

Val Vista RV Park, LLC
Request for Extension of Construction Permit
Section 73.3598(b) Tolling and Extension of Permit Request
W16DN-D Traverse City, MI, Facility ID# 186363
W27DU-D Traverse City, MI, Facility ID# 186364

Val Vista RV Park, LLC (“Val Vista”) permittee of the construction permits (“CP”) for W16DN-D Traverse City, MI, Facility ID#186363 and W27DU-D Traverse City, MI, Facility ID# 186364 requests tolling and extension of its construction permits. Val Vista is a sister entity to a locally owned and operated television broadcasting station that serves the Traverse City/Cadillac Michigan local television community and its environs with a full menu of locally produced and focused news and information programming, as it prepares to provide service to its viewers in a “post-linear” television era.¹ In 2021, Val Vista purchased ten CPs (inclusive of W16DN-D and W27DU-D), which it intends to use to provide locally generated simultaneous viewing options in a remote portion of northern Michigan. Val Vista’s plan requires all ten CPs to be built and operated in order to provide full coverage to the communities it intends to serve. As of the date of this filing, Val Vista has constructed and licensed six of the licenses it purchased last year. As explained in greater detail below, Val Vista has been diligently working to complete construction on the remaining CPs, however, circumstances beyond Val Vista’s control, such as pandemic-related supply chain delays, weather, and unexpected construction requirements, have made it impossible to complete construction on W16DN-D and W27DU-D prior to the expiration of the tolling deadline.

I. Initial Delays Due to Canadian Clearance

First, out of the gate, Val Vista experienced delays in receiving a grant on its applications due to circumstances outside its control. Val Vista filed its assignment application on March 18, 2021. As noted above, however, Val Vista is serving the northern portion of Michigan, some of which includes locations near the Canadian border, which required Canadian clearance before the FCC could approve the applications. This need for clearance extended the time for the assignments to be granted, as Val Vista needed to ensure all of its applications were granted prior to proceeding to build any of the CPs. Val Vista received Canadian approval on June 15, 2021 and consummated the sales on June 29, 2021. After grant, Val Vista began diligently working to construct its CPs by reaching out to its tower company, ordering equipment and scheduling necessary work, as described below.

II. Initial Transmitter Installation Delays

On June 20, 2021, within a week of Canadian approval and two weeks before closing, Val Vista contacted GatesAir to obtain a quote for a transmitter and mask filter. On June 23, 2021, Val

¹ Netflix Co-CEO Reed Hastings predicts streaming will be the choice of viewers stating: “It’s definitely the end of linear TV over the next five to 10 years,” See: [Netflix's Hastings: Broadcast and Cable TV Will Swim With the Fishes in 5-10 Years | Next TV](#), July 21, 2022

Vista submitted a purchase order for the transmitter, and received an estimated shipment date of November 22, 2021, five months from the order date.² As Val Vista explained in its first tolling request, Gates Air was experiencing manufacturing delays due to a shortage of parts and raw materials.³ The transmitter was delivered to Val Vista's shipping company, Classic Cargo, on November 29, 2021, roughly a week later than the initial estimation. Classic Cargo arranged to deliver the transmitter the week of December 6, 2021. However, due to several weather related delays, the transmitter was not able to be delivered until December 21, 2021.

Once Val Vista had a delivery date, it contacted a local electrician to schedule installation of the transmitter. The electrician advised that they had low availability of breaker panels, breakers, and conduits due to supply chain related issues. Though there was some delay on installation of the transmitter, Val Vista took every effort to ensure that the transmitter was properly installed as quickly as possible, and, as was previously reported in its second tolling request,⁴ had installed the transmitter by April 6, 2022. Thus, Val Vista has made substantial efforts to ensure its CPs are constructed in a timely fashion, despite delays beyond its control.

III. Antenna Installation Delays⁵

Val Vista's combined antenna for W16DN-D and W27DU-D is to be installed on a tower owned by Northern Tower near Traverse City. As the tower owner, Northern Tower requires that analyses, construction work, and installations be completed through its own crews or through work that it has personally commissioned. Val Vista has investigated whether other towers in the region would be able to install the antenna more quickly, however, the investigation revealed that any attempt to move to a new tower would have resulted in additional delays.⁶ Thus, Val Vista's ability to timely complete construction is limited by the tower owner's ability to conduct construction and installation.

In mid-May 2021, while its application was still pending, Val Vista contacted Northern Tower to begin the process of obtaining permission to add two new transmitters to the site and mount the antenna on the tower. On June 18, 2021, Tim Sawyer, of Tim Sawyer Technical Consultants, sent design work for a combined, co-located antenna to Dielectric Antennas. On June 20, 2021, Dielectric responded with their own proposed design. Val Vista sent a purchase order to Dielectric on June 22, 2021.⁷

Soon after issuing the purchase order, the designs for the antenna were forwarded to Northern Tower, including the Dielectric specification sheet listing the size and weight together with a drawing of the antenna. Val Vista confirmed with Northern Tower that these designs could be

² See Attachment B

³ See Attachment C.

⁴ See Val Vista's Second Requests For Tolling for W16DN-D, LMS File No. 0000188967 and W27DU-D, LMS File No. 0000188976.

⁵ Attachment A hereto is a timeline of all steps Val Vista has taken to complete installation of the antenna.

⁶ See Statement of Timothy Sawyer P.E. Attachment R.

⁷ See Attachment D.

accommodated on the tower by phone, and Northern Tower agreed that it could be installed as designed.⁸

The Dielectric antenna was delivered to the Traverse City site on September 27, 2021. On that day, despite having been provided with the specifications nearly three months earlier, Northern Tower expressed surprise at the size of the antenna and required a new Structural Analysis (“SA”) be completed before the antenna could be mounted on the tower. Northern Tower started the process of obtaining the SA in November with a soil report.⁹

Once the soil report was delivered, the tower was examined and the SA was completed from December 2021 to January 2022. The SA was delivered to the Northern Tower on January 25, 2022. The SA concluded that the tower as constructed was failing, required reinforcing the tower legs, replacing guy wires, modifying the base foundation, and replacing the guy anchors before the antenna could be installed.¹⁰ Northern Tower then commissioned a new tower design, which took several weeks to complete, during which the design company discovered an error in the SA that had to be corrected.¹¹ The corrected SA demonstrated that only the foundation needed to be modified and that new anchors needed to be installed.¹² While this modified design required less construction work, it introduced new delays as new quotes and designs needed to be commissioned. Northern Tower commissioned new quotes for this work in late February 2022.¹³

Understanding that this work could take several months and concerned about its permit deadlines, Val Vista asked Northern Tower to install the antenna prior to the work being completed.¹⁴ Northern Tower was informed that the engineers could not, and would not authorize installation until the tower work was completed.¹⁵ Thus, all construction must be completed before Val Vista can install its antenna.

The tower modifications were finalized in March, and shipment of equipment was scheduled for April 26, 2022.¹⁶ Northern Tower contacted a construction company to schedule work on the modifications to begin at the end of April, consecutive with equipment delivery. There were some delays in ensuring that all equipment could be timely delivered to the site, which pushed the anticipated start time back a few weeks.

There were further Northern Tower delays due to the need to obtain permits for the project. In confirming the scope of the construction work, the construction company clarified that it would not accept responsibility to provide the needed permits.¹⁷ Thus, in April, Northern Tower contacted its local permitting agency to determine if permits were required for the

⁸ Val Vista’s First Request For Tolling for W16DN-D, LMS File No. 0000178655, and W27DU-D, LMS File No. 0000178649.

⁹ See Attachment E.

¹⁰ See Attachment G.

¹¹ See Attachment F.

¹² See Attachment H.

¹³ See Attachment H.

¹⁴ See Attachment I.

¹⁵ See Attachment I.

¹⁶ See Attachment J.

¹⁷ See Attachment K.

modifications.¹⁸ Northern Tower was informed that a permit was required, applied, and was granted a permit in May.¹⁹

Though the contractor had initially indicated it could start work at the end of April or early May, this was delayed by weather and the contractor's schedule.²⁰ The contractor visited the site in late May to inspect the site and equipment, and evaluate whether the ground was sufficiently dry to begin work. As Val Vista has explained in its prior filings, this region is prone to late spring snow and then subsequent rainstorms. The weather needed to be sufficiently clear for the contractor to begin work. Despite hopes that the contractor would be able to start sooner, the work had to be scheduled for the second week of June.²¹ At that time, the contractor anticipated that it would be able to pour the foundations and anchors for the guylines in one week, let it cure for a required 28 days, and then move the guylines to the new anchors, which would allow for the antenna to be installed in the second week of July.²²

The contractor performed a second inspection in June, when the contractor discovered the soil was looser than anticipated and that it would have to complete construction one step at a time, allowing 28 days for each new anchor in the project to completely cure before proceeding with the next.²³ Thus, the contractor anticipated it would have to pour the anchors one at a time, allowing 28 days the first to completely cure before moving the guyline, and then repeating that process for the second and third anchors, anticipating at least 84 days or about three months to complete the entire project. Beginning of the work was further delayed to accommodate the new soil situation.

The concrete for the foundation was finally poured on Tuesday, June 28, 2022.²⁴ The contractor was hopeful at that time that the cure time may be faster than anticipated. They planned to conduct a break test after ten days, and if the concrete tested at 75% or higher, then they could proceed to the next step. The contractor also advised at that time that he may be able to do up to two anchors at a time, depending on the composition of the soil, and that the anchors' cure time could also possibly be shortened to ten days. Val Vista was advised that Northern Tower did not expect to be able to finish installation of the antenna by July 31.

On July 21, 2022, Northern Tower advised that the foundation was complete, that the anchors could all be completed at the same time, and the three anchors and cages were installed in the ground, and were awaiting concrete.²⁵ Once the inspection has been completed, concrete will be poured, and the first break tests will be conducted after ten days. If the concrete tests at 75% or higher, then the guylines can be transferred within roughly ten days. If the concrete only requires ten days to cure, then the antenna will be installed likely by the end of August. If,

¹⁸ See Attachment L.

¹⁹ See Attachment L.

²⁰ See Attachment M.

²¹ See Attachment M.

²² See Attachment N.

²³ See Attachment O.

²⁴ See Attachment P.

²⁵ See Attachment Q.

however, the concrete takes the full 28 days to cure, then the antenna will not be installed until mid-September.²⁶

At this time, based on the timetable supplied by Northern Tower, Val Vista anticipates that it will need until September 30, 2022 to install and perform program testing to obtain the license.

IV. The Public Interest is in Favor of Additional Tolling

Val Vista recognizes that additional tolling is an extraordinary step, but the public interest is in favor of additional tolling at this time. First, Val Vista has not been dilatory in its attempts to construct this CP. As demonstrated above, Val Vista has made every attempt to complete construction on this CP not just in a timely manner, but as promptly as possible. Even before its assignment applications were granted, Val Vista started the administrative work of getting approval from the tower owner to install the necessary equipment. Val Vista ordered all necessary equipment within weeks of obtaining FCC approval of the assignment, and promptly installed the equipment it was able to install upon arrival. The final step in this process is installing the antenna on the tower, and substantial progress has been made to prepare the tower for this purpose. While there have been some delays, they were due to surprise announcements from the tower owner and outside forces beyond Val Vista's control. Additionally, the required tower modifications were beyond Val Vista's control, though Val Vista has regularly checked in with the tower owner, explored all possibilities to ensure installation could happen as quickly as possible, and promptly responded with information the tower owner required to complete the project. Thus, this request is not due to dilatory behavior on the part of Val Vista.

Second, substantial expense has already been expended by Val Vista to complete this project. As demonstrated above, all equipment is on hand, the construction work has started, and it is well on its way to being completed. Val Vista estimates it will be able to seek a license for this CP by the end of September, which demonstrates just how close the project is to completion. Denying additional tolling at this stage would mean that the costs Val Vista have already expended in its good faith attempt to complete construction of these permits as quickly as possible, would become sunken costs with no benefit to the public at all and the purchased and delivered transmitter, cables, antenna and ancillary equipment would become useless. Allowing this project to conclude, however, will result in more innovative local service to a region that desperately needs it.

Third, Val Vista has actually constructed and licensed six out of the ten CPs it purchased last year, which demonstrates that Val Vista is not requesting tolling out of bad faith. Val Vista needs all ten of the CPs to fully realize its network and serve this region with access to quality, local programming in a new wireless streaming format consistent with new developments in the broadcasting industry and changing viewer preferences. Val Vista intends to provide quality, in-depth, local news and programming that will serve this community. Denying tolling here would deny Val Vista the ability to enact this plan, which would not serve the public interest.

²⁶ See *id.*

Fourth, there is no other viable option. Val Vista has explored other tower locations, however, moving towers at this stage would increase the time to complete installation, not decrease it. Additionally, Val Vista has contemplated installing the antenna under an STA or in some sort of temporary manner, however, that would extend this project further and potentially compromise equipment that is still difficult to obtain. Thus, the only viable option for Val Vista is to get these CPs on air is at the current location after the construction is completed. Denying tolling means the CPs would have to be surrendered, which is not in the public interest.

Finally, granting this request will not create a run on the Commission's rules or procedures. As demonstrated above, Val Vista has been subject to a series of unique circumstances and delays beyond their control that justify tolling. This is not a generic problem that was a result of Val Vista's delay or that will result in a number of other individuals being able to circumvent the Commission's rules or procedures.

Accordingly, a tolling of the construction permits is requested until September 30, 2022 to allow for completion of the tower modifications and improvements. This application is in the public interest and will allow Val Vista to provide unique and new television services to Traverse City area viewers.

LIST OF ATTACHMENTS

- **Attachment A** – Timeline of Antenna Installation
- **Attachment B** – GatesAir Purchase Order
- **Attachment C** – Gates Air Letter
- **Attachment D** – Dielectric Purchase Order
- **Attachment E** – Email Exchange between Mannik Smith Group and Northern Tower regarding Soil Report
- **Attachment F** – Email exchange between GDP Group and Northern Tower regarding Structural Analysis
- **Attachment G** – Email from GDP Group regarding “Failing” Structural Analysis and Structural Analysis
- **Attachment H** – February 28, 2022 Email Exchange between Val Vista and Northern Tower regarding structural analysis and next steps
- **Attachment I** – Email exchange between Val Vista and Northern Tower regarding mounting antenna prior to construction
- **Attachment J** – Email exchange between Sabre Industry and Northern Tower and between Valmot and Northern Tower regarding ordering parts
- **Attachment K** – Email exchange between Mill-R Contracting and Northern Tower scheduling contractor work
- **Attachment L** – Email exchange between Northern Tower and Permitting Agency
- **Attachment M** – Email exchange between Mill-R Contracting and Northern Tower regarding updated construction schedule
- **Attachment N** – Email Exchange between Val Vista and Northern Tower regarding status of construction
- **Attachment O** – July 6, 2022 Letter from Northern Tower regarding construction delays
- **Attachment P** – June 29, 2022 Email from Northern Tower regarding updated construction completion
- **Attachment Q** – July 21, 2022 Email from Northern Tower regarding status of project
- **Attachment R** – Statement of Timothy Sawyer, PE
- **Attachment S** – Pictures of installed equipment

ATTACHMENT A

Timeline of Antenna Installation

- May 2021 – Val Vista contacts Northern Tower to begin process of obtaining permission to add two new transmitters to the site and mount the antenna on the tower.
- June 2021
 - June 18 – Tim Sawyer sent design work for combined, co-located antenna to Dielectric Antennas
 - June 20 – Dielectric responded with their own proposed design
 - June 22 – Val Vista sent Purchase order to Dielectric
 - Late June – Val Vista forwards antenna design to Northern Tower and confirms by phone that the antenna can be installed as designed
- July-September 2021 – antenna is manufactured and shipped to Val Vista
- September 2021
 - September 27 – Antenna is delivered to Traverse City and Northern Tower orally informs Val Vista that a Structural Analysis needs to be completed before the antenna is installed
- November 2021
 - November 15 - Northern Tower hires Mannik & Smith Group to conduct soil borings and produce a geotechnical report on the tower
 - November 17 – Mannik & Smith inform Northern Tower that they can schedule the examination of the site for December 6, 2021 and produce a report by December 17.
 - November 18 – Northern Tower informs Mannik & Smith that they may proceed
- December 2021
 - December 27 – Northern Tower contacts GDP Group to perform a Structural Analysis on the tower
- January 2022
 - January 4 – GDP Group requests pictures of the tower
 - January 7 – Northern Tower provides pictures to GDP Group
 - January 12 – GDP Group and Northern Tower exchange regarding proposed loading on the tower
 - January 25 – GDP Group returns a “failing” Structural Analysis to Northern Tower
 - January 26 – Northern Tower requests a modified tower design from GDP Group and GDP Group confirms that it will begin work on the tower design
 - January 27- Northern Tower and GDP Group exchange emails regarding photos for tower design
- February 2022
 - February 3-February 21- Northern Tower and GDP Group confer regarding tower engineering
 - February 22 – GDP Group provides updated Structural Analysis after discovering an error in the original and updated tower designs.
 - February 28 – Northern Tower requests new quotes for the tower modification

- March 2022
 - March 1 – Val Vista asks if they can mount the antenna prior to modification due to the upcoming construction deadlines
 - March 3 – Northern Tower requests quote for tower parts from Sabre Industries
 - March 10 – Northern Tower informs Val Vista that they cannot mount antenna before construction work is completed
 - March 13 – Northern Tower receives revised quote for tower contracting work from Mill-R Contracting
 - March 15 – Northern Tower orders parts from Sabre Industries
 - March 15 – Northern Tower orders parts from Valmont
 - March 16 – Northern Tower confirms whether Mill-R Contracting's work includes permitting
 - March 18 – Northern Tower requests Mill-R Contracting begin work at the end of April/beginning of May
- April 2022
 - April 25 – Northern Tower emails Permitting Agency to inquire whether permits are required
- May 2022
 - May 2 – Permitting Agency confirms permits will be required
 - May 3 – Northern Tower follows up with Mill-R Contracting regarding the beginning of the construction work
 - May 3-May 4 – Northern Tower applies for and provides additional information for permits
 - May 5 – Mill-R Contracting emails Northern Tower informing them that construction will begin the first week of June
 - May 11 – Permits granted
- June 2022
 - June 1 – Val Vista emails Northern Tower regarding status of antenna and Northern Tower reports that the contractor was scheduled to begin the following week and that they anticipated the antenna should be able to be installed by the 2nd week of July.

ATTACHMENT B

626448

Purchase Order

TO GATESAR INC		SHIP TO VAL VISTA RUPARK LLC	
ADDRESS 5300 KINGS ISLAND DR. ST101		ADDRESS 1 BROADCAST WAY	
CITY, STATE, ZIP MASON OH 45040		CITY, STATE, ZIP CADILLAC MI 49601	
DATE	DATE REQUIRED	TERMS	HOW SHIPPED
			REQ. NO. OR DEPT.
			FOR

QUANTITY ORDERED	QUANTITY RECEIVED	PLEASE SUPPLY LISTED ITEMS BELOW	PRICE	UNIT
1	1	CH 16 VAXTE-6 G2 TRANSMITTER	104,676.13	
2	1	CH 27 VAXTE-6 G2 TRANSMITTER	109,676.13	
3	1	MASK FILTER & COMBINER	40,520.89	
4	1	ELECTRICIAN	1,893.60	
5	1	INSTALLATION	20,558.82	
6				
7				
8		TRAVERSE CITY LP PROJECT		
9				
10				
11				
12				
13				
14		TOTAL	272,325.52	
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				

IMPORTANT

Purchase Order Number must appear on all invoices - packaging, etc.
Please notify us immediately if you are unable to complete the order by date specified.

Please send _____ copies of your INVOICE with ORIGINAL BILL OF LADING.

PURCHASER SIGNATURE






Quote Number: Q-93179
www.gatesair.com

To:

Val Vista RC Park, LLC
One Broadcast Way
Cadillac, MI 49601 USA

Attn: Larry O'Donnell
231/775-3478
larryodonnell@9and10news.com

From:

GatesAir, Inc.
5300 Kings Island Drive, Suite 101
Mason, OH 45040 USA

Brian Szewczyk
Global Sales
brian.szewczyk@gatesair.com

Summary – All Prices are in USD

Summary	Amount
A. Channel 16	\$104,676.13
B. Channel 27	\$104,676.13
C. Mask Filter and Combiner	\$40,520.84
D. Electrical	\$1,893.60
E. Installation	\$20,558.82
Total Quote Price (Optional Items Not Included)	\$272,325.52

Is the purchase of this equipment or services exempt from sales tax? YES or NO
If NO - sales tax will be added to your invoices at the rate assigned to the ship to address.

If YES - Sales Tax Exemption Number * _____ COPY OF CERTIFICATE MUST BE ATTACHED

*Pending

Who can we contact regarding sales tax questions on behalf of your company?

Name: CINDY GRANGER

Phone Number: 231-

email - "CindyGranger@9and10news.com"



Quote Number: Q-93179
www.gatesair.com

Bill To:
Val Vista RC Park, LLC
One Broadcast Way
Cadillac MI, 49601 USA
Attn:
Larry O'Donnell
231/775-3478
larryodonnell@9and10news.com

Ship To:
Val Vista RC Park, LLC
One Broadcast Way
Cadillac MI, 49601 USA
Attn:
Larry O'Donnell
231/775-3478
larryodonnell@9and10news.com

Quote #: Q-93179

Payment Terms: 1/3 Down with Order, 1/3 Prior to Ship, Balance
Net 30

Effective Date: June 3, 2021

Valid Through: July 3, 2021

Send Orders to
orders@gatesair.com

Freight Terms: Not Included

A. Channel 16

No.	Product #	Qty	Net Unit Price	Ext. Price
2	UAXTE-6-G2	1	\$89,101.35	\$89,101.35

UAXTE-6-G2

Maxiva Series High Efficiency UAXTE-6-G2 Air-Cooled, Solid-State, Digital Television Transmitter. Band IV/V, 470-750MHz. 3-1/8in transmitter output connector. Transmitter installed in a 37 RU standard 19in rack.
3000W Average Power Wide Band PA (470-750Mhz) (Before Mask filter)
3600W Average Power Band A 888E PA (470-608) (Before Mask filter)

Three-Phase, 208-240 or 380-415 Volts, -15%/+10%, 47-63Hz (see Transmitter Technical Manuals for AC installation information)

TRANSMITTER INCLUDES:

- (1) 2 RU Multi-Standard XTE Exciter/Driver with:
 - RTAC(TM) (Real-Time Adaptive Correction)
 - Modulation software upgradeable
 - Easy-to-use operator interface via standard Web browser and external PC
 - RTAC(TM) (Real-Time Adaptive Correction)
 - Front panel display and control
 - Built-in compliance monitoring
- (2) ASI/SMPTE-310 inputs with auto-switching
- (2) IP Transport inputs with auto-switching
- 10MHz and 1PPS input for timing reference
- Integrated GPS receiver (Antenna/cable sold separately)
- Built in battery UPS
- For ATSC 1.0 modulation, optional SFN (software key required)
- (1) UHF Broadband LDMOS Power Amplifier
- (1) PA Power Supply

HIGH EFFICIENCY POWER AMPLIFIER BLOCK:

- (6) 3 RU High Efficiency Amplifier Block, including:
 - (3) UHF High efficiency LDMOS Power Amplifier Pallets
 - (1) High efficiency switch mode Power Supply
 - Hot Swappable PA back plane
- (1) Integrated I/O panel with wiring from transmitter to the I/O panel
- (1) Internal Rack AC Distribution
- (1) Pre-filter measurement coupler
- (1) Low pass (Harmonic) Filter
- (1) Factory Test at Rated Customer Power
- (1) 37 RU standard Rack
- (1) Maxiva UAXTE Series Transmitter Manual

GatesAir

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Quote Number: Q-93179
www.gatesair.com

No.	Product #	Qty	Net Unit Price	Ext. Price
Options (not included, sold separately): - Secondary Exciter (Dual Exciter Option) - Redundant switch mode power supply (1 Per PA Block) - Mask Filter - Post Mask Filter Coupler				
3	PA-UAXTEG2-E+-BN-A	6	\$0.00	\$0.00
ASSY, PA MODULE, UAXTE-G2, TYPE 888E BAND "A" "PALLET/MODULE TYPE 888E+ BAND A" UHF 470-608MHz BANDED MODULE "FOR PA MODULE SELECTION WITH MAIN TRANSMITTER LINE ITEM" "MUST HAVE TRANSMITTER LINE ITEM"				
4	UAXTE-SW-AT3	2	\$0.00	\$0.00
UAXTE ATSC3 Modulation Software				
5	UAXTE-DD	1	\$12,609.35	\$12,609.35
UAXTE Dual Driver / Exciter option Includes Driver/exciter & Auto switching system (1) 2 RU Multi-Standard XTE Exciter/Driver with: RTAC(TM) (Real-Time Adaptive Correction) - Modulation software upgradeable - Easy-to use operator interface via standard Web browser and external PC - RTAC(TM) (Real-Time Adaptive Correction) - Front panel display and control - Built-in compliance monitoring - (2) ASI/SMPTE-310 inputs with auto-switching - (2) IP Transport inputs with auto-switching - 10MHz and 1PPS input for timing reference - Integrated GPS receiver (Antenna/cable sold separately) - Built in battery UPS - For ATSC 1.0 modulation, optional SFN (software key required) - (1) UHF Broadband LDMOS Power Amplifier - (1) PA Power Supply				
6	STDLINEKT3-1810FT	1	\$2,965.43	\$2,965.43
RF XMSN LINE 3-1/8 10FT KIT CONTAINS: QTY (1) 10FT PIECE OF 3-1/8 XMSN LINE QTY (2) UNFLANGED TO FLANGED ADAPTERS QTY (4) BULLETS QTY (8) COUPLING SLEEVES WITH INNERS QTY (4) 90 DERGEE EQUAL LENGTH UN-FLANGED ELBOW				
7	WNTY_STD	1	\$0.00	\$0.00
Standard Product Warranty: Warranty of GatesAir manufactured products valid 15 months from date of shipment. Refer to GatesAir Standard Terms and Condition of sales for warranty details.				
A. Channel 16 TOTAL:				\$104,676.13

B. Channel 27

No.	Product #	Qty	Net Unit Price	Ext. Price
9	UAXTE-6-G2	1	\$89,101.35	\$89,101.35
UAXTE-6-G2 Maxiva Series High Efficiency UAXTE-6-G2 Air-Cooled, Solid-State, Digital Television Transmitter. Band IV/V, 470-750MHz. 3-1/8in transmitter output connector. Transmitter installed in a 37 RU standard 19in rack.				

GatesAir



Quote Number: Q-93179
www.gatesair.com

No.	Product #	Qty	Net Unit Price	Ext. Price
	3000W Average Power Wide Band PA (470-750Mhz) (Before Mask filter) 3600W Average Power Band A 888E PA (470-608) (Before Mask filter) Three-Phase, 208-240 or 380-415 Volts, -15%/+10%, 47-63Hz (see Transmitter Technical Manuals for AC installation information) TRANSMITTER INCLUDES: (1) 2 RU Multi-Standard XTE Exciter/Driver with: RTAC(TM) (Real-Time Adaptive Correction) - Modulation software upgradeable - Easy-to use operator interface via standard Web browser and external PC - RTAC(TM) (Real-Time Adaptive Correction) - Front panel display and control - Built-in compliance monitoring - (2) ASI/SMPTE-310 inputs with auto-switching - (2) IP Transport inputs with auto-switching - 10MHz and 1PPS input for timing reference - Integrated GPS receiver (Antenna/cable sold separately) - Built in battery UPS - For ATSC 1.0 modulation, optional SFN (software key required) - (1) UHF Broadband LDMOS Power Amplifier - (1) PA Power Supply HIGH EFFICIENCY POWER AMPLIFIER BLOCK: (6) 3 RU High Efficiency Amplifier Block, including: - (3) UHF High efficiency LDMOS Power Amplifier Pallets - (1) High efficiency switch mode Power Supply - Hot Swappable PA back plane (1) Integrated I/O panel with wiring from transmitter to the I/O panel (1) Internal Rack AC Distribution (1) Pre-filter measurement coupler (1) Low pass (Harmonic) Filter (1) Factory Test at Rated Customer Power (1) 37 RU standard Rack (1) Maxiva UAXTE Series Transmitter Manual Options (not included, sold separately): - Secondary Exciter (Dual Exciter Option) - Redundant switch mode power supply (1 Per PA Block) - Mask Filter - Post Mask Filter Coupler			
10	PA-UAXTEG2-E+-BN-A	6	\$0.00	\$0.00
	ASSY, PA MODULE, UAXTE-G2, TYPE 888E BAND "A" "PALLET/MODULE TYPE 888E+ BAND A" UHF 470-608MHz BANDED MODULE "FOR PA MODULE SELECTION WITH MAIN TRANSMITTER LINE ITEM" "MUST HAVE TRANSMITTER LINE ITEM"			
11	UAXTE-SW-AT3	2	\$0.00	\$0.00
	UAXTE ATSC3 Modulation Software			
12	UAXTE-DD	1	\$12,609.35	\$12,609.35
	UAXTE Dual Driver / Exciter option Includes Driver/exciter & Auto switching system (1) 2 RU Multi-Standard XTE Exciter/Driver with: RTAC(TM) (Real-Time Adaptive Correction) - Modulation software upgradeable - Easy-to use operator interface via standard Web browser and external PC - RTAC(TM) (Real-Time Adaptive Correction) - Front panel display and control - Built-in compliance monitoring - (2) ASI/SMPTE-310 inputs with auto-switching			



Quote Number: Q-93179
www.gatesair.com

No.	Product #	Qty	Net Unit Price	Ext. Price
	- (2) IP Transport inputs with auto-switching - 10MHz and 1PPS input for timing reference - Integrated GPS receiver (Antenna/cable sold separately) - Built in battery UPS - For ATSC 1.0 modulation, optional SFN (software key required) - (1) UHF Broadband LDMOS Power Amplifier - (1) PA Power Supply			
13	STDLINEKT3-1810FT	1	\$2,965.43	\$2,965.43
	RF XMSN LINE 3-1/8 10FT KIT CONTAINS: QTY (1) 10FT PIECE OF 3-1/8 XMSN LINE QTY (2) UNFLANGED TO FLANGED ADAPTERS QTY (4) BULLETS QTY (8) COUPLING SLEEVES WITH INNERS QTY (4) 90 DERGEE EQUAL LENGTH UN-FLANGED ELBOW			
14	WNTY_STD	1	\$0.00	\$0.00
Standard Product Warranty: Warranty of GatesAir manufactured products valid 15 months from date of shipment. Refer to GatesAir Standard Terms and Condition of sales for warranty details.				
B. Channel 27 TOTAL:				\$104,676.13

C. Mask Filter and Combiner

No.	Product #	Qty	Net Unit Price	Ext. Price
15	GA999TO	1	\$40,520.84	\$40,520.84
	Dielectric ATSC 2 channel Mask Filter / Combiner 3-1/8" Inputs , Combined 3-1/8" 50 Ohm output, 8 Pole Mask filters Full service Mask Compliant DIE – QN19344044			
C. Mask Filter and Combiner TOTAL:				\$40,520.84

D. Electrical

No.	Product #	Qty	Net Unit Price	Ext. Price
16	7401278000	1	\$1,893.60	\$1,893.60
	PARALLEL SURGE SUPPRESSOR, FOR 3PH WYE OR DELTA. Parallel surge protection device combining spark gap type 1 lightning protection and pluggable MOV type 2 transient protection in a NEMA 4X polycarbonate enclosure for 115V-200V, 120V-208V, 120V-240V, 240V-277V & 380V-415V 3 phase Wye or Delta applications with common neutral & ground or Separate neutral & ground.			
D. Electrical TOTAL:				\$1,893.60

TOTAL: \$272,325.52



Quote Number: Q-93179
www.gatesair.com

This Quote, and any Order resulting from this Quote, is subject to the Standard Terms and Conditions of Sale for GATESAIR which can be located at <http://www.gatesair.com/company/legal-compliance/terms-conditions>, which are incorporated herein by reference. The Standard Terms and Conditions for GATESAIR shall apply to the exclusion of any other terms and conditions except where expressly agreed in writing and signed by GATESAIR. For a hard copy of the terms and conditions, please call U.S. (513) 459-3502 or fax your request to (513) 459-3796, Attn.: Legal Dept., or email your request to GAContracts@gatesair.com.

As a part of its marketing efforts, GatesAir may publish general information about this order including customer name, solutions acquired, application for which the solutions are intended, and deal value. GatesAir will not publicize specific prices or other specific Confidential Information.

☐ I do not authorize GatesAir to publicize this order.

Total Quote Price (Optional Items Not Included)

\$272,325.52

GatesAir Approval:

Brian Szewczyk, Global Sales

Customer Approval:

Title:

Date:

Purchase Order #:

Return signed quote to orders@gatesair.com or brian.szewczyk@gatesair.com

ATTACHMENT C



Brian J Szewczyk
5300 Kings Island Dr
Mason, OH USA 45040
513.459.3400
Brian.Szewczyk@gatesair.com
gatesair.com

December 29, 2021

Val Vista RV Park, LLC
One Broadcast Way
Cadillac, MI 49601

Dear Larry

Thank you for the time on the phone this afternoon. GatesAir is being impacted as like many businesses by the global supply chain issues resulting in significant delays in obtaining parts and raw materials needed to manufacture our products. The result of these ongoing issues is that the lead time for our manufactured products has significantly increased. GatesAir is hopeful that the New Year bring a normalization to these issues and a return to more normal lead times.

Regards,

A handwritten signature in blue ink, appearing to read "Brian J Szewczyk", with a long, horizontal, sweeping line extending to the right.

Brian J Szewczyk
Regional Sales Manager



ATTACHMENT D

626449

Purchase Order

TO DIELECTRIC		SHIP TO VALVITA RV PARK LLC	
ADDRESS 22 TOWER RD		ADDRESS 1 BROADCAST WAY	
CITY, STATE, ZIP RAYMOND MI 48071		CITY, STATE, ZIP CADILLAC MI 49601	
DATE	DATE REQUIRED	TERMS	HOW SHIPPED
			REQ. NO. OR DEPT.
		FOR	

QUANTITY ORDERED	QUANTITY RECEIVED	PLEASE SUPPLY LISTED ITEMS BELOW	PRICE	UNIT
1		QUOTE #210064CMZ-1	6324353	
2		CH 16 & 27 ANTENNA & MOUNTS		
3				
4				
5		TRAVERSE CITY L.P. PROJECT		
6				
7				
8				
9				
10				
11				
12				
13				
14		TOTAL	6324353	
15				
16				
17		MI TAX EXEMPT		
18		FORM TO FOLLOW		
19				
20				
21				
22				
23				
24				

IMPORTANT

Purchase Order Number must appear on all invoices - packaging, etc.
Please notify us immediately if you are unable to complete the order by date specified.

Please send _____ copies of your INVOICE with ORIGINAL BILL OF LADING.

ORIGINAL



Quote Document

22 Tower Road
Raymond, ME 04071
Tel: +1 207.655.8100
Fax: +1 2.7.655.8173
www.dielectric.com

Bill to: VAL VISTA RV PARK LLC
PO BOX 627
CADILLAC, MI 49601

Ship to: TBD

Quote Number	210064CMZ-1
Facility ID	
Quote Date	6/2/2021
Sales Person	ZUBA
Currency	USD

Payments	
Incoterms	FOB Raymond ME PPA
Freight Carrier	
Shipping Instructions	
Governing Terms	Terms and Conditions of Sales for Broadcast or Engineering Services (Rev C. 1 January 2016)

FOR W16DN AND W27DU TRAVERSE CITY, MI PAYMENT TERMS 50% DUE WITH ORDER, BALANCE NET 30 DAYS. SHIPMENT 60-75 DAYS ARO.

Line	Item	Item Description	Qty	Unit	Net Price	Extended Price
1	11000000077	ANTENNA - TUL-C3-4/12M-1 ELLIPTICALLY POLARIZED PANEL ANTENNA FOR CH 16 & 27. DESIGNED PER C-71717-1. INPUT 1-5/8" EIA. INCLUDES FACTORY ASSEMBLY TO SUPPORT SPLINE.	1	EA	\$44,160.00	\$44,160.00
2	11000000077	CUSTOM ANTENNA MOUNTING BRACKETS FROM SUPPORT SPLINE TO TOWER. CUSTOMER MUST PROVIDE ALL REQUIRED TOWER DETAIL/DRAWINGS WITHIN 10 DAYS OF ORDER	1	EA	\$6,698.00	\$6,698.00
3		**** TRANSMISSION LINE - FLEXIBLE 1-5/8" FOAM DIELECTRIC - 450 FT.	1	EA		
4	11000005560	FLEX FOAM 1-5/8 ANDREW AVA7-50	450	FT	\$9.51	\$4,280.18
5	11000006299	CONN 1-5/8 EIA AL7E158-PS FOR 1-50 ANDREW AVA7-50 FLEX FOAM	1	EA	\$505.96	\$505.96
6	300003558	FACTORY ATTACH 1-50 FOAM AVA7-50	1	EA	\$35.98	\$35.98
7	11000006299	CONN 1-5/8 EIA AL7E158-PS FOR 1-50 ANDREW AVA7-50 FLEX FOAM	1	EA	\$505.96	\$505.96
8	R006A35401	CONN STD ANCHOR 1-50 "QS"	1	EA	\$47.60	\$47.60
9	11000002344	FLEXLINE 1-5/8 HOISTING GRIP 24312A	3	EA	\$30.39	\$91.16
10	11000002346	FLEX 1-5/8 BTFLY HNGR 10PK 42396A-2	9	EA	\$17.31	\$155.83
11	11000002444	FLEXLINE RMA4 31670-4 10PK	18	EA	\$23.02	\$414.32
12	11000002447	FLEXLINE ANGLE ADPTR 10PK - 31768A	9	EA	\$71.74	\$645.66
13	11000002449	FLEXLINE HRDW KIT 31769-1 3/8 X 1" 10PK	1	EA	\$10.23	\$10.23
14	11000002345	FLEXLINE 1-5/8WALL/ROOF FEEDTHRU SCE-158	1	EA	\$78.98	\$78.98
15	11000002343	FLEXLINE 1-5/8 GROUNDING KIT 241088-4	3	EA	\$30.92	\$92.77
16	11000002385	FLEXLINE WEATHERPROOF KIT - 221213	1	EA	\$22.88	\$22.88
17	FIELD SERVICE	VSWR SYSTEM SWEEP AFTER INSTALLATION. INCLUDES ONE TECHNICIAN FOR ONE DAY ON SITE.	1	EA	\$5,500.00	\$5,500.00

TOTAL PRICE

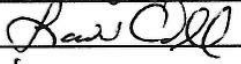
\$63,245.53

Bill to: Ship to:
VAL VISTA RV PARK LLC TBD
PO BOX 627
CADILLAC, MI 49601

Quote Number	210064CMZ-1
Facility ID	
Quote Date	6/2/2021
Sales Person	ZUBA
Currency	USD

Acceptance of Quotation

By execution below, or by sending a Purchase Order referencing this proposal, the undersigned accepts this proposal to furnish equipment and services on this schedule subject to the Terms and Conditions of Sale for Broadcast and Engineering Services attached hereto and/or incorporated by reference herein, and authorizes Dielectric LLC to proceed with the procurement and fabrication of this equipment. Your acceptance of this proposal is conditioned upon your acceptance of the Dielectric LLC terms and your agreement to be bound by and comply with the Dielectric LLC terms. Dielectric LLC's failure to object to provisions contained in any Purchase Order or other document from you shall not be construed as a waiver by Dielectric LLC of the Dielectric LLC Terms or an acceptance of any such provisions. Any conflicting or additional terms or conditions set forth in a Purchase Order or other document from you are not binding upon Dielectric LLC, and Dielectric LLC hereby expressly objects thereto. If for any reason this proposal is not accepted by Dielectric LLC any condition to an accepted order is removed. ONLY SUCH PORTION OF THE DOWN PAYMENT THAT HAS NOT BEEN COMMITTED OR SPENT WILL BE REFUNDED.

Compay Name: VAL VISTA RV PARK LLC (HERITAGE BROADCASTING)
Signature: 
Printed Name: LAWRENCE C. O'DONNELL
Title: CHIEF ENGINEER
Date: 22 JUN 2021
Requested Date: 6 SEP 2021

This requested ship date is subject to review by Dielectric. If Dielectric cannot meet the requested ship date, you will be contacted to work out a mutually acceptable shipment date. Dielectric requires that the customer take ownership of the product no later than 14 calendar days after the agreed-upon ship date.

ATTACHMENT E

RE: Northern Tower Erection Company

1 message

Ibraheem Shunnar <IShunnar@manniksmithgroup.com>

Sun, Nov 28, 2021 at 11:47 AM

To: Jeannie Gordon <jagordon@northerntowerco.com>

Cc: John Gordon <johngordon@northerntowerco.com>, "John S. Browning III" <JBrowning@manniksmithgroup.com>

Thank you Jeannie and John,

We will firm up our drilling schedule and let you know what days next week we will be drilling. Thanks.

Ibraheem Shunnar, PE

Principal

The Mannik & Smith Group, Inc.

2365 Haggerty Road

Canton, MI 48188

734-397-3100 x 6129 (Office)

734-755-9580 (Cell)

www.MannikSmithGroup.com



From: Jeannie Gordon <jagordon@northerntowerco.com>**Sent:** Monday, November 22, 2021 2:34 PM**To:** Ibraheem Shunnar <IShunnar@manniksmithgroup.com>**Cc:** John Gordon <johngordon@northerntowerco.com>; John S. Browning III <JBrowning@manniksmithgroup.com>**Subject:** Re: Message From Website - Geotechnical Survey

EXTERNAL EMAIL: Open with EXTREME caution!

Hello Ibraheem,

The signed proposal is attached. Thank you.

Jeannie Gordon

Northern Tower Erection Co

(231) 620-6048

On Nov 22, 2021, at 1:48 PM, Ibraheem Shunnar <IShunnar@manniksmithgroup.com> wrote:

Hello John,

Attached is our proposal. Please sign and return. We are looking forward to complete this project for you. Take care and have a happy holiday.

Ibraheem Shunnar, PE

Principal

The Mannik & Smith Group, Inc.

2365 Haggerty Road

Canton, MI 48188

734-397-3100 x 6129 (Office)

734-755-9580 (Cell)

www.MannikSmithGroup.com

From: John Gordon <johngordon@northerntowerco.com>
Sent: Thursday, November 18, 2021 3:38 PM
To: Ibraheem Shunnar <IShunnar@manniksmithgroup.com>
Cc: Jeannie Gordon <jagordon@northerntowerco.com>
Subject: RE: Message From Website - Geotechnical Survey

EXTERNAL EMAIL: Open with EXTREME caution!

I am good with the cost and timeline.

What do you need from us to get started?

Thank you.

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johngordon@northerntowerco.com

From: Ibraheem Shunnar <IShunnar@manniksmithgroup.com>
Sent: Wednesday, November 17, 2021 8:29 AM
To: John Gordon <johngordon@northerntowerco.com>
Subject: RE: Message From Website - Geotechnical Survey

Good Morning John,

We can do the work the week of December 6, 2021 and submit a report by December 17th. I hope this schedule meets your needs. Our cost will be \$8,200. Give me a call to discuss. (734) 755-9580. I am available before 9 or after 12. Thanks.

Ibraheem Shunnar, PE

Principal

The Mannik & Smith Group, Inc.

2365 Haggerty Road

Canton, MI 48188

734-397-3100 x 6129 (Office)

734-755-9580 (Cell)

www.MannikSmithGroup.com

From: John Gordon <johngordon@northerntowerco.com>

Sent: Tuesday, November 16, 2021 11:33 AM

To: Ibraheem Shunnar <IShunnar@manniksmithgroup.com>

Subject: RE: Message From Website - Geotechnical Survey

EXTERNAL EMAIL: Open with EXTREME caution!

Geotechnical report from adjacent tower.

Let me know if you have any questions.

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com

From: Ibraheem Shunnar <IShunnar@manniksmithgroup.com>
Sent: Monday, November 15, 2021 11:44 AM
To: Sheri Bokros <SBokros@manniksmithgroup.com>; John Gordon <johngordon@northerntowerco.com>
Cc: William Prall <WPrall@manniksmithgroup.com>
Subject: RE: Message From Website - Geotechnical Survey

John,

We can do geotechnical and GPR investigations. Can we talk over the phone tomorrow and discuss?

Ibraheem Shunnar, PE

Principal

The Mannik & Smith Group, Inc.

2365 Haggerty Road

Canton, MI 48188

734-397-3100 x 6129 (Office)

734-755-9580 (Cell)

www.MannikSmithGroup.com

From: Sheri Bokros <SBokros@manniksmithgroup.com>
Sent: Monday, November 15, 2021 11:33 AM
To: johngordon@northerntowerco.com
Cc: William Prall <WPrall@manniksmithgroup.com>; Ibraheem Shunnar <IShunnar@manniksmithgroup.com>; Walter Bolt <WBolt@manniksmithgroup.com>
Subject: RE: Message From Website - Geotechnical Survey

John,

Thank you for reaching out. I have cced Bill Prall with our Traverse City office and Ibraheem Shunnar with our Geoenvironmental Team to see if they can assist.

We appreciate the opportunity!

My Best,

Sheri

Sheri L. Bokros

Principal / Vice President

The Mannik & Smith Group, Inc.

sbokros@manniksmithgroup.com

419-279-5165 (Cell)

www.MannikSmithGroup.com

From: John Gordon

Sent: Monday, November 15, 2021 11:16 AM

To: Sheri Bokros <SBokros@manniksmithgroup.com>

Subject: Geotechnical Survey

EXTERNAL EMAIL: Open with EXTREME caution!

We are having a structural analysis performed on a tower and need to have soil borings and a geotechnical report.

The tower is located at 5256 Cedar Run Rd, Traverse City, MI 49684.

We do not know the size and depth of the existing anchors or the foundation. Do you perform an GPR services or have a company that you work with?

Thank you.

John Gordon Northern Tower 231-313-1133

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The information contained in this communication and its attachment(s) is intended only for the use of the individual to whom it is addressed and may contain information that is privileged, confidential or exempt from disclosure. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is prohibited. If you have received this communication in error, please notify postmaster@manniksmithgroup.com and delete the communication without retaining any copies. Thank you.

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ATTACHMENT F

Completed Modification Design - Cedar Run Rd Tower

3 messages

Lavanchy, Josh <jlavanchy@gpdgroup.com>

Tue, Feb 22, 2022 at 12:46 PM

To: John Gordon <johngordon@northerntowerco.com>

Cc: Jeannie Gordon <jagordon@northerntowerco.com>, "Daugherty, Brian" <bdaugherty@gpdgroup.com>, "Shumway, Micah" <mshumway@gpdgroup.com>

Good Afternoon John,

Please see the attached passing structural analysis with modification design for the above referenced site. Please note that we caught a mistake in the ice thickness used in the failing SA that was caused by recent issues with the ASCE online hazard tool. We updated the ice thickness from $\frac{3}{4}$ " to $\frac{1}{2}$ " per TIA-222-G which helped eliminate most of the tower leg failures.

Thank you for the opportunity to provide these engineering services. If you should have any questions or concerns please do not hesitate to call.

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP**T:** 317.295.3176**M:** 765.499.2572

From: John Gordon <johngordon@northerntowerco.com>**Sent:** Monday, February 21, 2022 7:45 AM**To:** Lavanchy, Josh <jlavanchy@gpdgroup.com>; Jeannie Gordon <jeannie.a.gordon@gmail.com>**Cc:** Jeannie Gordon <jagordon@northerntowerco.com>; Daugherty, Brian <bdaugherty@gpdgroup.com>**Subject:** RE: Cedar Run Rd Tower Structural Analysis**This Message originated outside your organization**

Josh,

For the preliminary design we'll go with the 8.5' deep and 20.5' long.

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com



From: Lavanchy, Josh <jlavanchy@gpdgroup.com>

Sent: Wednesday, February 16, 2022 4:48 PM

To: John Gordon <johngordon@northerntowerco.com>; Jeannie Gordon <jeannie.a.gordon@gmail.com>

Cc: Jeannie Gordon <jagordon@northerntowerco.com>; Daugherty, Brian <bdaugherty@gpdgroup.com>

Subject: RE: Cedar Run Rd Tower Structural Analysis

Hi John,

The engineering team is working on the new deadman anchor design and wanted to know if it would be preferred to install deeper or longer anchors? Based on our preliminary design, the tentative dimensions would be either 8.5' deep and 20.5' long OR 11' deep and 15' long.

Let me know your thoughts.

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP

T: 317.295.3176

M: 765.499.2572

From: John Gordon <johngordon@northerntowerco.com>

Sent: Thursday, February 3, 2022 3:17 PM

To: Lavanchy, Josh <jlavanchy@gpdgroup.com>; Jeannie Gordon <jeannie.a.gordon@gmail.com>

Cc: Jeannie Gordon <jagordon@northerntowerco.com>; Daugherty, Brian <bdaugherty@gpdgroup.com>

Subject: RE: Cedar Run Rd Tower Structural Analysis

This Message originated outside your organization

Josh,

There is no issue with bringing the anchors inward. All anchors are on the edge of the property line.

All guy lines were replaced April 2015.

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com



From: Lavanchy, Josh <jlavanchy@gpdgroup.com>

Sent: Thursday, February 3, 2022 1:49 PM

To: John Gordon <johngordon@northerntowerco.com>; Jeannie Gordon <jeannie.a.gordon@gmail.com>

Cc: Jeannie Gordon <jagordon@northerntowerco.com>; Daugherty, Brian <bdaugherty@gpdgroup.com>

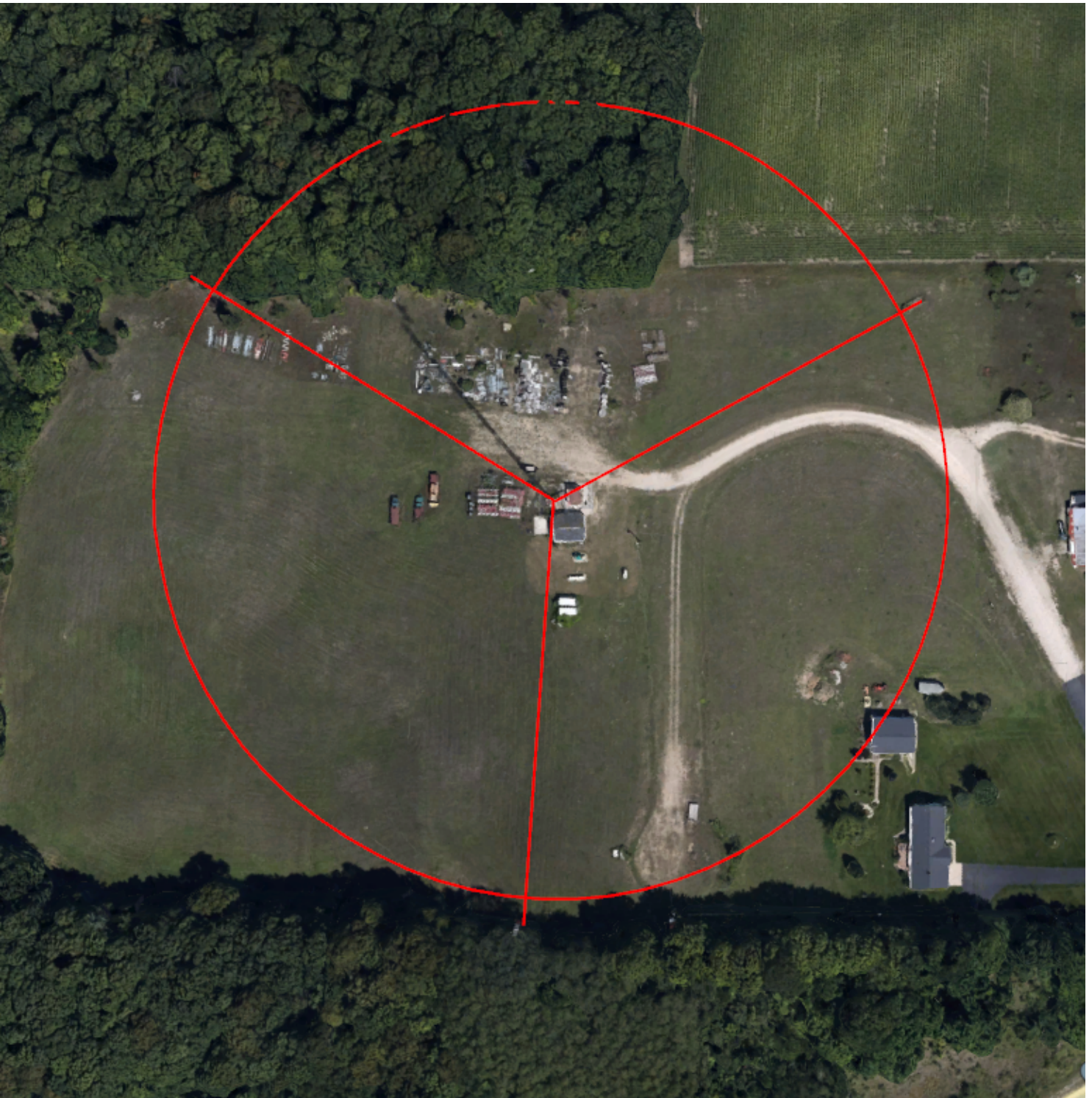
Subject: RE: Cedar Run Rd Tower Structural Analysis

Hi John/Jeannie,

Our engineers have a question regarding the location of the new guy anchors. Can you advise?

Bringing the anchor radii inward is better overall for the tower rating, and would allow for the re-use of the existing wires if they are in good condition, but will we be able to move the anchors and compounds in 25' to 30'? It doesn't look like the south and northwest anchors will be able to move outward anyway without possibly removing some trees.

Below is roughly the proposed radius if we move them inward. Looking at a 385' to 390' radius to the point of daylight.



Josh Lavanchy, EI
Associate Construction Manager

GPD GROUP

T: 317.295.3176

M: 765.499.2572

From: John Gordon <johngordon@northerntowerco.com>
Sent: Thursday, January 27, 2022 4:06 PM
To: Lavanchy, Josh <jlavanchy@gpdgroup.com>; Jeannie Gordon <jeannie.a.gordon@gmail.com>
Cc: Jeannie Gordon <jagordon@northerntowerco.com>; Daugherty, Brian <bdaugherty@gpdgroup.com>
Subject: RE: Cedar Run Rd Tower Structural Analysis

This Message originated outside your organization

Pictures have been uploaded. Let me know if you need more.

We do not have a drawing showing where the rebar is in tower base foundation. Is there a way to check for rebar that is non-destructive?

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johngordon@northerntowerco.com



From: Lavanchy, Josh <jlavanchy@gpdgroup.com>
Sent: Thursday, January 27, 2022 11:48 AM
To: Jeannie Gordon <jeannie.a.gordon@gmail.com>
Cc: John Gordon <johngordon@northerntowerco.com>; Jeannie Gordon <jagordon@northerntowerco.com>; Daugherty, Brian <bdaugherty@gpdgroup.com>
Subject: RE: Cedar Run Rd Tower Structural Analysis

Jeannie/John,

Could you upload any and all full size photos you have for this site to our FTP portal? I've attached directions.

Additionally, were you able to locate any steel rebar in the tower base foundation? Do you know if this was checked?

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP

T: 317.295.3176

M: 765.499.2572

From: Lavanchy, Josh
Sent: Wednesday, January 26, 2022 2:11 PM
To: Jeannie Gordon <jeannie.a.gordon@gmail.com>
Cc: John Gordon <john.gordon@northerntowerco.com>; Jeannie Gordon <jagordon@northerntowerco.com>; Daugherty, Brian <bdaugherty@gpdgroup.com>
Subject: RE: Cedar Run Rd Tower Structural Analysis

Thanks Jeannie. We will have these placed in production. Please expect drawings in 15 to 20 business days.

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP

T: 317.295.3176

M: 765.499.2572

From: Jeannie Gordon <jeannie.a.gordon@gmail.com>
Sent: Wednesday, January 26, 2022 10:18 AM
To: Lavanchy, Josh <jlavanchy@gpdgroup.com>
Cc: John Gordon <john.gordon@northerntowerco.com>; Jeannie Gordon <jagordon@northerntowerco.com>; Daugherty, Brian <bdaugherty@gpdgroup.com>
Subject: Re: Cedar Run Rd Tower Structural Analysis

This Message originated outside your organization

Hello Josh,

Please proceed with the mod design. The PO is attached. Thank you.

Jeannie Gordon

Northern Tower Erection Co

(231) 620-6048

On Jan 25, 2022, at 11:28 AM, Lavanchy, Josh <jlavanchy@gpdgroup.com> wrote:

Good Morning John,

Please find the attached failing SA for the above referenced site.

Based upon the analysis results we recommend reinforcing the tower legs from 0' – 300', replacing the guy wires at 302', modifying the tower base foundation, and replacing the guy anchors. All modifications must be engineered and are beyond the scope of this report.

Our quote for the modification design is \$3250. If you would like to move forward with the design, please provide a PO.

Thank you for the opportunity to provide these engineering services.

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP

T: 317.295.3176

M: 765.499.2572

From: John Gordon <johngordon@northerntowerco.com>
Sent: Wednesday, January 12, 2022 11:20 AM
To: Lavanchy, Josh <jlavanchy@gpdgroup.com>; Jeannie Gordon <jagordon@northerntowerco.com>
Cc: Daugherty, Brian <bdaugherty@gpdgroup.com>
Subject: RE: Cedar Run Rd Tower Structural Analysis

This Message originated outside your organization

Josh,

Yes, there is proposed loading for the tower. Please see the "proposed" area in the appurtenances spreadsheet.

Let me know if you have any other questions or need more information.

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

john.gordon@northerntowerco.com



From: Lavanchy, Josh <jlavanchy@gpdgroup.com>

Sent: Wednesday, January 12, 2022 11:04 AM

To: Jeannie Gordon <jagordon@northerntowerco.com>

Cc: John Gordon <john.gordon@northerntowerco.com>; Daugherty, Brian <bdaugherty@gpdgroup.com>

Subject: RE: Cedar Run Rd Tower Structural Analysis

John,

Can you confirm there is no proposed loading to be considered for the structural?

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP

T: 317.295.3176

M: 765.499.2572

From: Lavanchy, Josh

Sent: Wednesday, January 12, 2022 10:35 AM

To: Jeannie Gordon <jagordon@northerntowerco.com>

Cc: John Gordon <john.gordon@northerntowerco.com>; Daugherty, Brian <bdaugherty@gpdgroup.com>

Subject: RE: Cedar Run Rd Tower Structural Analysis

Thanks Jeannie! We will get this set up and in our queue.

Please let us know if you need anything else.

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP

T: 317.295.3176

M: 765.499.2572

From: Jeannie Gordon <jagordon@northerntowerco.com>
Sent: Tuesday, January 11, 2022 4:10 PM
To: Lavanchy, Josh <jlavanchy@gpdgroup.com>
Cc: John Gordon <johngordon@northerntowerco.com>
Subject: Fwd: Cedar Run Rd Tower Structural Analysis

This Message originated outside your organization

Hi Josh,

The signed Terms & Conditions, and PO#2022111CRTC are attached. Thank you.

Jeannie Gordon

Northern Tower Erection Co

(231) 620-6048

Begin forwarded message:

From: John Gordon <johngordon@northerntowerco.com>
Date: January 11, 2022 at 11:13:03 AM EST
To: Jeannie Gordon <jagordon@northerntowerco.com>
Subject: Fwd: Cedar Run Rd Tower Structural Analysis

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johngordon@northerntowerco.com

From: Lavanchy, Josh <jlavanchy@gpdgroup.com>
Sent: Tuesday, January 11, 2022 10:06:40 AM
To: John Gordon <johngordon@northerntowerco.com>
Subject: RE: Cedar Run Rd Tower Structural Analysis

Hi John,

Please find the POR for \$2000 attached to complete a structural analysis. If you would like to move forward, please provide a PO/check and sign & return the attached terms & conditions.

Thank you for the opportunity!

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP

T: 317.295.3176

M: 765.499.2572

From: John Gordon <johngordon@northerntowerco.com>
Sent: Friday, January 7, 2022 4:15 PM
To: Lavanchy, Josh <jlavanchy@gpdgroup.com>
Subject: RE: Cedar Run Rd Tower Structural Analysis

This Message originated outside your organization

Josh,

Attached are the pictures you asked for.

Please let me know if you need anything else.

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com

<image001.png>

From: Lavanchy, Josh <jlavanchy@gpdgroup.com>
Sent: Tuesday, January 4, 2022 11:36 AM
To: John Gordon <johngordon@northerntowerco.com>
Subject: RE: Cedar Run Rd Tower Structural Analysis

Overall tower, tower faces, tower base, guy anchors.

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP

T: 317.295.3176

M: 765.499.2572

From: John Gordon <johngordon@northerntowerco.com>
Sent: Tuesday, January 4, 2022 11:02 AM
To: Lavanchy, Josh <jlavanchy@gpdgroup.com>
Subject: RE: Cedar Run Rd Tower Structural Analysis

This Message originated outside your organization

Sure. Are there specific pictures you want?

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com

<image001.png>

From: Lavanchy, Josh <jlavanchy@gpdgroup.com>
Sent: Tuesday, January 4, 2022 10:48 AM
To: John Gordon <johngordon@northerntowerco.com>
Subject: RE: Cedar Run Rd Tower Structural Analysis

John,

Can you provide any photos?

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP

T: 317.295.3176

M: 765.499.2572

From: John Gordon <johngordon@northerntowerco.com>
Sent: Monday, December 27, 2021 3:24 PM
To: Lavanchy, Josh <jlavanchy@gpdgroup.com>
Subject: Cedar Run Rd Tower Structural Analysis

This Message originated outside your organization

Hi Josh,

We need a structural done on this tower.

Attached is hopefully all of the information you need. Let me know if you need more.

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com

<image001.png>

<2022.01.11 - Cedar Run Rd - GPD POR w Terms and Conditions.pdf>

2 attachments



2022.02.22_Cedar Run Rd_Modification Design.pdf
1642K



2022.02.22_Cedar Run Rd_Passing SA with Mods.pdf
1588K

John Gordon <johngordon@northerntowerco.com>

Thu, Mar 10, 2022 at 9:53 AM

To: "Lavanchy, Josh" <jlavanchy@gpdgroup.com>

Cc: Jeannie Gordon <jagordon@northerntowerco.com>, "Daugherty, Brian" <bdaugherty@gpdgroup.com>, "Shumway, Micah" <mshumway@gpdgroup.com>

Josh,

Can we get engineering permission to proceed with the proposed lines and antennas before the modifications are complete? Our customers have an FCC deadline to meet and need to get the equipment installed as soon as possible.

Thank you.

[Quoted text hidden]

Lavanchy, Josh <jlavanchy@gpdgroup.com>

Thu, Mar 10, 2022 at 11:04 AM

To: John Gordon <johngordon@northerntowerco.com>

Cc: Jeannie Gordon <jagordon@northerntowerco.com>, "Daugherty, Brian" <bdaugherty@gpdgroup.com>, "Shumway, Micah" <mshumway@gpdgroup.com>

Hi John,

After review, this site unfortunately does not fully qualify for the proposed loading to be installed prior to modifications being complete. All scope items with the exception of the new diagonal bracing from 2'-22' & 202'-222' would need to be installed first in order to allow the proposed loading to be installed early.

Let me know if there are any further questions.

[Quoted text hidden]

ATTACHMENT G

Fwd: Cedar Run Rd Tower Structural Analysis

Lavanchy, Josh <jlavanchy@gpdgroup.com>

Tue, Jan 25, 2022 at 11:27 AM

To: John Gordon <johngordon@northerntowerco.com>, Jeannie Gordon <jagordon@northerntowerco.com>

Cc: "Daugherty, Brian" <bdaugherty@gpdgroup.com>

Good Morning John,

Please find the attached failing SA for the above referenced site.

Based upon the analysis results we recommend reinforcing the tower legs from 0' – 300', replacing the guy wires at 302', modifying the tower base foundation, and replacing the guy anchors. All modifications must be engineered and are beyond the scope of this report.

Our quote for the modification design is \$3250. If you would like to move forward with the design, please provide a PO.

Thank you for the opportunity to provide these engineering services.

Josh Lavanchy, EI

Associate Construction Manager

GPD GROUP**T:** 317.295.3176**M:** 765.499.2572

From: John Gordon <johngordon@northerntowerco.com>**Sent:** Wednesday, January 12, 2022 11:20 AM**To:** Lavanchy, Josh <jlavanchy@gpdgroup.com>; Jeannie Gordon <jagordon@northerntowerco.com>**Cc:** Daugherty, Brian <bdaugherty@gpdgroup.com>**Subject:** RE: Cedar Run Rd Tower Structural Analysis**This Message originated outside your organization**

[Quoted text hidden]



2022.01.25_Cedar Run Rd_Failing Structural Analysis.pdf

1442K

NORTHERN TOWER

Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
(231) 947-6048



GPD GROUP

Professional Corporation

Brian Daugherty
520 South Main Street, Suite 2531
Akron, OH 44311
(216) 927-8687
bdaugherty@gpdgroup.com

GPD# 2022701.68

January 24, 2022

COMPREHENSIVE STRUCTURAL ANALYSIS REPORT

CLIENT DESIGNATION: **Site Name:** **Cedar Run Rd**

ANALYSIS CRITERIA: **Codes:** **TIA-222-G & 2015 Michigan Building Code**
115 mph (ultimate 3-second gust) w/ 0" ice
89 mph (nominal 3-second gust) w/ 0" ice
50 mph (3-second gust) w/ 0.75" ice

SITE DATA: **5256 Cedar Run Road, Traverse City, MI 49684**
Grand Traverse County
Latitude 44° 45' 37.62" N, Longitude 85° 40' 58.58" W
570' Guyed Tower

To whom it may concern,

GPD is pleased to submit this Comprehensive Structural Analysis Report to determine the structural integrity of the aforementioned tower. The purpose of the analysis is to determine the suitability of the tower with the existing and proposed loading configuration detailed in the analysis report.

Analysis Results

Tower Stress Level with Proposed Equipment:	146.5%	Fail
Foundation Ratio with Proposed Equipment:	>200.0%	Fail

We at GPD appreciate the opportunity of providing our continuing professional services to you and Northern Tower Erection Company. If you have any questions or need further assistance on this or any other projects please do not hesitate to call.

Respectfully submitted,

Christopher J. Scheks
Michigan #: 6201060804



1/24/2022

SUMMARY & RESULTS

The purpose of this analysis was to verify whether the existing structure is capable of carrying the proposed loading configuration as specified by Northern Tower.

This analysis utilizes an ultimate 3-second gust wind speed of 115 mph (converted to an equivalent 89 mph nominal 3-second gust wind speed per Section 1609.3.1 for use with TIA-222-G) as required by the 2015 Michigan Building Code. Applicable Standard references and design criteria are listed in Appendices A & B.

The proposed coax shall be installed as shown in Appendices A & B for the analysis results to be valid.

TOWER SUMMARY AND RESULTS

Member	Capacity	Results
Legs	146.5%	Fail
Diagonals	70.5%	Pass
Horizontals	38.0%	Pass
Member Bolts	70.5%	Pass
Guy Wires	107.5%	Fail
Base Foundation	>200.0%	Fail
Guy Anchors	>200.0%	Fail

RECOMMENDATIONS

We recommend reinforcing the tower legs from 0' – 300', replacing the guy wires at 302', modifying the tower base foundation, and replacing the guy anchors. All modifications must be engineered and are beyond the scope of this report

ANALYSIS METHOD

tnxTower (Version 8.1.1.0), a commercially available software program, was used to create a three-dimensional model of the tower and calculate primary member stresses for various load cases. Selected output from the analysis is included the report appendices. The following table details the information provided to complete this structural analysis. This analysis is solely based on this information.

DOCUMENTS PROVIDED

Document	Remarks	Source
Loading Document	Northern Tower Erection Company	Northern Tower
Tower Design	Not Provided	N/A
Foundation Design	Not Provided	N/A
Geotechnical Report	Mannik Smith Group Project #: N2940001, dated 12/14/2021	Northern Tower
Tower Mapping	Northern Tower Erection Company, dated 1/8/2010	Northern Tower
Foundation Mapping	Northern Tower Erection Company, dated 1/8/2010	Northern Tower
Previous Tower Analysis	Not Provided	N/A

ASSUMPTIONS

This structural analysis is based on the theoretical capacity of the members and is not a condition assessment of the tower. This analysis is from information supplied, and therefore, its results are based on and are as accurate as that supplied data. GPD has made no independent determination, nor is it required to, of its accuracy. The following assumptions were made for this structural analysis.

1. The tower member sizes and shapes are considered accurate as supplied. The material grade is as per data supplied and/or as assumed and as stated in the materials section.
2. The appurtenance configuration is as supplied, determined from available photos, and/or as modeled in the analysis. It is assumed to be complete and accurate. All antennas, mounts, coax and waveguides are assumed to be properly installed and supported as per manufacturer requirements.
3. All mounts, if applicable, are considered adequate to support the loading. No actual analysis of the mount(s) is performed. This analysis is limited to analyzing the tower only.
4. The soil parameters are as per data supplied or as assumed and stated in the calculations.
5. Foundations are properly designed and constructed to resist the original design loads indicated in the documents provided.
6. The tower and structures have been properly maintained in accordance with TIA Standards and/or with manufacturer's specifications.
7. All welds and connections are assumed to develop at least the member capacity unless determined otherwise and explicitly stated in this report.
8. All prior structural modifications, if applicable, are assumed to be as per data supplied/available and to have been properly installed.
9. Loading interpreted from photos is accurate to $\pm 5'$ AGL, antenna size accurate to ± 3.3 sf, and coax equal to the number of existing antennas without reserve.
10. All existing and proposed loading has been taken from the available site photos as well as documents supplied to GPD at the time of generating this report. All such documents are listed in the Documents Provided Table and are assumed to be accurate. GPD is not responsible for loading scenarios outside those conveyed in the supplied documentation.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and GPD should be allowed to review any new information to determine its effect on the structural integrity of the tower.

DISCLAIMER OF WARRANTIES

GPD has not performed a recent site visit to the tower to verify the member sizes or antenna/coax loading. If the existing conditions are not as represented on the tower elevation contained in this report, we should be contacted immediately to evaluate the significance of the discrepancy. This is not a condition assessment of the tower or foundation. This report does not replace a full tower inspection. The tower and foundations are assumed to have been properly fabricated, erected, maintained, in good condition, twist free, and plumb.

The engineering services rendered by GPD in connection with this Comprehensive Structural Analysis are limited to a computer analysis of the tower structure and theoretical capacity of its main structural members. No allowance was made for any damaged, bent, missing, loose, or rusted members (above and below ground). No allowance was made for loose bolts or cracked welds.

This analysis is limited to the designated maximum wind and seismic conditions per the governing tower standards and code. Wind forces resulting in tower vibrations near the structure's resonant frequencies were not considered in this analysis and are outside the scope of this analysis. Lateral loading from any dynamic response was not evaluated under a time-domain based fatigue analysis.

GPD does not analyze the fabrication of the structure (including welding). It is not possible to have all the very detailed information needed to perform a thorough analysis of every structural sub-component and connection of an existing tower. GPD provides a limited scope of service in that we cannot verify the adequacy of every weld, plate connection detail, etc. The purpose of this report is to assess the capability of adding appurtenances usually accompanied by transmission lines to the structure.

It is the owner's responsibility to determine the amount of ice accumulation in excess of the code specified amount, if any, that should be considered in the structural analysis.

The attached sketches are a schematic representation of the analyzed tower. If any material is fabricated from these sketches, the contractor shall be responsible for field verifying the existing conditions, proper fit, and clearance in the field. Any mentions of structural modifications are reasonable estimates and should not be used as a precise construction document. Precise modification drawings are obtainable from GPD, but are beyond the scope of this report.

Miscellaneous items such as antenna mounts, etc., have not been designed or detailed as a part of our work. We recommend that material of adequate size and strength be purchased from a reputable tower manufacturer.

Towers are designed to carry gravity, wind, and ice loads. All members, legs, diagonals, struts, and redundant members provide structural stability to the tower with little redundancy. Absence or removal of a member can trigger catastrophic failure unless a substitute is provided before any removal. Legs carry axial loads and derive their strength from shorter unbraced lengths by the presence of redundant members and their connection to the diagonals with bolts or welds. If the bolts or welds are removed without providing any substitute to the frame, the leg is subjected to a higher unbraced length that immediately reduces its load carrying capacity. If a diagonal is also removed in addition to the connection, the unbraced length of the leg is greatly increased, jeopardizing its load carrying capacity. Failure of one leg can result in a tower collapse because there is no redundancy. Redundant members and diagonals are critical to the stability of the tower.

GPD makes no warranties, expressed and/or implied, in connection with this report and disclaims any liability arising from material, fabrication, and erection of this tower. GPD will not be responsible whatsoever for, or on account of, consequential or incidental damages sustained by any person, firm, or organization as a result of any data or conclusions contained in this report. The maximum liability of GPD pursuant to this report will be limited to the total fee received for preparation of this report.

APPENDIX A

Tower Analysis Summary Form

Tower Analysis Summary Form

General Info

Site Name	Cedar Run Rd
Site Number	n/a
FA Number	n/a
Date of Analysis	1/24/2022
Company Performing Analysis	GPD

The information contained in this summary report is not to be used independently from the PE stamped tower analysis.

Tower Info	Description	Date
Tower Type (G, SST, MP)	G	
Tower Height (top of steel AGL)	570'	
Tower Manufacturer	N/A	
Tower Model	N/A	
Tower Design	N/A	
Foundation Design	N/A	
Geotech Report	Mannik Smith Group Project #: N2940001	12/14/2021
Tower Mapping	Northern Tower Erection Company	1/8/2010
Foundation Mapping	Northern Tower Erection Company	1/8/2010
Previous Structural Analysis	N/A	

Design Parameters	TIA-222-G
Design Code Used	2015 IBC & ASCE 7-10
Location of Tower (County, State)	Grand Traverse, MI
Nominal Wind Speed (mph)	89 (3-second gust)
Ice Thickness (in)	3/4"
Structure Classification (I, II, III)	II
Exposure Category (B, C, D)	C
Topographic Category (1 to 5)	1

Analysis Results (% Maximum Usage)

Existing/Reserved + Future + Proposed Condition	
Tower (%)	146.5%
Guy Wire (%)	107.5%
Foundation (%)	200.0%
Foundation Adequate?	No

Existing / Reserved Loading

Antenna								Mount			Transmission Line			
Antenna Owner	Mount Height (ft)	Antenna CL (ft)	Quantity	Type	Manufacturer	Model	Azimuth	Quantity	Manufacturer	Type	Quantity	Model	Size	Attachment Face/Leg
NOAA	562	562	1	Dipole	SRW	WRX-PD4W-DFDF		2	Unknown	Standoff	1	Unknown	7/8"	Face A
Unknown	532	532	1	Yagi	Unknown	Yagi		1		Leg Mounted	1	Unknown	7/8"	Face A
Unknown	492	495	1	Omni	Unknown	6' Omni		1	Unknown	Standoff	1	Unknown	7/8"	Face A
Unknown	476	486	1	Omni	Unknown	20' Omni		1	Unknown	Standoff	1	Unknown	7/8"	Face A
Unknown	476	486	1	Dipole	Unknown	20' Dipole		1	Unknown	Standoff	1	Unknown	7/8"	Face A
Unknown	400	410	1	Omni	Unknown	20' Omni		1	Unknown	Standoff	1	Unknown	1/2"	Face C
Unknown	382	392	1	Omni	Unknown	20' Omni		1	Unknown	Standoff	1	Unknown	7/8"	Face C
Unknown	382	382	1	TMA	Unknown	12" x 16" TMA				on the same mount				
Unknown	342	352	1	Omni	Unknown	20' Omni		1	Unknown	10' Box Arm	1	Unknown	1-5/8"	Face C
Unknown	312	312	1	Dish	Andrew	49074 Grid Dish (10')		1		Pipe Mounted				
WWTV	289.5	289.5	1	FM	Unknown	FM Antenna		1		Leg Mounted	1	Unknown	2-1/4"	Face A
Unknown	264	274	1	Omni	Unknown	20' Omni		1	Unknown	10' Box Arm	1	Unknown	7/8"	Face C
Unknown	224	234	1	Omni	Unknown	20' Omni		1	Unknown	Standoff	1	Unknown	1/2"	Face C
Unknown	212	212	1	Dish	Unknown	2 Dish		1		Pipe Mounted	1	Cat5e	1/4"	Face A
Elevate Net	203	203	3	Panel	Unknown	28" x 5" Antenna		3		Leg Mounted	1	Cat5e	1/4"	Face A
Unknown	160	170	1	Dipole	Unknown	20' Dipole		1	Unknown	Standoff	1	Unknown	7/8"	Face C
Unknown	160	170	1	Omni	Unknown	20' Omni		1	Unknown	Standoff	1	Unknown	7/8"	Face C
Unknown	155	155	1	Yagi	Unknown	Oval Antenna		1		Leg Mounted	1	LMR-400	3/8"	Face C
Unknown	155	155	1	Yagi	Unknown	Horseshoe Antenna		1		Leg Mounted	1	Unknown	1/2"	Face C
Unknown	155	155	1	Panel	Unknown	2' x 4" Antenna		1		Leg Mounted	1	LMR-400	3/8"	Face C
Unknown	140	140	1	Dish	Unknown	4' Grid Dish		1		Leg Mounted	1	Unknown	1/2"	Face C
Unknown	121	121	1	Yagi	Kathrein	HDCA-10/URM/75N CH-9 Yagi		1		Leg Mounted	1	Cat5e	1/4"	Face A
Unknown	112	112	1	Panel	Unknown	12" x 4" Panel		1		Leg Mounted	1	Cat5e	1/4"	Face A
Unknown	82	82	1	Panel	Ubiquiti	Nano Station		1		Leg Mounted	1	Cat5e	1/4"	Face A
Coli	42	42	1	Panel	Mikrotik	Antenna		1		Leg Mounted	1	Cat5e	1/4"	Face A
Unknown	30	30	1	Light	Unknown	Light Fixture		1		Standoff				
Unknown	22	22	1	Panel	Unknown	TV Antenna		1		Leg Mounted	1	Cat5e	1/4"	Face A

Proposed Loading

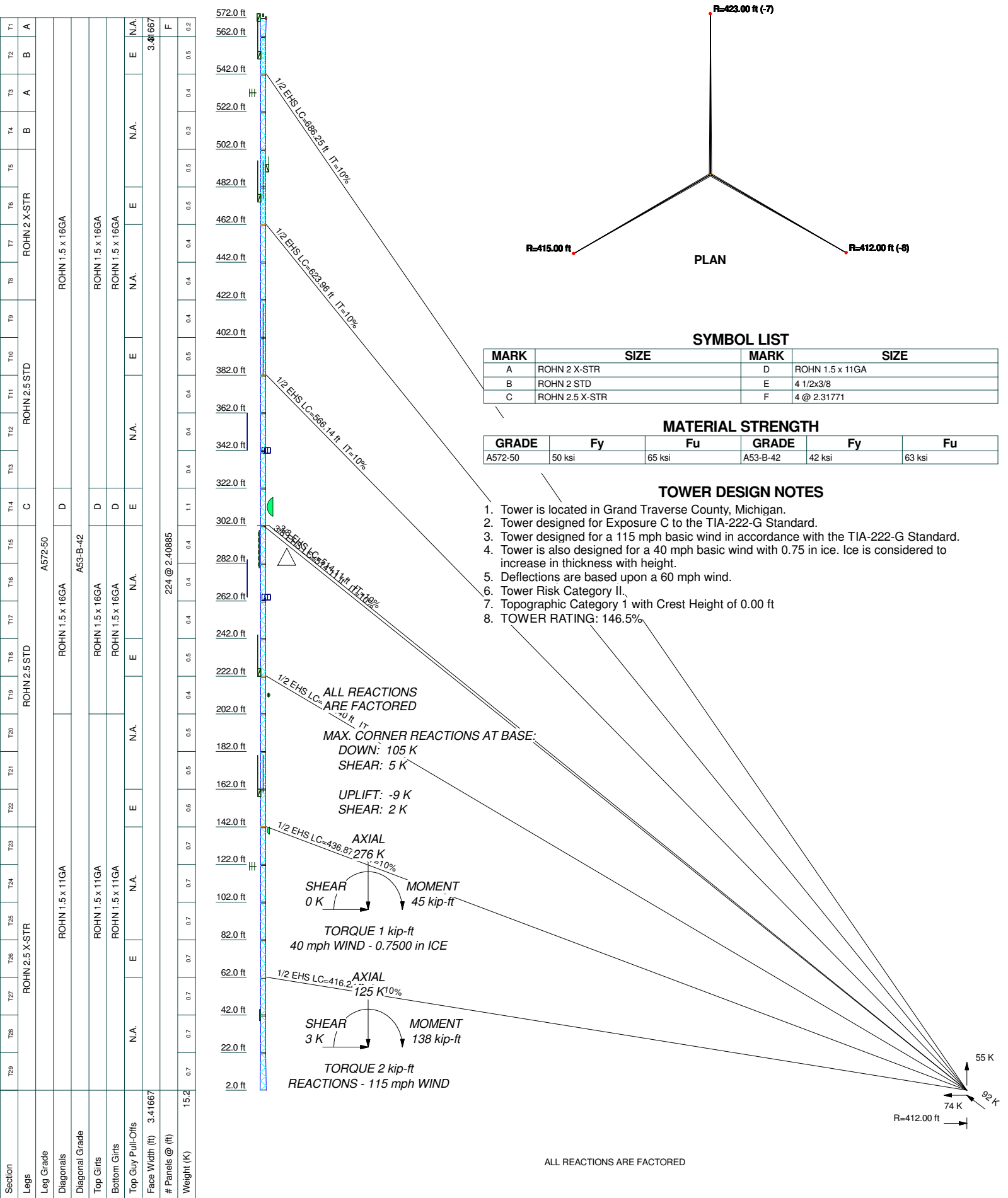
Antenna								Mount			Transmission Line			
Antenna Owner	Mount Height (ft)	Antenna CL (ft)	Quantity	Type	Manufacturer	Model	Azimuth	Quantity	Manufacturer	Type	Quantity	Model	Size	Attachment Face/Leg
Northern Tower	503	510	1	Panel	Dielectric	TUL-C3-4/12M-1-K		1		Leg Mounted	1	Unknown	2-1/4"	Face B
Northern Tower	440	450	1	Panel	Dielectric	TLP-8W/VP-R OS		1		Leg Mounted	1	Unknown	1-1/8"	Face B


Future Loading

Antenna								Mount			Transmission Line			
Antenna Owner	Mount Height (ft)	Antenna CL (ft)	Quantity	Type	Manufacturer	Model	Azimuth	Quantity	Manufacturer	Type	Quantity	Model	Size	Attachment Face/Leg

APPENDIX B

Tower Analysis Output File





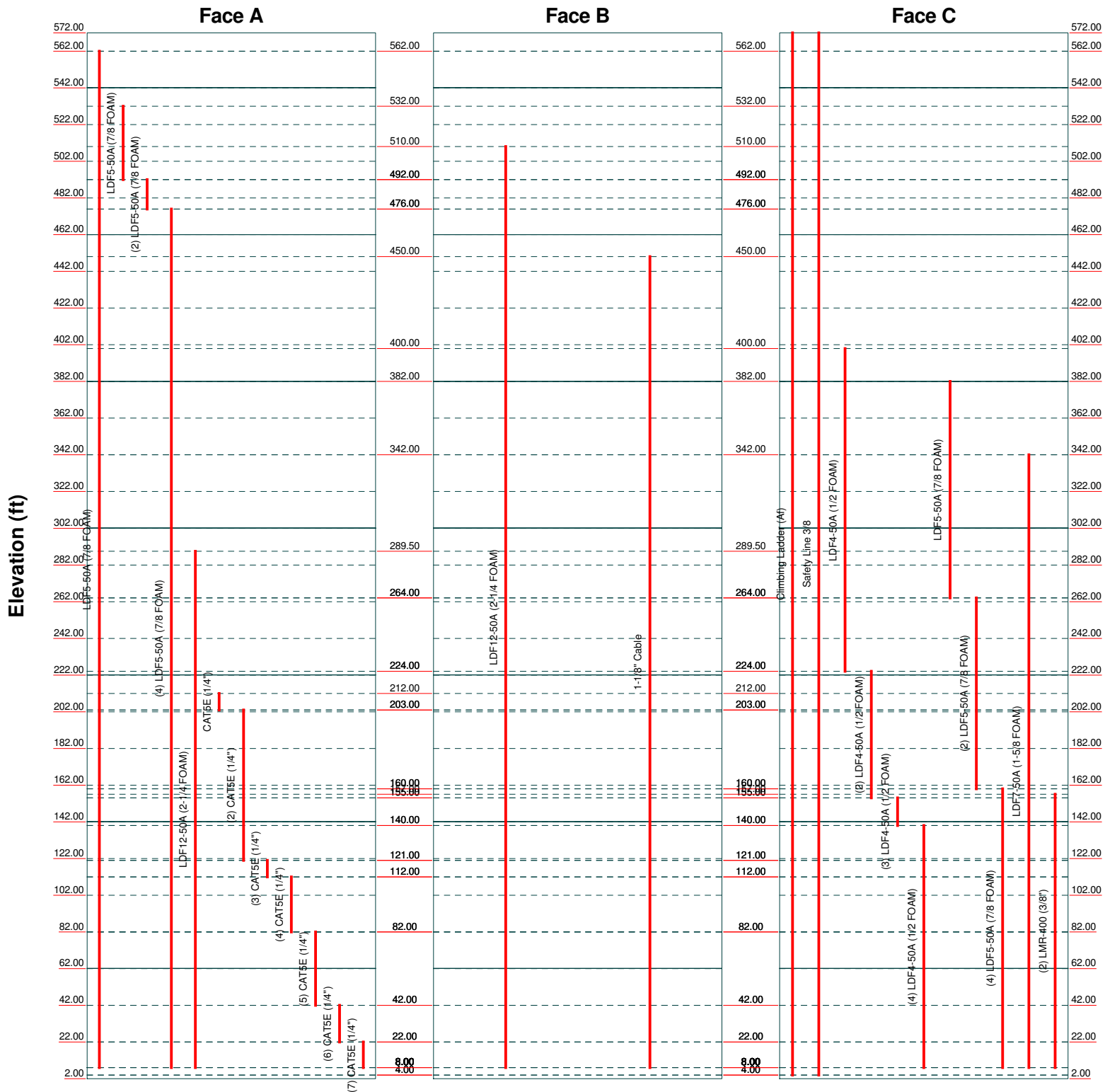
GPD
520 South Main Street Suite 2531
Akron, Ohio 44311
Phone: (330) 572-2100
FAX: (330) 572-2101

Job: Cedar Run Rd		
Project: 2022701.68		
Client: Northern Tower	Drawn by: kdavis	App'd:
Code: TIA-222-G	Date: 01/24/22	Scale: NTS
Path: Q:\2022\2022701.68 Northern Tower\5. Structural\50. Structural\50. Rev 003. Modeling\Cedar Run Rd.dwg		Dwg No. E-1

Feed Line Distribution Chart

2' - 572'

Round Flat App In Face App Out Face Truss Leg



tnxTower GPD 520 South Main Street Suite 2531 Akron, Ohio 44311 Phone: (330) 572-2100 FAX: (330) 572-2101	Job	Cedar Run Rd	Page	1 of 33
	Project	2022701.68	Date	11:56:49 01/24/22
	Client	Northern Tower	Designed by	kdavis

Tower Input Data

The main tower is a 3x guyed tower with an overall height of 572.00 ft above the ground line.

The base of the tower is set at an elevation of 2.00 ft above the ground line.

The face width of the tower is 3.42 ft at the top and 3.42 ft at the base.

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

The following design criteria apply:

Tower is located in Grand Traverse County, Michigan.

ASCE 7-10 Wind Data is used.

Basic wind speed of 115 mph.

Risk Category II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Nominal ice thickness of 0.7500 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.

Pressures are calculated at each section.

Stress ratio used in tower member 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.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Horizontals	Assume Legs Pinned	√ Calculate Redundant Bracing Forces
Consider Moments - Diagonals	Assume Rigid Index Plate	Ignore Redundant Members in FEA
Use Moment Magnification	√ Use Clear Spans For Wind Area	SR Leg Bolts Resist Compression
√ Use Code Stress Ratios	√ Use Clear Spans For KL/r	All Leg Panels Have Same Allowable
√ Use Code Safety Factors - Guys	√ Retension Guys To Initial Tension	Offset Girt At Foundation
Escalate Ice	√ Bypass Mast Stability Checks	√ Consider Feed Line Torque
Always Use Max Kz	√ Use Azimuth Dish Coefficients	√ Include Angle Block Shear Check
Use Special Wind Profile	√ Project Wind Area of Appurt.	Use TIA-222-G Bracing Resist. Exemption
√ Include Bolts In Member Capacity	√ Autocalc Torque Arm Areas	Use TIA-222-G Tension Splice Exemption
Leg Bolts Are At Top Of Section	Add IBC .6D+W Combination	Poles
√ Secondary Horizontal Braces Leg	√ Sort Capacity Reports By Component	Include Shear-Torsion Interaction
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Always Use Sub-Critical Flow
SR Members Have Cut Ends	Treat Feed Line Bundles As Cylinder	Use Top Mounted Sockets
SR Members Are Concentric	Ignore KL/ry For 60 Deg. Angle Legs	Pole Without Linear Attachments
		Pole With Shroud Or No Appurtenances
		Outside and Inside Corner Radii Are
		Known

tnxTower GPD 520 South Main Street Suite 2531 Akron, Ohio 44311 Phone: (330) 572-2100 FAX: (330) 572-2101	Job	Cedar Run Rd	Page	2 of 33
	Project	2022701.68	Date	11:56:49 01/24/22
	Client	Northern Tower	Designed by	kdavis

Tower Section Geometry

<i>Tower Section</i>	<i>Tower Elevation</i>	<i>Assembly Database</i>	<i>Description</i>	<i>Section Width</i>	<i>Number of Sections</i>	<i>Section Length</i>
	<i>ft</i>			<i>ft</i>		<i>ft</i>
T1	572.00-562.00			3.42	1	10.00
T2	562.00-542.00			3.00	1	20.00
T3	542.00-522.00			3.00	1	20.00
T4	522.00-502.00			3.00	1	20.00
T5	502.00-482.00			3.00	1	20.00
T6	482.00-462.00			3.00	1	20.00
T7	462.00-442.00			3.00	1	20.00
T8	442.00-422.00			3.00	1	20.00
T9	422.00-402.00			3.00	1	20.00
T10	402.00-382.00			3.00	1	20.00
T11	382.00-362.00			3.00	1	20.00
T12	362.00-342.00			3.00	1	20.00
T13	342.00-322.00			3.00	1	20.00
T14	322.00-302.00			3.00	1	20.00
T15	302.00-282.00			3.00	1	20.00
T16	282.00-262.00			3.00	1	20.00
T17	262.00-242.00			3.00	1	20.00
T18	242.00-222.00			3.00	1	20.00
T19	222.00-202.00			3.00	1	20.00
T20	202.00-182.00			3.00	1	20.00
T21	182.00-162.00			3.00	1	20.00
T22	162.00-142.00			3.00	1	20.00
T23	142.00-122.00			3.00	1	20.00
T24	122.00-102.00			3.00	1	20.00
T25	102.00-82.00			3.00	1	20.00
T26	82.00-62.00			3.00	1	20.00
T27	62.00-42.00			3.00	1	20.00
T28	42.00-22.00			3.00	1	20.00
T29	22.00-2.00			3.00	1	20.00

Tower Section Geometry (cont'd)

<i>Tower Section</i>	<i>Tower Elevation</i>	<i>Diagonal Spacing</i>	<i>Bracing Type</i>	<i>Has K Brace End Panels</i>	<i>Has Horizontals</i>	<i>Top Girt Offset</i>	<i>Bottom Girt Offset</i>
	<i>ft</i>	<i>ft</i>				<i>in</i>	<i>in</i>
T1	572.00-562.00	2.32	K Brace Left	No	No	7.3750	1.3750
T2	562.00-542.00	2.41	CX Brace	No	No	7.3750	1.3750
T3	542.00-522.00	2.41	K Brace Left	No	No	7.3750	1.3750
T4	522.00-502.00	2.41	K Brace Left	No	No	7.3750	1.3750
T5	502.00-482.00	2.41	CX Brace	No	No	7.3750	1.3750
T6	482.00-462.00	2.41	CX Brace	No	No	7.3750	1.3750
T7	462.00-442.00	2.41	K Brace Left	No	No	7.3750	1.3750
T8	442.00-422.00	2.41	K Brace Left	No	No	7.3750	1.3750
T9	422.00-402.00	2.41	K Brace Left	No	No	7.3750	1.3750
T10	402.00-382.00	2.41	K Brace Left	No	No	7.3750	1.3750
T11	382.00-362.00	2.41	K Brace Left	No	No	7.3750	1.3750
T12	362.00-342.00	2.41	K Brace Left	No	No	7.3750	1.3750
T13	342.00-322.00	2.41	K Brace Left	No	No	7.3750	1.3750
T14	322.00-302.00	2.41	K Brace Left	No	No	7.3750	1.3750
T15	302.00-282.00	2.41	K Brace Left	No	No	7.3750	1.3750
T16	282.00-262.00	2.41	K Brace Left	No	No	7.3750	1.3750
T17	262.00-242.00	2.41	K Brace Left	No	No	7.3750	1.3750
T18	242.00-222.00	2.41	K Brace Left	No	No	7.3750	1.3750
T19	222.00-202.00	2.41	K Brace Left	No	No	7.3750	1.3750

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<i>Tower Section</i>	<i>Tower Elevation</i>	<i>Diagonal Spacing</i>	<i>Bracing Type</i>	<i>Has K Brace End Panels</i>	<i>Has Horizontals</i>	<i>Top Girt Offset</i>	<i>Bottom Girt Offset</i>
	<i>ft</i>	<i>ft</i>				<i>in</i>	<i>in</i>
T20	202.00-182.00	2.41	K Brace Left	No	No	7.3750	1.3750
T21	182.00-162.00	2.41	K Brace Left	No	No	7.3750	1.3750
T22	162.00-142.00	2.41	K Brace Left	No	No	7.3750	1.3750
T23	142.00-122.00	2.41	K Brace Left	No	No	7.3750	1.3750
T24	122.00-102.00	2.41	K Brace Left	No	No	7.3750	1.3750
T25	102.00-82.00	2.41	K Brace Left	No	No	7.3750	1.3750
T26	82.00-62.00	2.41	K Brace Left	No	No	7.3750	1.3750
T27	62.00-42.00	2.41	K Brace Left	No	No	7.3750	1.3750
T28	42.00-22.00	2.41	K Brace Left	No	No	7.3750	1.3750
T29	22.00-2.00	2.41	K Brace Left	No	No	7.3750	1.3750

Tower Section Geometry (cont'd)

<i>Tower Elevation</i>	<i>Leg Type</i>	<i>Leg Size</i>	<i>Leg Grade</i>	<i>Diagonal Type</i>	<i>Diagonal Size</i>	<i>Diagonal Grade</i>
<i>ft</i>						
T1 572.00-562.00	Pipe	ROHN 2 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T2 562.00-542.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T3 542.00-522.00	Pipe	ROHN 2 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T4 522.00-502.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T5 502.00-482.00	Pipe	ROHN 2 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T6 482.00-462.00	Pipe	ROHN 2 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T7 462.00-442.00	Pipe	ROHN 2 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T8 442.00-422.00	Pipe	ROHN 2 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T9 422.00-402.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T10 402.00-382.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T11 382.00-362.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T12 362.00-342.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T13 342.00-322.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T14 322.00-302.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)
T15 302.00-282.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T16 282.00-262.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T17 262.00-242.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T18 242.00-222.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T19 222.00-202.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T20 202.00-182.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)
T21 182.00-162.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)

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<i>Tower Elevation ft</i>	<i>Leg Type</i>	<i>Leg Size</i>	<i>Leg Grade</i>	<i>Diagonal Type</i>	<i>Diagonal Size</i>	<i>Diagonal Grade</i>
T22 162.00-142.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)
T23 142.00-122.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)
T24 122.00-102.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)
T25 102.00-82.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)
T26 82.00-62.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)
T27 62.00-42.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)
T28 42.00-22.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)
T29 22.00-2.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)

Tower Section Geometry (cont'd)

<i>Tower Elevation ft</i>	<i>Top Girt Type</i>	<i>Top Girt Size</i>	<i>Top Girt Grade</i>	<i>Bottom Girt Type</i>	<i>Bottom Girt Size</i>	<i>Bottom Girt Grade</i>
T1 572.00-562.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T2 562.00-542.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T3 542.00-522.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T4 522.00-502.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T5 502.00-482.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T6 482.00-462.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T7 462.00-442.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T8 442.00-422.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T9 422.00-402.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T10 402.00-382.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T11 382.00-362.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T12 362.00-342.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T13 342.00-322.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T14 322.00-302.00	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 11GA	A53-B-42 (42 ksi)
T15 302.00-282.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T16 282.00-262.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T17 262.00-242.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T18 242.00-222.00	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)	Pipe	ROHN 1.5 x 16GA	A53-B-42 (42 ksi)
T19	Pipe	ROHN 1.5 x 16GA	A53-B-42	Pipe	ROHN 1.5 x 16GA	A53-B-42

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<i>Tower Elevation ft</i>	<i>Top Girt Type</i>	<i>Top Girt Size</i>	<i>Top Girt Grade</i>	<i>Bottom Girt Type</i>	<i>Bottom Girt Size</i>	<i>Bottom Girt Grade</i>
222.00-202.00			(42 ksi)			(42 ksi)
T20	Pipe	ROHN 1.5 x 11GA	A53-B-42	Pipe	ROHN 1.5 x 11GA	A53-B-42
202.00-182.00			(42 ksi)			(42 ksi)
T21	Pipe	ROHN 1.5 x 11GA	A53-B-42	Pipe	ROHN 1.5 x 11GA	A53-B-42
182.00-162.00			(42 ksi)			(42 ksi)
T22	Pipe	ROHN 1.5 x 11GA	A53-B-42	Pipe	ROHN 1.5 x 11GA	A53-B-42
162.00-142.00			(42 ksi)			(42 ksi)
T23	Pipe	ROHN 1.5 x 11GA	A53-B-42	Pipe	ROHN 1.5 x 11GA	A53-B-42
142.00-122.00			(42 ksi)			(42 ksi)
T24	Pipe	ROHN 1.5 x 11GA	A53-B-42	Pipe	ROHN 1.5 x 11GA	A53-B-42
122.00-102.00			(42 ksi)			(42 ksi)
T25 102.00-82.00	Pipe	ROHN 1.5 x 11GA	A53-B-42	Pipe	ROHN 1.5 x 11GA	A53-B-42
			(42 ksi)			(42 ksi)
T26 82.00-62.00	Pipe	ROHN 1.5 x 11GA	A53-B-42	Pipe	ROHN 1.5 x 11GA	A53-B-42
			(42 ksi)			(42 ksi)
T27 62.00-42.00	Pipe	ROHN 1.5 x 11GA	A53-B-42	Pipe	ROHN 1.5 x 11GA	A53-B-42
			(42 ksi)			(42 ksi)
T28 42.00-22.00	Pipe	ROHN 1.5 x 11GA	A53-B-42	Pipe	ROHN 1.5 x 11GA	A53-B-42
			(42 ksi)			(42 ksi)
T29 22.00-2.00	Pipe	ROHN 1.5 x 11GA	A53-B-42	Pipe	ROHN 1.5 x 11GA	A53-B-42
			(42 ksi)			(42 ksi)

Tower Section Geometry (*cont'd*)

<i>Tower Elevation</i>	<i>Gusset Area (per face)</i>	<i>Gusset Thickness</i>	<i>Gusset Grade</i>	<i>Adjust. Factor A_f</i>	<i>Adjust. Factor A_r</i>	<i>Weight Mult.</i>	<i>Double Angle Stitch Bolt Spacing Diagonals in</i>	<i>Double Angle Stitch Bolt Spacing Horizontals in</i>	<i>Double Angle Stitch Bolt Spacing Redundants in</i>
<i>ft</i>	<i>ft²</i>	<i>in</i>							
T1	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
572.00-562.00			(36 ksi)						
T2	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
562.00-542.00			(36 ksi)						
T3	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
542.00-522.00			(36 ksi)						
T4	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
522.00-502.00			(36 ksi)						
T5	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
502.00-482.00			(36 ksi)						
T6	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
482.00-462.00			(36 ksi)						
T7	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
462.00-442.00			(36 ksi)						
T8	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
442.00-422.00			(36 ksi)						
T9	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
422.00-402.00			(36 ksi)						
T10	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
402.00-382.00			(36 ksi)						
T11	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
382.00-362.00			(36 ksi)						
T12	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
362.00-342.00			(36 ksi)						
T13	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
342.00-322.00			(36 ksi)						
T14	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
322.00-302.00			(36 ksi)						
T15	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
302.00-282.00			(36 ksi)						

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	Northern Tower	kdavis

Tower Elevation	Gusset Area (per face)	Gusset Thickness	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
ft	ft ²	in							
T16	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
282.00-262.00			(36 ksi)						
T17	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
262.00-242.00			(36 ksi)						
T18	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
242.00-222.00			(36 ksi)						
T19	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
222.00-202.00			(36 ksi)						
T20	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
202.00-182.00			(36 ksi)						
T21	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
182.00-162.00			(36 ksi)						
T22	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
162.00-142.00			(36 ksi)						
T23	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
142.00-122.00			(36 ksi)						
T24	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
122.00-102.00			(36 ksi)						
T25	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
102.00-82.00			(36 ksi)						
T26	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
82.00-62.00			(36 ksi)						
T27	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
62.00-42.00			(36 ksi)						
T28	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
42.00-22.00			(36 ksi)						
T29 22.00-2.00	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
			(36 ksi)						

Tower Section Geometry (cont'd)

Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	Legs	K Factors ¹						
				X Brace Diags	K Brace Diags	Single Diags	Girts	Horiz.	Sec. Horiz.	Inner Brace
				X Y	X Y	X Y	X Y	X Y	X Y	X Y
ft										
T1	Yes	Yes	1	1	1	1	1	1	1	1
572.00-562.00				1	1	1	1	1	1	1
T2	Yes	Yes	1	1	1	1	1	1	1	1
562.00-542.00				1	1	1	1	1	1	1
T3	Yes	Yes	1	1	1	1	1	1	1	1
542.00-522.00				1	1	1	1	1	1	1
T4	Yes	Yes	1	1	1	1	1	1	1	1
522.00-502.00				1	1	1	1	1	1	1
T5	Yes	Yes	1	1	1	1	1	1	1	1
502.00-482.00				1	1	1	1	1	1	1
T6	Yes	Yes	1	1	1	1	1	1	1	1
482.00-462.00				1	1	1	1	1	1	1
T7	Yes	Yes	1	1	1	1	1	1	1	1
462.00-442.00				1	1	1	1	1	1	1
T8	Yes	Yes	1	1	1	1	1	1	1	1
442.00-422.00				1	1	1	1	1	1	1
T9	Yes	Yes	1	1	1	1	1	1	1	1
422.00-402.00				1	1	1	1	1	1	1
T10	Yes	Yes	1	1	1	1	1	1	1	1
402.00-382.00				1	1	1	1	1	1	1

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Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors ¹							
			Legs	X Brace Diags	K Brace Diags	Single Diags	Girts	Horiz.	Sec. Horiz.	Inner Brace
				X Y	X Y	X Y	X Y	X Y	X Y	X Y
T11	Yes	Yes	1	1	1	1	1	1	1	1
382.00-362.00				1	1	1	1	1	1	1
T12	Yes	Yes	1	1	1	1	1	1	1	1
362.00-342.00				1	1	1	1	1	1	1
T13	Yes	Yes	1	1	1	1	1	1	1	1
342.00-322.00				1	1	1	1	1	1	1
T14	Yes	Yes	1	1	1	1	1	1	1	1
322.00-302.00				1	1	1	1	1	1	1
T15	Yes	Yes	1	1	1	1	1	1	1	1
302.00-282.00				1	1	1	1	1	1	1
T16	Yes	Yes	1	1	1	1	1	1	1	1
282.00-262.00				1	1	1	1	1	1	1
T17	Yes	Yes	1	1	1	1	1	1	1	1
262.00-242.00				1	1	1	1	1	1	1
T18	Yes	Yes	1	1	1	1	1	1	1	1
242.00-222.00				1	1	1	1	1	1	1
T19	Yes	Yes	1	1	1	1	1	1	1	1
222.00-202.00				1	1	1	1	1	1	1
T20	Yes	Yes	1	1	1	1	1	1	1	1
202.00-182.00				1	1	1	1	1	1	1
T21	Yes	Yes	1	1	1	1	1	1	1	1
182.00-162.00				1	1	1	1	1	1	1
T22	Yes	Yes	1	1	1	1	1	1	1	1
162.00-142.00				1	1	1	1	1	1	1
T23	Yes	Yes	1	1	1	1	1	1	1	1
142.00-122.00				1	1	1	1	1	1	1
T24	Yes	Yes	1	1	1	1	1	1	1	1
122.00-102.00				1	1	1	1	1	1	1
T25	Yes	Yes	1	1	1	1	1	1	1	1
102.00-82.00				1	1	1	1	1	1	1
T26	Yes	Yes	1	1	1	1	1	1	1	1
82.00-62.00				1	1	1	1	1	1	1
T27	Yes	Yes	1	1	1	1	1	1	1	1
62.00-42.00				1	1	1	1	1	1	1
T28	Yes	Yes	1	1	1	1	1	1	1	1
42.00-22.00				1	1	1	1	1	1	1
T29	Yes	Yes	1	1	1	1	1	1	1	1
22.00-2.00				1	1	1	1	1	1	1

¹Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.

Tower Section Geometry (cont'd)

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
572.00-562.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T2	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
562.00-542.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T3	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
542.00-522.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T4	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
522.00-502.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	

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Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T5	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
502.00-482.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T6	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
482.00-462.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T7	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
462.00-442.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T8	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
442.00-422.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T9	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
422.00-402.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T10	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
402.00-382.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T11	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
382.00-362.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T12	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
362.00-342.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T13	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
342.00-322.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T14	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
322.00-302.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T15	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
302.00-282.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T16	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
282.00-262.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T17	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
262.00-242.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T18	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
242.00-222.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T19	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
222.00-202.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T20	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
202.00-182.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T21	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
182.00-162.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T22	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
162.00-142.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T23	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
142.00-122.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T24	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
122.00-102.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T25	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
102.00-82.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T26	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
82.00-62.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T27	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
62.00-42.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T28	Flange	0.7500	4	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
42.00-22.00		A325X		A325X		A325X		A325X		A325N		A325N		A325N	
T29 22.00-2.00	Flange	0.7500	0	0.5000	1	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0
		A325X		A325X		A325X		A325X		A325N		A325N		A325N	

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Guy Data

Guy Elevation	Guy Grade	Guy Size	Initial Tension	%	Guy Modulus	Guy Weight	L_u	Anchor Radius	Anchor Azimuth Adj.	Anchor Elevation	End Fitting Efficiency
ft			K		ksi	plf	ft	ft	°	ft	%
542.115	EHS	A 1/2	2.69	10%	23000	0.517	691.70	423.00	0.0000	-7.00	100%
		B 1/2	2.69	10%	23000	0.517	685.85	412.00	0.0000	-8.00	100%
		C 1/2	2.69	10%	23000	0.517	681.28	415.00	0.0000	0.00	100%
462.115	EHS	A 1/2	2.69	10%	23000	0.517	630.15	423.00	0.0000	-7.00	100%
		B 1/2	2.69	10%	23000	0.517	623.60	412.00	0.0000	-8.00	100%
		C 1/2	2.69	10%	23000	0.517	619.60	415.00	0.0000	0.00	100%
382.115	EHS	A 1/2	2.69	10%	23000	0.517	573.16	423.00	0.0000	-7.00	100%
		B 1/2	2.69	10%	23000	0.517	565.81	412.00	0.0000	-8.00	100%
		C 1/2	2.69	10%	23000	0.517	562.53	415.00	0.0000	0.00	100%
302.115	EHS	A 3/8	1.54	10%	23000	0.273	521.99	423.00	0.0000	-7.00	100%
		B 3/8	1.54	10%	23000	0.273	513.77	412.00	0.0000	-8.00	100%
		C 3/8	1.54	10%	23000	0.273	511.40	415.00	0.0000	0.00	100%
222.115	EHS	A 1/2	2.69	10%	23000	0.517	479.28	423.00	0.0000	-7.00	100%
		B 1/2	2.69	10%	23000	0.517	470.14	412.00	0.0000	-8.00	100%
		C 1/2	2.69	10%	23000	0.517	468.92	415.00	0.0000	0.00	100%
142.115	EHS	A 1/2	2.69	10%	23000	0.517	446.64	423.00	0.0000	-7.00	100%
		B 1/2	2.69	10%	23000	0.517	436.63	412.00	0.0000	-8.00	100%
		C 1/2	2.69	10%	23000	0.517	436.79	415.00	0.0000	0.00	100%
62.1146	EHS	A 1/2	2.69	10%	23000	0.517	426.68	423.00	0.0000	-7.00	100%
		B 1/2	2.69	10%	23000	0.517	415.99	412.00	0.0000	-8.00	100%
		C 1/2	2.69	10%	23000	0.517	417.69	415.00	0.0000	0.00	100%

Guy Data(cont'd)

Guy Elevation	Mount Type	Torque-Arm Spread	Torque-Arm Leg Angle	Torque-Arm Style	Torque-Arm Grade	Torque-Arm Type	Torque-Arm Size
ft		ft	°				
542.115	Corner						
462.115	Corner						
382.115	Corner						
302.115	Torque Arm	6.83	0.0000	Channel	A36 (36 ksi)	Channel	C12x20.7
222.115	Corner						
142.115	Corner						
62.1146	Corner						

Guy Data (cont'd)

Guy Elevation	Diagonal Grade	Diagonal Type	Upper Diagonal Size	Lower Diagonal Size	Is Strap.	Pull-Off Grade	Pull-Off Type	Pull-Off Size
ft								
542.11	A572-50 (50 ksi)	Solid Round			Yes	A36 (36 ksi)	Flat Bar	4 1/2x3/8
462.11	A572-50 (50 ksi)	Solid Round			Yes	A36 (36 ksi)	Flat Bar	4 1/2x3/8
382.11	A572-50 (50 ksi)	Solid Round			Yes	A36 (36 ksi)	Flat Bar	4 1/2x3/8
302.11	A572-50 (50 ksi)	Solid Round			Yes	A36 (36 ksi)	Flat Bar	4 1/2x3/8
222.11	A572-50 (50 ksi)	Solid Round			Yes	A36 (36 ksi)	Flat Bar	4 1/2x3/8
142.11	A572-50	Solid Round			Yes	A36	Flat Bar	4 1/2x3/8

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Guy Elevation ft	Diagonal Grade	Diagonal Type	Upper Diagonal Size	Lower Diagonal Size	Is Strap.	Pull-Off Grade	Pull-Off Type	Pull-Off Size
62.11	(50 ksi) A572-50 (50 ksi)	Solid Round			Yes	(36 ksi) A36 (36 ksi)	Flat Bar	4 1/2x3/8

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
Climbing Ladder (Af)	C	No	No	Af (CaAa)	572.00 - 4.00	0.0000	0	1	1	3.8400	3.8400		4.81
Safety Line 3/8	C	No	No	Ar (CaAa)	572.00 - 4.00	0.0000	0	1	1	0.3750	0.3750		0.22
LDF5-50A (7/8 FOAM)	A	No	No	Ar (CaAa)	562.00 - 8.00	0.0000	0.38	1	1	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	A	No	No	Ar (CaAa)	532.00 - 492.00	0.0000	-0.2	1	1	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	A	No	No	Ar (CaAa)	492.00 - 476.00	0.0000	-0.2	2	2	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	A	No	No	Ar (CaAa)	476.00 - 8.00	0.0000	-0.2	4	2	0.5000	1.0900		0.33
LDF12-50A (2-1/4 FOAM)	A	No	No	Ar (CaAa)	289.50 - 8.00	0.0000	0.45	1	1	1.0000	2.3500		1.22
LDF4-50A (1/2 FOAM)	C	No	No	Ar (CaAa)	400.00 - 224.00	0.0000	0.49	1	1	0.6300	0.6300		0.15
LDF4-50A (1/2 FOAM)	C	No	No	Ar (CaAa)	224.00 - 155.00	0.0000	0.49	2	2	0.6300	0.6300		0.15
LDF4-50A (1/2 FOAM)	C	No	No	Ar (CaAa)	155.00 - 140.00	0.0000	0.49	3	2	0.6300	0.6300		0.15
LDF4-50A (1/2 FOAM)	C	No	No	Ar (CaAa)	140.00 - 8.00	0.0000	0.49	4	2	0.6300	0.6300		0.15
LDF5-50A (7/8 FOAM)	C	No	No	Ar (CaAa)	382.00 - 264.00	0.0000	0.2	1	1	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	C	No	No	Ar (CaAa)	264.00 - 160.00	0.0000	0.2	2	2	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	C	No	No	Ar (CaAa)	160.00 - 8.00	0.0000	0.2	4	2	0.5000	1.0900		0.33
LDF7-50A (1-5/8 FOAM)	C	No	No	Ar (CaAa)	342.00 - 8.00	0.0000	-0.2	1	1	0.7500	1.9800		0.82
CAT5E (1/4")	A	No	No	Ar (CaAa)	212.00 - 203.00	0.0000	-0.49	1	1	0.2500	0.2500		0.10
CAT5E (1/4")	A	No	No	Ar (CaAa)	203.00 - 121.00	0.0000	-0.49	2	2	0.2500	0.2500		0.10
CAT5E (1/4")	A	No	No	Ar (CaAa)	121.00 - 112.00	0.0000	-0.49	3	2	0.2500	0.2500		0.10
CAT5E (1/4")	A	No	No	Ar (CaAa)	112.00 - 82.00	0.0000	-0.49	4	2	0.2500	0.2500		0.10
CAT5E (1/4")	A	No	No	Ar (CaAa)	82.00 - 42.00	0.0000	-0.49	5	3	0.2500	0.2500		0.10
CAT5E (1/4")	A	No	No	Ar (CaAa)	42.00 - 22.00	0.0000	-0.49	6	3	0.2500	0.2500		0.10
CAT5E (1/4")	A	No	No	Ar (CaAa)	22.00 - 8.00	0.0000	-0.49	7	3	0.2500	0.2500		0.10
LMR-400 (3/8")	C	No	No	Ar (CaAa)	157.00 - 8.00	0.0000	-0.49	2	2	0.4050	0.4050		0.07
LDF12-50A (2-1/4 FOAM)	B	No	No	Ar (CaAa)	510.00 - 8.00	0.0000	0.35	1	1	1.0000	2.3500		1.22
1-1/8" Cable	B	No	No	Ar (CaAa)	450.00 - 8.00	0.0000	0.29	1	1	1.0000	1.1250		1.00

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Discrete Tower Loads

<i>Description</i>	<i>Face or Leg</i>	<i>Offset Type</i>	<i>Offsets: Horz Lateral Vert ft ft ft</i>	<i>Azimuth Adjustment °</i>	<i>Placement ft</i>		<i>C_{AA} Front ft²</i>	<i>C_{AA} Side ft²</i>	<i>Weight K</i>
Lightning Rod 3/4"x5'	A	From Leg	0.00 0.00 2.50	0.0000	570.00	No Ice 1/2" Ice 1" Ice	0.38 0.89 1.36	0.38 0.89 1.36	0.03 0.03 0.04
Beacon Light	B	From Leg	0.00 0.00 1.00	0.0000	570.00	No Ice 1/2" Ice 1" Ice	2.00 2.50 3.00	2.00 2.50 3.00	0.02 0.03 0.04
Side Arm Mount [SO 304-1]	C	From Leg	1.00 0.00 0.00	0.0000	572.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
20' Dipole	C	From Leg	2.00 0.00 0.00	0.0000	562.00	No Ice 1/2" Ice 1" Ice	4.00 6.03 8.07	4.00 6.03 8.07	0.04 0.07 0.11
Side Arm Mount [SO 304-1]	C	From Leg	1.00 0.00 0.00	0.0000	552.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
3' Yagi	C	From Leg	3.00 0.00 0.00	0.0000	532.00	No Ice 1/2" Ice 1" Ice	0.52 0.71 0.90	0.52 0.71 0.90	0.02 0.02 0.03
TUL-C3-4/12M-1-K	A	From Leg	1.00 0.00 7.00	0.0000	503.00	No Ice 1/2" Ice 1" Ice	16.81 23.92 24.72	16.81 23.92 24.72	0.13 0.40 0.67
Side Arm Mount [SO 304-1]	B	From Leg	1.00 0.00 0.00	0.0000	492.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
6' Omni	B	From Leg	2.00 0.00 3.00	0.0000	492.00	No Ice 1/2" Ice 1" Ice	1.48 2.13 2.50	1.48 2.13 2.50	0.03 0.04 0.06
Side Arm Mount [SO 304-1]	C	From Leg	1.00 0.00 0.00	0.0000	476.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
Side Arm Mount [SO 304-1]	A	From Leg	1.00 0.00 0.00	0.0000	476.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
20' Omni	C	From Leg	2.00 0.00 10.00	0.0000	476.00	No Ice 1/2" Ice 1" Ice	4.00 6.03 8.07	4.00 6.03 8.07	0.04 0.07 0.11
20' Dipole	A	From Leg	2.00 0.00 10.00	0.0000	476.00	No Ice 1/2" Ice 1" Ice	4.00 6.03 8.07	4.00 6.03 8.07	0.04 0.07 0.11
TLP-8W/VP-R OS	C	From Leg	1.00 0.00 10.00	0.0000	440.00	No Ice 1/2" Ice 1" Ice	18.01 18.91 19.81	18.01 18.91 19.81	0.20 0.31 0.44
Side Arm Mount [SO 304-1]	A	From Leg	1.00 0.00 0.00	0.0000	400.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
20' Omni	A	From Leg	2.00 0.00 10.00	0.0000	400.00	No Ice 1/2" Ice 1" Ice	4.00 6.03 8.07	4.00 6.03 8.07	0.04 0.07 0.11
Side Arm Mount [SO 304-1]	A	From Leg	1.00 0.00 0.00	0.0000	382.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
20' Omni	A	From Leg	2.00 0.00 10.00	0.0000	382.00	No Ice 1/2" Ice 1" Ice	4.00 6.03 8.07	4.00 6.03 8.07	0.04 0.07 0.11

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<i>Description</i>	<i>Face or Leg</i>	<i>Offset Type</i>	<i>Offsets: Horz Lateral Vert ft ft ft</i>	<i>Azimuth Adjustment °</i>	<i>Placement ft</i>		<i>C_{AA} Front ft²</i>	<i>C_{AA} Side ft²</i>	<i>Weight K</i>
TMA (12"x16"x12")	A	From Leg	2.00 0.00 0.00	0.0000	382.00	No Ice 1/2" Ice 1" Ice	1.60 1.76 1.93	1.20 1.34 1.48	0.05 0.07 0.09
10' Box Arm	A	From Face	0.00 5.00 0.00	0.0000	342.00	No Ice 1/2" Ice 1" Ice	14.80 21.01 27.22	6.72 9.55 12.38	0.30 0.45 0.60
20' Omni	A	From Face	10.00 0.00 10.00	0.0000	342.00	No Ice 1/2" Ice 1" Ice	4.00 6.03 8.07	4.00 6.03 8.07	0.04 0.07 0.11
4' x 3" Mount Pipe	B	From Leg	0.50 0.00 0.00	0.0000	312.00	No Ice 1/2" Ice 1" Ice	0.91 1.36 1.62	0.91 1.36 1.62	0.03 0.04 0.05
25' Broadcast Antenna	C	From Leg	1.00 0.00 0.00	0.0000	289.50	No Ice 1/2" Ice 1" Ice	15.00 31.49 33.00	15.00 31.49 33.00	0.08 0.10 0.12
10' Box Arm	A	From Face	0.00 5.00 0.00	0.0000	264.00	No Ice 1/2" Ice 1" Ice	14.80 21.01 27.22	6.72 9.55 12.38	0.30 0.45 0.60
20' Omni	A	From Face	10.00 0.00 10.00	0.0000	264.00	No Ice 1/2" Ice 1" Ice	4.00 6.03 8.07	4.00 6.03 8.07	0.04 0.07 0.11
Beacon Light	C	From Leg	0.50 0.00 0.00	0.0000	242.00	No Ice 1/2" Ice 1" Ice	2.00 2.50 3.00	2.00 2.50 3.00	0.02 0.03 0.04
Side Arm Mount [SO 304-1]	C	From Leg	1.00 0.00 0.00	0.0000	224.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
20' Omni	C	From Leg	2.00 0.00 10.00	0.0000	224.00	No Ice 1/2" Ice 1" Ice	4.00 6.03 8.07	4.00 6.03 8.07	0.04 0.07 0.11
3' x 2" Mount Pipe	B	From Leg	0.50 0.00 0.00	0.0000	212.00	No Ice 1/2" Ice 1" Ice	0.58 0.77 0.97	0.58 0.77 0.97	0.01 0.02 0.02
28" x 5" Antenna	A	From Leg	0.50 0.00 0.00	0.0000	203.00	No Ice 1/2" Ice 1" Ice	1.45 1.63 1.82	1.25 1.42 1.60	0.03 0.04 0.06
28" x 5" Antenna	B	From Leg	0.50 0.00 0.00	0.0000	203.00	No Ice 1/2" Ice 1" Ice	1.45 1.63 1.82	1.25 1.42 1.60	0.03 0.04 0.06
28" x 5" Antenna	C	From Leg	0.50 0.00 0.00	0.0000	203.00	No Ice 1/2" Ice 1" Ice	1.45 1.63 1.82	1.25 1.42 1.60	0.03 0.04 0.06
Side Arm Mount [SO 304-1]	C	From Leg	1.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
Side Arm Mount [SO 304-1]	A	From Leg	1.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
20' Omni	C	From Leg	2.00 0.00 10.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice	4.00 6.03 8.07	4.00 6.03 8.07	0.04 0.07 0.11
20' Dipole	A	From Leg	2.00 0.00 10.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice	4.00 6.03 8.07	4.00 6.03 8.07	0.04 0.07 0.11
Oval Antenna	C	From Leg	1.50 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	0.80 1.11 1.43	1.04 1.42 1.81	0.05 0.07 0.09

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	CAAA Front ft ²	CAAA Side ft ²	Weight K
Horseshoe Yagi	A	From Leg	1.50 0.00 0.00	0.0000	155.00	No Ice 0.80 1/2" Ice 1.11 1" Ice 1.43	1.04 1.42 1.81	0.05 0.07 0.09
2' x 4" Panel Antenna	B	From Leg	0.50 0.00 0.00	0.0000	155.00	No Ice 2.09 1/2" Ice 2.39 1" Ice 2.70	2.09 2.39 2.70	0.03 0.04 0.06
6' Yagi	C	From Leg	3.00 0.00 0.00	0.0000	121.00	No Ice 1.20 1/2" Ice 1.80 1" Ice 2.17	1.20 1.80 2.17	0.03 0.04 0.05
Nano Station	A	From Leg	0.50 0.00 0.00	0.0000	112.00	No Ice 0.32 1/2" Ice 0.40 1" Ice 0.49	0.15 0.22 0.30	0.00 0.00 0.01
Nano Station	C	From Leg	0.50 0.00 0.00	0.0000	82.00	No Ice 0.32 1/2" Ice 0.40 1" Ice 0.49	0.15 0.22 0.30	0.00 0.00 0.01
Mikrotik Antenna	C	From Leg	0.50 0.00 0.00	0.0000	42.00	No Ice 0.53 1/2" Ice 0.63 1" Ice 0.73	0.14 0.20 0.26	0.00 0.01 0.01
Light Fixture	B	From Leg	3.00 0.00 0.00	0.0000	30.00	No Ice 0.60 1/2" Ice 0.70 1" Ice 0.81	0.60 0.70 0.81	0.03 0.04 0.05
3' Pipe Standoff Arm	B	From Leg	1.50 0.00 0.00	0.0000	30.00	No Ice 0.04 1/2" Ice 0.09 1" Ice 0.13	0.70 0.82 0.95	0.01 0.02 0.03
TV Antenna	B	From Leg	3.00 0.00 0.00	0.0000	22.00	No Ice 0.52 1/2" Ice 0.71 1" Ice 0.90	0.52 0.71 0.90	0.01 0.02 0.03

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft ²	Weight K
10' Grid Dish	B	Grid	From Leg	1.00 0.00 0.00	0.0000		312.00	10.00	No Ice 78.54 1/2" Ice 79.85 1" Ice 81.17	0.09 0.41 0.73
2' Dish	B	Paraboloid w/Radome	From Leg	1.00 0.00 0.00	0.0000		212.00	2.00	No Ice 3.14 1/2" Ice 3.41 1" Ice 3.68	0.01 0.02 0.03
4' Grid Dish	B	Grid	From Leg	1.00 0.00 0.00	0.0000		140.00	4.00	No Ice 8.80 1/2" Ice 9.17 1" Ice 9.53	0.08 0.09 0.10

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	572 - 562	11.076	37	0.1686	0.7619
T2	562 - 542	11.081	37	0.1699	0.7597
T3	542 - 522	11.149	37	0.2068	0.7353

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Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T4	522 - 502	11.381	37	0.1947	0.6973
T5	502 - 482	11.372	37	0.1004	0.6510
T6	482 - 462	11.004	37	0.1113	0.6557
T7	462 - 442	10.511	37	0.1003	0.6541
T8	442 - 422	10.177	37	0.1030	0.6546
T9	422 - 402	9.717	37	0.1348	0.5493
T10	402 - 382	9.132	37	0.1471	0.4150
T11	382 - 362	8.610	37	0.0961	0.2945
T12	362 - 342	8.446	37	0.0607	0.1946
T13	342 - 322	8.249	37	0.0846	0.1915
T14	322 - 302	7.841	37	0.1118	0.0424
T15	302 - 282	7.343	37	0.1025	0.0479
T16	282 - 262	6.987	37	0.1035	0.1109
T17	262 - 242	6.472	37	0.1503	0.1240
T18	242 - 222	5.744	37	0.1736	0.2098
T19	222 - 202	5.037	37	0.1205	0.2758
T20	202 - 182	4.809	31	0.0718	0.3038
T21	182 - 162	4.673	27	0.0840	0.3144
T22	162 - 142	4.347	27	0.1088	0.3174
T23	142 - 122	3.877	27	0.1028	0.3086
T24	122 - 102	3.488	27	0.1057	0.2943
T25	102 - 82	2.979	27	0.1447	0.2667
T26	82 - 62	2.278	27	0.1827	0.2288
T27	62 - 42	1.472	33	0.1835	0.1837
T28	42 - 22	0.775	33	0.1511	0.1260
T29	22 - 2	0.227	33	0.0946	0.0625

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
572.00	Side Arm Mount [SO 304-1]	37	11.076	0.1686	0.7619	495793
570.00	Lightning Rod 3/4"x5'	37	11.077	0.1681	0.7617	495793
562.00	20' Dipole	37	11.081	0.1699	0.7597	154443
552.00	Side Arm Mount [SO 304-1]	37	11.094	0.1868	0.7500	26749
542.11	Guy	37	11.148	0.2066	0.7355	15979
532.00	3' Yagi	37	11.266	0.2124	0.7187	243142
503.00	TUL-C3-4/12M-1-K	37	11.382	0.1052	0.6521	11302
492.00	Side Arm Mount [SO 304-1]	37	11.224	0.0865	0.6503	15347
476.00	Side Arm Mount [SO 304-1]	37	10.851	0.1138	0.6554	104663
462.11	Guy	37	10.514	0.1004	0.6540	15798
440.00	TLP-8W/VP-R OS	37	10.140	0.1055	0.6491	16452
400.00	Side Arm Mount [SO 304-1]	37	9.071	0.1443	0.4020	87249
382.11	Guy	37	8.612	0.0965	0.2951	9243
382.00	Side Arm Mount [SO 304-1]	37	8.610	0.0961	0.2945	9247
342.00	10' Box Arm	37	8.249	0.0846	0.1915	19343
312.00	10' Grid Dish	37	7.582	0.1109	0.0340	25494
302.11	Guy	37	7.346	0.1026	0.0476	12604
289.50	25' Broadcast Antenna	37	7.120	0.0977	0.0905	95749
264.00	10' Box Arm	37	6.535	0.1452	0.1205	18803
242.00	Beacon Light	37	5.744	0.1736	0.2098	38350
224.00	Side Arm Mount [SO 304-1]	37	5.091	0.1273	0.2713	8947
222.11	Guy	37	5.040	0.1209	0.2756	8587
212.00	2' Dish	37	4.843	0.0901	0.2932	18353
203.00	28" x 5" Antenna	31	4.812	0.0729	0.3030	27261
160.00	Side Arm Mount [SO 304-1]	27	4.302	0.1086	0.3170	28900
155.00	Oval Antenna	27	4.184	0.1084	0.3154	78513

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<i>Elevation</i>	<i>Appurtenance</i>	<i>Gov. Load Comb.</i>	<i>Deflection in</i>	<i>Tilt °</i>	<i>Twist °</i>	<i>Radius of Curvature ft</i>
<i>ft</i>						
142.11	Guy	27	3.879	0.1029	0.3086	19836
140.00	4' Grid Dish	27	3.834	0.1018	0.3074	21329
121.00	6' Yagi	27	3.467	0.1069	0.2932	27088
112.00	Nano Station	27	3.257	0.1223	0.2822	24669
82.00	Nano Station	27	2.278	0.1827	0.2288	29134
62.11	Guy	33	1.476	0.1836	0.1840	34656
42.00	Mikrotik Antenna	33	0.775	0.1511	0.1260	38517
30.00	Light Fixture	33	0.412	0.1218	0.0873	15259
22.00	TV Antenna	33	0.227	0.0946	0.0625	11314

Maximum Tower Deflections - Design Wind

<i>Section No.</i>	<i>Elevation ft</i>	<i>Horz. Deflection in</i>	<i>Gov. Load Comb.</i>	<i>Tilt °</i>	<i>Twist °</i>
T1	572 - 562	78.820	2	0.4228	1.7087
T2	562 - 542	78.524	2	0.4242	1.6986
T3	542 - 522	78.131	2	0.4630	1.6139
T4	522 - 502	78.311	2	0.4330	1.5170
T5	502 - 482	77.429	2	0.4447	1.3922
T6	482 - 462	74.957	10	0.7149	1.4313
T7	462 - 442	71.798	10	0.7432	1.4446
T8	442 - 422	68.837	10	0.8251	1.5393
T9	422 - 402	65.644	6	1.0134	1.2418
T10	402 - 382	61.993	6	1.0875	0.8754
T11	382 - 362	58.499	6	0.9015	0.6776
T12	362 - 342	56.291	6	0.7582	0.7202
T13	342 - 322	53.874	6	0.8284	0.7705
T14	322 - 302	50.498	6	0.9023	0.6136
T15	302 - 282	46.621	6	0.8746	0.5297
T16	282 - 262	43.200	6	0.8902	0.5658
T17	262 - 242	39.153	6	1.0650	0.5922
T18	242 - 222	34.317	6	1.1408	0.4805
T19	222 - 202	29.679	6	0.9019	0.7279
T20	202 - 182	26.701	6	0.6661	0.8650
T21	182 - 162	24.173	10	0.6679	0.9230
T22	162 - 142	21.545	10	0.7341	0.9528
T23	142 - 122	18.595	10	0.6620	0.9336
T24	122 - 102	16.041	10	0.6446	0.9112
T25	102 - 82	13.135	10	0.7648	0.8405
T26	82 - 62	9.654	10	0.8656	0.7310
T27	62 - 42	5.982	10	0.8107	0.5894
T28	42 - 22	3.065	8	0.6251	0.4127
T29	22 - 2	0.877	8	0.3727	0.2088

Critical Deflections and Radius of Curvature - Design Wind

<i>Elevation</i>	<i>Appurtenance</i>	<i>Gov. Load Comb.</i>	<i>Deflection in</i>	<i>Tilt °</i>	<i>Twist °</i>	<i>Radius of Curvature ft</i>
<i>ft</i>						
572.00	Side Arm Mount [SO 304-1]	2	78.820	0.4228	1.7087	45283
570.00	Lightning Rod 3/4"x5'	2	78.761	0.4223	1.7079	45283
562.00	20' Dipole	2	78.524	0.4242	1.6986	23221
552.00	Side Arm Mount [SO 304-1]	2	78.251	0.4429	1.6621	7553
542.11	Guy	2	78.131	0.4628	1.6144	4340
532.00	3' Yagi	2	78.234	0.4630	1.5708	30930

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Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
ft						
503.00	TUL-C3-4/12M-1-K	2	77.513	0.4242	1.3945	2642
492.00	Side Arm Mount [SO 304-1]	2	76.349	0.6154	1.4040	3428
476.00	Side Arm Mount [SO 304-1]	10	74.026	0.7377	1.4321	12053
462.11	Guy	10	71.815	0.7431	1.4441	4218
440.00	TLP-8W/VP-R OS	10	68.506	0.8413	1.5290	4026
400.00	Side Arm Mount [SO 304-1]	6	61.613	1.0784	0.8436	15859
382.11	Guy	6	58.515	0.9028	0.6774	2318
382.00	Side Arm Mount [SO 304-1]	6	58.499	0.9015	0.6776	2320
342.00	10' Box Arm	6	53.874	0.8284	0.7705	4469
312.00	10' Grid Dish	6	48.536	0.8960	0.5530	7822
302.11	Guy	6	46.642	0.8749	0.5298	3869
289.50	25' Broadcast Antenna	6	44.485	0.8655	0.5428	9234
264.00	10' Box Arm	6	39.600	1.0461	0.5990	5051
242.00	Beacon Light	6	34.317	1.1408	0.4805	16230
224.00	Side Arm Mount [SO 304-1]	6	30.072	0.9322	0.7092	2149
222.11	Guy	6	29.701	0.9036	0.7268	2064
212.00	2' Dish	6	28.039	0.7612	0.8079	3960
203.00	28" x 5" Antenna	6	26.831	0.6725	0.8604	9511
160.00	Side Arm Mount [SO 304-1]	10	21.252	0.7326	0.9527	8534
155.00	Oval Antenna	10	20.503	0.7201	0.9495	12360
142.11	Guy	10	18.611	0.6625	0.9338	4599
140.00	4' Grid Dish	10	18.324	0.6539	0.9316	4893
121.00	6' Yagi	10	15.910	0.6481	0.9091	7507
112.00	Nano Station	10	14.664	0.6951	0.8825	6324
82.00	Nano Station	10	9.654	0.8656	0.7310	7240
62.11	Guy	10	6.002	0.8114	0.5903	6052
42.00	Mikrotik Antenna	8	3.065	0.6251	0.4127	6489
30.00	Light Fixture	8	1.610	0.4851	0.2932	3480
22.00	TV Antenna	8	0.877	0.3727	0.2088	2784

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load Allowable	Allowable Ratio	Criteria
T1	572	Leg	A325X	0.7500	4	0.39	29.82	0.013	1	Bolt Tension
		Diagonal	A325X	0.5000	1	0.79	5.92	0.133	1	Member Bearing
		Top Girt	A325X	0.5000	1	0.07	5.92	0.012	1	Member Bearing
		Bottom Girt	A325X	0.5000	1	0.41	5.92	0.069	1	Member Bearing
T2	562	Leg	A325X	0.7500	4	1.21	29.82	0.041	1	Bolt Tension
		Diagonal	A325X	0.5000	1	1.08	5.92	0.183	1	Member Bearing
		Top Girt	A325X	0.5000	1	0.25	5.92	0.043	1	Member Bearing
		Bottom Girt	A325X	0.5000	1	0.68	5.92	0.115	1	Member Bearing
T3	542	Leg	A325X	0.7500	4	1.56	29.82	0.052	1	Bolt Tension
		Diagonal	A325X	0.5000	1	3.10	5.92	0.523	1	Member Bearing
		Top Girt	A325X	0.5000	1	1.36	5.92	0.230	1	Member Bearing
		Bottom Girt	A325X	0.5000	1	0.98	5.92	0.165	1	Member Bearing
T4	522	Leg	A325X	0.7500	4	3.13	29.82	0.105	1	Bolt Tension
		Diagonal	A325X	0.5000	1	1.99	5.92	0.336	1	Member Bearing
		Top Girt	A325X	0.5000	1	0.89	5.92	0.150	1	Member Bearing
		Bottom Girt	A325X	0.5000	1	0.47	5.92	0.079	1	Member Bearing
T5	502	Leg	A325X	0.7500	4	1.72	29.82	0.058	1	Bolt Tension
		Diagonal	A325X	0.5000	1	0.96	5.92	0.162	1	Member Bearing
		Top Girt	A325X	0.5000	1	0.43	5.92	0.073	1	Member Bearing
		Bottom Girt	A325X	0.5000	1	0.43	5.92	0.073	1	Member Bearing
T6	482	Leg	A325X	0.7500	4	2.59	29.82	0.087	1	Bolt Tension
		Diagonal	A325X	0.5000	1	1.75	5.92	0.296	1	Member Bearing
		Top Girt	A325X	0.5000	1	0.54	5.92	0.091	1	Member Bearing

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Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load Allowable	Allowable Ratio	Criteria
T7	462	Bottom Girt	A325X	0.5000	1	0.79	5.92	0.134	1	Member Bearing
		Leg	A325X	0.7500	4	2.83	29.82	0.095	1	Bolt Tension
		Diagonal	A325X	0.5000	1	3.08	5.92	0.521	1	Member Bearing
		Top Girt	A325X	0.5000	1	1.32	5.92	0.224	1	Member Bearing
T8	442	Bottom Girt	A325X	0.5000	1	1.06	5.92	0.178	1	Member Bearing
		Leg	A325X	0.7500	4	3.03	29.82	0.102	1	Bolt Tension
		Diagonal	A325X	0.5000	1	1.47	5.92	0.249	1	Member Bearing
		Top Girt	A325X	0.5000	1	0.71	5.92	0.119	1	Member Bearing
T9	422	Bottom Girt	A325X	0.5000	1	0.63	5.92	0.107	1	Member Bearing
		Leg	A325X	0.7500	4	3.04	29.82	0.102	1	Bolt Tension
		Diagonal	A325X	0.5000	1	2.78	5.92	0.469	1	Member Bearing
		Top Girt	A325X	0.5000	1	0.72	5.92	0.121	1	Member Bearing
T10	402	Bottom Girt	A325X	0.5000	1	1.06	5.92	0.180	1	Member Bearing
		Leg	A325X	0.7500	4	3.84	29.82	0.129	1	Bolt Tension
		Diagonal	A325X	0.5000	1	3.45	5.92	0.582	1	Member Bearing
		Top Girt	A325X	0.5000	1	1.09	5.92	0.184	1	Member Bearing
T11	382	Bottom Girt	A325X	0.5000	1	0.86	5.92	0.146	1	Member Bearing
		Leg	A325X	0.7500	4	3.74	29.82	0.125	1	Bolt Tension
		Diagonal	A325X	0.5000	1	4.17	5.92	0.705	1	Member Bearing
		Top Girt	A325X	0.5000	1	1.96	5.92	0.331	1	Member Bearing
T12	362	Bottom Girt	A325X	0.5000	1	1.21	5.92	0.205	1	Member Bearing
		Leg	A325X	0.7500	4	4.28	29.82	0.144	1	Bolt Tension
		Diagonal	A325X	0.5000	1	3.08	5.92	0.520	1	Member Bearing
		Top Girt	A325X	0.5000	1	1.15	5.92	0.195	1	Member Bearing
T13	342	Bottom Girt	A325X	0.5000	1	0.89	5.92	0.150	1	Member Bearing
		Leg	A325X	0.7500	4	4.28	29.82	0.144	1	Bolt Tension
		Diagonal	A325X	0.5000	1	2.72	5.92	0.460	1	Member Bearing
		Top Girt	A325X	0.5000	1	0.90	5.92	0.152	1	Member Bearing
T14	322	Bottom Girt	A325X	0.5000	1	1.01	5.92	0.170	1	Member Bearing
		Leg	A325X	0.7500	4	5.48	29.82	0.184	1	Bolt Tension
		Diagonal	A325X	0.5000	1	5.48	9.72	0.563	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.14	9.72	0.117	1	Bolt Shear
T15	302	Bottom Girt	A325X	0.5000	1	1.25	9.72	0.129	1	Bolt Shear
		Leg	A325X	0.7500	4	5.88	29.82	0.197	1	Bolt Tension
		Diagonal	A325X	0.5000	1	4.08	5.92	0.690	1	Member Bearing
		Top Girt	A325X	0.5000	1	2.67	7.02	0.380	1	Member Bearing
T16	282	Bottom Girt	A325X	0.5000	1	1.22	5.92	0.206	1	Member Bearing
		Leg	A325X	0.7500	4	5.80	29.82	0.195	1	Bolt Tension
		Diagonal	A325X	0.5000	1	1.94	5.92	0.327	1	Member Bearing
		Top Girt	A325X	0.5000	1	1.24	5.92	0.210	1	Member Bearing
T17	262	Bottom Girt	A325X	0.5000	1	1.24	5.92	0.210	1	Member Bearing
		Leg	A325X	0.7500	4	5.61	29.82	0.188	1	Bolt Tension
		Diagonal	A325X	0.5000	1	3.46	5.92	0.584	1	Member Bearing
		Top Girt	A325X	0.5000	1	1.29	5.92	0.218	1	Member Bearing
T18	242	Bottom Girt	A325X	0.5000	1	1.45	5.92	0.244	1	Member Bearing
		Leg	A325X	0.7500	4	6.63	29.82	0.222	1	Bolt Tension
		Diagonal	A325X	0.5000	1	4.16	5.92	0.703	1	Member Bearing
		Top Girt	A325X	0.5000	1	1.43	5.92	0.242	1	Member Bearing
T19	222	Bottom Girt	A325X	0.5000	1	1.38	5.92	0.233	1	Member Bearing
		Leg	A325X	0.7500	4	6.89	29.82	0.231	1	Bolt Tension
		Diagonal	A325X	0.5000	1	3.58	5.92	0.604	1	Member Bearing
		Top Girt	A325X	0.5000	1	1.88	5.92	0.317	1	Member Bearing
T20	202	Bottom Girt	A325X	0.5000	1	1.43	5.92	0.242	1	Member Bearing
		Leg	A325X	0.7500	4	7.13	29.82	0.239	1	Bolt Tension
		Diagonal	A325X	0.5000	1	2.55	9.72	0.262	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.48	9.72	0.152	1	Bolt Shear
T21	182	Bottom Girt	A325X	0.5000	1	1.48	9.72	0.152	1	Bolt Shear
		Leg	A325X	0.7500	4	6.94	29.82	0.233	1	Bolt Tension
		Diagonal	A325X	0.5000	1	1.40	9.72	0.144	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.48	9.72	0.153	1	Bolt Shear

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Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load Allowable	Allowable Ratio	Criteria
T22	162	Bottom Girt	A325X	0.5000	1	1.48	9.72	0.153	1	Bolt Shear
		Leg	A325X	0.7500	4	6.97	29.82	0.234	1	Bolt Tension
		Diagonal	A325X	0.5000	1	2.93	9.72	0.302	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.45	9.72	0.149	1	Bolt Shear
T23	142	Bottom Girt	A325X	0.5000	1	1.48	9.72	0.152	1	Bolt Shear
		Leg	A325X	0.7500	4	7.31	29.82	0.245	1	Bolt Tension
		Diagonal	A325X	0.5000	1	3.82	9.72	0.393	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.96	9.72	0.202	1	Bolt Shear
T24	122	Bottom Girt	A325X	0.5000	1	1.52	9.72	0.156	1	Bolt Shear
		Leg	A325X	0.7500	4	7.66	29.82	0.257	1	Bolt Tension
		Diagonal	A325X	0.5000	1	2.17	9.72	0.224	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.59	9.72	0.164	1	Bolt Shear
T25	102	Bottom Girt	A325X	0.5000	1	1.59	9.72	0.164	1	Bolt Shear
		Leg	A325X	0.7500	4	7.52	29.82	0.252	1	Bolt Tension
		Diagonal	A325X	0.5000	1	2.17	9.72	0.224	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.60	9.72	0.164	1	Bolt Shear
T26	82	Bottom Girt	A325X	0.5000	1	1.60	9.72	0.164	1	Bolt Shear
		Leg	A325X	0.7500	4	8.00	29.82	0.268	1	Bolt Tension
		Diagonal	A325X	0.5000	1	3.44	9.72	0.354	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.66	9.72	0.171	1	Bolt Shear
T27	62	Bottom Girt	A325X	0.5000	1	1.66	9.72	0.171	1	Bolt Shear
		Leg	A325X	0.7500	4	8.44	29.82	0.283	1	Bolt Tension
		Diagonal	A325X	0.5000	1	2.53	9.72	0.260	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.75	9.72	0.181	1	Bolt Shear
T28	42	Bottom Girt	A325X	0.5000	1	1.75	9.72	0.181	1	Bolt Shear
		Leg	A325X	0.7500	4	8.77	29.82	0.294	1	Bolt Tension
		Diagonal	A325X	0.5000	1	3.40	9.72	0.349	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.82	9.72	0.187	1	Bolt Shear
T29	22	Bottom Girt	A325X	0.5000	1	1.82	9.72	0.187	1	Bolt Shear
		Diagonal	A325X	0.5000	1	2.71	9.72	0.279	1	Bolt Shear
		Top Girt	A325X	0.5000	1	1.82	9.72	0.188	1	Bolt Shear
		Bottom Girt	A325X	0.5000	1	3.60	9.72	0.370	1	Bolt Shear

Guy Design Data

Section No.	Elevation ft	Size	Initial Tension K	Breaking Load K	Actual T_u K	Allowable ϕT_n K	Required S.F.	Actual S.F.
T2	542.11 (A) (1023)	1/2 EHS	2.69	26.90	15.51	16.14	1.000	1.041
	542.11 (B) (1022)	1/2 EHS	2.69	26.90	15.76	16.14	1.000	1.024
	542.11 (C) (1018)	1/2 EHS	2.69	26.90	15.51	16.14	1.000	1.041
T6	462.11 (A) (1029)	1/2 EHS	2.69	26.90	16.25	16.14	1.000	0.993
	462.11 (B) (1028)	1/2 EHS	2.69	26.90	16.57	16.14	1.000	0.974
	462.11 (C) (1024)	1/2 EHS	2.69	26.90	16.37	16.14	1.000	0.986
T10	382.11 (A) (1035)	1/2 EHS	2.69	26.90	15.42	16.14	1.000	1.047
	382.11 (B) (1034)	1/2 EHS	2.69	26.90	15.90	16.14	1.000	1.015
	382.11 (C) (1030)	1/2 EHS	2.69	26.90	15.53	16.14	1.000	1.039
T14	302.11 (A)	3/8 EHS	1.54	15.40	9.50	9.24	1.000	0.973

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Section No.	Elevation ft	Size	Initial Tension K	Breaking Load K	Actual T_u K	Allowable ϕT_n K	Required S.F.	Actual S.F.
T18	(1047) 302.11 (A)	3/8 EHS	1.54	15.40	9.50	9.24	1.000	0.973
	(1048) 302.11 (B)	3/8 EHS	1.54	15.40	9.93	9.24	1.000	0.931
	(1043) 302.11 (B)	3/8 EHS	1.54	15.40	9.94	9.24	1.000	0.930
	(1044) 302.11 (C)	3/8 EHS	1.54	15.40	9.49	9.24	1.000	0.974
	(1036) 302.11 (C)	3/8 EHS	1.54	15.40	9.48	9.24	1.000	0.975
	(1037) 222.11 (A)	1/2 EHS	2.69	26.90	12.62	16.14	1.000	1.279
	(1056) 222.11 (B)	1/2 EHS	2.69	26.90	12.93	16.14	1.000	1.248
	(1055) 222.11 (C)	1/2 EHS	2.69	26.90	12.50	16.14	1.000	1.291
	(1051) 142.11 (A)	1/2 EHS	2.69	26.90	11.52	16.14	1.000	1.401
	(1062) 142.11 (B)	1/2 EHS	2.69	26.90	11.19	16.14	1.000	1.442
T22	(1061) 142.11 (C)	1/2 EHS	2.69	26.90	11.43	16.14	1.000	1.412
	(1057) 62.11 (A)	1/2 EHS	2.69	26.90	9.42	16.14	1.000	1.713
	(1068) 62.11 (B)	1/2 EHS	2.69	26.90	9.39	16.14	1.000	1.719
T26	(1067) 62.11 (C)	1/2 EHS	2.69	26.90	9.47	16.14	1.000	1.705
	(1063)							

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in ²	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	572 - 562	ROHN 2 X-STR	10.00	2.32	72.6 K=2.00	1.4773	-1.46	45.22	0.032 ¹
T2	562 - 542	ROHN 2 STD	20.00	0.11	1.7 K=1.00	1.0745	-14.54	48.34	0.301 ¹
T3	542 - 522	ROHN 2 X-STR	20.00	2.41	75.4 K=2.00	1.4773	-17.94	43.86	0.409 ¹
T4	522 - 502	ROHN 2 STD	20.00	2.41	73.4 K=2.00	1.0745	-26.89	32.59	0.825 ¹
T5	502 - 482	ROHN 2 X-STR	20.00	2.41	37.7 K=1.00	1.4773	-24.41	59.91	0.407 ¹
T6	482 - 462	ROHN 2 X-STR	20.00	0.11	1.8 K=1.00	1.4773	-31.08	66.46	0.468 ¹
T7	462 - 442	ROHN 2 X-STR	20.00	2.41	75.4 K=2.00	1.4773	-33.84	43.86	0.772 ¹
T8	442 - 422	ROHN 2 X-STR	20.00	2.41	75.4 K=2.00	1.4773	-36.42	43.86	0.831 ¹
T9	422 - 402	ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-36.78	58.41	0.630 ¹
T10	402 - 382	ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-43.05	58.41	0.737 ¹

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T11	382 - 362	ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-45.57	58.41	0.780 ¹
T12	362 - 342	ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-50.82	58.41	0.870 ¹
T13	342 - 322	ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-51.91	58.41	0.889 ¹
T14	322 - 302	ROHN 2.5 X-STR	20.00	2.41	62.6 K=2.00	2.2535	-55.94	76.17	0.734 ¹
T15	302 - 282	ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-69.99	58.41	1.198 ¹
T16	282 - 262	4.8.1 (1.20 CR) - 524 ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-71.80	58.41	1.229 ¹
T17	262 - 242	4.8.1 (1.23 CR) - 557/4 ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-68.83	58.41	1.179 ¹
T18	242 - 222	4.8.1 (1.18 CR) - 590/8 ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-74.49	58.41	1.275 ¹
T19	222 - 202	4.8.1 (1.28 CR) - 624 ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-82.05	58.41	1.405 ¹
T20	202 - 182	4.8.1 (1.40 CR) - 657 ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-85.24	58.41	1.459 ¹
T21	182 - 162	4.8.1 (1.46 CR) - 690 ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-85.59	58.41	1.465 ¹
T22	162 - 142	4.8.1 (1.47 CR) - 723/7 ROHN 2.5 STD	20.00	2.41	61.0 K=2.00	1.7040	-83.31	58.41	1.426 ¹
T23	142 - 122	4.8.1 (1.43 CR) - 754/8 ROHN 2.5 X-STR	20.00	2.41	62.6 K=2.00	2.2535	-87.23	76.17	1.145 ¹
T24	122 - 102	4.8.1 (1.15 CR) - 787 ROHN 2.5 X-STR	20.00	2.41	62.6 K=2.00	2.2535	-91.60	76.17	1.203 ¹
T25	102 - 82	4.8.1 (1.20 CR) - 821 ROHN 2.5 X-STR	20.00	2.41	62.6 K=2.00	2.2535	-92.24	76.17	1.211 ¹
T26	82 - 62	4.8.1 (1.21 CR) - 854/6 ROHN 2.5 X-STR	20.00	2.41	62.6 K=2.00	2.2535	-93.19	76.17	1.223 ¹
T27	62 - 42	4.8.1 (1.22 CR) - 886 ROHN 2.5 X-STR	20.00	2.41	62.6 K=2.00	2.2535	-100.73	76.17	1.322 ¹
T28	42 - 22	4.8.1 (1.32 CR) - 921 ROHN 2.5 X-STR	20.00	2.41	62.6 K=2.00	2.2535	-104.77	76.17	1.376 ¹
T29	22 - 2	4.8.1 (1.38 CR) - 954 ROHN 2.5 X-STR	20.00	2.41	62.6 K=2.00	2.2535	-105.29	76.17	1.382 ¹
		4.8.1 (1.38 CR) - 987/6							

¹ P_u / φP_n controls

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Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	572 - 562	ROHN 1.5 x 16GA	3.83	3.58	84.3 K=1.00	0.2627	-0.80	6.42	0.124 ¹
T2	562 - 542	ROHN 1.5 x 16GA	3.85	3.59	84.5 K=1.00	0.2627	-1.15	6.40	0.179 ¹
T3	542 - 522	ROHN 1.5 x 16GA	3.85	3.59	84.5 K=1.00	0.2627	-3.12	6.40	0.487 ¹
T4	522 - 502	ROHN 1.5 x 16GA	3.85	3.59	84.5 K=1.00	0.2627	-2.03	6.40	0.317 ¹
T5	502 - 482	ROHN 1.5 x 16GA	3.85	3.59	84.5 K=1.00	0.2627	-1.13	6.40	0.177 ¹
T6	482 - 462	ROHN 1.5 x 16GA	3.85	3.59	84.5 K=1.00	0.2627	-1.72	6.40	0.268 ¹
T7	462 - 442	ROHN 1.5 x 16GA	3.85	3.59	84.5 K=1.00	0.2627	-3.15	6.40	0.492 ¹
T8	442 - 422	ROHN 1.5 x 16GA	3.85	3.59	84.5 K=1.00	0.2627	-1.55	6.40	0.241 ¹
T9	422 - 402	ROHN 1.5 x 16GA	3.85	3.54	83.3 K=1.00	0.2627	-2.88	6.49	0.444 ¹
T10	402 - 382	ROHN 1.5 x 16GA	3.85	3.54	83.3 K=1.00	0.2627	-3.46	6.49	0.533 ¹
T11	382 - 362	ROHN 1.5 x 16GA	3.85	3.54	83.3 K=1.00	0.2627	-4.38	6.49	0.675 ¹
T12	362 - 342	ROHN 1.5 x 16GA	3.85	3.54	83.3 K=1.00	0.2627	-3.28	6.49	0.506 ¹
T13	342 - 322	ROHN 1.5 x 16GA	3.85	3.54	83.3 K=1.00	0.2627	-2.74	6.49	0.423 ¹
T14	322 - 302	ROHN 1.5 x 11GA	3.85	3.54	86.7 K=1.00	0.5202	-5.32	12.39	0.430 ¹
T15	302 - 282	ROHN 1.5 x 16GA	3.85	3.54	83.3 K=1.00	0.2627	-4.35	6.49	0.671 ¹
T16	282 - 262	ROHN 1.5 x 16GA	3.85	3.54	83.3 K=1.00	0.2627	-2.19	6.49	0.337 ¹
T17	262 - 242	ROHN 1.5 x 16GA	3.85	3.54	83.3 K=1.00	0.2627	-3.76	6.49	0.579 ¹
T18	242 - 222	ROHN 1.5 x 16GA	3.85	3.54	83.3 K=1.00	0.2627	-4.18	6.49	0.645 ¹
T19	222 - 202	ROHN 1.5 x 16GA	3.85	3.54	83.3 K=1.00	0.2627	-3.93	6.49	0.606 ¹
T20	202 - 182	ROHN 1.5 x 11GA	3.85	3.54	86.7 K=1.00	0.5202	-2.55	12.39	0.206 ¹
T21	182 - 162	ROHN 1.5 x 11GA	3.85	3.54	86.7 K=1.00	0.5202	-1.40	12.39	0.113 ¹
T22	162 - 142	ROHN 1.5 x 11GA	3.85	3.54	86.7 K=1.00	0.5202	-2.90	12.39	0.234 ¹
T23	142 - 122	ROHN 1.5 x 11GA	3.85	3.54	86.7 K=1.00	0.5202	-3.82	12.39	0.308 ¹
T24	122 - 102	ROHN 1.5 x 11GA	3.85	3.54	86.7 K=1.00	0.5202	-2.17	12.39	0.176 ¹
T25	102 - 82	ROHN 1.5 x 11GA	3.85	3.54	86.7 K=1.00	0.5202	-2.17	12.39	0.175 ¹
T26	82 - 62	ROHN 1.5 x 11GA	3.85	3.54	86.7 K=1.00	0.5202	-3.44	12.39	0.278 ¹
T27	62 - 42	ROHN 1.5 x 11GA	3.85	3.54	86.7 K=1.00	0.5202	-2.53	12.39	0.204 ¹
T28	42 - 22	ROHN 1.5 x 11GA	3.85	3.54	86.7 K=1.00	0.5202	-3.40	12.39	0.274 ¹
T29	22 - 2	ROHN 1.5 x 11GA	4.16	3.86	94.7 K=1.00	0.5202	-2.58	11.34	0.227 ¹

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
K=1.00									

¹ P_u / φP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	572 - 562	ROHN 1.5 x 16GA	3.39	3.19	75.1 K=1.00	0.2627	-0.06	7.02	0.009 ¹
T2	562 - 542	ROHN 1.5 x 16GA	3.00	2.80	65.9 K=1.00	0.2627	-0.25	7.61	0.033 ¹
T3	542 - 522	ROHN 1.5 x 16GA	3.00	2.80	65.9 K=1.00	0.2627	-1.16	7.61	0.153 ¹
T4	522 - 502	ROHN 1.5 x 16GA	3.00	2.80	65.9 K=1.00	0.2627	-0.86	7.61	0.113 ¹
T5	502 - 482	ROHN 1.5 x 16GA	3.00	2.80	65.9 K=1.00	0.2627	-0.43	7.61	0.057 ¹
T6	482 - 462	ROHN 1.5 x 16GA	3.00	2.80	65.9 K=1.00	0.2627	-0.54	7.61	0.071 ¹
T7	462 - 442	ROHN 1.5 x 16GA	3.00	2.80	65.9 K=1.00	0.2627	-1.13	7.61	0.148 ¹
T8	442 - 422	ROHN 1.5 x 16GA	3.00	2.80	65.9 K=1.00	0.2627	-0.72	7.61	0.094 ¹
T9	422 - 402	ROHN 1.5 x 16GA	3.00	2.76	64.9 K=1.00	0.2627	-0.64	7.67	0.083 ¹
T10	402 - 382	ROHN 1.5 x 16GA	3.00	2.76	64.9 K=1.00	0.2627	-1.03	7.67	0.135 ¹
T11	382 - 362	ROHN 1.5 x 16GA	3.00	2.76	64.9 K=1.00	0.2627	-1.56	7.67	0.203 ¹
T12	362 - 342	ROHN 1.5 x 16GA	3.00	2.76	64.9 K=1.00	0.2627	-1.04	7.67	0.135 ¹
T13	342 - 322	ROHN 1.5 x 16GA	3.00	2.76	64.9 K=1.00	0.2627	-0.90	7.67	0.117 ¹
T14	322 - 302	ROHN 1.5 x 11GA	3.00	2.76	67.6 K=1.00	0.5202	-1.14	14.85	0.077 ¹
T15	302 - 282	ROHN 1.5 x 16GA	3.00	2.76	64.9 K=1.00	0.2627	-2.67	7.67	0.348 ¹
T16	282 - 262	ROHN 1.5 x 16GA	3.00	2.76	64.9 K=1.00	0.2627	-1.24	7.67	0.162 ¹
T17	262 - 242	ROHN 1.5 x 16GA	3.00	2.76	64.9 K=1.00	0.2627	-1.21	7.67	0.157 ¹
T18	242 - 222	ROHN 1.5 x 16GA	3.00	2.76	64.9 K=1.00	0.2627	-1.38	7.67	0.180 ¹
T19	222 - 202	ROHN 1.5 x 16GA	3.00	2.76	64.9 K=1.00	0.2627	-1.43	7.67	0.187 ¹
T20	202 - 182	ROHN 1.5 x 11GA	3.00	2.76	67.6 K=1.00	0.5202	-1.48	14.85	0.100 ¹
T21	182 - 162	ROHN 1.5 x 11GA	3.00	2.76	67.6 K=1.00	0.5202	-1.48	14.85	0.100 ¹
T22	162 - 142	ROHN 1.5 x 11GA	3.00	2.76	67.6 K=1.00	0.5202	-1.45	14.85	0.098 ¹
T23	142 - 122	ROHN 1.5 x 11GA	3.00	2.76	67.6 K=1.00	0.5202	-1.62	14.85	0.109 ¹
T24	122 - 102	ROHN 1.5 x 11GA	3.00	2.76	67.6 K=1.00	0.5202	-1.59	14.85	0.107 ¹
T25	102 - 82	ROHN 1.5 x 11GA	3.00	2.76	67.6 K=1.00	0.5202	-1.60	14.85	0.108 ¹

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T26	82 - 62	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.66	14.85	0.112 ¹
T27	62 - 42	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.75	14.85	0.118 ¹
T28	42 - 22	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.82	14.85	0.123 ¹
T29	22 - 2	ROHN 1.5 x 11GA	3.01	2.77	K=1.00 68.0	0.5202	-1.82	14.81	0.123 ¹

¹ P_u / φP_n controls

Bottom Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	572 - 562	ROHN 1.5 x 16GA	3.00	2.81	66.0	0.2627	-0.35	7.60	0.045 ¹
T2	562 - 542	ROHN 1.5 x 16GA	3.00	2.80	K=1.00 65.9	0.2627	-0.25	7.61	0.033 ¹
T3	542 - 522	ROHN 1.5 x 16GA	3.00	2.80	K=1.00 65.9	0.2627	-0.93	7.61	0.122 ¹
T4	522 - 502	ROHN 1.5 x 16GA	3.00	2.80	K=1.00 65.9	0.2627	-0.47	7.61	0.061 ¹
T5	502 - 482	ROHN 1.5 x 16GA	3.00	2.80	K=1.00 65.9	0.2627	-0.43	7.61	0.057 ¹
T6	482 - 462	ROHN 1.5 x 16GA	3.00	2.80	K=1.00 65.9	0.2627	-0.54	7.61	0.071 ¹
T7	462 - 442	ROHN 1.5 x 16GA	3.00	2.80	K=1.00 65.9	0.2627	-0.92	7.61	0.121 ¹
T8	442 - 422	ROHN 1.5 x 16GA	3.00	2.80	K=1.00 65.9	0.2627	-0.63	7.61	0.083 ¹
T9	422 - 402	ROHN 1.5 x 16GA	3.00	2.76	K=1.00 64.9	0.2627	-0.91	7.67	0.119 ¹
T10	402 - 382	ROHN 1.5 x 16GA	3.00	2.76	K=1.00 64.9	0.2627	-0.80	7.67	0.104 ¹
T11	382 - 362	ROHN 1.5 x 16GA	3.00	2.76	K=1.00 64.9	0.2627	-1.06	7.67	0.138 ¹
T12	362 - 342	ROHN 1.5 x 16GA	3.00	2.76	K=1.00 64.9	0.2627	-0.89	7.67	0.116 ¹
T13	342 - 322	ROHN 1.5 x 16GA	3.00	2.76	K=1.00 64.9	0.2627	-0.90	7.67	0.117 ¹
T14	322 - 302	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.14	14.85	0.077 ¹
T15	302 - 282	ROHN 1.5 x 16GA	3.00	2.76	K=1.00 64.9	0.2627	-1.22	7.67	0.159 ¹
T16	282 - 262	ROHN 1.5 x 16GA	3.00	2.76	K=1.00 64.9	0.2627	-1.24	7.67	0.162 ¹
T17	262 - 242	ROHN 1.5 x 16GA	3.00	2.76	K=1.00 64.9	0.2627	-1.21	7.67	0.158 ¹
T18	242 - 222	ROHN 1.5 x 16GA	3.00	2.76	K=1.00 64.9	0.2627	-1.38	7.67	0.180 ¹
T19	222 - 202	ROHN 1.5 x 16GA	3.00	2.76	K=1.00 64.9	0.2627	-1.43	7.67	0.187 ¹
T20	202 - 182	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.48	14.85	0.100 ¹
T21	182 - 162	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.48	14.85	0.100 ¹

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T22	162 - 142	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.45	14.85	0.098 ¹
T23	142 - 122	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.52	14.85	0.102 ¹
T24	122 - 102	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.59	14.85	0.107 ¹
T25	102 - 82	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.60	14.85	0.108 ¹
T26	82 - 62	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.66	14.85	0.112 ¹
T27	62 - 42	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.75	14.85	0.118 ¹
T28	42 - 22	ROHN 1.5 x 11GA	3.00	2.76	K=1.00 67.6	0.5202	-1.82	14.85	0.123 ¹
T29	22 - 2	ROHN 1.5 x 11GA	3.41	3.17	K=1.00 77.8	0.5202	-0.20	13.56	0.015 ¹

¹ P_u / φP_n controls

Top Guy Pull-Off Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T14	322 - 302	4 1/2x3/8	3.00	2.76	306.0 K=1.00	1.6875	-2.97	4.07	0.730 ¹

KL/R > 200 (C) - 1042

¹ P_u / φP_n controls

Torque-Arm Top Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T14	322 - 302 (1038)	C12x20.7	3.42	3.30	49.6 K=1.00	6.0900	-2.30	173.33	0.013
T14	322 - 302 (1039)	C12x20.7	3.42	3.30	49.6 K=1.00	6.0900	-2.31	173.33	0.013
T14	322 - 302 (1045)	C12x20.7	3.42	3.30	49.6 K=1.00	6.0900	-3.74	173.33	0.022
T14	322 - 302 (1046)	C12x20.7	3.42	3.30	49.6 K=1.00	6.0900	-2.73	173.33	0.016
T14	322 - 302 (1049)	C12x20.7	3.42	3.30	49.6 K=1.00	6.0900	-2.74	173.33	0.016
T14	322 - 302 (1050)	C12x20.7	3.42	3.30	49.6 K=1.00	6.0900	-3.78	173.33	0.022

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Torque-Arm Top Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
T14	322 - 302 (1038)	C12x20.7	-17.78	68.58	0.259	0.00	7.01	0.000
T14	322 - 302 (1039)	C12x20.7	-18.45	68.58	0.269	0.00	7.01	0.000
T14	322 - 302 (1045)	C12x20.7	-18.08	68.58	0.264	0.00	7.01	0.000
T14	322 - 302 (1046)	C12x20.7	-19.03	68.58	0.278	0.00	7.01	0.000
T14	322 - 302 (1049)	C12x20.7	-19.45	68.58	0.284	0.00	7.01	0.000
T14	322 - 302 (1050)	C12x20.7	-18.02	68.58	0.263	-0.00	7.01	0.000

Torque-Arm Top Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T14	322 - 302 (1038)	C12x20.7	0.013	0.259	0.000	0.266	1.000	4.8.1
T14	322 - 302 (1039)	C12x20.7	0.013	0.269	0.000	0.276	1.000	4.8.1
T14	322 - 302 (1045)	C12x20.7	0.022	0.264	0.000	0.274	1.000	4.8.1
T14	322 - 302 (1046)	C12x20.7	0.016	0.278	0.000	0.285	1.000	4.8.1
T14	322 - 302 (1049)	C12x20.7	0.016	0.284	0.000	0.292	1.000	4.8.1
T14	322 - 302 (1050)	C12x20.7	0.022	0.263	0.000	0.274	1.000	4.8.1

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in ²	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	572 - 562	ROHN 2 X-STR	10.00	0.11	1.8	1.4773	1.57	66.48	0.024 ¹
T2	562 - 542	ROHN 2 STD	20.00	2.41	36.7	1.0745	12.32	48.35	0.255 ¹
T3	542 - 522	ROHN 2 X-STR	20.00	0.11	1.8	1.4773	5.12	66.48	0.077 ¹
T4	522 - 502	ROHN 2 STD	20.00	2.41	36.7	1.0745	14.43	48.35	0.298 ¹
T5	502 - 482	ROHN 2 X-STR	20.00	0.61	9.6	1.4773	12.54	66.48	0.189 ¹
T6	482 - 462	ROHN 2 X-STR	20.00	2.41	37.7	1.4773	7.57	66.48	0.114 ¹
T10	402 - 382	ROHN 2.5 STD	20.00	2.41	30.5	1.7040	14.37	76.68	0.187 ¹
T11	382 - 362	ROHN 2.5 STD	20.00	0.61	7.8	1.7040	4.57	76.68	0.060 ¹
T18	242 - 222	ROHN 2.5 STD	20.00	2.41	30.5	1.7040	1.59	76.68	0.021 ¹
T29	22 - 2	4.8.1 (1.24 CR) - 623 ROHN 2.5 X-STR 4.8.1 (1.38 CR) - 987	20.00	0.11	1.5	2.2535	9.34	101.41	0.092 ¹

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Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	

¹ P_u / φP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	
T1	572 - 562	ROHN 1.5 x 16GA	3.83	3.58	84.3	0.2627	0.79	9.93	0.079 ¹
T2	562 - 542	ROHN 1.5 x 16GA	3.85	3.59	84.5	0.2627	1.08	9.93	0.109 ¹
T3	542 - 522	ROHN 1.5 x 16GA	3.85	3.59	84.5	0.2627	3.10	9.93	0.312 ¹
T4	522 - 502	ROHN 1.5 x 16GA	3.85	3.59	84.5	0.2627	1.99	9.93	0.200 ¹
T5	502 - 482	ROHN 1.5 x 16GA	3.85	3.59	84.5	0.2627	0.96	9.93	0.097 ¹
T6	482 - 462	ROHN 1.5 x 16GA	3.85	3.59	84.5	0.2627	1.75	9.93	0.176 ¹
T7	462 - 442	ROHN 1.5 x 16GA	3.85	3.59	84.5	0.2627	3.08	9.93	0.310 ¹
T8	442 - 422	ROHN 1.5 x 16GA	3.85	3.59	84.5	0.2627	1.47	9.93	0.148 ¹
T9	422 - 402	ROHN 1.5 x 16GA	3.85	3.54	83.3	0.2627	2.78	9.93	0.280 ¹
T10	402 - 382	ROHN 1.5 x 16GA	3.85	3.54	83.3	0.2627	3.45	9.93	0.347 ¹
T11	382 - 362	ROHN 1.5 x 16GA	3.85	3.54	83.3	0.2627	4.17	9.93	0.420 ¹
T12	362 - 342	ROHN 1.5 x 16GA	3.85	3.54	83.3	0.2627	3.08	9.93	0.310 ¹
T13	342 - 322	ROHN 1.5 x 16GA	3.85	3.54	83.3	0.2627	2.72	9.93	0.274 ¹
T14	322 - 302	ROHN 1.5 x 11GA	3.85	3.54	86.7	0.5202	5.48	19.67	0.278 ¹
T15	302 - 282	ROHN 1.5 x 16GA	3.85	3.54	83.3	0.2627	4.08	9.93	0.411 ¹
T16	282 - 262	ROHN 1.5 x 16GA	3.85	3.54	83.3	0.2627	1.94	9.93	0.195 ¹
T17	262 - 242	ROHN 1.5 x 16GA	3.85	3.54	83.3	0.2627	3.46	9.93	0.348 ¹
T18	242 - 222	ROHN 1.5 x 16GA	3.85	3.54	83.3	0.2627	4.16	9.93	0.419 ¹
T19	222 - 202	ROHN 1.5 x 16GA	3.85	3.54	83.3	0.2627	3.58	9.93	0.360 ¹
T20	202 - 182	ROHN 1.5 x 11GA	3.85	3.54	86.7	0.5202	2.22	19.67	0.113 ¹
T21	182 - 162	ROHN 1.5 x 11GA	3.85	3.54	86.7	0.5202	1.12	19.67	0.057 ¹
T22	162 - 142	ROHN 1.5 x 11GA	3.85	3.54	86.7	0.5202	2.93	19.67	0.149 ¹
T23	142 - 122	ROHN 1.5 x 11GA	3.85	3.54	86.7	0.5202	3.50	19.67	0.178 ¹
T24	122 - 102	ROHN 1.5 x 11GA	3.85	3.54	86.7	0.5202	1.79	19.67	0.091 ¹
T25	102 - 82	ROHN 1.5 x 11GA	3.85	3.54	86.7	0.5202	1.96	19.67	0.100 ¹
T26	82 - 62	ROHN 1.5 x 11GA	3.85	3.54	86.7	0.5202	3.13	19.67	0.159 ¹
T27	62 - 42	ROHN 1.5 x 11GA	3.85	3.54	86.7	0.5202	2.08	19.67	0.106 ¹
T28	42 - 22	ROHN 1.5 x 11GA	3.85	3.54	86.7	0.5202	2.94	19.67	0.150 ¹
T29	22 - 2	ROHN 1.5 x 11GA	3.88	3.58	87.8	0.5202	2.71	19.67	0.138 ¹

¹ P_u / φP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	
T1	572 - 562	ROHN 1.5 x 16GA	3.39	3.19	75.1	0.2627	0.07	9.93	0.007 ¹
T2	562 - 542	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.25	9.93	0.025 ¹
T3	542 - 522	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	1.36	9.93	0.137 ¹
T4	522 - 502	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.89	9.93	0.089 ¹
T5	502 - 482	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.43	9.93	0.043 ¹
T6	482 - 462	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.54	9.93	0.054 ¹
T7	462 - 442	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	1.32	9.93	0.133 ¹
T8	442 - 422	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.71	9.93	0.071 ¹
T9	422 - 402	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	0.72	9.93	0.072 ¹
T10	402 - 382	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.09	9.93	0.109 ¹
T11	382 - 362	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.96	9.93	0.197 ¹

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Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	
T12	362 - 342	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.15	9.93	0.116 ¹
T13	342 - 322	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	0.90	9.93	0.091 ¹
T14	322 - 302	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.14	19.67	0.058 ¹
T15	302 - 282	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.43	9.93	0.144 ¹
T16	282 - 262	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.24	9.93	0.125 ¹
T17	262 - 242	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.29	9.93	0.130 ¹
T18	242 - 222	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.43	9.93	0.144 ¹
T19	222 - 202	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.88	9.93	0.189 ¹
T20	202 - 182	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.48	19.67	0.075 ¹
T21	182 - 162	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.48	19.67	0.075 ¹
T22	162 - 142	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.45	19.67	0.074 ¹
T23	142 - 122	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.96	19.67	0.100 ¹
T24	122 - 102	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.59	19.67	0.081 ¹
T25	102 - 82	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.60	19.67	0.081 ¹
T26	82 - 62	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.66	19.67	0.085 ¹
T27	62 - 42	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.75	19.67	0.089 ¹
T28	42 - 22	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.82	19.67	0.093 ¹
T29	22 - 2	ROHN 1.5 x 11GA	3.01	2.77	68.0	0.5202	1.82	19.67	0.093 ¹

¹ P_u / φP_n controls

Bottom Girt Design Data (Tension)

Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	
T1	572 - 562	ROHN 1.5 x 16GA	3.00	2.81	66.0	0.2627	0.41	9.93	0.041 ¹
T2	562 - 542	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.68	9.93	0.068 ¹
T3	542 - 522	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.98	9.93	0.098 ¹
T4	522 - 502	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.47	9.93	0.047 ¹
T5	502 - 482	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.43	9.93	0.043 ¹
T6	482 - 462	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.79	9.93	0.080 ¹
T7	462 - 442	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	1.06	9.93	0.106 ¹
T8	442 - 422	ROHN 1.5 x 16GA	3.00	2.80	65.9	0.2627	0.63	9.93	0.064 ¹
T9	422 - 402	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.06	9.93	0.107 ¹
T10	402 - 382	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	0.86	9.93	0.087 ¹
T11	382 - 362	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.21	9.93	0.122 ¹
T12	362 - 342	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	0.89	9.93	0.090 ¹
T13	342 - 322	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.01	9.93	0.101 ¹
T14	322 - 302	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.25	19.67	0.064 ¹
T15	302 - 282	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.22	9.93	0.123 ¹
T16	282 - 262	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.24	9.93	0.125 ¹
T17	262 - 242	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.45	9.93	0.146 ¹
T18	242 - 222	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.38	9.93	0.139 ¹
T19	222 - 202	ROHN 1.5 x 16GA	3.00	2.76	64.9	0.2627	1.43	9.93	0.144 ¹
T20	202 - 182	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.48	19.67	0.075 ¹
T21	182 - 162	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.48	19.67	0.075 ¹
T22	162 - 142	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.48	19.67	0.075 ¹
T23	142 - 122	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.52	19.67	0.077 ¹
T24	122 - 102	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.59	19.67	0.081 ¹
T25	102 - 82	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.60	19.67	0.081 ¹
T26	82 - 62	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.66	19.67	0.085 ¹
T27	62 - 42	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.75	19.67	0.089 ¹
T28	42 - 22	ROHN 1.5 x 11GA	3.00	2.76	67.6	0.5202	1.82	19.67	0.093 ¹
T29	22 - 2	ROHN 1.5 x 11GA	3.41	3.17	77.8	0.5202	3.60	19.67	0.183 ¹

¹ P_u / φP_n controls

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Top Guy Pull-Off Design Data (Tension)

Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	
T2	562 - 542	4 1/2x3/8	3.00	2.80	310.6	1.6875	4.36	54.67	0.080 ¹
T6	482 - 462	4 1/2x3/8	3.00	2.80	310.6	1.6875	5.08	54.67	0.093 ¹
T10	402 - 382	4 1/2x3/8	3.00	2.76	306.0	1.6875	5.55	54.67	0.102 ¹
T14	322 - 302	4 1/2x3/8	3.00	2.76	306.0	1.6875	4.06	54.67	0.074 ¹
T18	242 - 222	4 1/2x3/8	3.00	2.76	306.0	1.6875	5.43	54.67	0.099 ¹
T22	162 - 142	4 1/2x3/8	3.00	2.76	306.0	1.6875	4.80	54.67	0.088 ¹
T26	82 - 62	4 1/2x3/8	3.00	2.76	306.0	1.6875	4.33	54.67	0.079 ¹

¹ P_u / φP_n controls

Torque-Arm Top Design Data

Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	
T14	322 - 302 (1038)	C12x20.7	3.42	3.30	49.6	6.0900	1.58	197.32	0.008
T14	322 - 302 (1039)	C12x20.7	3.42	3.30	49.6	6.0900	1.58	197.32	0.008
T14	322 - 302 (1045)	C12x20.7	3.42	3.30	49.6	6.0900	1.49	197.32	0.008
T14	322 - 302 (1046)	C12x20.7	3.42	3.30	49.6	6.0900	1.24	197.32	0.006
T14	322 - 302 (1049)	C12x20.7	3.42	3.30	49.6	6.0900	1.23	197.32	0.006
T14	322 - 302 (1050)	C12x20.7	3.42	3.30	49.6	6.0900	1.47	197.32	0.007

Torque-Arm Top Bending Design Data

Section No.	Elevation	Size	M _{ux}	φM _{nx}	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M _{uy}	φM _{ny}	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	ft		kip-ft	kip-ft		kip-ft	kip-ft	
T14	322 - 302 (1038)	C12x20.7	-22.58	68.58	0.329	-0.00	7.01	0.000
T14	322 - 302 (1039)	C12x20.7	-23.12	68.58	0.337	0.00	7.01	0.000
T14	322 - 302 (1045)	C12x20.7	-22.92	68.58	0.334	-0.00	7.01	0.000
T14	322 - 302 (1046)	C12x20.7	-23.89	68.58	0.348	-0.00	7.01	0.000
T14	322 - 302 (1049)	C12x20.7	-24.27	68.58	0.354	0.00	7.01	0.000
T14	322 - 302 (1050)	C12x20.7	-22.52	68.58	0.328	-0.00	7.01	0.000

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Torque-Arm Top Interaction Design Data

Section No.	Elevation ft	Size	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
			ϕP_u	M_{ux}	M_{uy}			
T14	322 - 302 (1038)	C12x20.7	0.008	0.329	0.000	0.333	1.000	4.8.1
T14	322 - 302 (1039)	C12x20.7	0.008	0.337	0.000	0.341	1.000	4.8.1
T14	322 - 302 (1045)	C12x20.7	0.008	0.334	0.000	0.338	1.000	4.8.1
T14	322 - 302 (1046)	C12x20.7	0.006	0.348	0.000	0.351	1.000	4.8.1
T14	322 - 302 (1049)	C12x20.7	0.006	0.354	0.000	0.357	1.000	4.8.1
T14	322 - 302 (1050)	C12x20.7	0.007	0.328	0.000	0.332	1.000	4.8.1

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	572 - 562	Leg	ROHN 2 X-STR	2	-1.46	45.22	3.2	Pass
T2	562 - 542	Leg	ROHN 2 STD	23	-14.54	48.34	30.1	Pass
T3	542 - 522	Leg	ROHN 2 X-STR	79	-17.94	43.86	40.9	Pass
T4	522 - 502	Leg	ROHN 2 STD	112	-26.89	32.59	82.5	Pass
T5	502 - 482	Leg	ROHN 2 X-STR	145	-24.41	59.91	40.7	Pass
T6	482 - 462	Leg	ROHN 2 X-STR	204	-31.08	66.46	46.8	Pass
T7	462 - 442	Leg	ROHN 2 X-STR	259	-33.84	43.86	77.2	Pass
T8	442 - 422	Leg	ROHN 2 X-STR	292	-36.42	43.86	83.1	Pass
T9	422 - 402	Leg	ROHN 2.5 STD	325	-36.78	58.41	63.0	Pass
T10	402 - 382	Leg	ROHN 2.5 STD	359	-43.05	58.41	73.7	Pass
T11	382 - 362	Leg	ROHN 2.5 STD	391	-45.57	58.41	78.0	Pass
T12	362 - 342	Leg	ROHN 2.5 STD	425	-50.82	58.41	87.0	Pass
T13	342 - 322	Leg	ROHN 2.5 STD	458	-51.91	58.41	88.9	Pass
T14	322 - 302	Leg	ROHN 2.5 X-STR	490	-55.94	76.17	73.4	Pass
T15	302 - 282	Leg	ROHN 2.5 STD	524	-69.99	58.41	119.8	Fail
T16	282 - 262	Leg	ROHN 2.5 STD	557	-71.80	58.41	122.9	Fail
T17	262 - 242	Leg	ROHN 2.5 STD	590	-68.83	58.41	117.9	Fail
T18	242 - 222	Leg	ROHN 2.5 STD	624	-74.49	58.41	127.5	Fail
T19	222 - 202	Leg	ROHN 2.5 STD	657	-82.05	58.41	140.5	Fail
T20	202 - 182	Leg	ROHN 2.5 STD	690	-85.24	58.41	145.9	Fail
T21	182 - 162	Leg	ROHN 2.5 STD	723	-85.59	58.41	146.5	Fail
T22	162 - 142	Leg	ROHN 2.5 STD	754	-83.31	58.41	142.6	Fail
T23	142 - 122	Leg	ROHN 2.5 X-STR	787	-87.23	76.17	114.5	Fail
T24	122 - 102	Leg	ROHN 2.5 X-STR	821	-91.60	76.17	120.3	Fail
T25	102 - 82	Leg	ROHN 2.5 X-STR	854	-92.24	76.17	121.1	Fail
T26	82 - 62	Leg	ROHN 2.5 X-STR	886	-93.19	76.17	122.3	Fail
T27	62 - 42	Leg	ROHN 2.5 X-STR	921	-100.73	76.17	132.2	Fail
T28	42 - 22	Leg	ROHN 2.5 X-STR	954	-104.77	76.17	137.6	Fail
T29	22 - 2	Leg	ROHN 2.5 X-STR	987	-105.29	76.17	138.2	Fail
T1	572 - 562	Diagonal	ROHN 1.5 x 16GA	10	-0.80	6.42	12.4	Pass
							13.3 (b)	
T2	562 - 542	Diagonal	ROHN 1.5 x 16GA	37	-1.15	6.40	17.9	Pass
							18.3 (b)	
T3	542 - 522	Diagonal	ROHN 1.5 x 16GA	111	-3.12	6.40	48.7	Pass
							52.3 (b)	
T4	522 - 502	Diagonal	ROHN 1.5 x 16GA	143	-2.03	6.40	31.7	Pass
							33.6 (b)	
T5	502 - 482	Diagonal	ROHN 1.5 x 16GA	156	-1.13	6.40	17.7	Pass

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Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T6	482 - 462	Diagonal	ROHN 1.5 x 16GA	221	-1.72	6.40	26.8	Pass
T7	462 - 442	Diagonal	ROHN 1.5 x 16GA	289	-3.15	6.40	29.6 (b) 49.2	Pass
T8	442 - 422	Diagonal	ROHN 1.5 x 16GA	323	-1.55	6.40	52.1 (b) 24.1	Pass
T9	422 - 402	Diagonal	ROHN 1.5 x 16GA	334	-2.88	6.49	24.9 (b) 44.4	Pass
T10	402 - 382	Diagonal	ROHN 1.5 x 16GA	375	-3.46	6.49	46.9 (b) 53.3	Pass
T11	382 - 362	Diagonal	ROHN 1.5 x 16GA	422	-4.38	6.49	58.2 (b) 67.5	Pass
T12	362 - 342	Diagonal	ROHN 1.5 x 16GA	455	-3.28	6.49	70.5 (b) 50.6	Pass
T13	342 - 322	Diagonal	ROHN 1.5 x 16GA	468	-2.74	6.49	52.0 (b) 42.3	Pass
T14	322 - 302	Diagonal	ROHN 1.5 x 11GA	506	-5.32	12.39	46.0 (b) 43.0	Pass
T15	302 - 282	Diagonal	ROHN 1.5 x 16GA	555	-4.35	6.49	56.3 (b) 67.1	Pass
T16	282 - 262	Diagonal	ROHN 1.5 x 16GA	588	-2.19	6.49	69.0 (b) 33.7	Pass
T17	262 - 242	Diagonal	ROHN 1.5 x 16GA	599	-3.76	6.49	57.9	Pass
T18	242 - 222	Diagonal	ROHN 1.5 x 16GA	638	-4.18	6.49	58.4 (b) 64.5	Pass
T19	222 - 202	Diagonal	ROHN 1.5 x 16GA	685	-3.93	6.49	70.3 (b) 60.6	Pass
T20	202 - 182	Diagonal	ROHN 1.5 x 11GA	718	-2.55	12.39	20.6	Pass
T21	182 - 162	Diagonal	ROHN 1.5 x 11GA	732	-1.40	12.39	26.2 (b) 11.3	Pass
T22	162 - 142	Diagonal	ROHN 1.5 x 11GA	768	-2.90	12.39	14.4 (b) 23.4	Pass
T23	142 - 122	Diagonal	ROHN 1.5 x 11GA	817	-3.82	12.39	30.2 (b) 30.8	Pass
T24	122 - 102	Diagonal	ROHN 1.5 x 11GA	851	-2.17	12.39	39.3 (b) 17.6	Pass
T25	102 - 82	Diagonal	ROHN 1.5 x 11GA	862	-2.17	12.39	22.4 (b) 17.5	Pass
T26	82 - 62	Diagonal	ROHN 1.5 x 11GA	895	-3.44	12.39	22.4 (b) 27.8	Pass
T27	62 - 42	Diagonal	ROHN 1.5 x 11GA	928	-2.53	12.39	35.4 (b) 20.4	Pass
T28	42 - 22	Diagonal	ROHN 1.5 x 11GA	961	-3.40	12.39	26.0 (b) 27.4	Pass
T29	22 - 2	Diagonal	ROHN 1.5 x 11GA	994	-2.58	11.34	34.9 (b) 22.7	Pass
T1	572 - 562	Top Girt	ROHN 1.5 x 16GA	6	-0.06	7.02	27.9 (b) 0.9	Pass
T2	562 - 542	Top Girt	ROHN 1.5 x 16GA	25	-0.25	7.61	1.2 (b) 3.3	Pass
T3	542 - 522	Top Girt	ROHN 1.5 x 16GA	83	-1.16	7.61	4.3 (b) 15.3	Pass
T4	522 - 502	Top Girt	ROHN 1.5 x 16GA	116	-0.86	7.61	23.0 (b) 11.3	Pass
T5	502 - 482	Top Girt	ROHN 1.5 x 16GA	150	-0.43	7.61	15.0 (b) 5.7	Pass
T6	482 - 462	Top Girt	ROHN 1.5 x 16GA	206	-0.54	7.61	7.3 (b) 7.1	Pass
T7	462 - 442	Top Girt	ROHN 1.5 x 16GA	262	-1.13	7.61	9.1 (b) 14.8	Pass
T8	442 - 422	Top Girt	ROHN 1.5 x 16GA	295	-0.72	7.61	22.4 (b) 9.4	Pass

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	Client	Northern Tower	Designed by	kdavis

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T9	422 - 402	Top Girt	ROHN 1.5 x 16GA	330	-0.64	7.67	11.9 (b) 8.3	Pass
T10	402 - 382	Top Girt	ROHN 1.5 x 16GA	363	-1.03	7.67	12.1 (b) 13.5	Pass
T11	382 - 362	Top Girt	ROHN 1.5 x 16GA	395	-1.56	7.67	18.4 (b) 20.3	Pass
T12	362 - 342	Top Girt	ROHN 1.5 x 16GA	428	-1.04	7.67	33.1 (b) 13.5	Pass
T13	342 - 322	Top Girt	ROHN 1.5 x 16GA	460	-0.90	7.67	19.5 (b) 11.7	Pass
T14	322 - 302	Top Girt	ROHN 1.5 x 11GA	495	-1.14	14.85	15.2 (b) 7.7	Pass
T15	302 - 282	Top Girt	ROHN 1.5 x 16GA	528	-2.67	7.67	11.7 (b) 34.8	Pass
T16	282 - 262	Top Girt	ROHN 1.5 x 16GA	559	-1.24	7.67	38.0 (b) 16.2	Pass
T17	262 - 242	Top Girt	ROHN 1.5 x 16GA	592	-1.21	7.67	21.0 (b) 15.7	Pass
T18	242 - 222	Top Girt	ROHN 1.5 x 16GA	626	-1.38	7.67	21.8 (b) 18.0	Pass
T19	222 - 202	Top Girt	ROHN 1.5 x 16GA	658	1.88	9.93	24.2 (b) 18.9	Pass
T20	202 - 182	Top Girt	ROHN 1.5 x 11GA	692	-1.48	14.85	31.7 (b) 10.0	Pass
T21	182 - 162	Top Girt	ROHN 1.5 x 11GA	725	-1.48	14.85	15.2 (b) 10.0	Pass
T22	162 - 142	Top Girt	ROHN 1.5 x 11GA	759	-1.45	14.85	15.3 (b) 9.8	Pass
T23	142 - 122	Top Girt	ROHN 1.5 x 11GA	790	-1.62	14.85	14.9 (b) 10.9	Pass
T24	122 - 102	Top Girt	ROHN 1.5 x 11GA	823	-1.59	14.85	20.2 (b) 10.7	Pass
T25	102 - 82	Top Girt	ROHN 1.5 x 11GA	856	-1.60	14.85	16.4 (b) 10.8	Pass
T26	82 - 62	Top Girt	ROHN 1.5 x 11GA	891	-1.66	14.85	16.4 (b) 11.2	Pass
T27	62 - 42	Top Girt	ROHN 1.5 x 11GA	923	-1.75	14.85	17.1 (b) 11.8	Pass
T28	42 - 22	Top Girt	ROHN 1.5 x 11GA	956	-1.82	14.85	18.1 (b) 12.3	Pass
T29	22 - 2	Top Girt	ROHN 1.5 x 11GA	989	-1.82	14.81	18.7 (b) 12.3	Pass
T1	572 - 562	Bottom Girt	ROHN 1.5 x 16GA	7	-0.35	7.60	18.8 (b) 4.5	Pass
T2	562 - 542	Bottom Girt	ROHN 1.5 x 16GA	28	0.68	9.93	6.9 (b) 6.8	Pass
T3	542 - 522	Bottom Girt	ROHN 1.5 x 16GA	86	-0.93	7.61	11.5 (b) 12.2	Pass
T4	522 - 502	Bottom Girt	ROHN 1.5 x 16GA	120	-0.47	7.61	16.5 (b) 6.1	Pass
T5	502 - 482	Bottom Girt	ROHN 1.5 x 16GA	153	-0.43	7.61	7.9 (b) 5.7	Pass
T6	482 - 462	Bottom Girt	ROHN 1.5 x 16GA	208	0.79	9.93	7.3 (b) 8.0	Pass
T7	462 - 442	Bottom Girt	ROHN 1.5 x 16GA	265	-0.92	7.61	13.4 (b) 12.1	Pass
T8	442 - 422	Bottom Girt	ROHN 1.5 x 16GA	300	-0.63	7.61	17.8 (b) 8.3	Pass
T9	422 - 402	Bottom Girt	ROHN 1.5 x 16GA	333	-0.91	7.67	10.7 (b) 11.9	Pass
							18.0 (b)	

<i>tnxTower</i> GPD 520 South Main Street Suite 2531 Akron, Ohio 44311 Phone: (330) 572-2100 FAX: (330) 572-2101	Job	Cedar Run Rd	Page	32 of 33
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	Client	Northern Tower	Designed by	kdavis

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T10	402 - 382	Bottom Girt	ROHN 1.5 x 16GA	366	-0.80	7.67	10.4	Pass
T11	382 - 362	Bottom Girt	ROHN 1.5 x 16GA	398	-1.06	7.67	14.6 (b)	Pass
T12	362 - 342	Bottom Girt	ROHN 1.5 x 16GA	430	-0.89	7.67	13.8	Pass
T13	342 - 322	Bottom Girt	ROHN 1.5 x 16GA	463	-0.90	7.67	20.5 (b)	Pass
T14	322 - 302	Bottom Girt	ROHN 1.5 x 11GA	498	-1.14	14.85	11.6	Pass
T15	302 - 282	Bottom Girt	ROHN 1.5 x 16GA	529	-1.22	7.67	15.0 (b)	Pass
T16	282 - 262	Bottom Girt	ROHN 1.5 x 16GA	562	-1.24	7.67	11.7	Pass
T17	262 - 242	Bottom Girt	ROHN 1.5 x 16GA	596	-1.21	7.67	17.0 (b)	Pass
T18	242 - 222	Bottom Girt	ROHN 1.5 x 16GA	629	-1.38	7.67	7.7	Pass
T19	222 - 202	Bottom Girt	ROHN 1.5 x 16GA	662	-1.43	7.67	12.9 (b)	Pass
T20	202 - 182	Bottom Girt	ROHN 1.5 x 11GA	695	-1.48	14.85	15.9	Pass
T21	182 - 162	Bottom Girt	ROHN 1.5 x 11GA	728	-1.48	14.85	20.6 (b)	Pass
T22	162 - 142	Bottom Girt	ROHN 1.5 x 11GA	762	-1.45	14.85	16.2	Pass
T23	142 - 122	Bottom Girt	ROHN 1.5 x 11GA	795	-1.52	14.85	21.0 (b)	Pass
T24	122 - 102	Bottom Girt	ROHN 1.5 x 11GA	826	-1.59	14.85	15.8	Pass
T25	102 - 82	Bottom Girt	ROHN 1.5 x 11GA	859	-1.60	14.85	24.4 (b)	Pass
T26	82 - 62	Bottom Girt	ROHN 1.5 x 11GA	894	-1.66	14.85	18.0	Pass
T27	62 - 42	Bottom Girt	ROHN 1.5 x 11GA	926	-1.75	14.85	23.3 (b)	Pass
T28	42 - 22	Bottom Girt	ROHN 1.5 x 11GA	959	-1.82	14.85	18.7	Pass
T29	22 - 2	Bottom Girt	ROHN 1.5 x 11GA	992	3.60	19.67	24.2 (b)	Pass
T2	562 - 542	Guy A@542.115	1/2	1023	15.51	16.14	10.0	Pass
T6	482 - 462	Guy A@462.115	1/2	1029	16.25	16.14	15.2 (b)	Fail
T10	402 - 382	Guy A@382.115	1/2	1035	15.42	16.14	9.8	Pass
T14	322 - 302	Guy A@302.115	3/8	1048	9.50	9.24	15.2 (b)	Fail
T18	242 - 222	Guy A@222.115	1/2	1056	12.62	16.14	10.2	Pass
T22	162 - 142	Guy A@142.115	1/2	1062	11.52	16.14	15.6 (b)	Pass
T26	82 - 62	Guy A@62.1146	1/2	1068	9.42	16.14	16.4 (b)	Pass
T2	562 - 542	Guy B@542.115	1/2	1022	15.76	16.14	10.8	Pass
T6	482 - 462	Guy B@462.115	1/2	1028	16.57	16.14	16.4 (b)	Fail
T10	402 - 382	Guy B@382.115	1/2	1034	15.90	16.14	11.2	Pass
T14	322 - 302	Guy B@302.115	3/8	1044	9.94	9.24	17.1 (b)	Fail
T18	242 - 222	Guy B@222.115	1/2	1055	12.93	16.14	78.2	Pass
T22	162 - 142	Guy B@142.115	1/2	1061	11.19	16.14	71.4	Pass
T26	82 - 62	Guy B@62.1146	1/2	1067	9.39	16.14	58.2	Pass
T2	562 - 542	Guy C@542.115	1/2	1018	15.51	16.14	58.2	Pass
T6	482 - 462	Guy C@462.115	1/2	1024	16.37	16.14	96.1	Fail
T10	402 - 382	Guy C@382.115	1/2	1030	15.53	16.14	101.4	Pass
T14	322 - 302	Guy C@302.115	3/8	1036	9.49	9.24	96.3	Fail
T18	242 - 222	Guy C@222.115	1/2	1051	12.50	16.14	102.7	Pass
T22	162 - 142	Guy C@142.115	1/2	1057	11.43	16.14	77.5	Pass
T26	82 - 62	Guy C@62.1146	1/2	1063	9.47	16.14	70.8	Pass

<i>tnxTower</i> GPD 520 South Main Street Suite 2531 Akron, Ohio 44311 Phone: (330) 572-2100 FAX: (330) 572-2101	Job	Cedar Run Rd	Page	33 of 33
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	Client	Northern Tower	Designed by	kdavis

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T2	562 - 542	Top Guy	4 1/2x3/8	1019	4.36	54.67	8.0	Pass
		Pull-Off@542.115						
T6	482 - 462	Top Guy	4 1/2x3/8	1025	5.08	54.67	9.3	Pass
		Pull-Off@462.115						
T10	402 - 382	Top Guy	4 1/2x3/8	1031	5.55	54.67	10.2	Pass
		Pull-Off@382.115						
T14	322 - 302	Top Guy	4 1/2x3/8	1042	-2.97	4.07	73.0	Pass
		Pull-Off@302.115						
T18	242 - 222	Top Guy	4 1/2x3/8	1052	5.43	54.67	9.9	Pass
		Pull-Off@222.115						
T22	162 - 142	Top Guy	4 1/2x3/8	1059	4.80	54.67	8.8	Pass
		Pull-Off@142.115						
T26	82 - 62	Top Guy	4 1/2x3/8	1064	4.33	54.67	7.9	Pass
		Pull-Off@62.1146						
T14	322 - 302	Torque Arm	C12x20.7	1049	-2.74	173.33	35.7	Pass
		Top@302.115						

Summary ELC: Proposed

Leg (T21)	146.5	Fail
Diagonal (T11)	70.5	Pass
Top Girt (T15)	38.0	Pass
Bottom Girt (T29)	37.0	Pass
Guy A (T14)	102.8	Fail
Guy B (T14)	107.5	Fail
Guy C (T14)	102.7	Fail
Top Guy Pull-Off (T14)	73.0	Pass
Torque Arm Top (T14)	35.7	Pass
Bolt Checks	70.5	Pass
Rating =	146.5	Fail

APPENDIX C

Additional Calculations

Pier and Pad Foundation

Site Name: Cedar Run Rd

TIA-222 Revision: G
Tower Type: Guyed

Top & Bot. Pad Rein. Different?: ☐
Block Foundation?: ☒
Rectangular Pad?: ☐

Superstructure Analysis Reactions		
Compression, P_{comp} :	125.21	kips
Base Shear, V_{u_comp} :	2.75	kips
Moment, M_u :	138.45	ft-kips
Tower Height, H :	570	ft
BP Dist. Above Fdn, bp_{dist} :		in
Bolt Circle / Bearing Plate Width, BC :	12	in

Foundation Analysis Checks				
	Capacity	Demand	Rating	Check
Lateral (Sliding) (kips)	32.27	2.75	8.5%	Pass
Bearing Pressure (ksf)	3.79	7.37	194.4%	FAIL
Overturning (kip*ft)	25.79	152.20	>200.0%	FAIL
Pad Flexure (kip*ft)	1927.14	170.01	8.8%	Pass
Pad Shear - 1-way (kips)	328.30	0.00	0.0%	Pass
Pad Shear - 2-way (Comp) (ksi)	0.164	0.008	5.1%	Pass

Structural Rating: 8.8%
Soil Rating: >200.0%

Pad Properties		
Depth, D :	3.167	ft
Pad Width, W_1 :	6	ft
Pad Thickness, T :	5	ft
Pad Rebar Size (Bottom dir. 2), Sp_2 :	8	
Pad Rebar Quantity (Bottom dir. 2), mp_2 :	10	
Pad Clear Cover, cc_{pad} :	3	in

Material Properties		
Rebar Grade, F_y :	60	ksi
Concrete Compressive Strength, F'_c :	3	ksi
Dry Concrete Density, δ_c :	150	pcf

Soil Properties		
Total Soil Unit Weight, γ :	100	pcf
Ultimate Net Bearing, Q_{net} :	6.000	ksf
Cohesion, C_u :		ksf
Friction Angle, ϕ :	30	degrees
SPT Blow Count, N_{blows} :		
Base Friction, μ :		
Neglected Depth, N :	3.50	ft
Foundation Bearing on Rock?	No	
Groundwater Depth, gw :	N/A	ft

<--Toggle between Gross and Net



Guyed Tower Anchor Foundation
Cedar Run Rd
2022701.68

Guy Anchor Location	
Azimuth/Leg	A/B/C
Radius (ft)	Varies
Tower Height (ft)	570

Tower Reactions	
Vertical	55.02 k
Horizontal	73.64 k

Anchor Block Geometry	
Width	6 ft
Height	4 ft
Length	6 ft
Depth	8 ft

General Info	
Foundation Criteria	GPD
TIA Code	TIA-222-G
Soil	105%
Reinforcement/Steel	105%

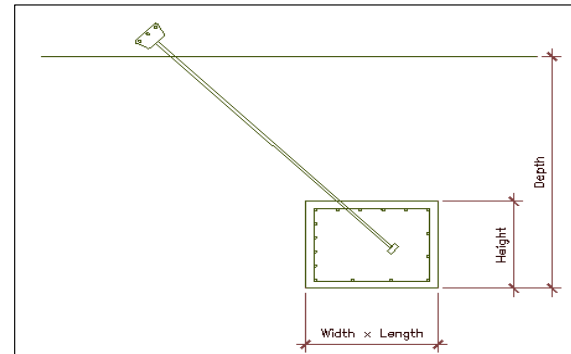
Soil Capacity Calculations	
W_s	15.70 k
W_c	21.60 k
Uplift Resistance	33.57 k
Horizontal Resistance	25.92 k
Uplift Capacity=	163.9% NG
Horizontal Capacity=	284.1% NG

Anchor Block Reinforcement	
Is Reinforcement Known?	assume min
f_c'	3 ksi
F_y	60 ksi

Capacity Summary		
Soil Capacity=	284.1%	NG
Reinforcing Capacity=	13.7%	OK
Controlling Capacity=	284.1%	NG

Minimum steel has been assumed

Soil Properties									
Layer	C_u , psf	ϕ , degrees	V_{soil} , pcF	$\gamma_{concrete}$, pcF	d, ft	$P_{p,top}$, psf	$P_{p,bot}$, psf	f_p , psf	
1			100	150	3.5				
2		30	100	150	4.5	840	1920		
3									
4									
5									
6									
Ignored Depth	3.5 ft			Consider soil for uplift		User Input Angle (°)			
Water Table	99 ft			Granular		Angle for Uplift (°)		3.75	



Block Moment and Shear Calculations			
Moment Check			
M_{ux} =	41.27 k-ft	M_{uy} =	55.23 k-ft
ϕM_{nx} =	2006.96 k-ft	ϕM_{ny} =	3207.41 k-ft
Capacity	2.1% OK	Capacity	1.7% OK
Shear Check			
V_{ux} =	27.51 k	V_{uy} =	36.82 k
ϕV_{nx} =	260.28 k	ϕV_{ny} =	268.66 k
Capacity	10.6% OK	Capacity	13.7% OK

Guy Anchor Shaft Calculations	
Shape of Anchor Shaft	Unknown

ATTACHMENT H

Hi Larry,

Yes, we have received the mod design. Fortunately, they made an error in the original calculation and the modification necessary are not as extensive. We are waiting now for quotes for the foundation mods and the new anchors. Once I have those and a timeline for their completion we can schedule.

Jeannie Gordon
Treasurer, CFO
Northern Tower Erection Co
(231) 620-6048

On Feb 28, 2022, at 2:29 PM, Larry ODonnell <LarryODonnell@9and10news.com> wrote:

Jeannie,

Pete asked me to see if you have gotten the reply about the work needed to mod the SA for your tower back yet?

Larry
Larry ODonnell
Chief Engineer
231.775.3478 Ext. 3157

ATTACHMENT I

From: Jeannie Gordon [<mailto:jagordon@northerntowerco.com>]
Sent: Wednesday, March 23, 2022 16:27
To: Larry ODonnell <LarryODonnell@9and10news.com>
Subject: Re: Traverse City SA

Hi Larry,

I finally have all the quotes in and I have a tentative schedule for the end of April for the concrete work to begin.

I have attached a copy of the quote for the modifications. Traverse Bay Tower Leasing can afford to pay half, but I can't cover the whole project. Please let me know if Heritage will be able to pay for half. If there is someone I need to meet with to go over the details, let me know. Thanks Larry.

Jeannie Gordon

Treasurer, CFO

Northern Tower Erection Co

(231) 620-6048

On Mar 10, 2022, at 11:49 AM, Larry ODonnell <LarryODonnell@9and10news.com> wrote:

I appreciate your asking. I'll let my boss know which will not make his day.

Thanks.

Larry

Larry ODonnell
Chief Engineer
231.775.3478 Ext. 3157



From: Jeannie Gordon [<mailto:jagordon@northerntowerco.com>]
Sent: Thursday, March 10, 2022 11:44
To: Larry ODonnell <LarryODonnell@9and10news.com>
Subject: Re: Traverse City SA

Hi Larry,

We heard back from the Engineers today and they will not approve installation of the equipment prior to the mods being completed. I'm sorry.

Jeannie Gordon

Treasurer, CFO

Northern Tower Erection Co

(231) 620-6048

On Mar 1, 2022, at 9:27 AM, Larry ODonnell <LarryODonnell@9and10news.com> wrote:

Jeannie,

Pete asked we if we can get permission to mount the antennas prior to the modification? Our deadline is right at 5 weeks away.

Larry

Larry ODonnell
Chief Engineer
231.775.3478 Ext. 3157



ATTACHMENT J

FW: New Quote 44932 Order 500716

2 messages

John Gordon <johngordon@northerntowerco.com>
To: Jeannie Gordon <jagordon@northerntowerco.com>

Wed, Mar 16, 2022 at 3:25 PM

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johngordon@northerntowerco.com



From: Angela Welch <akwelch@sabreindustries.com>
Sent: Wednesday, March 16, 2022 3:23 PM
To: John Gordon <johngordon@northerntowerco.com>
Subject: RE: New Quote 44932 Order 500716

Okay the total with freight and sales tax is \$6007.54.

From: John Gordon <johngordon@northerntowerco.com>
Sent: Tuesday, March 15, 2022 4:34 PM
To: Angela Welch <akwelch@sabreindustries.com>
Subject: Re: New Quote 44932

WARNING: The sender of this email could not be validated and may not match the person in the "From" field.

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Yes, shipping to our location.

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
john.gordon@northerntowerco.com

From: Angela Welch <akwelch@sabreindustries.com>
Sent: Tuesday, March 15, 2022 5:32:56 PM
To: John Gordon <john.gordon@northerntowerco.com>
Cc: Jeannie Gordon <jagordon@northerntowerco.com>
Subject: RE: New Quote 44932

Shipping to the below address, correct?

From: John Gordon <john.gordon@northerntowerco.com>
Sent: Tuesday, March 15, 2022 1:39 PM
To: Angela Welch <akwelch@sabreindustries.com>
Cc: Jeannie Gordon <jagordon@northerntowerco.com>
Subject: RE: New Quote 44932

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CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you

recognize the sender and know the content is safe.

Please place the order. As soon as I get the total from you we will send a check.

Thank you.

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com



From: Angela Welch <akwelch@sabreindustries.com>

Sent: Tuesday, March 15, 2022 11:18 AM

To: John Gordon <johngordon@northerntowerco.com>

Subject: RE: New Quote 44932

Yes, if that is what you want to do let me know. I'll place the order and I'll have the total w exact sales tax.

From: John Gordon <johngordon@northerntowerco.com>

Sent: Monday, March 14, 2022 4:43 PM

To: Angela Welch <akwelch@sabreindustries.com>

Subject: RE: New Quote 44932

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CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Angela,

I don't think we have an account set up with Sabre.

Can we send a check?

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com



From: Angela Welch <akwelch@sabreindustries.com>

Sent: Monday, March 7, 2022 5:21 PM

To: John Gordon <johngordon@northerntowerco.com>

Subject: RE: New Quote 44932

Attached. The freight, tax and lead time are noted on the quote.

From: John Gordon <johnngordon@nortertowerco.com>
Sent: Monday, March 7, 2022 1:39 PM
To: Angela Welch <akwelch@sabreindustries.com>
Subject: RE: New Quote 44932

WARNING: The sender of this email could not be validated and may not match the person in the "From" field.

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Three

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johnngordon@nortertowerco.com



From: Angela Welch <akwelch@sabreindustries.com>
Sent: Monday, March 7, 2022 1:52 PM
To: John Gordon <johnngordon@nortertowerco.com>
Subject: RE: New Quote 44932

How many do you need?

From: John Gordon <johnngordon@northerntowerco.com>
Sent: Thursday, March 3, 2022 3:50 PM
To: Angela Welch <akwelch@sabreindustries.com>
Subject: New Quote

WARNING: The sender of this email could not be validated and may not match the person in the "From" field.

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Angela,

May I please have a quote for Sabre part number C30129056. See the attached drawing for reference.

If possible, include all taxes and shipping costs.

Let me know if you have any questions.

Thank you.

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com



John Gordon <johngordon@northerntowerco.com>
To: Jeannie Gordon <jagordon@northerntowerco.com>

Wed, Mar 23, 2022 at 3:57 PM

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com



[Quoted text hidden]

Cedar Run FINAL dwgs & estimated ship date

2 messages

Chittenden, Kari <kari.chittenden@valmont.com>

Tue, Mar 15, 2022 at 11:24 AM

To: John Gordon <johngordon@northerntowerco.com>

Cc: Jeannie Gordon <jagordon@northerntowerco.com>, "Gendel, Emily M." <Emily.Gendel@valmont.com>

Attached is a "Final" dwg package for your records (your PO # 202239CRTC, our sales order # 828137).

This will ship to 6010 E Traverse Hwy, Traverse City MI 49684

I'm scheduling your order to ship by approximately 4-26-22.

Please let me know if you need anything else.

Thanks,

Kari

Kari Chittenden | CAD/Design Tech, Estimator

Valmont Site Pro 1 | 1545 Pidco Drive | Plymouth, IN 46563

Typical hours M-F 7:00am–noon EST

Phone: +1 (574) 948-3227

kc8@valmont.com | sitepro1.com

The information contained in this E-mail message and the documents accompanying this message are privileged and confidential, and may be protected from disclosure. Please be aware that any use, printing, copying, disclosure or dissemination of this communication may be subject to legal restriction or sanction. If you think that you have received this E-mail message in error, please reply to the sender.

 **Cedar Run FINAL dwgs.pdf**
719K

Jeannie Gordon <jeannie.a.gordon@gmail.com>

Tue, Apr 5, 2022 at 3:30 PM

To: Jeannie Gordon <ntc@torchlake.com>

Jeannie Gordon
Treasurer, CFO
Northern Tower Erection Co
(231) 620-6048

Begin forwarded message:

From: "Chittenden, Kari" <kari.chittenden@valmont.com>
Date: March 15, 2022 at 11:24:31 AM EDT
To: John Gordon <johngordon@northerntowerco.com>
Cc: Jeannie Gordon <jagordon@northerntowerco.com>, "Gendel, Emily M." <Emily.Gendel@valmont.com>
Subject: Cedar Run FINAL dwgs & estimated ship date

Attached is a "Final" dwg package for your records (your PO # 202239CRTC, our sales order # 828137).

This will ship to 6010 E Traverse Hwy, Traverse City MI 49684

I'm scheduling your order to ship by approximately 4-26-22.

Please let me know if you need anything else.

Thanks,

Kari

Kari Chittenden | CAD/Design Tech, Estimator

Valmont Site Pro 1 | 1545 Pidco Drive | Plymouth, IN 46563

Typical hours M-F 7:00am–noon EST

Phone: +1 (574) 948-3227

kc8@valmont.com | sitepro1.com

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 **Cedar Run FINAL dwgs.pdf**
719K



A valmont COMPANY

FINAL DWGS

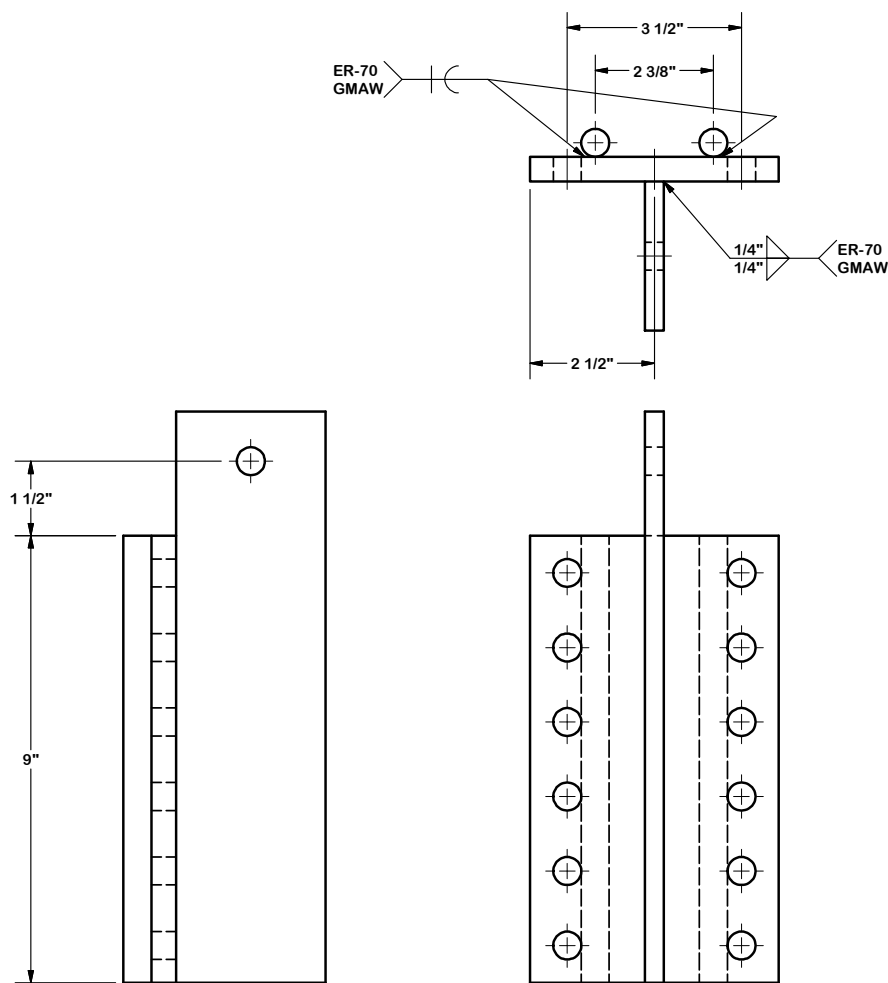
Cedar Run partial quote

SP1# 828137

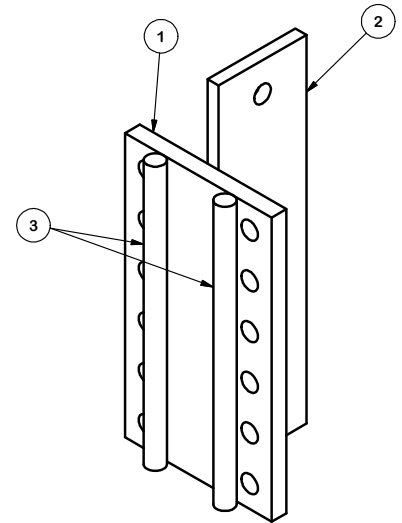
CPD# 5868

Kit QTY	Kit Number	Part QTY	Part Number	DESCRIPTION	Note area (sheet number on bldg plans or elevation, etc.)	SHIPPED QTY
CUSTOMER KIT #		MTR PACKAGE				
1	828137	1	MTRS	MTR & CWI package for custom parts only		
		CUSTOM STEEL				
		42	828137-W1	lug weldment		
		CUSTOM HARDWARE		A325 bolts, F436 washers, A563 heavy hex nuts UNO. If noted, GR5 bolts = full thread		
		1	828137-HW	(252) 1/2" x 3" x 5" U-bolt assy kit, Grade B-7	3-1/2" C/C	
				(54) 1/2" X 2" A325 bolt kits (FW, LW HHN)		
				Note: Custom steel & custom hardware is non-cancellable & non-returnable once your order has been placed.		
				Estimated lead time is 5-6 weeks after drawing appvl UNO		

HEAVY STAMP
PART NUMBER



PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	1	828137-BP	BACK PLATE	9 in	5.97	5.97
2	1	828137-GP	GUSSET PLATE	11 1/2 in	3.65	3.65
3	2		9/16" SOLID ROUND (A572-50)	9 in	0.64	1.27
TOTAL WT. #						11.54



FINISH:
HOT DIP GALVANIZED.

QTY 42
WITH MTR & CWI

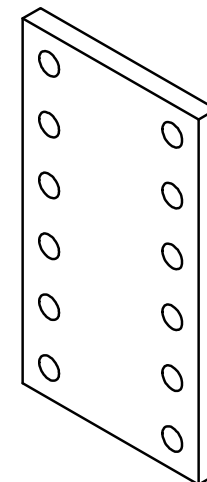
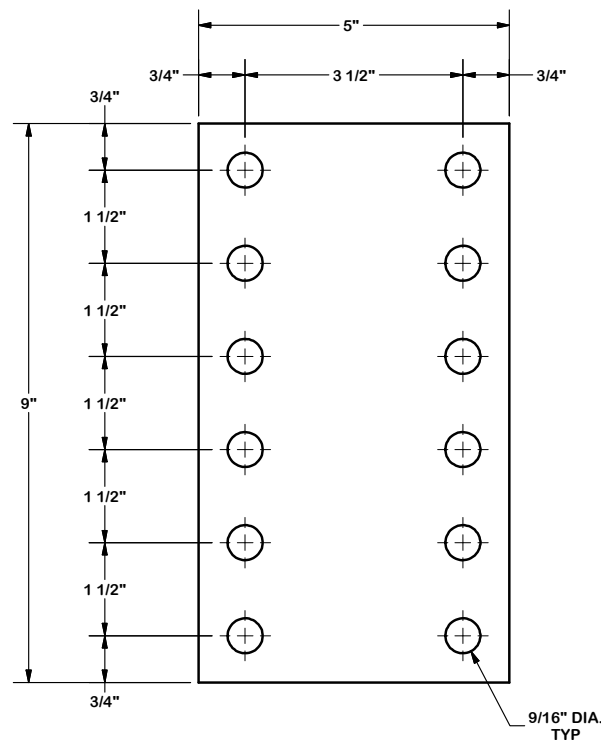
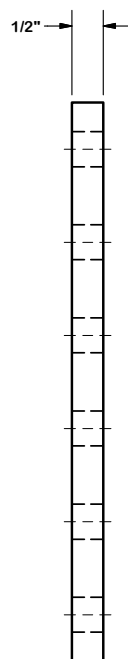
TOLERANCE NOTES	
TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE: SAWED, SHEARED AND GAS CUT EDGES ($\pm 0.030"$) DRILLED AND GAS CUT HOLES ($\pm 0.030"$) - NO CONING OF HOLES LASER CUT EDGES AND HOLES ($\pm 0.010"$) - NO CONING OF HOLES BENDS AND ANGLES ARE $\pm 1/2$ DEGREE ALL OTHER MACHINING ($\pm 0.030"$) ALL OTHER ASSEMBLY ($\pm 0.060"$)	
PROPRIETARY NOTE: THE DATA AND TECHNIQUES CONTAINED IN THIS DRAWING ARE PROPRIETARY INFORMATION OF VALMONT INDUSTRIES AND CONSIDERED A TRADE SECRET. ANY USE OR DISCLOSURE WITHOUT THE CONSENT OF VALMONT INDUSTRIES IS STRICTLY PROHIBITED.	

DESCRIPTION		
LUG WELDMENT		
CPD NO. 5868	DRAWN BY KC8 3/10/2022	ENG. APPROVAL
CLASS 81	SUB 02	DRAWING USAGE SHOP

SITE PRO 1 A valmont COMPANY		Locations: New York, NY Atlanta, GA Los Angeles, CA Plymouth, IN Salem, OR Dallas, TX Tampa, FL
Engineering Support Team: 1-888-753-7446		
PART NO. 828137-W1	DWG. NO. 828137-W1	

WRITE P/N
IN YELLOW

PARTS LIST					
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.
1	1	828137-BP	1/2" FLAT STOCK (A572-50)	9 in	5.97
					NET WT.



FINISH:
BLACK

TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES ($\pm 0.030"$)
DRILLED AND GAS CUT HOLES ($\pm 0.030"$) - NO CONING OF HOLES
LASER CUT EDGES AND HOLES ($\pm 0.010"$) - NO CONING OF HOLES
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ALL OTHER MACHINING ($\pm 0.030"$)
ALL OTHER ASSEMBLY ($\pm 0.060"$)

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DESCRIPTION

BACK PLATE
FOR WELDMENT

CPD NO.
5868

DRAWN BY
KC8 3/10/2022

ENG. APPROVAL

CLASS SUB
81 03

DRAWING USAGE
SHOP

CHECKED BY



Engineering
Support Team:
1-888-753-7446

Locations:
New York, NY
Atlanta, GA
Los Angeles, CA
Plymouth, IN
Salem, OR
Dallas, TX
Tampa, FL

PART NO.

828137-BP

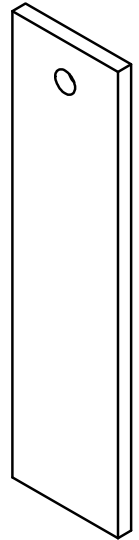
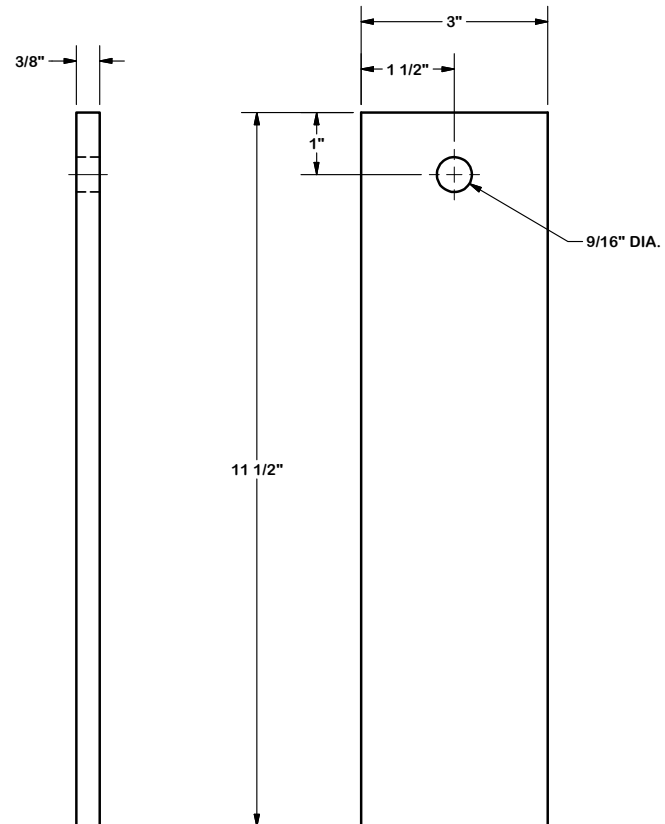
DWG. NO.

828137-BP

PAGE
1 OF 1

WRITE P/N
IN YELLOW

PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	1	828137-GP	3/8" FLAT STOCK (A572-50)	11 1/2 in	3.65	3.65



FINISH:
BLACK

TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES ($\pm 0.030"$)
DRILLED AND GAS CUT HOLES ($\pm 0.030"$) - NO CONING OF HOLES
LASER CUT EDGES AND HOLES ($\pm 0.010"$) - NO CONING OF HOLES
BENDS AND ANGLES ARE $\pm 1/2$ DEGREE
ALL OTHER MACHINING ($\pm 0.030"$)
ALL OTHER ASSEMBLY ($\pm 0.060"$)

PROPRIETARY NOTE:
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DESCRIPTION

GUSSET PLATE
FOR WELDMENT

CPD NO.
5868

DRAWN BY
KC8 3/10/2022

ENG. APPROVAL

CLASS SUB
81 03

DRAWING USAGE
SHOP

CHECKED BY



A valmont COMPANY

Engineering
Support Team:
1-888-753-7446

Locations:
New York, NY
Atlanta, GA
Los Angeles, CA
Plymouth, IN
Salem, OR
Dallas, TX
Tampa, FL

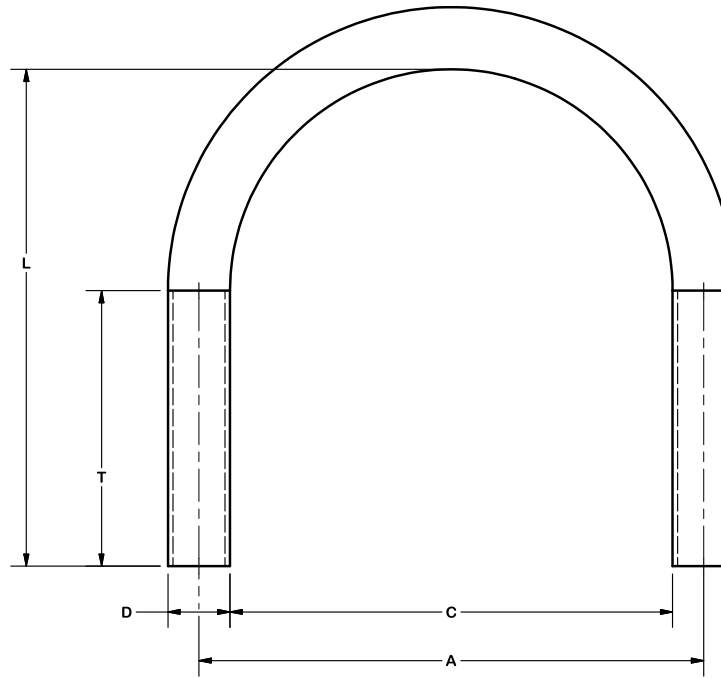
PART NO.

828137-GP

DWG. NO.

828137-GP

PAGE
1 OF 1



JOB NAME Cedar Run

CPD _____

KIT NUMBER _____

MATERIAL SPEC

U-BOLT: A193, Gr B7

NUT: A563 HEAVY HEX (OR EQUIV.)

FLAT WASHER: F436 (OR EQUIV.)

LOCK WASHER: B18.21.1 (OR EQUIV.)

TOTAL QTY	D	L	A	C	T	FLATWASHER QTY	LOCKWASHER QTY	HEX NUT QTY	COATING TYPE
252	1/2"	5"	3-1/2"	3"	2"	2	2	2	galv

TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
 SAWED, SHEARED AND GAS CUT EDGES ($\pm 0.030"$)
 DRILLED AND GAS CUT HOLES ($\pm 0.030"$) - NO CONING OF HOLES
 LASER CUT EDGES AND HOLES ($\pm 0.010"$) - NO CONING OF HOLES
 BENDS ARE $\pm 1/2$ DEGREE
 ALL OTHER MACHINING ($\pm 0.030"$)
 ALL OTHER ASSEMBLY ($\pm 0.060"$)

PROPRIETARY NOTE:
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DESCRIPTION

U-BOLT TEMPLATE

CPD NO.

DRAWN BY

ENG. APPROVAL

CLASS
01

SUB
01

DRAWING USAGE

CHECKED BY



Engineering
 Support Team:
 1-888-753-7446

Locations:
 New York, NY
 Atlanta, GA
 Los Angeles, CA
 Plymouth, IN
 Salem, OR
 Dallas, TX

PART NO.

DWG. NO.

PAGE
1 OF 1

ATTACHMENT K

FW: Mill-R Contracting Quote - Cedar Run, MI - REVISED

Scott Millar <mill_rcontractinginc@fastmail.com>

Mon, Mar 21, 2022 at 11:14 AM

To: John Gordon <johngordon@northerntowerco.com>

Cc: Jeannie Gordon <jagordon@northerntowerco.com>

Yes sir!

Best regards,**Scott Millar**mill_rcontractinginc@fastmail.com**5968 Anglers Dr.****Ortonville, MI 48462****Cell - 810.287.4121**

On Fri, Mar 18, 2022, at 4:52 PM, John Gordon wrote:

Hi Scott,

Can you please pencil us in on your schedule for the end of April/beginning of May?

Thanks.

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com



From: Scott Millar <mill_rcontractinginc@fastmail.com>
Sent: Wednesday, March 16, 2022 10:14 AM
To: John Gordon <johngordon@northerntowerco.com>
Subject: Re: Mill-R Contracting Quote - Cedar Run, MI - REVISED

No Permit, but it does include concrete testing

Best regards,

Scott Millar

mill_rcontractinginc@fastmail.com

5968 Anglers Dr.

Ortonville, MI 48462

Cell - 810.287.4121

On Wed, Mar 16, 2022, at 9:11 AM, John Gordon wrote:

Hi Scott,

Does your quote include permits?

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com



From: Scott Millar <mill_rcontractinginc@fastmail.com>

Sent: Monday, March 14, 2022 7:01 PM

To: John Gordon <johngordon@northerntowerco.com>

Subject: Re: Mill-R Contracting Quote - Cedar Run, MI - REVISED

John, the restoration is clean up, finish grading etc. We can cut the old anchor Rods off below grade, but that would not include any concrete removal.

Best regards,

Scott Millar

mill_rcontractinginc@fastmail.com

5968 Anglers Dr.

Ortonville, MI 48462

Cell - 810.287.4121

On Mon, Mar 14, 2022, at 7:44 AM, John Gordon wrote:

Hi Scott,

Is the “site restoration” for removing the old anchors?

John Gordon

Operations Manager

Northern Tower Erection Company

6010 East Traverse Highway

Traverse City, MI 49684

P 231-947-6048

M 231-313-1133 voice or text

F 231-947-3615

johngordon@northerntowerco.com



From: Scott Millar <mill_rcontractinginc@fastmail.com>

Sent: Sunday, March 13, 2022 3:00 PM

To: John Gordon <johngordon@northerntowerco.com>

Subject: Mill-R Contracting Quote - Cedar Run, MI - REVISED

Good afternoon John,

See attached revised quote with *corrected company name only*. Otherwise, no change.

My apologies for any inconvenience.

Best regards,

Mari Messina/Accountant
mill_rcontractinginc@fastmail.com
5968 Anglers Dr.
Ortonville, MI 48462
Cell - 586.212.9171

ATTACHMENT L

From: Jeannie Gordon jeannie.a.gordon@gmail.com
Subject: Fwd: FW: Building Permit
Date: July 1, 2022 at 4:55 PM
To: Jeannie Gordon ntc@torchlake.com



----- Forwarded message -----
From: John Gordon <johngordon@northerntowerco.com>
Date: Wed, May 11, 2022 at 3:03 PM
Subject: FW: Building Permit
To: Jeannie Gordon <jagordon@northerntowerco.com>

Can you please make out a check so that I can pick up the building permit.

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johngordon@northerntowerco.com



From: Jamie Douglass <douglass@garfield-twp.com>
Sent: Wednesday, May 11, 2022 2:42 PM
To: John Gordon <johngordon@northerntowerco.com>
Subject: RE: Building Permit

The permit fee is \$570.00. We accept cash, check, or card. There is a service fee of 3% when using a card though, just so you know.



Jamie Douglass
[Garfield Charter Township](http://garfield-twp.com)
3848 Veterans Dr. Traverse City, MI.
49684
Phone (231) 941-1620 Fax (231) 941-1588
Monday - Thursday: 7:30am to 6:00pm

From: John Gordon <johngordon@northerntowerco.com>
Sent: Wednesday, May 11, 2022 2:17 PM
To: Jamie Douglass <douglass@garfield-twp.com>
Subject: RE: Building Permit

What do I need to bring with me when I pick it up?

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johngordon@northerntowerco.com



From: Jamie Douglass <douglass@garfield-twp.com>
Sent: Wednesday, May 11, 2022 1:56 PM
To: John Gordon <johngordon@northerntowerco.com>
Subject: RE: Building Permit

Your permit is ready for pick up at your convenience.

Thank you,
Jamie



Jamie Douglass

[Garfield Charter Township](#)

3848 Veterans Dr. Traverse City, MI.
49684

Phone (231) 941-1620 Fax (231) 941-1588

Monday - Thursday: 7:30am to 6:00pm

From: John Gordon <johngordon@northerntowerco.com>
Sent: Wednesday, May 4, 2022 1:10 PM
To: Jamie Douglass <jdouglass@garfield-twp.com>
Cc: Mike Green <mgreen@garfield-twp.com>
Subject: RE: Building Permit

There is a site plan on page F-01. Do you need more than that?

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johngordon@northerntowerco.com



From: Jamie Douglass <jdouglass@garfield-twp.com>
Sent: Wednesday, May 4, 2022 1:06 PM
To: John Gordon <johngordon@northerntowerco.com>
Cc: Mike Green <mgreen@garfield-twp.com>
Subject: RE: Building Permit

Thank you, just need a site plan.



Jamie Douglass

[Garfield Charter Township](#)

3848 Veterans Dr. Traverse City, MI.
49684

Phone (231) 941-1620 Fax (231) 941-1588

Monday - Thursday: 7:30am to 6:00pm

From: John Gordon <johngordon@northerntowerco.com>
Sent: Wednesday, May 4, 2022 12:46 PM
To: Jamie Douglass <jdouglass@garfield-twp.com>
Cc: Mike Green <mgreen@garfield-twp.com>
Subject: RE: Building Permit

Drawings attached.

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johngordon@northerntowerco.com



From: Jamie Douglass <jdouglass@garfield-twp.com>
Sent: Wednesday, May 4, 2022 12:36 PM
To: John Gordon <johngordon@northerntowerco.com>
Cc: Mike Green <mgreen@garfield-twp.com>
Subject: RE: Building Permit

Hello,

I look like we are missing the site plan that goes with the land use application and the plan drawings that go with the building application.

LOOKS LIKE WE ARE MISSING THE SITE PLAN THAT GOES WITH THE LAND USE APPLICATION AND THE PLAN DRAWINGS THAT GO WITH THE BUILDING APPLICATION.



Jamie Douglass

[Garfield Charter Township](#)

3848 Veterans Dr. Traverse City, MI.
49684

Phone (231) 941-1620 Fax (231) 941-1588

Monday - Thursday: 7:30am to 6:00pm

From: John Gordon <john.gordon@northerntowerco.com>
Sent: Wednesday, May 4, 2022 11:08 AM
To: Jamie Douglass <douglass@garfield-twp.com>
Cc: Mike Green <mgreen@garfield-twp.com>
Subject: RE: Building Permit

Jamie/Mike,

Attached are the building permit and the land use permit.

Please let me know what my next steps are.

Thank you.

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
john.gordon@northerntowerco.com



From: Jamie Douglass <douglass@garfield-twp.com>
Sent: Monday, May 2, 2022 11:37 AM
To: John Gordon <john.gordon@northerntowerco.com>
Subject: RE: Building Permit

Good morning,

Carl asked me to reach out to you, he has been out sick the past week. Yes we would need Building Permit and Land Use Permit for this. You can find the applications on our web page, [Building APPLICATIONS](#) tab.

Please let me know if you have any questions.

Thank you,

Jamie



Jamie Douglass

[Garfield Charter Township](#)

3848 Veterans Dr. Traverse City, MI.
49684

Phone (231) 941-1620 Fax (231) 941-1588

Monday - Thursday: 7:30am to 6:00pm

From: Carl Studzinski <cstudzinski@garfield-twp.com>
Sent: Monday, May 2, 2022 9:18 AM
To: Mike Green <mgreen@garfield-twp.com>; Jamie Douglass <douglass@garfield-twp.com>
Subject: FW: Building Permit

Can you call this guy and say yes we need permits

From: John Gordon <john.gordon@northerntowerco.com>
Sent: Monday, April 25, 2022 6:54 PM
To: Carl Studzinski <cstudzinski@garfield-twp.com>
Subject: Building Permit

Carl,

I am inquiring if we will need a building permit for our project.

We are installing new anchors, adding additional structural members, and adding to the foundation for the tower located at 5268 Cedar Run Rd, Traverse City, MI 49684.

I have attached drawings for the project.

Please let me know if you have any questions or if you need additional information.

Thank you.

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
john.gordon@northerntowerco.com



--
Jeannie Gordon
Northern Tower Erection Co.

ATTACHMENT M

John Gordon

From: Scott Millar <mill_rcontractinginc@fastmail.com>
Sent: Thursday, May 5, 2022 8:43 AM
To: John Gordon
Cc: Jeannie Gordon
Subject: Re: Mill-R Contracting Quote - Cedar Run, MI - REVISED

John, it's looking like 1st week of June. The spring got away from me this year. A new coi will be emailed shortly.

Best regards,

Scott Millar
mill_rcontractinginc@fastmail.com
5968 Anglers Dr.
Ortonville, MI 48462
Cell - 810.287.4121

On Tue, May 3, 2022, at 11:31 AM, John Gordon wrote:

Hi Scott,

Just wondering what your schedule looks like.

Also, when you get a chance can you please send over an updated COI.

Thank you.

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johngordon@northerntowerco.com



From: Scott Millar <mill_rcontractinginc@fastmail.com>
Sent: Monday, March 21, 2022 11:15 AM
To: John Gordon <johngordon@northerntowerco.com>

Cc: Jeannie Gordon <jagordon@northerntowerco.com>
Subject: Re: Mill-R Contracting Quote - Cedar Run, MI - REVISED

Yes sir!

Best regards,

Scott Millar
mill_rcontractinginc@fastmail.com
5968 Anglers Dr.
Ortonville, MI 48462
Cell - 810.287.4121

On Fri, Mar 18, 2022, at 4:52 PM, John Gordon wrote:

Hi Scott,

Can you please pencil us in on your schedule for the end of April/beginning of May?

Thanks.

John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
johnngordon@northerntowerco.com



From: Scott Millar <mill_rcontractinginc@fastmail.com>
Sent: Wednesday, March 16, 2022 10:14 AM
To: John Gordon <johnngordon@northerntowerco.com>
Subject: Re: Mill-R Contracting Quote - Cedar Run, MI - REVISED

No Permit, but it does include concrete testing

Best regards,

Scott Millar
mill_rcontractinginc@fastmail.com
5968 Anglers Dr.

Ortonville, MI 48462
Cell - 810.287.4121

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John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
john.gordon@northerntowerco.com



From: Scott Millar <mill_rcontractinginc@fastmail.com>
Sent: Monday, March 14, 2022 7:01 PM
To: John Gordon <john.gordon@northerntowerco.com>
Subject: Re: Mill-R Contracting Quote - Cedar Run, MI - REVISED

John, the restoration is clean up, finish grading etc. We can cut the old anchor Rods off below grade, but that would not include any concrete removal.

Best regards,

Scott Millar
mill_rcontractinginc@fastmail.com
5968 Anglers Dr.
Ortonville, MI 48462
Cell - 810.287.4121

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John Gordon
Operations Manager
Northern Tower Erection Company
6010 East Traverse Highway
Traverse City, MI 49684
P 231-947-6048
M 231-313-1133 voice or text
F 231-947-3615
john.gordon@nortertowerco.com



From: Scott Millar <mill_rcontractinginc@fastmail.com>
Sent: Sunday, March 13, 2022 3:00 PM
To: John Gordon <john.gordon@nortertowerco.com>
Subject: Mill-R Contracting Quote - Cedar Run, MI - REVISED

Good afternoon John,

See attached revised quote with *corrected company name only*. Otherwise, no change.

My apologies for any inconvenience.

Best regards,

Mari Messina/Accountant
mill_rcontractinginc@fastmail.com
5968 Anglers Dr.
Ortonville, MI 48462
Cell - 586.212.9171

ATTACHMENT N

Hi Larry,

Contractor is scheduled to begin the anchors and foundation mods next week. Concrete will need 28 days to cure - this puts us around 2nd week of July to move guylines to new anchors. We should be able to do the antenna install 2nd week of July.

Jeannie Gordon

Treasurer, CFO

Northern Tower Erection Co

(231) 620-6048

On Jun 1, 2022, at 9:38 AM, Larry ODonnell <LarryODonnell@9and10news.com> wrote:

Jeannie,

The extension the FCC gave us is about to expire again and so I am having to request an additional extension. Can you give us an estimated time frame for the tower work before the new antennas can be up so I can provide that to the FCC in our request?

Appreciate it much.

Larry

Larry ODonnell

Chief Engineer

231.775.3478 Ext. 3157

ATTACHMENT O



July 6, 2022

RE: Cedar Run Rd

Modification Construction

The excavation company performing the foundation modification and new anchor install was scheduled to start work the end of April and beginning of May 2022. Due to unforeseen circumstances with the weather during spring 2022 and workforce shortages the contractor was unable to meet this deadline.

Due to the proximity of the new anchors to the existing anchors and the geo technical information it was determined by the contractor performing the excavation that a cautious approach should be taken when digging for the new anchors, and Northern Tower Co. agrees. To minimize the chance of all the existing anchors pulling through to the new anchor excavation at once, the decision was made to work at one anchor at a time. The only work around to this would have been to temporary guy the tower; and this would have added considerable cost and delays to the project.

Per the modification design, page N-02, under Foundation notes: 6. CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI IN 28 DAYS. 28 days has always been the standard curing time for structural concrete. The excavation company has asked the concrete supplier for test samples so that the concrete can be tested at 7, 14, & 28 days. If the concrete test at 7 days shows a sufficient cure, the rest of the modifications can continue.

Please see the below reference regarding concrete curing.

<https://www.cement.org/learn/concrete-technology/concrete-construction/curing-in-construction>

Additional delays have been experienced in scheduling and receiving the necessary inspections by the Township.

John Gordon
Operations Manager

ATTACHMENT P

From: Jeannie Gordon [<mailto:jagordon@nortertowerco.com>]
Sent: Wednesday, June 29, 2022 12:47 PM
To: Josh Trust <JoshTrust@9and10news.com>
Cc: Pete Ludviksen <PeteLudviksen@9and10news.com>
Subject: Re: Tower Information

Hello Josh,

I have an update on the modifications. The inspection was performed on Monday and the concrete for the foundation was poured on Tuesday. We spoke with the contractor and he informed us that we may only have to wait 10 days for curing, depending on the break test. The break test will be performed in 10 days – if the concrete tests at 75% or greater at that time, then a load can be placed on it.

We also spoke to him further regarding the anchors. He said when he digs to do the first anchor, if the soil holds up, he may do a second anchor at the same time. He still is not comfortable doing all 3 at once. However, with a 10 day cure time as opposed to a 28 day, that definitely shortens the amount of time for completion.

I am still not confident we can get this all complete by July 31st, however, we can definitely get this done by August 31st with the shortened cure time.

I received your e-mail. I will begin putting this together and sending over the documents you requested, however, I do not have documentation on all of your list items – most of the back and forth regarding the contractor's schedule and his conclusion on the anchor excavation was verbal in person or over the phone. I can have John complete a summary of this, but we have no e-mails.

I will keep you up to date on the schedule as we go.

Jeannie Gordon
Treasurer, CFO
Northern Tower Erection Co
(231) 620-6048

ATTACHMENT Q

Ashley Brydone-Jack

From: Gregg Skall
Sent: Thursday, July 21, 2022 4:23 PM
To: Ashley Brydone-Jack
Subject: FW: More detail needed

Gregg P. Skall, Member

(o) 202.789.3121 | (m) 703.623.0600 | gskall@tlp.law

1025 Connecticut Ave, NW, Suite 1011, Washington DC 20036 vCard | Bio | www.tlp.law This message is sent by a law firm and may contain information that is privileged or confidential. If you received this transmission in error, please notify the sender and delete the message and any attachments without printing, copying or further disseminating it. This e-mail also should not be relied upon by you as a source of US federal tax advice.

-----Original Message-----

From: Josh Trust <JoshTrust@9and10news.com>
Sent: Thursday, July 21, 2022 4:19 PM
To: Gregg Skall <GSkall@tlp.law>
Subject: Fwd: More detail needed

Sent from my iPhone

Josh Trust
COO
231.775.3478 Ext. 3358 - Direct Dial: 231-876-9710
Cell: 419-654-5674

[<https://910signature.s3.amazonaws.com/signature2022.png>]

Begin forwarded message:

From: Jeannie Gordon <jagordon@northerntowerco.com>
Date: July 21, 2022 at 4:17:55 PM EDT
To: Josh Trust <JoshTrust@9and10news.com>
Subject: Re: More detail needed

Hello Josh,
Here are my answers to your questions:

1. Was the break test done on the foundation?
 - a. If so, did the concrete test at 75% or not?
 - b. If not, why hasn't it been concluded yet?

This is irrelevant to the anchors – the foundation is already completed. The concrete for the anchors is separate, as it was not done at the same time as the foundation so will not be the same batch of concrete. The test needs to be done on the batch of concrete used for the anchors. This is because an immediate and direct load will be placed on the anchors when the guylines are moved.

2. Are they proceeding to the next step now? Yes
 - a. If so, what is that step? A rough idea of what is left to do and a best case and worst case timeline would be helpful here.
 - b. If not, what needs to be done to get to that step and where are we (again, timeline of remaining events and rough idea of best and worst case completions would be helpful)

3. Is the contractor doing two anchors at time? If not, can we get something explaining why he made the change again?

4. Has the contractor agreed to a cure time of 10 days or still using 28 days? And any support we have for this decision would be helpful.

Once the contractor was able to dig down at the first anchor and visually assess how the soils would hold up, he concluded that all (3) anchors could be done at once. Presently, all (3) anchors and cages are installed in the ground and awaiting concrete. The concrete will be scheduled after the inspection has been completed by the township. I am waiting to hear back on when the inspection will take place.

After concrete has been installed, the break tests will be completed at the previously stated intervals. The results of this test will determine when we can commence moving the guylines to the new anchors. Best case scenario is 10 days from pour – if the concrete tests at 75%, we can continue. We then estimate another 7 – 10 days to move all the guylines to the new anchors and tension. Best case scenario estimated completion date would then be end of August to have your new antennas up and running. Worst case is the concrete requires the full 28 days of cure time. This timeframe is not determined by the Contractor – this is a standard (please see the Modification Design notes by the Engineer). That would put us near the end of August before we can move the guylines, and mid-September before we could have your antennas on the tower.

Jeannie Gordon
Treasurer, CFO
Northern Tower Erection Co
(231) 620-6048

On Jul 21, 2022, at 1:55 PM, Josh Trust <JoshTrust@9and10news.com> wrote:

Hi Jeannie,

Our attorney is asking for information to the below please. Thank you

1. Was the break test done on the foundation?
 - a. If so, did the concrete test at 75% or not?
 - b. If not, why hasn't it been concluded yet?

2. Are they proceeding to the next step now?
 - a. If so, what is that step? A rough idea of what is left to do and a best case and worst case timeline would be helpful here.
 - b. If not, what needs to be done to get to that step and where are we (again, timeline of remaining events and rough idea of best and worst case completions would be helpful)
3. Is the contractor doing two anchors at time? If not, can we get something explaining why he made the change again?
4. Has the contractor agreed to a cure time of 10 days or still using 28 days? And any support we have for this decision would be helpful.

We have some concern that you may not make the September 30 date and that we should request a greater tolling because you said today that you are waiting for the concrete to be poured for the anchors, and previously said the foundation was poured June 28, which was 23 days ago. That would indicate that the break test was not sufficient to allow for a shorter cure time and to proceed to the anchors, and may indicate that we need 30 day cure time for each anchor. That would take us to the middle of October.

Any Reports from the contractor to Northern tower would be helpful attachments as well. do you have anything in writing or by e-mail that we can have?

Sent from my iPhone

Josh Trust
COO
231.775.3478 Ext. 3358 - Direct Dial: 231-876-9710
Cell: 419-654-5674
www.9and10news.com

ATTACHMENT R

T Z SAWYER TECHNICAL CONSULTANTS

2130 HUTCHISON GROVE COURT, SUITE 100
FALLS CHURCH, VIRGINIA 22043
TELEPHONE (703) 848-2130 / (202) 642-2130

DIGITAL LPTV TOLLING REQUEST ALTERNATE TOWER SITES CONSIDERATION FOR TRAVERSE CITY, MICHIGAN

**VAL VISTA RV PARK, LLC
W16DN - FACILITY ID: 186363
W27DU - FACILITY ID: 186364
&
CADILLAC TELECASTING CO.
W23FL - FACILITY ID: 182741**

ENGINEERING NARRATIVE

Evaluation of Possible Late Date Site Change

W16DN and W27DU, share a common antenna system. W23FL has it own separate antenna system. All are currently to be located on the same tower.¹

Each of the proposed antenna systems have been designed, built and delivered and are ready for installation upon the current tower as authorized in each facility's FCC construction permit once structural upgrades to the tower are completed.

Each of the antennas are directional and have been optimized to provide maximum service to the public from the current site location and antenna elevation, while providing interference protection to existing facilities. A change in site location would likely involve re-engineering of the antenna design, which would have a cascading negative effect on the project completion time line. Essentially, a change in site location would restart the approval and engineering processes, which would add a significant increase in the anticipated project completion date.

Should a tower site change be contemplated to complete construction, the following items would be required to be modified or evaluated at a minimum:

- Tower Lease (If space is available at alternate sites);
- Antenna Design Engineering (Consulting Engineer & Manufacturer);
- Tower Structural Analysis (Structural Engineer);
- Electrical Power Service Evaluations (Local Electrician);

¹ A total of two antennas and transmission lines are required, the two antennas are located at separate elevations on the tower.

- Local Building Permits (if required);
- FCC Construction Permits (Modification of Permits will be required);
- Environmental Evaluation (a new study would be required);
- Possible re-manufacturing of each antenna (or a new antenna);
- Local Operation Infrastructure.²

As unavoidable delays (out of the permittee's control) continue at the current site due to tower structural issues every effort is being made to complete construction. A change in site location at this late date would extend the completion date well beyond the time required to finish at the current location.

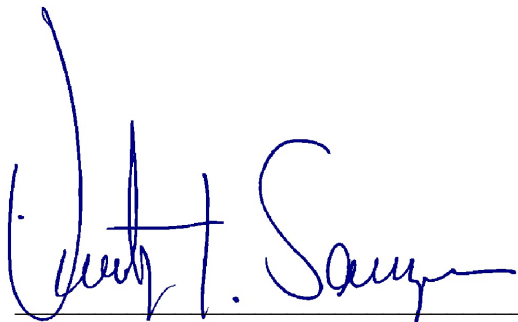
Additionally, a change of site location could have a negative impact on the service area and population served of each facility.

My advice is not to seek or change sites. The problems associated with completion of construction are being addressed, and progress continues to be made as outlined elsewhere in this additional tolling request. Third-party construction delays which the permittees have no control over are in play here.

The foregoing was prepared by Timothy Z. Sawyer of T Z Sawyer Technical Consultants, Falls Church, Virginia. My qualifications are a matter of record with the Federal Communications Commission. The statements herein are true and correct of my knowledge, except such statements made on information and belief, and to those statements, I believe them to be true and correct.

Respectfully submitted,

July 25, 2022



Timothy Z. Sawyer, Consulting Engineer

T Z Sawyer Technical Consultants
2130 Hutchison Grove Court, Suite 100
Falls Church, VA 22043
Tel.: (703) 848-2130
e-mail: tzsawyer@tzsawyer.com

² Currently located, operating and licensed at the current Traverse City tower site is LPTV WWTV-DRT, Facility ID: 26994 on channel 25, this facility is a digital replacement translator (DRT) for full-service facility WWTV-DT Channel 9, Cadillac, MI. The Traverse City proposals by Val Vista and Cadillac share an existing operational structure with Heritage Broadcasting Company of Michigan, licensee of WWTV-DT

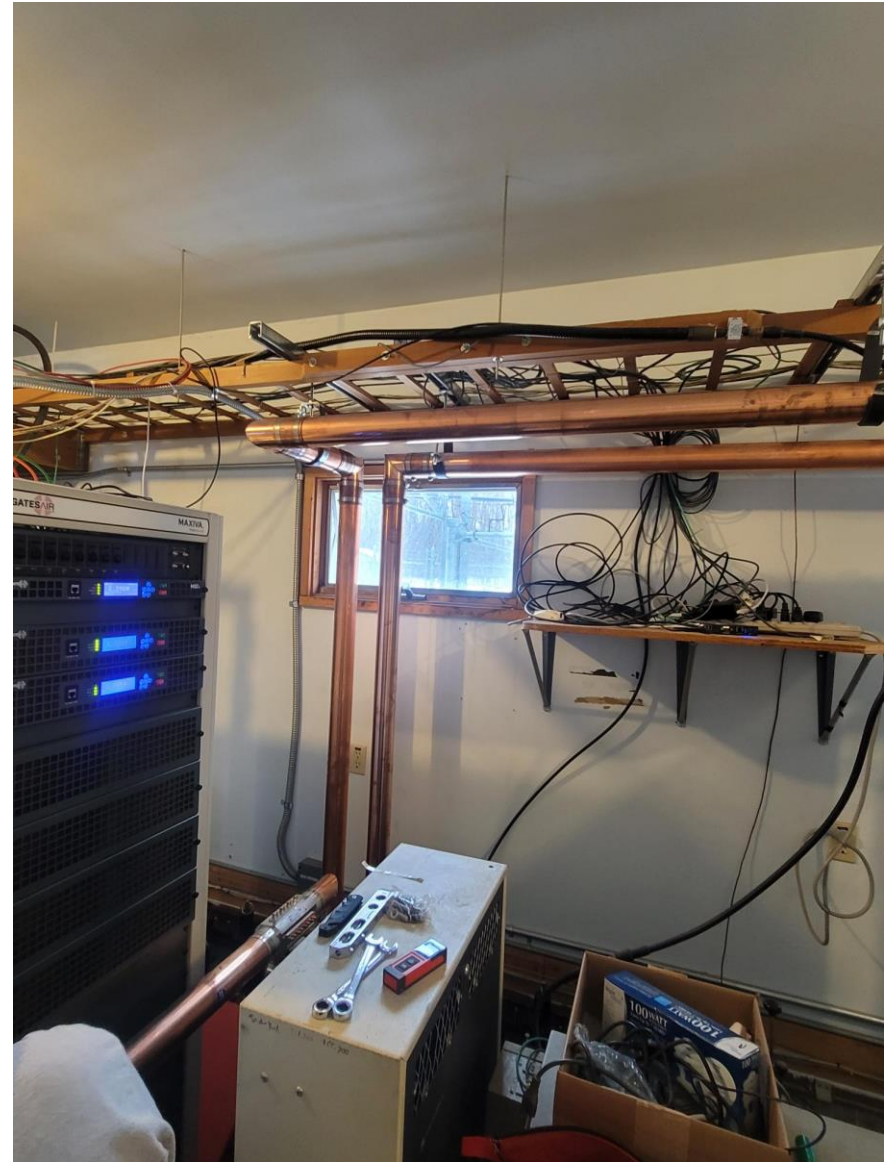
ATTACHMENT S

Val Vista
Traverse City Equipment
W16DN-D and W27DU-D Equipment Installed

Mask Filter & Combiner for W16DN-D and W27DU-D



Mask Filter Plumbed



Left side of W16DN-D and W27DU-D Transmitter



W16DN-D and W27DU-D transmitters and Equipment Rack



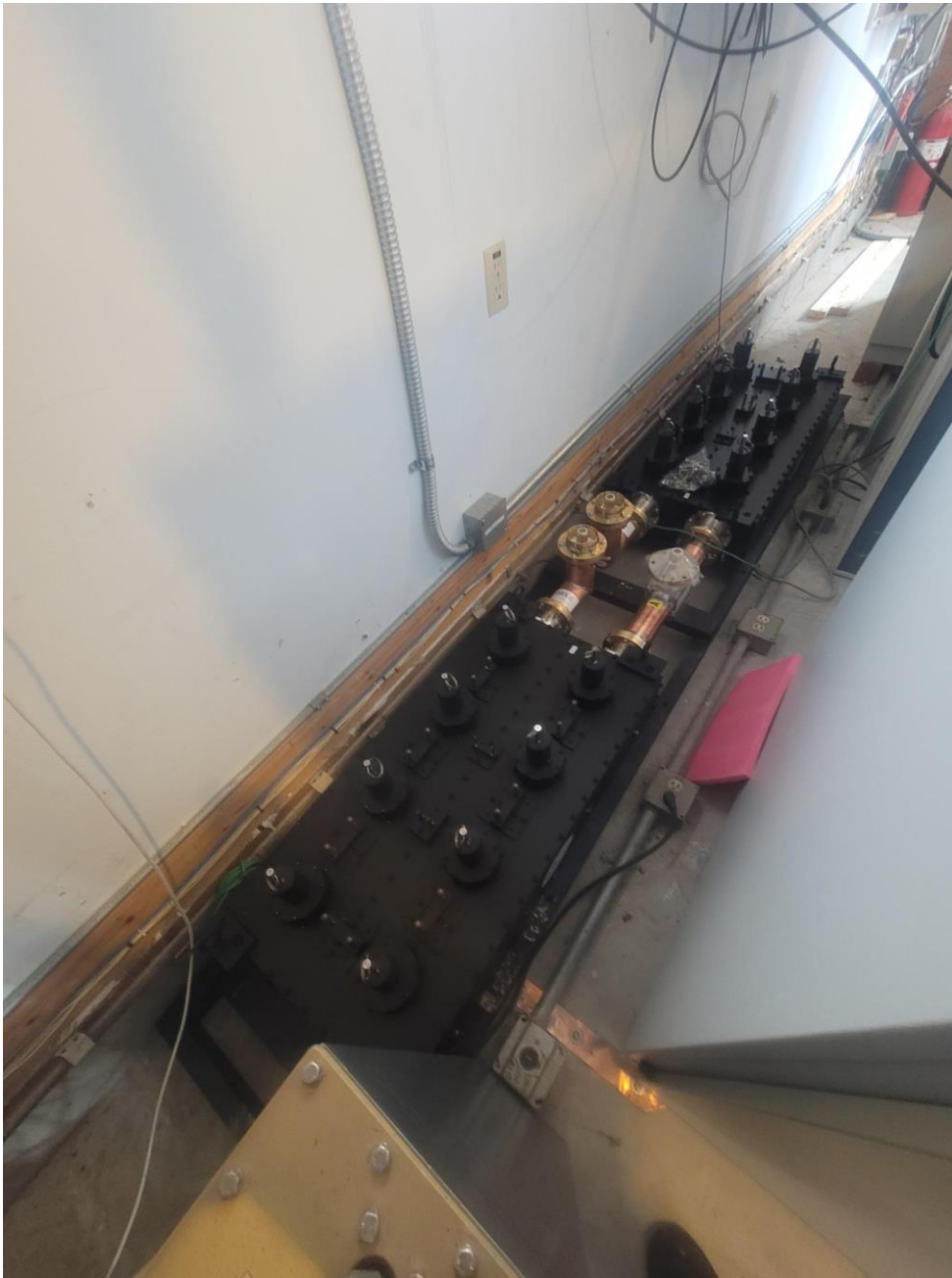
W16DN-D and W27DU-D Delivered prior to Full Installatoin



Transmitter room prior to installation of Equipment Rack



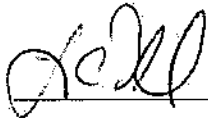
Mask Filter & Combiner for W16DN-D and W27DU-D



Certification

I, Larry O'Donnell, Chief Engineer for Val Vista RV Park, LLC, have reviewed the foregoing Section 73.3598(b) Tolling and Extension of Permit Request and I certify under penalty of perjury that the facts set forth therein, except those of which public notice may be taken, are true and correct.

Executed on July 26, 2022.



Larry O'Donnell
Chief Engineer
Val Vista RV Park, LLC.