

W-T COMMUNICATION DESIGN GROUP, LLC

2675 PRATUM AVENUE, HOFFMAN ESTATES, ILLINOIS 60192
(224) 293-6333 FAX (224) 293-6444

STRUCTURAL ANALYSIS REPORT FOR A 200' SELF SUPPORTING TOWER

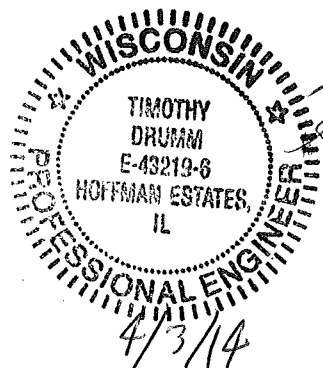
DATE: 4/03/2014

SITE NAME: VIEBAHN

ADDRESS: 3110 VIEBAHN ST, MANITOWOC, WI

WT JOB NUMBER: T141739

The calculations included herein, as listed above, were prepared by me, or under my direct supervision, and, to the best of my knowledge; comply with the requirements of all applicable codes and ordinances.



Timothy Drumm, P.E.
Wisconsin License No. E-43219-6
Expires: 7/31/2014

Site Info

Site Name	VIEBAHN
Site Address	3110 Viebahn St, Manitowoc, WI

Steel Strength (ksi)

Leg	A572-50
Diagonal	A36
Bolts	A325N

Design Parameters

Design Code	TIA/EIA-222-G
Location (County, State)	Manitowoc, WI
Basic Wind Speed (mph)	90 mph w/o ice
Wind speed w/ Ice (mph)	40 mph w/ 0.75" ice
Structure Classification	III
Exposure Category	C
Topographic Category	1

References

Tower Type	Self Supporting Tower
Tower Height	200'
Tower Designer	N/A
Tower Design Job #	N/A
Foundation Design	N/A
Geotechnical Report	N/A
Tower Mapping	W-T Communication Design Group, LLC
Foundation Mapping	N/A

Notes

-Tower Mapping was conducted in 3/17/09.
-Bolts were not part of this analysis as this information was not provided.

Proposed Loading

Carrier	Appurtenance Manufacturer & Model	Qty.	C.L.	Mount Type	Coax*
City of Manitowoc	Yagi Antenna	2	70	6' Standoff Mount	(2) 7/8"
City of Manitowoc	4' Dish	2	185	Leg Mount + Ice Shield	(2) EW63

*Note: Except for FAA lighting, removal of all other mounts and cables is required.

Analysis Criteria

Our structural analysis of this tower was completed using the tnxTower 6.0 software program to create a three-dimensional, non-linear model of the tower which takes into account second order geometric effects due to displacements and calculates stresses for various load combinations. Tower information was derived from 'W-T Communication Design Group' previous analysis report dated 04/30/2009, and loading information was provided by the City of Manitowoc.



Results

The self supporting tower has the capacity to support the proposed loading as per the minimum code requirements. The following table shows a summary of the member usages:

Component Type	Percent Usage (%)	Pass/Fail
Leg (20'-0' elevation)	102.8	Pass
Diagonal (100'-80' elevation)	64.6	Pass

We compared the base reactions with the original tower foundation reactions.

Reaction	Original Reactions	Revised Reactions
Leg Compression	114	96
Leg Uplift	Not Known	80
Leg Shear	15	12

We were not provided with the existing foundation design and soils report so we cannot accurately determine its capacity. The ROHN catalog lists base reactions for SSV type towers per previous structural analysis report completed in 2009. Those reactions are compared here. The foundation has been probably designed for additional safety factors on these loads. However without any documentation on the foundation or a foundation investigation the foundation capacity is undetermined.

Overall Rating

The maximum overall structure rating is 102.8%

Conclusion

The analysis of the existing self supporting tower indicates that it is **structurally adequate** and in compliance with the code requirements indicated above.

If you have any questions or concerns regarding this analysis, please give us a call.

Sincerely,

W-T Communication Design Group, LLC.

Juanita Loayza-Ramos, E.I.T.
Structural Designer



**W-T COMMUNICATION
DESIGN GROUP, LLC**
WIRELESS INFRASTRUCTURE

Standard Conditions and Assumptions

This analysis is based on the theoretical capacity of the members and is not a condition assessment of the tower. The analysis is based solely on the information supplied, and the results, in turn, are only as accurate as data extracted from this information. We were provided with the tower and loading information and assume the information supplied is accurate. W-T Communication Design Group, LLC has made no independent determination of its accuracy. The following assumptions were made for this structural analysis:

1. No allowance was made for any damaged, missing, or rusted members. The existing tower is assumed to have been properly maintained in accordance with the TIA/EIA Standard and/or its original manufacturer's recommendations. The existing tower is assumed to be in good condition with no structural defects and with no deterioration to its member capacities. The tower member sizes and geometry are considered accurate as supplied. The material grade is as per data supplied and/or as assumed and stated in the materials section.
2. The structural analysis by W-T Communication Design Group, Inc. verifies the adequacy of the main structural members of the tower. W-T Communication Design Group, Inc. provides a limited scope of service in that we cannot verify the adequacy of every structural sub-component, mounting frame, bolt, weld, plate connection, etc. All bolts, welds and connections are assumed to develop at least the member capacity, unless determined otherwise and explicitly stated in this report.
3. All prior structural modifications, if any, are assumed to be as per date supplied/available, to be properly installed and to be fully effective.
4. This tower has been analyzed according to the original design criteria or the minimum design wind loads recommended by the Telecommunications Industry Association Standard TIA/EIA-222-G. If the owner or local or state agencies require a higher design wind load, W-T Communication Design Group, Inc. should be made aware of this requirement.
5. The antenna configuration is as supplied and/or stated in the analysis section. It is assumed to be complete and accurate. All antennas, mounts, coaxial cables and waveguides are assumed to be properly installed and supported as per the manufacturer's requirements.
6. Some assumptions are made regarding antenna and mount sizes and their projected areas based on the best interpretation of the data supplied and the best knowledge of antenna type and industry practice. Miscellaneous items such as antenna mounts etc. have not been structurally verified, 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.
7. The existing foundation is assumed to be in good condition with no structural defects and with no deterioration to its member capacities. The foundation system is assumed to support the structure as originally designed.



EXHIBITS



**W-T COMMUNICATION
DESIGN GROUP, LLC**
WIRELESS INFRASTRUCTURE

August 7, 2013

ADDENDA NO. 1

**PROJECT: REQUEST FOR PROPOSAL FOR COMMUNICATION TOWER
FOR CITY OF MANITOWOC - CONTRACT NO. WO-13-16R**

PROPOSALS DUE: WEDNESDAY, AUGUST 14, 2013 AT 4:00 P.M.

REQUEST FOR PROPOSAL COMMUNICATION TOWER

1. DELETE - Communication Tower item 2.2.B.g.

g. Site for two (2) medium Yagi Antenna's on a six (6) foot pivot side arm (50 inch pipe) (70 feet)

i. SELECTED VENDOR will provide one Yagi antenna on a six (6) foot pivot side arm (50 inch pipe) and 7/8 inch cable to tower control room.

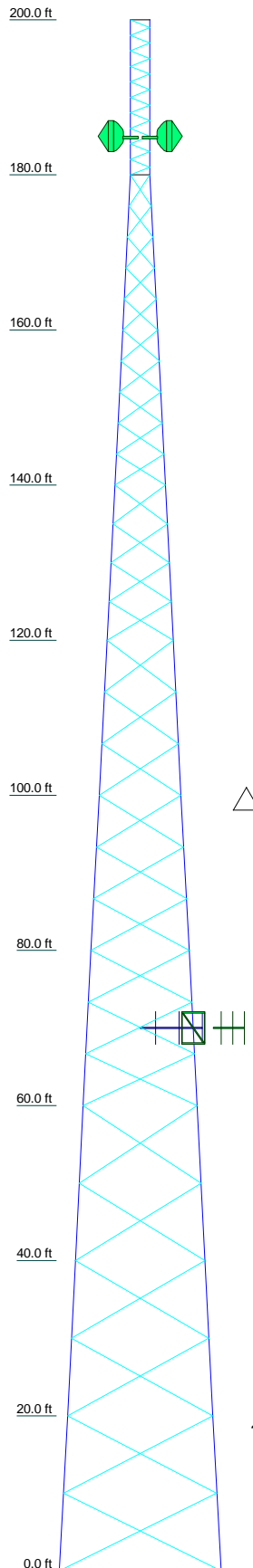
ii. SELECTED VENDOR will include the second Yagi antenna on a six (6) foot pivot side arm (50 inch pipe) into the engineering study for future use.

2. DELETE - Communication Tower item 2.2.B.k.

k. SELECTED VENDOR will include in the engineering study two (2) microwave four (4) foot dishes and ice shields and cabling (180 – 185 feet)

i. **Proposal Option #1** – RESPONDENT shall bid as an option two microwave four (4) foot dishes, ice shields, cabling and their installation.

Section	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
Legs	SR 1 7/16	ROHN 2 STD			ROHN 2.5 STD		ROHN 3 STD	P3.5x.226	P4x.237	
Leg Grade					A572-50					
Diagonals	SR 5/8" solid		L1 1/2x1 1/2x1/8		L1 3/4x1 3/4x1/8	L2x2x1/8	L 2.5 x 2.5 x 3/16	L3x3x3/16	L3 1/2x3 1/2x1/4	
Diagonal Grade										
Top Girts	L1 1/2x1 1/2x1/8					N.A.				
Bottom Girts	L1 1/2x1 1/2x1/8					N.A.				
Face Width (ft)	2.5	4.52	6.5625	8.5625	10.5625	12.604	14.6525	16.698	18.698	20.781
# Panels @ (ft)	20 @ 1	10 @ 4	4 @ 5	9 @ 6.66667	6 @ 10	6 @ 10	6 @ 10	6 @ 10	6 @ 10	6 @ 10
Weight (K)	0.5	0.4	0.5	0.6	0.7	0.8	1.3	1.4	1.6	2.2



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
ice shield 4' x 1'	185	Yagi Antenna	70
ice shield 4' x 1'	185	Yagi Antenna	70
Andrew 4' w/Radome	185	Pirot 6' Side Mount Standoff (1)	70
Andrew 4' w/Radome	185	Pirot 6' Side Mount Standoff (1)	70

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

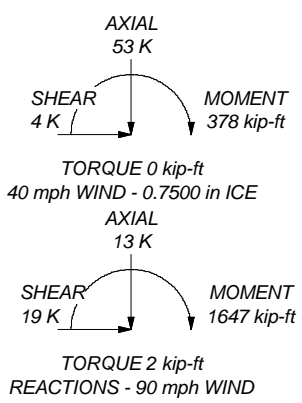
1. Tower is located in Manitowoc County, Wisconsin.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 90 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness 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. TOWER RATING: 102.8%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:

DOWN: 96 K
SHEAR: 12 K

UPLIFT: -80 K
SHEAR: 10 K



W-T Communication Design Group, LLC			Job: 200ft SST at Viebahn, Manitowoc, WI		
2675 Pratum Avenue			Project: T141739		
Hoffman Estates, IL 60192			Client: City of Manitowoc	Drawn by: JLoayza	App'd:
Phone: (224) 293-6333			Code: TIA-222-G	Date: 04/03/14	Scale: NTS
FAX: (224) 293-6444			Path:		Dwg No. E-1

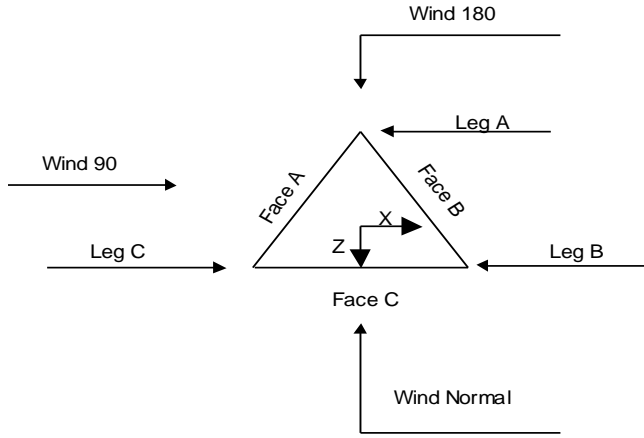
<p>tnxTower</p> <p>W-T Communication Design Group, LLC</p> <p>2675 Pratum Avenue Hoffman Estates, IL 60192 Phone: (224) 293-6333 FAX: (224) 293-6444</p>	<p>Job</p> <p>200ft SST at Viebahn, Manitowoc, WI</p>	<p>Page</p> <p>1 of 17</p>
	<p>Project</p> <p>T141739</p>	<p>Date</p> <p>16:21:44 04/03/14</p>
	<p>Client</p> <p>City of Manitowoc</p>	<p>Designed by</p> <p>JLoayza</p>

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 200.00 ft above the ground line.
 The base of the tower is set at an elevation of 0.00 ft above the ground line.
 The face width of the tower is 2.50 ft at the top and 20.78 ft at the base.
 This tower is designed using the TIA-222-G standard.

The following design criteria apply:

- Tower is located in Manitowoc County, Wisconsin.
- Basic wind speed of 90 mph.
- Structure Class III.
- 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.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.



Triangular Tower

tnxTower W-T Communication Design Group, LLC 2675 Pratum Avenue Hoffman Estates, IL 60192 Phone: (224) 293-6333 FAX: (224) 293-6444	Job 200ft SST at Viebahn, Manitowoc, WI	Page 2 of 17
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	Client City of Manitowoc	Designed by JLoayza

Tower Section Geometry

Tower Section	Tower Elevation <i>ft</i>	Assembly Database	Description	Section Width <i>ft</i>	Number of Sections	Section Length <i>ft</i>
T1	200.00-180.00			2.50	1	20.00
T2	180.00-160.00			2.50	1	20.00
T3	160.00-140.00			4.52	1	20.00
T4	140.00-120.00			6.56	1	20.00
T5	120.00-100.00			8.56	1	20.00
T6	100.00-80.00			10.56	1	20.00
T7	80.00-60.00			12.60	1	20.00
T8	60.00-40.00			14.65	1	20.00
T9	40.00-20.00			16.70	1	20.00
T10	20.00-0.00			18.70	1	20.00

Tower Section Geometry (cont'd)

Tower Section	Tower Elevation <i>ft</i>	Diagonal Spacing <i>ft</i>	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset <i>in</i>	Bottom Girt Offset <i>in</i>
T1	200.00-180.00	1.00	K Brace Left	No	No	0.0000	0.0000
T2	180.00-160.00	4.00	X Brace	No	No	0.0000	0.0000
T3	160.00-140.00	4.00	X Brace	No	No	0.0000	0.0000
T4	140.00-120.00	5.00	X Brace	No	No	0.0000	0.0000
T5	120.00-100.00	6.67	X Brace	No	No	0.0000	0.0000
T6	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T7	80.00-60.00	6.67	X Brace	No	No	0.0000	0.0000
T8	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T9	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T10	20.00-0.00	10.00	X Brace	No	No	0.0000	0.0000

Tower Section Geometry (cont'd)

Tower Elevation <i>ft</i>	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 200.00-180.00	Solid Round	1 7/16	A572-50 (50 ksi)	Solid Round	5/8" solid	A36 (36 ksi)
T2 180.00-160.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)
T3 160.00-140.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)
T4 140.00-120.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)
T5 120.00-100.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Single Angle	L1 3/4x1 3/4x1/8	A36 (36 ksi)
T6 100.00-80.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Single Angle	L2x2x1/8	A36 (36 ksi)
T7 80.00-60.00	Pipe	ROHN 3 STD	A572-50 (50 ksi)	Single Angle	L 2.5 x 2.5 x 3/16	A36 (36 ksi)
T8 60.00-40.00	Pipe	P3.5x.226	A572-50	Single Angle	L3x3x3/16	A36

tnxTower W-T Communication Design Group, LLC 2675 Pratum Avenue Hoffman Estates, IL 60192 Phone: (224) 293-6333 FAX: (224) 293-6444	Job 200ft SST at Viebahn, Manitowoc, WI	Page 3 of 17
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Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T9 40.00-20.00	Pipe	P4x.237	(50 ksi) A572-50	Single Angle	L3x3x3/16	(36 ksi) A36
T10 20.00-0.00	Pipe	P4x.237	(50 ksi) A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x1/4	(36 ksi) A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 200.00-180.00	Equal Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)	Equal Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Gusset Area (per face) ft ²	Gusset Thickness in	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 200.00-180.00	0.00	0.0000	A36 (36 ksi)	1	1	1.01	Mid-Pt	30.0000
T2 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1	1	1.01	Mid-Pt	30.0000
T3 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1.01	Mid-Pt	30.0000
T4 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1.01	Mid-Pt	30.0000
T5 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1.01	Mid-Pt	30.0000
T6 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1.01	Mid-Pt	30.0000
T7 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1.01	Mid-Pt	30.0000
T8 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1.01	Mid-Pt	30.0000
T9 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1.01	Mid-Pt	30.0000
T10 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1.01	Mid-Pt	30.0000

Tower Section Geometry (cont'd)

tnxTower W-T Communication Design Group, LLC 2675 Pratum Avenue Hoffman Estates, IL 60192 Phone: (224) 293-6333 FAX: (224) 293-6444	Job	200ft SST at Viebahn, Manitowoc, WI	Page	4 of 17
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Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	Legs	X Brace Diags	K Brace Diags	Single Diags	Girts	Horiz.	Sec. Horiz.	Inner Brace
ft				X Y	X Y	X Y	X Y	X Y	X Y	X Y
T1	No	Yes	1	1	1	1	1	1	1	1
200.00-180.00				1	1	1	1	1	1	1
T2	Yes	Yes	1	1	1	1	1	1	1	1
180.00-160.00				1	1	1	1	1	1	1
T3	Yes	Yes	1	1	1	1	1	1	1	1
160.00-140.00				1	1	1	1	1	1	1
T4	Yes	Yes	1	1	1	1	1	1	1	1
140.00-120.00				1	1	1	1	1	1	1
T5	Yes	Yes	1	1	1	1	1	1	1	1
120.00-100.00				1	1	1	1	1	1	1
T6	Yes	Yes	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1
T7	Yes	Yes	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1
T8	Yes	Yes	1	1	1	1	1	1	1	1
60.00-40.00				1	1	1	1	1	1	1
T9	Yes	Yes	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1
T10	Yes	Yes	1	1	1	1	1	1	1	1
20.00-0.00				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		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
200.00-180.00														
T2	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
180.00-160.00														
T3	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
160.00-140.00														
T4	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
140.00-120.00														
T5	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
120.00-100.00														
T6	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
100.00-80.00														
T7	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
80.00-60.00														
T8	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
60.00-40.00														
T9	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
40.00-20.00														
T10	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
20.00-0.00														

Feed Line/Linear Appurtenances - Entered As Round Or Flat

<p style="text-align: center;">tnxTower</p> <p style="text-align: center;">W-T Communication Design Group, LLC 2675 Pratum Avenue Hoffman Estates, IL 60192 Phone: (224) 293-6333 FAX: (224) 293-6444</p>	Job 200ft SST at Viebahn, Manitowoc, WI	Page 5 of 17
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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
LDF5-50A (7/8 FOAM)	A	No	Ar (CaAa)	70.00 - 8.00	0.0000	0.45	2	2	0.5000	1.0900		0.33
EW63	C	No	Ar (CaAa)	185.00 - 8.00	0.0000	0.45	2	2	0.5000	1.5742		0.51
									1.5742			

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
T1	200.00-180.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	1.574	0.000	0.01
T2	180.00-160.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	6.297	0.000	0.02
T3	160.00-140.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	6.297	0.000	0.02
T4	140.00-120.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	6.297	0.000	0.02
T5	120.00-100.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	6.297	0.000	0.02
T6	100.00-80.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	6.297	0.000	0.02
T7	80.00-60.00	A	0.000	0.000	2.180	0.000	0.01
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	6.297	0.000	0.02
T8	60.00-40.00	A	0.000	0.000	4.360	0.000	0.01
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	6.297	0.000	0.02
T9	40.00-20.00	A	0.000	0.000	4.360	0.000	0.01
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	6.297	0.000	0.02
T10	20.00-0.00	A	0.000	0.000	2.616	0.000	0.01
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	3.778	0.000	0.01

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
T1	200.00-180.00	A	2.234	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	6.324	0.000	0.08
T2	180.00-160.00	A	2.209	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	25.121	0.000	0.31
T3	160.00-140.00	A	2.182	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00

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Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
T4	140.00-120.00	C	2.151	0.000	0.000	24.929	0.000	0.30
		A		0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
T5	120.00-100.00	C	2.115	0.000	0.000	24.712	0.000	0.30
		A		0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
T6	100.00-80.00	C	2.073	0.000	0.000	24.463	0.000	0.29
		A		0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
T7	80.00-60.00	C	2.021	0.000	0.000	24.170	0.000	0.28
		A		0.000	0.000	10.573	0.000	0.11
		B		0.000	0.000	0.000	0.000	0.00
T8	60.00-40.00	C	1.955	0.000	0.000	23.810	0.000	0.27
		A		0.000	0.000	20.677	0.000	0.21
		B		0.000	0.000	0.000	0.000	0.00
T9	40.00-20.00	C	1.857	0.000	0.000	23.343	0.000	0.26
		A		0.000	0.000	19.996	0.000	0.20
		B		0.000	0.000	0.000	0.000	0.00
T10	20.00-0.00	C	1.664	0.000	0.000	22.663	0.000	0.25
		A		0.000	0.000	11.186	0.000	0.10
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	12.790	0.000	0.13

Feed Line Center of Pressure

Section	Elevation ft	CP _X in	CP _Z in	CP _X Ice in	CP _Z Ice in
T1	200.00-180.00	-0.4562	0.3193	-0.0343	0.0240
T2	180.00-160.00	-1.2382	0.8457	-0.2321	0.1586
T3	160.00-140.00	-1.7762	1.1862	-0.4107	0.2743
T4	140.00-120.00	-2.1952	1.4506	-0.5734	0.3789
T5	120.00-100.00	-2.6451	1.7371	-0.7289	0.4787
T6	100.00-80.00	-2.8407	1.8581	-0.8184	0.5353
T7	80.00-60.00	-2.5574	0.5620	-0.8154	0.1423
T8	60.00-40.00	-2.7711	-0.4604	-0.9508	-0.2374
T9	40.00-20.00	-2.8852	-0.4818	-1.0422	-0.2611
T10	20.00-0.00	-1.8061	-0.3026	-0.7453	-0.1872

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T1	2	EW63	180.00 - 185.00	0.6000	0.2679
T2	2	EW63	160.00 - 180.00	0.6000	0.4165
T3	2	EW63	140.00 - 160.00	0.6000	0.5516
T4	2	EW63	120.00 - 140.00	0.6000	0.6000

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Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T5	2	EW63	100.00 - 120.00	0.6000	0.6000
T6	2	EW63	80.00 - 100.00	0.6000	0.6000
T7	1	LDF5-50A (7/8 FOAM)	60.00 - 70.00	0.6000	0.6000
T7	2	EW63	60.00 - 80.00	0.6000	0.6000
T8	1	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T8	2	EW63	40.00 - 60.00	0.6000	0.6000
T9	1	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T9	2	EW63	20.00 - 40.00	0.6000	0.6000
T10	1	LDF5-50A (7/8 FOAM)	8.00 - 20.00	0.6000	0.6000
T10	2	EW63	8.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	Placement	C_{AA} Front	C_{AA} Side	Weight
			ft ft ft	°	ft	ft ²	ft ²	K
Yagi Antenna	A	From Leg	3.00	0.0000	70.00	No Ice	0.30	0.01
			0.00			1/2" Ice	0.42	0.02
			0.00			1" Ice	0.54	0.03
Yagi Antenna	B	From Leg	3.00	0.0000	70.00	No Ice	0.30	0.01
			0.00			1/2" Ice	0.42	0.02
			0.00			1" Ice	0.54	0.03
Pirod 6' Side Mount Standoff (1)	B	From Leg	0.00	0.0000	70.00	No Ice	4.97	0.07
			0.00			1/2" Ice	6.12	0.13
			0.00			1" Ice	7.27	0.19
Pirod 6' Side Mount Standoff (1)	A	From Leg	0.00	0.0000	70.00	No Ice	4.97	0.07
			0.00			1/2" Ice	6.12	0.13
			0.00			1" Ice	7.27	0.19
ice shield 4' x 1'	C	From Leg	0.00	0.0000	185.00	No Ice	2.80	0.04
			0.00			1/2" Ice	3.15	0.07
			0.00			1" Ice	3.52	0.11
ice shield 4' x 1'	B	From Leg	0.00	0.0000	185.00	No Ice	2.80	0.04
			0.00			1/2" Ice	3.15	0.07
			0.00			1" Ice	3.52	0.11

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight	
				ft ft ft	°	°	ft	ft	ft ²	K	
Andrew 4' w/Radome	C	Paraboloid w/Radome	From Leg	1.00	45.0000		185.00	4.00	No Ice	12.57	0.14
				0.00					1/2" Ice	13.10	0.28

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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
Andrew 4' w/Radome	B	Paraboloid w/Radome	From Leg	0.00 1.00 0.00 0.00	-45.0000		185.00	4.00	1" Ice 13.62 No Ice 12.57 1/2" Ice 13.10 1" Ice 13.62	0.42 0.14 0.28 0.42

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 90 deg - No Ice
5	0.9 Dead+1.6 Wind 90 deg - No Ice
6	1.2 Dead+1.6 Wind 180 deg - No Ice
7	0.9 Dead+1.6 Wind 180 deg - No Ice
8	1.2 Dead+1.0 Ice+1.0 Temp
9	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
10	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
11	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
12	Dead+Wind 0 deg - Service
13	Dead+Wind 90 deg - Service
14	Dead+Wind 180 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft	
T1	200 - 180	Leg	Max Tension	7	3.58	0.00	0.00	
			Max. Compression	4	-4.54	-0.05	0.01	
			Max. Mx	4	1.14	0.19	0.04	
			Max. My	4	-1.22	-0.02	-0.08	
			Max. Vy	4	-0.49	-0.02	-0.08	
			Max. Vx	6	-0.20	0.04	0.01	
			Diagonal	Max Tension	4	1.67	0.00	0.00
				Max. Compression	4	-1.61	0.00	0.00
				Max. Mx	10	0.04	0.01	0.00
				Max. My	10	-0.04	0.00	-0.00
				Max. Vy	10	-0.01	0.00	0.00
				Max. Vx	10	0.00	0.00	0.00
		Top Girt	Max Tension	7	0.00	0.00	0.00	
			Max. Compression	3	-0.00	0.00	0.00	
			Max. Mx	9	0.00	-0.01	0.00	
			Max. My	4	0.00	0.00	-0.00	
			Max. Vy	9	0.02	0.00	0.00	
			Max. Vx	4	0.00	0.00	0.00	
		Bottom Girt	Max Tension	7	0.28	0.00	0.00	
			Max. Compression	4	-0.65	0.00	0.00	
			Max. Mx	8	-0.01	-0.01	0.00	
			Max. My	4	-0.65	0.00	-0.00	
			Max. Vy	8	0.02	0.00	0.00	
			Max. Vx	4	0.00	0.00	0.00	

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft			
T2	180 - 160	Leg	Max Tension	5	10.34	-0.03	-0.01			
			Max. Compression	4	-11.37	0.03	-0.02			
			Max. Mx	4	-5.18	0.04	-0.03			
			Max. My	4	-0.10	-0.00	0.05			
			Max. Vy	2	-0.02	0.03	-0.00			
			Max. Vx	4	-0.03	-0.00	0.05			
			Max Tension	5	1.04	0.00	-0.00			
		Diagonal	Max. Compression	4	-1.19	0.00	0.00			
			Max. Mx	10	0.03	0.01	-0.00			
			Max. My	4	-1.18	-0.00	-0.00			
			Max. Vy	11	0.02	0.01	-0.00			
			Max. Vx	4	0.00	0.00	0.00			
			T3	160 - 140	Leg	Max Tension	5	16.86	-0.03	-0.02
						Max. Compression	4	-18.23	0.03	-0.03
Max. Mx	3	-17.67				0.04	0.00			
Max. My	4	-0.49				-0.00	0.05			
Max. Vy	3	-0.02				0.04	0.00			
Max. Vx	2	-0.03				-0.02	0.04			
Max Tension	4	0.97				0.00	0.00			
Diagonal	Max. Compression	4			-0.99	0.00	0.00			
	Max. Mx	11			0.12	0.02	-0.00			
	Max. My	10			0.15	0.02	-0.00			
	Max. Vy	11			0.03	0.02	0.00			
	Max. Vx	10			-0.00	0.00	0.00			
	T4	140 - 120			Leg	Max Tension	7	23.91	-0.06	-0.00
						Max. Compression	2	-26.10	0.07	0.00
Max. Mx			3	-25.87		0.07	0.00			
Max. My			4	-0.61		-0.00	0.07			
Max. Vy			3	-0.04		0.06	0.00			
Max. Vx			2	-0.04		-0.04	0.07			
Max Tension			4	1.26		0.00	0.00			
Diagonal			Max. Compression	4	-1.28	0.00	0.00			
			Max. Mx	11	0.15	0.03	-0.00			
			Max. My	9	0.04	0.03	0.00			
			Max. Vy	11	0.03	0.03	0.00			
			Max. Vx	9	0.00	0.00	0.00			
			T5	120 - 100	Leg	Max Tension	7	31.28	-0.08	-0.00
						Max. Compression	2	-34.77	0.08	0.00
Max. Mx	3	-31.43				0.09	0.00			
Max. My	4	-1.01				-0.00	0.09			
Max. Vy	3	-0.04				0.09	0.00			
Max. Vx	2	-0.05				-0.04	0.09			
Max Tension	4	1.61				0.00	0.00			
Diagonal	Max. Compression	4			-1.65	0.00	0.00			
	Max. Mx	11			0.27	0.06	-0.01			
	Max. My	9			-0.01	0.06	0.01			
	Max. Vy	11			0.04	0.06	0.01			
	Max. Vx	9			0.00	0.00	0.00			
	T6	100 - 80			Leg	Max Tension	7	39.34	-0.07	-0.00
						Max. Compression	2	-44.37	0.10	0.01
Max. Mx			9	-18.93		0.11	0.00			
Max. My			4	-1.06		-0.00	0.09			
Max. Vy			3	-0.05		0.10	0.01			
Max. Vx			2	0.05		-0.04	0.09			
Max Tension			4	1.89		0.00	0.00			
Diagonal			Max. Compression	4	-1.95	0.00	0.00			
			Max. Mx	11	0.14	0.08	0.01			
			Max. My	10	0.23	0.08	-0.01			
			Max. Vy	11	0.06	0.08	0.01			
			Max. Vx	9	0.00	0.00	0.00			
			T7	80 - 60	Leg	Max Tension	7	48.03	-0.15	0.02

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T8	60 - 40	Leg	Max. Compression	2	-55.31	0.17	0.01
			Max. Mx	10	0.65	-0.20	-0.01
			Max. My	5	-1.04	-0.00	0.18
			Max. Vy	6	-0.11	-0.17	0.02
			Max. Vx	4	0.12	-0.01	0.18
			Max Tension	4	2.44	0.00	0.00
			Max. Compression	4	-2.50	0.00	0.00
			Max. Mx	11	0.09	0.13	0.02
			Max. My	10	-0.26	0.11	0.02
			Max. Vy	11	0.08	0.12	0.02
			Max. Vx	9	-0.00	0.00	0.00
			Max Tension	7	56.96	-0.18	-0.01
			Max. Compression	2	-66.37	0.27	0.01
			Max. Mx	11	2.74	-0.29	-0.00
			Max. My	4	-2.20	-0.02	0.32
			Max. Vy	3	-0.09	0.27	0.01
T9	40 - 20	Leg	Max. Vx	4	0.10	-0.02	0.32
			Max Tension	4	3.06	0.00	0.00
			Max. Compression	4	-3.16	0.00	0.00
			Max. Mx	11	0.15	0.19	-0.02
			Max. My	11	0.61	0.18	0.03
			Max. Vy	11	0.10	0.18	0.03
			Max. Vx	10	-0.01	0.00	0.00
			Max Tension	7	67.18	-0.18	-0.01
			Max. Compression	2	-79.18	0.33	0.01
			Max. Mx	11	2.75	-0.46	0.00
			Max. My	4	-2.79	-0.03	0.40
			Max. Vy	11	0.09	-0.46	0.00
			Max. Vx	4	0.11	-0.03	0.40
			Max Tension	4	3.48	0.00	0.00
			Max. Compression	2	-3.62	0.00	0.00
			Max. Mx	11	0.11	0.23	-0.03
T10	20 - 0	Leg	Max. My	11	-0.73	0.20	0.03
			Max. Vy	11	0.11	0.21	0.03
			Max. Vx	10	0.01	0.00	0.00
			Max Tension	7	77.33	-0.21	-0.00
			Max. Compression	2	-92.37	0.00	0.00
			Max. Mx	11	3.80	-0.46	0.00
			Max. My	4	-3.45	-0.03	0.47
			Max. Vy	11	-0.09	-0.46	0.00
			Max. Vx	4	0.11	-0.03	0.47
			Max Tension	4	3.80	0.00	0.00
			Max. Compression	2	-3.99	0.00	0.00
			Max. Mx	11	-0.15	0.33	-0.04
			Max. My	11	-1.36	0.32	-0.04
			Max. Vy	11	0.13	0.33	-0.04
			Max. Vx	11	-0.01	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	6	45.78	4.07	-3.82
	Max. H _x	6	45.78	4.07	-3.82
	Max. H _z	3	-42.55	-3.97	3.93
	Min. Vert	5	-73.87	-8.10	3.84

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Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg B	Min. H _x	5	-73.87	-8.10	3.84
	Min. H _z	6	45.78	4.07	-3.82
	Max. Vert	4	81.43	-8.76	-4.16
	Max. H _x	3	-42.58	4.03	3.82
	Max. H _z	3	-42.58	4.03	3.82
	Min. Vert	3	-42.58	4.03	3.82
Leg A	Min. H _x	4	81.43	-8.76	-4.16
	Min. H _z	4	81.43	-8.76	-4.16
	Max. Vert	2	95.73	-0.07	11.77
	Max. H _x	7	-79.84	0.05	-9.77
	Max. H _z	2	95.73	-0.07	11.77
	Min. Vert	7	-79.84	0.05	-9.77
	Min. H _x	4	4.09	-1.40	0.36
	Min. H _z	7	-79.84	0.05	-9.77

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	10.65	-0.00	0.00	0.29	0.34	-0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	12.74	-0.00	-19.41	-1646.41	0.43	-2.42
0.9 Dead+1.6 Wind 0 deg - No Ice	9.54	-0.00	-19.42	-1646.61	0.32	-2.42
1.2 Dead+1.6 Wind 90 deg - No Ice	12.74	18.16	0.01	2.74	-1602.41	1.20
0.9 Dead+1.6 Wind 90 deg - No Ice	9.54	18.17	0.01	2.66	-1602.65	1.21
1.2 Dead+1.6 Wind 180 deg - No Ice	12.75	-0.00	17.20	1494.08	0.42	1.95
0.9 Dead+1.6 Wind 180 deg - No Ice	9.55	-0.00	17.21	1494.11	0.32	1.95
1.2 Dead+1.0 Ice+1.0 Temp	52.90	0.00	-0.00	2.41	9.29	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	52.89	0.00	-4.00	-378.11	9.29	0.02
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	52.89	3.89	0.00	2.66	-369.67	0.05
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	52.89	0.00	3.80	371.14	9.29	-0.03
Dead+Wind 0 deg - Service	10.65	-0.00	-4.69	-397.38	0.34	-0.58
Dead+Wind 90 deg - Service	10.65	4.39	0.00	0.77	-386.78	0.29
Dead+Wind 180 deg - Service	10.65	0.00	4.16	361.13	0.35	0.47

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-10.65	0.00	0.00	10.65	-0.00	0.000%
2	0.00	-12.79	-19.44	0.00	12.74	19.41	0.224%
3	0.00	-9.59	-19.44	0.00	9.54	19.42	0.223%
4	18.19	-12.79	0.01	-18.16	12.74	-0.01	0.261%
5	18.19	-9.59	0.01	-18.17	9.54	-0.01	0.262%

tnxTower W-T Communication Design Group, LLC 2675 Pratum Avenue Hoffman Estates, IL 60192 Phone: (224) 293-6333 FAX: (224) 293-6444	Job	200ft SST at Viebahn, Manitowoc, WI	Page	12 of 17
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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
6	0.00	-12.79	17.23	0.00	12.75	-17.20	0.236%
7	0.00	-9.59	17.23	0.00	9.55	-17.21	0.235%
8	0.00	-52.90	0.00	-0.00	52.90	0.00	0.003%
9	0.00	-52.90	-4.04	-0.00	52.89	4.00	0.082%
10	3.93	-52.90	0.00	-3.89	52.89	-0.00	0.084%
11	0.00	-52.90	3.85	-0.00	52.89	-3.80	0.086%
12	0.00	-10.65	-4.69	0.00	10.65	4.69	0.084%
13	4.39	-10.65	0.00	-4.39	10.65	-0.00	0.092%
14	0.00	-10.65	4.16	-0.00	10.65	-4.16	0.081%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	6	0.00000001	0.00078295
3	Yes	6	0.00000001	0.00078380
4	Yes	6	0.00004801	0.00085114
5	Yes	6	0.00000001	0.00085138
6	Yes	6	0.00000001	0.00075728
7	Yes	6	0.00000001	0.00075666
8	Yes	4	0.00000001	0.00005172
9	Yes	5	0.00021752	0.00042308
10	Yes	5	0.00022008	0.00045876
11	Yes	5	0.00022173	0.00048645
12	Yes	5	0.00000001	0.00053357
13	Yes	5	0.00000001	0.00058468
14	Yes	5	0.00000001	0.00052437

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	200 - 180	5.835	13	0.2819	0.0506
T2	180 - 160	4.652	13	0.2773	0.0322
T3	160 - 140	3.558	13	0.2388	0.0141
T4	140 - 120	2.646	13	0.1922	0.0082
T5	120 - 100	1.893	13	0.1610	0.0047
T6	100 - 80	1.280	12	0.1281	0.0026
T7	80 - 60	0.803	12	0.0938	0.0011
T8	60 - 40	0.453	12	0.0670	0.0007
T9	40 - 20	0.210	12	0.0434	0.0004
T10	20 - 0	0.057	12	0.0223	0.0002

Critical Deflections and Radius of Curvature - Service Wind

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Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
185.00	Andrew 4' w/Radome	13	4.943	0.2811	0.0370	78034
70.00	Yagi Antenna	12	0.613	0.0796	0.0008	39419

Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
T1	200 - 180	24.186	5	1.1684	0.2095
T2	180 - 160	19.279	5	1.1495	0.1334
T3	160 - 140	14.745	5	0.9901	0.0585
T4	140 - 120	10.963	5	0.7967	0.0340
T5	120 - 100	7.841	5	0.6675	0.0195
T6	100 - 80	5.306	3	0.5308	0.0107
T7	80 - 60	3.327	3	0.3887	0.0046
T8	60 - 40	1.877	3	0.2776	0.0028
T9	40 - 20	0.868	3	0.1797	0.0018
T10	20 - 0	0.237	3	0.0923	0.0007

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
185.00	Andrew 4' w/Radome	5	20.487	1.1654	0.1535	18886
70.00	Yagi Antenna	3	2.540	0.3300	0.0033	9514

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio P _u /φP _n
	ft		ft	ft		in ²	K	K	
T1	200 - 180	1 7/16	20.00	1.00	66.8 K=2.00	1.6229	-4.54	52.71	0.086 ¹
T2	180 - 160	ROHN 2 STD	20.03	4.01	61.1 K=1.00	1.0745	-11.37	36.81	0.309 ¹
T3	160 - 140	ROHN 2 STD	20.03	4.01	61.1 K=1.00	1.0745	-18.23	36.81	0.495 ¹
T4	140 - 120	ROHN 2.5 STD	20.03	5.01	63.4 K=1.00	1.7040	-26.10	57.14	0.457 ¹
T5	120 - 100	ROHN 2.5 STD	20.03	6.68	84.6 K=1.00	1.7040	-34.77	45.45	0.765 ¹

tnxTower W-T Communication Design Group, LLC 2675 Pratum Avenue Hoffman Estates, IL 60192 Phone: (224) 293-6333 FAX: (224) 293-6444	Job 200ft SST at Viebahn, Manitowoc, WI	Page 14 of 17
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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 $\frac{P_u}{\phi P_n}$
T6	100 - 80	ROHN 2.5 STD	20.03	6.68	84.6 K=1.00	1.7040	-44.37	45.45	0.976 ¹
T7	80 - 60	ROHN 3 STD	20.03	6.68	68.9 K=1.00	2.2285	-55.31	70.89	0.780 ¹
T8	60 - 40	P3.5x.226	20.03	10.02	89.9 K=1.00	2.6795	-66.37	66.75	0.994 ¹
T9	40 - 20	P4x.237	20.03	10.02	79.6 K=1.00	3.1741	-79.18	89.84	0.881 ¹
T10	20 - 0	P4x.237	20.04	10.02	79.6 K=1.00	3.1741	-92.37	89.83	1.028 ¹
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¹ P_u / φP_n controls

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	200 - 180	5/8" solid	2.69	2.56	137.8 K=0.70	0.3068	-1.61	3.65	0.441 ¹
T2	180 - 160	L1 1/2x1 1/2x1/8	4.83	2.46	104.7 K=1.05	0.3594	-1.19	6.53	0.182 ¹
T3	160 - 140	L1 1/2x1 1/2x1/8	7.51	3.76	144.7 K=0.95	0.3594	-0.99	3.88	0.255 ¹
T4	140 - 120	L1 1/2x1 1/2x1/8	9.70	4.86	178.5 K=0.91	0.3594	-1.28	2.55	0.502 ¹
T5	120 - 100	L1 3/4x1 3/4x1/8	12.21	6.16	191.1 K=0.90	0.4219	-1.65	2.61	0.631 ¹
T6	100 - 80	L2x2x1/8	13.96	7.04	190.5 K=0.90	0.4844	-1.95	3.02	0.646 ¹
T7	80 - 60	L 2.5 x 2.5 x 3/16	15.79	7.92	174.9 K=0.91	0.9020	-2.50	6.66	0.375 ¹
T8	60 - 40	L3x3x3/16	19.03	9.62	176.2 K=0.91	1.0900	-3.16	7.93	0.399 ¹
T9	40 - 20	L3x3x3/16	20.77	10.45	189.0 K=0.90	1.0900	-3.62	6.89	0.525 ¹
T10	20 - 0	L3 1/2x3 1/2x1/4	22.60	11.38	178.5 K=0.91	1.6900	-3.99	11.98	0.333 ¹

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 $\frac{P_u}{\phi P_n}$
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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 $\frac{P_u}{\phi P_n}$
T1	200 - 180	L1 1/2x1 1/2x1/8	2.50	2.38	96.4 K=1.00	0.3594	-0.00	7.14	0.001 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	200 - 180	L1 1/2x1 1/2x1/8	2.50	2.38	96.4 K=1.00	0.3594	-0.65	7.14	0.092 ¹ ✓

¹ P_u / φP_n controls

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	200 - 180	1 7/16	20.00	1.00	33.4	1.6229	3.58	73.03	0.049 ¹ ✓
T2	180 - 160	ROHN 2 STD	20.03	4.01	61.1	1.0745	10.34	48.35	0.214 ¹ ✓
T3	160 - 140	ROHN 2 STD	20.03	4.01	61.1	1.0745	16.86	48.35	0.349 ¹ ✓
T4	140 - 120	ROHN 2.5 STD	20.03	5.01	63.4	1.7040	23.91	76.68	0.312 ¹ ✓
T5	120 - 100	ROHN 2.5 STD	20.03	6.68	84.6	1.7040	31.28	76.68	0.408 ¹ ✓
T6	100 - 80	ROHN 2.5 STD	20.03	6.68	84.6	1.7040	39.34	76.68	0.513 ¹ ✓
T7	80 - 60	ROHN 3 STD	20.03	6.68	68.9	2.2285	48.03	100.28	0.479 ¹ ✓
T8	60 - 40	P3.5x.226	20.03	10.02	89.9	2.6795	56.96	120.58	0.472 ¹ ✓
T9	40 - 20	P4x.237	20.03	10.02	79.6	3.1741	67.18	142.83	0.470 ¹ ✓
T10	20 - 0	P4x.237	20.04	10.02	79.6	3.1741	77.33	142.83	0.541 ¹ ✓

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<p style="text-align: center;">tnxTower</p> <p style="text-align: center;">W-T Communication Design Group, LLC</p> <p style="text-align: center;">2675 Pratum Avenue Hoffman Estates, IL 60192 Phone: (224) 293-6333 FAX: (224) 293-6444</p>	<p>Job</p> <p style="text-align: center;">200ft SST at Viebahn, Manitowoc, WI</p>	<p>Page</p> <p style="text-align: center;">16 of 17</p>
	<p>Project</p> <p style="text-align: center;">T141739</p>	<p>Date</p> <p style="text-align: center;">16:21:44 04/03/14</p>
	<p>Client</p> <p style="text-align: center;">City of Manitowoc</p>	<p>Designed by</p> <p style="text-align: center;">JLoayza</p>

¹ $P_u / \phi P_n$ controls

Diagonal 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	200 - 180	5/8" solid	2.69	2.56	196.9	0.3068	1.67	9.94	0.168 ¹
T2	180 - 160	L1 1/2x1 1/2x1/8	4.83	2.46	63.5	0.3594	1.04	11.64	0.090 ¹
T3	160 - 140	L1 1/2x1 1/2x1/8	7.51	3.76	97.0	0.3594	0.97	11.64	0.084 ¹
T4	140 - 120	L1 1/2x1 1/2x1/8	9.70	4.86	125.3	0.3594	1.26	11.64	0.109 ¹
T5	120 - 100	L1 3/4x1 3/4x1/8	12.21	6.16	135.5	0.4219	1.61	13.67	0.118 ¹
T6	100 - 80	L2x2x1/8	13.96	7.04	134.9	0.4844	1.89	15.69	0.120 ¹
T7	80 - 60	L 2.5 x 2.5 x 3/16	15.79	7.92	122.1	0.9020	2.44	29.22	0.084 ¹
T8	60 - 40	L3x3x3/16	19.03	9.62	122.9	1.0900	3.06	35.32	0.087 ¹
T9	40 - 20	L3x3x3/16	20.77	10.45	133.6	1.0900	3.48	35.32	0.098 ¹
T10	20 - 0	L3 1/2x3 1/2x1/4	22.60	11.38	125.3	1.6900	3.80	54.76	0.069 ¹

¹ $P_u / \phi P_n$ controls

Top Girt 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	200 - 180	L1 1/2x1 1/2x1/8	2.50	2.38	61.4	0.3594	0.00	11.64	0.000 ¹

¹ $P_u / \phi P_n$ controls

Bottom Girt 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	200 - 180	L1 1/2x1 1/2x1/8	2.50	2.38	61.4	0.3594	0.28	11.64	0.024 ¹

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¹ $P_u / \phi P_n$ controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	200 - 180	Leg	1 7/16	2	-4.54	52.71	8.6	Pass
T2	180 - 160	Leg	ROHN 2 STD	71	-11.37	36.81	30.9	Pass
T3	160 - 140	Leg	ROHN 2 STD	104	-18.23	36.81	49.5	Pass
T4	140 - 120	Leg	ROHN 2.5 STD	138	-26.10	57.14	45.7	Pass
T5	120 - 100	Leg	ROHN 2.5 STD	165	-34.77	45.45	76.5	Pass
T6	100 - 80	Leg	ROHN 2.5 STD	186	-44.37	45.45	97.6	Pass
T7	80 - 60	Leg	ROHN 3 STD	207	-55.31	70.89	78.0	Pass
T8	60 - 40	Leg	P3.5x.226	228	-66.37	66.75	99.4	Pass
T9	40 - 20	Leg	P4x.237	243	-79.18	89.84	88.1	Pass
T10	20 - 0	Leg	P4x.237	258	-92.37	89.83	102.8	Fail X
T1	200 - 180	Diagonal	5/8" solid	13	-1.61	3.65	44.1	Pass
T2	180 - 160	Diagonal	L1 1/2x1 1/2x1/8	98	-1.19	6.53	18.2	Pass
T3	160 - 140	Diagonal	L1 1/2x1 1/2x1/8	107	-0.99	3.88	25.5	Pass
T4	140 - 120	Diagonal	L1 1/2x1 1/2x1/8	140	-1.28	2.55	50.2	Pass
T5	120 - 100	Diagonal	L1 3/4x1 3/4x1/8	167	-1.65	2.61	63.1	Pass
T6	100 - 80	Diagonal	L2x2x1/8	188	-1.95	3.02	64.6	Pass
T7	80 - 60	Diagonal	L 2.5 x 2.5 x 3/16	209	-2.50	6.66	37.5	Pass
T8	60 - 40	Diagonal	L3x3x3/16	230	-3.16	7.93	39.9	Pass
T9	40 - 20	Diagonal	L3x3x3/16	248	-3.62	6.89	52.5	Pass
T10	20 - 0	Diagonal	L3 1/2x3 1/2x1/4	263	-3.99	11.98	33.3	Pass
T1	200 - 180	Top Girt	L1 1/2x1 1/2x1/8	4	-0.00	7.14	0.5	Pass
T1	200 - 180	Bottom Girt	L1 1/2x1 1/2x1/8	7	-0.65	7.14	9.2	Pass
Summary								
Leg (T10)							102.8	Fail X
Diagonal (T6)							64.6	Pass
Top Girt (T1)							0.5	Pass
Bottom Girt (T1)							9.2	Pass
RATING =							102.8	Fail X

REFERENCED FOUNDATION AND GEOTECH. INFORMATION
(Not Available)



PREVIOUS TOWER ANALYSIS



**W-T COMMUNICATION
DESIGN GROUP, LLC**
WIRELESS INFRASTRUCTURE

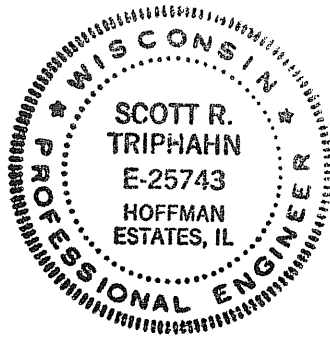
W-T COMMUNICATION DESIGN GROUP, LLC

2675 PRATUM AVENUE, HOFFMAN ESTATES, ILLINOIS 60192
(224) 293-6333 FAX (224) 293-6444

Project: 200' Self Support Tower
Site Name: VIEBAHN
Manitowoc County, WI

W-T Job No.: T090468

Structural Analysis Report

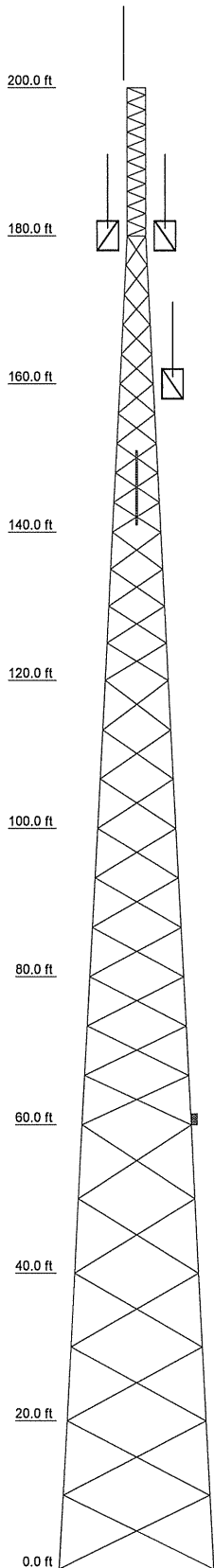


Reviewed By:

A handwritten signature in black ink, appearing to read "Scott Triphahn", written over a horizontal line.

Scott Triphahn, P.E., PLS
Wisconsin License No. E-25743
Expires 11-30-09
Date: 4-30-09

Section	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1
Legs	P4x.237		P3.5x.226	ROHN 3 STD	ROHN 2.5 STD	ROHN 2.5 STD		ROHN 2 STD		SR 1 7/16
Leg Grade				L 2.5 x 2.5 x 3/16	L2x2x1/8	L1 3/4x1 3/4x1/8	L1 1/2x1 1/2x1/8	L1 1/2x1 1/2x1/8		SR 5/8" solid
Diagonals	L3 1/2x3 1/2x1/4	L3x3x3/16								
Diagonal Grade										
Top Girts										L1 1/2x1 1/2x1/8
Bottom Girts										L1 1/2x1 1/2x1/8
Face Width (ft)	20.781	18.698	16.698	14.6525	12.604	10.5625	8.5625	6.5625	4.52	2.5
# Panels @ (ft)		6 @ 10					4 @ 5		10 @ 4	20 @ 1
Weight (K)	10.3		1.4	1.4	1.4	0.7	0.6	0.5	0.4	0.5



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
PD220	200	PD220	160
PD220	180	Pirolod 6' Side Mount Standoff (1)	140
PD220	180	PD220	140
Pirolod 6' Side Mount Standoff (1)	180	(2) Yagi Antenna	60
Pirolod 6' Side Mount Standoff (1)	180	Pirolod 6' Side Mount Standoff (1)	60
Pirolod 6' Side Mount Standoff (1)	160		

MATERIAL STRENGTH

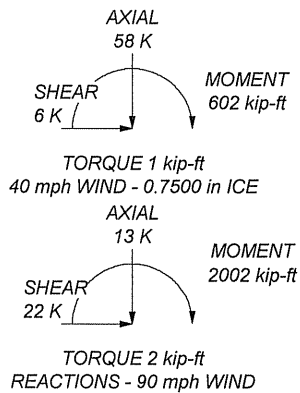
GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower is located in Manitowoc 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 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. TOWER RATING: 127.4%

MAX. CORNER REACTIONS AT BASE:

DOWN: 116 K
 UPLIFT: -98 K
 SHEAR: 14 K



W-T Communication Design Group

2675 Pratum Ave.
 Hoffman Estates, IL 60192

Phone:
 FAX:

Job: **200ft SST at Viebahn, Manitowoc, WI**

Project: **T090468**

Client: _____ Drawn by: **SDharia**

App'd: _____

Code: **TIA-222-G** Date: **05/01/09**

Scale: **NTS**

Path: _____ Dwg No. **E-1**

T:\090468_051\090468_Tower.dwg - Considered Deleted and Copy to B:\090468\090468_051_01.dwg by [unclear]

RISATower W-T Communication Design Group 2675 Pratum Ave. Hoffman Estates, IL 60192 Phone: FAX:	Job 200ft SST at Viebahn, Manitowoc, WI	Page 15 of 16
	Project T090468	Date 10:36:59 05/01/09
	Client	Designed by SDharia

Top Girt 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	200 - 180	L1 1/2x1 1/2x1/8	2.50	2.38	61.4	0.3594	0.12	11.64	0.010 ¹ ✓

¹ P_u / φP_n controls

Bottom Girt 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	200 - 180	L1 1/2x1 1/2x1/8	2.50	2.38	61.4	0.3594	0.20	11.64	0.017 ¹ ✓

¹ P_u / φP_n controls

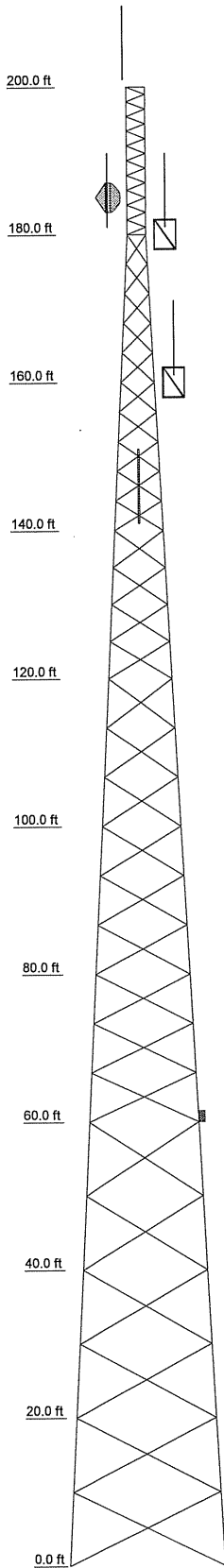
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	σP _{allow} K	% Capacity	Pass Fail	
T1	200 - 180	Leg	1 7/16	3	-4.64	52.71	8.8	Pass	
		Diagonal	5/8" solid	13	-0.59	1.79	33.2	Pass	
T2	180 - 160	Top Girt	L1 1/2x1 1/2x1/8	6	-0.11	7.14	1.5	Pass	
		Bottom Girt	L1 1/2x1 1/2x1/8	7	-0.23	7.14	3.3	Pass	
T3	160 - 140	Leg	ROHN 2 STD	72	-13.51	36.81	36.7	Pass	
		Diagonal	L1 1/2x1 1/2x1/8	98	-1.28	6.53	19.6	Pass	
T4	140 - 120	Leg	ROHN 2 STD	105	-23.77	36.81	64.6	Pass	
		Diagonal	L1 1/2x1 1/2x1/8	107	-1.30	3.88	33.5	Pass	
T5	120 - 100	Leg	ROHN 2.5 STD	138	-35.15	57.14	61.5	Pass	
		Diagonal	L1 1/2x1 1/2x1/8	140	-1.51	2.55	59.5	Pass	
T6	100 - 80	Leg	ROHN 2.5 STD	165	-46.16	45.45	101.6	Fail ✗	
		Diagonal	L1 3/4x1 3/4x1/8	167	-1.93	2.61	73.8	Pass	
T7	80 - 60	Leg	ROHN 2.5 STD	186	-57.91	45.45	127.4	Fail ✗	
		Diagonal	L2x2x1/8	188	-2.25	3.02	74.5	Pass	
T8	60 - 40	Leg	ROHN 3 STD	207	-70.52	70.89	99.5	Pass	
		Diagonal	L 2.5 x 2.5 x 3/16	209	-2.72	6.66	40.8	Pass	
T9	40 - 20	Leg	P3.5x.226	228	-83.07	66.75	124.4	Fail ✗	
		Diagonal	L3x3x3/16	232	-3.48	7.93	43.8	Pass	
T10	20 - 0	Leg	P4x.237	243	-97.37	89.84	108.4	Fail ✗	
		Diagonal	L3x3x3/16	247	-4.03	6.89	58.4	Pass	
T10	20 - 0	Leg	P4x.237	258	-111.97	89.83	124.7	Fail ✗	
		Diagonal	L3 1/2x3 1/2x1/4	262	-4.41	11.98	36.8	Pass	
Summary									
							Leg (T6)	127.4	Fail ✗
							Diagonal (T6)	74.5	Pass
							Top Girt	1.5	Pass

RISATower W-T Communication Design Group 2675 Pratum Ave. Hoffman Estates, IL 60192 Phone: FAX:	Job 200ft SST at Viebahn, Manitowoc, WI	Page 16 of 16
	Project T090468	Date 10:36:59 05/01/09
	Client	Designed by SDharia

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
						(T1)		
						Bottom Girt	3.3	Pass
						(T1)		
						RATING =	127.4	Fail X

Section	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1
Legs	P4x.237		P3.5x.226	ROHN 3 STD	ROHN 2.5 STD	ROHN 2.5 STD	ROHN 2 STD	ROHN 2 STD		SR 1 7/16
Leg Grade				L 2.5 x 2.5 x 3/16	L 1 3/4 x 1 3/4 x 1/8	L 1 3/4 x 1 3/4 x 1/8	L 1 1/2 x 1 1/2 x 1/8	L 1 1/2 x 1 1/2 x 1/8		SR 5/8" solid
Diagonals	L 3 1/2 x 3 1/2 x 1/4	L 3 x 3 x 3/16			L 2 x 2 x 1/8	L 1 3/4 x 1 3/4 x 1/8	L 1 1/2 x 1 1/2 x 1/8	L 1 1/2 x 1 1/2 x 1/8		L 1 1/2 x 1 1/2 x 1/8
Diagonal Grade										
Top Girts										
Bottom Girts										
Face Width (ft)	20.781	18.698	16.698	14.6525	12.604	10.5625	8.5625	6.5625	4.52	2.5
# Panels @ (ft)		6 @ 10	6 @ 10	6 @ 10	9 @ 6.66667	9 @ 6.66667	4 @ 5	10 @ 4	20 @ 1	20 @ 1
Weight (K)	10.3	2.3	1.6	1.4	1.4	0.7	0.8	0.8	0.4	0.5



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
PD220	200	PD220	160
RFS-220	200	Pirod 6' Side Mount Standoff (1)	160
Pirod 6' Side Mount Standoff (1)	200	PD220	140
4'6"x3" Pipe Mount	185	Pirod 6' Side Mount Standoff (1)	140
4' Dish w/Radome	185	RFS-220	130
Pirod 6' Side Mount Standoff (1)	180	Pirod 6' Side Mount Standoff (1)	130
Pirod 6' Side Mount Standoff (1)	180	DB5030 Outtrigger Assembly	130
PD220	180	(2) Yagi Antenna	60
PD220	180	Pirod 6' Side Mount Standoff (1)	60

MATERIAL STRENGTH

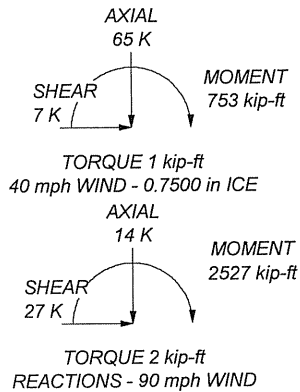
GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower is located in Manitowoc 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 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. TOWER RATING: 169%

MAX. CORNER REACTIONS AT BASE:

DOWN: 145 K
 UPLIFT: -127 K
 SHEAR: 16 K



W-T Communication Design Group

2675 Pratum Ave.
 Hoffman Estates, IL 60192
 Phone:
 FAX:

Job: **200ft SST at Viebahn, Manitowoc, WI**

Project: **T090468**

Client:

Drawn by: SDharia

App'd:

Code: TIA-222-G

Date: 04/30/09

Scale: NTS

Path: T:\T090468 SST VieBahn Tower\F - Consultant Dwg and Calc\15.E\T090468_proposed.dwg

Dwg No. E-1

RISATower W-T Communication Design Group 2675 Pratum Ave. Hoffman Estates, IL 60192 Phone: FAX:	Job 200ft SST at Viebahn, Manitowoc, WI	Page 17 of 17
	Project T090468	Date 18:20:28 04/30/09
	Client	Designed by SDharia

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	θP_{allow} K	% Capacity	Pass Fail
T1	200 - 180	Leg	1 7/16	3	-8.44	52.71	16.0	Pass
		Diagonal	5/8" solid	13	-1.67	1.79	93.2	Pass
		Top Girt	L1 1/2x1 1/2x1/8	4	-0.21	7.14	3.0	Pass
		Bottom Girt	L1 1/2x1 1/2x1/8	7	-0.65	7.14	9.2	Pass
T2	180 - 160	Leg	ROHN 2 STD	72	-20.88	36.81	56.7	Pass
		Diagonal	L1 1/2x1 1/2x1/8	98	-1.97	6.53	30.1	Pass
T3	160 - 140	Leg	ROHN 2 STD	105	-33.68	36.81	91.5	Pass
		Diagonal	L1 1/2x1 1/2x1/8	107	-1.64	3.88	42.3	Pass
T4	140 - 120	Leg	ROHN 2.5 STD	138	-47.78	57.14	83.6	Pass
		Diagonal	L1 1/2x1 1/2x1/8	140	-2.26	2.55	88.7	Pass
T5	120 - 100	Leg	ROHN 2.5 STD	165	-62.00	45.45	136.4	Fail X
		Diagonal	L1 3/4x1 3/4x1/8	167	-2.70	2.61	103.5	Fail X
T6	100 - 80	Leg	ROHN 2.5 STD	186	-76.80	45.45	169.0	Fail X
		Diagonal	L2x2x1/8	188	-3.01	3.02	99.7	Pass
T7	80 - 60	Leg	ROHN 3 STD	207	-92.23	70.89	130.1	Fail X
		Diagonal	L 2.5 x 2.5 x 3/16	209	-3.47	6.66	52.1	Pass
T8	60 - 40	Leg	P3.5x.226	228	-107.16	66.75	160.5	Fail X
		Diagonal	L3x3x3/16	230	-4.30	7.93	54.1	Pass
T9	40 - 20	Leg	P4x.237	243	-123.99	89.84	138.0	Fail X
		Diagonal	L3x3x3/16	245	-4.82	6.89	70.0	Pass
T10	20 - 0	Leg	P4x.237	258	-140.91	89.83	156.9	Fail X
		Diagonal	L3 1/2x3 1/2x1/4	260	-5.16	11.98	43.1	Pass
Summary								
Leg (T6)							169.0	Fail X
Diagonal (T5)							103.5	Fail X
Top Girt (T1)							3.0	Pass
Bottom Girt (T1)							9.2	Pass
RATING =							169.0	Fail X

STRUCTURAL TOWER MAPPING PREPARED FOR:

MANITOWOC COUNTY

Site Name: Viebahn

Site Number:

Address: 3110 Viebahn St Manitowoc WI

Latitude: 44.067424

Longitude: -87.688643

Date of Visit: 3-17-09

Tower Brand: Rohn

Tower Model #: SSV

Serial #:

Date of Manufacture: 1968



**W-T COMMUNICATION
DESIGN GROUP, LLC**

WIRELESS INFRASTRUCTURE

PREPARED BY:

DARYL SNOWDEN

CHECKLIST

Page Title	Initial	Page # (s)	Notes
Notes	WS		
Compound Plan Sketch	WS		
Ladder & Waveguide	N-A		
Tower Elevation			
Tower Section Elevation			
Tower Top Flange Info	WS		
Member Sizes	WS		
Transmission Cables	WS		
Ant. /Mount Sketch & Photo	WS		
Photo Log	WS		
Miscellaneous	WS		

PROFILE & SIGNATURE

Print your name and names of all crew members present on site.

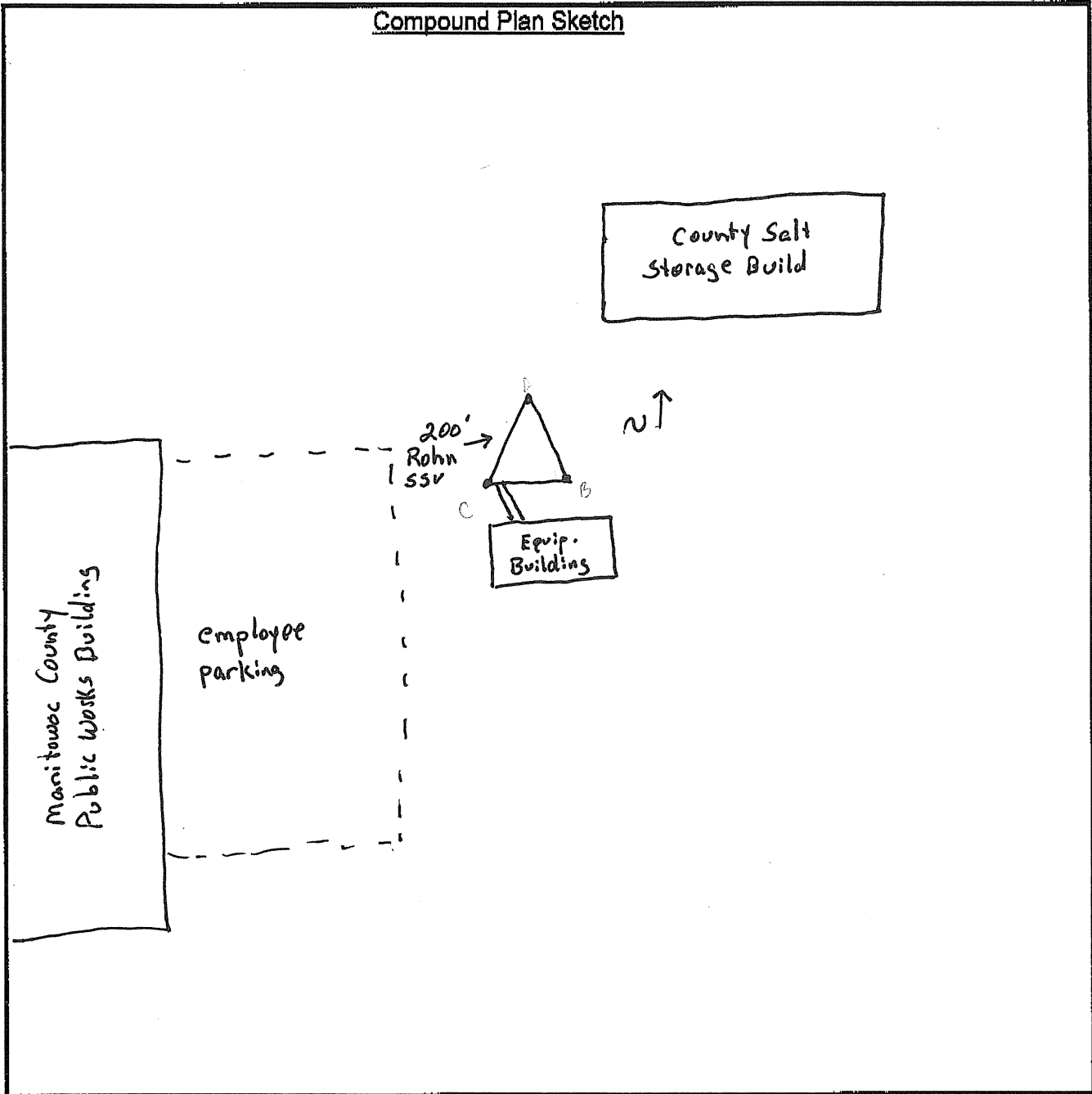
Crew Members:
(Please Print)
Daryl Snowden
Chris Jones
Signature of Crew Leader: <i>Daryl Snowden</i>
Mapping Completion Date: 3-17-09

NOTES

Longitude:	87.688643	
Ground Elevation:		
Site Address:	3110 Viebahn St. Manitowoc WI	
Directions:		
FCC #:	1063295	
Tower ID Plate:	N-A	
Telephone Company:	AT&T	
Pedestal # & Location:		
Power Company:	Wisconsin Power + Light	
Meter # & Location:		
Gate Combo:	Key	
Existing Carriers/Site Numbers	ALL equip on tower property of Manitowoc County Sheriff's Dept	

COMPOUND PLAN SKETCH

Draw plan view of compound showing all physical features and / or dimensions
Show magnetic north and designante tower leg "A" with magnetic azimuth



LADDER & WAVEGUIDE

Draw a front elevation view of climbing ladder(s) and waveguide ladder(s)
 Drawings should be **typical** when appropriate, showing dimensions

Climbing Ladder Sketch

Tower is not equipped with a climbing ladder
 Foot pegs for climbing from 2' - 180' on SW leg

Description	#	Height	Width	Step	Length	Diameter	Safety Wire type & size
Ladder							
Ladder							
Ladder							
Description	#	Height	Width	Step	Rail type & size	Rung type & size	Holes qty, size & spacing
Waveguide							
Waveguide							
Waveguide							
Waveguide							

ANTENNA LOADING SUMMARY SHEET

ELEV.	QTY.	ANT. MODEL	QTY. COAX	COAX SIZE	AZIMUTH	MOUNT TYPE	STATUS	CARRIER NAME
60'	1	Ham Radio Ant.	1	1/2"	SW 3	6' side arm	Good	Private
140'	1	PD-220 omni	1	1/2"	N 3	6' side arm	Good	MCSD
160'	1	PD-220 omni	1	7/8"	W 3	6' side arm	Good	MCSD
180'	1	PD-220 omni	1	1 1/4"	S 3	6' side arm	Good	MCSD
180'	1	PD-220 omni	1	7/8"	E 3	6' side arm	Good	MCSD
200'	1	PD-220 omni	1	7/8"	SE leg	leg mount	Good	MCSD

All antennas except Ham Radio antenna at 60' level are omni 20' fiberglass whip type.

MISCELLANEOUS

During previous inspections Flaking rust and rusty water was found in leg weep holes
Concrete leg piers are flaking and cracking
Tower is approx 50-60' from County salt storage shed

mc50- Uiebahn Tower - Photo Log

3-30-09

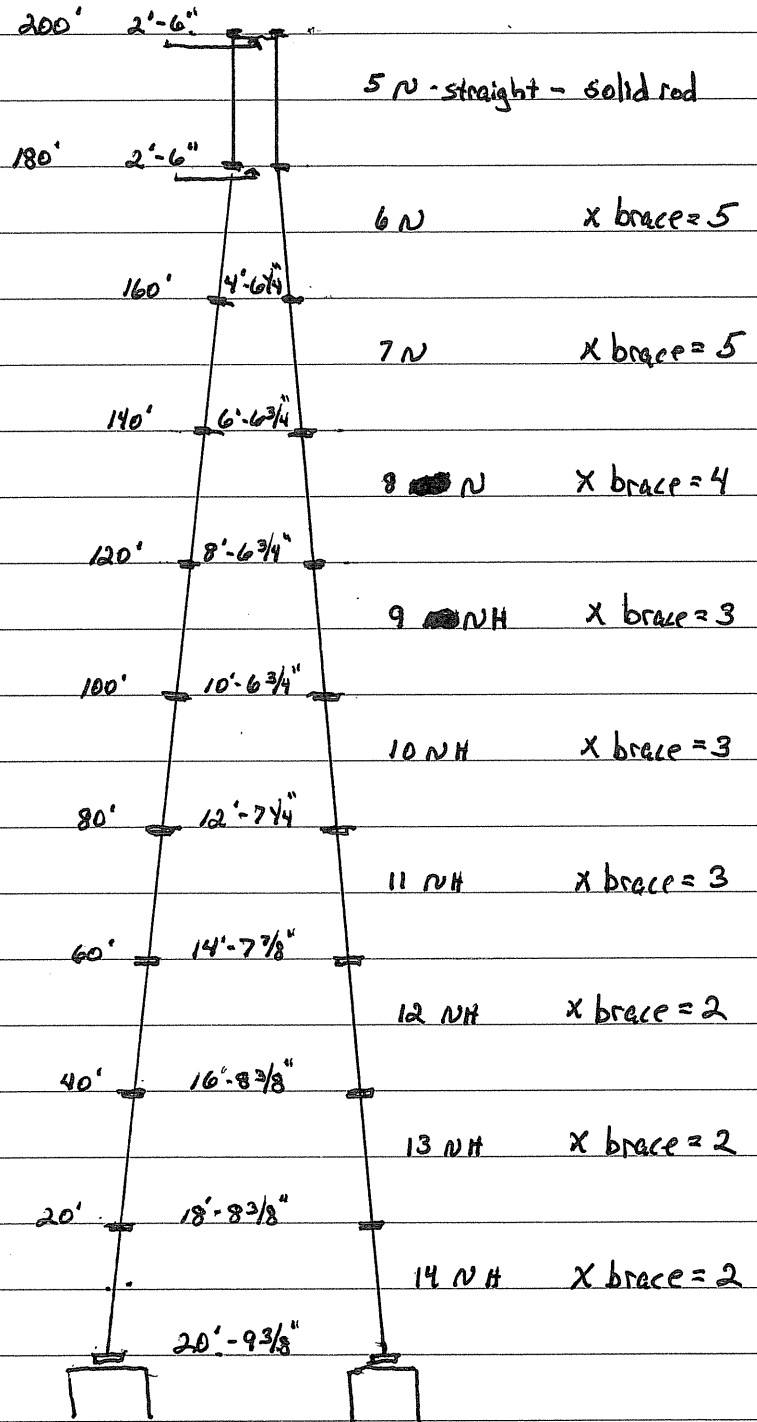
200 ft Rohn SSV

- (1) PD-220 antenna sway brace leg clamp typ.
- (2) PD-220 antenna sway brace typ
- (3) "Ham" Radio antenna on 6' side arm at 60 ft level
- (4) (5) (6) Tower side markers (3) @ 100 ft level
- (8) (7) PD-220 omni antenna on 6 ft side arm
- (9) Lighting junction box @ 100 ft level
- (16) (10) PD-220 antenna sway brace
- (17) (11) PD-220 on 6 ft side arm
- (18) (13) (12) PD-220 sway brace leg clamp
- (15) (14) PD-220 6 ft side arm leg clamp
- (19) 300 mm code beacon at 200 ft level on SE leg
- (20) PD-220 antenna on 2 1/2" x 3" leg mounted mast pipe at 200' level
- (21) mast pipe leg clamp at 200' level
- (22) site signage - and adjacent salt storage shed
- (23) Beacon light and PD-220 antenna at 200' level
- (24) View of compound from 200' level
- (25) Tower view from ground showing South tower face and 3/4" rigid conduit
- (26) leg piers
- (27) Over-all tower view from West
- (28) County owned salt storage building near tower
- (29) Lighting controller and ice bridge at approx 10 ft level

4-14-09

MCSD - Viebahn Tower

Rohn 200ft self-support



notes =

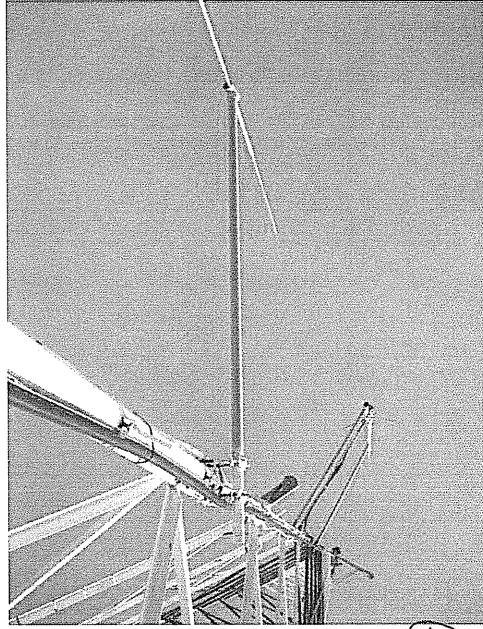
- 1) over-all condition - Poor
- 2) visible rust - rust particles visible in leg weep-holes
on N leg @ 40', 60', 80' SE leg @ 60', 80', 120'
SW leg @ base, 40', 60'
- 3) loose or missing hardware - none
- 4) bent or missing structural members - none
- 5) tower re-painted 2004

(9) 20 ft tapered sections (1) 20 ft straight section (solid)

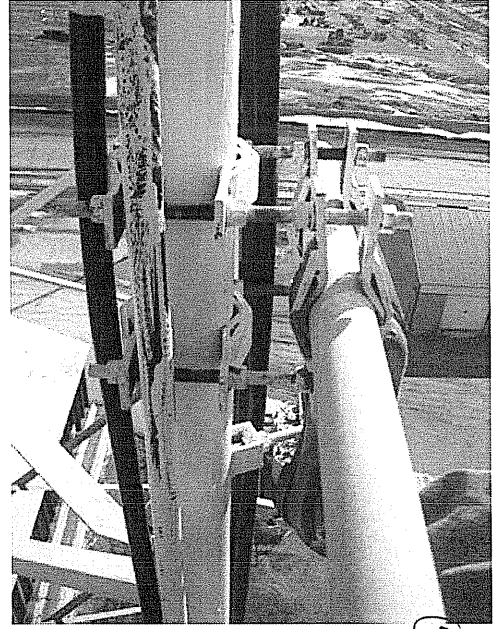
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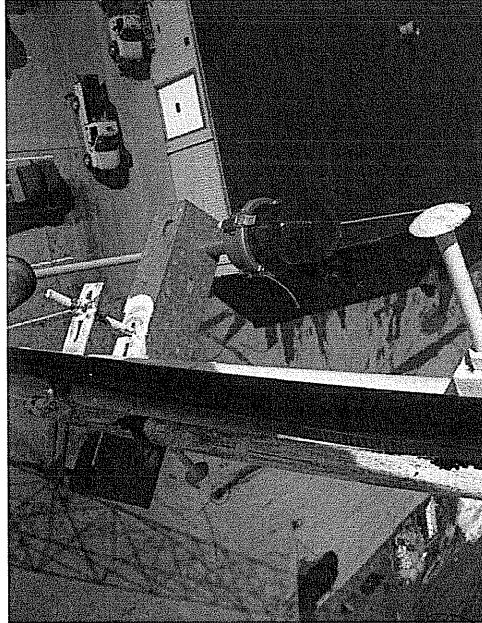
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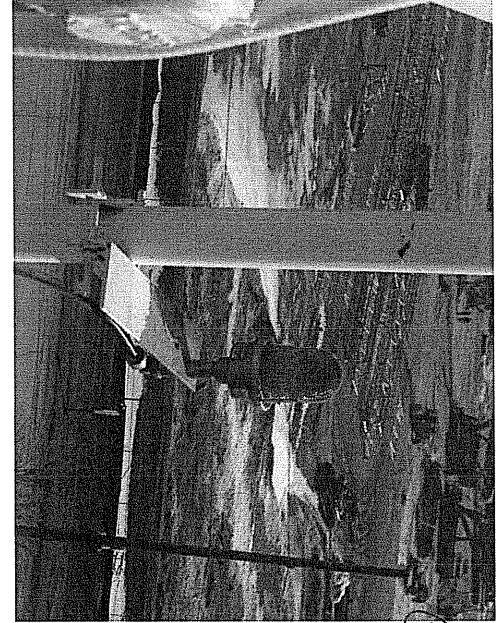
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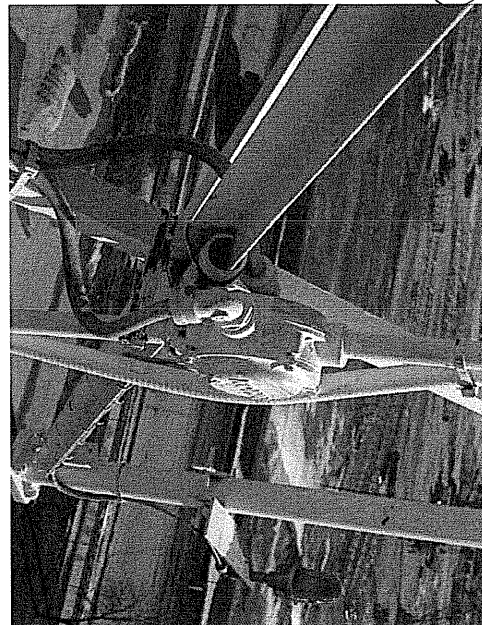
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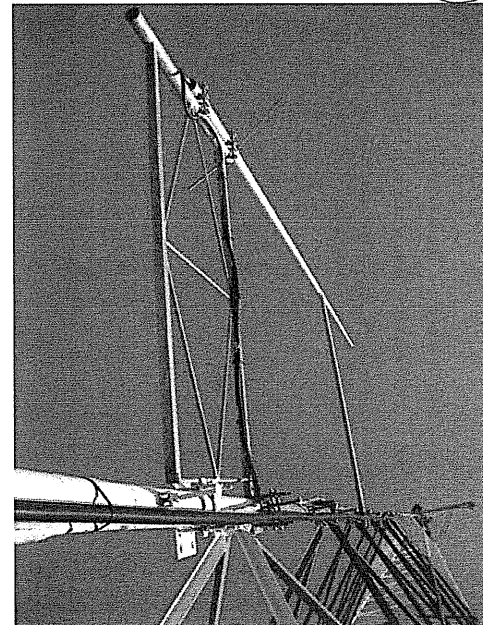
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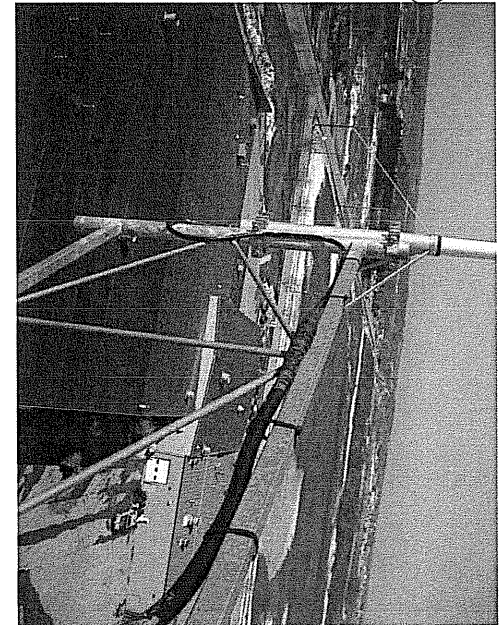
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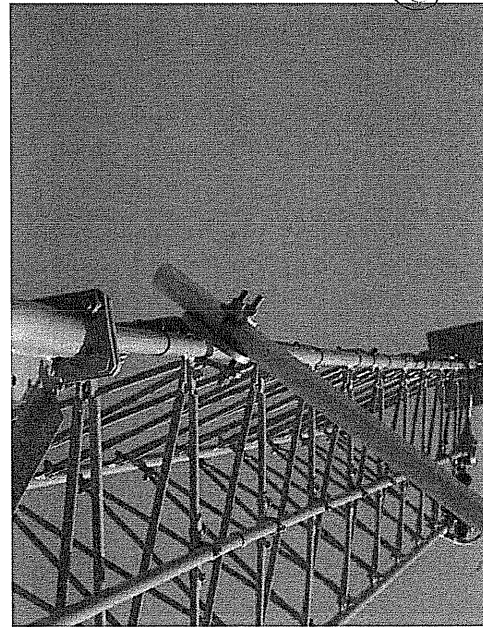
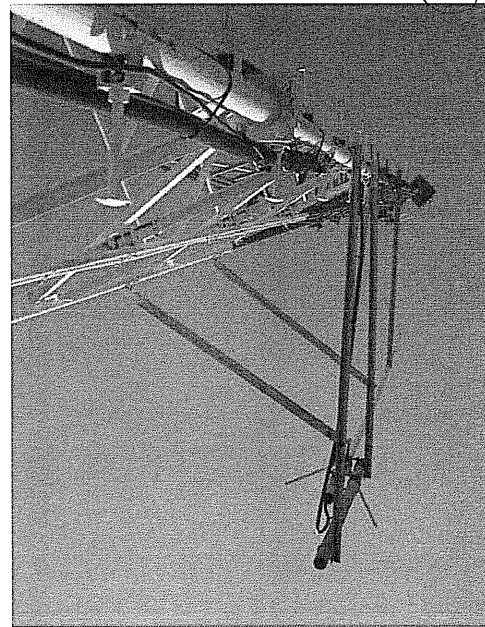
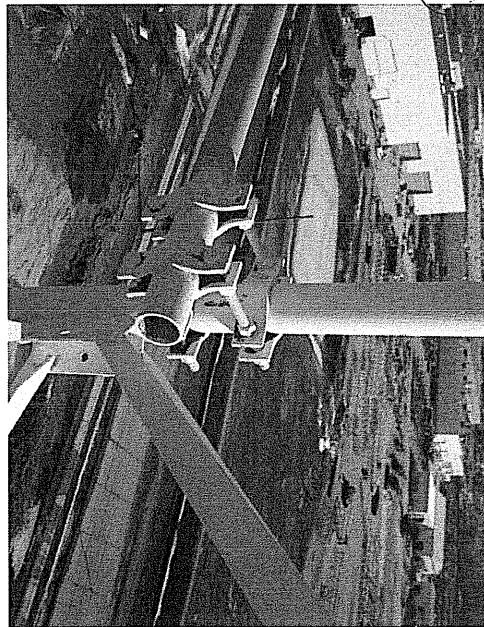
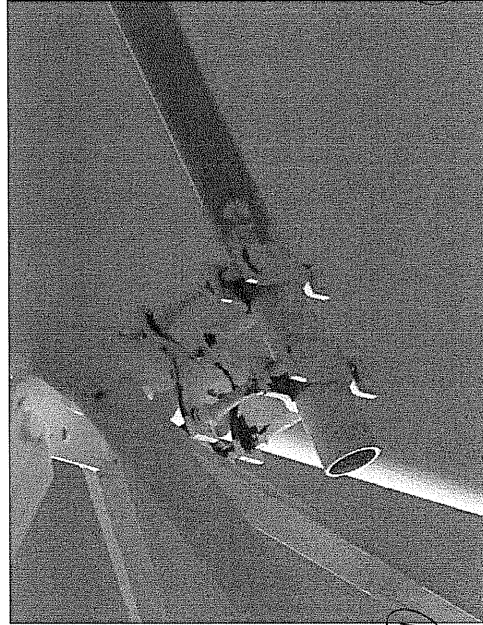
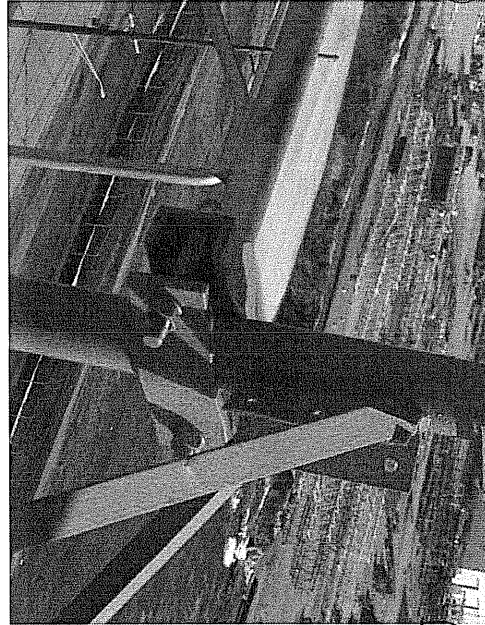
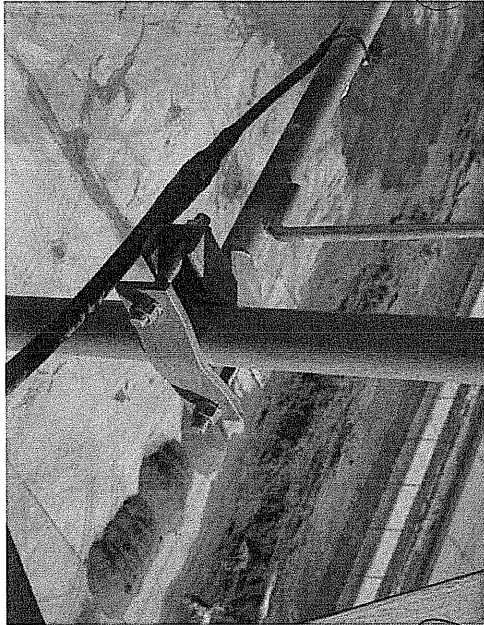
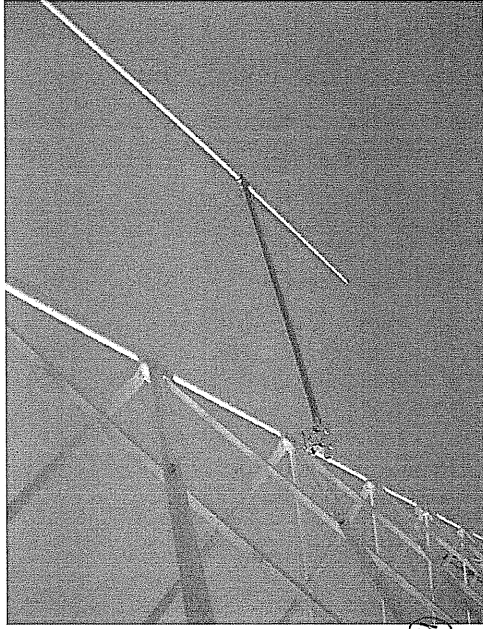
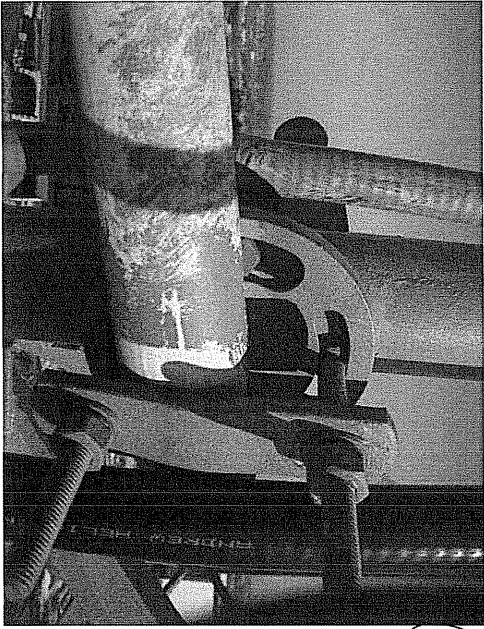


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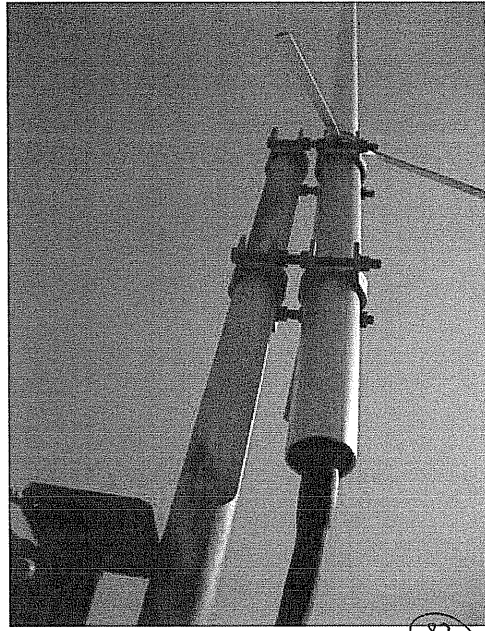




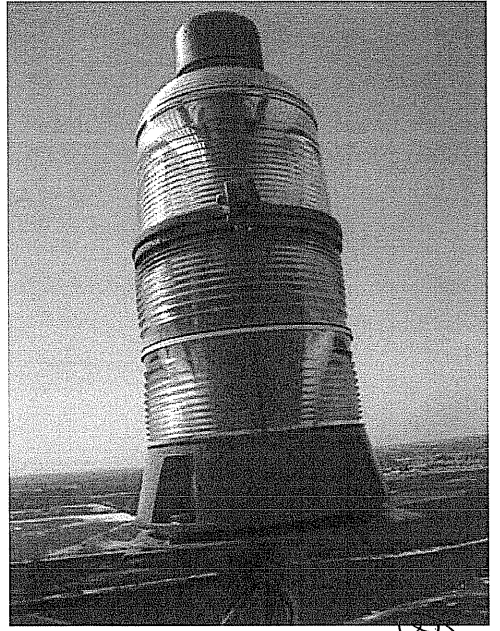
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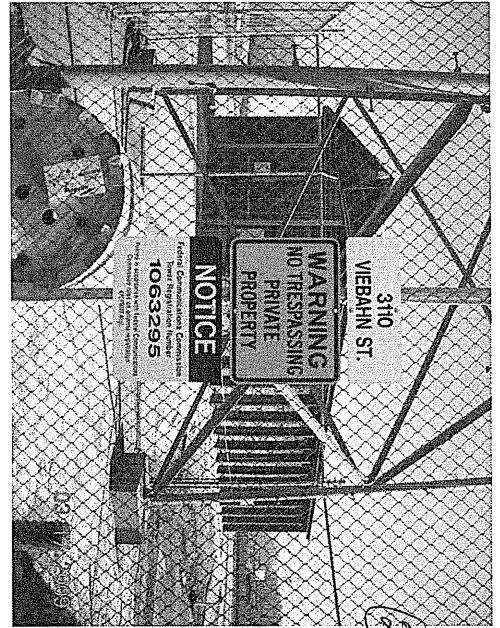
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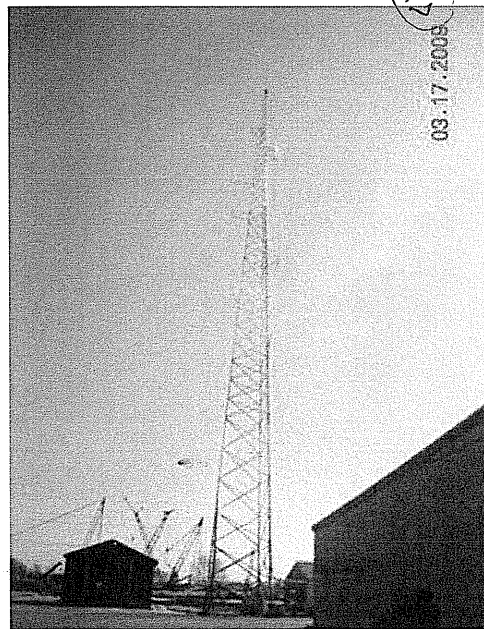
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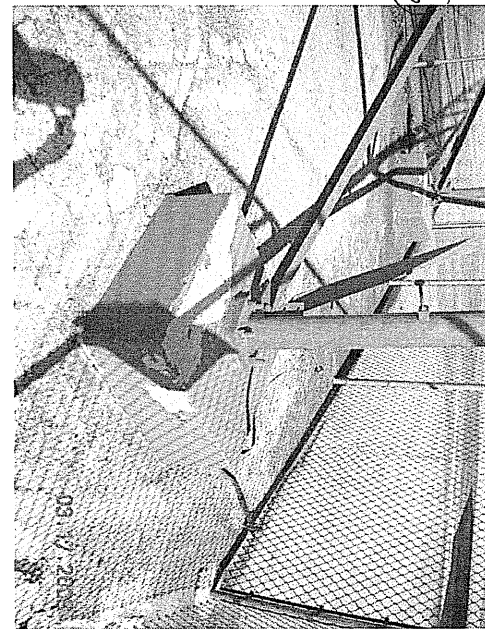
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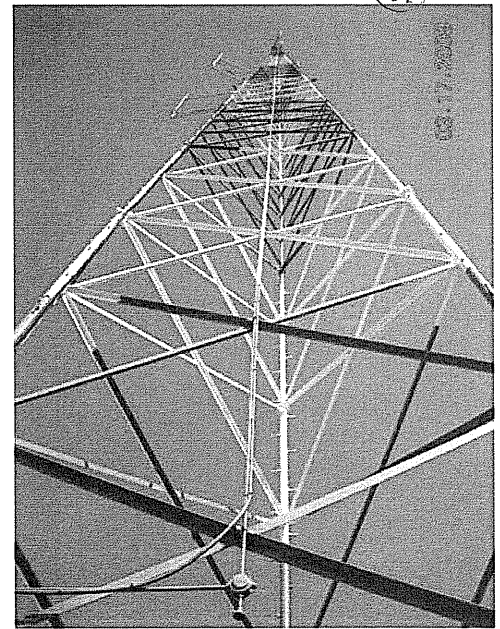
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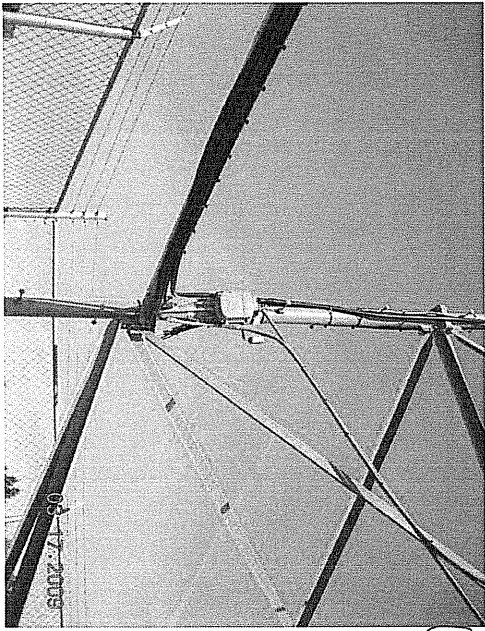


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