

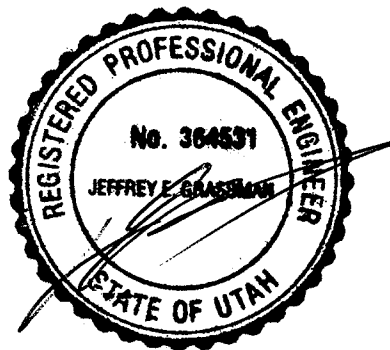


## STRUCTURES

VALMONT MICROFLECT  
3275 25th STREET  
SALEM, OR 97302  
PHONE: 1-800-547-2151  
ENGINEER: Alan Helt 6656  
Reviewed by: *MF*

# COMMUNICATION POLE DESIGN CALCULATIONS

*20 PAGES*



APR 18 2012

CenturyLink  
VALMONT ORDER #173392-1  
SITE NAME: Westinghouse-Ogden North, UT  
POLE HEIGHT: 100



# STRUCTURES

4/17/12

## ENGINEERING DATA

for

CenturyLink

Westinghouse-Ogden North, UT

VALMONT ORDER 173392-1

- 1) STRUCTURE DESIGN CONFORMS TO EIA/TIA-222-G INCLUDING:  
 90.0 MPH WIND (3 SECOND GUST, 50 YR. RETURN PERIOD)  
 50.0 MPH ICE WIND (50 YR. RETURN PERIOD)  
 DESIGN ICE THICKNESS = 0.25 INCHES  
 EXPOSURE CATEGORY C  
 STRUCTURE CLASSIFICATION II  
 TOPOGRAPHIC CATEGORY 1  
 60.0 MPH BASIC WIND SPEED WITH NO ICE FOR TWIST AND SWAY  
 SPECTRAL RESPONSE ACCELERATION AT SHORT PERIODS AND 1 SEC.:  $S_s = 1.78$  &  $S_1 = 0.76$
- 2) FEEDLINES ARE ASSUMED TO BE PLACED INTERIOR TO THE POLE.
- 3) ALL MICROWAVE ASSUMED TO BE 6 GHz UNLESS OTHERWISE NOTED.
- 4) LOADING AS FOLLOWS:  
 100.0' POLE  
 1 - 6' SOLID DISH (w/PM) @ 99.0

### STRUCTURE ANCHORAGE INFORMATION

POLE HEIGHT(FT):	100	NUMBER OF A.B.'s:	8
BOLT CIRCLE(IN):	30.88	DIA. OF A.B.'s(IN):	2
BASE VERTICAL(K):	8.74	LENGTH OF A.B.'s(IN):	60.00
BASE SHEAR(K):	5.48	PROJECTION LENGTH(IN):	10.00
BASE MOMENT(FT-K):	374	TEMPLATE OD(IN):	34.38

## STRUCTURES

BY \_\_\_\_\_ DATE \_\_\_\_\_  
CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

SHEET NO. \_\_\_\_\_

4/17/12

### ENGINEERING DATA

for

**CenturyLink****Westinghouse-Ogden North, UT****VALMONT ORDER 173392-1****EIATIA-222-G**

BASIC WIND:	90.0 MPH	DESIGN ICE THICKNESS:	0.25 IN.
WIND & ICE:	50.0 MPH	EXPOSURE CATEGORY:	C
TWIST & SWAY:	60.0 MPH	STRUCTURE CLASS.:	II
S <sub>s</sub> :	1.78	TOPOGRAPHIC CATEGORY:	1
S <sub>t</sub> :	0.76		

QTY DESCRIPTION	HEIGHT	DATA W.O. ICE		DATA W/ ICE	
		EPA	WT	EPA	WT
1 6' SOLID DISH (w/PM)	@ 99.0'	45.73	187	47.41	352



32-bit

Design Code: TIA-222-G Addendum 2

\*\*\* SUMMARY \*\*\*

DESIGN SUMMARY

Height Above Base Plate (ft) 100.00 Ground Line Diameter (in) 24.000 Pole Shaft Weight (lbs) 6676

Top Diameter (in) 12.750

Pole Taper (in/ft) 0.0000 Shape: Round

Connections Between Sections /First/ /Second/

Height Above Ground (ft) 40.00 80.00  
Type Step Flg. Jt. Step Flg. Jt.

Section Characteristics /First/ /Second/ /Third/

Base Diameter (in) 24.000 18.000 12.750  
Top Diameter (in) 24.000 18.000 12.750  
Thickness (in) 0.37500 0.25000 0.37500  
Length (ft) 40.000 40.000 20.000  
Weight (lbs) 3787 1897 992

ANALYSIS SUMMARY

Governing Load Case	Pt. of Fixity	Governing Level			Pole Top
		Sec.1	Sec.2	Sec.3	
Height (ft)	0.00	0.00	40.00	80.00	WIND 100.00
Resultant Moment (in-kips)	4484	4484	2163	535	0
Shear Force (lbs)	5503	5503	4075	2640	0
Axial Force (lbs)	8360	8360	3676	1276	0
Combined Interaction Value	0.69	0.69	0.90	0.29	0.00
Total Deflection (in)	0.00	0.00	7.49	32.19	49.42

Note: Diameters are outside, measured across the flats  
Forces and moments are reported in the local element coordinate system

BY VALMONT INDUSTRIES FOR:

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
Fuse 1.10.0.524

32-bit

\*\*\* POLE SHAFT POINT OF FIXITY REACTIONS \*\*\*

Loading Case Identifier	Moments About X-Axis (in-kips)	Moments About Y-Axis (in-kips)	Moments Resultant (X & Y) (in-kips)	Moments Torsional (in-kips)	Vertical Force (lbs)	Shear In X-Direction (lbs)	Shear In Y-Direction (lbs)	Notes
WIND	0	-4484	4484	0	8372	5484	0	5484
ICE + WIND	0	-1335	1335	0	9612	1820	0	1820
T+S	0	-1111	1111	0	6871	1365	0	1365
Seismic	0	-1458	1458	0	8235	1725	0	1725

Note: Positive vertical force is downward.  
Reactions are considered in the global coordinate system.

BY VALMONT INDUSTRIES FOR:

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12

Fuse 1.10.0.524

32-bit

\*\*\* INPUT LOADS \*\*\*

Design Code TIA-222-G Addendum 2  
Loading Case WIND

Basic Wind Velocity is 90.00 mph Ice Thickness 0.00  
 Wind Orientation is 0.0 Degrees Clockwise From -X- Axis  
 Structure Weight Overload Factor is 1.200  
 Exposure C, Gust Factor 1.10  
 Structure Category 2, Topographic Category 1, Crest Height 0.00 ft  
 Orientations are Measured Clockwise From -X- Axis  
 Positive -Y- Axis is 90 Degrees Clockwise From -X- Axis  
 Foundation Rotation of 0.00 Degrees

Orientation of System  
 +\*\*\*\*\* +X-Axis  
 \* \* \* \* \*  
 \* \* \* \* \* (Transverse)

(Longitudinal) \* \* \* \* \* (Vertical)  
 +Y-Axis \* \* \* \* \* +Z-Axis

Load Number	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Load Orientation in XY Plane (Degrees)	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	EPA (ft^2)
1	99.00	99.00	0.00	0.00	2002	0	224	45.73

1-6' SOLID DI

BY VALMONT INDUSTRIES FOR:

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
Fuse 1.10.0.524

32-bit

\*\*\* INPUT LOADS \*\*\*

Design Code TIA-222-G Addendum 2  
Loading Case ICE + WIND

Basic Wind Velocity is 50.00 mph Ice Thickness 0.25  
 Wind Orientation is 0.0 Degrees Clockwise From -X- Axis  
 Structure Weight Overload Factor is 1.200  
 Exposure C, Gust Factor 1.10  
 Structure Category 2, Topographic Category 1, Crest Height 0.00 ft  
 Orientations are Measured Clockwise From -X- Axis  
 Positive -Y- Axis is 90 Degrees Clockwise From -X- Axis  
 Foundation Rotation of 0.00 Degrees

Orientation of System

+\*\*\*\*\* +X-Axis  
 \* \* (Transverse)  
 \* \*  
 \* \*  
 \* \*  
 \* \* (Vertical)  
 +Y-Axis \* \* +Z-Axis

Load Number	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Orientation in XY Plane (Degrees)	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	EPA (ft^2)
1	99.00	99.00	0.00	0.00	400	0	422	47.41

1-6' SOLID DI

BY VALMONT INDUSTRIES FOR:

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
Fuse 1.10.0.524

32-bit

\*\*\* INPUT LOADS \*\*\*

Design Code TIA-222-G Addendum 2  
Loading Case T+S

Basic Wind Velocity is 60.00 mph Ice Thickness 0.00  
Wind Orientation is 0.0 Degrees Clockwise From -X- Axis  
Structure Weight Overload Factor is 1.000  
Exposure C, Gust Factor 1.10  
Structure Category 1, Topographic Category 1, Crest Height 0.00 ft  
Orientations are Measured Clockwise From -X- Axis  
Positive -Y- Axis is 90 Degrees Clockwise From -X- Axis  
Foundation Rotation of 0.00 Degrees

Orientation of System  
+\*\*\*\*\* +X-Axis  
\* \* \* \* \*  
(Transverse)

(Longitudinal) \* \* \* \* \*  
+Y-Axis \* \* \* \* \*  
+Z-Axis

Load Number	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Load Orientation in XY Plane (Degrees)	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	EPA (ft <sup>2</sup> )
1	99.00	99.00	0.00	0.00	498	0	187	45.73

1-6' SOLID DI



BY VALMONT INDUSTRIES FOR: CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
Fuse 1.10.0.524

32-bit

\*\*\* INPUT LOADS \*\*\*

Design Code TIA-222-G Addendum 2  
Loading Case Seismic  
Seismic analysis following the equivalent modal analysis procedure  
Structure Category: 2  
Site Class: D

Response Acceleration at short periods: 1.78  
Response Acceleration at one second: 0.76

The above are used to obtain the acceleration and velocity based site coefficients Fa and Fv

Foundation Rotation of 0.00 Degrees

Load Number	Mounting Height (ft)	Load Height (ft)	Load Eccentricity (ft)	Load Orientation in XY Plane (Degrees)	Force-X (lbs)	Force-Y (lbs)	Force-Z (lbs)	EPA (ft^2)
1	99.00	99.00	0.00	0.00	0	0	224	45.73

1-6' SOLID DI

BY VALMONT INDUSTRIES FOR:

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12

Fuse 1.10.0.524

32-bit

\*\*\* Properties \*\*\*

Connection Locations	Distance From Base (ft)	Diameter Across Flats (in)	Wall Thickness (in)	D/t Across Flats	w/t Across Flats	Moments of Inertia (in <sup>4</sup> )	Area (in <sup>2</sup> )
Top of Sect 3	100.00	12.750	0.3750	34.00		279	14.57
EPA 1	99.00	12.750	0.3750	34.00		279	14.57
	95.00	12.750	0.3750	34.00		279	14.57
	90.00	12.750	0.3750	34.00		279	14.57
	85.00	12.750	0.3750	34.00		279	14.57
	80.00	12.750	0.3750	34.00		279	14.57
Top of Sect 2	80.00	18.000	0.2500	72.00		548	13.94
	75.00	18.000	0.2500	72.00		548	13.94
	70.00	18.000	0.2500	72.00		548	13.94
	65.00	18.000	0.2500	72.00		548	13.94
	60.00	18.000	0.2500	72.00		548	13.94
	55.00	18.000	0.2500	72.00		548	13.94
	50.00	18.000	0.2500	72.00		548	13.94
	45.00	18.000	0.2500	72.00		548	13.94
	40.00	18.000	0.2500	72.00		548	13.94
Top of Sect 1	40.00	24.000	0.3750	64.00		1939	27.82
	35.00	24.000	0.3750	64.00		1939	27.82
	30.00	24.000	0.3750	64.00		1939	27.82
	25.00	24.000	0.3750	64.00		1939	27.82
	20.00	24.000	0.3750	64.00		1939	27.82
	15.00	24.000	0.3750	64.00		1939	27.82
	10.00	24.000	0.3750	64.00		1939	27.82
	5.00	24.000	0.3750	64.00		1939	27.82
Pt of Fixity	0.00	24.000	0.3750	64.00		1939	27.82

BY VALMONT INDUSTRIES FOR:

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
Fuse 1.10.0.524

32-bit

Forces and Moments for Pole in the Local Element Coordinate System

Loading Case WIND

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
100.00	0	0	0	0	0	0	0	0
99.00	0	0	0	0	32	0	32	59
99.00	0	0	0	0	2046	0	2046	135
95.00	0	-101	101	0	2174	0	2174	374
90.00	0	-237	237	0	2332	0	2332	675
85.00	0	-381	381	0	2486	0	2486	979
80.00	0	-535	535	0	2640	0	2640	1276
80.00	0	-535	535	0	2636	0	2636	1283
75.00	0	-699	699	0	2838	0	2838	1575
70.00	0	-876	876	0	3034	0	3034	1869
65.00	0	-1064	1064	0	3223	0	3223	2166
60.00	0	-1263	1263	0	3406	0	3406	2466
55.00	0	-1473	1473	0	3581	0	3581	2770
50.00	0	-1693	1693	0	3746	0	3746	3078
45.00	0	-1924	1924	0	3902	0	3902	3391
40.00	0	-2163	2163	0	4075	0	4075	3676
40.00	0	-2163	2163	0	4057	0	4057	3696
35.00	0	-2413	2413	0	4275	0	4275	4275
30.00	0	-2676	2676	0	4483	0	4483	4856
25.00	0	-2952	2952	0	4678	0	4678	5439
20.00	0	-3238	3238	0	4860	0	4860	6023
15.00	0	-3536	3536	0	5026	0	5026	6610
10.00	0	-3843	3843	0	5179	0	5179	7200
5.00	0	-4159	4159	0	5325	0	5325	7792
0.00	0	-4484	4484	0	5503	0	5503	8360

BY VALMONT INDUSTRIES FOR:  
 Deflections and Stresses for Pole

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
 Fuse 1.10.0.524

Loading Case WIND

\*\*\* Deflections and Stresses \*\*\*

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Rotation (deg.)	Axial Interaction Term	Flexural Interaction Term	Shear Interaction Term	Torsion Interaction Term	Combined Stress Interaction
100.00	49.4	0.0	49.4	1.4	4.25	0.00	0.00	0.00	0.00	0.01
99.00	48.5	0.0	48.5	1.3	4.25	0.00	0.00	0.00	0.00	0.01
99.00	48.5	0.0	48.5	1.3	4.25	0.00	0.00	0.02	0.00	0.01
95.00	45.0	0.0	45.0	1.2	4.23	0.00	0.05	0.02	0.00	0.06
90.00	40.6	0.0	40.6	1.0	4.16	0.00	0.13	0.02	0.00	0.13
85.00	36.3	0.0	36.3	0.9	4.03	0.00	0.21	0.02	0.00	0.21
80.00	32.2	0.0	32.2	0.7	3.83	0.00	0.29	0.02	0.00	0.29
80.00	32.2	0.0	32.2	0.7	3.83	0.00	0.22	0.02	0.00	0.22
75.00	28.2	0.0	28.2	0.6	3.70	0.00	0.29	0.03	0.00	0.29
70.00	24.5	0.0	24.5	0.5	3.53	0.00	0.36	0.03	0.00	0.36
65.00	20.9	0.0	20.9	0.4	3.32	0.00	0.44	0.03	0.00	0.44
60.00	17.5	0.0	17.5	0.3	3.07	0.00	0.52	0.03	0.00	0.53
55.00	14.5	0.0	14.5	0.2	2.77	0.01	0.61	0.03	0.00	0.61
50.00	11.7	0.0	11.7	0.2	2.43	0.01	0.70	0.03	0.00	0.70
45.00	9.4	0.0	9.4	0.1	2.04	0.01	0.79	0.03	0.00	0.80
40.00	7.5	0.0	7.5	0.1	1.60	0.01	0.89	0.04	0.00	0.90
40.00	7.5	0.0	7.5	0.1	1.60	0.00	0.33	0.02	0.00	0.33
35.00	5.9	0.0	5.9	0.1	1.46	0.00	0.37	0.02	0.00	0.37
30.00	4.4	0.0	4.4	0.0	1.30	0.00	0.41	0.02	0.00	0.41
25.00	3.2	0.0	3.2	0.0	1.13	0.01	0.45	0.02	0.00	0.45
20.00	2.1	0.0	2.1	0.0	0.94	0.01	0.49	0.02	0.00	0.50
15.00	1.2	0.0	1.2	0.0	0.73	0.01	0.54	0.02	0.00	0.54
10.00	0.5	0.0	0.5	0.0	0.51	0.01	0.58	0.02	0.00	0.59
5.00	0.1	0.0	0.1	0.0	0.26	0.01	0.63	0.02	0.00	0.64
0.00	0.0	0.0	0.0	0.0	0.00	0.01	0.68	0.02	0.00	0.69

BY VALMONT INDUSTRIES FOR:

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
Fuse 1.10.0.524

32-bit

Forces and Moments for Pole in the Local Element Coordinate System

Loading Case ICE + WIND

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
100.00	0	0	0	0	0	0	0	0
99.00	0	0	0	0	13	13	13	68
99.00	0	0	0	0	422	422	422	482
95.00	0	-22	22	0	474	474	474	754
90.00	0	-52	52	0	537	537	537	1094
85.00	0	-86	86	0	600	600	600	1433
80.00	0	-124	124	0	663	663	663	1772
80.00	0	-124	124	0	661	661	661	1773
75.00	0	-166	166	0	743	743	743	2117
70.00	0	-213	213	0	822	822	822	2460
65.00	0	-265	265	0	899	899	899	2804
60.00	0	-321	321	0	974	974	974	3148
55.00	0	-382	382	0	1045	1045	1045	3491
50.00	0	-447	447	0	1114	1114	1114	3834
45.00	0	-516	516	0	1178	1178	1178	4177
40.00	0	-589	589	0	1248	1248	1248	4517
40.00	0	-589	589	0	1242	1242	1242	4519
35.00	0	-666	666	0	1329	1329	1329	5161
30.00	0	-748	748	0	1413	1413	1413	5802
25.00	0	-836	836	0	1492	1492	1492	6442
20.00	0	-927	927	0	1565	1565	1565	7082
15.00	0	-1024	1024	0	1632	1632	1632	7719
10.00	0	-1124	1124	0	1695	1695	1695	8355
5.00	0	-1228	1228	0	1755	1755	1755	8987
0.00	0	-1335	1335	0	1826	1826	1826	9611

BY VALMONT INDUSTRIES FOR:  
 Deflections and Stresses for Pole

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
 Fuse 1.10.0.524

Loading Case ICE + WIND

\*\*\* Deflections and Stresses \*\*\*

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Rotation (deg.)	Axial Interaction Term	Flexural Interaction Term	Shear Interaction Term	Torsion Interaction Term	Combined Stress Interaction
100.00	13.6	0.0	13.6	0.1	1.13	0.00	0.00	0.00	0.00	0.01
99.00	13.4	0.0	13.4	0.1	1.13	0.00	0.00	0.00	0.00	0.01
99.00	13.4	0.0	13.4	0.1	1.13	0.00	0.00	0.00	0.00	0.01
95.00	12.4	0.0	12.4	0.1	1.12	0.00	0.01	0.00	0.00	0.01
90.00	11.3	0.0	11.3	0.1	1.11	0.00	0.03	0.00	0.00	0.03
85.00	10.1	0.0	10.1	0.1	1.08	0.00	0.05	0.01	0.00	0.05
80.00	9.0	0.0	9.0	0.1	1.03	0.00	0.07	0.01	0.00	0.07
80.00	9.0	0.0	9.0	0.1	1.03	0.00	0.05	0.01	0.00	0.05
75.00	7.9	0.0	7.9	0.1	1.00	0.00	0.07	0.01	0.00	0.07
70.00	6.9	0.0	6.9	0.0	0.96	0.00	0.09	0.01	0.00	0.09
65.00	5.9	0.0	5.9	0.0	0.91	0.01	0.11	0.01	0.00	0.11
60.00	5.0	0.0	5.0	0.0	0.85	0.01	0.13	0.01	0.00	0.14
55.00	4.1	0.0	4.1	0.0	0.77	0.01	0.16	0.01	0.00	0.16
50.00	3.4	0.0	3.4	0.0	0.68	0.01	0.18	0.01	0.00	0.19
45.00	2.7	0.0	2.7	0.0	0.58	0.01	0.21	0.01	0.00	0.22
40.00	2.2	0.0	2.2	0.0	0.46	0.01	0.24	0.01	0.00	0.25
40.00	2.2	0.0	2.2	0.0	0.46	0.00	0.09	0.01	0.00	0.09
35.00	1.7	0.0	1.7	0.0	0.42	0.00	0.10	0.01	0.00	0.11
30.00	1.3	0.0	1.3	0.0	0.38	0.01	0.11	0.01	0.00	0.12
25.00	0.9	0.0	0.9	0.0	0.33	0.01	0.13	0.01	0.00	0.13
20.00	0.6	0.0	0.6	0.0	0.28	0.01	0.14	0.01	0.00	0.15
15.00	0.4	0.0	0.4	0.0	0.22	0.01	0.16	0.01	0.00	0.16
10.00	0.2	0.0	0.2	0.0	0.15	0.01	0.17	0.01	0.00	0.18
5.00	0.0	0.0	0.0	0.0	0.08	0.01	0.19	0.01	0.00	0.19
0.00	0.0	0.0	0.0	0.0	0.00	0.01	0.20	0.01	0.00	0.21

BY VALMONT INDUSTRIES FOR: CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
Fuse 1-10.0.524

32-bit

Forces and Moments for Pole in the Local Element Coordinate System

Loading Case T+S

Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)
100.00	0	0	0	0	0	0	0	0
99.00	0	0	0	0	8	0	8	50
99.00	0	0	0	0	509	0	509	227
95.00	0	-25	25	0	540	0	540	426
90.00	0	-59	59	0	578	0	578	674
85.00	0	-95	95	0	616	0	616	922
80.00	0	-133	133	0	654	0	654	1170
80.00	0	-133	133	0	653	0	653	1171
75.00	0	-173	173	0	702	0	702	1408
70.00	0	-217	217	0	750	0	750	1646
65.00	0	-263	263	0	797	0	797	1884
60.00	0	-313	313	0	842	0	842	2122
55.00	0	-365	365	0	886	0	886	2360
50.00	0	-419	419	0	927	0	927	2599
45.00	0	-476	476	0	966	0	966	2838
40.00	0	-535	535	0	1009	0	1009	3075
40.00	0	-535	535	0	1005	0	1005	3076
35.00	0	-597	597	0	1059	0	1059	3550
30.00	0	-663	663	0	1111	0	1111	4024
25.00	0	-731	731	0	1160	0	1160	4498
20.00	0	-802	802	0	1206	0	1206	4973
15.00	0	-876	876	0	1247	0	1247	5447
10.00	0	-952	952	0	1287	0	1287	5922
5.00	0	-1030	1030	0	1324	0	1324	6397
0.00	0	-1111	1111	0	1369	0	1369	6870

BY VALMONT INDUSTRIES FOR:  
 Deflections and Stresses for Pole

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
 Fuse 1.10.0.524

\*\*\* Deflections and Stresses \*\*\*

Loading Case T+S

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Rotation (deg.)	Axial Interaction Term	Flexural Interaction Term	Shear Interaction Term	Torsion Interaction Term	Combined Stress Interaction
100.00	12.2	0.0	12.2	0.1	1.05	0.00	0.00	0.00	0.00	0.01
99.00	12.0	0.0	12.0	0.1	1.05	0.00	0.00	0.00	0.00	0.01
95.00	12.0	0.0	12.0	0.1	1.05	0.00	0.00	0.00	0.00	0.01
90.00	11.1	0.0	11.1	0.1	1.05	0.00	0.01	0.00	0.00	0.01
85.00	10.1	0.0	10.1	0.1	1.03	0.00	0.03	0.00	0.00	0.03
80.00	9.0	0.0	9.0	0.1	1.00	0.00	0.05	0.01	0.00	0.05
75.00	8.0	0.0	8.0	0.1	0.95	0.00	0.07	0.01	0.00	0.07
70.00	8.0	0.0	8.0	0.1	0.95	0.00	0.05	0.01	0.00	0.06
65.00	7.0	0.0	7.0	0.0	0.92	0.00	0.07	0.01	0.00	0.07
60.00	6.1	0.0	6.1	0.0	0.87	0.00	0.09	0.01	0.00	0.09
55.00	5.2	0.0	5.2	0.0	0.82	0.00	0.11	0.01	0.00	0.11
50.00	4.3	0.0	4.3	0.0	0.76	0.00	0.13	0.01	0.00	0.13
45.00	3.6	0.0	3.6	0.0	0.69	0.00	0.15	0.01	0.00	0.15
40.00	2.9	0.0	2.9	0.0	0.60	0.00	0.17	0.01	0.00	0.18
35.00	2.3	0.0	2.3	0.0	0.50	0.01	0.20	0.01	0.00	0.20
30.00	1.9	0.0	1.9	0.0	0.40	0.01	0.22	0.01	0.00	0.23
25.00	1.9	0.0	1.9	0.0	0.40	0.00	0.08	0.00	0.00	0.08
20.00	1.5	0.0	1.5	0.0	0.36	0.00	0.09	0.00	0.00	0.09
15.00	1.1	0.0	1.1	0.0	0.32	0.00	0.10	0.00	0.00	0.10
10.00	0.8	0.0	0.8	0.0	0.28	0.00	0.11	0.01	0.00	0.11
5.00	0.5	0.0	0.5	0.0	0.23	0.00	0.12	0.01	0.00	0.13
0.00	0.3	0.0	0.3	0.0	0.18	0.01	0.13	0.01	0.00	0.14
	0.1	0.0	0.1	0.0	0.13	0.01	0.14	0.01	0.00	0.15
	0.0	0.0	0.0	0.0	0.07	0.01	0.16	0.01	0.00	0.16
	0.0	0.0	0.0	0.0	0.00	0.01	0.17	0.01	0.00	0.17



BY VALMONT INDUSTRIES FOR: CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
Fuse 1.10.0.524

32-bit  
Forces and Moments for Pole in the Local Element Coordinate System

Loading Case Seismic									
Dist. From Base (ft)	Mx (in-kips)	My (in-kips)	Resultant Mx & My (in-kips)	Torsion (in-kips)	Shear X-Dir. (lbs)	Shear Y-Dir. (lbs)	Resultant Shear (lbs)	Axial (lbs)	
100.00	0	0	0	0	0	0	0	0	0
99.00	0	0	0	0	76	0	76	58	0
99.00	0	0	0	0	355	0	355	275	0
95.00	0	-24	24	0	614	0	614	506	0
90.00	0	-68	68	0	846	0	846	799	0
85.00	0	-123	123	0	993	0	993	1094	0
80.00	0	-185	185	0	1078	0	1078	1389	0
80.00	0	-185	185	0	1077	0	1077	1390	0
75.00	0	-251	251	0	1113	0	1113	1675	0
70.00	0	-318	318	0	1122	0	1122	1961	0
65.00	0	-385	385	0	1120	0	1120	2247	0
60.00	0	-452	452	0	1119	0	1119	2534	0
55.00	0	-520	520	0	1127	0	1127	2820	0
50.00	0	-588	588	0	1146	0	1146	3107	0
45.00	0	-658	658	0	1174	0	1174	3394	0
40.00	0	-730	730	0	1217	0	1217	3678	0
40.00	0	-730	730	0	1211	0	1211	3680	0
35.00	0	-805	805	0	1297	0	1297	4249	0
30.00	0	-886	886	0	1383	0	1383	4817	0
25.00	0	-971	971	0	1462	0	1462	5386	0
20.00	0	-1061	1061	0	1536	0	1536	5956	0
15.00	0	-1156	1156	0	1603	0	1603	6525	0
10.00	0	-1254	1254	0	1661	0	1661	7095	0
5.00	0	-1355	1355	0	1704	0	1704	7666	0
0.00	0	-1458	1458	0	1731	0	1731	8234	0

BY VALMONT INDUSTRIES FOR:  
 Deflections and Stresses for Pole

CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
 Fuse 1.10.0.524

Loading Case Seismic

\*\*\* Deflections and Stresses \*\*\*

Distance From Base (ft)	Defl. X-Dir (in)	Defl. Y-Dir (in)	Defl. Resultant X & Y (in)	Defl. Z-Dir (in)	Rotation (deg.)	Axial Interaction Term	Flexural Interaction Term	Shear Interaction Term	Torsion Interaction Term	Combined Stress Interaction
100.00	16.7	0.0	16.7	0.2	1.44	0.00	0.00	0.00	0.00	0.01
99.00	16.4	0.0	16.4	0.2	1.44	0.00	0.00	0.00	0.00	0.01
99.00	16.4	0.0	16.4	0.2	1.44	0.00	0.00	0.00	0.00	0.01
95.00	15.2	0.0	15.2	0.1	1.43	0.00	0.01	0.01	0.00	0.01
90.00	13.7	0.0	13.7	0.1	1.42	0.00	0.04	0.01	0.00	0.04
85.00	12.2	0.0	12.2	0.1	1.37	0.00	0.07	0.01	0.00	0.07
80.00	10.8	0.0	10.8	0.1	1.31	0.00	0.10	0.01	0.00	0.10
80.00	10.8	0.0	10.8	0.1	1.31	0.00	0.08	0.01	0.00	0.08
75.00	9.4	0.0	9.4	0.1	1.26	0.00	0.10	0.01	0.00	0.11
70.00	8.1	0.0	8.1	0.1	1.20	0.00	0.13	0.01	0.00	0.13
65.00	6.9	0.0	6.9	0.0	1.12	0.00	0.16	0.01	0.00	0.16
60.00	5.8	0.0	5.8	0.0	1.03	0.00	0.19	0.01	0.00	0.19
55.00	4.8	0.0	4.8	0.0	0.93	0.01	0.21	0.01	0.00	0.22
50.00	3.9	0.0	3.9	0.0	0.81	0.01	0.24	0.01	0.00	0.25
45.00	3.1	0.0	3.1	0.0	0.67	0.01	0.27	0.01	0.00	0.28
40.00	2.4	0.0	2.4	0.0	0.52	0.01	0.30	0.01	0.00	0.31
40.00	2.4	0.0	2.4	0.0	0.52	0.00	0.11	0.01	0.00	0.11
35.00	1.9	0.0	1.9	0.0	0.48	0.00	0.12	0.01	0.00	0.13
30.00	1.4	0.0	1.4	0.0	0.43	0.00	0.13	0.01	0.00	0.14
25.00	1.0	0.0	1.0	0.0	0.37	0.01	0.15	0.01	0.00	0.15
20.00	0.7	0.0	0.7	0.0	0.31	0.01	0.16	0.01	0.00	0.17
15.00	0.4	0.0	0.4	0.0	0.24	0.01	0.18	0.01	0.00	0.18
10.00	0.2	0.0	0.2	0.0	0.17	0.01	0.19	0.01	0.00	0.20
5.00	0.0	0.0	0.0	0.0	0.09	0.01	0.21	0.01	0.00	0.21
0.00	0.0	0.0	0.0	0.0	0.00	0.01	0.22	0.01	0.00	0.23

MINIMUM DEFLECTION RATIO // DEFLECTION LIMIT / DEFLECTION // IS

BY VALMONT INDUSTRIES FOR: CENTURYLINK 100' POLE, SITE: WESTINGHOUSE-OGDEN NORTH, UT

DATE 04/17/12  
Fuse 1.10.0.524

32-bit

\*\*\* ANCHOR BOLT CHARACTERISTICS GOVERNED BY LOADING CASE WIND \*\*\*

NUMBER OF BOLTS	DIAMETER (IN.)	LENGTH (IN.)	WEIGHT (LB.)	SHIPPED AS	PROJECTION LENGTH (IN.)	GALVANIZED LENGTH (IN.)	THREAD SIZE
8	2.000	60	668	BOLTS, TEMPLATES	10.00	18.00	4.5-UNC-2A

STEEL SPECIF.	MAXIMUM BOLT FORCE (LB.)	MAXIMUM BOLT SHEAR FORCE (LB.)	FACTORED NOMINAL TENS. STRENGTH (LB.)	STRESS AREA (SQ. IN.)	INTERACTION VALUE	CONFIGURATION OF BOTTOM END
F155	73659	686	150004	2.500	0.50	THREADED WITH HEAVY HEX HEAD NUT

NOTE: BOLT INTERACTION VALUE WAS CALCULATED BY DIVIDING SHEAR FORCE BY FACTOR RELATED TO DETAIL TYPE d) IN EIA-G SPECS.

\*\*\* BOLT COORDINATES AND FORCES \*\*\*

BOLT NO.	X-COORD	Y-COORD	MAX TENSION-LB	MAX FORCE-LB	* BOLT NO.	X-COORD	Y-COORD	MAX TENSION-LB	MAX FORCE-LB
1	15.437	0.00	50298	52391	*	2	10.916	10.916	71566
3	0.00	15.437	50298	52391	*				73659

MAX. BOLT CIRCLE = 30.87 IN.

TEMPLATE DIAMETER = 36.87 IN.

\*\*\* BASE PLATE CHARACTERISTICS GOVERNED BY LOADING CASE WIND \*\*\*

DRAWING NUMBER	OVERALL LENGTH (IN.)	OVERALL WIDTH (IN.)	THICKNESS (IN.)	ACTUAL WEIGHT (LB.)	RAW MATERIAL WEIGHT (LB.)	SIDE LENGTH (IN.)
POL6-98	36.21	36.21	1.7500 MIN. USE 2.00"	371	650	9.70

TOP WIDTH (IN.)	POLE DIAM. (MAJOR DIAM.) (IN.)	CRITICAL FAILURE MODE	TOTAL LENGTH OF FAIL MODE LINE (IN.)	EFFECTIVE LENGTH (IN.)	TOTAL MOMENT ALONG FAIL LINE (IN.-LB.)
9.70	24.00	2	47.25	31.51	582264

VALMONT STEEL SPECIF.	OTHER	BENDING STRESS (PSI)	EFFECTIVE YIELD STRESS (PSI)	MAX. VERTICAL SHEAR STRESS (PSI)
S56	A572	36207	50000	6219

\*\*\* LOADS AT POLE BASE IN THE GLOBAL COORDINATE SYSTEM \*\*\*\*\* LOADING CASES \*\*\*\*\*

LOADING CASE IDENTIFICATION	WIND	ICE	T+S	Seis	MAX CRITERION- LOAD CASE
MOMENT ABT. X-AXIS (IN-KIP)	0.	0.	0.	0.	] MOMENT ABT. X WIND
MOMENT ABT. Y-AXIS (IN-KIP)	- 4484	- 1335	- 1111	- 1458	] MOMENT ABT. Y WIND
SHEAR FORCE (LB.)	5484	1820	1365	1725	] RES. MOMENT WIND
VERTICAL FORCE (LB.)	8372	9612	6871	8235	] SHEAR FORCE WIND
					] BOLT FORCE WIND
					] BOLT TENSION WIND

SLAB (Rev.1/28/92)	Date:	04/17/12	Time:	18:51
Project: 173392-1-1	Run by:	CWB		
Input (Blue):	Checked by:	MF		
legs	1	1 = Pole \ 3 or 4 = Tower		
otm_t	374 k-ft	total pole overturning moment		
sh_t	5.48 k	total pole shear		
sh_l	5.48 k			
wt	7.85 k	total pole weight * 0.9		
f_w	2.57 ft	anchor bolt circle dia		
b	14.00 ft	slab width (rigid square slab only)		
t	24.00 in	slab thickness		
net_p_a	6.00 ksf	ultimate soil bearing pressure		
s_f	1.00	allowable stress increase factor (rebar)		
c_h	24.00 in	cap height above slab		
c_s	54.00 in	cap dia		
d_f	3.50 ft.	depth from final grade to bottom of footing		
d_fl	18.00 in	depth of fill over slab		
dens_c	0.150 kcf	density of concrete		
dens_s	0.100 kcf	density of soil		
dens_fl	0.100 kcf	density of fill over slab		
f_c	3,000 psi	concrete compres. strength		
c_type		concrete type		
f_y	60,000 psi	rebar yield strength		
u	1.00	soil factor of safety: qult/qall		

Output Summary (see complete calculations below):

s_r	1.59	OK (overturning F.S. OK)
net_p	1.23 ksf	OK (net soil bearing pressure is OK)
vol_c	16.02 cu.yd.	Total volume of concrete.
slab two-way shear:		(punching shear ok)
slab beam shear:		(beam shear ok)

Slab Reinforcement (ASTM A615 Gr.60):

		Size	Quan. (E/W)	Len. (ft)	Spc. (in)	Total (lbs)	
y	Top Bar					271	<---OK
	Options	#5	10	13.50	18.00	282	<---OK
		#6	7	13.50	27.00	284	
	As>=2.82	#7	5	13.50	40.50	276	
		#8	4	13.50	54.00	288	
		#9	3	13.50	81.00	275	
	Bot.Bar	#4	23	13.50	7.36	415	<---OK
y	Options	#5	11	13.50	16.20	422	<---OK
		#6	11	13.50	16.20	446	<---OK
	As>=4.44	#7	8	13.50	23.14	442	
		#8	6	13.50	32.40	433	
		#9	5	13.50	40.50	459	

(special design req'd for cap shear reinforcement)  
(special design req'd for cap flexural/tensile reinforcement.)

Top of slab may also be raised above ground, thereby eliminating caps.

Special Cap Reinforcement:

Project: 173392-1-1  
Date: 04/17/12

Vertical Reinforcement Size = # **8**  
Quantity of vertical rebar = **16**

Factored max moment in cap =  $M + (V \cdot h_{cap}) = 386.3 \text{ ft-k}$  (conservatively neglect passive pressure of soil)  
Section Modulus of rebar =  $147.7 \text{ in}^3$   
 $f_b = M/S = 31.4 \text{ ksi} \leq 54 \text{ ksi, OK}$

Req'd vert. bar dev. length =  $(3d_b/40) \cdot (f_y/f'_c)^{0.5} \cdot (1/2.5) = 32.86 \text{ in}$  provide min 33 in vert. rebar dev. length  
concrete cover = **3.00** in  
length of vert rebar = 3.50 ft  
a = 42.00 in > 33 in of vert. rebar dev. length OK  
d\* = 6.00 in  
b = 1.25 ft ACI318-95 7.1.2  
total wt of vert rebar = 203 lbs  
radius of vert rebar = 23.00 in

Shear tie rebar size = # **4**  
vertical spacing = **12.00** in

Factored max shear in cap = 5.5 k  
Concrete shear capacity =  $0.85 \cdot 2 \cdot \sqrt{f'_c} \cdot b_w \cdot d = 251.4 \text{ k, OK}$

tie diameter (a) = 4.00 ft  
circumference = 12.57 ft  
# of ties = 5.00  
total wt of ties = 42 lbs  
d\*\* = 2.00 in  
10db = 5.00 in

Anchor Bolt Diameter = **2.00** in  
Length Of Anchor Bolts = **60.00** in  
Anchor Bolt Projection = **10.00** in  
Depth of Pocket to Accommodate Anchor Bolts = 5.00 in  
Total Depth from Final Grade = 3.92 ft  
Pocket Vol = 4.39 ft<sup>3</sup>

**REINFORCEMENT STEEL SCHEDULE**

	Sym	Type	Rebar Size	Rebar Spacing	Dimensions				Weight (lbs)	Qty	
					a	b	c	d (10db)			
CAP TIES	1	C	#4	EQUAL	4.00 ft			2 in	5 in	42	5
CAP VERTICAL REBAR	2	B	#8	-----	3.50 ft	1.25 ft		6 in		203	16
SLAB TOP STEEL	3	A	#4	11.57 in	13.50 ft					271	30
SLAB BOTTOM STEEL	4	A	#5	11.57 in	13.50 ft					422	30
TOTAL STEEL WEIGHT FOR COMPLETE FOUNDATION INSTALLATION =										938	

**TOTAL VOLUME OF CONCRETE FOR FOUNDATION INSTALLATION = 16.18 yd<sup>3</sup>**