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April 26, 2019

Cushing Civil Engineers
Attn: Kenny McManaway
107 SE Washington Street
Suite 265
Portland, OR. 97214

Reference: 80' Direct Embed Tapered Steel Pole
Chehalis Ridge, Lewis County, WA.

File Number: 230062

<u>Copies</u>	<u>Drawing Number</u>	<u>Description</u>
1	230062-01-D1	Design Drawing Sealed for the State of Washington

Email Address: Kenny@cushingcivilengineers.com

Phone: 503 387 5331

Sincerely,

Danny Otten

crp



1 Fairholm Avenue
Peoria, IL 61603 USA
Phone: (309)-566-3000
Fax: (309)-566-3079

DATE: APRIL 26, 2019

PURCHASER: CUSHING CIVIL ENGINEERS

PROJECT: 80 FT DIRECT EMBED TAPERED STEEL POLE
CHEHALIS RIDGE, WASHINGTON

FILE NUMBER: 230062

DRAWINGS: 230062-01-D1

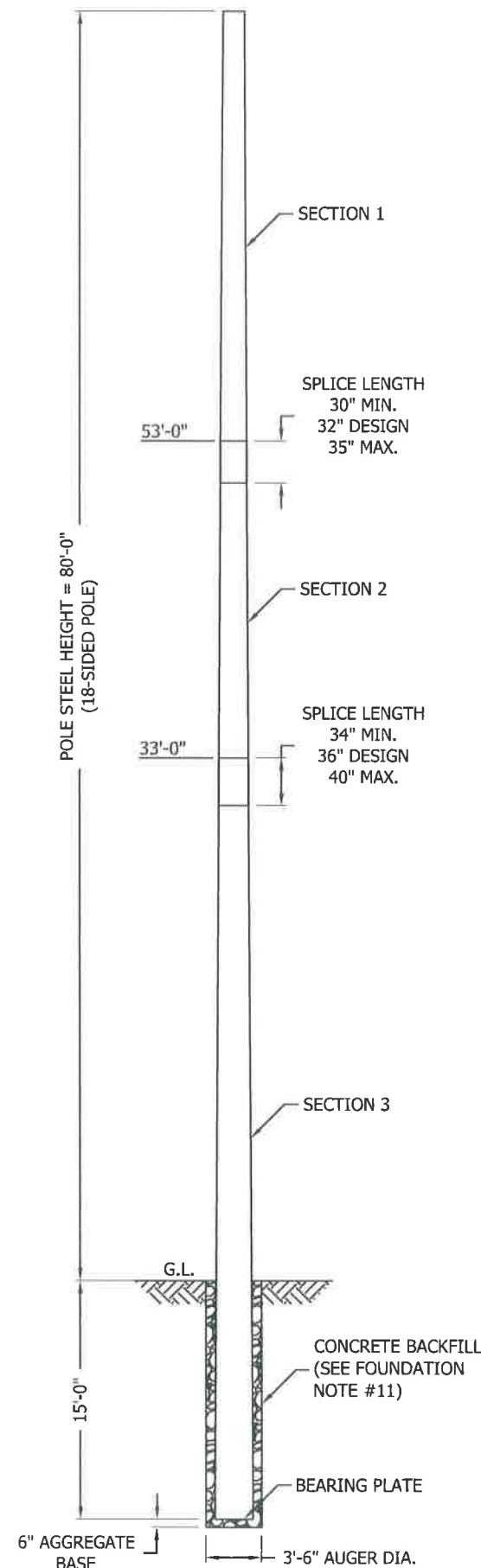
I CERTIFY THAT THE REFERENCED DRAWINGS WERE PREPARED UNDER MY SUPERVISION IN ACCORDANCE WITH THE DESIGN AND LOADING CRITERIA SPECIFIED BY THE PURCHASER AND THAT I AM A REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WASHINGTON.

CERTIFIED BY: _____

DATE: _____



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POLE DESIGN LOADING		
DESIGN WIND LOAD PER ANSI/TIA-222-G USING THE FOLLOWING DESIGN CRITERIA: ASCE 7-16 FACTORED WIND SPEED (NO ICE): 103 MPH BASIC WIND SPEED (WITH ICE): 30 MPH PER ASCE 7-16 DESIGN ICE THICKNESS: 0.5" PER ASCE 7-16 EXPOSURE CATEGORY: C STRUCTURE CLASSIFICATION: III TOPOGRAPHIC CATEGORY: 5 CREST HEIGHT: 298 FT DISTANCE FROM CREST: 82 FT Lh: 702 FT EARTHQUAKE SPECTRAL RESPONSE ACCELERATION, Ss: 1.184 ; S1 = 0.487 THIS POLE IS DESIGNED TO SUPPORT THE FOLLOWING LOADS:		
ELEVATION (FT)	ANTENNA TYPE	LINE SIZE (NOM)
TOP	BEACON & LIGHTNING ROD	(1) 1/2"
79	(3) DB224 ON (3) 3 FT SIDE ARMS	(3) 1/2"
75	(2) 4 FT HP DISHES [AZ. 0 & 180 DEG] [6 GHZ]	(2) 1/2"
50	(3) DB224 ON (3) 3 FT SIDE ARMS	(3) 1/2"

- FOUNDATION NOTES:**
- FOUNDATION DESIGN HAS BEEN DEVELOPED IN ACCORDANCE WITH GENERALLY ACCEPTED PROFESSIONAL ENGINEERING PRINCIPLES AND PRACTICES WITHIN THE LIMITS OF THE SUBSURFACE DATA PROVIDED. FOUNDATION DESIGN MODIFICATIONS MAY BE REQUIRED IN THE EVENT THE FOLLOWING DESIGN PARAMETERS ARE NOT APPLICABLE FOR THE SUBSURFACE CONDITIONS ENCOUNTERED.
- | DEPTH (FT) | SOIL TYPE | K (PCI) | γ (PCF) | Φ (DEG) | C (KSF) | ε ₅₀ (IN/IN) |
|------------|-----------|---------|---------|---------|---------|-------------------------|
| 0.0-2.0 | SOFT CLAY | 5.0 | 80.0 | 0.0 | 0.100 | 0.035 |
| 2.0-5.0 | SAND | 34.0 | 103.0 | 30.0 | 0.000 | 0.000 |
| 5.0-7.5 | SAND | 229.0 | 126.0 | 37.0 | 0.000 | 0.000 |
| 7.5-10 | SAND | 198.0 | 124.0 | 36.0 | 0.000 | 0.000 |
| 10.0-15.0 | SAND | 236.0 | 128.0 | 38.0 | 0.000 | 0.000 |
- WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES, SAFETY REGULATIONS AND UNLESS OTHERWISE NOTED, THE LATEST REVISION OF ACI 318, "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE". PROCEDURES FOR THE PROTECTION OF EXCAVATIONS, EXISTING CONSTRUCTION AND UTILITIES SHALL BE ESTABLISHED PRIOR TO FOUNDATION INSTALLATION.
 - FOUNDATION EMBEDMENT IS BASED ON A SOILS REPORT NO. **180178-GEO** DATED **3/19/2019** BY **BLACK MOUNTAIN CONSULTING, LLC**.
 - EMBEDMENT DEPTH INDICATED IS BASED ON THE GRADE LINE DESCRIBED IN THE REFERENCED GEOTECHNICAL REPORT. FOUNDATION MODIFICATION MAY BE REQUIRED IN THE EVENT CUT OR FILL OPERATIONS HAVE TAKEN PLACE SUBSEQUENT TO THE GEOTECHNICAL INVESTIGATION.
 - FOUNDATION DESIGN ASSUMES LEVEL GRADE AT STRUCTURE SITE.
 - FOUNDATION DESIGN ASSUMES THE RECOMMENDATIONS IN THE REFERENCED GEOTECHNICAL REPORT CONCERNING VERIFICATION OF SUBSURFACE CONDITIONS ARE IMPLEMENTED PRIOR TO PLACEMENT OF CONCRETE.
 - FOUNDATION INSTALLATION SHALL BE SUPERVISED BY PERSONNEL KNOWLEDGEABLE AND EXPERIENCED WITH THE PROPOSED FOUNDATION TYPE. CONSTRUCTION SHALL BE IN ACCORDANCE WITH GENERALLY ACCEPTED INSTALLATION PRACTICES.
 - FOUNDATION DESIGN ASSUMES INSTALLATION PROCEDURES WILL INCORPORATE THE PROCEDURES RECOMMENDED IN THE REFERENCED GEOTECHNICAL REPORT.
 - FOUNDATION DESIGN ASSUMES FIELD INSPECTIONS WILL BE PERFORMED TO VERIFY THAT CONSTRUCTION MATERIALS, INSTALLATION METHODS AND ASSUMED DESIGN PARAMETERS ARE ACCEPTABLE BASED ON CONDITIONS EXISTING AT THE SITE.
 - LOOSE MATERIAL SHALL BE REMOVED FROM BOTTOM OF EXCAVATION PRIOR TO PLACEMENT OF POLE. SIDES OF EXCAVATION SHALL BE ROUGH AND FREE OF LOOSE CUTTINGS.
 - PROPORTIONS OF CONCRETE MATERIALS SHALL BE SUITABLE FOR THE INSTALLATION METHOD UTILIZED AND SHALL RESULT IN DURABLE CONCRETE FOR RESISTANCE TO LOCAL ANTICIPATED AGGRESSIVE ACTIONS. THE DURABILITY REQUIREMENTS OF ACI 318 CHAPTER 4 SHALL BE SATISFIED BASED ON THE CONDITIONS EXPECTED AT SITE. AS A MINIMUM, CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI(20.7 MPa) IN 28 DAYS.
 - CONCRETE SHALL BE PLACED IN A MANNER THAT WILL PREVENT SEGREGATION OF CONCRETE MATERIALS, INFILTRATION OF WATER OR SOIL AND OTHER OCCURRENCES WHICH MAY DECREASE THE STRENGTH OR DURABILITY OF THE FOUNDATION.

MAXIMUM FACTORED REACTIONS	
DOWNLOAD =	10.5 KIPS
SHEAR =	11.2 KIPS
O.T.M. =	614.1 FT-KIPS

- GENERAL NOTES:**
- ROHN PRODUCTS POLE DESIGNS CONFORM TO ANSI/TIA-222-G UNLESS OTHERWISE SPECIFIED UNDER POLE DESIGN LOADING.
 - THE DESIGN LOADING CRITERIA INDICATED HAS BEEN PROVIDED TO ROHN. THE DESIGN LOADING CRITERIA HAS BEEN ASSUMED TO BE BASED ON SITE-SPECIFIC DATA IN ACCORDANCE WITH ANSI/TIA-222-G AND MUST BE VERIFIED BY OTHERS PRIOR TO INSTALLATION.
 - ANTENNAS AND LINES LISTED IN POLE DESIGN LOADING TABLE ARE PROVIDED BY OTHERS UNLESS OTHERWISE SPECIFIED.
 - STEP BOLTS WITH A SAFETY CLIMB SYSTEM ARE PROVIDED AS A CLIMBING FACILITY FOR THE INSTALLATION OF THE STRUCTURE.
 - POLE MEMBER DESIGN DOES NOT INCLUDE STRESSES DUE TO ERECTION SINCE ERECTION EQUIPMENT AND CONDITIONS ARE UNKNOWN. DESIGN ASSUMES COMPETENT AND QUALIFIED PERSONNEL WILL ERECT THE POLE.
 - WORK SHALL BE IN ACCORDANCE WITH ANSI/TIA-222-G, "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES".
 - STRUCTURAL STEEL SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ANSI/TIA-222-G.
 - PURCHASER SHALL VERIFY THE INSTALLATION IS IN CONFORMANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS FOR OBSTRUCTION MARKING AND LIGHTING.
 - TOLERANCE ON POLE STEEL HEIGHT IS EQUAL TO PLUS 1% OR MINUS 1/2%.
 - DESIGN ASSUMES THAT, AS A MINIMUM, MAINTENANCE AND INSPECTION WILL BE PERFORMED OVER THE LIFE OF THE STRUCTURE IN ACCORDANCE WITH ANSI/TIA-222-G.
 - DESIGN ASSUMES ALL TRANSMISSION LINES ARE ROUTED INTERNALLY.
 - DESIGN ASSUMES LEVEL GRADE AT POLE SITE.
 - POLE SHAFT CONFORMS TO ASTM A572 GRADE 65. POLE BEARING PLATE STEEL CONFORMS TO ASTM A36.

SECTION SCHEDULE						
SECTION	LENGTH (FT)	DIAMETER		WALL THICK (IN)	Fy (KSI)	WEIGHT (KIPS)
		BOT	TOP			
1	29.67	20.37	16.00	0.1875	65.0	1.144
2	23.00	22.87	19.48	0.1875	65.0	1.037
3	48.00	29.00	21.93	0.2500	65.0	3.473

FOR POLYGONAL POLES, DIAMETER IS MEASURED ACROSS FLATS.

NOTE: TABULATED WEIGHTS ARE APPROXIMATE. REFER TO ASSEMBLY DRAWING FOR FINAL WEIGHTS. ALL WEIGHTS SHALL BE VERIFIED PRIOR TO LIFTING.

FILE NO.	230062			
REVISIONS				
REV	DESCRIPTION	DWN	CHK	APP
				
PO BOX 5999 PEORIA, IL 61601-5999 TOLL FREE 800-727-ROHN				
THIS DRAWING IS THE PROPERTY OF ROHN. IT IS NOT TO BE REPRODUCED, COPIED OR TRACED IN WHOLE OR IN PART WITHOUT OUR WRITTEN CONSENT.				
CUSHING CIVIL ENGINEERS DESIGN PROFILE 80' DIRECT EMBED TAPERED STEEL POLE CHEHALIS RIDGE, WA				
DWN:	SWG	CHK'D:	HA	DATE: 4/25/2019
ENG'R:	HA	SHEET #:		1 OF 1
PRJ. ENG'R:	SWG	PRJ. MANG'R:		
DRAWING NO: 230062-01-D1				REV: 0



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Contract: 230062

Project: 80 FT DEP

Date and Time: 4/25/2019 3:00:48 PM

Revision: 0

Site: CHEHALIS RIDGE- WA

Engineer: SWG

✓ HA

DESIGN SPECIFICATION

Design Standard: ANSI/TIA-222-G-2005 Add.2
Ultimate Design Wind Speed (No Ice) = 96.1 (mph)
Nominal Design Wind Speed (No Ice) = 74.4 (mph)
Basic Wind Speed (With Ice) = 30.0 (mph)
Design Ice Thickness = 0.25 (in)
Structure Class = III
Exposure Category = C
Topographic Category = 5

Sct.	Length (ft)	Overlap (ft)	Top Dia. (in)	Bot Dia. (in)	Thick. (in)
3	29.67	0.00	16.00	20.29	0.1875
2	23.00	2.67	19.53	22.86	0.1875
1	48.00	3.00	22.05	29.00	0.2500

95.00

MAXIMUM BASE REACTIONS

Download (Kips)	10.5
Shear (Kips)	11.2
Moment (Kipsft)	614.1



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Contract: 230062
Project: 80 FT DEP
Date and Time: 4/25/2019 3:00:48 PM

Revision: 0
Site: CHEHALIS RIDGE- WA
Engineer: SWG

Section A: PROJECT DATA

Project Title: 80 FT DEP
Customer Name: CUSHING CIVIL ENGINEERS
Site: CHEHALIS RIDGE- WA
Contract No.: 230062
Revision: 0
Engineer: SWG
Date: Apr 25 2019
Time: 03:00:31 PM

Design Standard: ANSI/TIA-222-G-2005 Addendum 2

GENERAL DESIGN CONDITIONS

Start wind direction: 0.00 (Deg)
End wind direction: 315.00 (Deg)
Increment wind direction: 45.00 (Deg)
Elevation above ground: 0.00 (ft)
Gust Response Factor Gh: 1.10
Structure class: III
Exposure category: C
Topographic category: 5
Type of Hill: 2-D Ridge
Height of crest above surrounding terrain: 298.23 (ft)
Distance from Crest to the tower (x): 82.12 (ft)
Distance upwind of crest where difference in
elevation is half the hill height (Lh): 702.13 (ft)
Location of tower on the hill: Downwind
Material Density: 490.1 (lbs/ft³)
Young's Modulus: 29000.0 (ksi)
Poisson Ratio: 0.30
Weight Multiplier: 1.06

WIND ONLY CONDITIONS:

Ultimate Design Wind Speed (No Ice): 96.06 (mph)
Nominal Design Wind Speed (No Ice): 74.41 (mph)
Directionality Factor Kd: 0.95
Importance Factor I: 1.15
Wind Load Factor: 1.60
Dead Load Factor: 1.20

WIND AND ICE CONDITIONS:

Basic Wind Speed (With Ice): 30.00 (mph)
Directionality Factor Kd: 0.95
Wind Load Importance Factor Iw: 1.00
Ice Thickness Importance Factor Ii: 1.25
Ice Thickness: 0.25 (in)
Ice Density: 56.19 (lbs/ft³)
Wind Load Factor: 1.00
Dead Load Factor: 1.20
Ice Load Factor: 1.00

WIND ONLY SERVICEABILITY CONDITIONS:

Serviceability Wind Speed: 60.00 (mph)
Directionality Factor Kd: 0.85
Importance Factor I: 1.00
Wind Load Factor: 1.00
Dead Load Factor: 1.00

EARTHQUAKE CONDITIONS:

Site class definition: D
Spectral response acceleration Ss: 1.184



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Contract: 230062

Project: 80 FT DEP

Date and Time: 4/25/2019 3:00:48 PM

Revision: 0

Site: CHEHALIS RIDGE- WA

Engineer: SWG

Spectral response acceleration S1: 0.487 ✓
Acceleration-based site coefficient Fa: 1.026
Velocity-based site coefficient Fv: 1.513
Design spectral response acceleration Sds: 0.810
Design spectral response acceleration Sd1: 0.491
Seismic analysis method: 1
Fundamental frequency of structure f1: 0.808
Total seismic shear Vs (Kips) : 2.90 ✓

Analysis performed using: TowerSoft Finite Element Analysis Program



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Contract: 230062
Project: 80 FT DEP
Date and Time: 4/25/2019 3:00:48 PM

Revision: 0
Site: CHEHALIS RIDGE- WA
Engineer: SWG

Section B: STRUCTURE GEOMETRY

Total Height (ft)	Bottom Diameter (in)	Top Diameter (in)	Embed. Depth (ft)
95.00	29.00	16.00	15.00

Sect. No	Length (ft)	Overlap (ft)	Bot Dia. (in)	Top Dia. (in)	Thick. (in)	Sides	Joint Type	Yield Stress (ksi)	Mass (lbs)	Calculated Taper (in/ft)
3	29.67	0.00	20.29	16.00	0.1875	18-sided	Telescopic	65.0	1143.8	0.14474
2	23.00	2.67	22.86	19.53	0.1875	18-sided	Telescopic	65.0	1037.4	0.14474
1	48.00	3.00	29.00	22.05	0.2500	18-sided	Embedded	65.0	3472.7	0.14474
Total Mass:									5653.9	



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Contract: 230062

Project: 80 FT DEP

Date and Time: 4/25/2019 3:00:48 PM

Revision: 0

Site: CHEHALIS RIDGE- WA

Engineer: SWG

Section C: ANTENNA DATA

Structure Azimuth from North: 0

ANTENNAS

Ant No.	Elev. (ft)	Antenna (#) Type	Ant. Azim.	Mount. Radius (ft)	Mount Type	Mount Azim.	Tx Line (#)Type	Mounting Pipe Size (in)	Length (ft) Full Shielded	Ka
1	75.00	(1) HP4	0	1.00		0				1.00
		Vert. Offset 0.00 (ft)								
2	75.00	(1) HP4	180	1.00		180				1.00
		Vert. Offset 0.00 (ft)								

ANTENNA AND MOUNT WIND AREAS AND WEIGHTS

Ant No.	Antenna/Mount	Frontal Bare Area (ft) ²	Lateral Bare Area (ft) ²	Frontal Iced Area (ft) ²	Lateral Iced Area (ft) ²	Weight Bare (lbs)	Weight Iced (lbs)	Frequency GHz	Allowable Signal Loss dB	Gh Mount Ka
1	HP4	18.87	1.31	18.87	1.31	169.75	342.52	6.00	10	1.10
2	HP4	18.87	1.31	18.87	1.31	169.75	342.52	6.00	10	1.10



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Contract: 230062

Project: 80 FT DEP

Date and Time: 4/25/2019 3:00:48 PM

Revision: 0

Site: CHEHALIS RIDGE- WA

Engineer: SWG

Section D: TRANSMISSION LINE DATA

Transmission Lines Position

No.	Bot El (ft)	Top El (ft)	Desc.	Radius (ft)	Az.	Orient.	No.	Shielded	Shielded Lines	Antenna
1	0.00	80.00	3/8" CABLE	2.00	0.00	0.00	1	No	0	
2	0.00	80.00	LDF4P-50A	0.00	0.00	0.00	1	Yes	1	
3	0.00	79.00	LDF4P-50A	0.00	0.00	0.00	3	Yes	3	
4	0.00	75.00	LDF4P-50A	0.00	0.00	0.00	2	Yes	2	
5	0.00	50.00	LDF4P-50A	0.00	0.00	0.00	3	Yes	3	

Transmission Lines Details

No.	Desc.	Width (in)	Depth (in)	Unit Mass (lb/ft)
1	3/8" CABLE	0.38	0.38	1.00
2	LDF4P-50A	0.63	0.63	0.15
3	LDF4P-50A	0.63	0.63	0.15
4	LDF4P-50A	0.63	0.63	0.15
5	LDF4P-50A	0.63	0.63	0.15

Utilization of the cross-section for TX Lines: 0.77%



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Project: 80 FT DEP

Date and Time: 4/25/2019 3:00:48 PM

Revision: 0

Site: CHEHALIS RIDGE- WA

Engineer: SWG

Section F: POINT LOAD DATA

Structure Azimuth from North:0.00

POINT LOADS

No.	Description	Elev. (ft)	Radius (ft)	Azim. (Deg)	Orient. (Deg)	Vertical Offset (ft)	Tx Line	Comments
1	BEACON & LR	80.00	0.00	0.0	0.0	0.00		
2	(3) DB-224 3FTSA	79.00	0.65	0.0	0.0	0.00		
3	(3) DB-224 3FTSA	50.00	1.00	0.0	0.0	0.00		

POINT LOADS WIND AREAS AND WEIGHTS

No.	Description	Frontal Bare Area (ft^2)	Lateral Bare Area (ft^2)	Frontal Iced Area (ft^2)	Lateral Iced Area (ft^2)	Weight Bare (Kips)	Weight Iced (Kips)	Gh
1	BEACON & LR	5.00	5.00	10.00	10.00	0.25	0.50	1.10
2	(3) DB-224 3FTSA	23.50	23.50	39.00	39.00	0.45	0.75	1.10
3	(3) DB-224 3FTSA	23.50	23.50	39.00	39.00	0.45	0.75	1.10



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Contract: 230062

Project: 80 FT DEP

Date and Time: 4/25/2019 3:00:48 PM

Revision: 0

Site: CHEHALIS RIDGE- WA

Engineer: SWG

Section H: STRUCTURE DISPLACEMENT DATA

Load Combination Wind Only - Serviceability

Wind Direction

Maximum displacements

Elev. (ft)	N-S Disp (in)	W-E Disp (in)	Vert. Disp (in)	N-S Rot (deg)	W-E Rot (deg)	Twist Rot (deg)
80.00	-17.5	-14.9	-0.2	-1.45	1.72	-0.02
74.64	-15.6	-13.3	-0.2	-1.44	1.71	-0.02
69.27	-13.7	-11.6	-0.1	-1.41	1.68	-0.02
63.91	-11.8	-10.1	-0.1	-1.37	1.62	-0.02
58.54	-10.0	-8.6	-0.1	-1.30	1.55	-0.02
53.18	-8.4	-7.2	-0.1	-1.23	1.45	-0.01
50.51	-7.6	-6.5	-0.1	-1.18	1.40	-0.01
47.01	-6.6	-5.6	-0.1	-1.12	1.32	-0.01
43.51	-5.6	-4.8	0.0	-1.05	1.23	-0.01
40.01	-4.8	-4.1	0.0	-0.97	1.13	-0.01
36.50	-4.0	-3.4	0.0	-0.89	1.04	-0.01
33.00	-3.2	-2.8	0.0	-0.80	0.93	-0.01
30.00	-2.7	-2.3	0.0	-0.72	0.83	-0.01
25.00	-1.9	-1.6	0.0	-0.61	0.71	0.00
20.00	-1.2	-1.1	0.0	-0.49	0.57	0.00
15.00	-0.7	-0.6	0.0	-0.37	0.43	0.00
10.00	-0.3	-0.3	0.0	-0.25	0.29	0.00
5.00	-0.1	-0.1	0.0	-0.13	0.15	0.00
0.00	0.0	0.0	0.0	0.00	0.00	0.00



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Project: 80 FT DEP

Date and Time: 4/25/2019 3:00:48 PM

Revision: 0

Site: CHEHALIS RIDGE- WA

Engineer: SWG

Section J: ANTENNA DISPLACEMENT DATA

Load Combination Wind Only - Serviceability

Wind Direction		Maximum displacements						
Ant.	Elev. (ft)	N-S Disp (in)	W-E Disp (in)	Vert. Disp (in)	N-S Rot (Deg)	W-E Rot (Deg)	Twist Tot (Deg)	Allow. (Deg)
1	75.00	-16.6	-14.1	-0.2	-1.44	1.72	-0.02	2.21
2	75.00	-16.6	-14.1	-0.2	-1.44	1.72	-0.02	2.21



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Project: 80 FT DEP

Date and Time: 4/25/2019 3:00:48 PM

Revision: 0

Site: CHEHALIS RIDGE- WA

Engineer: SWG

Section K: POLE OUTPUT LOAD DATA

Load Combination		Max Envelope		
Wind Direction		Maximum		
Elev. (ft)	Axial Ld. (kips)	Shear Ld. (kips)	Torque (kipsft)	Bend Mom. (kipsft)
80.00	1.46	1.94	0.82	0.45
74.64	1.46	1.94	0.82	10.63
74.64	2.73	4.65	1.16	10.71
69.27	2.73	4.65	1.25	35.67
69.27	3.10	5.00	1.25	35.68
63.91	3.10	5.00	1.31	62.37
63.91	3.48	5.37	1.31	62.38
58.54	3.48	5.37	1.37	91.19
58.54	3.87	5.74	1.37	91.20
53.18	3.87	5.74	1.41	121.82
53.18	4.17	6.03	1.41	121.83
50.51	4.17	6.03	1.42	137.80
50.51	5.20	7.55	2.34	138.27
47.01	5.20	7.55	2.32	164.71
47.01	5.66	8.03	2.52	164.80
43.51	5.66	8.03	2.52	192.91
43.51	5.94	8.28	2.52	192.91
40.01	5.94	8.28	2.51	221.90
40.01	6.23	8.53	2.51	221.90
36.50	6.23	8.53	2.51	251.48
36.50	6.52	8.78	2.51	251.49
33.00	6.52	8.78	2.51	282.23
33.00	6.80	9.01	2.51	282.24
30.00	6.80	9.01	2.51	309.37
30.00	7.31	9.30	2.51	309.38
25.00	7.31	9.30	2.51	355.67
25.00	7.97	9.66	2.51	355.67
20.00	7.97	9.66	2.51	403.76
20.00	8.52	10.01	2.51	403.77
15.00	8.52	10.01	2.51	453.92
15.00	9.08	10.35	2.51	453.93
10.00	9.08	10.35	2.51	505.46
10.00	9.65	10.69	2.51	505.47
5.00	9.65	10.69	2.51	559.08
5.00	10.23	11.04	2.51	559.09
0.00	10.23	11.04	2.50	614.13
Base	10.52	11.24	2.50	614.13



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Contract: 230062

Project: 80 FT DEP

Date and Time: 4/25/2019 3:00:48 PM

Revision: 0

Site: CHEHALIS RIDGE- WA

Engineer: SWG

Section L: STRENGTH ASSESSMENT DATA

Load Combination Max Envelope
Wind Direction Maximum

Elev. (ft)	Axial Ld. (kips)	Axial Cap (kips)	Moment (kipsft)	Mom. Cap (kipsft)	Assess.
80.00	1.46	700.28	0.45	227.26	0.004
74.64	1.46	734.60	10.63	250.22	0.007
74.64	2.73	734.60	10.71	250.22	0.045
69.27	2.73	768.93	35.67	274.28	0.132
69.27	3.10	768.93	35.68	274.28	0.132
63.91	3.10	803.25	62.37	299.45	0.210
63.91	3.48	803.25	62.38	299.45	0.211
58.54	3.48	837.58	91.19	325.73	0.282
58.54	3.87	837.58	91.20	325.73	0.283
53.18	3.87	863.27	121.82	349.61	0.351
53.18	4.17	863.27	121.83	349.61	0.351
50.51	5.20	862.79	138.27	349.14	0.400
47.01	5.20	878.92	164.71	364.90	0.455
47.01	5.66	878.92	164.80	364.90	0.456
43.51	5.66	894.74	192.91	380.87	0.510
43.51	5.94	894.74	192.91	380.87	0.511
40.01	5.94	910.26	221.90	397.04	0.563
40.01	6.23	910.26	221.90	397.04	0.563
36.50	6.23	925.47	251.48	413.40	0.613
36.50	6.52	925.47	251.49	413.40	0.613
33.00	6.52	940.38	282.23	429.95	0.661
33.00	6.80	940.38	282.24	429.95	0.661
30.00	7.31	1310.89	309.38	597.62	0.521
25.00	7.31	1353.55	355.67	637.37	0.562
25.00	7.97	1353.55	355.67	637.37	0.562
20.00	7.97	1396.21	403.76	678.40	0.599
20.00	8.52	1396.21	403.77	678.40	0.599
15.00	8.52	1438.87	453.92	720.71	0.634
15.00	9.08	1438.87	453.93	720.71	0.634
10.00	9.08	1481.54	505.46	764.30	0.666
10.00	9.65	1481.54	505.47	764.30	0.666
5.00	9.65	1515.83	559.08	804.73	0.699
5.00	10.23	1515.83	559.09	804.73	0.700
0.00	10.23	1546.86	614.13	844.40	0.732



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Revision: 0

Site: CHEHALIS RIDGE- WA

Engineer: SWG

Section M: SECTION PROPERTIES DATA

Elev. (ft)	Diam. (in)	Width (in)	Thick. (in)	W/t	Area (in^2)	S (in^3)
80.0	16.0	2.5	0.188	13.1	9.4	36.71
74.6	16.8	2.6	0.188	13.8	9.9	40.41
74.6	16.8	2.6	0.188	13.8	9.9	40.41
69.3	17.6	2.7	0.188	14.5	10.3	44.30
69.3	17.6	2.7	0.188	14.5	10.3	44.30
63.9	18.4	2.9	0.188	15.3	10.8	48.37
63.9	18.4	2.9	0.188	15.3	10.8	48.37
58.5	19.1	3.0	0.188	16.0	11.3	52.61
58.5	19.1	3.0	0.188	16.0	11.3	52.61
53.2	19.9	3.1	0.188	16.7	11.7	57.03
53.2	19.9	3.1	0.188	16.7	11.7	57.03
50.5	20.3	3.2	0.188	17.1	12.0	59.30
50.5	19.9	3.1	0.188	16.7	11.7	56.94
47.0	20.4	3.2	0.188	17.2	12.0	59.93
47.0	20.4	3.2	0.188	17.2	12.0	59.93
43.5	20.9	3.3	0.188	17.7	12.3	62.98
43.5	20.9	3.3	0.188	17.7	12.3	62.98
40.0	21.4	3.4	0.188	18.1	12.6	66.12
40.0	21.4	3.4	0.188	18.1	12.6	66.12
36.5	21.9	3.5	0.188	18.6	12.9	69.33
36.5	21.9	3.5	0.188	18.6	12.9	69.33
33.0	22.4	3.6	0.188	19.1	13.2	72.61
33.0	22.4	3.6	0.188	19.1	13.2	72.61
30.0	22.9	3.7	0.188	19.5	13.5	75.49
30.0	22.5	3.5	0.250	13.9	17.6	96.53
25.0	23.2	3.6	0.250	14.4	18.2	102.95
25.0	23.2	3.6	0.250	14.4	18.2	102.95
20.0	23.9	3.7	0.250	14.9	18.8	109.57
20.0	23.9	3.7	0.250	14.9	18.8	109.57
15.0	24.7	3.8	0.250	15.4	19.4	116.41
15.0	24.7	3.8	0.250	15.4	19.4	116.41
10.0	25.4	4.0	0.250	15.9	19.9	123.45
10.0	25.4	4.0	0.250	15.9	19.9	123.45
5.0	26.1	4.1	0.250	16.4	20.5	130.70
5.0	26.1	4.1	0.250	16.4	20.5	130.70
0.0	26.8	4.2	0.250	16.9	21.1	138.15

Note: w/t values marked with * (asterisk) indicate width to thickness exceeding maximum allowable values by standards.

Rohn Products LLC.

Designed By: SWG

Checked By: HA

Eng. File: 230062

LPile: ver. 4

Customer: CUSHING CIVIL ENGINEERS

Site: CHEHALIS RIDGE- WA

Date: 4/25/2019 1:59:58 PM

Date: 4/25/19

Building Code: TIA Rev. G

LPile_1: ver. 3.1.2

FACTORED REACTIONS

	DESIGN	OPERATIONAL
Download, kips	10.5	6.1
OTM, ft-kips	614.1	194.3
Shear, kips	11.2	3.6

LPILE INPUT PARAMETERS

Depth(ft)	Soil Type	K(pci)	γ (pcf)	ϕ (deg)	C(ksf)	ϵ_{50} (in/in)	N	RQD
0.0-2.0	Soft Clay	5.0	80.0	0.0	0.100	0.035	1	0
2.0-5.0	Sand	34.0	103.0	30.0	0.000	0.000	10	0
5.0-7.5	Sand	229.0	126.0	37.0	0.000	0.000	44	0
7.5-10.0	Sand	200.0	124.0	36.0	0.000	0.000	38	0
10.0-15.0	Sand	240.0	128.0	38.0	0.000	0.000	48	0

Reaction Modification Factor = 1.33

Direct Embed Pole: Concrete Backfill

Pier Diameter = 3' - 6", Pier Depth = 15' - 0" and Ground Slope = 0 Deg.

Effective OD = 3' - 6", Effective ID = 2' - 2"

SUMMARY OF LPILE RESULTS

(See Attached Graphs)

	DESIGN	OPERATIONAL
Deflection at Top, in.	3.24	0.17 ✓
Moment, ft-kips	650.0	205.0
Shear, kips	118.5	32.3
Lateral Soil Pressure, ksf	20.11	5.28 ✓

230062
SWG

