength and relatively low compressibility characteristics under the anticipated load range.

For a more detailed description of subsurface conditions, please refer to Figure 3, Boring Log.

Groundwater was not encountered during drilling operations

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

Investigations to determine the type of existing foundation were inconclusive. Dimensions of the existing foundation must be confirmed prior to determination of the foundations ability to support the proposed additional forces. The following discussion and recommendations, presented in Section 5.4, Drilled Pier Foundations, is a summary of the likely diameters and depths of the existing foundation. Assumptions have been made in order to determine the ultimate capacities, such as clean excavation, properly dewatered, depth, diameter, etc.

A new tower (if required) must be constructed according to the recommendations below.

The results of our analyses indicate the foundation for the tower may consist of drilled piers or enlarged spread footing (to resist overturning).

GSH recommends that the enlarged spread footing (if utilized) for the monopole be supported on a minimum 8 inches of relatively clean (less than 8 percent fines) structural fill overlying suitable natural soils.

Non-engineered fill soils may be present at the site due to the previous development. Loose/disturbed soils and non-engineered fills (if encountered) must be completely removed and replaced with granular structural fill within the footprint of the enclosure.

In the following sections, detailed discussions pertaining to on-site soil parameters for temporary excavations, utility trench backfill, drilled pier foundations, enlarged spread footing, and the geoseismic setting of the site are provided.

5.2 EARTHWORK

5.2.1 Site Preparation

Site preparation will consist of the stripping and removal of the surface vegetation/topsoil, loose or disturbed soils, non-engineered fill (if encountered), and any deleterious materials encountered extending a minimum of 4 feet beyond the enlarged spread footing foundation.

GSH recommends that the enlarged spread footing (if utilized) be supported on a minimum of 8 inches of relatively clean structural fill (washed gravel) with less than 8 percent fines. Subsequent to the above operations and prior to the placement of structural fill, concrete slabs, and/or drilled shafts, the exposed subgrade must be proof rolled by passing moderate-weight compaction equipment over the surface at least twice. If any loose, soft, or disturbed zones are encountered, they must be completely removed and replaced with granular structural fill. If additional removal required is greater than 2 feet, GSH must be notified to review conditions.

5.2.2 Structural Fill

Structural fill is defined as all fill which will ultimately be subjected to structural loadings, such as imposed by the pier and slab. Structural fill may be required as site grading fill, replacement fill below the enlarged spread footing, and potential backfill for utilities. All structural fill must be free of sod, rubbish, topsoil, frozen soil, and other deleterious materials.

Structural site grading fill is defined as fill placed over fairly large open areas to raise the overall site grade. For structural site grading fill, the maximum particle size should generally not exceed 4 inches; although, occasional larger particles, not exceeding 8 inches in diameter, may be incorporated if placed randomly in a manner such that “honeycombing” does not occur and the desired degree of compaction can be achieved. The maximum particle size within structural fill placed within confined areas should generally be restricted to 2 inches.

Imported granular soils shall consist of relatively well graded mixtures of sands and gravels containing less than 15 percent fines (clays/silts) and no more than 30 percent retained on the three-quarter-inch sieve. Fine-grained soils are not recommended as structural fill. The 8 inches of clean soil directly below the shelter slab shall consist of a granular material with less than 8 percent fines (clays/silts).

Non-structural site grading fill is defined as all fill material not designated as structural fill or in structural areas and may consist of any cohesive or granular soils not containing excessive amounts of degradable material.

5.2.3 Fill Placement and Compaction

All structural fill shall be placed in lifts not exceeding 8 inches in loose thickness. Structural fills shall be compacted in accordance with the percent of the maximum dry density as determined by the AASHTO[1] T-180 (ASTM[2] D1557) compaction criteria in accordance with the following table:

Location	Total Fill Thickness (feet)	Minimum Percentage of Maximum Dry Density
Beneath an area extending a minimum 3 feet beyond the perimeter of the drilled pier, and enclosure	0 to 5	95
Site grading fill outside area defined above	0 to 5	90
Utility trench backfill below structural areas	--	96

Structural fills greater than 5 feet thick are not anticipated at the site.

Subsequent to stripping and prior to the placement of structural site grading fill, the subgrade shall be prepared as discussed in Section 5.2.1, Site Preparation, of this report. In confined areas, subgrade preparation should consist of the removal of all loose or disturbed soils.

Non-structural fill may be placed in lifts not exceeding 12 inches in loose thickness and compacted by passing construction, spreading, or hauling equipment over the surface at least twice.

5.2.4 General Excavations

The soils encountered within the boring consisted of silty sand. Temporary construction excavations in site soils, above the water table, not exceeding 4 feet, should be no steeper than one-half horizontal to one vertical (0.5H:1V). For excavations up to 8 feet, in site soils and above the water table, the slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations deeper than 8 feet (excluding the drilled pier) are not anticipated at the site. Open excavations encountering saturated or clean cohesionless soils may become difficult to maintain, requiring very flat sideslopes and/or shoring, bracing/dewatering as these soils will tend to flow into the excavation.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated.

---

1 American Association of State Highway and Transportation Officials
2 American Society for Testing and Materials

5.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (flatwork, etc.) shall be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill shall be proof rolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proof rolling shall be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proof rolling, they shall be removed to a maximum depth of 2 feet below design finish grade and replaced with structural fill.

Fined-grained soils (clays/silts) are not recommended as trench backfill in structural areas.

5.3 ENLARGED SPREAD FOOTING

The results of our analysis indicate that a new tower may be supported upon an enlarged spread footing established upon suitable natural soils and/or structural fill extending to suitable natural soils. For design, the following parameters are provided:

Minimum Recommended Depth of Embedment for Frost Protection	- 30 inches
Minimum Recommended Depth of Embedment for Non-frost Conditions	- 15 inches
Minimum Recommended Width for Spread Footings	- 36 inches
Recommended Net Bearing Capacity for Real Load Conditions	- 2,500 pounds per square foot

The term “net bearing capacity” refers to the allowable pressure imposed by the portion of the structure located above lowest adjacent final grade. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total load includes all dead and live loads, including seismic and wind.

5.3.1 Installation

Under no circumstances shall the footing be installed upon non-engineered fills, loose or disturbed soils, topsoil, surface vegetation, root systems, rubbish, construction debris, or other deleterious materials. If unsuitable soils are encountered, they must be removed and replaced with compacted granular fill. If granular soils become loose or disturbed, they must be recompacted prior to pouring the concrete.

The width of structural replacement fill below footings should be equal to the width of the footing plus one foot for each foot of fill thickness.

5.3.2 Settlements

Based on column loadings, soil bearing capacities, and the foundation recommendations as discussed above, we expect settlements beneath the footing to be less than approximately one inch.

5.4 DRILLED PIER FOUNDATIONS

5.4.1 Design Parameters

The parameters and capacity of potential pier foundations are presented in the following sections. As stated above the dimensions of the existing foundation must be confirmed prior to determination of the foundations ability to support the proposed additional forces.

A new drilled concrete pier foundation (if required) may be used to support a new tower at the site. Additionally, we anticipate that drilled pier design may be governed by lateral loading and acceptable lateral deflections. Soil parameters presented in this report for lateral design were calculated utilizing the LPILE computer method. The primary parameter for evaluation of lateral pile and drilled pier capacity is the coefficient of lateral subgrade reaction (k).

In this report, recommended values for k are presented as k_{LPILE} for the different soil strata encountered within the boring. Recommended soil parameter values for the soils encountered in the boring log for lateral and vertical pier design are provided in the following tables:

Boring No.	Depth Range (feet)	Soil Type	Estimated Effective Unit Weight (pcf)	Estimated Cohesion (psf)	Estimated ϕ	Static k_{LPILE} Recommended (pci)
B-1	0-4.0	SM	120	0	43	25
B-1	4.0-8.0	SM	120	275	39	25
B-1	8.0-17.8	SM	120	275	39	90
B-1	17.8-31.0	SM	120	275	39	60

Average values for bearing capacity and side friction of the drilled pier may be taken from the table on the following page. These values are based on the existing soil conditions encountered within Boring B-1. Additionally, these values are based on a clean pier excavation.

Depth Range (feet)	Ultimate End-Bearing (psf)	Ultimate Skin Friction (psf)	Ultimate Uplift Friction (psf)
0-4.0	6,000	224	148
4.0-8.0	6,000	583	385
8.0-17.8	12,000	1,254	828
17.8-31.0	16,800	2,371	1,565

GSH performed a lateral analysis utilizing values in the table above for the potential diameters, of 12, 17, 18, and 24 inches, for the existing pier foundation or future pier foundation (if needed). Each diameter was analyzed for pier depths between 10 to 20 feet below the surface. The analysis is based on a maximum lateral deflection of 1 inch. A vertical load of 20,000 pounds was used in the calculations. A moment load at the pile head was not incorporated.

Pile Diameter (in)	Pile Depth (feet)	Ultimate Maximum Shear Load (lbs)	Maximum Moment in Pile (in-lbs)
12	10	9,721	252,677
	15	9,729	254,375
	20	9,716	253,733
17	10	18,437	591,233
	15	21,245	768,031
	20	21,092	760,282
18	10	19,180	621,671
	15	22,883	855,616
	20	22,710	847,699
24	10	22,871	774,602
	15	39,815	1,918,325
	20	41,471	2,121,577

5.4.2 Installation

The pier excavation shall be inspected to ensure it is clean of loose soil that may slough into the excavation. The pier excavation should have a straight smooth side and not be allowed to flare near the ground surface. The excavation shall be inspected for irregularities that may affect the pier performance to determine if the excavation meets the structural engineer's design tolerances. The pier should be reinforced its entire length. Concrete shall be placed immediately following drilling to reduce the safety risk of the open excavation and additional sloughing following drying of the sand soils.

Concrete shall be pumped or tremmied to the bottom of the excavation and not allowed to free-fall more than 3 feet. Placement of the concrete shall continue to be pumped until all floating water/cement paste is expelled and coarse aggregate is visible at the surface. The volume of concrete shall be compared with planned pier volume.

5.4.3 Settlements

Post-static settlements of drilled piers designed with a minimum embedment depth of 10 to 20 feet are projected to be less than approximately 1 inch.

5.5 LATERAL RESISTANCE

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of friction of 0.40 may be utilized for natural granular soils or granular structural fill. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 300 pounds per cubic foot. Below the water table, this granular soil should be considered equivalent to a fluid with a density of 150 pounds per cubic foot.

A combination of passive earth resistance and friction may be utilized provided that the friction component of the total is divided by 1.5.

5.6 CEMENT TYPES

The laboratory tests indicate that the natural soils tested contain a negligible amount of water-soluble sulfates. Based on our test results, concrete in contact with the on-site soil will have a low potential for sulfate reaction (ACI 318, Table 4.3.1). Therefore, all concrete which will be in contact with the site soils may be prepared using Type I or IA cement.

5.7 GEOSEISMIC SETTING

5.7.1 General

Utah municipalities have adopted the International Building Code (IBC) 2018. The IBC 2018 code refers to ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) determines the seismic hazard for a site based upon mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

5.7.2 Faulting

Based on our review of available literature, no active faults pass through or immediately adjacent to the site. The nearest active mapped fault consists of the Weber Section of the Wasatch Fault zone, located about 1.1 mile to the northeast of the site.

5.7.3 Site Class

For dynamic structural analysis, the Site Class D – Default Soil Profile as defined in Chapter 20 of ASCE 7-16 (per Section 1613.3.2, Site Class Definitions, of IBC 2018) can be utilized.

5.7.4 Ground Motions

The IBC 2018 code is based on USGS mapping, which provides values of short and long period accelerations for average bedrock values for the Western United States and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for the MCE event and incorporates the appropriate soil amplification factor for a Site Class D – Default* Soil Profile. Based on the site latitude and longitude (41.1761 degrees north and 111.9567 degrees west, respectively) and Risk Category I, the values for this site are tabulated below:

Spectral Acceleration Value, T	Bedrock Boundary [mapped values] (% g)	Site Coefficient	Site Class D - Default* [adjusted for site class effects] (% g)	Design Values** (% g)
0.2 Seconds (Short Period Acceleration)	S_S = 136.2	F_a = 1.200	S_{MS} = 163.4	S_{DS} = 109.0
1.0 Second (Long Period Acceleration)	S_1 = 49.6	F_v = 1.804	S_{M1} = 89.5	S_{D1} = 59.7

* If a measured site class in accordance with IBC 2018/ ASCE 7-16 is beneficial based on the project structural engineers review, please contact GSH for additional options for obtaining this measured site class.

**IBC 2018/ASCE 7-16 may require a site-specific study based on the project structural engineer's evaluation and recommendations. If needed, GSH can provide additional information and analysis including a complete site-specific study in accordance with chapter 21 of ASCE 7-16.

5.7.5 Liquefaction

The site is located in an area that has been identified by the Utah Geological Survey (UGS) as being a "moderate to low" liquefaction potential zone. Liquefaction is defined as the condition when saturated, loose, granular soils lose their support capabilities because of excessive pore water

pressure, which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

Due to the density of the granular soils and the lack of groundwater, liquefaction is not anticipated to occur within the soils encountered at this site.

5.8 SITE VISITS

If the existing tower does not meet the parameters above and a new tower is to be constructed, GSH must verify that all topsoil/disturbed soils and any other unsuitable soils have been removed, that non-engineered fills (if encountered) have been removed and/or properly prepared, and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements. Additionally, GSH must observe fill placement and verify in-place moisture content and density of fill materials placed at the site.

5.9 CLOSURE

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, Inc.

Dion A Obermeyer
Staff Geologist

Reviewed by:

REGISTERED PROFESSIONAL ENGINEER
No. 334228
ALAN D. SPILKER
STATE OF UTAH

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

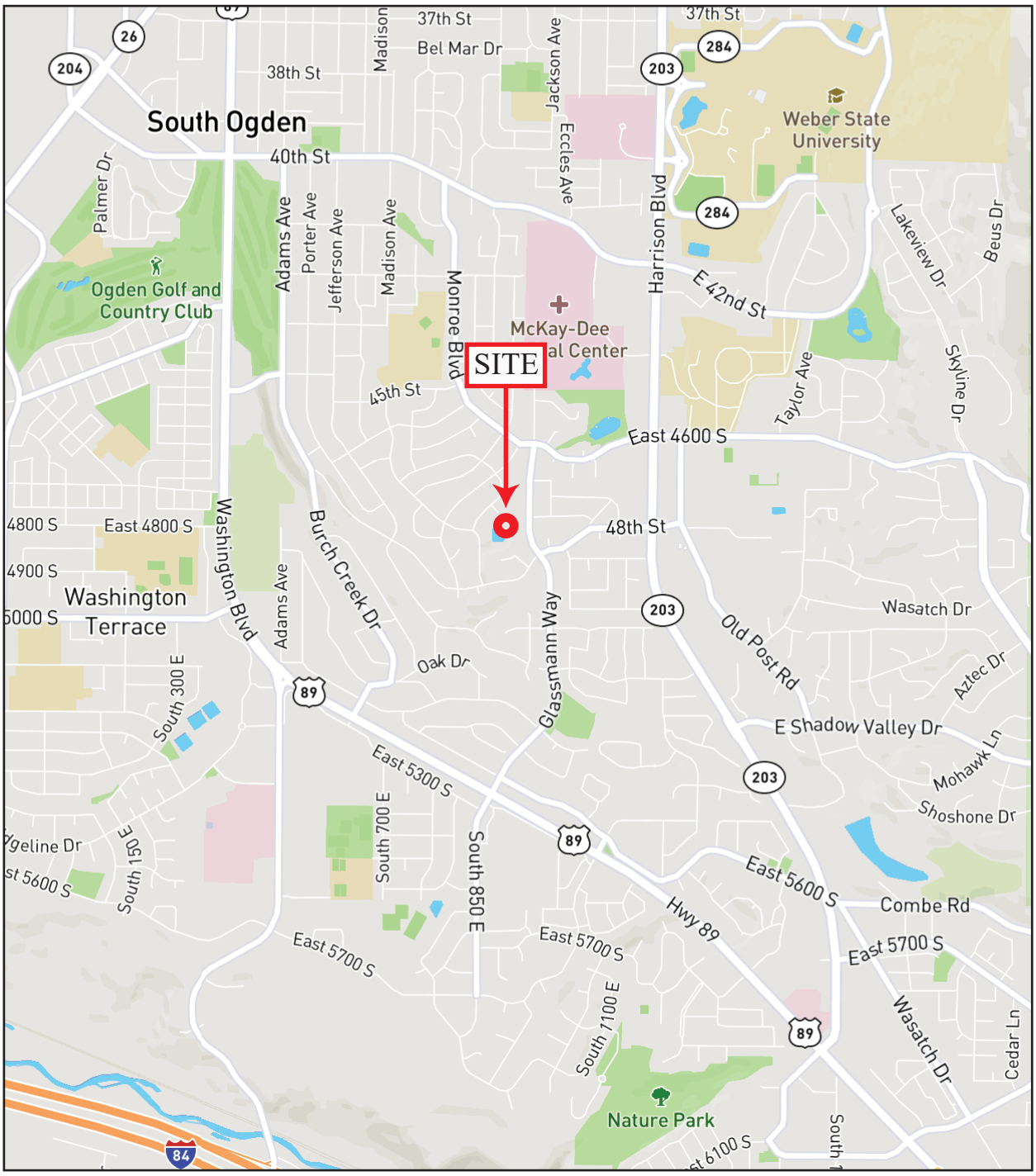
DAO/ADS:jlh

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figure 3, Boring Log
Figure 4, Key to Boring Log (USCS)

Attachment 1, Foundation Exploration

Addressee (email)

ANDERSON ENGINEERING COMPANY INC
JOB NO. 2554-002-20



0.5 0 0.5 1 KM 1.5

0.2 0 0.2 0.4 0.6 0.8 1 MI 1.2

FIGURE 1
VICINITY MAP

REFERENCE:
ALL TRAILS - NATIONAL GEOGRAPHIC TERRAIN
DATED 2020

GSH

ANDERSON ENGINEERING COMPANY INC
JOB NO. 2554-002-20

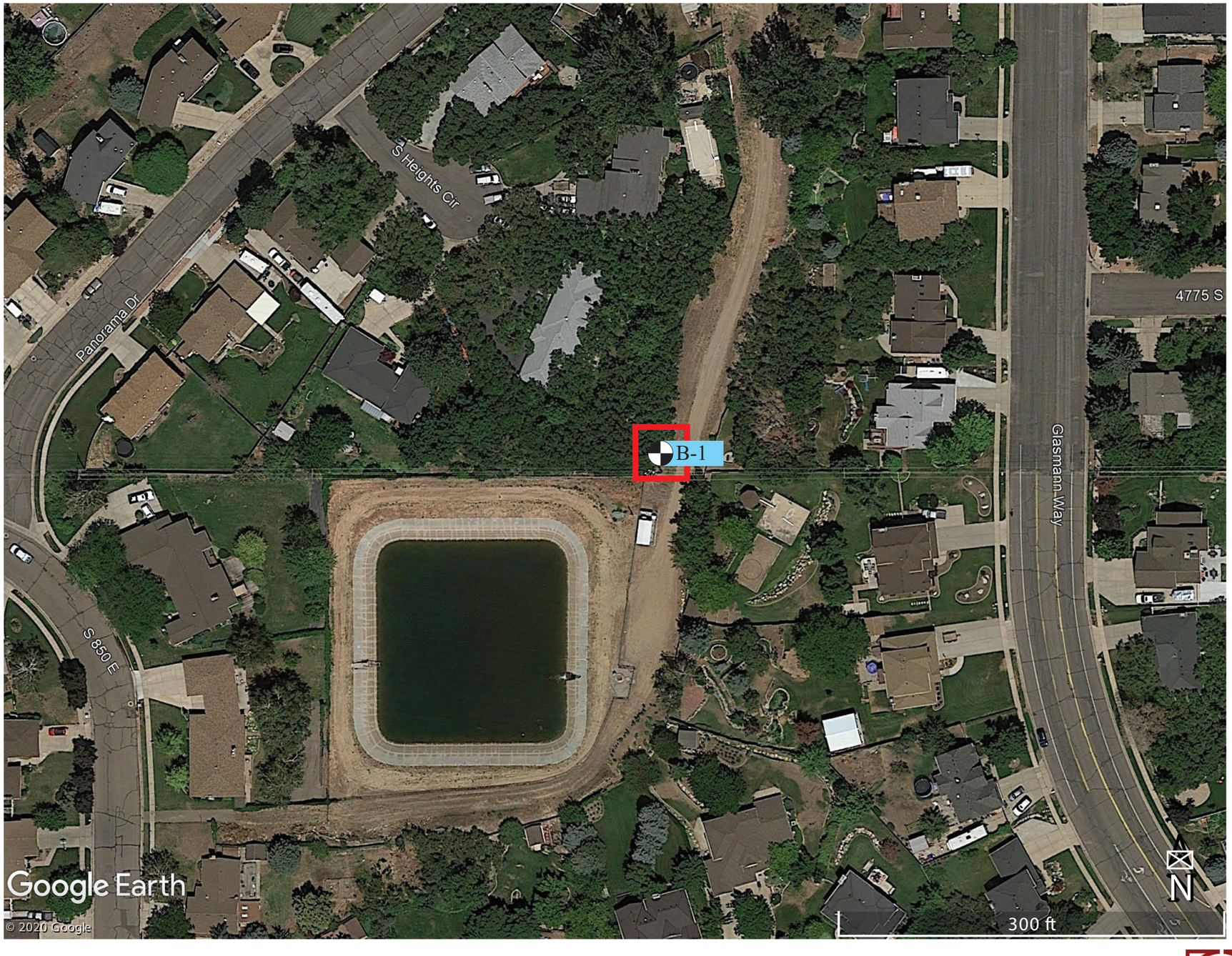


FIGURE 2
SITE PLAN

REFERENCE:
ADAPTED FROM GOOGLE EARTH
DATED 18 JULY 2019

GSH

BORING LOG

Page: 1 of 2

BORING: B-1

CLIENT: Anderson Engineering Company, Inc. PROJECT NUMBER: 2554-002-20

PROJECT: Ogden Tower Site DATE STARTED: 8/28/20 DATE FINISHED: 8/28/20

LOCATION: Approximately 4700 South Glasmann Way, Ogden, Utah GSH FIELD REP.: HB

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger HAMMER: Automatic WEIGHT: 140 lbs DROP: 30"

GROUNDWATER DEPTH: 17.8' (9/2/20) ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM	SILTY FINE SAND brown									slightly moist loose
				18							
			5	16							
			10	27		7.1	94				medium dense
		grades with trace clay	15	37		25.4	98				moist
▼											saturated
			20	39		25.9	95				
			25	15		22.4		35.9			

See Subsurface Conditions section in the report for additional information.

FIGURE 3

GSH

BORING LOG

Page: 2 of 2

BORING: B-1

CLIENT: Anderson Engineering Company, Inc. PROJECT NUMBER: 2554-002-20

PROJECT: Ogden Tower Site DATE STARTED: 8/28/20 DATE FINISHED: 8/28/20

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
			25	15		22.4		35.9			
		grades with occasional layers of fine sandy clay up to 2" thick									
		grades with occasional layers of clayey fine sand up to 2" thick	30	14		35.9		51.6			
		End of Exploration at 31.0'. Installed 1.25" diameter slotted PVC pipe to 31.0'.	35								
			40								
			45								
			50								

See Subsurface Conditions section in the report for additional information.

FIGURE 3
(continued)

CLIENT: Anderson Engineering Company, Inc.
PROJECT: Ogden Tower Site
PROJECT NUMBER: 2554-002-20

KEY TO BORING LOG

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫

COLUMN DESCRIPTIONS

① **Water Level:** Depth to measured groundwater table. See symbol below.

② **USCS:** (Unified Soil Classification System) Description of soils encountered; typical symbols are explained below.

③ **Description:** Description of material encountered; may include color, moisture, grain size, density/consistency,

④ **Depth (ft.):** Depth in feet below the ground surface.

⑤ **Blow Count:** Number of blows to advance sampler 12" beyond first 6", using a 140-lb hammer with 30" drop.

⑥ **Sample Symbol:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

⑦ **Moisture (%):** Water content of soil sample measured in laboratory; expressed as percentage of dryweight of

⑧ **Dry Density (pcf):** The density of a soil measured in laboratory; expressed in pounds per cubic foot.

⑨ **% Passing 200:** Fines content of soils sample passing a No. 200 sieve; expressed as a percentage.

⑩ **Liquid Limit (%):** Water content at which a soil changes from plastic to liquid behavior.

⑪ **Plasticity Index (%):** Range of water content at which a soil exhibits plastic properties.

⑫ **Remarks:** Comments and observations regarding drilling or sampling made by driller or field personnel. May include other field and laboratory test results using the following abbreviations:

CEMENTATION:

Weakly: Crumbles or breaks with handling or slight finger pressure.

Moderately: Crumbles or breaks with considerable finger pressure.

Strongly: Will not crumble or break with finger pressure.

MODIFIERS:

Trace <5%

Some 5-12%

With > 12%

MOISTURE CONTENT (FIELD TEST):

Dry: Absence of moisture, dusty, dry to the touch.

Moist: Damp but no visible water.

Saturated: Visible water, usually soil below water table.

Descriptions and stratum lines are interpretive; field descriptions may have been modified to reflect lab test results. Descriptions on the logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No. 200 sieve size.	GRAVELS More than 50% of coarse fraction retained on No. 4 sieve.	CLEAN GRAVELS (little or no fines)	GW	Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
			GP	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
		GRAVELS WITH FINES (appreciable amount of fines)	GM	Silty Gravels, Gravel-Sand-Silt Mixtures
			GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS More than 50% of coarse fraction passing through No. 4 sieve.	CLEAN SANDS (little or no fines)	SW	Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP	Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (appreciable amount of fines)	SM	Silty Sands, Sand-Silt Mixtures
			SC	Clayey Sands, Sand-Clay Mixtures
FINE-GRAINED SOILS More than 50% of material is smaller than No. 200 sieve size.	SILTS AND CLAYS Liquid Limit less than 50%		ML	Inorganic Silts and Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
			CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
			OL	Organic Silts and Organic Silty Clays o f Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH	Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils
			CH	Inorganic Clays of High Plasticity, Fat Clays
			OH	Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT	Peat, Humus, Swamp Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications.

STRATIFICATION:

DESCRIPTION	THICKNESS
Seam	up to 1/8"
Layer	1/8" to 12"

Occasional: One or less per 6" of thickness

Numerous; More than one per 6" of thickness

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Bulk/Bag Sample
- Standard Penetration Split Spoon Sampler
- Rock Core
- No Recovery
- 3.25" OD, 2.42" ID D&M Sampler
- 3.0" OD, 2.42" ID D&M Sampler
- California Sampler
- Thin Wall

WATER SYMBOL

Water Level

FIGURE 4

GSH

Attachment 1 – Foundation Exploration

September 25, 2020
Job No. 2554-002-20

Mr. Ryan D. Eddy
Anderson Engineering Company, Inc.
2053 North Hillcrest Road
Saratoga Springs, Utah 84045

Mr. Eddy:

Re: Letter – Addendum #1
Tower Foundation Update
Ogden Tower Site
Approximately 4700 South Glasmann Way
Ogden, Utah

Introduction

This letter serves as an addendum to the geotechnical study completed by GSH for the above-mentioned site dated September 17, 2020[1]. GSH was notified by Mr. Ryan Eddy of Anderson Engineering Company, Inc. that the foundation of the cell tower located at the above-referenced site may be a driven steel pipe pile.

Steel Pipe Pile Foundation

As stated in the previously referenced report, investigations to determine the type of existing foundation were inconclusive. Dimensions of the existing foundation must be confirmed prior to determination of the foundation's ability to support the proposed additional forces. The following parameters for the potentially existing steel pipe pile foundation are based on a 0.1875-inch pipe wall thickness and a diameter of 17-inch diameter steel circular pipe pile. Assumptions have been made in order to determine the ultimate capacities, such as properly installed, etc.

GSH performed a lateral analysis utilizing the soil values presented in Section 5.4, Drilled Pier Foundations, of the above-referenced report. The 0.1875-inch pipe wall thickness and 17-inch diameter was analyzed for pier depths between 10 to 20 feet below the surface. The analysis is based on a maximum lateral deflection of 1 inch. A vertical load of 20,000 pounds was used in the calculations. A moment load at the pile head was not incorporated.

[1] "Report, Updated Geotechnical Study, Ogden Tower Site, Approximately 4700 South Glasmann Way, Ogden, Utah." GSH Job No. 2554-002-20.

Steel Pipe Pile Diameter (in)	Steel Pipe Pile Wall Thickness (in)	Steel Pipe Pile Depth (feet)	Ultimate Maximum Shear Load (lbs)	Maximum Moment in Pile (in-lbs)
17	0.1875	10	20,770	689,919
		15	29,524	1,244,170
		20	29,478	1,253,154

Closure

If you have any questions or would like to discuss these items further, please feel free to contact us at 801.685.9190.

Respectfully submitted,

GSH Geotechnical, Inc.

Dion A. Obermeyer,
Staff Geologist

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
No. 334228
ALAN D. SPILKER
STATE OF UTAH

DAO/ADS:jlh

Addressee (email)

cc: Mr. Corey Anderson (email)
Anderson Engineering Company, Inc.