Notice of Public Meeting February 5th, 2025 1:00 P.M.	COMMUNICATION ADVISORY TECHNICAL SUB-COMMITTEE	*Door County Government Center* *County Board Room* *421 Nebraska St* *Sturgeon Bay, WI 54235*

Public Safety Committee is the Oversight Committee for Communication Advisory Technical Sub-Committee

AGENDA (Amended)

1. Call Meeting to Order
2. Establish a Quorum
3. Adopt Agenda / Properly Noticed
4. Approve Minutes of the 10/3/2024 meeting
5. Public Comment
6. New Business
   - 6.1 Fish Creek Tower Update
   - 6.2 New 800MHz System Project
     - 6.2.1 Status Update
     - 6.2.2 Communications Plan
   - 6.3 2024 Nsight Tower Inspection Review
     - 6.3.1 Repair Quote Review
   - 6.4 2024 Bay Electronics Review of Towers
     - 6.4.1 Repair Quote Review
     - 6.4.2 Sunnyslope Lighting
   - 6.5 Sunnyslope Tower Modifications
7. Matters to be Placed on a Future Agenda or Referred to a Committee, Official, or Employee
8. Next CATS Committee Meeting Date: To be determined
9. Adjourn

This meeting will be conducted by teleconference or video conference. Members of the public may join the meeting remotely or in-person.

To attend the meeting via computer:
Go To:
https://us02web.zoom.us/j/84529645740?pwd=FVY5w11bt3o8BaLFYj8m1NamIklnMq.1

Webinar ID: 845 2964 5740
Passcode: 936243
To Connect via Phone:

Call: 1-312-626-6799

Deviation from the order shown may occur

In compliance with the Americans with Disabilities Act, any person needing assistance to participate in this meeting, should contact the Office of the County Clerk at (920)746 2200. Notification 48 hours prior to a meeting will enable the County to make reasonable arrangements to ensure accessibility to that meeting.

MINUTES December 16th, 2024	COMMUNICATION ADVISORY TECHNICAL SUB-COMMITTEE	*Door County Government Center* *County Board Room* *421 Nebraska St* *Sturgeon Bay, WI 54235*

Public Safety Committee is the Oversight Committee for Communication Advisory Technical Sub-Committee

"These minutes have not been reviewed by the oversight committee and are subject to approval at the next regular committee meeting."

Call Meeting to Order

The Monday December 16th meeting was called to order by Chairperson Elizabeth Gauger at the Door County Government Center at 2:00 pm.

Establish a Quorum

Members Present: Elizabeth Gauger, Howie Hathaway, Aaron LeClair, Ashley DeGrave, Greg Diltz, Joseph Saelens, Patrick McCarty, Kyle Veeser, Brenda Bley

Remote – Chris Hecht

Others Present

Jason Rouer, Ken Pabich, Jason Baudhuin Bay Electronics, Chris Monzingo OCG – Remote, Scott Pagels - Remote

Adopt Agenda / Properly Noticed

Motion made by Diltz second by LeClair to approve the agenda. Motion carried by voice vote.

Approve Minutes of the 10/03/2024 meeting

Motion made by LeClair second by Hathaway to approve the minutes from the October 3rd meeting. Motion carried by voice vote.

Public Comment

New Business

Fish Creek Tower Update

DeGrave explained shelter and tower are going to be delivered this week. WPS Electrical pushed back until January as an extra path thru DNR property needed to be cut. After electrical is installed, equipment moves will be scheduled. Hoping for go live end of January/early February.

Big Hill Tower Update

DeGrave provided update that the US Cellular tower is not a possibility as that tower was part of a program/plan that US Cellular is no longer running. Discussions with the City and they are willing to do an engineering study on the Water Tower and see what options we would have for height and how we mount the gear. DeGrave to provide them an equipment estimate so they can run study.

New 800 MHz System Project Update

- Status Update
    - DeGrave addressed question from last meeting regarding use of pagers. Reviewed with OCG and the plan includes an upgrade to digital on the pagers as well. Hathaway questioned if all gear would be coming down because the ARES gear is part of the Counties equipment. Jason Baudhuin to review inventory at each site and indicate which antennas are for ARES and the County can include those in the structural analysis of those sites.

  DeGrave explained Nsight has been working thru land acquisition and reviewed status of each site.
    - Baileys Harbor – Secondary site land owner is interested in leasing. We will continue to explore options with original site and if that does not pan out, will discuss leasing options.
    - Horseshoe Bay – Nsight to reach out to land owner who has several parcels of farm land in our search area.
    - Bayshore Drive – This site works in conjunction with Horseshoe Bay, will wait for that site to be selected for possible adjustments.
    - Sevastopol – Town property on Haberli Rd was a previous DNR parcel and has restrictions for building towers. Nsight to make contact with school on possible use of their parcel on Dunn Rd.
    - Claybanks – Nsight has sent letters to six land owners and is awaiting responses.
    - Highway North / ECB Ellison Bay – Alternative plans were developed by OCG after concerns from previous CATS meeting. Several options between different heights and locations are possible. Biggest concern at this point is the Ellison Bay ECB site. DeGrave is working with ECB to do a structural analysis to see if this site will be viable in our new plan. After that determination is made, alternative Highway North plans will be evaluated. ECB's estimate is a month for the structural analysis. Hathaway questioned fund previously budgeted for new Ellison Bay Site. DeGrave explained monies were budgeted for the tower project but not for any specific site.

- 2024 Nsight Tower Inspection Review

  DeGrave pointed out highlights from the inspection reports. Weed control and building concerns will be discussed with Facilities and Parks. Nsight will prepare a quote for things that are maintenance repairs, ex: butyl lines leaking, and upgrades, ex: grounding upgrades. Will review those proposals and present at next meeting. Baudhuin said that on the Sunnyslope site there is a note about feedlines being grounded at entry port. He explained that there is actual grounding in the entry port it is just not visible. DeGrave said she would explain that to Nsight and remove that from the quote.

- 2024 Bay Electronics Review of Towers

  Baudhuin reviewed the summary sheet of adjustments at each site. Explained that although it may look like a lot, these are typical/minimal adjustments to the system. Items that were of concern, a power amplifier was replaced at the Fish Creek tower, there is a leaking battery at Sunnyslope, and a bad battery at the Justice Center which both should be replaced.

  Sunnyslope has a microwave link that needs to be repaired, but current microwaves are no longer made or serviced. Hathaway explained he has someone out of MN who recently did a system upgrade and may have spare parts for us. Hathaway to provide information to Baudhuin. DeGrave explained that it was discussed again about doing a second yearly inspection and at this point, the amount of adjustments we are seeing does not justify the added cost for inspection.

  Baudhuin explained a lighting issue at Sunnyslope came up after the inspections. The side beacon light is faulty and needs to be replaced. The current lighting is dated and no longer serviced so lighting and gear inside the tower should be replaced but cabling should not need to be re-run. Baudhuin had received quote for the lighting and is awaiting quote from Nsight Towers to do the replacement.

Southwest is showing some interference with the Highway Repeater that was recently installed and should be evaluated. DeGrave questioned if this is something Baycom should come out and look at or something that should be coordinated, Baudhuin said best if this was a coordinated test with both.

Baudhuin to provide quotes for batter replacements and lighting repair. Will be provided at next CATS Meeting.

Matters to be Placed on a Future Agenda or Referred to a Committee, Official, or Employee

New 800 MHz System Project

Big Hill Tower

Fish Creek Tower Update

Communications Plan

Next CATS Committee Meeting Date: TBD

Adjourn

Motion made by Diltz second by Hathaway to adjourn. Motion carried by voice vote at 2:55 pm.

Respectfully submitted by: Ashley DeGrave

Project Details	
Project Name	Door County Public Safety Radio System Upgrade
Reporting Period	10/9/24-1/31/25
Report Date	2/4/25
Project Manager	Ashley DeGrave
Total Project Completion	1.21%

Phase 1 Project Details

Objective	Sub-Objective	Tasks	Task Lead	Status	Completion %	Anticipated Completion	Notes
Site Finalization					**13%**		
New Site Construction				Not Started	0%		
Existing Site Readiness				Not Started	0%		
Stakeholder Finalization				Not Started	0%		
Radio Vendor RFP				Not Started	0%		
Equipment Purchase				Not Started	0%		
Equipment Installations				Not Started	0%		
Frequency Coordination				Not Started	0%		
User Training				Not Started	0%		
System Testing				Not Started	0%		
System Implementation/Go-Live				Not Started	0%		
Old System Decomission/Equipment Removals				Not Started	0%		

Nsight Tower

5475 Glendale Ave
Green Bay, WI 54313
Office: (920) 617-7100
Fax: (920) 617-7021

Proposal for:

Door County Attn: Ashley DeGrave 1201 S. Duluth Ave Sturgeon Bay, WI 54235 ADeGrave@co.door.wi.us (920) 746-2395	Estimated by: RJ Riordan Estimator Office: (920) 617-7907 Estimator Email: RJ.Riordan@Nsight.com Proposal Date: 1/23/2025 Site Location: Multiple Proposal Expires: 3/31/2025 Proposal Number: DCO-250123-A

Scope of Work

Nsight Tower (NST) will perform maintenance repairs for Door County (DCO) on their Sunnyslope, Southwest, Mill Road, and Justice Center towers as outlined in the 2024 TIA inspections and as directed by DCO. At Justice Center, weather proofing will be applied to leaking butyl and Cadwell ground to the fence. For Mill Road, conduit will be sealed and replaced if needed, weather proofing applied to leaking butyl and patch the building concrete. At Southwest, conduits will be sealed, patch the building concrete, and secure EW 90 and EW65. For Sunnyslope, the repairs will be new grounds for the anchors installed, mouse the fraying guyline ends, weatherproof leaking butyl, and secure EW65. Sunnyslope's upgrades will be adding a bus bar to tower base grounding, add mid-point grounding kit, and add lace up hoist grip for both shackles. If this project and/or DCO is tax exempt, a tax-exempt certificate is required.

Justice Center - Repair			$	1,350.00
Mill Road - Repair			$	1,275.00
Southwest - Repair			$	1,550.00
Sunnyslope - Repair			$	2,350.00
Sunnyslope - Upgrades			$	1,350.00
	Subtotal		$	7,875.00
	Sales & Use Tax	0.0%	$	-
	Total		$	**7,875.00**

Acceptance of proposal assumes acceptance of Nsight Tower's "Terms & Conditions".

BAY ELECTRONICS INC
MAKING WAVES SINCE 1974

23 East Oak Street
Sturgeon Bay, WI 54235
Phone (920) 743-0190 Fax (920) 743-2914
jbaudhuin@bayelectronicsinc.com

Quotation Number
BATTERYREPLACEMENTS 012225.REV(-)
Quotation Date
January 22, 2025
Quotation valid until:
February 21, 2025
Sales Rep:
Jason Baudhuin
Terms:
Net 30
Shipping:
FOB Origin, Prepaid and Added

Sent To:
Door County Technical Service Department
Attn: Ashley DeGrave
421 Nebraska Street
Sturgeon Bay, WI 54235

Quantity	Part Number	Description	Unit Price	Total
1.00	TEL12-70	C&D Telecom Series Battery, 12V, 69 AH, AGM (Sunnslope 6GHz microwave battery), includes installation of new battery	$ 1,139.00	$ 1,139.00
1.00	TEL12-30	C&D Telecom Series Battery, 12V, 30 AH, AGM (Justice Center Radio battery), includes installation of new battery	$ 508.00	$ 508.00
			Sub-Total	$ 1,647.00
			Tax	$ -
			TOTAL	**$ 1,647.00**

BAY ELECTRONICS INC
MAKING WAVES SINCE 1974

23 East Oak Street
Sturgeon Bay, WI 54235
Phone (920) 743-0190 Fax (920) 743-2914
jbaudhuin@bayelectronicsinc.com

Quotation Number
SUNNYSLOPELIGHTS 010225.REV(-)
Quotation Date
January 2, 2025
Quotation valid until:
February 1, 2025
Sales Rep:
Jason Baudhuin
Terms:
Net 30
Shipping:
FOB Origin, Prepaid and Added

Sent To:
Door County Communication Advisory Technical Sub-Committee
Attn: Ashley DeGrave
421 Nebraska Street
Sturgeon Bay, WI 54235

Quantity	Part Number	Description	Unit Price	Total
1.00	LE23-R	TWR LoneStar Series RetroFit Kit, includes: (1) Controller and (3) Beacons	$ 16,200.00	$ 16,200.00
1.00	50030	Removal of existing Lighting System, Installation of New Lighting System, Alarm Connection and Testing	$ 11,300.00	$ 11,300.00
		Sub-Total		$ 27,500.00
		Tax		$ -
		TOTAL		**$ 27,500.00**

Ashley DeGrave
Ashley DeGrave
Tech Services Project Manager
01/17/2025

TWR Lighting Technologies

LONESTAR

FAA Medium Intensity Obstruction Light

Lonestar | Leading the Way in Aviation Lighting

The LONESTAR beacon, an FAA Type L864/865 compliant LED obstruction light, meets and exceeds FAA standards with robust construction and modular electronics. Paired with the LC-STAR controller, it ensures reliable day and night marking. Its advanced optics and controls enable seamless installation with one controller and cable. The modular design allows easy field repairs and supports both AC and DC power, featuring an optional integrated power supply.

Key Features

- Five-year warranty
- Electronics available in light fixture or at ground level
- Transient protection per IEEE c62.41-1991
- Modular design, easy access to all components
- Simpler cable installation
- Low power consumption
- 15-20 years of operation
- Infra-red (IR) included
- Optional GPS synchronization
- Optional DC power supply

Performance

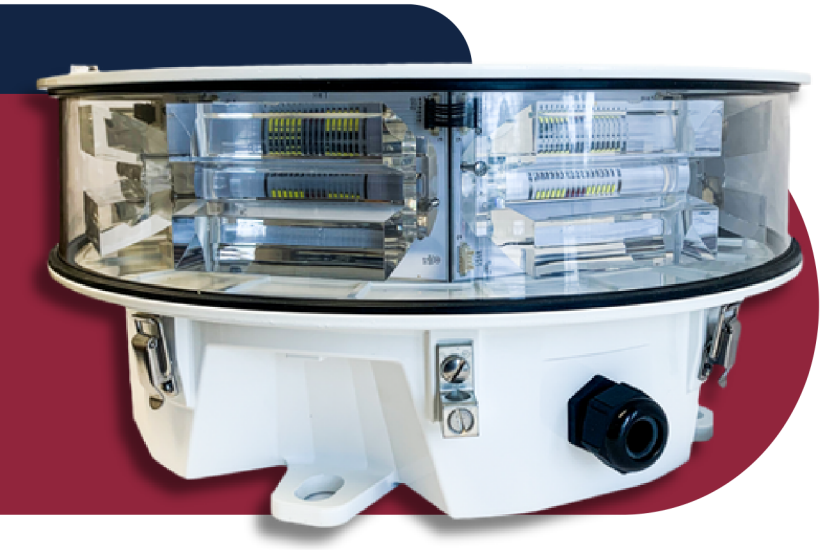
- Effective intensity 20,000cd white, 2,000cd red and 246mW/sr IR Radiant
- Horizontal beam coverage 360 degrees
- Vertical beam coverage 3 degree
- Form "C" failure alarm
- LED Temperature Intensity Compensation

Standards and Certifications

- FAA AC70/7460-1M
- ICAO Annex 14 Volume 2
- CAR 621
- DGAC

FAA-L864/865

Dual Red/White with IR



LONESTAR

FAA Medium Intensity Obstruction Light

Optional Monitoring Features

- 10 additional alarm inputs
- Cabinet access alarm
- SNMP programming Get/Sets
- SNMP traps for alarms
- System operation event history record
- Manual control override of connected lights
- Cabinet temperature
- Backup battery discharge protection
- Real-time clock / Eprom for configuration
- 0-30 VDC analog monitoring ports
- GPRS/CDMA Wireless modem
- Ethernet CP/IP modem

Monitoring Services

- FCC QLI Compliant
- TWR Web Portal provides online access to review your monitored sites
- Automatic email notification of NOTAM status changes.
- TWR NOC full reporting monitoring service
- HIMS (Hark Independent Monitoring Service) (Client-monitored)

Flashes Per Minute

Product	Night	Day
L864-IR (Red)	30	-
L865-IR (White)	40	40
L864-IR/I865 (Red/White)	30	40

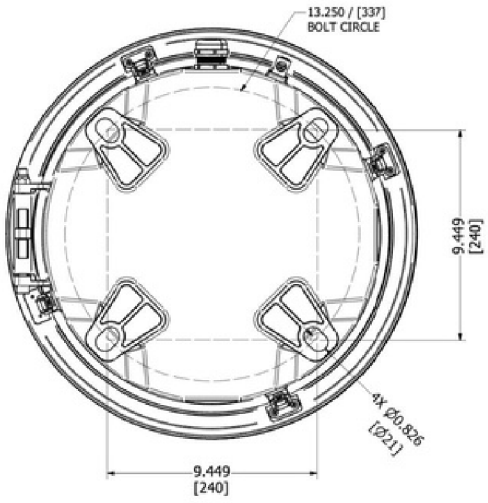
Power Consumption @ 20 °C

Product	Night	Day
L864-IR (Red)	12.5 W	1 W
L865-IR (White)	7.5 W	32 W
L864-IR/I865 (Red/White)	12.5 W	32 W

General Specifications

Operating Voltage	120-240 VAC
Frequency	50/60 Hz
Beacon Dimension L x W x H	18.5" x 18.5" x 8.5" in. (469.9 x 469.9 x 215.9 mm.)
Beacon Weight	36 lbs. (16.3 kg.)
Controller Dimension L x W x H	16.5" x 16" x 7.75" in. (416 x 406 x 196 mm)
Controller Weight	18 lbs. (8.16 kg.)
Controller Protection Rating	NEMA 4 IP66
Operating Temperature Range	-40°F to +130°F (-40°C to +55°C)
Power Consumption	Night < 15 watts Day < 35 watts

Lonestar Mounting Dimensions



Edge
Consulting Engineers, Inc.

624 Water Street
Prairie du Sac, WI 53578

608.644.1449 phone
608.644.1549 fax

January 30, 2025

Ashley DeGrave
Door County Technology Services
421 Nebraska Street
Sturgeon Bay, WI 54235

SUBJECT: STRUCTURAL ANALYSIS SUMMARY LETTER
WEC EQUIPMENT INSTALLATION
DOT CARLSVILLE
EGG HARBOR, WI
EDGE PROJECT 40556

Ms. DeGrave:

A structural analysis for the above-mentioned tower pursuant to the ANSI/TIA-222-G standard (TIA-222) was completed on 12/23/2024. The results of our analysis indicate that the existing tower **is not structurally adequate** to support the described loading. This assessment was completed using background information provided by the client and/or obtained in the field (where noted) and in conformance with current applicable codes, client directed protocols, and the judgment of the structural engineer.

BACKGROUND INFORMATION AND ANALYSIS CRITERIA

The subject tower is an existing LeBlanc 400 foot tall, model LRM33 guyed tower which was originally designed in September of 1998. We were provided the following information at the project outset:

1. Tower & foundation drawings: LeBlanc Eng. File: 4080830 Rev. 1 dated 9/23/1998
2. Structural analysis/mod.: Edge Eng. File: 14724 dated 3/1/2018 *
3. Tower inventory confirmation per 26523 Edge site visit dated 5/8/2020
4. Geotechnical report: STS Consultants Eng. File: 23756 dated 2/24/1997

The following table summarizes the proposed change in loading:

Ant. Height	#	Key	Manufacturer & Model #	Mounting Type	Technology / Notes	Feedline (#) Size	Owner	Status
166'	**1**	**PTT 02**	**Comprod 778-70-HDWBTM**	**6' Standoff**	**Dipole**	**(1) 7/8"**	**WEC**	**Proposed**
127'	**1**	**NLOS 01**	**Comprod 874F-70-220**	**6' Standoff**	**Dipole**	**(1) 7/8"**	**WEC**	**Proposed**

This analysis used the following structural design criteria:

Location
Door County, WI
Governing Codes/Standards
TIA-EIA Rev. G
General Structural Design Criteria

Importance/Risk Category	III
Wind Speed	90 mph (Nominal/Service Level)
Exposure Category	C
Topographic Category	1 - Flat/Rolling
Ice Thickness	0.5"
Wind Speed w/ Ice	40 mph

ANALYSIS METHOD AND RESULTS

Structural analysis computations and modeling of the tower structure were performed using TNX Tower Version 8.0 software. TNX Tower is a general-purpose modeling, analysis, and design program created specifically for communications towers using the currently adopted TIA-222 Standards. Steel design is checked using the referenced AISC Specifications. This program automatically generates nodes and elements for a subsequent finite element analysis (FEA) for standard tower types including self-support towers, guyed towers and monopoles. It allows entry of dishes, feedlines, discrete loads (loads from appurtenances) and user defined loads anywhere on the tower. TNX Tower uses wind effects from multiple directions and ice loads to develop pressure coefficients, wind pressures, ice loads and resulting forces on the tower per TIA-222 requirements.

The tower foundation system was also reviewed for the resulting applied forces due to the described loading condition. Items reviewed include checking the global overturning and shear of the foundation system. In addition, the anchor bolts and guy anchors were also reviewed for structural adequacy.

The analysis results of the existing tower structure when considering the described loading condition indicate the tower structure **is not structurally adequate.** The tower elements determined not adequate are summarized below:

Capacity - Results		
Tower Structure Elements	**Capacity Ratio (%)**	**Comment**
Guys		
175'	**109.7%**	**Not Adequate**
118'	**113.2%**	**Not Adequate**

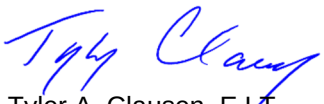
Structural modifications may be installed as possible means to address the structural deficiencies identified.

RECOMMENDATION

Structural modifications may be installed as possible means to address the structural deficiencies identified.

Please refer to the report referenced above for further information. Feel free to contact us if you have any questions or concerns.

Sincerely,
Edge Consulting Engineers, Inc.



Tyler A. Clausen, E.I.T.
Project Engineer

PREPARED FOR:

WEC Energy Group

STRUCTURAL ANALYSIS REPORT

400 FT GUYED TOWER
EQUIPMENT INSTALLATION
DOT CARLSVILLE
EGG HARBOR, WISCONSIN

EDGE PROJECT NUMBER: 40556

DECEMBER 23, 2024

Edge
Consulting Engineers, Inc.

624 Water Street
Prairie du Sac, Wisconsin 53578
608.644.1449 Phone
608.644.1549 Fax
www.edgeconsult.com

Reliable
Comprehensive
Exceeding Expectations

STRUCTURAL ANALYSIS REPORT

Project Information:

DOT Carlsville
Egg Harbor, WI
44.98002, -87.28047

Client:

Lockard & White, Inc.
3001 Earl Rudder Fwy, Ste. 100
College Station, TX 77845
Contact: Joey Rychetsky

Tower Owner:

Door County
Attn.: 911 Center Supervisor
1201 South Duluth Street
Justice Center
Sturgeon Bay, WI 54235

Consultant:

Edge Consulting Engineers
624 Water Street
Prairie du Sac, WI 53578
Contact: Aaron P. Kenealy
Phone: (608) 644-1449

Edge Project Number:

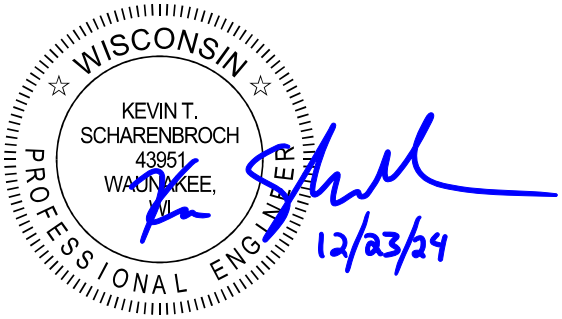
40556

Date:

December 23, 2024

Tyler A. Clausen, E.I.T.
Project Engineer

12/23/24
Date



Kevin T. Scharenbroch, P.E.
Professional Engineer

12/23/24
Date

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FIGURES

APPENDICES

SECTION 1
EXECUTIVE SUMMARY

Site Name: **DOT Carlsville**
Site Location: **Egg Harbor, Wisconsin**
Tower Type: **400 ft. Guyed Tower**

A structural analysis for the above-described tower pursuant to the ANSI/TIA-222-G standard (TIA-222) was completed. One loading scenario was considered in the analysis. This is further described in Section 3.2, with reference to the feedline placement diagram (Figure 1).

The analysis was completed per the TIA-222 standard and is considered a rigorous analysis.

The results of our analysis indicate that the existing tower **is not structurally adequate** to support the described loading. Refer to Section 3.5 for additional information regarding assumptions for this analysis.

Please refer to the report which follows this summary for further information. Feel free to contact us if you have any questions or concerns.

SECTION 2
INTRODUCTION

2.1 PURPOSE OF REPORT

Edge Consulting Engineers (Edge) performed a structural analysis for the existing tower to determine whether the tower is structurally adequate to support the loading condition referenced in Section 3.2, pursuant to the TIA-222 standard. This assessment was completed using background information provided by the client and/or obtained in the field (where noted) and in conformance with current applicable codes, client directed protocols, and the judgment of the structural engineer.

2.2 SCOPE OF SERVICES

The scope of services for this project included a structural analysis and modeling of the tower structure and foundation systems in accordance with client supplied information. This type of analysis, under the TIA-222 standard, is considered to be a “rigorous” analysis of the tower.

This report summarizes the structural analysis results.

SECTION 3
ANALYSIS

3.1 BACKGROUND INFORMATION

The subject tower is an existing LeBlanc 400 foot tall, model LRM33 guyed tower which was originally designed in September of 1998. It is our understanding that the tower geometry has been altered from the original design. We were provided the following information at the project outset:

1. Tower & foundation drawings: LeBlanc Eng. File: 4080830 Rev. 1 dated 9/23/1998
2. Structural analysis/mod.: Edge Eng. File: 14724 dated 3/1/2018 *
3. Tower inventory confirmation per 26523 Edge site visit dated 5/8/2020
4. Proposed antenna and feedline loading configuration
5. Geotechnical report: STS Consultants Eng. File: 23756 dated 2/24/1997

*This modification design was verified to have been installed by the client. It was generally found to conform to the required modifications detailed in the associated modification report.

3.2 LOADING CONDITION

The listed heights for appurtenances are representative of the centerline. For omni and dipole antennas the listed heights represent the base of the antenna.

The following loading condition was considered during this analysis:

Ant. Height	#	Key	Manufacturer & Model #	Mounting Type	Technology / Notes	Feedline (#) Size	Owner	Status
396'	2	A31, A35	20' Omni	LeBlanc 10' Standoff	Omni	(1) 7/8" (1) 1-1/4"	Door Co	Existing
396'	1	A34	10' Omni	LeBlanc 10' Standoff	Omni	(1) 7/8"	Door Co	Existing
396'	1	A36	10' Dipole	LeBlanc 10' Standoff	Dipole	(1) 7/8"	Door Co	Existing
396'	1	A33	PD340	LeBlanc 10' Standoff	Dipole	(1) 7/8"	DSP	Existing
396'	1	A32	Comprod 874F-70-220	LeBlanc 10' Standoff	Dipole	(1) 7/8"	WISCOM	Existing
330.5'	2	A26, A28	20' Omni	LeBlanc 10' Standoff	Omni	(3) 7/8"	Door Co	Existing
330.5'	1	A29	10' Dipole	LeBlanc 10' Standoff	Dipole	(1) 7/8"	Door Co	Existing
330.5'	1	A27	Comprod 874F-70-220	LeBlanc 10' Standoff	Dipole	(1) 7/8"	WISCOM	Existing
307'	2	A23,A24	Dipole Grid Dish	Tight Mount	Reflector	(1) 7/8"	Door Co	Existing
270.5'	1	A19	20' Omni	2' Standoff	Omni	(1) 7/8"	Door Co	Existing
249.5'	1	A18	20' Omni	4' Standoff	Omni	(1) 1/2"	Door Co	Existing
228'	1	A17	15' Dipole	Tight Mount	Dipole	(1) 7/8"	Door Co	Existing
208.5'	1	A16	1' Dipole	Tight Mount	Dipole	(1) 7/8"	Door Co	Existing
193.5'	1	A14	RFS 8' Dish	Pipe Mount	Dish	(1) EW63	State of WI	Existing
190'	1	A13	RFS PAD6-65	Pipe Mount	Dish	(1) EW63	Door Co	Existing
181'	1	A12	Andrew PAR6-59WA	Pipe Mount	Dish	(1) EW52	Door Co	Existing
166'	**1**	**PTT 02**	**Comprod 778-70-HDWBTM**	**6' Standoff**	**Dipole**	**(1) 7/8"**	**WEC**	**Proposed**
162.5'	1	A11	RFS PAD6-65	Pipe Mount	Dish	(1) EW63	Door County	Existing
159.5'	1	A10	RFS 6' Dish	Pipe Mount	Dish	(1) EW63	State of WI	Existing
149'	1	A9	Andrew PL6-59WC	Pipe Mount	Dish	(1) EW63	WEC	Existing
149'	1	A8	Andrew VHLP3-11W-6GA	Pipe Mount	Dish	(1) EW90	Door Co	Existing
140'	1	A7	Radiowaves 4' Dish	Pipe Mount	Dish	(1) EW63	Door Co	Existing
127'	**1**	**NLOS 01**	**Comprod 874F-70-220**	**6' Standoff**	**Dipole**	**(1) 7/8"**	**WEC**	**Proposed**
121'	1	A6	Andrew VHLP4-11W-6GA	Pipe Mount	Dish	(1) EW90	Door Co	Existing
110'	1	A5	Andrew VHLP4-6WC	Pipe Mount	Dish	(1) EW63	WEC	Existing
109'	1	A4	Comprod 874F-70-220	2' Standoff	Dipole	(1) 7/8"	Door Co	Existing
107.5'	1	A3	Comprod 874F-70-220	2' Standoff	Dipole	(1) 1/2"	WEC	Existing
95'	1	A1	Andrew PL4-107/F	Pipe Mount	Dish	(1) EW90	WEC	Existing

If the loading condition is altered from that analyzed, this report shall be deemed obsolete and further analysis will be required.

The feedline placement associated with the loading condition which was considered in this analysis is attached as Figure 1. The loading condition is further described in the Designed Appurtenance Loading table provided in Appendix A.

3.3 ANALYSIS CRITERIA

This analysis used the following structural design criteria:

Location
Door County, WI

Governing Codes/Standards
TIA-EIA Rev. G

General Structural Design Criteria

Importance/Risk Category	III
Wind Speed	90 mph (Nominal/Service Level)
Exposure Category	C
Topographic Category	1 - Flat/Rolling
Ice Thickness	0.5"
Wind Speed w/ Ice	40 mph

These criteria were selected based on the location and use of the subject tower. For this analysis, Structure Class III was selected since the tower is primarily utilized for essential communication (Public Safety/E911) purposes. The client and/or tower owner **must** review these criteria for applicability and notify Edge if a different tower structure class, topographic category, or exposure criteria are warranted.

3.4 ANALYSIS METHOD

Structural analysis computations and modeling of the tower structure were performed using TNX Tower Version 8.0 software. TNX Tower is a general-purpose modeling, analysis, and design program created specifically for communications towers using the TIA-222-H or any previous TIA/EIA Standards back to RS-222 (1959). Steel design is checked using the referenced AISC Specifications. This program automatically generates nodes and elements for a subsequent finite element analysis (FEA) for standard tower types including self-support towers, guyed towers and monopoles. It allows entry of dishes, feedlines, discrete loads (loads from appurtenances) and user defined loads anywhere on the tower. TNX Tower uses wind effects from multiple directions and ice loads to develop pressure coefficients, wind pressures, ice loads and resulting forces on the tower per TIA-222 requirements.

The tower foundation system was also reviewed for the resulting applied forces due to the described loading condition. Items reviewed include checking the global overturning and shear of the foundation system. In addition, the anchor bolts and guy anchors (where applicable) were also reviewed for structural adequacy.

3.5 ASSUMPTIONS

For the purpose of this analysis, it has been assumed that the tower and foundation have been properly installed and maintained per the manufacturer’s specifications and recommendations. Further limitations and restrictions have been provided in Section 5.

SECTION 4
RESULTS

4.1 TOWER STRUCTURE

The analysis results of the existing tower structure when considering the described loading condition indicate the tower structure **is not structurally adequate**. Refer to Section 3.5 for additional information regarding assumptions for this analysis.

The results of the analysis are shown in the following table. The ratio listed for each tower element represents the capacity ratio calculated for the controlling member(s) for each element type.

Capacity - Results		
Tower Structure Elements	**Capacity Ratio (%)**	**Comment**
Legs		
0.1'-6'	83.4%	Adequate
Diagonals		
100'-120'	75.1%	Adequate
Horizontals		
160'-180'	29.5%	Adequate
Girts		
0.1'-6'	47.8%	Adequate
Guys		
175'	**109.7%**	**Not Adequate**
118'	**113.2%**	**Not Adequate**
Top Guy Pull-Off		
175'	80.0%	Adequate
Bottom Guy Pull-Off		
175'	95.6%	Adequate
Torque Arm Top		
175'	22.3%	Adequate
Torque Arm Bottom		
175'	56.5%	Adequate
Bolts		
100' (Leg Bolt Tension)	56.0%	Adequate

Diagrams of the tower's maximum deflection, tilt, and twist are provided in Appendix A.

4.2 TOWER FOUNDATIONS

The results of the analysis indicate that the tower base foundation **is adequate**. From this analysis it was determined that the foundation meets strength requirements per the current ACI specification.

The existing guy anchors were evaluated for both sliding and uplift as per the given soil properties from the geotechnical report. The reactions in the guy anchors from the described loading condition are less than the allowable. Therefore, the anchors **are considered structurally adequate**.

Refer to Appendix A for support calculations and to Section 3.5 for additional information regarding assumptions for this analysis.

4.3 RECOMMENDATIONS

The client and tower owner shall closely review this report including assumptions made, analysis criteria selected and loading conditions modeled. Any questions or discrepancies with these items shall be clarified with the engineer.

Edge recommends that qualified personnel assess the physical condition of the tower, in accordance with the guidelines and frequency provided in the TIA-222 standard.

Structural modifications may be installed as possible means to address the structural deficiencies identified.

SECTION 5
LIMITATIONS AND RESTRICTIONS

1. This report was prepared in accordance with generally accepted structural engineering practices common to the tower industry and makes no other warranties, either expressed or implied, as to the professional advice provided under the terms of the agreement between Engineer and Client. This report has not been prepared for uses or parties other than those specifically named, or for uses or applications other than those enumerated herein. The report may contain insufficient or inaccurate information for other purposes, applications, and/or other uses.
2. This report is intended for the use of the client, and cannot be utilized or relied upon by other parties without the written consent of Edge Consulting Engineers.
3. Edge Consulting Engineers is not responsible for any, and all, tower modifications completed prior to, or hereafter, which Edge Consulting Engineers was not, or will not, be directly involved.
4. The model, conclusions, and recommendations contained within this report are based upon the supplied and attained information as described within the report and supplemented with historical information available to Edge Consulting Engineers. If it is known, or becomes known, that any item(s) are in conflict with what is described within this document, this report should be considered void and Edge Consulting Engineers should be contacted immediately.
5. Edge Consulting Engineers disclaims all liability for any information, conclusion, or recommendation that is not expressly stated or represented within this report.
6. Edge Consulting Engineers shall not be liable for any incidental, consequential, indirect, special or punitive damages arising out of any claim associated with the use of this report.
7. The scope of work performed for this analysis is limited to the items in which we were furnished complete and accurate information.
8. Accessories and appurtenances such as antenna mounts, feed line ladders, climbing ladders, lighting mounts, etc. were not analyzed as part of this work, and Edge Consulting Engineers makes no claim as to their adequacy of their design or their installation.
9. This analysis was performed under the assumption that all tower elements are in like new condition, free from rust and other deterioration. Additionally, this analysis assumes that all installed modification designs were thoroughly reviewed and approved by the respective engineer of record and they are able to carry their intended design capacity. It is also assumed the tower was properly installed per construction documents, and that the tower and all associated appurtenances were originally designed and fabricated in accordance with all applicable codes and standards. Edge Consulting Engineers cannot account for, nor be held responsible, if tower elements are deteriorated, damaged, and/or missing.
10. This tower analysis was performed based upon the antenna, feed line and other appurtenance loading and placement as described within this report. Any alterations to the described loading or placement will require re-analysis of the tower, and the findings contained in this report are not valid.
11. The loading conditions utilized for this analysis is based on information provided by the client, and readily available manufacturer/vendor information (antenna and mount projected areas, weight and shape factors). However, if the described loading criteria and design assumptions within this report are not accurate, are altered, or changed in any form, this analysis shall be considered void and an additional analysis must be performed.
12. It is the responsibility of the client and the tower owner to thoroughly review the existing and proposed loading, and bring any discrepancy to the attention of Edge Consulting Engineers.
13. Modification designs are to be based upon a rigorous or comprehensive analysis per the referenced TIA-222 standard. As such designs assume any suggested modifications are installed as recommended and are not intended to address temporary conditions on the tower as modifications are being performed. It is strongly recommended that the Installer of any tower modification thoroughly assess installation procedures and how temporary conditions present while modifications are being performed influence tower members. Installer is responsible for sequence of operation and any required temporary bracing or strengthening of tower during modification operations.
14. Site-specific loading or local building code requirements may be more stringent than the minimum loading requirements specified in the Standard. These and other unique loads or loading combination requirements are to be specified by the owner (in the procurement specifications).
15. Supplementary rime ice and in-cloud ice loadings (including thickness, density, escalation with height and corresponding wind speed) are to be included in the procurement specification when appropriate for a given site location.
16. The service loads and deformation limits specified in the Standard are the minimum requirements for communication structures. When more stringent requirements are required for a specific application, the serviceability limit state basic wind speed and, if required, the serviceability limit state design ice thickness; the deformation limitations (twist, sway and horizontal displacement) and the location/elevation where the deformation limitations apply are to be included in the procurement specification.

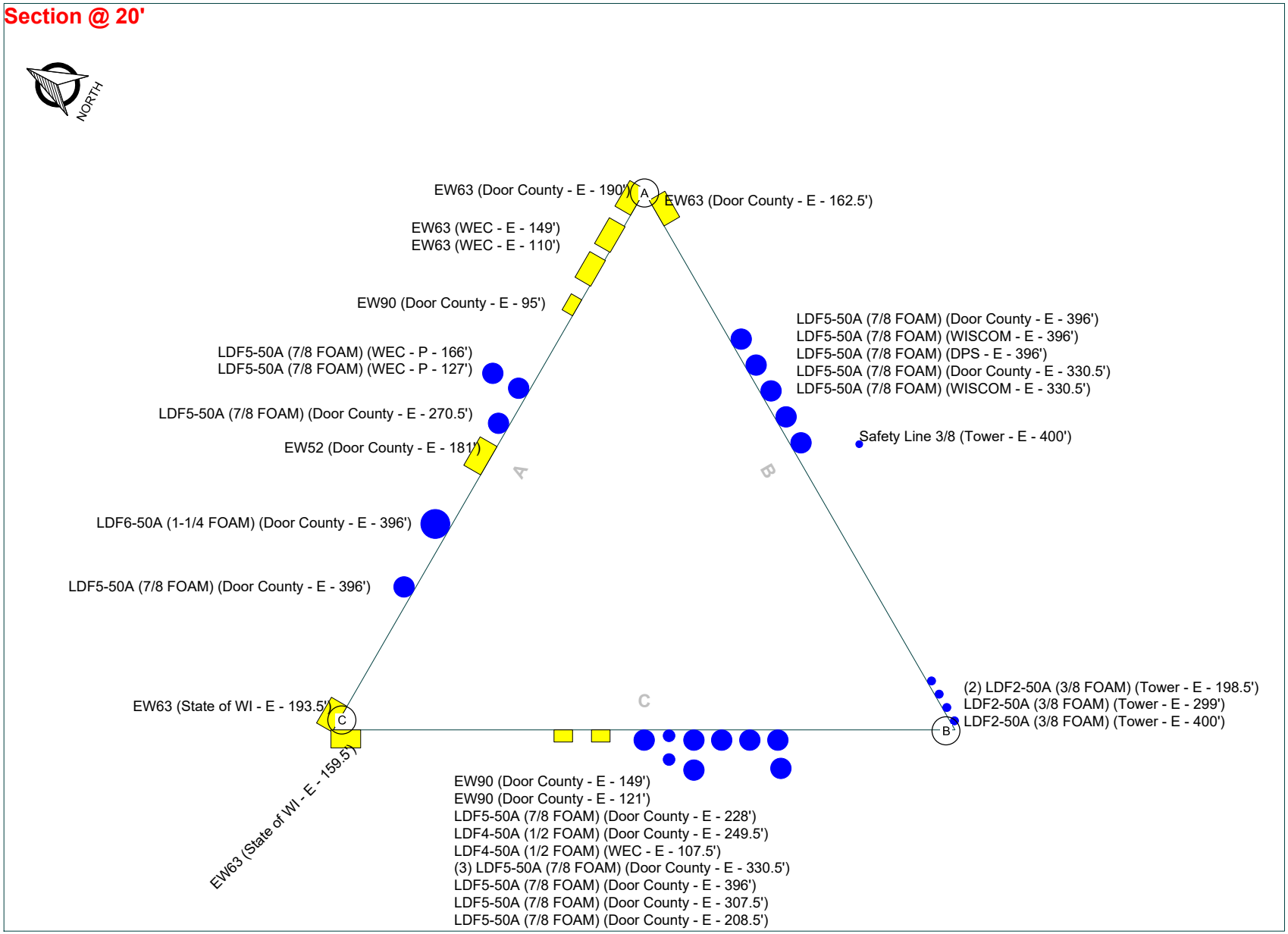
Figure 1

Feedline Placement Diagram

Feed Line Plan
20'

Round | Flat | App In Face | App Out Face

Section @ 20'



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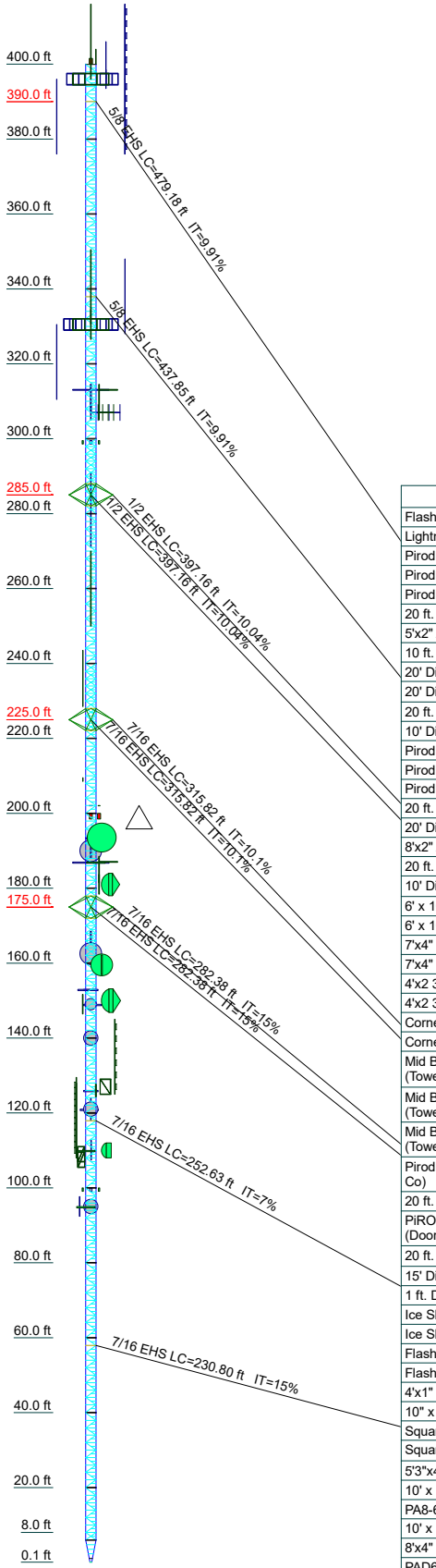
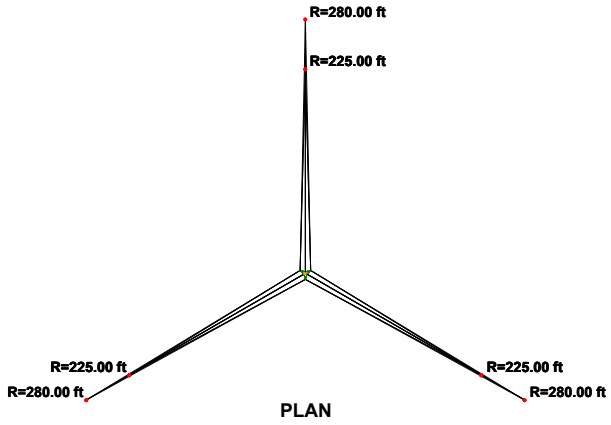
Project: ***40556***			
Client: Lockard & White	Drawn by: tclausen	App'd:	
Code: TIA-222-G	Date: 12/11/24	Scale: NTS	
Path: O:\40500\40556\Structural\2024-12-02_Tower Analysis\Tower Model\40556_Carlsville_TNX Tower_2024-12-02.eri		Dwg No. E-7	

Appendix A

Structural Calculations

Section		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
Legs		4x1/4	N.A.	SR 1 1/2	4x1/4	N.A.	SR 2	SR 1 3/4	N.A.	4x1/4	SR 2	N.A.	SR 2 1/2	N.A.	N.A.	4x1/4	N.A.	SR 2	4x1/4	N.A.	N.A.	
Leg Grade		834.2	740.5	740.5	834.2	740.5	1907.6	873.4	873.4	1907.6	1026.8	1026.8	2275.6	1026.8	1026.8	1055.4	1026.8	1026.8	1055.4	1026.8	607.9	447.2
Diagonals	A			SR 7/8	SR 1						A572-50											
Diagonal Grade	A										A36											
Top Girts	B	A									SR 3/4											
Bottom Girts	D	C	N.A.								SR 3/4											
Horizontals	E										SR 3/4											
Sec. Horizontals	A										SR 3/4											
Top Guy Pull-Offs		N.A.			4x1/4	N.A.				4x1/4	N.A.		4x1/4	N.A.		4x1/4	N.A.					
Bot Guy Pull-Offs										4x1/4	N.A.		4x1/4				N.A.					
Face Width (ft)	0.5																					
# Panels @ (ft)	F										197 @ 1.98333											2.75
Weight (lb)	22191.4																					





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION
Flash Beacon Lighting (Tower)	400
Lightning Rod 5/8x4' (Tower)	400
Pirod Candelabra Arm (1) (Door Co)	396
Pirod Candelabra Arm (1) (Door Co)	396
Pirod Candelabra Arm (1) (Door Co)	396
20 ft. Omnis (Door Co)	396
5'x2" Antenna Mount Pipe (Door Co)	396
10 ft. Omnis (Door Co)	396
20' Dipole (Edge Generic) (WISCOM)	396
20' Dipole (Edge Generic) (DSP)	396
20 ft. Omnis (Door Co)	396
10' Dipole (Edge Generic) (Door Co)	396
Pirod Candelabra Arm (1) (Door Co)	330.5
Pirod Candelabra Arm (1) (Door Co)	330.5
Pirod Candelabra Arm (1) (Door Co)	330.5
20 ft. Omnis (Door Co)	330.5
20' Dipole (Edge Generic) (WISCOM)	330.5
8'x2" Antenna Mount Pipe (Door Co)	330.5
20 ft. Omnis (Door Co)	330.5
10' Dipole (Edge Generic) (Door Co)	330.5
6' x 10' Ice Shield (Door Co)	313
6' x 10' Ice Shield (Door Co)	313
7'x4" Pipe Mount (Door Co)	313
7'x4" Pipe Mount (Door Co)	313
4'x2 3/8" Mast Pipe (Door Co)	307
4'x2 3/8" Mast Pipe (Door Co)	307
Corner Reflector (Door Co)	307
Corner Reflector (Door Co)	307
Mid Beacon (w/ Small Ice Shield) (Tower)	299
Mid Beacon (w/ Small Ice Shield) (Tower)	299
Mid Beacon (w/ Small Ice Shield) (Tower)	299
Pirod 4' Side Mount Standoff (1) (Door Co)	270.5
20 ft. Omnis (Door Co)	270.5
PiROD 6' Standard Bogner Mount (Door Co)	249.5
20 ft. Omnis (Door Co)	249.5
15' Dipole (Edge Generic) (Door Co)	228
1 ft. Dipole (Door Co)	208.5
Ice Shield (Beacon) (Tower)	202
Ice Shield (Beacon) (Tower)	202
Flash Beacon Lighting (Tower)	198.5
Flash Beacon Lighting (Tower)	198.5
4'x1" Pipe Mount (Tower)	196
10" x 13" x 5.5" Junction Box (Tower)	196
Square Tube Face Mount (60") (DSP)	193.5
Square Tube Face Mount (60") (DSP)	193.5
5'3"x4" Pipe Mount (DSP)	193.5
10' x 1-1/2" Pipe Mount (DSP)	193.5
PA8-65 w/ Radome (State of WI)	193.5
10' x 1-1/2" Pipe Mount (Door Co)	190
8'x4" Pipe Mount (Door Co)	190
PAD6-65 w/ radome (Door County)	190
10' x 1-1/2" Pipe Mount (Door Co)	187
10' x 1-1/2" Pipe Mount (Door Co)	187
7'x4" Pipe Mount (Door Co)	187
6' x 10' Ice Shield (Door Co)	187
5'3"x4" Pipe Mount (Door Co)	181

TYPE	ELEVATION
PAR6-59W-PXA w/Radome (Door County)	181
Pirod 6' Side Mount Standoff (1) (WPS)	166
20' Dipole (Edge Generic) (WPS)	166
10' x 1-1/2" Pipe Mount (Door Co)	162.5
8'x4" Pipe Mount (Door Co)	162.5
PAD6-65 w/ radome (Door County)	162.5
Square Tube Face Mount (60") (DSP)	159.5
5'3"x4" Pipe Mount (DSP)	159.5
Square Tube Face Mount (60") (DSP)	159.5
PAD6-W59B w/Radome (State of WI)	159.5
10' x 1-1/2" Pipe Mount (Door Co)	153
Ice Shield (4'x2') (Door Co)	153
PL6-59W w/ Radome (WPS)	150
Site Pro R5 Pipe Mount (Brackets Only) (Door Co)	149
Site Pro R5 Pipe Mount (Brackets Only) (WPS)	149
5'3"x4" Pipe Mount (WPS)	149
7'x4" Pipe Mount (Door Co)	149
10' x 1-1/2" Pipe Mount (Door Co)	149
VHLP3-6W-6GR w/ Shroud (Door County)	149
HP4-11 w/ Radome (Door Co)	140
Pirod 6' Side Mount Standoff (1) (WPS)	127
874F-70-220 (16.6' Dipole) (WPS)	127
Site Pro MM01 (8" Standoff) (Door Co)	126
Ice Shield (6' x 4.5') (Door Co)	126
Square Tube Face Mount (40") (Door Co)	126
6'x3 STD Mast Pipe (Door Co)	126
Site Pro R5 Pipe Mount (Brackets Only) (Door Co)	121
10' x 1-1/2" Pipe Mount (Door Co)	121
8'x4" Pipe Mount (Door Co)	121
VHLP4-11W-6WH w/Shroud (Door County)	121
Site Pro R5 Pipe Mount (Brackets Only) (WPS)	110
10' x 1-1/2" Pipe Mount (Door Co)	110
VHLP4-6W-6WH/C (WPS)	110
5'3"x4" Pipe Mount (DSP)	110
Pirod 3' Side Mount Standoff (1) (WPS)	109
20' Dipole (Edge Generic) (WPS)	109
Pirod 3' Side Mount Standoff (1) (Door Co)	107.5
20' Dipole (Edge Generic) (Door Co)	107.5
Mid Beacon (w/ Small Ice Shield) (Tower)	99.5
Mid Beacon (w/ Small Ice Shield) (Tower)	99.5
Mid Beacon (w/ Small Ice Shield) (Tower)	99.5
5'3"x4" Pipe Mount (DSP)	95
10' x 1-1/2" Pipe Mount (Door Co)	95
PL4-107/F w/Radome (WPS)	95
Site Pro R5 Pipe Mount (Brackets Only) (WPS)	95

SYMBOL LIST

MARK	SIZE	MARK	SIZE

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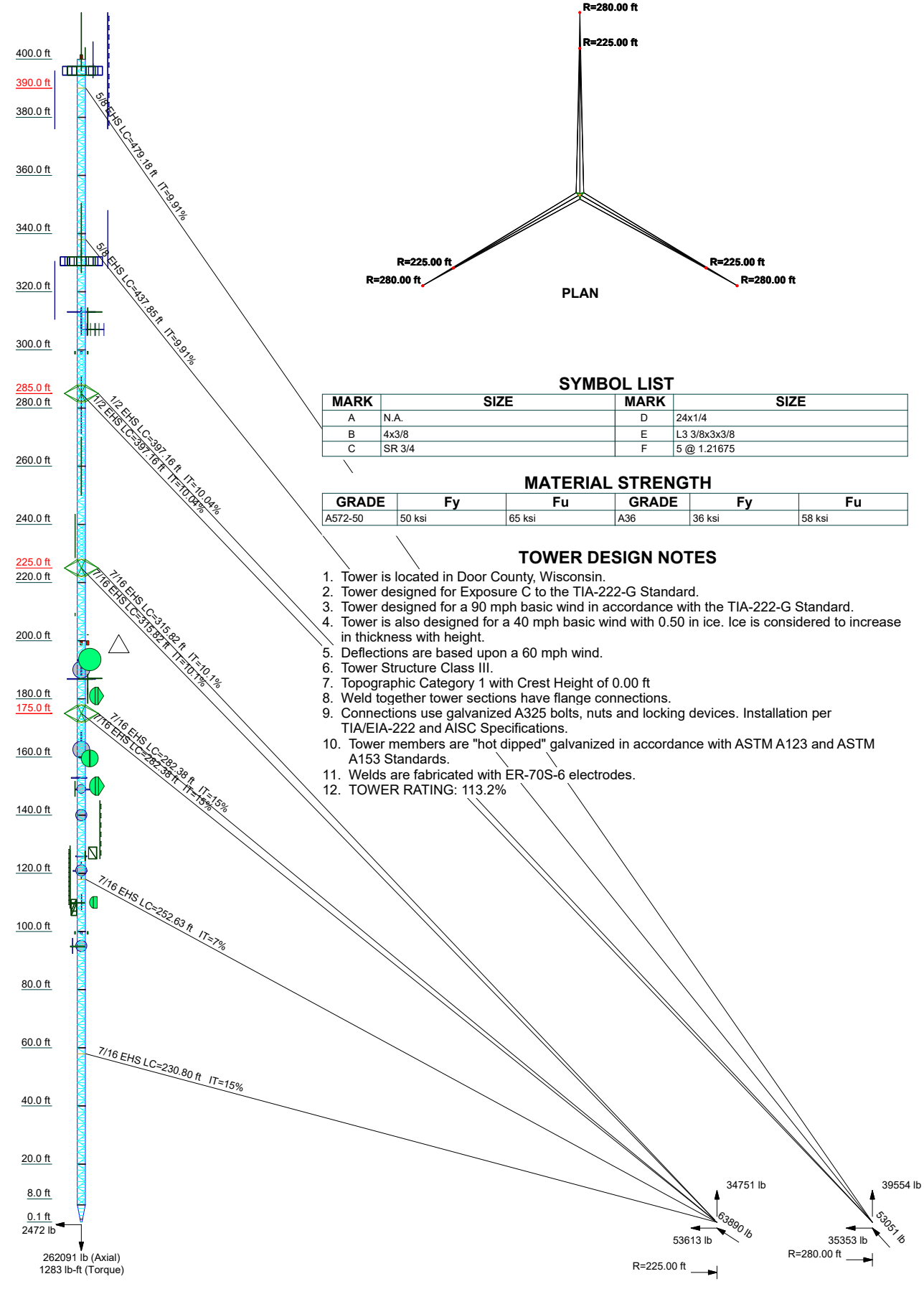
Client: Lockard & White	Drawn by: ajorenby	App'd:	
Code: TIA-222-G	Date: 12/23/24	Scale: NTS	
Path: O:\40500\40556\Structural\2024-12-02_Tower Analysis\Tower Model\40556_Carlsville_TNX Tower_2024-12-02.eri		Dwg No. E-1	

Section		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
Legs		SR 1 1/2					SR 2	SR 1 3/4			SR 2		SR 2 1/2				SR 2					
Leg Grade		A572-50																				
Diagonals	A	SR 1	SR 7/8	SR 1									SR 7/8									
Diagonal Grade	A	A36																				
Top Girts	B	A	SR 3/4																			
Bottom Girts	D	C	N.A.	SR 3/4																		
Horizontals	E	SR 3/4																				
Sec. Horizontals	A	SR 3/4																				
Top Guy Pull-Offs		N.A.	4x1/4	N.A.	4x1/4	N.A.	4x1/4	N.A.	4x1/4	4x1/4	N.A.	4x1/4	4x1/4	N.A.	4x1/4	4x1/4	N.A.	4x1/4	N.A.	4x1/4	N.A.	4x1/4
Bot Guy Pull-Offs			N.A.			N.A.	4x1/4	N.A.		4x1/4	N.A.		4x1/4									
Face Width (ft)	0.5	2.75																				
# Panels @ (ft)	F	197 @ 1.98333																				
Weight (lb)	22191.4	834.2	740.5	740.5	834.2	740.5	1907.6	873.4	873.4	1907.6	1026.8	1026.8	2275.6	1026.8	1026.8	1055.4	1026.8	1026.8	1055.4	1026.8	807.9	447.2



SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	N.A.	D	24x1/4
B	4x3/8	E	L3 3/8x3x3/8
C	SR 3/4	F	5 @ 1.21675

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower is located in Door County, Wisconsin.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 90 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40 mph basic wind with 0.50 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class III.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. Weld together tower sections have flange connections.
9. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
10. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
11. Welds are fabricated with ER-70S-6 electrodes.
12. TOWER RATING: 113.2%

ALL REACTIONS ARE FACTORED

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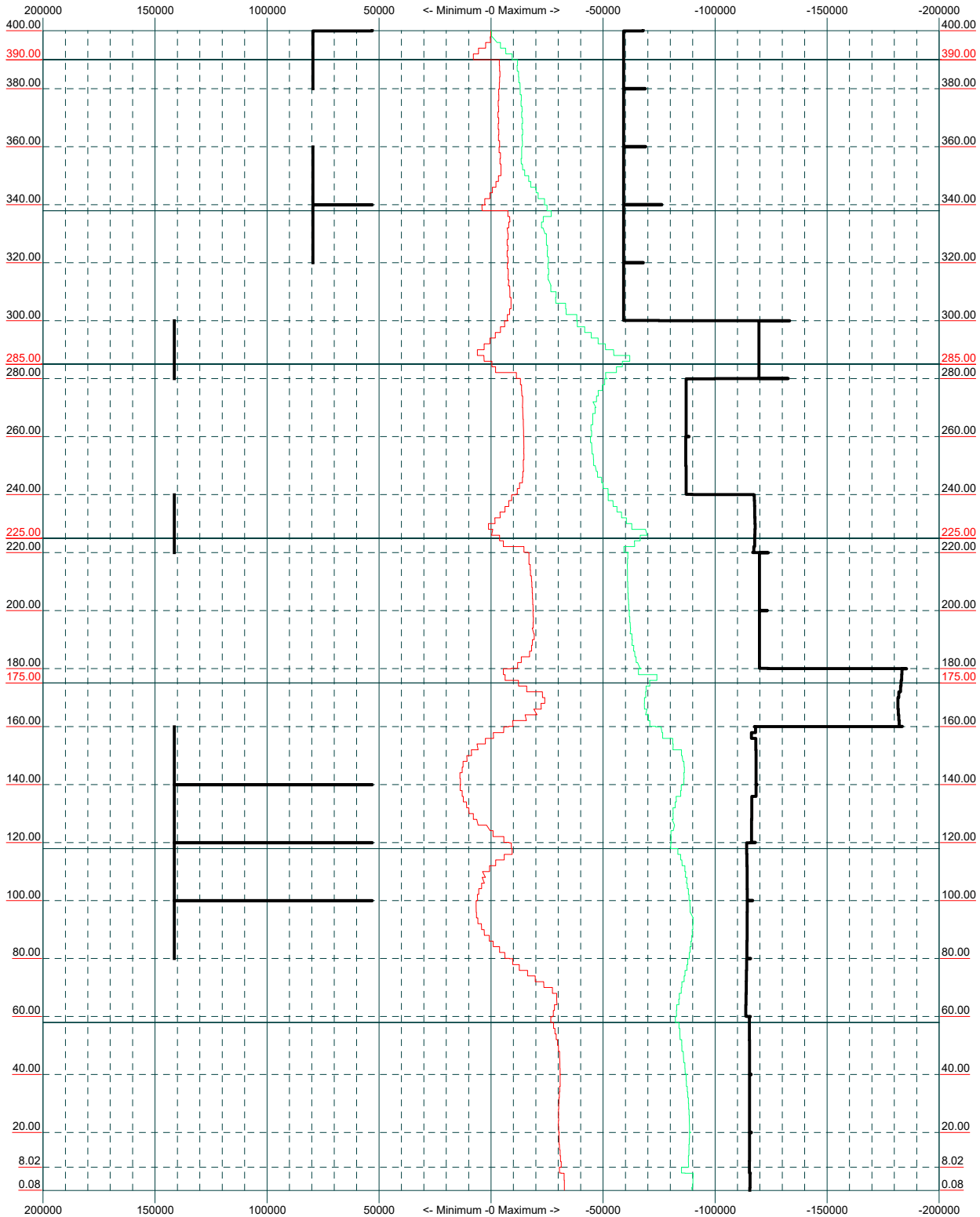
Code: TIA-222-G	Date: 12/23/24	Scale: NTS	
Path: O:\40500\40556\Structural\2024-12-02_Tower Analysis\Tower Model\40556_Carlsville_TNX Tower_2024-12-02.eri		Dwg No. E-1	

TIA-222-G - 90 mph/40 mph 0.5000 in Ice Exposure C

Leg Capacity ——— **Leg Compression (lb)**



Elevation (ft)

SA-3

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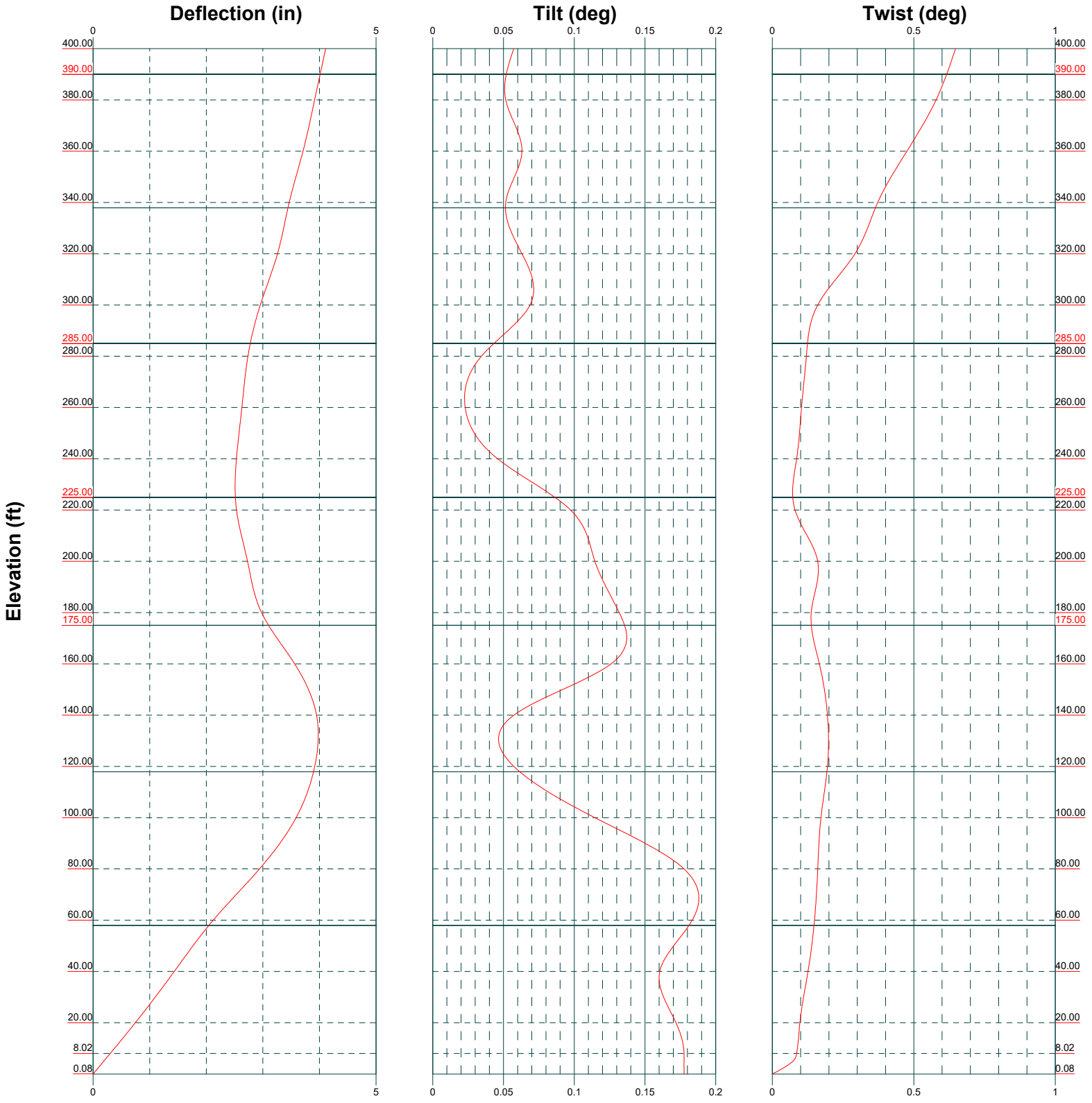
Code: TIA-222-G	Date: 12/23/24	Scale: NTS	
Path: O:\40500\40556\Structural\2024-12-02_Tower Analysis\Tower Model\40556_Carlsville_TNX Tower_2024-12-02.eri		Dwg No. E-3	

TIA-222-G - Service - 60 mph

Maximum Values



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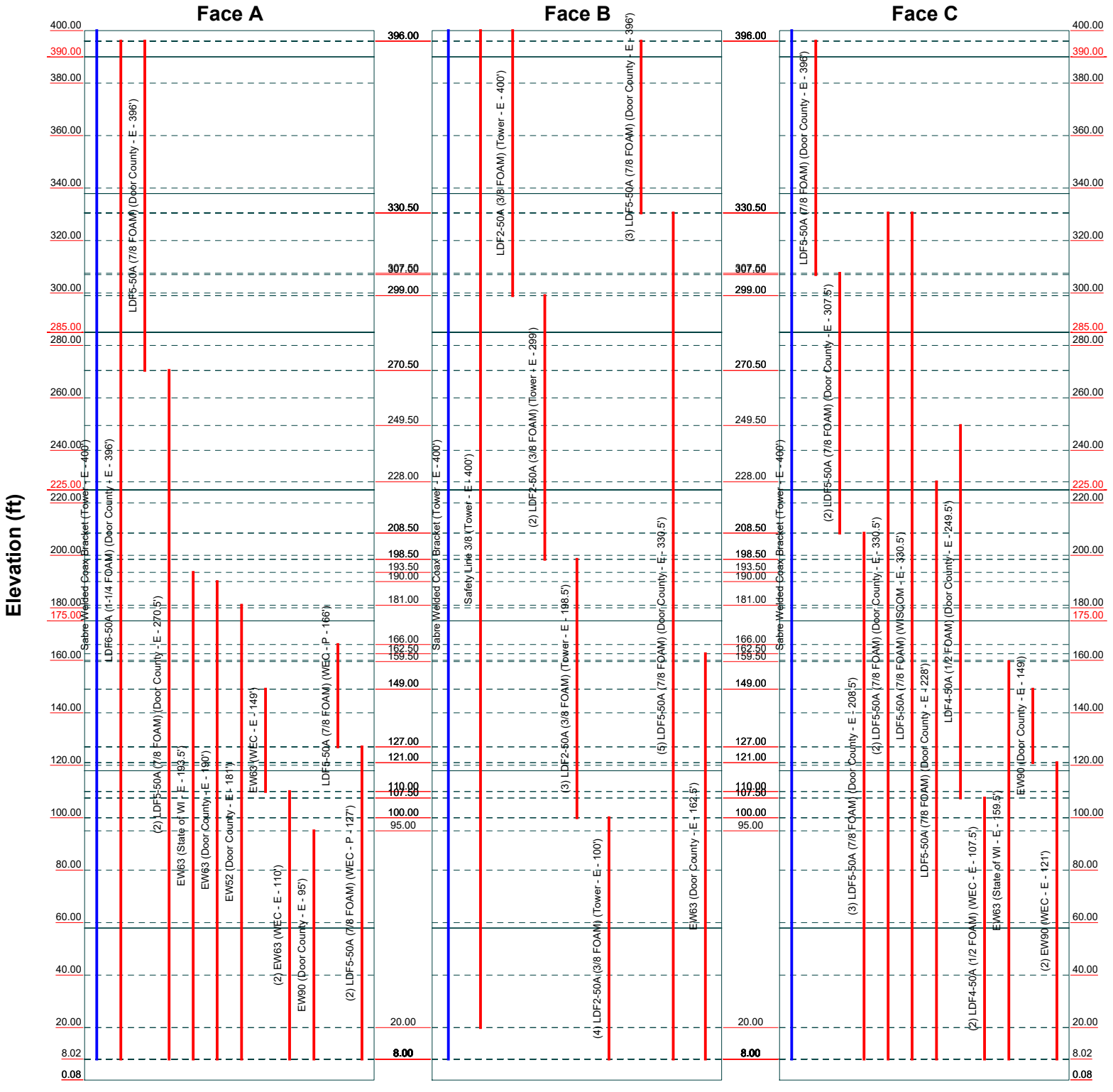
Job: ***Carlsville***		
Project: ***40556***		
Client: Lockard & White	Drawn by: ajorenby	App'd:
Code: TIA-222-G	Date: 12/23/24	Scale: NTS
Path: O:\40500\40556\Structural\2024-12-02_Tower Analysis\Tower Model\40556_Carlsville_TNX Tower_2024-12-02.eri		Dwg No. E-5

Feed Line Distribution Chart
31/32" - 400'

Round | Flat | App In Face | App Out Face | Truss Leg



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Path: O:\40500\40556\Structural\2024-12-02_Tower Analysis\Tower Model\40556_Carlsville_TNX Tower_2024-12-02.eri		Dwg No. E-7	

Foundation Analysis

Project Name - DOT Carlsville
Egg Harbor, Wisconsin
Edge #40556

Edge Consulting Engineers, Inc.

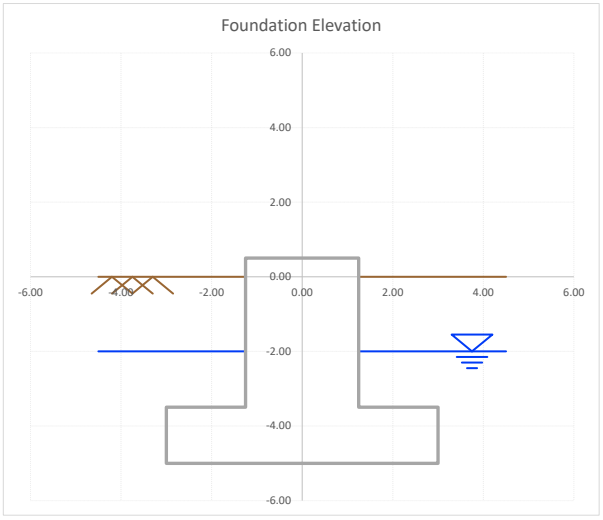
Completed By: TAC
Checked By: KTS

General Information:

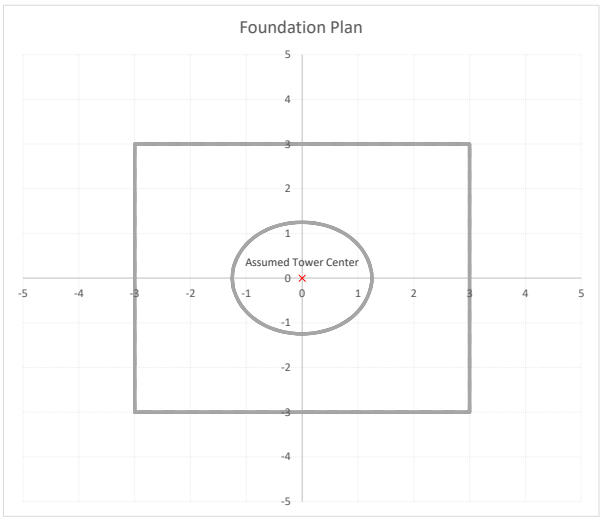
Design Code: ACI 318-14
Footing Type: Spread Footing
Column Type: Pedestal

Geometry:

Existing Foundation		
Foundation Depth =	5.00	ft
Slab Length (Z) =	6.00	ft
Slab Width (X) =	6.00	ft
Slab Thickness =	18.00	in
Pier Height =	4.00	ft
Pier Shape =	Circle	
Pier Diameter =	2.50	ft



Note: Vertical Axis is Y Axis and Horizontal Axis is Z Axis



Note: "Vertical" Axis is X Axis and "Horizontal" Axis is Z Axis

Materials:

Existing Foundation			
Concrete Strength (f'_c) =	3000	psi	
Concrete Unit Weight (w_c) =	150	pcf	--> Normal Weight
Concrete Elasticity Modulus (E_c) =	3320.6	ksi	
Steel Elasticity Modulus (E_s) =	29000	ksi	
Pad, Steel Yield Stress (f_y) =	60	ksi	
Pier Vert. Bars, Steel Yield Stress (f_y) =	60	ksi	
Pier Ties, Steel Yield Stress (f_y) =	60	ksi	

Soil Parameters:

Unit Weight of Soil (γ_{soil}) =	100	pcf
Submerged soil unit weight ($\gamma_{sub,soil}$) =	67.5	pcf
Coefficient of Friction Against Sliding =	0.25	Assumed
Depth to Water Table =	2	ft

Foundation Analysis

Project Name - DOT Carlsville
Egg Harbor, Wisconsin
Edge #40556

Edge Consulting Engineers, Inc.

Completed By: TAC
Checked By: KTS

Reinforcement Details:

Existing Footing Reinforcement

Clear Cover:	3	in
Bottom Reinf.Parallel to X Axis:	#6 @ 7.25"	
Bottom Reinf.Parallel to Z Axis:	#6 @ 7.25"	

Existing Pedestal Reinforcement

Clear Cover:	3	in
Vertical Reinforcement:	(10) #8 Bars	
Provided Area:	7.90	in^2
Transverse Reinforcement:	(9) #3 Ties	
Legs Parallel to X Axis:	2	
Legs Parallel to Z Axis:	2	

Loading Conditions to be Included in Design:

Service Load Combinations:

S1..... 1.0 D + 1.0 G
S2..... 1.0 D + 1.0 G + 0.7 I
S3..... 1.0 D + 1.0 G + 1.0 Wo_x
S4..... 1.0 D + 1.0 G + 1.0 Wo_z
S5..... 1.0 D + 1.0 G + 0.7 I + 0.7 Wi_x
S6..... 1.0 D + 1.0 G + 0.7 I + 0.7 Wi_z
S7..... 0.6 D + 0.6 G + 1.0 Wo_x
S8..... 0.6 D + 0.6 G + 1.0 Wo_z
S9..... 0.6 D + 0.6 G + 0.7 I + 0.7 Wi_x
S10..... 0.6 D + 0.6 G + 0.7 I + 0.7 Wi_z

Design Load Combinations:

D1..... 1.2 D + 1.0 G + 1.6 Wo_x
D2..... 1.2 D + 1.0 G + 1.6 Wo_z
D3..... 1.2 D + 1.0 G + 1.0 I + 1.0 Wi_x
D4..... 1.2 D + 1.0 G + 1.0 I + 1.0 Wi_z
D5..... 1.2 D + 1.0 G

Applied Loads:

Condition	Axial (kip)	Mxx (kip*ft)	Mzz (kip*ft)	Vx (kip)	Vz (kip)
Dead Load (DL)	40.78	0	0	0	0
Ice Load (IL)	153.62	0	0	0	0
Guy Load (G)	55.21	0	0	0	0
Wind w/out Ice (X-Dir.)	44.19	0	0	1.55	0
Wind w/out Ice (Z-Dir.)	44.19	0	0	0	1.55
Wind with Ice (X-Dir.)	4.32	0	0	0.96	0
Wind with Ice (Z-Dir.)	4.32	0	0	0	0.96

Foundation Analysis

Project Name - DOT Carlsville
Egg Harbor, Wisconsin
Edge #40556

Edge Consulting Engineers, Inc.

Completed By: TAC
Checked By: KTS

Results:

Soil Bearing:

Eccentricity in Z Direction=	0.0176	ft
Kern for Z Direction =	1	ft
Maximum Net Bearing Pressure =	5,949	psf
ASD Allowable, Net Bearing Capacity =	8,000	psf
DCR =	74.36%	✓

Foundation Sliding Check:

In Z Direction				In X Direction			
Controlling Load Combination:	S8			Controlling Load Combination:	S7		
Force Resisting Sliding =	27.78	kip		Force Resisting Sliding =	27.78	kip	
Sliding Force =	1.55	kip		Sliding Force =	1.55	kip	
Factor of Safety =	17.92	> 1.50	✓	Factor of Safety =	17.92	> 1.50	✓

Foundation Overturning Check:

About X-X Axis				About Z-Z Axis			
Controlling Load Combination:	S8			Controlling Load Combination:	S7		
Restoring Moment =	344.82	kip-ft		Restoring Moment =	344.82	kip-ft	
Overturning Moment =	8.53	kip-ft		Overturning Moment =	8.53	kip-ft	
Factor of Safety =	40.45	> 1.50	✓	Factor of Safety =	40.45	> 1.50	✓

Footing Flexure Checks:

Reduction Factor: 0.90

Direction	Controlling Load Combination	Location	Flexural Demand (M_u, kip)	Flexural Capacity (φM_n, kip)	DCR $M_u / \varphi M_n$	Check	
Bending About X Axis	D3	Pier Face	68.35	260.49	26.2%		✓
Bending About Z Axis	D3	Pier Face	68.35	260.49	26.2%		✓

Shear Checks (One-Way Shear):

Reduction Factor:	0.75	
Shear Area:	999	in^2

Direction	Controlling Load Combination	Location	Shear Demand (V_u, kip)	Shear Capacity (φV_c, kip)	DCR $V_u / \varphi V_c$	Check	
Bending About X Axis	D3	Critical Section	26.55	82.08	32.4%		✓
Bending About Z Axis	D3	Critical Section	26.55	82.08	32.4%		✓

Punching Shear Checks (Two-Way Shear):

Reduction Factor: 0.75

Controlling Load Combination	Location	Perimeter at Critical Section (b_o, in)	Punching Shear Area (A_{cr}, in^2)	Shear Demand (V_u, kip)	Shear Capacity (φV_c, kip)	DCR $V_u / \varphi V_c$	Check	
D3	Existing Pier	139.02	1,981	185.38	325.51	57.0%		✓

Guy Anchor Calculations

Project Name - DOT Carlsville
Egg Harbor, Wisconsin
Edge #40556

Edge Consulting Engineers, Inc.

Completed By: TAC
Checked By: KTS

Guy Anchor Reactions (225 ft. Radius):

Uplift (U) =	34.75	kip	*Per TNX Tower Output
Shear (V) =	53.62	kip	

Soil Properties:

Soil Unit Weight (γ_{Soil}) =	130	lb/ft^3
Effective Soil Unit Weight ($\gamma`_{soil}$) =	67.5	lb/ft^3
Depth to Water Table (d_{water}) =	0	ft
Soil Friction Angle (Φ_{soil}) =	0	°
Ultimate Passive Earth Pressure (σ_p) =	236	psf/ft of soil depth
Ultimate Skin Friction (σ_s) =	259.2	psf
Horizontal Plane Friction Coefficient (μ_h) =	0.00	
Vertical Plane Friction Coefficient (μ_v) =	0.00	
phi factor (Φ) =	0.75	

Guy Anchor Geometry:

Depth to Bottom of Guy Anchor (h) =	8.00	ft
Guy Anchor Depth (d) =	2.50	ft
Guy Anchor Width (b) =	3.50	ft
Guy Anchor Length (L) =	21.00	ft
Guy Anchor Toe Height (t) =	0.00	ft

Calculated Geometry

$$w = \tan(\phi_{soil}) \cdot l$$

Soil Wedge Height Above Anchor (l_{min}) =	5.50	ft	Soil Wedge Width Above Anchor (w_{min}) =	0.00	ft
Soil Wedge Height From Bottom (l_{max}) =	8.00	ft	Soil Wedge Width From Bottom (w_{max}) =	0.00	ft
Wet Soil Wedge Height Above Anchor (l_w) =	5.50	ft	Wet Soil Wedge Width Above Anchor (w_w) =	0.00	ft
Wet Soil Wedge Height From Bottom ($l_{m,w}$) =	8.00	ft	Wet Soil Wedge Width From Bottom ($w_{m,w}$) =	0.00	ft

Guy Anchor Forces:

$$W_{concrete} = d \cdot b \cdot L \cdot (\gamma_c = 150pcf)$$

Effective Weight of Concrete Block ($W_{concrete}$) =	16.1	kips	*If below water table, reduced by the weight of water
Effective Weight of Soil in Block (W_{block}) =	12.4	kips	*Weight of Anchor Block if it was soil for later calc.

$$W_i = \frac{1}{3} \cdot l_i \cdot \left(b \cdot L + \sqrt{b \cdot L \cdot (b + 2w_i) \cdot (L + 2w_i)} + (b + 2w_i) \cdot (L + 2w_i) \right) \cdot \frac{\gamma_i}{1000}$$

Dry Weight of Soil Above Anchor (W_{min}) =	52.6	kips
Dry Weight of Soil From Bottom (W_{max}) =	76.4	kips
Buoyed Weight of Soil Above Anchor (W_w) =	25.3	kips
Buoyed Weight of Soil From Bottom ($W_{m,w}$) =	36.8	kips

$$W_{top} = W_{min} - W_w \qquad W_{add} = W_{max} - W_{m,w} - W_{top} - W_{block}$$

Net Weight of Soil Above Anchor (W_{top}) =	27.3	kips	
Max Weight Increase to Bottom (W_{add}) =	0.0	kips	*Can't be less than zero

$$V_{toe} = 0.6 \cdot \frac{4}{3} \cdot \sqrt{f_c'} \cdot 2 \cdot (b + L) \cdot (t - 2in)$$

Concrete Toe Capacity (V_{toe}) =	0.0	kips	*Can't be less than zero

$$W_{soil} = W_{top} + \min(W_{add}, V_{toe})$$

Effective Weight of Soil on Anchor (W_{soil}) =	27.3	kips

$$W_{dir} = (b \cdot L) \cdot \left((l_{min} - l_w) \cdot \gamma_{soil} + l_w \cdot \gamma'_{soil} \right)$$

Weight Directly on Block (W_{dir}) =	27.3	kips

$$N_{comp} = W_{Concrete} + W_{dir} - \mathrm{U}$$

Net Compression Force (N_{comp}) =	8.6	kips	*Can't be less than zero

$$F_{sf} = d \cdot (2 \cdot b + L) \cdot \sigma_s$$

Skin Friction on Block (F_{sf}) =	18.1	kips

$$R_{soil} = \frac{1}{2} \left(\sigma_{p,top} + \sigma_{p,bottom} \right) \cdot d \cdot L$$

Passive Soil Pressure at Top of Block ($\sigma_{p,top}$) =	1299	psf
Passive Soil Pressure at Bottom of Block ($\sigma_{p,bottom}$) =	1890	psf
Soil Resistance (R_{Soil}) =	83.7	kips

Guy Anchor Uplift Case:

$$\phi U = \phi(\mu_v \cdot \max(V - \mu_h \cdot N_{comp}, 0) + W_{concrete} + \max(W_{soil}, W_{dir} + F_{sf})$$

Uplift Resistance (ΦU) =	46.1	kips	
Unity =	0.75		**OK**

Guy Anchor Slippage Case:

$$\phi V = \phi(R_{soil} + \mu_h \cdot N_{comp})$$

Shear Resistance (ΦV) =	62.8	kips	
Unity =	0.85		**OK**

Guy Anchor Calculations

Project Name - DOT Carlsville
Egg Harbor, Wisconsin
Edge #40556

Edge Consulting Engineers, Inc.

Completed By: TAC
Checked By: KTS

Guy Anchor Reactions (280 ft. Radius):

Uplift (U) =	39.55	kip	*Per TNX Tower Output
Shear (V) =	35.35	kip	

Soil Properties:

Soil Unit Weight (γ_{Soil}) =	130	lb/ft^3
Effective Soil Unit Weight ($\gamma`_{soil}$) =	68	lb/ft^3
Depth to Water Table (d_{water}) =	0	ft
Soil Friction Angle (Φ_{soil}) =	0	°
Ultimate Passive Earth Pressure (σ_p) =	236	psf/ft of soil depth
Ultimate Skin Friction (σ_s) =	323.8	psf
Horizontal Plane Friction Coefficient (μ_h) =	0	
Vertical Plane Friction Coefficient (μ_v) =	0.00	
phi factor (Φ) =	0.75	

Guy Anchor Geometry:

Depth to Bottom of Guy Anchor (h) =	10.00	ft
Guy Anchor Depth (d) =	2.50	ft
Guy Anchor Width (b) =	4.00	ft
Guy Anchor Length (L) =	24.00	ft
Guy Anchor Toe Height (t) =	0.00	ft

Calculated Geometry

$$w = \tan(\phi_{soil}) \cdot l$$

Soil Wedge Height Above Anchor (l_{min}) =	7.50	ft	Soil Wedge Width Above Anchor (w_{min}) =	0.00	ft
Soil Wedge Height From Bottom (l_{max}) =	10.00	ft	Soil Wedge Width From Bottom (w_{max}) =	0.00	ft
Wet Soil Wedge Height Above Anchor (l_w) =	7.50	ft	Wet Soil Wedge Width Above Anchor (w_w) =	0.00	ft
Wet Soil Wedge Height From Bottom ($l_{m,w}$) =	10.00	ft	Wet Soil Wedge Width From Bottom ($w_{m,w}$) =	0.00	ft

Guy Anchor Forces:

$$W_{concrete} = d \cdot b \cdot L \cdot (\gamma_c = 150pcf)$$

Effective Weight of Concrete Block ($W_{concrete}$) =	21.0	kips	*If below water table, reduced by the weight of water
Effective Weight of Soil in Block (W_{block}) =	16.2	kips	*Weight of Anchor Block if it was soil for later calc.

$$W_i = \frac{1}{3} \cdot l_i \cdot \left(b \cdot L + \sqrt{b \cdot L \cdot (b + 2w_i) \cdot (L + 2w_i)} + (b + 2w_i) \cdot (L + 2w_i) \right) \cdot \frac{\gamma_i}{1000}$$

Dry Weight of Soil Above Anchor (W_{min}) =	93.6	kips
Dry Weight of Soil From Bottom (W_{max}) =	124.8	kips
Buoyed Weight of Soil Above Anchor (W_w) =	45.0	kips
Buoyed Weight of Soil From Bottom ($W_{m,w}$) =	60.0	kips

$$W_{top} = W_{min} - W_w \qquad W_{add} = W_{max} - W_{m,w} - W_{top} - W_{block}$$

Net Weight of Soil Above Anchor (W_{top}) =	48.6	kips	
Max Weight Increase to Bottom (W_{add}) =	0.0	kips	*Can't be less than zero

$$V_{toe} = 0.6 \cdot \frac{4}{3} \cdot \sqrt{f_c'} \cdot 2 \cdot (b + L) \cdot (t - 2in)$$

Concrete Toe Capacity (V_{toe}) =	0.0	kips	*Can't be less than zero

$$W_{soil} = W_{top} + \min(W_{add}, V_{toe})$$

Effective Weight of Soil on Anchor (W_{soil}) =	48.6	kips

$$W_{dir} = (b \cdot L) \cdot \left((l_{min} - l_w) \cdot \gamma_{soil} + l_w \cdot \gamma'_{soil} \right)$$

Weight Directly on Block (W_{dir}) =	48.6	kips

$$N_{comp} = W_{Concrete} + W_{dir} - \mathrm{U}$$

Net Compression Force (N_{comp}) =	30.1	kips	*Can't be less than zero

$$F_{sf} = d \cdot (2 \cdot b + L) \cdot \sigma_s$$

Skin Friction on Block (F_{sf}) =	25.9	kips

$$R_{soil} = \frac{1}{2} \left(\sigma_{p,top} + \sigma_{p,bottom} \right) \cdot d \cdot L$$

Passive Soil Pressure at Top of Block ($\sigma_{p,top}$) =	1772	psf
Passive Soil Pressure at Bottom of Block ($\sigma_{p,bottom}$) =	2363	psf
Soil Resistance (R_{Soil}) =	124.0	kips

Guy Anchor Uplift Case:

$$\phi U = \phi(\mu_v \cdot \max(V - \mu_h \cdot N_{comp}, 0) + W_{concrete} + \max(W_{soil}, W_{dir} + F_{sf})$$

Uplift Resistance (ΦU) =	71.6	kips	
Unity =	0.55		**OK**

Guy Anchor Slippage Case:

$$\phi V = \phi(R_{soil} + \mu_h \cdot N_{comp})$$

Shear Resistance (ΦV) =	93.0	kips	
Unity =	0.38		**OK**

Guy Wire Tensions

Project Name - DOT Carlsville
Egg Harbor, Wisconsin
Edge #40556

Edge
Consulting Engineers, Inc.

Completed By: TAC
Checked By: KTS

Guy Wire Tensions

The given tension values are for the A anchor*. The tensions should be maintained as close as possible for these guys, while the remaining guys are used to plumb the tower. Check tension in all guy wires and adjust as appropriate.

*For tower orientation refer to Figure 1: Feedline Placement Diagram.

Guy Elevation (ft)	Anchor Location	Approx. Radius (ft)	Approx. Elev Change (ft)	Guy Size	Tension at Temperature of Tensioning, lbs.						
					0°F	20°F	40°F	60°F	80°F	100°F	120°F
390.0	A	280	390	5/8 EHS	4739	4556	4377	4202	4031	3865	3703
337.9	A	280	338	5/8 EHS	4847	4627	4412	4202	3998	3801	3612
285.0	A	280	285	1/2 EHS	3199	3028	2862	2701	2545	2395	2253
225.0	A	225	225	7/16 EHS	2517	2376	2237	2101	1968	1840	1717
175.0	A	225	175	7/16 EHS	3682	3493	3306	3120	2936	2753	2573
117.9	A	225	118	7/16 EHS	2022	1819	1630	1456	1301	1165	1044
57.9	A	225	58	7/16 EHS	3977	3689	3403	3120	2841	2567	2300

2024 DOOR COUNTY PUBLIC SAFETY RADIO SYSTEM MAINTENANCE REPORT

REVISION (-)

Antenna Letter	Antenna Use	Base Level	Orientation	Frame/Leg	Manufacturer	Model Number	Frequency Range (MHz)	Gain	Beam	Transmission Line	Color Band	Note
A	Spare	410'	Up	A	Decibel	DB-616AB	150-164	5.5 dB	Omni	LDF5-50 (7/8')	White-Yellow	
B												Removed from 2023 Report
D	PT2PT/VLAW	250'	Up	B	Celwave	PD220-3A	150-158	5.25 dBd	Omni	LDF4-50 (1/2')	White-Blue	
E												Removed from 2023 Report
F												Removed from 2023 Report
G	UHF Med	410'	Up	C	Decibel	DB640-C	450-482	10 dB	Omni	LDF6-50 (1 1/4")	Blue	
H	Master RX	410'	Up	Top T-Frame	DB Spectra	DS1F03F36U-N	150-164	3 dBd	Omni	AVA5-50 (7/8")	White-White	
J1	Master TX #1	330'	Down	T-Frame	DB Spectra	DS1F03F36D-N	150-164	3 dBd	Omni	AVA5-50 (7/8")	Violet-Violet	
J2	Master TX #2	330'	Down	T-Frame	DB Spectra	DS1F03F36D-N	150-164	3 dBd	Omni	AVA5-50 (7/8")	Violet-Yellow	
K	Highway	270'	Up	A	Commander	220-3BN	151-159	5.25 dBd	Omni	LDF5-50 (7/8')	Red-White	
LC1	Amateur	230'	Up	C	Sinclair	SRL-310C2/210C2	138-174 / 406-512	2 dBd	Omni	LDF5-50 (7/8')	Orange-Brown	
M	Spare	310'	Up	Corner	Comprod	470-70	138-174	7 dBd	22° / 202°	LDF5-50 (7/8')	N/A	
N	Sunnyslope - Justice Center 6 GHz Microwave	178'	Up	A	Commscope	PAR6-59	5925-6425	38.2 dB	206.56°	EW52	Blue-Blue	
O1	Sunnyslope - Ellison Bay 6 GHz Microwave	196'	Up	B	RFS	PAD6-59	5925-6425	38.9 dB	27.39°	EW52	Red	
O2	Sunnyslope - Ellison Bay 6 GHz Microwave	166'	Up	B	RFS	PAD6-59	5925-6425	38.9 dB	27.39°	EW52	Orange-Green	
P	Sunnyslope-Baileys Harbor 11 GHz Microwave	115'	Up	B	Commscope	VHLP4-11W	10700-11100	40.8 dBi	50.29°	EW90	Red-Red	
Q	Sunnyslope - Jacksonport 11 GHz Microwave	120'	Up	C	Commscope	VHLP3-11W	10700-11100	38.5 dBi	100.84°	EW90	Red-Yellow	
R	APRS Packet Radio	400'	Down	SW Leg	N/A	N/A	146-165	N/A	Omni	LDF4-50 (1/2")	Orange	
S	ARES/RACES	205'	Up	NW Leg	Telewave	N/A	138-174	N/A	Omni	LDF5-50 (7/8')	Brown	
T	Emergency Mangement Temporary Use	330'	Down	SW	Telewave	N/A	146-165	N/A	Omni	LDF5-50 (7/8')	Orange-Orange	
U	Test Antenna									LDF5-50 (7/8')	Yellow	

SUNNYSLOPE ANTENNAS				
	SIZE	FSCM NO	DWG NO	REV
DRAWN JASON BAUDHUIN		90507	DCMAINT-2024-1	-
ISSUED 11.26.24	SCALE NONE		SHEET 14 OF 20	