NorthWest Tower Engineering

WSDOT Hyak, WA

60-ft Self-Supporting Tower
Extend to 90-ft

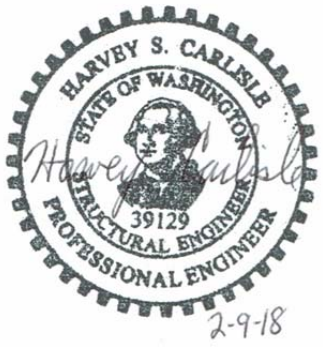
Odelia Pacific / PSERN

Structural Analysis Report No. 181700.03
February 9, 2018

Analysis and Report by: Harvey Carlisle, S.E.

Checked by: Kirk Wieber, P.E. & Steven Diamond, P.E.

Approved by: Harvey Carlisle, S.E.



NorthWest Tower Engineering

Hyak, WA | Report No. 181700.03 | February 9, 2018

Introduction

NorthWest Tower Engineering (NWTE) has completed a structural analysis of a 60-foot self-supporting tower at the Washington State Department of Transportation (WSDOT) maintenance facility in Hyak, WA. The analysis was performed at the request of Odelia Pacific to determine the feasibility of extending the tower 30' to support proposed Puget Sound Emergency Radio Network (PSERN) equipment.

Tower Information

NWTE visited the site on 10-31-17 to gather information for the structural analysis. The tower is a Rohn Model SSV (File No. 29716AE). Rohn tower and foundation drawings dated 05-16-95 and 04-28-95 were provided (File No. 29716AE; Drawing Nos. A951637, A951462 Sheets1-3). The foundation drawing references geotechnical boring logs dated 04-07-95 by Geo Engineers. The boring logs were not provided. A WSDOT as-built foundation drawing dated 11-12-03 was provided (Project No. 5119DB01). If further information useful to the analysis is presented, then a revised report may be issued.

Assessed Condition

This analysis was performed to determine the ability of the tower to support the following load conditions (continued on the next page):

Existing Appurtenances

Elevation	Location	Appurtenance	Tx Line	Tx Line No.
17'	Leg A (N)	Single Loop Dipole	1/4" Coax	# 15
36'	Leg B (SE)	16"x12" Panel	(3) 3/8" Coax	# 6,7,8
40'	Interior	Platform	N/A	N/A
42'	Leg A (N) Face A & B	CCTV Camera (2) 12"x12"x6" Junction Boxes	3/4" Conduit	# 1
42'	Leg C (SW)	18"x18"x8" Junction Box	1/4" Coax	# 9
45'	Leg C (SW)	CCTV Camera	3/4" Conduit	# 1
44'	Leg B (SE)	Commscope VHLP4-11W 4' HP MW Dish w/(2) ODU (WSDOT, Stampede Pass)	(2) ½" Coax	# 4, 13
52'	Leg A (N)	2' Standard MW Dish w/(2) ODU (WSDOT, Dodge Ridge)	(2) ½" Coax	# 12, 14
55'	Interior	Platform	N/A	N/A
56'	Leg A (N)	Empty Pipe Mount	N/A	N/A
59'	Leg C (SW)	Commscope P8-105 8' MW Dish w/Radome (WSDOT, Stampede Pass)	EW90	# 5
63'	Leg A (N)	5' Omni Mast (VHF) on Pipe Extension (WSP)	½" Coax	# 3
63'	Leg B (SE)	12' Omni Mast on Pipe Extension	½" Coax	# 11
63'	Leg C (SW)	3' Omni Mast (800 MHz) on Pipe Extension	½" Coax	# 2

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Proposed Appurtenances

All existing antennas plus the following:

Elevation	Location	Appurtenance	Tx Line	Tx Line No.
35’	Leg C (SW)	**Proposed** 6’ HP MW Dish (PSERN, Stampede Pass)	**Proposed** EW65	# 18
60’-90’	Tower Top	**Proposed Tower Extension** (1) 20’ Tower Section (1) 10’ Tower Section	N/A	N/A
63’	Leg A (N)	**Relocate** 5’ Omni Mast (VHF) Onto New Standoff Mount (WSP)	**Reuse** ½” Coax	# 3
63’	Leg B (SE)	**Remove** 12’ Omni Mast (WSDOT)	**Remove** ½” Coax	# 11
65’	Leg C (SW)	**Relocate** 3’ Omni Mast (800 MHz) Onto New Standoff Mount (WSDOT)	**Reuse** ½” Coax	# 2
80’	Leg A (N)	**Proposed** Commscope HP4-107 4’ HP MW Dish (WSDOT, Dodge Ridge) On Exist Pipe Mount (Pipe Mount Relocated from 56’)	**Proposed** EW90	# 17
85’	Leg A (N)	**Proposed** 4’ HP MW Dish (PSERN, Dodge Ridge)	**Proposed** EW65	# 19
90’	Leg B (SE)	**Proposed** DB Spectra DS7D06F36U-N (WSDOT) 7’ Omni Mast, Mounted to Tower Leg	**Proposed** 7/8” Coax	# 16
86’	Leg C (SW)	**Proposed** 4’ Lightning Rod on 15’ Pipe Extension (Tip Height = 104’)	N/A	N/A

Antenna center elevations are listed for microwave, yagi, and panel type antennas. Base elevations are listed for other antenna types.

Information on tower geometry and structural member sizes was taken from the drawings and confirmed on site. Antenna and feed line information was gathered during NWTE’s site visit. Proposed antenna and feed line information was provided by Odelia Pacific in an email dated 10-12-17 and by WSDOT in emails dated 11-02-17, 11-03-17, 12-12-17, 02-08-18.

Yield strengths for structural steel members are given by Rohn as follows:

- Pipe Legs 50 ksi
- Angle Bracing 36 ksi

The attached drawings show tower geometry, structural member sizes, existing antennas, feed lines, and other supported appurtenances.

Wind Load Specifications

A rigorous structural analysis was performed using the provisions of the current design standard, TIA-222-G, "Structural Standard for Antenna Supporting Structures and Antennas." This standard is referenced in the 2015 International Building Code. The minimum basic wind speed of 85 mph (V_{asd}, 3-second gust) as listed in the standard for Kittitas County, Washington was used. A basic wind speed of 50 mph (V_{asd}, 3-second gust) in combination with a design ice thickness of 1 inch was also considered. Exposure Category C, Topographic Category 1 (no wind speed-up effect), and Structure Class III (structure used for essential communications) were used for the analysis.

Wind loads calculated using a basic wind speed of 85 mph (V_{asd}) with a wind load factor of 1.6 and importance factor of 1.15 for Class III structures per the TIA-222-G standard are similar to those calculated using an ultimate design wind speed of 115 mph (V_{ult}) for Risk Category IV with wind load and importance factors of 1.0 per the 2015 IBC and ASCE 7-10 standard.

Analysis Method

A three-dimensional finite element model of the tower was created using *tnxTower Version 7.0.7.0 (Tower Numerics, 2016)*. This computer software program calculates and distributes wind and ice loads in the model. It calculates the resulting forces (required strength) in all structural members and determines tower deflections and foundation loads. Required strength of each structural member is compared to each member's design strength determined using the TIA-222-G standard.

Analysis Results

The following ratios of required strength to design strength for the tower's structural members were found:

MEMBER STRENGTH RATIO

Elevation (ft)	Member	Existing Configuration Maximum % Capacity	Proposed Configuration w/ 30' Extension Maximum % Capacity
90 – 60	Leg	N/A	18
	Diagonal	N/A	38
	Horizontal	N/A	7
60 - 0	Leg	49	107
	Diagonal	43	112
	Horizontal	8	11

The attached tables contain more detailed lists of member forces and capacities. For the proposed configuration, capacities of leg members were found to be exceeded in the bottom section and capacities of diagonal bracing members were found to be exceeded between 20'-60'.

The tower rests on a 17'-6" square by 4' thick concrete mat. The tower centroid is offset from the center of the foundation approximately 2'-6" to the southwest. The base of the North leg has an extra base plate and (2) ¾" diameter post installed anchors in addition to the original anchor bolts. The post installed anchors were added because two of the original anchor bolts were damaged prior to tower erection. The repair was designed by Rohn.
Calculations confirmed the adequacy of the foundation.

Calculations confirmed the adequacy of the anchor bolts and the bolts in each leg splice and bracing connection. Welds, plates, and other elements of the connections are assumed to be adequate.

Seismic calculations were performed using the equivalent modal analysis procedure as set forth in Section 2.7 of the TIA-222-G standard. Seismic forces on each 20-ft section of the tower were calculated. The total seismic shear is much less than the total wind load. The capacities of each structural member were found to be adequate when the seismic forces were distributed as specified over the full height of the tower.

The extended tower was found to fall within the Twist and Sway limitations for microwave antennas set forth in the TIA-222-G Standard for 3dB degradation in RF signal. Calculated twist and sway values at each microwave dish location for 60-mph (V_{asd}, 3-second gust) wind were found not to exceed allowable values. Operating frequencies of 6GHz & 11GHz were assumed.

Conclusion

The extended tower does not meet the requirements of the TIA-222-G standard for the proposed antenna configuration considered. NWTE recommends the following structural modifications to bring the tower into compliance with the TIA-222-G standard and WSDOT maximum capacity requirement of **90%**:

- Replace diagonal bracing members with members of higher capacity in the sections between 20'-60'.
- Install mid-bay horizontal bracing members in the section between 0'-20'.
- Replace damaged diagonals 0'-7' noted during NWTE site visit.

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An analysis was performed considering the structural modifications listed above. Results show that strength ratios of all structural members are reduced to acceptable levels.

MEMBER STRENGTH RATIO

Elevation (ft)	Member	Proposed Configuration w/ 30' Extension & Structural Mods Maximum % Capacity
90 – 60	Leg	18
	Diagonal	38
	Horizontal	7
60 - 0	Leg	79
	Diagonal	62
	Horizontal	19

Conditions of Analysis

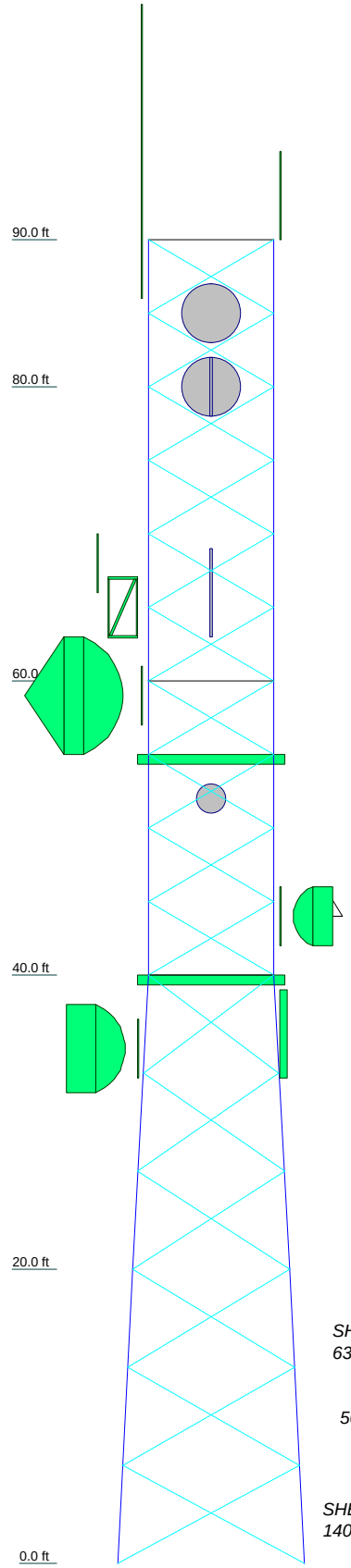
The analysis performed and the conclusions contained herein are based on the following assumptions:

- The tower has been properly installed and maintained.
- Steel grades for structural members are as listed above.
- No x-ray, subsurface excavation, or other similar examination of the tower, foundation system, or welded connections was conducted. For portions of the tower and foundation system that were not visually accessible, no determination regarding the condition or adequacy was made.
- All structural components of the tower including, but not limited to, structural members (legs, bracing, etc.), connection components (gusset plates, welds, bolts), and foundations are in good condition. Deficiencies found during the site visit will be corrected.
- Proposed microwave dishes will be installed with standard pipe mounts and stabilizers as recommended by the manufacturer.
- Pipe extensions at the top of the existing tower will be removed. Existing omni antennas at the top of tower that are to remain will be placed on new standoff mounts.
- Proposed WSDOT omni antenna will be placed on a standard standoff mount or mounted to tower leg.
- Proposed PSERN feed lines will be placed on a new waveguide ladder. Proposed WSDOT feed lines will be placed on the existing waveguide ladder.

Deviations to these assumptions may affect the analysis results.

Section	T1	T2	T3	T4	T5
Legs	ROHN 2.5 STD (2.875"x.203)			ROHN 2.5 EH (2.875"x.276)	
Leg Grade	A572-50				
Diagonals	L1 3/4x1 3/4x3/16		L1 3/4x1 3/4x1/8	L2x2x1/8	L2 1/2x2 1/2x3/16
Diagonal Grade	A36				
Top Girts	L2x2x1/8	N.A.	L2x2x1/8		N.A.
Face Width (ft)	8.5625			10.6042	
# Panels @ (ft)	10 @ 5			6 @ 6.66667	
Weight (lb)	493.0	876.1	757.1	875.0	1225.7

4227.0



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
DB Spectra DS7D06F36U-N (WSDOT)	90	Platform	55
4' Lightning Rod on 15' Extension Pipe (Tip 104')	86	2' MW STD (WSDOT, Dodge Ridge)	52
Dish Mount (PSERN)	85	CCTV	45
4' MW HP (PSERN, Dodge Ridge)	85	4' MW HP (WSDOT, Stampede)	44
Dish Mount (relocate)	80	Dish Mount	44
4' MW HP (WSDOT, Dodge Ridge)	80	Junction Box	42
Standoff Mount (WSDOT)	65	CCTV	42
3' omni (WSDOT, relocated)	65	Junction Box	42
Standoff Mount (WSP)	63	Junction Box	42
5' omni (WSP, relocate)	63	Platform	40
Dish Mount	59	Platform	40
8' MW RAD (WSDOT, Stampede)	59	Platform	40
Platform	55	16"x12" Panel	36
Platform	55	6' MW HP (PSERN, Stampede)	35
		Dish Mount (PSERN)	35
		Single Loop Dipole	17

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 85 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0'
7. TOWER RATING: 111.9%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 65544 lb
SHEAR: 8349 lb

UPLIFT: -54668 lb
SHEAR: 7046 lb

AXIAL 54520 lb
SHEAR 6322 lb *MOMENT 312360 lb-ft*

TORQUE 2846 lb-ft
50 mph WIND - 1.0000 in ICE

AXIAL 9641 lb
SHEAR 14001 lb *MOMENT 681049 lb-ft*

TORQUE 10680 lb-ft
REACTIONS - 85 mph WIND

NWTE

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Phone: 425 258 4248
FAX: 425 258 4289

Job:	***181700.03 90-ft SSV WSDOT Hyak, WA***		
Project:	***Proposed Extension Vasd=85-mph, 50-mph With 1" Ic***		
Client: Odelia/PSERN	Drawn by: Steven Diamond	App'd:	
Code: TIA-222-G	Date: 02/09/18	Scale: NTS	
Path:		Dwg No. E-1	

NorthWest Tower Engineering
2210 Hewitt Ave. Suite 209
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Phone: 425-258-4248
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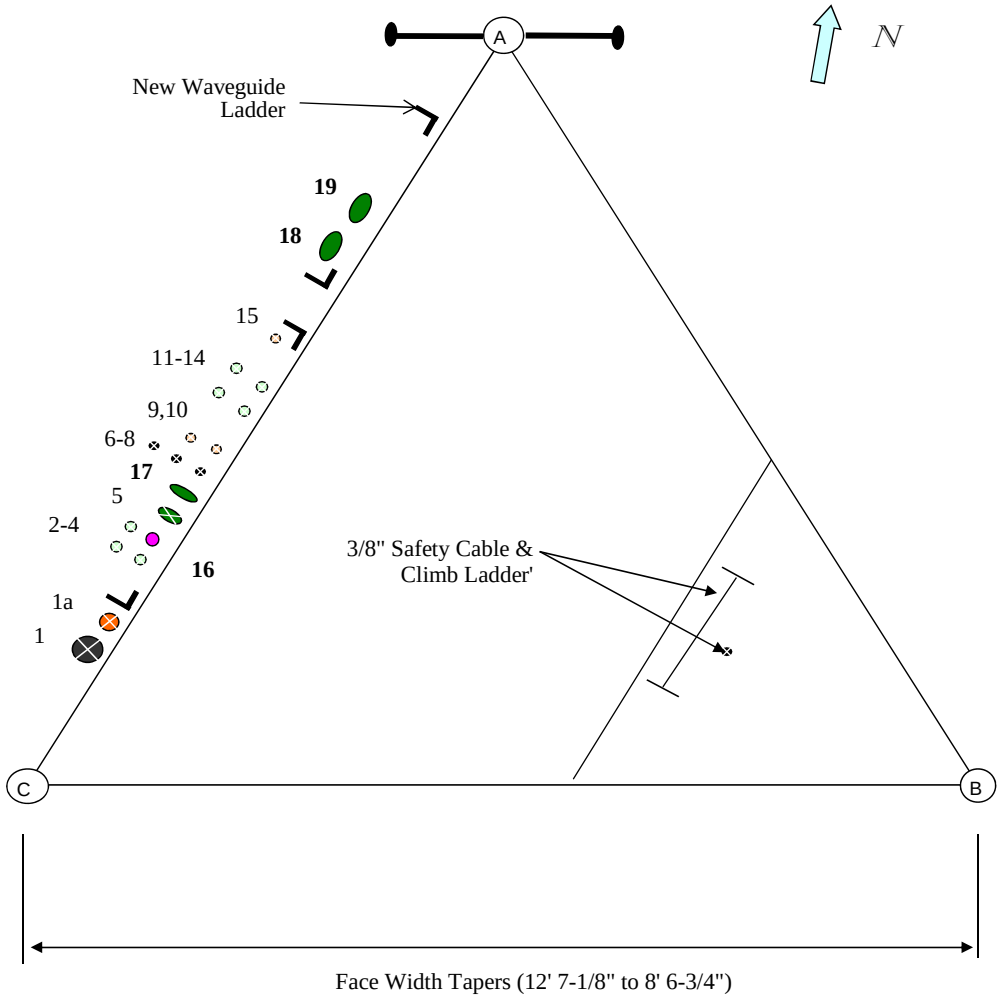
Job Name:	60-ft S.S. (Extend to 90') - WSDOT Hyak, WA	Page:	A-1
Project Number:	181700.03	Date:	2/9/2018
Client Name:	Odelia Pacific / PSERN	By:	HC

EXISTING FEEDLINES

Coax Number	Coax Description	Termination Elevation	Coax Key
1	3" Conduit	45'	
1a	1" Conduit	45'	
	3/4" Flex Conduit	45' to 60'	
2	1/2" Coax	63'	
3	1/2" Coax	63'	
4	1/2" Coax	52'	
5	EW90	59'	
6-8	(3) 3/8" Coax	36'	
9	1/4" Coax	42'	
10	1/4" Coax (dead)	26'	
11	1/2" Coax **(remove)**	63'	
12	1/2" Coax	52'	
13	1/2" Coax	44'	
14	1/2" Coax	52'	
15	1/4" Coax	17'	

PROPOSED FEEDLINES

16	7/8" Coax	90'	
17	EW90	80'	
18	EW65	35'	
19	EW65	85'	



tnxTower	Job	Page
	181700.03 60-ft SSV WSDOT Hyak, WA	1 of 1
NorthWest Tower Engineering 2210 Hewitt Ave Everett, WA 98201 Phone: 425 258 4248 FAX: 425 258 4289	**Project** Existing Vasd=85-mph, 50-mph With 1" Ice	**Date** 14:35:20 02/09/18
	Client Odelia/PSERN	**Designed by** Steven Diamond

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
T1	60 - 40	Leg	ROHN 2.5 STD (2.875"x.203)	1	-7537.50	57192.30	13.2	Pass
		Diagonal	L1 3/4x1 3/4x3/16	11	-1857.09	5170.40	35.9	Pass
		Top Girt	L2x2x1/8	5	-146.50	1823.87	8.0	Pass
T2	40 - 20	Leg	ROHN 2.5 EH (2.875"x.276)	33	-17386.60	58511.80	29.7	Pass
		Diagonal	L2x2x3/16	41	-2027.06	4716.47	43.0	Pass
		Top Girt	L2x2x1/8	36	-52.70	2716.41	1.9	Pass
T3	20 - 0	Leg	ROHN 2.5 EH (2.875"x.276)	57	-28717.00	58516.20	49.1	Pass
		Diagonal	L2 1/2x2 1/2x3/16	62	-2289.10	7215.05	31.7	Pass
							36.2 (b)	
							Summary	
						Leg (T3)	49.1	Pass
						Diagonal (T2)	43.0	Pass
						Top Girt (T1)	8.0	Pass
						Bolt Checks	36.2	Pass
						RATING =	**49.1**	**Pass**

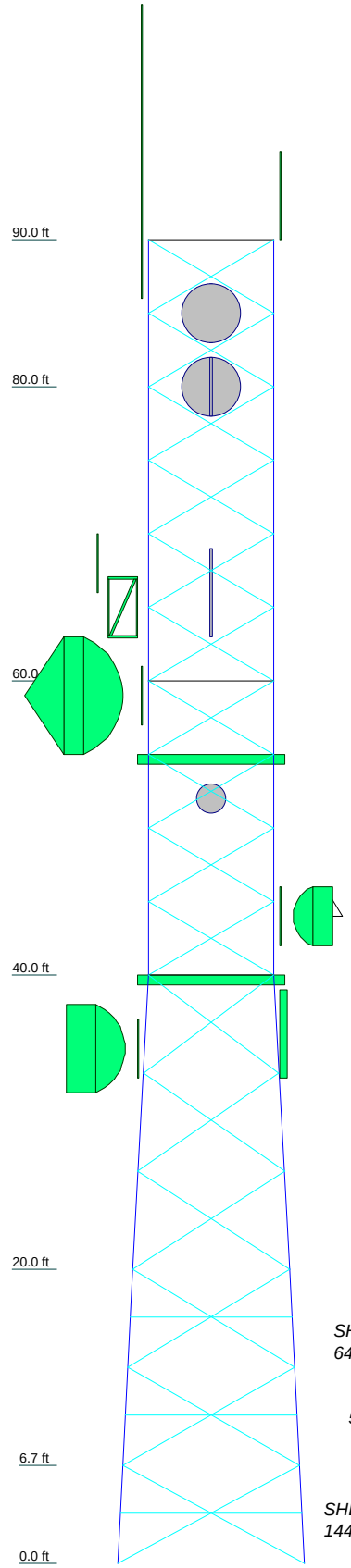
Program Version 7.0.7.0 - 7/18/2016 File:P:/Projects 2018/King County PSERN/181700.03 60' SS WDSOT Hyak, WA ReAN PSERN/Analysis/181700.03 60' SSV WSDOT Hyak, WA existing.eri

tnxTower	Job	Page
	181700.03 90-ft SSV WSDOT Hyak, WA	1 of 1
NorthWest Tower Engineering 2210 Hewitt Ave Everett, WA 98201 Phone: 425 258 4248 FAX: 425 258 4289	**Project** Proposed Extension Vasd=85-mph, 50-mph With 1" Ice	**Date** 14:34:02 02/09/18
	Client Odelia/PSERN	**Designed by** Steven Diamond

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
T1	90 - 80	Leg	ROHN 2.5 STD (2.875"x.203)	3	-2697.32	57192.30	4.7	Pass
		Diagonal	L1 3/4x1 3/4x3/16	9	-825.94	5170.40	16.0	Pass
		Top Girt	L2x2x1/8	6	-118.38	1823.87	6.5	Pass
T2	80 - 60	Leg	ROHN 2.5 STD (2.875"x.203)	21	-10349.50	57192.30	18.1	Pass
		Diagonal	L1 3/4x1 3/4x3/16	24	-1975.07	5170.40	38.2	Pass
T3	60 - 40	Leg	ROHN 2.5 STD (2.875"x.203)	47	-27156.40	57192.30	47.5	Pass
		Diagonal	L1 3/4x1 3/4x1/8	56	-3446.59	3581.11	96.2	Pass
		Top Girt	L2x2x1/8	50	-60.93	1838.00	3.3	Pass
T4	40 - 20	Leg	ROHN 2.5 EH (2.875"x.276)	78	-45321.20	58511.80	77.5	Pass
		Diagonal	L2x2x1/8	86	-3640.18	3252.87	111.9	Fail ✗
		Top Girt	L2x2x1/8	81	-193.10	1838.00	10.5	Pass
T5	20 - 0	Leg	ROHN 2.5 EH (2.875"x.276)	102	-62694.20	58516.20	107.1	Fail ✗
		Diagonal	L2 1/2x2 1/2x3/16	107	-3747.02	7215.05	51.9	Pass
							59.1 (b)	
							Summary	
						Leg (T5)	107.1	Fail ✗
						Diagonal (T4)	111.9	Fail ✗
						Top Girt (T4)	10.5	Pass
						Bolt Checks	91.2	Pass
						RATING =	**111.9**	**Fail ✗**

Section	T1	T2	T3	T4	T5	T6	
Legs	ROHN 2.5 STD (2.875"x.203)			ROHN 2.5 EH (2.875"x.276)			8.5625
Leg Grade	A572-50						10 @ 5
Diagonals	L1 3/4x1 3/4x3/16		L2x2x1/4		L2 1/2x2 1/2x3/16	L3x3x1/4	
Diagonal Grade	A36						
Top Girts	L2x2x1/8	N.A.	L2x2x1/8		N.A.		
Sec. Horizontals	N.A.				L2x2x1/4		10.6042
Face Width (ft)	12.6042					11.9375	
# Panels @ (ft)	6 @ 6.66667						
Weight (lb)	493.0	876.1	1175.1	1199.6	1022.1	690.1	5456.0



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
DB Spectra DS7D06F36U-N (WSDOT)	90	Platform	55
4' Lightning Rod on 15' Extension Pipe (Tip 104')	86	2' MW STD (WSDOT, Dodge Ridge)	52
Dish Mount (PSERN)	85	CCTV	45
4' MW HP (PSERN, Dodge Ridge)	85	4' MW HP (WSDOT, Stampede)	44
Dish Mount (relocate)	80	Dish Mount	44
4' MW HP (WSDOT, Dodge Ridge)	80	Junction Box	42
Standoff Mount (WSDOT)	65	CCTV	42
3' omni (WSDOT, relocated)	65	Junction Box	42
Standoff Mount (WSP)	63	Junction Box	42
5' omni (WSP, relocate)	63	Platform	40
Dish Mount	59	Platform	40
8' MW RAD (WSDOT, Stampede)	59	Platform	40
Platform	55	16"x12" Panel	36
Platform	55	6' MW HP (PSERN, Stampede)	35
		Dish Mount (PSERN)	35
		Single Loop Dipole	17

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 85 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0'
7. TOWER RATING: 78.5%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 66911 lb
SHEAR: 8771 lb

UPLIFT: -55019 lb
SHEAR: 7193 lb

AXIAL 57814 lb
SHEAR 6426 lb *MOMENT 314581 lb-ft*
TORQUE 2846 lb-ft
50 mph WIND - 1.0000 in ICE

AXIAL 11116 lb
SHEAR 14452 lb *MOMENT 690596 lb-ft*
TORQUE 10682 lb-ft
REACTIONS - 85 mph WIND

NWTE
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Phone: 425 258 4248
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Job:	***181700.03 90-ft SSV WSDOT Hyak, WA***		
Project:	***Proposed Extension & UG Vasd=85-mph, 50-mph With 1" Ic***		
Client: Odelia/PSERN	Drawn by: Steven Diamond	App'd:	
Code: TIA-222-G	Date: 02/09/18	Scale: NTS	
Path:		Dwg No. E-1	

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
T1	90 - 80	Leg	ROHN 2.5 STD (2.875"x.203)	3	-2695.80	57192.30	4.7	Pass
		Diagonal	L1 3/4x1 3/4x3/16	9	-827.87	5170.40	16.0	Pass
		Top Girt	L2x2x1/8	6	-119.05	1823.87	6.5	Pass
T2	80 - 60	Leg	ROHN 2.5 STD (2.875"x.203)	21	-10345.70	57192.30	18.1	Pass
		Diagonal	L1 3/4x1 3/4x3/16	24	-1973.62	5170.40	38.2	Pass
T3	60 - 40	Leg	ROHN 2.5 STD (2.875"x.203)	47	-27352.20	57192.30	47.8	Pass
		Diagonal	L2x2x1/4	56	-3508.78	10120.40	34.7	Pass
							55.1 (b)	
		Top Girt	L2x2x1/8	50	-100.26	1838.00	5.5	Pass
T4	40 - 20	Leg	ROHN 2.5 EH (2.875"x.276)	78	-45902.80	58511.80	78.5	Pass
		Diagonal	L2x2x1/4	86	-3696.03	6093.61	60.7	Pass
							61.5 (b)	
		Top Girt	L2x2x1/8	81	-62.83	1838.00	3.4	Pass
							5.0 (b)	
T5	20 - 6.66667	Leg	ROHN 2.5 EH (2.875"x.276)	102	-58108.60	87636.10	66.3	Pass
		Diagonal	L2 1/2x2 1/2x3/16	107	-3788.04	7859.43	48.2	Pass
							60.2 (b)	
		Secondary Horizontal	L2x2x1/4	110	-1007.73	6274.02	16.1	Pass
T6	6.66667 - 0	Leg	ROHN 2.5 EH (2.875"x.276)	123	-63809.90	87718.20	72.7	Pass
		Diagonal	L3x3x1/4	128	-3952.04	16475.10	24.0	Pass
							59.4 (b)	
		Secondary Horizontal	L2x2x1/4	131	-1106.60	5756.47	19.2	Pass
							Summary	
							Leg (T4)	78.5	Pass
							Diagonal (T4)	61.5	Pass
							Secondary Horizontal (T6)	19.2	Pass
							Top Girt (T1)	6.5	Pass
							Bolt Checks	61.5	Pass
							RATING =	**78.5**	**Pass**