100 MW WIND FARM DESIGN
F20-25
CIVIL/MECHANICAL REPORT PACKAGE

3J2LM ENGINEERING

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C-M ANALYSIS REPORT 1

SUBSTATION BILL OF MATERIALS

QTY	DESCRIPTION	ESTIMATED COST		
		UNITS	HISTORIC PRICE (IN $)	TOTAL PRICE($)
1	138 kV Circuit Breaker	EA	$ 74,000.00	$ 74,000.00
5	34.5 kV Circuit Breaker	EA	$ 48,000.00	$ 240,000.00
2	Current Transformer (Set of 3): 138 kV CT	EA	$ 105,100.00	$ 210,200.00
6	Current Transformer (Set of 3): 34.5 kV CT	EA	$ 61,800.00	$ 370,800.00
1	34.5 kV Bus, support and fittings	EA	$ 5,700.00	$ 5,700.00
5	34.5 kV Switches	EA	$ 19,000.00	$ 95,000.00
5	Relay: SEL-351S Single Cost	EA	$ 2,570.00	$ 12,850.00
1	Relay: SEL-587Z Single Cost	EA	$ 4,080.00	$ 4,080.00
1	Relay: SEL-487E Single Cost	EA	$ 6,990.00	$ 6,990.00
1	Relay: SEL-387A Single Cost	EA	$ 3,810.00	$ 3,810.00
1	Relay: SEL-311C Single Cost	EA	$ 4,670.00	$ 4,670.00
30	10' Stick of #6 Rebar	EA	$ 9.00	$ 270.00
115	4000 PSI Concrete	cubic yards	$ 155.00	$ 17,825.00
12	18' Conductor 796 KCMIL *DRAKE* ACSR/AW	EA		
			Total	$ 1,046,195.00

C-M ANALYSIS REPORT 2

Mines 138KV Transmission Line Staking Table											
Structure Number	Station (ft)	X Easting (ft)	Y Northing (ft)	Centerline Z Elevation (ft)	Ahead Span (ft)	Line Angle (deg)	Struct. Height (ft)	Structure Number	Above Ground Height	Foundation Type	Embed Length or Pier Size
1	32808398950	2125246.092	1441295.382	786	236.607		50	Substation H-Frame	Height = 50'	Substation H-Frame	
2	32808399278	2125482.025	1441277.542	786	581.807	-3.3327	80	1/2	Height = 80'	Drilled Pier	7' Diameter, 16.50' Length
3	32808399606	2126063.745	1441267.475	786	601.51	-0.2313	65.5	1/3	Height = 75'	Direct Embed	9.5
4	32808399934	2126665.202	1441259.495	786	592.731	-0.0791	61	1/4	Height = 70'	Direct Embed	9
5	32808400262	2127257.891	1441252.45	786	576.316	-0.3495	65.5	1/5	Height = 75'	Direct Embed	9.5
6	32808400591	2127834.197	1441249.115	786	616.247	0.484	65.5	1/6	Height = 75'	Direct Embed	9.5
7	32808400919	2128450.382	1441240.344	788	585.52	0.4009	65.5	1/7	Height = 75'	Direct Embed	9.5
8	32808401247	2129035.77	1441227.914	788	590.024	1.4014	65.5	1/8	Height = 75'	Direct Embed	9.5
9	32808401575	2129625.178	1441200.965	788	610.74	1.5447	61	1/9	Height = 70'	Direct Embed	9
10	32808401903	2130234.307	1441156.633	788	596.981	0.533	65.5	1/10	Height = 75	Direct Embed	9.5
11	32808402231	2130829.284	1441107.763	788			80	1/11	Height = 80'	Drilled Pier	7' Diameter, 16.50' Length

C-M ANALYSIS REPORT 3

Mines 138KV Transmission Line Structure Locations & Usage Report							
Structure Number	Structure Name	Line Angle (deg)	Structure Strength Usage (%)	Insulator Swing Usage (%)	Minimum Required Vertical Load (Uplift)	Pole Tip Deflection Usage (%)	OK or NG
2	cs18-2440_eng_089_1-1.pol	-3.33	85.4	0.0	OK	13.4	OK
3	Tangent_70_H5_9E.pol	-0.23	93.7	69.3	OK	66.5	OK
4	Tangent_70_H5_9E.pol	-0.08	79.7	45.4	OK	60.1	OK
5	Tangent_70_H5_9E.pol	-0.35	85.5	49.3	OK	59.9	OK
6	Tangent_75_H6_9.5E.pol	0.48	81.4	47.0	OK	61.1	OK
7	Tangent_70_H6_9E.pol	0.40	83.0	56.0	OK	57.6	OK
8	Tangent_70_H5_9E.pol	1.40	92.1	53.4	OK	70.4	OK
9	Tangent_70_H5_9E.pol	1.54	83.6	79.6	OK	62.5	OK
10	Tangent_70_H5_9E.pol	0.53	85.6	0.0	OK	73.9	OK
11	cs18-2440_eng_089_1-1.pol	0.00	85.6	0.0	OK	73.9	OK

C-M ANALYSIS REPORT 4

Mines 138KV Transmission Line Section Usage Report														
Sec No.	Cable Name	From Str. No.	To Str. No.	WC No.	Weather Case Description	Condition	Allowable % of Ultimate	Actual % of Ultimate	Allowable Tension (lbs)	Actual Tension (lbs)	Allowable Catenary (ft)	Actual Catenary (ft)	% of Allowable Capacity	OK or NG.
1	brugg_49ay85acs-2c_a.wir	1	2	2	NESC CL-0#,0",60deg	Initial RS	60.0	15.2	0.0	3421.1	0.0	7805.8	25.4	OK
1	brugg_49ay85acs-2c_a.wir	1	2	3	NESC CL-6#,0",60deg	Initial RS	80.0	15.3	0.0	3450.6	0.0	7178.2	19.2	OK
1	brugg_49ay85acs-2c_a.wir	1	2	4	NESC CL-0#,1/2",32deg	Initial RS	80.0	20.5	0.0	4604.0	0.0	4095.0	25.6	OK
1	brugg_49ay85acs-2c_a.wir	1	2	1	Everyday_60deg	Initial RS	35.0	15.2	0.0	3421.1	0.0	7805.8	43.5	OK
1	brugg_49ay85acs-2c_a.wir	1	2	1	Everyday_60deg	Creep RS	25.0	11.8	0.0	2659.2	0.0	6063.2	47.3	OK
1	brugg_49ay85acs-2c_a.wir	1	2	2	NESC CL-0#,0",60deg	Initial RS	50.0	15.2	0.0	3421.1	0.0	7805.8	30.4	OK
1	brugg_49ay85acs-2c_a.wir	1	2	21	NESC XW-90mph,0",60deg	Initial RS	60.0	17.6	0.0	3950.4	0.0	3875.7	29.3	OK
1	brugg_49ay85acs-2c_a.wir	1	2	27	NESC HWI-4#,1",15deg	Initial RS	70.0	27.8	0.0	6239.0	0.0	2403.2	39.6	OK
1	brugg_49ay85acs-2c_a.wir	1	2	1	Everyday_60deg	Initial RS	15.3	15.2	0.0	3421.1	0.0	7805.8	99.5	OK *
1	brugg_49ay85acs-2c_a.wir	1	2	1	Everyday_60deg	Creep RS	13.4	11.8	0.0	2659.2	0.0	6063.2	88.3	OK
2	3_8ehs	1	2	2	NESC CL-0#,0",60deg	Initial RS	60.0	13.3	0.0	2053.0	0.0	7462.6	22.2	OK
2	3_8ehs	1	2	3	NESC CL-6#,0",60deg	Initial RS	80.0	13.5	0.0	2075.9	0.0	6913.9	16.8	OK
2	3_8ehs	1	2	4	NESC CL-0#,1/2",32deg	Initial RS	80.0	18.7	0.0	2887.2	0.0	3536.7	23.4	OK
2	3_8ehs	1	2	1	Everyday_60deg	Initial RS	35.0	13.3	0.0	2053.0	0.0	7462.6	38.1	OK
2	3_8ehs	1	2	1	Everyday_60deg	Creep RS	25.0	13.3	0.0	2053.0	0.0	7462.6	53.3	OK
2	3_8ehs	1	2	2	NESC CL-0#,0",60deg	Initial RS	50.0	13.3	0.0	2053.0	0.0	7462.6	26.7	OK
2	3_8ehs	1	2	21	NESC XW-90mph,0",60deg	Initial RS	60.0	15.6	0.0	2407.7	0.0	3854.4	26.1	OK
2	3_8ehs	1	2	27	NESC HWI-4#,1",15deg	Initial RS	70.0	28.4	0.0	4368.0	0.0	2035.0	40.5	OK
2	3_8ehs	1	2	1	Everyday_60deg	Initial RS	15.3	13.3	0.0	2053.0	0.0	7462.6	87.1	OK
2	3_8ehs	1	2	1	Everyday_60deg	Creep RS	13.4	13.3	0.0	2053.0	0.0	7462.6	99.5	OK *
3	drake	1	2	2	NESC CL-0#,0",60deg	Initial RS	60.0	15.2	0.0	4802.3	0.0	4371.5	25.4	OK
3	drake	1	2	3	NESC CL-6#,0",60deg	Initial RS	80.0	15.5	0.0	4891.4	0.0	4219.4	19.4	OK
3	drake	1	2	4	NESC CL-0#,1/2",32deg	Initial RS	80.0	22.5	0.0	7082.6	0.0	3365.4	28.1	OK
3	drake	1	2	1	Everyday_60deg	Initial RS	35.0	15.2	0.0	4802.3	0.0	4371.5	43.6	OK
3	drake	1	2	1	Everyday_60deg	Creep RS	25.0	12.5	0.0	3948.2	0.0	3591.5	50.1	OK
3	drake	1	2	2	NESC CL-0#,0",60deg	Initial RS	50.0	15.2	0.0	4802.3	0.0	4371.5	30.5	OK
3	drake	1	2	21	NESC XW-90mph,0",60deg	Initial RS	60.0	19.0	0.0	5991.8	0.0	3027.6	31.7	OK
3	drake	1	2	27	NESC HWI-4#,1",15deg	Initial RS	70.0	30.2	0.0	9517.9	0.0	2451.2	43.2	OK
3	drake	1	2	1	Everyday_60deg	Initial RS	15.3	15.2	0.0	4802.3	0.0	4371.5	99.6	OK *
3	drake	1	2	1	Everyday_60deg	Creep RS	13.4	12.5	0.0	3948.2	0.0	3591.5	93.5	OK
4	brugg_49ay85acs-2c_a.wir	2	10	2	NESC CL-0#,0",60deg	Initial RS	60.0	15.3	0.0	3434.0	0.0	7872.0	25.5	OK
4	brugg_49ay85acs-2c_a.wir	2	10	3	NESC CL-6#,0",60deg	Initial RS	80.0	15.8	0.0	3547.2	0.0	7407.2	19.7	OK
4	brugg_49ay85acs-2c_a.wir	2	10	4	NESC CL-0#,1/2",32deg	Initial RS	80.0	24.5	0.0	5506.9	0.0	4920.9	30.6	OK
4	brugg_49ay85acs-2c_a.wir	2	10	1	Everyday_60deg	Initial RS	35.0	15.3	0.0	3434.0	0.0	7872.0	43.6	OK
4	brugg_49ay85acs-2c_a.wir	2	10	1	Everyday_60deg	Creep RS	25.0	12.8	0.0	2873.7	0.0	6583.0	51.1	OK
4	brugg_49ay85acs-2c_a.wir	2	10	2	NESC CL-0#,0",60deg	Initial RS	50.0	15.3	0.0	3434.0	0.0	7872.0	30.5	OK

Mines 138KV Transmission Line Section Usage Report														
Sec No.	Cable Name	From Str. No.	To Str. No.	WC No.	Weather Case Description	Condition	Allowable % of Ultimate	Actual % of Ultimate	Allowable Tension (lbs)	Actual Tension (lbs)	Allowable Catenary (ft)	Actual Catenary (ft)	% of Allowable Capacity	OK or NG.
4	brugg_49ay85acs-2c_a.wir	2	10	21	NESC XW-90mph,0",60deg	Initial RS	60.0	21.1	0.0	4746.6	0.0	4997.4	35.2	OK
4	brugg_49ay85acs-2c_a.wir	2	10	27	NESC HWI-4#,1",15deg	Initial RS	70.0	38.0	0.0	8538.8	0.0	3301.5	54.3	OK
4	brugg_49ay85acs-2c_a.wir	2	10	1	Everyday_60deg	Initial RS	15.3	15.3	0.0	3434.0	0.0	7872.0	99.8	OK *
4	brugg_49ay85acs-2c_a.wir	2	10	1	Everyday_60deg	Creep RS	13.4	12.8	0.0	2873.7	0.0	6583.0	95.4	OK
5	drake	2	10	2	NESC CL-0#,0",60deg	Initial RS	60.0	14.6	0.0	4584.6	0.0	4169.0	24.3	OK
5	drake	2	10	3	NESC CL-6#,0",60deg	Initial RS	80.0	15.1	0.0	4767.2	0.0	4107.1	18.9	OK
5	drake	2	10	4	NESC CL-0#,1/2",32deg	Initial RS	80.0	24.7	0.0	7773.3	0.0	3689.0	30.8	OK
5	drake	2	10	1	Everyday_60deg	Initial RS	35.0	14.6	0.0	4584.6	0.0	4169.0	41.6	OK
5	drake	2	10	1	Everyday_60deg	Creep RS	25.0	13.4	0.0	4212.2	0.0	3827.4	53.5	OK
5	drake	2	10	2	NESC CL-0#,0",60deg	Initial RS	50.0	14.6	0.0	4584.6	0.0	4169.0	29.1	OK
5	drake	2	10	21	NESC XW-90mph,0",60deg	Initial RS	60.0	21.2	0.0	6692.4	0.0	3591.0	35.4	OK
5	drake	2	10	27	NESC HWI-4#,1",15deg	Initial RS	70.0	37.7	0.0	11888.6	0.0	3055.8	53.9	OK
5	drake	2	10	1	Everyday_60deg	Initial RS	15.3	14.6	0.0	4584.6	0.0	4169.0	95.1	OK
5	drake	2	10	1	Everyday_60deg	Creep RS	13.4	13.4	0.0	4212.2	0.0	3827.4	99.8	OK *

C-M ANALYSIS REPORT 5

PLS-CADD Version 16.51x64 6:38:15 PM Tuesday, April 13, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'

Line Statistics:

Total alignment length: 1.06 (miles), Total of span lengths strung 1.06 (miles)

Total number of sections: 5
Longest section by linear length: 1.01 (miles)
Longest section by number of structures: 10 structures

Total number of structures used: 11
Average number of structures per alignment Mile: 10.39, Average number of structures per span Mile: 10.39

Total number of alignment line angles: 9
Average number of alignment line angles per alignment Mile: 8.50
Number of <= 1 deg line angles: 6
Number of <= 5 deg line angles: 3
Number of <= 15 deg line angles: 0
Number of <= 30 deg line angles: 0
Number of <= 90 deg line angles: 0
Number of > 90 deg line angles: 0

Total number of deadend structures: 3
Average number of deadend structures per alignment Mile: 2.83, Average number of deadend structures per span Mile: 2.83
Maximum number of suspension structures between deadend structures: 8
Average number of suspension structures between deadend structures: 2.67

Structure List Report

Struct. Number	Station (ft)	Line Angle (deg)	Ahead Span (ft)	Height Adjust (ft)	Offset Adjust (ft)	Orient Angle (deg)	Name/Description/Comments/Material
1	NA	0.00	236.61	0.00	0.00	90.00	C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\h-frame_50ft.stk H-Frame - 50ft Substation H-Frame Height = 50' Substation H-Frame
2	NA	-3.33	581.81	1.00	0.00	0.00	C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\cs18-2440_eng_089_1-1.pol 138kV, SC, Steel, 1-Pole, Polymer, Dead-End (Hvy Ang), Vert. Conf., Self-Supotng 1/2 Height = 80' Drilled Pier 7' Diameter, 16.50' Length 1 CS18-2440
3	NA	-0.23	601.51	0.00	0.00	90.00	C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_75_H5_9.5E.pol 138kV, SC, Steel, 1-Pole, Polymer, 0° Braced Post, Delta Conf., , embed len=9.50 1/3 Height = 75' Direct Embed 9.500' 1 CS11-2396
4	NA	-0.08	592.73	0.00	0.00	90.00	C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_70_H5_9E.pol Braced Post embed len=9.00 1/4 Height = 70' Direct Embed 9.000' 1 CS11-2396
5	NA	-0.35	576.32	0.00	0.00	90.00	C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_75_H5_9.5E.pol 138kV, SC, Steel, 1-Pole, Polymer, 0° Braced Post, Delta Conf., , embed len=9.50 1/5 Height = 75' Direct Embed 9.500' 1 CS11-2396
6	NA	0.48	616.25	0.00	0.00	90.00	C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_75_H6_9.5E.pol 138kV, SC, Steel, 1-Pole, Polymer, 0° Braced Post, Delta Conf., , embed len=9.50 1/6 Height = 75' Direct Embed 9.500' 1 CS11-2396
7	NA	0.40	585.52	0.00	0.00	90.00	C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_75_H6_9.5E.pol 138kV, SC, Steel, 1-Pole, Polymer, 0° Braced Post, Delta Conf., , embed len=9.50 1/7 Height = 75' Direct Embed 9.500' 1 CS11-2396
8	NA	1.40	590.02	0.00	0.00	90.00	C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_75_H5_9.5E.pol 138kV, SC, Steel, 1-Pole, Polymer, 0° Braced Post, Delta Conf., , embed len=9.50 1/8 Height = 75' Direct Embed 9.500' 1 CS11-2396
9	NA	1.54	610.74	0.00	0.00	90.00	C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_70_H5_9E.pol Braced Post embed len=9.00 1/9 Height = 70' Direct Embed 9.000' 1 CS11-2396
10	NA	0.53	596.98	1.00	0.00	90.00	C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_75_H4_9.5E.pol 138kV, SC, Steel, 1-Pole, Polymer, 0° Braced Post, Delta Conf., , embed len=9.50 1/10 Height = 75 Direct Embed 9.500' 1 CS11-2396
11	NA	0.00	0.00	0.00	0.00	0.00	C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\cs18-2440_eng_089_1-1.pol 138kV, SC, Steel, 1-Pole, Polymer, Dead-End (Hvy Ang), Vert. Conf., Self-Supotng 1/11 Height = 80' Drilled Pier 7' Diameter, 16.50' Length 1 CS18-2440

Structure Coordinates Report

Struct. Number	Station (ft)	Line Angle (deg)	Ahead Span (ft)	X (ft)	Y (ft)	Z (ft)	Structure Name	Sets In XY Structure Line Angle Calculation
1	NA	0.00	236.61	2125246.09	1441295.38	786.00	h-frame_50ft.stk	1-60
2	NA	-3.33	581.81	2125482.02	1441277.54	786.00	cs18-2440_eng_089_1-1.pol	1-60
3	NA	-0.23	601.51	2126063.75	1441267.48	786.00	Tangent_75_H5_9.5E.pol	1-60
4	NA	-0.08	592.73	2126665.20	1441259.50	786.00	Tangent_70_H5_9E.pol	1-60
5	NA	-0.35	576.32	2127257.89	1441252.45	786.00	Tangent_75_H5_9.5E.pol	1-60
6	NA	0.48	616.25	2127834.20	1441249.12	786.23	Tangent_75_H6_9.5E.pol	1-60
7	NA	0.40	585.52	2128450.38	1441240.34	788.00	Tangent_75_H6_9.5E.pol	1-60
8	NA	1.40	590.02	2129035.77	1441227.91	788.00	Tangent_75_H5_9.5E.pol	1-60
9	NA	1.54	610.74	2129625.18	1441200.97	788.00	Tangent_70_H5_9E.pol	1-60
10	NA	0.53	596.98	2130234.31	1441156.63	788.00	Tangent_75_H4_9.5E.pol	1-60
11	NA	0.00	0.00	2130829.28	1441107.76	788.00	cs18-2440_eng_089_1-1.pol	1-60

Structure Attachment Coordinates

Coordinates and arc lengths along the wire are for weather case 'NESC CL-0#,0",60deg', Creep RS, wind from the left.
Arc lengths are adjusted for the number of subconductors and to exclude the length of strain insulators.
Arc lengths and slack are computed with any concentrated loads removed. Other columns are with concentrated loads applied.

Struct. Number	Set No.	Phase No.	Circuit Phase Label	Structure Name	Set Label	Insulator Attach Point X (ft)	Insulator Attach Point Y (ft)	Insulator Attach Point Z (ft)	Wire Attach Point X (ft)	Wire Attach Point Y (ft)	Wire Attach Point Z (ft)	Mid Span Point X (ft)	Mid Span Point Y (ft)	Mid Span Point Z (ft)	Low Span Point X (ft)	Low Span Point Y (ft)	Low Span Point Z (ft)	TIN Z below Insulator Attach Point (ft)	TIN Z below Wire Attach Point (ft)	TIN Z below Mid Span Point (ft)	TIN Z below Low Span Point (ft)	Ahead Span Arc Length (ft)	Ahead Span Slack (ft)
1	2	1		h-frame_50ft.stk	OPGW - Ahead	2125246.09	1441305.38	836.00	2125246.09	1441305.38	836.00	2125363.43	1441291.49	850.27	2125246.15	1441305.38	836.01	786.00	786.00	786.00	786.00	238.284	0.010
	3	1			SW - Ahead	2125246.09	1441285.38	836.00	2125246.09	1441285.38	836.00	2125363.43	1441281.47	849.56	2125246.15	1441285.38	836.01	0.00	0.00	0.00	0.00	236.649	0.015
	10	1			Conductor - Ahead	2125246.09	1441308.38	826.00	2125253.99	1441307.35	826.78	2125364.77	1441292.81	839.63	2125254.04	1441307.34	826.78	786.00	786.00	786.00	786.00	225.419	0.037
		2				2125246.09	1441295.38	826.00	2125254.07	1441294.78	826.25	2125364.66	1441286.37	831.59	2125254.12	1441294.77	826.25	786.00	0.00	0.00	0.00	222.312	0.037
		3				2125246.09	1441282.38	826.00	2125254.07	1441282.22	825.44	2125364.47	1441279.94	819.49	2125474.81	1441277.66	817.03	0.00	0.00	0.00	786.00	221.040	0.036
2	1	1		cs18-2440_eng_089_1-1.pol		2125482.79	1441277.54	866.00	2125483.29	1441277.53	865.97	2125773.52	1441272.50	852.75	2125970.46	1441269.09	850.17	786.00	786.00	0.00	0.00	580.888	0.144
	3	1				2125482.92	1441277.54	857.00	2125488.58	1441277.39	856.41	2125776.16	1441269.77	837.67	2125882.22	1441266.96	836.21	786.00	786.00	0.00	0.00	576.120	0.538
		2				2125483.14	1441277.54	841.00	2125488.82	1441277.50	840.48	2125776.28	1441275.21	825.22	2125836.18	1441274.73	824.76	786.00	786.00	0.00	0.00	575.551	0.537
		3				2125483.48	1441277.54	817.00	2125489.17	1441277.39	816.72	2125776.46	1441269.71	813.35	2125677.81	1441272.35	812.08	786.00	786.00	0.00	0.00	575.502	0.537
	11	1				2125481.27	1441277.54	866.50	2125480.78	1441277.60	866.43	0.00	0.00	0.00	0.00	0.00	0.00	786.00	786.00	0.00	0.00	0.000	0.000
	12	1				2125481.25	1441277.54	865.50	2125480.76	1441277.56	865.43	0.00	0.00	0.00	0.00	0.00	0.00	786.00	786.00	0.00	0.00	0.000	0.000
	13	1				2125481.13	1441277.54	857.00	2125475.56	1441278.27	856.08	0.00	0.00	0.00	0.00	0.00	0.00	786.00	786.00	0.00	0.00	0.000	0.000
		2				2125480.91	1441277.54	841.00	2125475.25	1441277.97	840.45	0.00	0.00	0.00	0.00	0.00	0.00	786.00	786.00	0.00	0.00	0.000	0.000
		3				2125480.57	1441277.54	817.00	2125474.87	1441277.66	817.03	0.00	0.00	0.00	0.00	0.00	0.00	786.00	786.00	0.00	0.00	0.000	0.000
3	1	1		Tangent_75_H5_9.5E.pol		2126063.75	1441267.48	850.75	2126063.75	1441267.48	850.75	2126364.47	1441263.49	842.48	2126420.68	1441262.74	842.27	0.00	0.00	786.00	0.00	601.687	0.161
	60	1				2126063.75	1441262.15	840.50	2126063.75	1441262.15	840.50	2126364.47	1441258.16	826.47	2126393.14	1441257.78	826.36	0.00	0.00	786.00	786.00	602.142	0.615
		2				2126063.74	1441272.92	831.50	2126063.74	1441272.92	831.50	2126364.47	1441269.00	813.46	2126444.17	1441267.96	812.64	0.00	0.00	786.00	0.00	602.253	0.615
		3				2126063.75	1441262.03	831.50	2126063.75	1441262.03	831.50	2126364.47	1441257.97	813.46	2126444.17	1441256.90	812.64	0.00	0.00	786.00	0.00	602.256	0.615
4	1	1		Tangent_70_H5_9E.pol		2126665.20	1441259.50	846.25	2126665.20	1441259.50	846.25	2126961.55	1441255.97	842.66	2126904.50	1441256.65	842.44	0.00	0.00	0.00	0.00	592.902	0.154
	60	1				2126665.20	1441254.17	836.00	2126665.20	1441254.17	836.00	2126961.55	1441250.65	826.81	2126932.43	1441250.99	826.70	0.00	0.00	0.00	0.00	593.336	0.589
		2				2126665.20	1441265.07	819.00	2126665.20	1441265.07	819.00	2126961.55	1441261.48	813.81	2126880.62	1441262.46	812.95	0.00	0.00	0.00	0.00	593.453	0.588
		3				2126665.20	1441253.92	819.00	2126665.20	1441253.92	819.00	2126961.55	1441250.46	813.81	2126880.62	1441251.41	812.95	0.00	0.00	0.00	0.00	593.450	0.588
5	1	1		Tangent_75_H5_9.5E.pol		2127257.89	1441252.45	850.75	2127257.89	1441252.45	850.75	2127546.04	1441250.78	845.34	2127543.05	1441250.80	845.34	0.00	0.00	0.00	0.00	576.457	0.141
	60	1				2127257.89	1441247.13	840.50	2127257.89	1441247.13	840.50	2127546.04	1441245.37	829.80	2127544.53	1441245.38	829.80	0.00	0.00	0.00	0.00	576.858	0.541
		2				2127257.89	1441257.90	831.50	2127257.89	1441257.90	831.50	2127546.04	1441256.32	816.80	2127597.79	1441256.03	816.45	0.00	0.00	0.00	787.84	576.908	0.541
		3				2127257.89	1441247.00	831.50	2127257.89	1441247.00	831.50	2127546.04	1441245.25	816.80	2127597.79	1441244.93	816.45	0.00	0.00	0.00	787.84	576.910	0.541
6	1	1		Tangent_75_H6_9.5E.pol		2127834.20	1441249.12	850.98	2127834.20	1441249.12	850.98	2128142.29	1441244.73	845.55	2128120.66	1441245.04	845.52	0.00	0.00	0.00	0.00	616.423	0.173
	60	1				2127834.20	1441243.62	840.73	2127834.20	1441243.62	840.73	2128142.29	1441239.23	829.25	2128131.27	1441239.39	829.23	0.00	0.00	0.00	0.00	616.911	0.661
		2				2127834.20	1441254.73	823.73	2127834.20	1441254.73	823.73	2128142.29	1441250.35	812.25	2128131.27	1441250.50	812.23	0.00	0.00	0.00	0.00	616.911	0.661
		3				2127834.20	1441243.50	823.73	2127834.20	1441243.50	823.73	2128142.29	1441239.11	812.25	2128131.27	1441239.27	812.23	0.00	0.00	0.00	0.00	616.911	0.661
7	1	1		Tangent_75_H6_9.5E.pol		2128450.38	1441240.34	852.75	2128450.38	1441240.34	852.75	2128743.08	1441234.13	847.05	2128743.04	1441234.13	847.05	0.00	0.00	0.00	0.00	585.668	0.148
	60	1				2128450.38	1441234.85	842.50	2128450.38	1441234.85	842.50	2128743.08	1441228.72	831.34	2128743.04	1441228.72	831.34	0.00	0.00	0.00	0.00	586.084	0.567
		2				2128450.38	1441245.96	825.50	2128450.38	1441245.96	825.50	2128743.08	1441239.66	818.33	2128690.66	1441240.79	817.98	0.00	0.00	0.00	0.00	586.146	0.567
		3				2128450.38	1441234.73	825.50	2128450.38	1441234.73	825.50	2128743.08	1441228.60	818.33	2128690.66	1441229.69	817.98	0.00	0.00	0.00	0.00	586.138	0.567
8	1	1		Tangent_75_H5_9.5E.pol		2129035.77	1441227.91	852.75	2129035.77	1441227.91	852.75	2129330.47	1441214.44	844.71	2129387.71	1441211.82	844.49	0.00	0.00	0.00	0.00	590.192	0.151
	60	1				2129035.77	1441222.59	842.50	2129035.77	1441222.59	842.50	2129330.47	1441209.12	828.91	2129359.72	1441207.78	828.80	0.00	0.00	0.00	0.00	590.622	0.581

		2		2129035.77	1441233.36	833.50	2129035.77	1441233.36	833.50	2129330.47	1441219.95	815.91	2129411.67	1441216.26	815.05	0.00	0.00	0.00	0.00	590.731	0.580
		3		2129035.77	1441222.47	833.50	2129035.77	1441222.47	833.50	2129330.47	1441208.93	815.91	2129411.67	1441205.20	815.05	0.00	0.00	0.00	0.00	590.742	0.580
9	1	1	Tangent_70_H5_9E.pol	2129625.18	1441200.97	848.25	2129625.18	1441200.97	848.25	2129929.74	1441178.80	844.80	2129862.26	1441183.71	844.49	0.00	0.00	788.00	788.00	610.933	0.168
	60	1		2129625.18	1441195.64	838.00	2129625.18	1441195.64	838.00	2129929.74	1441173.39	828.60	2129895.28	1441175.90	828.45	0.00	0.00	788.00	788.00	611.421	0.644
		2		2129625.18	1441206.54	821.00	2129625.18	1441206.54	821.00	2129929.74	1441184.37	815.60	2129845.16	1441190.53	814.66	0.00	0.00	788.00	788.00	611.533	0.644
		3		2129625.18	1441195.39	821.00	2129625.18	1441195.39	821.00	2129929.74	1441173.23	815.60	2129845.16	1441179.38	814.66	0.00	0.00	788.00	788.00	611.533	0.644
10	1	1	Tangent_75_H4_9.5E.pol	2130234.31	1441156.63	853.75	2130234.31	1441156.63	853.75	2130531.93	1441132.22	854.43	2130366.15	1441145.82	852.59	0.00	0.00	788.00	788.00	597.547	0.157
	60	1		2130234.31	1441151.13	843.50	2130234.31	1441151.13	843.50	2130529.41	1441129.65	839.05	2130439.39	1441136.21	837.99	0.00	0.00	788.00	788.00	592.524	0.586
		2		2130234.31	1441162.20	834.50	2130234.31	1441162.20	834.50	2130529.53	1441135.24	826.55	2130484.44	1441139.36	826.28	0.00	0.00	788.00	788.00	593.529	0.589
		3		2130234.31	1441151.06	834.50	2130234.31	1441151.06	834.50	2130529.69	1441129.62	814.68	2130638.04	1441121.75	813.14	0.00	0.00	788.00	788.00	593.138	0.587
11	1	1	cs18-2440_eng_089_1-1.pol	2130830.05	1441107.76	867.00	2130829.55	1441107.80	866.97	0.00	0.00	0.00	0.00	0.00	0.00	788.00	788.00	0.00	0.00	0.000	0.000
	3	1		2130830.18	1441107.76	858.00	2130824.52	1441108.17	857.42	0.00	0.00	0.00	0.00	0.00	0.00	788.00	788.00	0.00	0.00	0.000	0.000
		2		2130830.40	1441107.76	842.00	2130824.75	1441108.28	841.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	788.00	0.00	0.00	0.000	0.000
		3		2130830.74	1441107.76	818.00	2130825.06	1441108.18	817.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	788.00	0.00	0.00	0.000	0.000

Circuit and Phase Definitions and Labels:

Section Number	Section Note	Cable File	Section Voltage (kV)	Start Structure	Start Set #	Start Phase	End Structure	End Set #	End Phase	Jumpers Modeled	Connected Backwards	Connected Set #	Connected Phase #	Connected Section #	Circuit Label	Phase Label	Break Link	Notes
1		3_8ehs	0	1	2	1	2	11	1	No	No		1	0			No	
2	brugg_49ay85acs-2c_a.wir		0	1	3	1	2	12	1	No	No		1	0			No	
3		drake	138	1	10	1	2	13	1	No	No		1	0			No	
3		drake	138	1	10	2	2	13	2	No	No		2	0			No	
3		drake	138	1	10	3	2	13	3	No	No		3	0			No	
4		3_8ehs	0	2	1	1	11	1	1	No	No		1	0			No	
5		drake	138	2	3	1	11	3	1	No	No		1	0			No	
5		drake	138	2	3	2	11	3	2	No	No		2	0			No	
5		drake	138	2	3	3	11	3	3	No	No		3	0			No	

Section Sagging Data

Circuit Sec. No.	Cable File Name	From Str.	To Str.	Voltage (kV)	Ruling Span (ft)	Sagging Data: Condition	Temp. (deg F)	Catenary Constant (ft)	Horiz. Tension (lbs)	Display: Weather Case	Condition	Catenary Constant (ft)
1	3_8ehs	1	2	0	234.9	Initial RS	60.0	7485.0	2043.4	Everyday_60deg	Creep RS	7474.1
2	brugg_49ay85acs-2c_a.wir	1	2	0	233.5	Initial RS	60.0	7827.4	3404.9	Everyday_60deg	Creep RS	6015.1
3	drake	1	2	138	235.1	Initial RS	60.0	4388.4	4800.9	Everyday_60deg	Creep RS	3507.5
4	3_8ehs	2	11	0	595.0	Initial RS	60.0	7522.0	2053.5	Everyday_60deg	Creep RS	7516.6
5	drake	2	11	138	595.0	Initial RS	60.0	4256.8	4656.9	Everyday_60deg	Creep RS	3840.1

Section Stringing Data

Section Number	Cable Name	Struct. Number	Set Number	Phasing	Set Label
1	3_8ehs	1	2	1	OPGW - Ahead
		2	11	1	
2	brugg_49ay85acs-2c_a.wir	1	3	1	SW - Ahead
		2	12	1	
3	drake	1	10	123	Conductor - Ahead
		2	13	123	
4	3_8ehs	2	1	1	
		3	1	1	
		4	1	1	
		5	1	1	
		6	1	1	
		7	1	1	
		8	1	1	
		9	1	1	
		10	1	1	
		11	1	1	
5	drake	2	3	123	
		3	60	123	
		4	60	123	
		5	60	123	
		6	60	123	
		7	60	123	
		8	60	123	
		9	60	123	
		10	60	123	
		11	3	123	

Section Geometry Data

Notes: Lengths are arc lengths along the wire at 60 (deg F), Initial.
Lengths are adjusted for the number of phases, the number of subconductors and to exclude the length of strain insulators.
Lengths are computed with any concentrated loads removed.

Circuit Sec. No.	Cable File Name	From Str.	To Str.	Number of Phases	Wires Per Phase	Min. Span (ft)	Max. Span (ft)	Ruling Span (ft)	Total Cable Length (ft)
1	3_8ehs	1	2	1	1	236.8	236.8	234.9	238.3
2	brugg_49ay85acs-2c_a.wir	1	2	1	1	235.3	235.3	233.5	236.6
3	drake	1	2	3	1	235.5	235.5	235.1	668.7
4	3_8ehs	2	11	1	1	576.3	616.2	595.0	5352.7
5	drake	2	11	3	1	576.3	616.2	595.0	16036.6

Structure Material List Report

Structure File Name	Number in Selected Line	Number in All Lines
C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\Delta 60ft_8	0	0
C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\Delta 65ft_8.5	0	0
C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\Delta 70ft_9	0	0
C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\Delta 75ft_10	0	0
C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\Delta 80ft_10	0	0
C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\Delta 85ft_10.5fte	0	0
C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\Delta 90ft_0fte.stk	0	0
C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\h-frame_50ft.stk	1	1
C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\Vertical DE_80ft_0fte	0	0
C:\Users\Public\Documents\PLS\pls_cadd\examples\struct\Vertical DE_90ft_0fte.stk	0	0
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\cs11-2396_h3_105_e14.5.pol	0	0
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\cs18-2440_eng_089_1-1.pol	2	2
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Deadend_80.pol	0	0
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_60_H3_8E.pol	0	0
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_65_H3_8.5E.pol	0	0
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_70_H2_9E.pol	0	0
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_70_H3_9E.pol	0	0
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_70_H4_9E.pol	0	0
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_70_H5_9E.pol	2	2
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_70_H6_9E.pol	0	0
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_75_H3_9.5E.pol	0	0
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_75_H4_9.5E.pol	1	1
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_75_H5_9.5E.pol	3	3
C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\Tangent_75_H6_9.5E.pol	2	2
Total number of structures =	11	11

Cable Material List Report

Notes: Lengths are arc lengths along the wire at 60 (deg F), Initial.
Lengths are adjusted for the number of phases, the number of subconductors and to exclude the length of strain insulators.
Lengths are computed with any concentrated loads removed.

Cable File Name	Number Of Sections	Cable Length At Stringing Condition (ft)
C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\3_8ehs	2	5591
C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\brugg_49ay85acs-2c_a	1	237
C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake	2	16705

C-M ANALYSIS REPORT 6

Mines 138KV Transmission Line Wind & Weight Span Report

Wind & Weight Span Report

LC #	WC #	Weather Case Description	Cable Condition
1	18	NESC HV-4#,1/2",0deg	Creep RS
2	22	NESC XW-100mph,0",60deg	Creep RS
3	30	ASCE-74 XW-100mph,0",60deg	Creep RS
4	37	HV WD/Ice-50mph,1",0deg	Creep RS

Heaviest Cable Wind & Weight Spans

Span lengths used are distances between structure centers.
Presence of insulator counter weights is noted in the comment column and causes an increase in actual weight span equal to weight divided by vertical load per unit length for the relevant weather case.

Str. No.	Station (ft)	Req	Structure File Name	Line Angle (deg)	Extra Cost	Wind Span (ft)	Weight Span LC# 1 (ft)	Weight Span LC# 2 (ft)	Weight Span LC# 3 (ft)	Weight Span LC# 4 (ft)	Comment
1	NA	N	h-frame_50ft.stk	0.00	0	118	-34	-143	-143	-11	
2	NA	N	cs18-2440_eng_089_1-1.pol	0.00	0	409	586	714	714	560	
3	NA	N	Tangent_75_H5_9.5E.pol	0.00	0	592	627	655	655	624	
4	NA	N	Tangent_70_H5_9E.pol	0.00	0	597	480	386	386	494	
5	NA	N	Tangent_75_H5_9.5E.pol	0.00	0	585	677	749	749	666	
6	NA	N	Tangent_75_H6_9.5E.pol	0.00	0	596	555	522	522	560	
7	NA	N	Tangent_75_H6_9.5E.pol	0.00	0	601	579	562	562	582	
8	NA	N	Tangent_75_H5_9.5E.pol	0.00	0	588	681	755	755	670	
9	NA	N	Tangent_70_H5_9E.pol	0.00	0	600	478	380	380	493	
10	NA	N	Tangent_75_H4_9.5E.pol	0.00	0	604	657	699	699	651	
11	NA	N	cs18-2440_eng_089_1-1.pol	0.00	0	298	310	319	319	309	

Wind & Weight Spans By Attachment Set

Span lengths used are distances between attachment sets.
Presence of insulator counter weights is noted in the comment column and causes an increase in actual weight span equal to weight divided by vertical load per unit length for the relevant weather case.

Str. No.	Station (ft)	Req	Structure File Name	Line Angle (deg)	Extra Cost	Attachment Set No.	Attachment Set Desc.	Back Cable Name	Ahead Cable Name	Wind Span (ft)	Weight Span LC# 1 (ft)	Weight Span LC# 2 (ft)	Weight Span LC# 3 (ft)	Weight Span LC# 4 (ft)	Comment
1	NA	N	h-frame_50ft.stk	0.00	0	2	OPGW - Ahead		3_8ehs	119	-250	-1010	-1010	-136	
						3	SW - Ahead		brugg_49ay85acs-2c_a	119	-262	-854	-854	-162	
						10	Conductor - Ahead		drake	118	-35	-145	-145	-12	
2	NA	N	cs18-2440_eng_089_1-1.pol	0.00	0	1			3_8ehs	291	397	586	586	370	
						3			drake	290	314	333	333	312	
						11		3_8ehs		119	489	1249	1249	375	
						12		brugg_49ay85acs-2c_a		119	499	1091	1091	400	
						13		drake		118	271	381	381	248	
3	NA	N	Tangent_75_H5_9.5E.pol	0.00	0	1		3_8ehs	3_8ehs	591	516	381	381	536	
						60		drake	drake	591	627	655	655	623	
4	NA	N	Tangent_70_H5_9E.pol	0.00	0	1		3_8ehs	3_8ehs	597	537	428	428	553	
						60		drake	drake	597	480	386	386	494	
5	NA	N	Tangent_75_H5_9.5E.pol	0.00	0	1		3_8ehs	3_8ehs	585	614	666	666	607	
						60		drake	drake	585	677	749	749	666	
6	NA	N	Tangent_75_H6_9.5E.pol	0.00	0	1		3_8ehs	3_8ehs	596	587	569	569	590	
						60		drake	drake	596	555	522	522	560	
7	NA	N	Tangent_75_H6_9.5E.pol	0.00	0	1		3_8ehs	3_8ehs	601	613	634	634	611	
						60		drake	drake	601	579	562	562	582	
8	NA	N	Tangent_75_H5_9.5E.pol	0.00	0	1		3_8ehs	3_8ehs	588	619	674	674	612	
						60		drake	drake	588	681	755	755	670	
9	NA	N	Tangent_70_H5_9E.pol	0.00	0	1		3_8ehs	3_8ehs	600	534	414	414	552	
						60		drake	drake	600	478	380	380	493	
10	NA	N	Tangent_75_H4_9.5E.pol	0.00	0	1		3_8ehs	3_8ehs	604	552	457	457	566	
						60		drake	drake	604	658	700	700	652	
11	NA	N	cs18-2440_eng_089_1-1.pol	0.00	0	1		3_8ehs		299	389	549	549	366	
						3		drake		299	310	319	319	309	

Wind & Weight Spans By Side

Span lengths used are distances between attachment sets.
Presence of insulator counter weights is noted in the comment column and causes an increase in actual weight span equal to weight divided by vertical load per unit length for the relevant weather case.

Str. No.	Station (ft)	Req	Structure File Name	Line Angle (deg)	Extra Cost	Attachment Set No.	Attachment Set Desc.	LC No.	Back Cable Name	Ahead Cable Name	Total Wind Span (ft)	Back Wind Span (ft)	Ahead Wind Span (ft)	Total Weight Span (ft)	Back Weight Span (ft)	Ahead Weight Span (ft)	Comment
1	NA	N	h-frame_50ft.stk	0.00	0	2	OPGW - Ahead	1		3_8ehs	119	0	119	-250	0	-250	
							OPGW - Ahead	2		3_8ehs	119	0	119	-1010	0	-1010	
							OPGW - Ahead	3		3_8ehs	119	0	119	-1010	0	-1010	
							OPGW - Ahead	4		3_8ehs	119	0	119	-136	0	-136	
						3	SW - Ahead	1		brugg_49ay85acs-2c_a	119	0	119	-262	0	-262	
							SW - Ahead	2		brugg_49ay85acs-2c_a	119	0	119	-854	0	-854	
							SW - Ahead	3		brugg_49ay85acs-2c_a	119	0	119	-854	0	-854	
							SW - Ahead	4		brugg_49ay85acs-2c_a	119	0	119	-162	0	-162	
						10	Conductor - Ahead	1		drake	118	0	118	-35	0	-35	
							Conductor - Ahead	2		drake	118	0	118	-145	0	-145	
							Conductor - Ahead	3		drake	118	0	118	-145	0	-145	
							Conductor - Ahead	4		drake	118	0	118	-12	0	-12	
2	NA	N	cs18-2440_eng_089_1-1.pol	0.00	0	1		1		3_8ehs	291	0	291	397	0	397	
								2		3_8ehs	291	0	291	586	0	586	
								3		3_8ehs	291	0	291	586	0	586	
								4		3_8ehs	291	0	291	370	0	370	
						3		1		drake	290	0	290	314	0	314	
								2		drake	290	0	290	333	0	333	
								3		drake	290	0	290	333	0	333	
								4		drake	290	0	290	312	0	312	
						11		1	3_8ehs		119	119	0	489	489	0	
								2	3_8ehs		119	119	0	1249	1249	0	
								3	3_8ehs		119	119	0	1249	1249	0	
								4	3_8ehs		119	119	0	375	375	0	
						12		1	brugg_49ay85acs-2c_a		119	119	0	499	499	0	
								2	brugg_49ay85acs-2c_a		119	119	0	1091	1091	0	
								3	brugg_49ay85acs-2c_a		119	119	0	1091	1091	0	
								4	brugg_49ay85acs-2c_a		119	119	0	400	400	0	
						13		1	drake		118	118	0	271	271	0	
								2	drake		118	118	0	381	381	0	
								3	drake		118	118	0	381	381	0	
								4	drake		118	118	0	248	248	0	
3	NA	N	Tangent_75_H5_9.5E.pol	0.00	0	1		1	3_8ehs	3_8ehs	591	291	301	516	185	331	
								2	3_8ehs	3_8ehs	591	291	301	381	-5	385	
								3	3_8ehs	3_8ehs	591	291	301	381	-5	385	
								4	3_8ehs	3_8ehs	591	291	301	536	213	324	
						60		1	drake	drake	591	290	301	627	267	360	
								2	drake	drake	591	290	301	655	248	407	
								3	drake	drake	591	290	301	655	248	407	
								4	drake	drake	591	290	301	623	270	353	
4	NA	N	Tangent_70_H5_9E.pol	0.00	0	1		1	3_8ehs	3_8ehs	597	301	296	537	271	266	
								2	3_8ehs	3_8ehs	597	301	296	428	217	211	
								3	3_8ehs	3_8ehs	597	301	296	428	217	211	
								4	3_8ehs	3_8ehs	597	301	296	553	279	274	
						60		1	drake	drake	597	301	296	480	243	237	
								2	drake	drake	597	301	296	386	196	190	
								3	drake	drake	597	301	296	386	196	190	
								4	drake	drake	597	301	296	494	250	244	
5	NA	N	Tangent_75_H5_9.5E.pol	0.00	0	1		1	3_8ehs	3_8ehs	585	296	288	614	327	287	
								2	3_8ehs	3_8ehs	585	296	288	666	382	284	
								3	3_8ehs	3_8ehs	585	296	288	666	382	284	
								4	3_8ehs	3_8ehs	585	296	288	607	320	288	
						60		1	drake	drake	585	296	288	677	356	320	

							2	drake	drake	585	296	288	749	404	346
							3	drake	drake	585	296	288	749	404	346
							4	drake	drake	585	296	288	666	349	317
6	NA	N	Tangent_75_H6_9.5E.pol	0.00	0	1	1	3_8ehs	3_8ehs	596	288	308	587	290	297
							2	3_8ehs	3_8ehs	596	288	308	569	293	276
							3	3_8ehs	3_8ehs	596	288	308	569	293	276
							4	3_8ehs	3_8ehs	596	288	308	590	290	300
						60	1	drake	drake	596	288	308	555	257	298
							2	drake	drake	596	288	308	522	231	290
							3	drake	drake	596	288	308	522	231	290
							4	drake	drake	596	288	308	560	261	300
7	NA	N	Tangent_75_H6_9.5E.pol	0.00	0	1	1	3_8ehs	3_8ehs	601	308	293	613	320	293
							2	3_8ehs	3_8ehs	601	308	293	634	341	293
							3	3_8ehs	3_8ehs	601	308	293	634	341	293
							4	3_8ehs	3_8ehs	601	308	293	611	317	293
						60	1	drake	drake	601	308	293	579	319	260
							2	drake	drake	601	308	293	562	327	234
							3	drake	drake	601	308	293	562	327	234
							4	drake	drake	601	308	293	582	318	264
8	NA	N	Tangent_75_H5_9.5E.pol	0.00	0	1	1	3_8ehs	3_8ehs	588	293	295	619	293	326
							2	3_8ehs	3_8ehs	588	293	295	674	293	381
							3	3_8ehs	3_8ehs	588	293	295	674	293	381
							4	3_8ehs	3_8ehs	588	293	295	612	293	318
						60	1	drake	drake	588	293	295	681	326	355
							2	drake	drake	588	293	295	755	352	403
							3	drake	drake	588	293	295	755	352	403
							4	drake	drake	588	293	295	670	322	348
9	NA	N	Tangent_70_H5_9E.pol	0.00	0	1	1	3_8ehs	3_8ehs	600	295	305	534	265	269
							2	3_8ehs	3_8ehs	600	295	305	414	209	204
							3	3_8ehs	3_8ehs	600	295	305	414	209	204
							4	3_8ehs	3_8ehs	600	295	305	552	273	279
						60	1	drake	drake	600	295	305	478	236	242
							2	drake	drake	600	295	305	380	188	192
							3	drake	drake	600	295	305	380	188	192
							4	drake	drake	600	295	305	493	243	250
10	NA	N	Tangent_75_H4_9.5E.pol	0.00	0	1	1	3_8ehs	3_8ehs	604	305	299	552	342	210
							2	3_8ehs	3_8ehs	604	305	299	457	407	50
							3	3_8ehs	3_8ehs	604	305	299	457	407	50
							4	3_8ehs	3_8ehs	604	305	299	566	333	233
						60	1	drake	drake	604	305	299	658	369	288
							2	drake	drake	604	305	299	700	420	280
							3	drake	drake	604	305	299	700	420	280
							4	drake	drake	604	305	299	652	362	290
11	NA	N	cs18-2440_eng_089_1-1.pol	0.00	0	1	1	3_8ehs		299	299	0	389	389	0
							2	3_8ehs		299	299	0	549	549	0
							3	3_8ehs		299	299	0	549	549	0
							4	3_8ehs		299	299	0	366	366	0
						3	1	drake		299	299	0	310	310	0
							2	drake		299	299	0	319	319	0
							3	drake		299	299	0	319	319	0
							4	drake		299	299	0	309	309	0

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Mines 138KV Transmission Line Blowout Report																	
Start Struct Number	Start Struct Set	Start Struct Phase	End Struct Number	End Struct Set	End Struct Phase	Ahead Span Cable File Name	Volt -age (kV)	Weather Case Description	Cable Condition	Wind From	Max Blowout Station (ft)	Max Blowout Offset (ft)	Leftmost Blowout Station (ft)	Leftmost Blowout Offset (ft)	Rightmost Blowout Station (ft)	Rightmost Blowout Offset (ft)	Notes
1	2	1	2	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	-0.75	-9.97	-0.75	-9.97	218.07	1.21	
1	2	1	2	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	78.86	-11.44	78.86	-11.44	297.18	-0.31	
1	3	1	2	11	1	3_8ehs	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	72.86	11.08	297.22	0.29	72.86	11.08	
1	3	1	2	11	1	3_8ehs	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	0.75	9.97	225.61	-0.87	0.75	9.97	
1	10	1	2	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	6.93	-12.07	6.93	-12.07	233.48	0.50	
1	10	2	2	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	143.62	5.00	292.26	-0.34	143.62	5.00	
1	10	3	2	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	52.07	13.59	292.38	-0.34	52.07	13.59	
1	10	1	2	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	63.15	-13.96	63.15	-13.96	292.19	-1.15	
1	10	2	2	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	154.10	-5.75	154.10	-5.75	7.96	-0.58	
1	10	3	2	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	8.92	12.03	246.73	-1.63	8.92	12.03	
2	12	1	3	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	615.92	15.16	985.88	-4.99	615.92	15.16	
2	12	1	3	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	677.09	-21.00	677.09	-21.00	298.20	0.19	
2	13	1	3	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	638.11	19.82	986.14	-0.45	638.11	19.82	
2	13	2	3	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	589.97	14.95	985.56	-11.22	589.97	14.95	
2	13	3	3	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	636.53	20.07	986.14	-0.34	636.53	20.07	
2	13	1	3	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	650.02	-20.30	650.02	-20.30	303.50	-0.19	
2	13	2	3	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	697.53	-26.04	697.53	-26.04	303.64	-0.05	
2	13	3	3	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	651.92	-19.97	651.92	-19.97	303.81	0.27	
3	1	1	4	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	1358.72	15.41	985.88	-4.99	1358.72	15.41	
3	1	1	4	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	1296.53	-21.14	1296.53	-21.14	1669.10	-0.70	
3	3	1	4	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	1354.73	22.27	986.14	-0.45	1354.73	22.27	
3	3	2	4	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	1354.68	11.49	985.56	-11.22	1354.68	11.49	
3	3	3	4	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	1355.23	22.40	986.14	-0.34	1355.23	22.40	
3	3	1	4	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	1300.06	-17.90	1300.06	-17.90	1669.14	4.85	
3	3	2	4	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	1300.01	-28.68	1300.01	-28.68	1669.07	-5.94	
3	3	3	4	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	1300.06	-17.76	1300.06	-17.76	1669.14	4.98	
4	1	1	5	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	2003.69	17.74	2338.77	1.25	2003.69	17.74	
4	1	1	5	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	2004.18	-17.18	2004.18	-17.18	1669.10	-0.70	
4	3	1	5	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	2003.73	24.52	2338.77	5.80	2003.73	24.52	
4	3	2	5	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	2003.63	13.74	2338.73	-4.98	2003.63	13.74	
4	3	3	5	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	2003.73	24.65	2338.77	5.93	2003.73	24.65	
4	3	1	5	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	2004.23	-13.87	2004.23	-13.87	1669.14	4.85	
4	3	2	5	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	2004.13	-24.66	2004.13	-24.66	1669.07	-5.94	
4	3	3	5	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	2004.23	-13.74	2004.23	-13.74	1669.14	4.98	
5	1	1	6	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	2687.43	19.12	2338.77	1.25	2687.43	19.12	
5	1	1	6	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	2684.96	-18.32	2684.96	-18.32	3033.64	-0.44	
5	3	1	6	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	2686.90	26.04	2338.77	5.80	2686.90	26.04	
5	3	2	6	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	2685.99	15.12	3033.68	-5.08	2685.99	15.12	
5	3	3	6	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	2686.40	26.14	2338.77	5.93	2686.40	26.14	
5	3	1	6	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	2685.42	-15.22	2685.42	-15.22	3033.59	5.02	
5	3	2	6	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	2686.49	-26.14	2686.49	-26.14	2338.72	-5.94	
5	3	3	6	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	2685.92	-15.12	2685.92	-15.12	3033.59	5.09	
6	1	1	7	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	3461.94	28.51	3033.62	1.49	3461.94	28.51	

Mines 138KV Transmission Line Blowout Report																	
Start Struct Number	Start Struct Set	Start Struct Phase	End Struct Number	End Struct Set	End Struct Phase	Ahead Span Cable File Name	Volt -age (kV)	Weather Case Description	Cable Condition	Wind From	Max Blowout Station (ft)	Max Blowout Offset (ft)	Leftmost Blowout Station (ft)	Leftmost Blowout Offset (ft)	Rightmost Blowout Station (ft)	Rightmost Blowout Offset (ft)	Notes
6	1	1	7	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	3339.12	-14.15	3339.12	-14.15	3768.39	12.84	
6	3	1	7	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	3454.35	35.61	3033.58	5.97	3454.35	35.61	
6	3	2	7	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	3454.46	24.56	3033.68	-5.08	3454.46	24.56	
6	3	3	7	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	3454.34	35.68	3033.58	6.04	3454.34	35.68	
6	3	1	7	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	3768.72	18.30	3346.62	-11.30	3768.72	18.30	
6	3	2	7	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	3346.73	-22.35	3346.73	-22.35	3768.04	7.27	
6	3	3	7	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	3768.72	18.37	3346.62	-11.23	3768.72	18.37	
7	1	1	8	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	4005.71	23.05	4390.35	1.26	4005.71	23.05	
7	1	1	8	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	3768.39	12.84	4153.06	-8.95	3768.39	12.84	
7	3	1	8	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	4015.05	29.38	4390.68	5.80	4015.05	29.38	
7	3	2	8	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	4015.87	18.45	4389.98	-4.96	4015.87	18.45	
7	3	3	8	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	4015.55	29.47	4390.69	5.93	4015.55	29.47	
7	3	1	8	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	3768.72	18.30	4144.34	-5.28	3768.72	18.30	
7	3	2	8	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	4142.17	-16.15	4142.17	-16.15	3768.04	7.27	
7	3	3	8	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	3768.72	18.37	4143.85	-5.17	3768.72	18.37	
8	1	1	9	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	4732.09	18.41	4390.35	1.26	4732.09	18.41	
8	1	1	9	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	4731.84	-17.85	4731.84	-17.85	4390.32	-0.69	
8	3	1	9	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	4732.19	25.28	4390.68	5.80	4732.19	25.28	
8	3	2	9	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	4731.46	14.52	4389.98	-4.96	4731.46	14.52	
8	3	3	9	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	4732.20	25.41	4390.69	5.93	4732.20	25.41	
8	3	1	9	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	4732.18	-14.65	4732.18	-14.65	4390.67	4.84	
8	3	2	9	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	4731.46	-25.40	4731.46	-25.40	4389.98	-5.92	
8	3	3	9	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	4732.19	-14.51	4732.19	-14.51	4390.68	4.97	
9	1	1	10	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	5324.60	10.55	5589.80	0.16	5324.60	10.55	
9	1	1	10	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	5326.58	-10.15	5326.58	-10.15	5589.80	0.08	
9	3	1	10	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	5299.96	14.36	5584.89	0.78	5299.96	14.36	
9	3	2	10	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	5362.38	9.08	5072.97	-4.95	5362.38	9.08	
9	3	3	10	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	5300.96	14.53	5585.37	1.01	5300.96	14.53	
9	3	1	10	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	5358.75	-8.77	5358.75	-8.77	5073.82	4.80	
9	3	2	10	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	5295.59	-14.23	5295.59	-14.23	5585.13	-0.20	
9	3	3	10	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	5358.25	-8.58	5358.25	-8.58	5073.83	4.94	

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Mines 138KV Tranmission Line Departure Angle Report

Structure Number	Structure File Name	Station (ft)	Line Angle (deg)	Set	Phase	Ahead Span Cable File Name	Volt -age (kV)	Weather Case Description	Cable Condition	Wind From	Horiz. Departure Angle Back (deg)	Horiz. Departure Angle Ahead (deg)	Vertical Departure Angle Back (deg)	Vertical Departure Angle Ahead (deg)	Wire Angle Turned (deg)
1	h-frame_50ft.stk	-9999.00	0.00	2	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.0	10.1	0.0	-6.9	0.0
1	h-frame_50ft.stk	-9999.00	0.00	2	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	0.0	2.2	0.0	-6.9	0.0
1	h-frame_50ft.stk	-9999.00	0.00	3	1	3_8ehs	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.0	6.1	0.0	-6.9	0.0
1	h-frame_50ft.stk	-9999.00	0.00	3	1	3_8ehs	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	0.0	-1.2	0.0	-6.9	0.0
1	h-frame_50ft.stk	-9999.00	0.00	10	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.0	10.6	0.0	-6.2	0.0
1	h-frame_50ft.stk	-9999.00	0.00	10	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.0	8.1	0.0	-3.9	0.0
1	h-frame_50ft.stk	-9999.00	0.00	10	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.0	5.5	0.0	-1.6	0.0
1	h-frame_50ft.stk	-9999.00	0.00	10	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	0.0	2.7	0.0	-6.2	0.0
1	h-frame_50ft.stk	-9999.00	0.00	10	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	0.0	0.3	0.0	-3.9	0.0
1	h-frame_50ft.stk	-9999.00	0.00	10	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	0.0	-2.3	0.0	-1.6	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	-87.8	0.0	8.4	0.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	-79.9	0.0	8.4	0.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	-87.3	0.0	8.3	0.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	-89.8	0.0	6.0	0.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	-87.7	0.0	3.8	0.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-79.3	0.0	8.3	0.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-81.9	0.0	6.0	0.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-84.4	0.0	3.8	0.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	11	1	3_8ehs	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	-88.8	0.0	8.4	0.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	11	1	3_8ehs	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	-83.9	0.0	8.4	0.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	12	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.0	81.5	0.0	3.7	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	12	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	0.0	86.7	0.0	3.7	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	13	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.0	80.5	0.0	4.3	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	13	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.0	81.4	0.0	4.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	13	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.0	80.5	0.0	3.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	13	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	0.0	86.5	0.0	4.3	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	13	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	0.0	85.6	0.0	4.0	0.0
2	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	13	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	0.0	86.5	0.0	3.0	0.0
3	Tangent_70_H5_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	3.1	6.5	-1.2	1.2	9.7
3	Tangent_70_H5_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	-8.3	-4.9	-1.2	1.2	13.2
3	Tangent_70_H5_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	3.5	7.3	-0.4	2.0	11.0
3	Tangent_70_H5_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	4.4	7.3	-0.1	2.0	11.9
3	Tangent_70_H5_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	3.6	7.3	0.9	2.0	11.2
3	Tangent_70_H5_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-9.5	-5.7	-0.4	2.0	15.3
3	Tangent_70_H5_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-8.6	-5.7	-0.1	2.0	14.4
3	Tangent_70_H5_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-9.5	-5.7	0.9	2.0	15.5
4	Tangent_70_H5_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	4.9	6.1	1.2	1.0	11.3
4	Tangent_70_H5_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	-6.5	-5.1	1.2	1.0	11.9
4	Tangent_70_H5_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	5.7	6.9	1.9	1.7	13.1
4	Tangent_70_H5_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	5.7	6.9	1.9	1.7	13.1
4	Tangent_70_H5_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	5.7	6.9	1.9	1.7	13.1
4	Tangent_70_H5_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-7.3	-5.9	1.9	1.7	13.7
4	Tangent_70_H5_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-7.3	-5.9	1.9	1.7	13.7

Mines 138KV Tranmission Line Departure Angle Report															
Structure Number	Structure File Name	Station (ft)	Line Angle (deg)	Set	Phase	Ahead Span Cable File Name	Volt -age (kV)	Weather Case Description	Cable Condition	Wind From	Horiz. Departure Angle Back (deg)	Horiz. Departure Angle Ahead (deg)	Vertical Departure Angle Back (deg)	Vertical Departure Angle Ahead (deg)	Wire Angle Turned (deg)
4	Tangent_70_H5_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-7.3	-5.9	1.9	1.7	13.7
5	Tangent_70_H5_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	5.1	5.4	1.4	1.0	10.8
5	Tangent_70_H5_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	-6.1	-6.3	1.4	1.0	12.6
5	Tangent_70_H5_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	5.9	6.2	2.1	1.8	12.7
5	Tangent_70_H5_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	5.9	6.2	2.1	1.8	12.7
5	Tangent_70_H5_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	5.9	6.2	2.1	1.8	12.7
5	Tangent_70_H5_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-6.9	-7.1	2.1	1.8	14.5
5	Tangent_70_H5_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-6.9	-7.1	2.1	1.8	14.5
5	Tangent_70_H5_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-6.9	-7.1	2.1	1.8	14.5
6	Tangent_75_H6_9.5E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	6.3	6.6	1.5	1.5	13.2
6	Tangent_75_H6_9.5E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	-5.4	-5.7	1.5	1.5	11.5
6	Tangent_75_H6_9.5E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	7.1	7.5	2.2	2.3	15.2
6	Tangent_75_H6_9.5E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	7.1	7.5	2.2	2.3	15.2
6	Tangent_75_H6_9.5E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	7.1	7.5	2.2	2.3	15.2
6	Tangent_75_H6_9.5E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-6.2	-6.5	2.2	2.3	13.5
6	Tangent_75_H6_9.5E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-6.2	-6.5	2.2	2.3	13.5
6	Tangent_75_H6_9.5E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-6.2	-6.5	2.2	2.3	13.5
7	Tangent_70_H6_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	5.7	7.5	1.1	1.1	13.4
7	Tangent_70_H6_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	-6.6	-2.9	1.1	1.1	9.8
7	Tangent_70_H6_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	6.5	8.2	1.9	1.8	15.2
7	Tangent_70_H6_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	6.5	8.2	1.9	1.8	15.2
7	Tangent_70_H6_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	6.5	8.2	1.9	1.8	15.2
7	Tangent_70_H6_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-7.5	-3.6	1.9	1.8	11.7
7	Tangent_70_H6_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-7.5	-3.6	1.9	1.8	11.7
7	Tangent_70_H6_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-7.5	-3.6	1.9	1.8	11.7
8	Tangent_70_H5_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	2.9	9.6	1.1	1.2	12.7
8	Tangent_70_H5_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	-7.5	-1.9	1.1	1.2	9.7
8	Tangent_70_H5_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	3.6	10.4	1.8	1.9	14.5
8	Tangent_70_H5_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	3.6	10.4	1.8	1.9	14.5
8	Tangent_70_H5_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	3.6	10.4	1.8	1.9	14.5
8	Tangent_70_H5_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-8.2	-2.7	1.8	1.9	11.5
8	Tangent_70_H5_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-8.2	-2.7	1.8	1.9	11.5
8	Tangent_70_H5_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-8.2	-2.7	1.8	1.9	11.5
9	Tangent_70_H5_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	1.9	9.5	1.2	-2.3	11.4
9	Tangent_70_H5_9E.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	-9.6	1.0	1.3	-2.3	8.7
9	Tangent_70_H5_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	2.7	9.6	2.0	-1.6	12.2
9	Tangent_70_H5_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	2.7	10.8	2.0	-1.3	13.5
9	Tangent_70_H5_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	2.7	9.6	2.0	0.0	12.4
9	Tangent_70_H5_9E.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-10.4	-0.2	2.0	-1.6	10.6
9	Tangent_70_H5_9E.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-10.4	1.0	2.0	-1.3	9.4
9	Tangent_70_H5_9E.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-10.4	-0.2	2.0	0.0	10.7
10	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Left	-0.8	0.0	4.2	0.0	0.0
10	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	1	1	brugg_49ay85acs-2c_a.wir	0	NESC XW-140mph,0",60deg	Max Sag RS	Right	-9.7	0.0	4.2	0.0	0.0

Mines 138KV Tranmission Line Departure Angle Report															
Structure Number	Structure File Name	Station (ft)	Line Angle (deg)	Set	Phase	Ahead Span Cable File Name	Volt -age (kV)	Weather Case Description	Cable Condition	Wind From	Horiz. Departure Angle Back (deg)	Horiz. Departure Angle Ahead (deg)	Vertical Departure Angle Back (deg)	Vertical Departure Angle Ahead (deg)	Wire Angle Turned (deg)
10	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.2	0.0	4.5	0.0	0.0
10	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	-1.0	0.0	4.2	0.0	0.0
10	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Left	0.2	0.0	2.9	0.0	0.0
10	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	1	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-9.6	0.0	4.5	0.0	0.0
10	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	2	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-10.8	0.0	4.2	0.0	0.0
10	cs18-2440_eng_089_1-1.pol	-9999.00	0.00	3	3	drake	138	NESC XW-140mph,0",60deg	Max Sag RS	Right	-9.6	0.0	2.9	0.0	0.0

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Mines 138KV Transmission Line Section Sag Tension Report

Section Sagging Data

Circuit Sec. No.	Cable File Name	From Str.	To Str.	Voltage (kV)	Ruling Span (ft)	Sagging Data: Condition	Sagging Data: Temp. (deg F)	Sagging Data: Catenary Constant (ft)	Sagging Data: Horiz. Tension (lbs)	Display: Weather Case	Display: Condition	Display: Catenary Constant (ft)
1	brugg_49ay85acs-2c_a.wir	1	2	0	297.2	Initial RS	60.0	7805.8	3395.5	Everyday_60deg	Creep RS	6063.2
2	3_8ehs	1	2	0	295.8	Initial RS	60.0	7473.6	2040.3	Everyday_60deg	Creep RS	7462.6
3	drake	1	2	138	297.5	Initial RS	60.0	4371.6	4782.5	Everyday_60deg	Creep RS	3591.5
4	brugg_49ay85acs-2c_a.wir	2	10	0	669.6	Initial RS	60.0	7871.9	3424.3	Everyday_60deg	Creep RS	6583.0
5	drake	2	10	138	669.6	Initial RS	60.0	4168.9	4560.8	Everyday_60deg	Creep RS	3827.4

Section Geometry Data

Notes: Lengths are arc lengths along the wire at 60 (deg F), Initial.
Lengths are adjusted for the number of phases, the number of subconductors and to exclude the length of strain insulators.
Lengths are computed with any concentrated loads removed.

Circuit Sec. No.	Cable File Name	From Str.	To Str.	Number of Phases	Wires Per Phase	Min. Span (ft)	Max. Span (ft)	Ruling Span (ft)	Total Cable Length (ft)
1	brugg_49ay85acs-2c_a.wir	1	2	1	1	298.8	298.8	297.2	299.9
2	3_8ehs	1	2	1	1	297.4	297.4	295.8	298.5
3	drake	1	2	3	1	298.0	298.0	297.5	855.7
4	brugg_49ay85acs-2c_a.wir	2	10	1	1	517.3	733.9	669.6	5293.1
5	drake	2	10	3	1	517.5	733.9	669.6	15859.7

Section #1 from structure #1 to structure #2, start set #2 'OPGW - Ahead', end set #1 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\brugg_49ay85acs-2c_a.wir', Ruling span (ft) 297.174
Sagging data: Catenary (ft) 7805.75, Horiz. Tension (lbs) 3395.5 Condition I Temperature (deg F) 60
Weather case for final after creep Everyday_60deg, Equivalent to 31.8 (deg F) temperature increase
Weather case for final after load NESC HV-4#,1/2",0deg, Equivalent to 10.0 (deg F) temperature increase

Ruling Span Sag Tension Report

Weather Case	Cable Load			R.S. Initial Cond.					R.S. Final Cond. After Creep					R.S. Final Cond. After Load				
# Description	Hor. Load (lbs/ft)	Vert Load (lbs/ft)	Res. Load (lbs/ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)
1 Everyday_60deg	0.00	0.43	0.43	3421	3396	15	7806	1.41	2659	2637	12	6063	1.82	3171	3147	14	7235	1.53
2 NESC CL-0#,0",60deg	0.00	0.43	0.43	3421	3396	15	7806	1.41	2659	2637	12	6063	1.82	3171	3147	14	7235	1.53
3 NESC CL-6#,0",60deg	0.20	0.43	0.48	3451	3428	15	7178	1.54	2713	2694	12	5641	1.96	3210	3188	14	6676	1.65
4 NESC CL-0#,1/2",32deg	0.00	1.11	1.11	4604	4559	20	4095	2.70	4063	4021	18	3612	3.06	4499	4454	20	4001	2.76
5 NESC CL-0#,1/4",32deg	0.00	0.70	0.70	4251	4216	19	6054	1.82	3589	3557	16	5108	2.16	4091	4057	18	5825	1.90
6 MOT	0.00	0.43	0.43	1094	1079	5	2481	4.45	912	898	4	2064	5.35	1007	993	4	2282	4.84
7 SWING 1-6#,0",0deg	0.30	0.43	0.53	4864	4839	22	9202	1.20	4204	4181	19	7951	1.39	4767	4742	21	9017	1.22
8 SWING 2-6#,0",120deg	0.30	0.43	0.53	2285	2269	10	4315	2.56	1754	1740	8	3308	3.34	2058	2042	9	3884	2.84
9 GALLOP-2#,1/2",32deg	0.27	1.11	1.14	4630	4586	21	4007	2.76	4096	4054	18	3542	3.12	4528	4485	20	3919	2.82
10 GALLOP-0#,1/2",32deg	0.00	1.11	1.11	4604	4559	20	4095	2.70	4063	4021	18	3612	3.06	4499	4454	20	4001	2.76
11 Underbuild-0#,0",30deg	0.00	0.43	0.43	4123	4094	18	9410	1.17	3379	3353	15	7708	1.43	3937	3909	18	8986	1.23
12 Overbld HV-0#,1/2",32deg	0.00	1.11	1.11	4604	4559	20	4095	2.70	4063	4021	18	3612	3.06	4499	4454	20	4001	2.76
13 Overbld MD-0#,1/4",32deg	0.00	0.70	0.70	4251	4216	19	6054	1.82	3589	3557	16	5108	2.16	4091	4057	18	5825	1.90
14 Overbld MD-0#,1",32deg	0.00	2.41	2.41	5850	5771	26	2391	4.62	5531	5452	25	2259	4.89	5850	5771	26	2391	4.62
15 COLD-0#,0",0deg	0.00	0.43	0.43	4836	4803	22	11043	1.00	4149	4120	18	9471	1.17	4728	4696	21	10795	1.02
16 MD Ice-0#,1/2",0deg	0.00	1.11	1.11	5248	5200	23	4671	2.36	4716	4670	21	4195	2.63	5202	5155	23	4630	2.38
17 **STR LOAD CASES	0.00	0.43	0.43	4836	4803	22	11043	1.00	4149	4120	18	9471	1.17	4728	4696	21	10795	1.02
18 NESC HV-4#,1/2",0deg	0.53	1.11	1.54	5582	5531	25	3584	3.08	5142	5093	23	3300	3.35	5582	5531	25	3584	3.08
19 NESC MD-4#,1/4",15deg	0.36	0.70	0.99	4829	4793	21	4863	2.27	4260	4226	19	4287	2.58	4741	4705	21	4773	2.31
20 NESC LT-9#,0",30deg	0.44	0.43	0.67	4258	4239	19	6317	1.75	3590	3572	16	5324	2.07	4101	4082	18	6083	1.81
21 NESC XW-90mph,0",60deg	0.92	0.43	1.02	3950	3937	18	3876	2.85	3406	3392	15	3339	3.31	3798	3784	17	3726	2.96
22 NESC XW-100mph,0",60deg	1.13	0.43	1.21	4160	4146	19	3416	3.23	3661	3647	16	3004	3.67	4033	4019	18	3311	3.33
23 NESC XW-110mph,0",60deg	1.37	0.43	1.44	4395	4381	20	3046	3.63	3942	3927	18	2730	4.04	4293	4279	19	2974	3.71
24 NESC XW-120mph,0",60deg	1.63	0.43	1.69	4657	4642	21	2749	4.02	4249	4233	19	2506	4.41	4582	4567	20	2704	4.08
25 NESC XW-130mph,0",60deg	1.92	0.43	1.96	4941	4924	22	2507	4.40	4571	4554	20	2319	4.76	4892	4875	22	2482	4.45
26 NESC XW-140mph,0",60deg	2.22	0.43	2.26	5245	5226	23	2309	4.78	4912	4892	22	2162	5.11	5219	5200	23	2298	4.81
27 NESC HWI-4#,1",15deg	0.86	2.41	2.56	6239	6160	28	2403	4.59	5946	5868	26	2289	4.82	6239	6160	28	2403	4.59
28 NESC MWI-2.3#,0.5",15deg	0.30	1.11	1.15	4972	4927	22	4269	2.59	4442	4399	20	3811	2.90	4902	4858	22	4208	2.62
29 ASCE-74 XW-95mph,0",60deg	1.02	0.43	1.11	4050	4037	18	3632	3.04	3528	3514	16	3162	3.49	3910	3897	17	3506	3.15
30 ASCE-74 XW-100mph,0",60deg	1.13	0.43	1.21	4160	4146	19	3416	3.23	3661	3647	16	3004	3.67	4033	4019	18	3311	3.33
31 ASCE-74 XW-101mph,0",60deg	1.15	0.43	1.23	4178	4164	19	3384	3.26	3681	3667	16	2981	3.70	4053	4039	18	3283	3.36
32 ASCE-74 XW-110mph,0",60deg	1.37	0.43	1.44	4395	4381	20	3046	3.63	3942	3927	18	2730	4.04	4293	4279	19	2974	3.71
33 ASCE-74 XW-120mph,0",60deg	1.63	0.43	1.69	4657	4642	21	2749	4.02	4249	4233	19	2506	4.41	4582	4567	20	2704	4.08
34 ASCE-74 XW-130mph,0",60deg	1.92	0.43	1.96	4941	4924	22	2507	4.40	4571	4554	20	2319	4.76	4892	4875	22	2482	4.45
35 ASCE-74 XW-140mph,0",60deg	2.22	0.43	2.26	5245	5226	23	2309	4.78	4912	4892	22	2162	5.11	5219	5200	23	2298	4.81
36 MD WD/Ice-50mph,1/2",0deg	0.80	1.19	1.43	5482	5439	24	3807	2.90	5022	4981	22	3486	3.17	5472	5430	24	3800	2.91
37 HV WD/Ice-50mph,1",0deg	1.31	2.65	2.96	6807	6722	30	2273	4.86	6572	6488	29	2194	5.03	6807	6722	30	2273	4.86
38 XTRM WD/Ice-50mph,2",0deg	2.34	7.72	8.07	10794	10554	48	1308	8.45	10794	10554	48	1308	8.45	10794	10554	48	1308	8.45
39 XTRM Ice/bare-50mph,1.75",0deg	2.08	6.19	6.53	9682	9490	43	1454	7.60	9682	9490	43	1454	7.60	9682	9490	43	1454	7.60
40 Heavy Ice MD-0#,3/4",0deg	0.00	1.69	1.69	5712	5650	25	3352	3.29	5296	5236	24	3106	3.55	5712	5650	25	3352	3.29
41 Heavy Ice HV-0#,1.25",0deg	0.00	3.30	3.30	7113	7007	32	2126	5.20	6914	6808	31	2065	5.35	7113	7007	32	2126	5.20
42 XTRM Ice -0#,2.5",0deg	0.00	10.04	10.04	12140	11825	54	1177	9.39	12140	11825	54	1177	9.39	12140	11825	54	1177	9.39
43 BROKEN PHASE-70mph,0",0deg	0.56	0.43	0.71	4946	4929	22	6987	1.58	4325	4309	19	6108	1.81	4867	4849	22	6874	1.61
44 EVERYDAY-0#,0",60deg	0.00	0.43	0.43	3421	3396	15	7806	1.41	2659	2637	12	6063	1.82	3171	3147	14	7235	1.53
45 DEFLECT-1#,0",60deg	0.05	0.43	0.44	3421	3396	15	7756	1.42	2664	2643	12	6036	1.83	3176	3152	14	7201	1.53
46 MAINTENANCE-2#,0",60deg	0.10	0.43	0.45	3430	3405	15	7634	1.45	2674	2653	12	5948	1.86	3181	3157	14	7079	1.56
47 STRINGING-2#,0",30deg	0.10	0.43	0.45	4126	4098	18	9188	1.20	3388	3363	15	7541	1.46	3941	3914	18	8775	1.26
48 Bare-50mph,0",0deg	0.28	0.43	0.52	4860	4835	22	9313	1.19	4199	4176	19	8044	1.37	4762	4737	21	9124	1.21

Section #2 from structure #1 to structure #2, start set #3 'SW - Ahead', end set #11 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\3_8ehs', Ruling span (ft) 295.766
Sagging data: Catenary (ft) 7473.63, Horiz. Tension (lbs) 2040.3 Condition I Temperature (deg F) 60
Weather case for final after creep Everyday_60deg, Equivalent to 0.2 (deg F) temperature increase
Weather case for final after load NESC HV-4#,1/2",0deg, Equivalent to 3.3 (deg F) temperature increase

Ruling Span Sag Tension Report

Weather Case	Cable Load			R.S. Initial Cond.					R.S. Final Cond. After Creep					R.S. Final Cond. After Load				
# Description	Hor. Load (lbs/ft)	Vert Load (lbs/ft)	Res. Load (lbs/ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)
1 Everyday_60deg	0.00	0.27	0.27	2053	2037	13	7463	1.47	2053	2037	13	7463	1.47	2010	1995	13	7307	1.50
2 NESC CL-0#,0",60deg	0.00	0.27	0.27	2053	2037	13	7463	1.47	2053	2037	13	7463	1.47	2010	1995	13	7307	1.50
3 NESC CL-6#,0",60deg	0.12	0.27	0.30	2076	2062	13	6914	1.58	2076	2062	13	6914	1.58	2035	2021	13	6777	1.61
4 NESC CL-0#,1/2",32deg	0.00	0.81	0.81	2887	2857	19	3537	3.09	2887	2857	19	3537	3.09	2879	2849	19	3527	3.10
5 NESC CL-0#,1/4",32deg	0.00	0.46	0.46	2537	2515	16	5437	2.01	2537	2515	16	5437	2.01	2516	2495	16	5392	2.03
6 MOT	0.00	0.27	0.27	840	831	5	3043	3.59	792	782	5	2865	3.82	778	768	5	2815	3.89
7 SWING 1-6#,0",0deg	0.18	0.27	0.33	2801	2786	18	8519	1.28	2801	2786	18	8519	1.28	2786	2771	18	8474	1.29
8 SWING 2-6#,0",120deg	0.18	0.27	0.33	1512	1502	10	4592	2.38	1481	1470	10	4497	2.43	1448	1438	9	4397	2.49
9 GALLOP-2#,1/2",32deg	0.23	0.81	0.84	2921	2892	19	3447	3.17	2921	2892	19	3447	3.17	2913	2883	19	3437	3.18
10 GALLOP-0#,1/2",32deg	0.00	0.81	0.81	2887	2857	19	3537	3.09	2887	2857	19	3537	3.09	2879	2849	19	3527	3.10
11 Underbuild-0#,0",30deg	0.00	0.27	0.27	2405	2388	16	8746	1.25	2405	2388	16	8746	1.25	2379	2362	15	8651	1.26
12 Overbld HV-0#,1/2",32deg	0.00	0.81	0.81	2887	2857	19	3537	3.09	2887	2857	19	3537	3.09	2879	2849	19	3527	3.10
13 Overbld MD-0#,1/4",32deg	0.00	0.46	0.46	2537	2515	16	5437	2.01	2537	2515	16	5437	2.01	2516	2495	16	5392	2.03
14 Overbld MD-0#,1",32deg	0.00	1.96	1.96	4103	4040	27	2057	5.32	4103	4040	27	2057	5.32	4103	4040	27	2057	5.32
15 COLD-0#,0",0deg	0.00	0.27	0.27	2777	2757	18	10099	1.08	2777	2757	18	10099	1.08	2761	2742	18	10042	1.09
16 MD Ice-0#,1/2",0deg	0.00	0.81	0.81	3201	3169	21	3923	2.79	3201	3169	21	3923	2.79	3198	3166	21	3919	2.79
17 **STR LOAD CASES	0.00	0.27	0.27	2777	2757	18	10099	1.08	2777	2757	18	10099	1.08	2761	2742	18	10042	1.09
18 NESC HV-4#,1/2",0deg	0.45	0.81	1.24	3616	3580	23	2896	3.78	3616	3580	23	2896	3.78	3616	3580	23	2896	3.78
19 NESC MD-4#,1/4",15deg	0.29	0.46	0.74	2980	2957	19	3973	2.75	2980	2957	19	3973	2.75	2973	2950	19	3964	2.76
20 NESC LT-9#,0",30deg	0.27	0.27	0.43	2525	2513	16	5791	1.89	2525	2513	16	5791	1.89	2505	2492	16	5743	1.90
21 NESC XW-90mph,0",60deg	0.56	0.27	0.62	2408	2399	16	3854	2.84	2408	2399	16	3854	2.84	2387	2379	16	3821	2.86
22 NESC XW-100mph,0",60deg	0.69	0.27	0.74	2542	2534	17	3412	3.21	2542	2534	17	3412	3.21	2529	2521	16	3394	3.22
23 NESC XW-110mph,0",60deg	0.84	0.27	0.88	2700	2692	18	3062	3.57	2700	2692	18	3062	3.57	2689	2681	17	3049	3.59
24 NESC XW-120mph,0",60deg	0.99	0.27	1.03	2872	2863	19	2776	3.94	2872	2863	19	2776	3.94	2865	2855	19	2769	3.95
25 NESC XW-130mph,0",60deg	1.17	0.27	1.20	3058	3048	20	2543	4.30	3058	3048	20	2543	4.30	3053	3043	20	2538	4.31
26 NESC XW-140mph,0",60deg	1.35	0.27	1.38	3258	3246	21	2351	4.65	3258	3246	21	2351	4.65	3256	3245	21	2350	4.65
27 NESC HWI-4#,1",15deg	0.79	1.96	2.12	4368	4306	28	2035	5.38	4368	4306	28	2035	5.38	4368	4306	28	2035	5.38
28 NESC MWI-2.3#,0.5",15deg	0.26	0.81	0.85	3089	3059	20	3604	3.03	3089	3059	20	3604	3.03	3084	3054	20	3599	3.04
29 ASCE-74 XW-95mph,0",60deg	0.62	0.27	0.68	2473	2465	16	3622	3.02	2473	2465	16	3622	3.02	2454	2446	16	3594	3.04
30 ASCE-74 XW-100mph,0",60deg	0.69	0.27	0.74	2542	2534	17	3412	3.21	2542	2534	17	3412	3.21	2529	2521	16	3394	3.22
31 ASCE-74 XW-101mph,0",60deg	0.70	0.27	0.75	2555	2546	17	3383	3.23	2555	2546	17	3383	3.23	2539	2530	16	3362	3.25
32 ASCE-74 XW-110mph,0",60deg	0.84	0.27	0.88	2700	2692	18	3062	3.57	2700	2692	18	3062	3.57	2689	2681	17	3049	3.59
33 ASCE-74 XW-120mph,0",60deg	0.99	0.27	1.03	2872	2863	19	2776	3.94	2872	2863	19	2776	3.94	2865	2855	19	2769	3.95
34 ASCE-74 XW-130mph,0",60deg	1.17	0.27	1.20	3058	3048	20	2543	4.30	3058	3048	20	2543	4.30	3053	3043	20	2538	4.31
35 ASCE-74 XW-140mph,0",60deg	1.35	0.27	1.38	3258	3246	21	2351	4.65	3258	3246	21	2351	4.65	3256	3245	21	2350	4.65
36 MD WD/Ice-50mph,1/2",0deg	0.69	0.87	1.11	3483	3455	23	3117	3.51	3483	3455	23	3117	3.51	3483	3455	23	3117	3.51
37 HV WD/Ice-50mph,1",0deg	1.20	2.18	2.49	4821	4753	31	1910	5.73	4821	4753	31	1910	5.73	4821	4753	31	1910	5.73
38 XTRM WD/Ice-50mph,2",0deg	2.23	6.94	7.29	8429	8209	55	1126	9.73	8429	8209	55	1126	9.73	8429	8209	55	1126	9.73
39 XTRM Ice/bare-50mph,1.75",0deg	1.97	5.49	5.83	7472	7300	49	1252	8.74	7472	7300	49	1252	8.74	7472	7300	49	1252	8.74
40 Heavy Ice MD-0#,3/4",0deg	0.00	1.31	1.31	3696	3651	24	2791	3.92	3696	3651	24	2791	3.92	3696	3651	24	2791	3.92
41 Heavy Ice HV-0#,1.25",0deg	0.00	2.78	2.78	5090	5003	33	1802	6.07	5090	5003	33	1802	6.07	5090	5003	33	1802	6.07
42 XTRM Ice -0#,2.5",0deg	0.00	9.16	9.16	9513	9220	62	1006	10.89	9513	9220	62	1006	10.89	9513	9220	62	1006	10.89
43 BROKEN PHASE-70mph,0",0deg	0.34	0.27	0.43	2867	2856	19	6568	1.66	2867	2856	19	6568	1.66	2854	2843	19	6538	1.67
44 EVERYDAY-0#,0",60deg	0.00	0.27	0.27	2053	2037	13	7463	1.47	2053	2037	13	7463	1.47	2010	1995	13	7307	1.50
45 DEFLECT-1#,0",60deg	0.03	0.27	0.27	2056	2040	13	7429	1.47	2056	2040	13	7429	1.47	2014	1998	13	7276	1.50
46 MAINTENANCE-2#,0",60deg	0.06	0.27	0.28	2059	2043	13	7311	1.50	2059	2043	13	7311	1.50	2016	2001	13	7160	1.53
47 STRINGING-2#,0",30deg	0.06	0.27	0.28	2408	2391	16	8554	1.28	2408	2391	16	8554	1.28	2382	2365	15	8461	1.29
48 Bare-50mph,0",0deg	0.17	0.27	0.32	2798	2783	18	8614	1.27	2798	2783	18	8614	1.27	2783	2768	18	8568	1.28

Section #3 from structure #1 to structure #2, start set #10 'Conductor - Ahead', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 297.54
Sagging data: Catenary (ft) 4371.57, Horiz. Tension (lbs) 4782.5 Condition I Temperature (deg F) 60
Weather case for final after creep Everyday_60deg, Equivalent to 20.2 (deg F) temperature increase
Weather case for final after load NESC HV-4#,1/2",0deg, Equivalent to 21.6 (deg F) temperature increase

Ruling Span Sag Tension Report

Weather Case	Cable Load			R.S. Initial Cond.					R.S. Final Cond. After Creep					R.S. Final Cond. After Load				
# Description	Hor. Load (lbs/ft)	Vert Load (lbs/ft)	Res. Load (lbs/ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)
1 Everyday_60deg	0.00	1.09	1.09	4802	4782	15	4372	2.53	3948	3929	13	3592	3.08	3895	3876	12	3543	3.12
2 NESC CL-0#,0",60deg	0.00	1.09	1.09	4802	4782	15	4372	2.53	3948	3929	13	3592	3.08	3895	3876	12	3543	3.12
3 NESC CL-6#,0",60deg	0.37	1.09	1.15	4891	4872	16	4219	2.62	4057	4038	13	3497	3.16	4005	3986	13	3452	3.21
4 NESC CL-0#,1/2",32deg	0.00	2.09	2.09	7083	7046	22	3365	3.29	6686	6650	21	3176	3.48	6637	6602	21	3153	3.51
5 NESC CL-0#,1/4",32deg	0.00	1.52	1.52	6424	6397	20	4219	2.62	5839	5812	19	3833	2.89	5784	5757	18	3797	2.91
6 MOT	0.00	1.09	1.09	2122	2103	7	1922	5.76	2114	2095	7	1915	5.78	2122	2103	7	1922	5.76
7 SWING 1-6#,0",0deg	0.55	1.09	1.23	7514	7492	24	6110	1.81	7230	7209	23	5879	1.88	7156	7135	23	5818	1.90
8 SWING 2-6#,0",120deg	0.55	1.09	1.23	3294	3275	10	2671	4.14	2852	2833	9	2310	4.79	2876	2857	9	2330	4.75
9 GALLOP-2#,1/2",32deg	0.35	2.09	2.12	7117	7081	23	3335	3.32	6732	6696	21	3154	3.51	6678	6642	21	3128	3.54
10 GALLOP-0#,1/2",32deg	0.00	2.09	2.09	7083	7046	22	3365	3.29	6686	6650	21	3176	3.48	6637	6602	21	3153	3.51
11 Underbuild-0#,0",30deg	0.00	1.09	1.09	6046	6024	19	5507	2.01	5308	5287	17	4833	2.29	5236	5216	17	4768	2.32
12 Overbld HV-0#,1/2",32deg	0.00	2.09	2.09	7083	7046	22	3365	3.29	6686	6650	21	3176	3.48	6637	6602	21	3153	3.51
13 Overbld MD-0#,1/4",32deg	0.00	1.52	1.52	6424	6397	20	4219	2.62	5839	5812	19	3833	2.89	5784	5757	18	3797	2.91
14 Overbld MD-0#,1",32deg	0.00	3.72	3.72	8881	8818	28	2373	4.66	8839	8776	28	2362	4.69	8816	8752	28	2356	4.70
15 COLD-0#,0",0deg	0.00	1.09	1.09	7413	7390	24	6755	1.64	7106	7083	23	6474	1.71	7018	6996	22	6395	1.73
16 MD Ice-0#,1/2",0deg	0.00	2.09	2.09	8272	8235	26	3933	2.81	8216	8179	26	3906	2.83	8165	8128	26	3882	2.85
17 **STR LOAD CASES	0.00	1.09	1.09	7413	7390	24	6755	1.64	7106	7083	23	6474	1.71	7018	6996	22	6395	1.73
18 NESC HV-4#,1/2",0deg	0.70	2.09	2.52	8676	8635	28	3428	3.23	8626	8585	27	3409	3.25	8676	8635	28	3428	3.23
19 NESC MD-4#,1/4",15deg	0.54	1.52	1.81	7405	7375	24	4079	2.71	7088	7058	23	3903	2.84	7027	6997	22	3870	2.86
20 NESC LT-9#,0",30deg	0.83	1.09	1.42	6393	6374	20	4476	2.47	5789	5770	18	4052	2.73	5728	5708	18	4009	2.76
21 NESC XW-90mph,0",60deg	1.64	1.09	1.97	5992	5972	19	3028	3.66	5437	5417	17	2746	4.03	5391	5371	17	2723	4.07
22 NESC XW-100mph,0",60deg	2.03	1.09	2.30	6414	6393	20	2776	3.99	5938	5916	19	2569	4.31	5901	5880	19	2553	4.34
23 NESC XW-110mph,0",60deg	2.45	1.09	2.69	6890	6867	22	2558	4.33	6496	6473	21	2411	4.59	6463	6439	21	2398	4.62
24 NESC XW-120mph,0",60deg	2.92	1.09	3.12	7405	7380	24	2368	4.67	7096	7070	23	2269	4.88	7063	7037	22	2258	4.90
25 NESC XW-130mph,0",60deg	3.42	1.09	3.60	7959	7930	25	2206	5.02	7736	7706	25	2144	5.16	7697	7668	24	2133	5.19
26 NESC XW-140mph,0",60deg	3.97	1.09	4.12	8536	8504	27	2064	5.36	8399	8366	27	2031	5.45	8366	8334	27	2023	5.47
27 NESC HWI-4#,1",15deg	1.04	3.72	3.86	9518	9455	30	2451	4.52	9476	9413	30	2440	4.54	9518	9454	30	2451	4.52
28 NESC MWI-2.3#,0.5",15deg	0.40	2.09	2.13	7743	7706	25	3614	3.06	7513	7477	24	3506	3.16	7455	7419	24	3479	3.18
29 ASCE-74 XW-95mph,0",60deg	1.83	1.09	2.13	6194	6174	20	2897	3.82	5678	5658	18	2655	4.17	5640	5620	18	2637	4.20
30 ASCE-74 XW-100mph,0",60deg	2.03	1.09	2.30	6414	6393	20	2776	3.99	5938	5916	19	2569	4.31	5901	5880	19	2553	4.34
31 ASCE-74 XW-101mph,0",60deg	2.06	1.09	2.33	6449	6428	20	2758	4.01	5984	5962	19	2558	4.33	5942	5920	19	2540	4.36
32 ASCE-74 XW-110mph,0",60deg	2.45	1.09	2.69	6890	6867	22	2558	4.33	6496	6473	21	2411	4.59	6463	6439	21	2398	4.62
33 ASCE-74 XW-120mph,0",60deg	2.92	1.09	3.12	7405	7380	24	2368	4.67	7096	7070	23	2269	4.88	7063	7037	22	2258	4.90
34 ASCE-74 XW-130mph,0",60deg	3.42	1.09	3.60	7959	7930	25	2206	5.02	7736	7706	25	2144	5.16	7697	7668	24	2133	5.19
35 ASCE-74 XW-140mph,0",60deg	3.97	1.09	4.12	8536	8504	27	2064	5.36	8399	8366	27	2031	5.45	8366	8334	27	2023	5.47
36 MD WD/Ice-50mph,1/2",0deg	0.98	2.15	2.36	8522	8485	27	3595	3.08	8473	8436	27	3574	3.10	8488	8451	27	3580	3.09
37 HV WD/Ice-50mph,1",0deg	1.46	3.87	4.14	10242	10176	33	2460	4.50	10195	10129	32	2448	4.52	10242	10176	33	2460	4.50
38 XTRM WD/Ice-50mph,2",0deg	2.41	9.34	9.64	14935	14764	47	1531	7.23	14935	14764	47	1531	7.23	14935	14764	47	1531	7.23
39 XTRM Ice/bare-50mph,1.75",0deg	2.17	7.72	8.02	13657	13518	43	1686	6.57	13657	13518	43	1686	6.57	13657	13518	43	1686	6.57
40 Heavy Ice MD-0#,3/4",0deg	0.00	2.83	2.83	8981	8933	29	3160	3.50	8931	8882	28	3142	3.52	8980	8932	29	3160	3.50
41 Heavy Ice HV-0#,1.25",0deg	0.00	4.76	4.76	10829	10748	34	2258	4.90	10792	10710	34	2250	4.92	10829	10748	34	2258	4.90
42 XTRM Ice -0#,2.5",0deg	0.00	12.31	12.31	16873	16640	54	1352	8.20	16873	16640	54	1352	8.20	16873	16640	54	1352	8.20
43 BROKEN PHASE-70mph,0",0deg	0.99	1.09	1.48	7707	7687	24	5203	2.13	7504	7485	24	5066	2.18	7431	7412	24	5017	2.21
44 EVERYDAY-0#,0",60deg	0.00	1.09	1.09	4802	4782	15	4372	2.53	3948	3929	13	3592	3.08	3895	3876	12	3543	3.12
45 DEFLECT-1#,0",60deg	0.09	1.09	1.10	4811	4791	15	4364	2.54	3954	3935	13	3584	3.09	3901	3882	12	3535	3.13
46 MAINTENANCE-2#,0",60deg	0.18	1.09	1.11	4829	4809	15	4335	2.55	3977	3958	13	3567	3.10	3924	3905	12	3520	3.14
47 STRINGING-2#,0",30deg	0.18	1.09	1.11	6063	6042	19	5446	2.03	5331	5310	17	4786	2.31	5259	5239	17	4722	2.34
48 Bare-50mph,0",0deg	0.51	1.09	1.21	7497	7475	24	6200	1.78	7207	7186	23	5961	1.86	7133	7112	23	5899	1.88

Tension Distribution in Inner and Outer Materials

Weather Case	Initial Condition Horiz. Tension (lbs)			Final After Creep Horiz. Tension (lbs)			Final After Load Horiz. Tension (lbs)		
# Description	Total	Core	Outer	Total	Core	Outer	Total	Core	Outer
1 Everyday_60deg	4782	2574	2209	3929	2782	1147	3876	2856	1020
2 NESC CL-0#,0",60deg	4782	2574	2209	3929	2782	1147	3876	2856	1020
3 NESC CL-6#,0",60deg	4872	2617	2255	4038	2822	1217	3986	2897	1089
4 NESC CL-0#,1/2",32deg	7046	3436	3611	6650	3473	3177	6602	3560	3042
5 NESC CL-0#,1/4",32deg	6397	3113	3284	5812	3166	2645	5757	3247	2510
6 MOT	2103	2103	0	2095	2095	0	2103	2103	0
7 SWING 1-6#,0",0deg	7492	3379	4113	7209	3330	3879	7135	3405	3730
8 SWING 2-6#,0",120deg	3275	2405	870	2833	2833	0	2857	2857	0
9 GALLOP-2#,1/2",32deg	7081	3453	3628	6696	3490	3206	6642	3575	3067
10 GALLOP-0#,1/2",32deg	7046	3436	3611	6650	3473	3177	6602	3560	3042
11 Underbuild-0#,0",30deg	6024	2911	3114	5287	2953	2335	5216	3023	2192
12 Overbld HV-0#,1/2",32deg	7046	3436	3611	6650	3473	3177	6602	3560	3042
13 Overbld MD-0#,1/4",32deg	6397	3113	3284	5812	3166	2645	5757	3247	2510
14 Overbld MD-0#,1",32deg	8818	4324	4494	8776	4265	4511	8752	4350	4402
15 COLD-0#,0",0deg	7390	3328	4063	7083	3283	3799	6996	3353	3642
16 MD Ice-0#,1/2",0deg	8235	3755	4479	8179	3691	4488	8128	3772	4356
17 **STR LOAD CASES	7390	3328	4063	7083	3283	3799	6996	3353	3642
18 NESC HV-4#,1/2",0deg	8635	3959	4676	8585	3897	4688	8635	3959	4676
19 NESC MD-4#,1/4",15deg	7375	3451	3924	7058	3438	3620	6997	3519	3478
20 NESC LT-9#,0",30deg	6374	3084	3290	5770	3129	2641	5708	3207	2502
21 NESC XW-90mph,0",60deg	5972	3154	2818	5417	3326	2090	5371	3412	1959
22 NESC XW-100mph,0",60deg	6393	3361	3032	5916	3509	2407	5880	3600	2279
23 NESC XW-110mph,0",60deg	6867	3594	3273	6473	3713	2760	6439	3807	2632
24 NESC XW-120mph,0",60deg	7380	3847	3533	7070	3931	3138	7037	4027	3011
25 NESC XW-130mph,0",60deg	7930	4120	3811	7706	4164	3542	7668	4258	3411
26 NESC XW-140mph,0",60deg	8504	4405	4099	8366	4406	3960	8334	4501	3833
27 NESC HWI-4#,1",15deg	9455	4504	4951	9413	4446	4967	9454	4504	4951
28 NESC MWI-2.3#,0.5",15deg	7706	3617	4089	7477	3591	3886	7419	3675	3744
29 ASCE-74 XW-95mph,0",60deg	6174	3253	2921	5658	3414	2243	5620	3504	2116
30 ASCE-74 XW-100mph,0",60deg	6393	3361	3032	5916	3509	2407	5880	3600	2279
31 ASCE-74 XW-101mph,0",60deg	6428	3378	3050	5962	3526	2436	5920	3615	2305
32 ASCE-74 XW-110mph,0",60deg	6867	3594	3273	6473	3713	2760	6439	3807	2632
33 ASCE-74 XW-120mph,0",60deg	7380	3847	3533	7070	3931	3138	7037	4027	3011
34 ASCE-74 XW-130mph,0",60deg	7930	4120	3811	7706	4164	3542	7668	4258	3411
35 ASCE-74 XW-140mph,0",60deg	8504	4405	4099	8366	4406	3960	8334	4501	3833
36 MD WD/Ice-50mph,1/2",0deg	8485	3883	4602	8436	3822	4615	8451	3891	4559
37 HV WD/Ice-50mph,1",0deg	10176	4750	5426	10129	4691	5437	10176	4750	5426
38 XTRM WD/Ice-50mph,2",0deg	14764	7173	7590	14764	7173	7590	14764	7173	7590
39 XTRM Ice/bare-50mph,1.75",0deg	13518	6505	7013	13518	6505	7013	13518	6505	7013
40 Heavy Ice MD-0#,3/4",0deg	8933	4111	4822	8882	4049	4834	8932	4110	4822
41 Heavy Ice HV-0#,1.25",0deg	10748	5047	5701	10710	4996	5714	10748	5047	5701
42 XTRM Ice -0#,2.5",0deg	16640	8197	8443	16640	8197	8443	16640	8197	8443
43 BROKEN PHASE-70mph,0",0deg	7687	3478	4210	7485	3431	4054	7412	3508	3904
44 EVERYDAY-0#,0",60deg	4782	2574	2209	3929	2782	1147	3876	2856	1020
45 DEFLECT-1#,0",60deg	4791	2578	2213	3935	2784	1151	3882	2858	1023
46 MAINTENANCE-2#,0",60deg	4809	2587	2222	3958	2792	1166	3905	2867	1038
47 STRINGING-2#,0",30deg	6042	2919	3122	5310	2961	2349	5239	3032	2207
48 Bare-50mph,0",0deg	7475	3371	4105	7186	3321	3865	7112	3396	3715

Section #4 from structure #2 to structure #10, start set #12 '', end set #1 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\brugg_49ay85acs-2c_a.wir', Ruling span (ft) 669.573
Sagging data: Catenary (ft) 7871.95, Horiz. Tension (lbs) 3424.3 Condition I Temperature (deg F) 60
Weather case for final after creep Everyday_60deg, Equivalent to 35.3 (deg F) temperature increase
Weather case for final after load NESC HV-4#,1/2",0deg, Equivalent to 17.8 (deg F) temperature increase

Ruling Span Sag Tension Report

Weather Case	Cable Load			R.S. Initial Cond.					R.S. Final Cond. After Creep					R.S. Final Cond. After Load				
# Description	Hor. Load (lbs/ft)	Vert Load (lbs/ft)	Res. Load (lbs/ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)
1 Everyday_60deg	0.00	0.43	0.43	3434	3424	15	7872	7.12	2874	2864	13	6583	8.51	3141	3131	14	7198	7.79
2 NESC CL-0#,0",60deg	0.00	0.43	0.43	3434	3424	15	7872	7.12	2874	2864	13	6583	8.51	3141	3131	14	7198	7.79
3 NESC CL-6#,0",60deg	0.20	0.43	0.48	3547	3537	16	7407	7.57	3012	3001	13	6285	8.92	3269	3259	15	6824	8.21
4 NESC CL-0#,1/2",32deg	0.00	1.11	1.11	5507	5479	24	4921	11.39	5151	5122	23	4601	12.19	5393	5364	24	4818	11.64
5 NESC CL-0#,1/4",32deg	0.00	0.70	0.70	4547	4531	20	6505	8.62	4062	4045	18	5808	9.65	4337	4321	19	6204	9.04
6 MOT	0.00	0.43	0.43	1833	1821	8	4186	13.40	1632	1620	7	3724	15.06	1714	1702	8	3913	14.33
7 SWING 1-6#,0",0deg	0.30	0.43	0.53	4727	4717	21	8969	6.25	4131	4121	18	7837	7.15	4480	4470	20	8501	6.59
8 SWING 2-6#,0",120deg	0.30	0.43	0.53	2882	2871	13	5459	10.27	2507	2495	11	4744	11.82	2673	2662	12	5061	11.08
9 GALLOP-2#,1/2",32deg	0.27	1.11	1.14	5573	5545	25	4845	11.57	5228	5199	23	4542	12.34	5467	5438	24	4752	11.80
10 GALLOP-0#,1/2",32deg	0.00	1.11	1.11	5507	5479	24	4921	11.39	5151	5122	23	4601	12.19	5393	5364	24	4818	11.64
11 Underbuild-0#,0",30deg	0.00	0.43	0.43	3965	3956	18	9093	6.16	3341	3332	15	7659	7.32	3663	3653	16	8397	6.67
12 Overbld HV-0#,1/2",32deg	0.00	1.11	1.11	5507	5479	24	4921	11.39	5151	5122	23	4601	12.19	5393	5364	24	4818	11.64
13 Overbld MD-0#,1/4",32deg	0.00	0.70	0.70	4547	4531	20	6505	8.62	4062	4045	18	5808	9.65	4337	4321	19	6204	9.04
14 Overbld MD-0#,1",32deg	0.00	2.41	2.41	8091	8018	36	3322	16.88	7986	7912	36	3278	17.11	8091	8018	36	3322	16.88
15 COLD-0#,0",0deg	0.00	0.43	0.43	4552	4542	20	10441	5.37	3902	3892	17	8947	6.26	4271	4261	19	9796	5.72
16 MD Ice-0#,1/2",0deg	0.00	1.11	1.11	5956	5929	26	5325	10.53	5598	5570	25	5003	11.21	5870	5843	26	5248	10.68
17 **STR LOAD CASES	0.00	0.43	0.43	4552	4542	20	10441	5.37	3902	3892	17	8947	6.26	4271	4261	19	9796	5.72
18 NESC HV-4#,1/2",0deg	0.53	1.11	1.54	6825	6786	30	4397	12.75	6573	6534	29	4234	13.24	6825	6786	30	4397	12.75
19 NESC MD-4#,1/4",15deg	0.36	0.70	0.99	5462	5440	24	5519	10.16	5065	5042	23	5115	10.96	5332	5309	24	5387	10.41
20 NESC LT-9#,0",30deg	0.44	0.43	0.67	4516	4504	20	6711	8.35	4020	4007	18	5971	9.39	4297	4285	19	6385	8.78
21 NESC XW-90mph,0",60deg	0.84	0.43	0.95	4747	4730	21	4997	11.22	4366	4349	19	4594	12.20	4587	4570	20	4828	11.61
22 NESC XW-100mph,0",60deg	1.04	0.43	1.13	5164	5144	23	4572	12.26	4825	4804	21	4269	13.13	5041	5021	22	4462	12.57
23 NESC XW-110mph,0",60deg	1.26	0.43	1.33	5621	5597	25	4211	13.31	5322	5298	24	3986	14.07	5531	5507	25	4143	13.53
24 NESC XW-120mph,0",60deg	1.49	0.43	1.56	6107	6078	27	3905	14.36	5851	5821	26	3740	14.99	6054	6025	27	3871	14.49
25 NESC XW-130mph,0",60deg	1.75	0.43	1.81	6619	6585	29	3644	15.39	6403	6368	28	3524	15.92	6604	6569	29	3635	15.43
26 NESC XW-140mph,0",60deg	2.03	0.43	2.08	7153	7112	32	3419	16.40	6982	6939	31	3336	16.81	7153	7112	32	3419	16.40
27 NESC HWI-4#,1",15deg	0.86	2.41	2.56	8539	8463	38	3301	16.99	8473	8396	38	3276	17.12	8539	8463	38	3301	16.99
28 NESC MWI-2.3#,0.5",15deg	0.30	1.11	1.15	5827	5798	26	5023	11.16	5478	5449	24	4720	11.88	5735	5706	26	4943	11.34
29 ASCE-74 XW-95mph,0",60deg	0.94	0.43	1.03	4949	4931	22	4775	11.74	4591	4573	20	4428	12.66	4807	4789	21	4637	12.09
30 ASCE-74 XW-100mph,0",60deg	1.04	0.43	1.13	5164	5144	23	4572	12.26	4825	4804	21	4269	13.13	5041	5021	22	4462	12.57
31 ASCE-74 XW-101mph,0",60deg	1.05	0.43	1.14	5200	5180	23	4543	12.34	4863	4842	22	4247	13.20	5077	5056	23	4434	12.64
32 ASCE-74 XW-110mph,0",60deg	1.26	0.43	1.33	5621	5597	25	4211	13.31	5322	5298	24	3986	14.07	5531	5507	25	4143	13.53
33 ASCE-74 XW-120mph,0",60deg	1.49	0.43	1.56	6107	6078	27	3905	14.36	5851	5821	26	3740	14.99	6054	6025	27	3871	14.49
34 ASCE-74 XW-130mph,0",60deg	1.75	0.43	1.81	6619	6585	29	3644	15.39	6403	6368	28	3524	15.92	6604	6569	29	3635	15.43
35 ASCE-74 XW-140mph,0",60deg	2.03	0.43	2.08	7153	7112	32	3419	16.40	6982	6939	31	3336	16.81	7153	7112	32	3419	16.40
36 MD WD/Ice-50mph,1/2",0deg	0.73	1.18	1.39	6520	6487	29	4664	12.02	6234	6201	28	4459	12.58	6491	6458	29	4644	12.07
37 HV WD/Ice-50mph,1",0deg	1.20	2.65	2.90	9285	9199	41	3167	17.71	9285	9199	41	3167	17.71	9285	9199	41	3167	17.71
38 XTRM WD/Ice-50mph,2",0deg	2.14	7.70	7.99	16349	16021	73	2004	28.03	16349	16021	73	2004	28.03	16349	16021	73	2004	28.03
39 XTRM Ice/bare-50mph,1.75",0deg	1.90	6.17	6.46	14437	14190	64	2197	25.56	14437	14190	64	2197	25.56	14437	14190	64	2197	25.56
40 Heavy Ice MD-0#,3/4",0deg	0.00	1.69	1.69	7104	7058	32	4187	13.39	6885	6839	31	4057	13.82	7104	7058	32	4187	13.39
41 Heavy Ice HV-0#,1.25",0deg	0.00	3.30	3.30	9933	9827	44	2981	18.82	9933	9827	44	2981	18.82	9933	9827	44	2981	18.82
42 XTRM Ice -0#,2.5",0deg	0.00	10.04	10.04	18743	18297	83	1822	30.85	18743	18297	83	1822	30.85	18743	18297	83	1822	30.85
43 BROKEN PHASE-70mph,0",0deg	0.51	0.43	0.67	5018	5007	22	7482	7.49	4500	4488	20	6706	8.36	4818	4807	21	7183	7.80
44 EVERYDAY-0#,0",60deg	0.00	0.43	0.43	3434	3424	15	7872	7.12	2874	2864	13	6583	8.51	3141	3131	14	7198	7.79
45 DEFLECT-1#,0",60deg	0.05	0.43	0.44	3441	3431	15	7838	7.15	2884	2874	13	6564	8.54	3149	3139	14	7170	7.82
46 MAINTENANCE-2#,0",60deg	0.10	0.43	0.45	3464	3454	15	7745	7.24	2909	2899	13	6500	8.62	3174	3164	14	7095	7.90
47 STRINGING-2#,0",30deg	0.10	0.43	0.45	3988	3978	18	8920	6.28	3375	3365	15	7544	7.43	3693	3683	16	8259	6.79
48 Bare-50mph,0",0deg	0.26	0.43	0.51	4686	4676	21	9233	6.07	4083	4073	18	8041	6.97	4434	4424	20	8735	6.42

Section #5 from structure #2 to structure #10, start set #13 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 669.622
Sagging data: Catenary (ft) 4168.92, Horiz. Tension (lbs) 4560.8 Condition I Temperature (deg F) 60
Weather case for final after creep Everyday_60deg, Equivalent to 24.1 (deg F) temperature increase
Weather case for final after load NESC HV-4#,1/2",0deg, Equivalent to 25.8 (deg F) temperature increase

Ruling Span Sag Tension Report

Weather Case	Cable Load (lbs/ft)			R.S. Initial Cond.					R.S. Final Cond. After Creep					R.S. Final Cond. After Load				
# Description	Hor.	Vert	Res.	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)	Max. Tens. (lbs)	Hori. Tens. (lbs)	Max Ten %UL	C (ft)	R.S. Sag (ft)
1 Everyday_60deg	0.00	1.09	1.09	4585	4561	15	4169	13.45	4212	4187	13	3827	14.65	4185	4160	13	3802	14.75
2 NESC CL-0#,0",60deg	0.00	1.09	1.09	4585	4561	15	4169	13.45	4212	4187	13	3827	14.65	4185	4160	13	3802	14.75
3 NESC CL-6#,0",60deg	0.37	1.09	1.15	4767	4742	15	4107	13.65	4403	4376	14	3790	14.80	4374	4348	14	3766	14.89
4 NESC CL-0#,1/2",32deg	0.00	2.09	2.09	7773	7724	25	3689	15.20	7590	7540	24	3601	15.57	7556	7506	24	3585	15.65
5 NESC CL-0#,1/4",32deg	0.00	1.52	1.52	6274	6240	20	4116	13.63	5967	5932	19	3913	14.33	5933	5898	19	3890	14.42
6 MOT	0.00	1.09	1.09	3155	3124	10	2856	19.65	3142	3111	10	2844	19.73	3155	3124	10	2856	19.65
7 SWING 1-6#,0",0deg	0.55	1.09	1.23	6091	6068	19	4948	11.33	5748	5724	18	4668	12.01	5701	5677	18	4630	12.11
8 SWING 2-6#,0",120deg	0.55	1.09	1.23	4223	4194	13	3420	16.40	3914	3883	12	3167	17.72	3897	3866	12	3152	17.80
9 GALLOP-2#,1/2",32deg	0.35	2.09	2.12	7842	7792	25	3670	15.28	7668	7618	24	3588	15.63	7631	7580	24	3570	15.71
10 GALLOP-0#,1/2",32deg	0.00	2.09	2.09	7773	7724	25	3689	15.20	7590	7540	24	3601	15.57	7556	7506	24	3585	15.65
11 Underbuild-0#,0",30deg	0.00	1.09	1.09	5082	5060	16	4625	12.12	4689	4666	15	4265	13.15	4655	4631	15	4233	13.25
12 Overbld HV-0#,1/2",32deg	0.00	2.09	2.09	7773	7724	25	3689	15.20	7590	7540	24	3601	15.57	7556	7506	24	3585	15.65
13 Overbld MD-0#,1/4",32deg	0.00	1.52	1.52	6274	6240	20	4116	13.63	5967	5932	19	3913	14.33	5933	5898	19	3890	14.42
14 Overbld MD-0#,1",32deg	0.00	3.72	3.72	11321	11221	36	3020	18.58	11304	11204	36	3016	18.61	11321	11221	36	3020	18.58
15 COLD-0#,0",0deg	0.00	1.09	1.09	5700	5679	18	5191	10.80	5316	5294	17	4839	11.59	5267	5245	17	4794	11.70
16 MD Ice-0#,1/2",0deg	0.00	2.09	2.09	8379	8332	27	3979	14.09	8301	8254	26	3942	14.23	8257	8209	26	3921	14.30
17 **STR LOAD CASES	0.00	1.09	1.09	5700	5679	18	5191	10.80	5316	5294	17	4839	11.59	5267	5245	17	4794	11.70
18 NESC HV-4#,1/2",0deg	0.70	2.09	2.52	9372	9314	30	3698	15.17	9340	9282	30	3685	15.22	9372	9314	30	3698	15.17
19 NESC MD-4#,1/4",15deg	0.54	1.52	1.81	7370	7330	23	4054	13.83	7159	7119	23	3937	14.24	7121	7081	23	3916	14.32
20 NESC LT-9#,0",30deg	0.83	1.09	1.42	6051	6023	19	4230	13.26	5725	5695	18	4000	14.02	5689	5659	18	3975	14.11
21 NESC XW-90mph,0",60deg	1.50	1.09	1.85	6692	6654	21	3591	15.62	6420	6380	20	3443	16.29	6390	6350	20	3427	16.37
22 NESC XW-100mph,0",60deg	1.85	1.09	2.15	7423	7378	24	3438	16.32	7200	7154	23	3333	16.83	7169	7123	23	3319	16.90
23 NESC XW-110mph,0",60deg	2.23	1.09	2.49	8232	8179	26	3288	17.06	8070	8016	26	3222	17.41	8038	7984	26	3210	17.48
24 NESC XW-120mph,0",60deg	2.66	1.09	2.87	9103	9039	29	3144	17.84	9013	8949	29	3113	18.02	8980	8916	29	3101	18.09
25 NESC XW-130mph,0",60deg	3.12	1.09	3.31	10021	9946	32	3008	18.65	10001	9926	32	3002	18.69	9986	9910	32	2997	18.72
26 NESC XW-140mph,0",60deg	3.62	1.09	3.78	10983	10893	35	2881	19.47	10968	10878	35	2877	19.50	10983	10893	35	2881	19.47
27 NESC HWI-4#,1",15deg	1.04	3.72	3.86	11889	11787	38	3056	18.36	11873	11771	38	3052	18.39	11889	11787	38	3056	18.36
28 NESC MWI-2.3#,0.5",15deg	0.40	2.09	2.13	8179	8130	26	3813	14.71	8054	8005	26	3754	14.94	8014	7964	25	3735	15.02
29 ASCE-74 XW-95mph,0",60deg	1.67	1.09	1.99	7048	7007	22	3515	15.96	6798	6756	22	3389	16.55	6769	6727	21	3375	16.62
30 ASCE-74 XW-100mph,0",60deg	1.85	1.09	2.15	7423	7378	24	3438	16.32	7200	7154	23	3333	16.83	7169	7123	23	3319	16.90
31 ASCE-74 XW-101mph,0",60deg	1.88	1.09	2.17	7484	7438	24	3426	16.37	7263	7217	23	3324	16.87	7235	7188	23	3311	16.94
32 ASCE-74 XW-110mph,0",60deg	2.23	1.09	2.49	8232	8179	26	3288	17.06	8070	8016	26	3222	17.41	8038	7984	26	3210	17.48
33 ASCE-74 XW-120mph,0",60deg	2.66	1.09	2.87	9103	9039	29	3144	17.84	9013	8949	29	3113	18.02	8980	8916	29	3101	18.09
34 ASCE-74 XW-130mph,0",60deg	3.12	1.09	3.31	10021	9946	32	3008	18.65	10001	9926	32	3002	18.69	9986	9910	32	2997	18.72
35 ASCE-74 XW-140mph,0",60deg	3.62	1.09	3.78	10983	10893	35	2881	19.47	10968	10878	35	2877	19.50	10983	10893	35	2881	19.47
36 MD WD/Ice-50mph,1/2",0deg	0.89	2.14	2.32	8919	8867	28	3820	14.68	8887	8835	28	3807	14.73	8862	8810	28	3796	14.78
37 HV WD/Ice-50mph,1",0deg	1.33	3.86	4.08	12577	12469	40	3056	18.36	12566	12458	40	3054	18.37	12577	12469	40	3056	18.36
38 XTRM WD/Ice-50mph,2",0deg	2.19	9.30	9.55	20888	20559	66	2153	26.09	20888	20559	66	2153	26.09	20888	20559	66	2153	26.09
39 XTRM Ice/bare-50mph,1.75",0deg	1.97	7.69	7.93	18768	18511	60	2333	24.07	18768	18511	60	2333	24.07	18768	18511	60	2333	24.07
40 Heavy Ice MD-0#,3/4",0deg	0.00	2.83	2.83	10054	9986	32	3532	15.88	10024	9955	32	3522	15.93	10054	9986	32	3532	15.88
41 Heavy Ice HV-0#,1.25",0deg	0.00	4.76	4.76	13816	13683	44	2875	19.52	13816	13683	44	2875	19.52	13816	13683	44	2875	19.52
42 XTRM Ice -0#,2.5",0deg	0.00	12.31	12.31	24087	23619	76	1919	29.29	24087	23619	76	1919	29.29	24087	23619	76	1919	29.29
43 BROKEN PHASE-70mph,0",0deg	0.90	1.09	1.42	6640	6613	21	4659	12.04	6357	6330	20	4459	12.58	6312	6285	20	4427	12.67
44 EVERYDAY-0#,0",60deg	0.00	1.09	1.09	4585	4561	15	4169	13.45	4212	4187	13	3827	14.65	4185	4160	13	3802	14.75
45 DEFLECT-1#,0",60deg	0.09	1.09	1.10	4594	4570	15	4162	13.47	4224	4199	13	3824	14.67	4197	4171	13	3800	14.76
46 MAINTENANCE-2#,0",60deg	0.18	1.09	1.11	4630	4606	15	4151	13.51	4261	4236	14	3818	14.69	4235	4209	13	3794	14.78
47 STRINGING-2#,0",30deg	0.18	1.09	1.11	5131	5109	16	4605	12.18	4741	4717	15	4252	13.19	4704	4681	15	4219	13.29
48 Bare-50mph,0",0deg	0.46	1.09	1.19	5977	5954	19	5015	11.18	5621	5598	18	4715	11.89	5576	5553	18	4676	11.99

Tension Distribution in Inner and Outer Materials

Weather Case	Initial Condition Horiz. Tension (lbs)			Final After Creep Horiz. Tension (lbs)			Final After Load Horiz. Tension (lbs)		
# Description	Total	Core	Outer	Total	Core	Outer	Total	Core	Outer
1 Everyday_60deg	4561	2466	2095	4187	2956	1231	4160	3062	1098
2 NESC CL-0#,0",60deg	4561	2466	2095	4187	2956	1231	4160	3062	1098
3 NESC CL-6#,0",60deg	4742	2554	2188	4376	3026	1351	4348	3132	1217
4 NESC CL-0#,1/2",32deg	7724	3774	3950	7540	3880	3660	7506	3992	3513
5 NESC CL-0#,1/4",32deg	6240	3036	3205	5932	3291	2641	5898	3399	2500
6 MOT	3124	3124	0	3111	3111	0	3124	3124	0
7 SWING 1-6#,0",0deg	6068	2665	3403	5724	2867	2857	5677	2964	2714
8 SWING 2-6#,0",120deg	4194	2841	1353	3883	3496	387	3866	3612	254
9 GALLOP-2#,1/2",32deg	7792	3808	3984	7618	3908	3710	7580	4019	3561
10 GALLOP-0#,1/2",32deg	7724	3774	3950	7540	3880	3660	7506	3992	3513
11 Underbuild-0#,0",30deg	5060	2436	2624	4666	2806	1860	4631	2906	1726
12 Overbld HV-0#,1/2",32deg	7724	3774	3950	7540	3880	3660	7506	3992	3513
13 Overbld MD-0#,1/4",32deg	6240	3036	3205	5932	3291	2641	5898	3399	2500
14 Overbld MD-0#,1",32deg	11221	5549	5672	11204	5516	5688	11221	5549	5672
15 COLD-0#,0",0deg	5679	2471	3208	5294	2710	2584	5245	2802	2443
16 MD Ice-0#,1/2",0deg	8332	3805	4527	8254	3793	4460	8209	3902	4308
17 **STR LOAD CASES	5679	2471	3208	5294	2710	2584	5245	2802	2443
18 NESC HV-4#,1/2",0deg	9314	4307	5007	9282	4253	5029	9314	4307	5007
19 NESC MD-4#,1/4",15deg	7330	3429	3902	7119	3541	3578	7081	3650	3431
20 NESC LT-9#,0",30deg	6023	2910	3113	5695	3183	2513	5659	3288	2371
21 NESC XW-90mph,0",60deg	6654	3489	3165	6380	3759	2621	6350	3872	2478
22 NESC XW-100mph,0",60deg	7378	3846	3532	7154	4042	3112	7123	4156	2966
23 NESC XW-110mph,0",60deg	8179	4243	3936	8016	4358	3658	7984	4471	3513
24 NESC XW-120mph,0",60deg	9039	4672	4367	8949	4700	4250	8916	4810	4107
25 NESC XW-130mph,0",60deg	9946	5127	4818	9926	5085	4840	9910	5168	4742
26 NESC XW-140mph,0",60deg	10893	5606	5287	10878	5575	5302	10893	5606	5287
27 NESC HWI-4#,1",15deg	11787	5708	6079	11771	5679	6092	11787	5708	6079
28 NESC MWI-2.3#,0.5",15deg	8130	3831	4299	8005	3865	4140	7964	3975	3989
29 ASCE-74 XW-95mph,0",60deg	7007	3662	3344	6756	3897	2859	6727	4011	2716
30 ASCE-74 XW-100mph,0",60deg	7378	3846	3532	7154	4042	3112	7123	4156	2966
31 ASCE-74 XW-101mph,0",60deg	7438	3876	3563	7217	4065	3151	7188	4180	3008
32 ASCE-74 XW-110mph,0",60deg	8179	4243	3936	8016	4358	3658	7984	4471	3513
33 ASCE-74 XW-120mph,0",60deg	9039	4672	4367	8949	4700	4250	8916	4810	4107
34 ASCE-74 XW-130mph,0",60deg	9946	5127	4818	9926	5085	4840	9910	5168	4742
35 ASCE-74 XW-140mph,0",60deg	10893	5606	5287	10878	5575	5302	10893	5606	5287
36 MD WD/Ice-50mph,1/2",0deg	8867	4078	4789	8835	4024	4811	8810	4122	4687
37 HV WD/Ice-50mph,1",0deg	12469	5950	6520	12458	5930	6529	12469	5950	6520
38 XTRM WD/Ice-50mph,2",0deg	20559	10405	10153	20559	10405	10153	20559	10405	10153
39 XTRM Ice/bare-50mph,1.75",0deg	18511	9239	9272	18511	9239	9272	18511	9239	9272
40 Heavy Ice MD-0#,3/4",0deg	9986	4653	5333	9955	4601	5354	9986	4653	5333
41 Heavy Ice HV-0#,1.25",0deg	13683	6594	7089	13683	6594	7089	13683	6594	7089
42 XTRM Ice -0#,2.5",0deg	23619	12158	11461	23619	12158	11461	23619	12158	11461
43 BROKEN PHASE-70mph,0",0deg	6613	2938	3676	6330	3089	3241	6285	3190	3095
44 EVERYDAY-0#,0",60deg	4561	2466	2095	4187	2956	1231	4160	3062	1098
45 DEFLECT-1#,0",60deg	4570	2470	2100	4199	2961	1238	4171	3066	1106
46 MAINTENANCE-2#,0",60deg	4606	2488	2118	4236	2974	1262	4209	3080	1129
47 STRINGING-2#,0",30deg	5109	2460	2649	4717	2825	1893	4681	2924	1757
48 Bare-50mph,0",0deg	5954	2608	3346	5598	2821	2777	5553	2917	2635

C-M ANALYSIS REPORT 10

Mines 138KV Transmission Line Survey Points Clearance Report

Weather Cases Relevant for Terrain Clearances by Span

WC #	Description	Air Density Factor (psf/mph^2)	Wind Vel. (mph)	Wind Pres. (psf)	Wire Ice Thick (in)	Wire Ice Density (lbs/ft^3)	Wire Ice Load (lbs/ft)	Wire Temp (deg F)	Ambient Temp (deg F)	Weather Load Factor	NESC Constant (lbs/ft)	Wire Wind Height Adjust Model	Wire Gust Response Factor
1	Everyday_60deg	0.00256	0	0.0	0.00	0.000	0.00	60	60	1.00	0.00	None	1
3	NESC CL-6#,0",60deg	0.00256	40	4.0	0.00	0.000	0.00	60	60	1.00	0.00	None	1
18	NESC HV-4#,1/2",0deg	0.00256	40	4.0	0.50	57.000	0.00	0	0	1.00	0.31	None	1

Weather case for final after creep 'Everyday_60deg'
Weather case for final after load NESC HV-4#,1/2",0deg

Survey Point Clearance Criteria

LC #	WC #	Weather Case Description	Cable Condition
1	3	NESC CL-6#,0",60deg	Max Sag RS

Survey Point Clearance and Danger Tree Locator functions are considering a Continuous Range of wind values from left blowout to right blowout.

Survey Point Clearance functions are treating points with insufficient vertical clearance but adequate horizontal clearance as non violations.

Required Clearances

Feature Code	Feature Description	Aerial Obstacle	Point is on Ground	Required Clearance (ft) 0 kV Vert.	0 kV Horiz.	138 kV Vert.	138 kV Horiz.	Structure Base/Guy to Spotting Constraint
1	Ground - GPS	No	Yes	0.000	0.000	25.000	0.000	0.000
2	River	No	Yes	0.000	0.000	25.000	0.000	0.000
3	ETO-WAT-LNS	No	Yes	0.000	0.000	25.000	0.000	0.000
4	Contour - Normal	No	Yes	0.000	0.000	25.000	0.000	0.000
5	Contour - High	No	Yes	0.000	0.000	25.000	0.000	0.000
6	Ground	No	Yes	0.000	0.000	25.000	0.000	0.000
200	?UNKNOWN FEATURE CODE?	No	Yes	0.000	0.000	25.000	0.000	0.000
9999	Point of Interconnect	No	Yes	0.000	0.000	25.000	0.000	0.000

Feature code used to determine required clearance to ground 1
Feature code used for interpolated TIN points 200

Sections Evaluated

Circuit Label	Section Number	Start Structure Set	End Structure Set	Ruling Span (ft)	Insulator Clipped	Section Notes	Cable File Name	Voltage (kV)	Bundle Shape (# Wires)	Bundle Spacing (in)
	1	1:2	2:1	297.2	No		brugg_49ay85acs-2c_a.wir	0	None (1)	0.000000
	2	1:3	2:11	295.8	No		3_8ehs	0	None (1)	0.000000
	3	1:10	2:3	297.5	No		drake	138	None (1)	0.000000
	4	2:12	10:1	669.6	No		brugg_49ay85acs-2c_a.wir	0	None (1)	0.000000
	5	2:13	10:3	669.6	No		drake	138	None (1)	0.000000

Terrain Clearances by Span Report

This report includes survey points with all feature codes (not restricted to limited list of feature codes).
Spans being analyzed:
Back Structures: 1 - 10
Circuits: All
This report includes only survey points with a horizontal distance to wire of less than 50.00 (ft).

Clearance to ground centerline is not being checked at regular intervals (only being checked at existing survey points) ??
Clearance to TIN is not being checked ??

PLS-CADD analyzes clearances for all of the weather cases specified in Criteria/Survey Point Clearances but reports results only for the weather case it deems the worst case violation (lowest vertical clearance margin). Detailed results for all weather cases and wind directions can be obtained through Terrain/Clearance if desired.

Explanation of comments printed in this report
Ground clear controls: Constrained by required clearance to ground rather than required clearances for point Feature Code.
Point above wires: Aerial obstacle that is above wires for specified criteria.
Closer inspection may be required to ensure wires remain below obstacle at colder temperatures.

Point between wires: Aerial obstacle that is above some wires and below other wires for specified criteria.
Closer inspection may be required to ensure there are no violations when transitioning from cold to hot temperatures.
Nonprojectable: Point can't be projected onto span. Constrained by clearance to end of span.

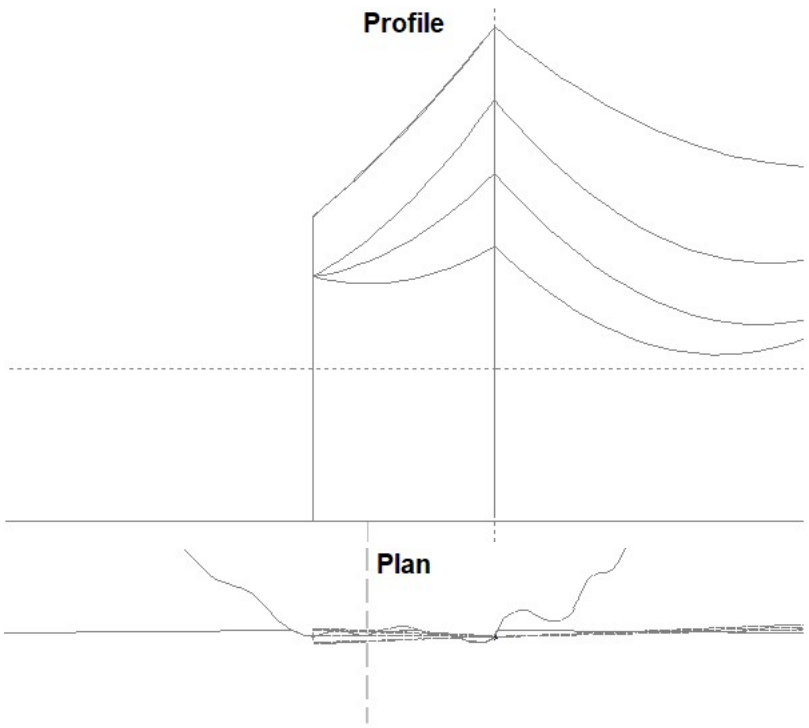
Points simultaneously violating both horizontal and vertical clearance requirements are indicated as "NG" and shown in red.

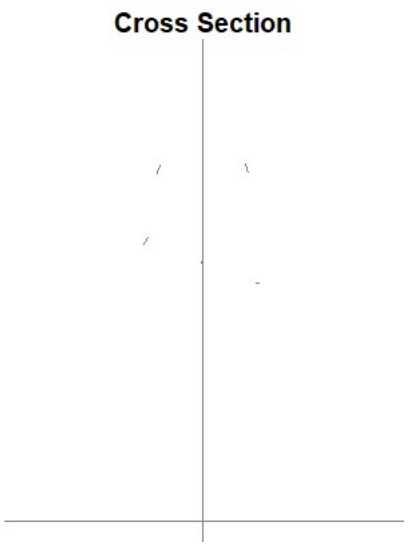
A clearance value of 10000 indicates the program was unable to calculate a clearance (no wires in span, no wires crossing point, unknown ground elevation, no points meeting above criteria...).

Back Structure Number	Ahead Structure Number	Controlling Weather Case	Clearance Margin Vert. (ft)	Clearance Margin Horiz. (ft)	OK	Comment	Survey Pt. Clearance Violations in Span	Aerial Pts. Above or Between Wires	Point ID	Feature Code Description	Station (ft)	Offset (ft)	Z (ft)	Height (ft)
1	2	NESC CL-6#,0",60deg(adj 0.0mph)	13.88	10.87	OK		0	0	DXF	Contour - Normal	88.84	-2.08	786.00	0.00
2	3	NESC CL-6#,0",60deg(adj 0.0mph)	9.35	49.41	OK		0	0	DXF	Contour - Normal	432.17	-48.74	786.00	0.00
3	4	NESC CL-6#,0",60deg(adj 0.0mph)	2.76	11.43	OK		0	0	DXF	Contour - Normal	1187.19	-21.37	786.00	0.00
4	5	NESC CL-6#,0",60deg(adj 0.0mph)	13.82	49.31	OK		0	0	DXF	Contour - Normal	2319.70	-54.82	788.00	0.00
5	6	NESC CL-6#,0",60deg(adj 28.0mph)	15.45	48.53	OK		0	0	DXF	Contour - Normal	2339.45	-53.94	788.00	0.00
6	7	NESC CL-6#,0",60deg(adj 0.0mph)	2.43	12.07	OK		0	0	ALIGN	Ground - GPS	3564.46	3.20	787.64	0.00
7	8	NESC CL-6#,0",60deg(adj 28.0mph)	15.48	5.45	OK		0	0	ALIGN	Ground - GPS	4390.32	0.00	788.00	0.00
8	9	NESC CL-6#,0",60deg(adj 0.0mph)	0.57	10.00	OK		0	0	DXF	Contour - Normal	4675.93	4.66	788.00	0.00
9	10	NESC CL-6#,0",60deg(adj 0.0mph)	8.94	49.34	OK		0	0	DXF	Contour - Normal	5331.50	52.35	788.00	0.00

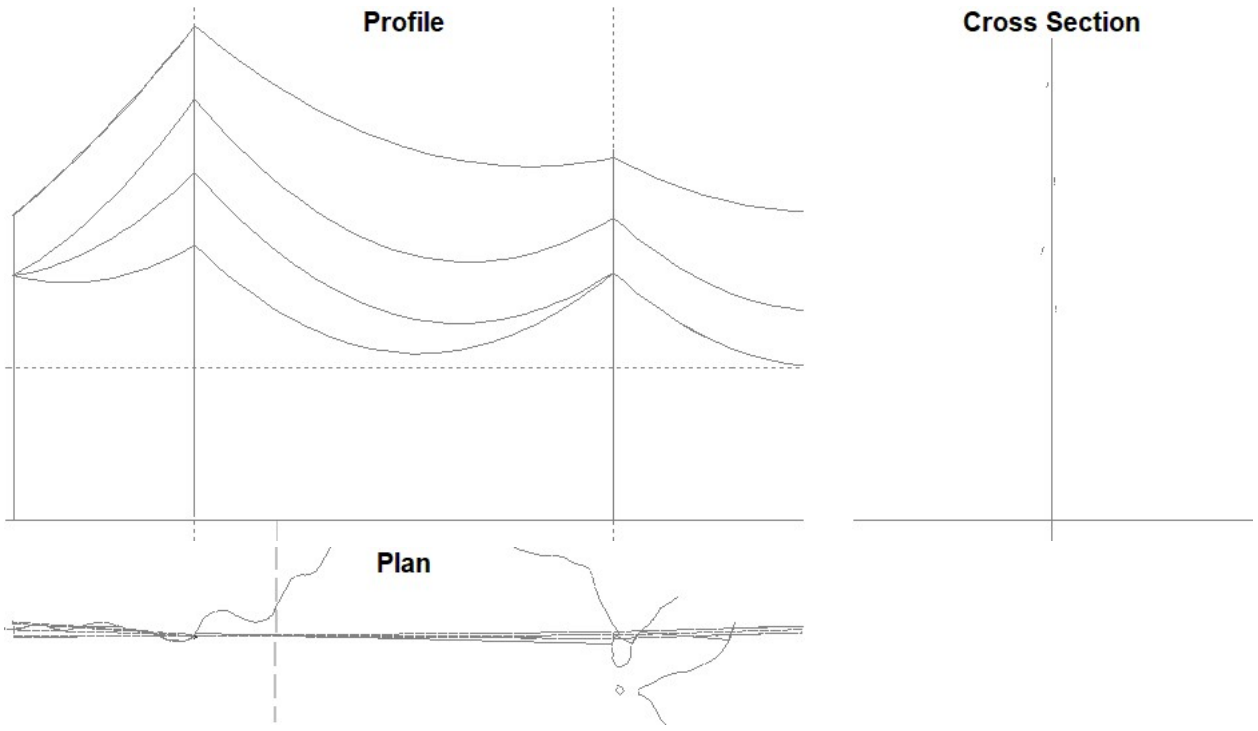
0 spans with clearance violations OK
9 spans without clearance violations

Span from structure 1 to 2 and cross section at station 88.84 (ft) X=2125334.83 Y=1441290.80 (ft)

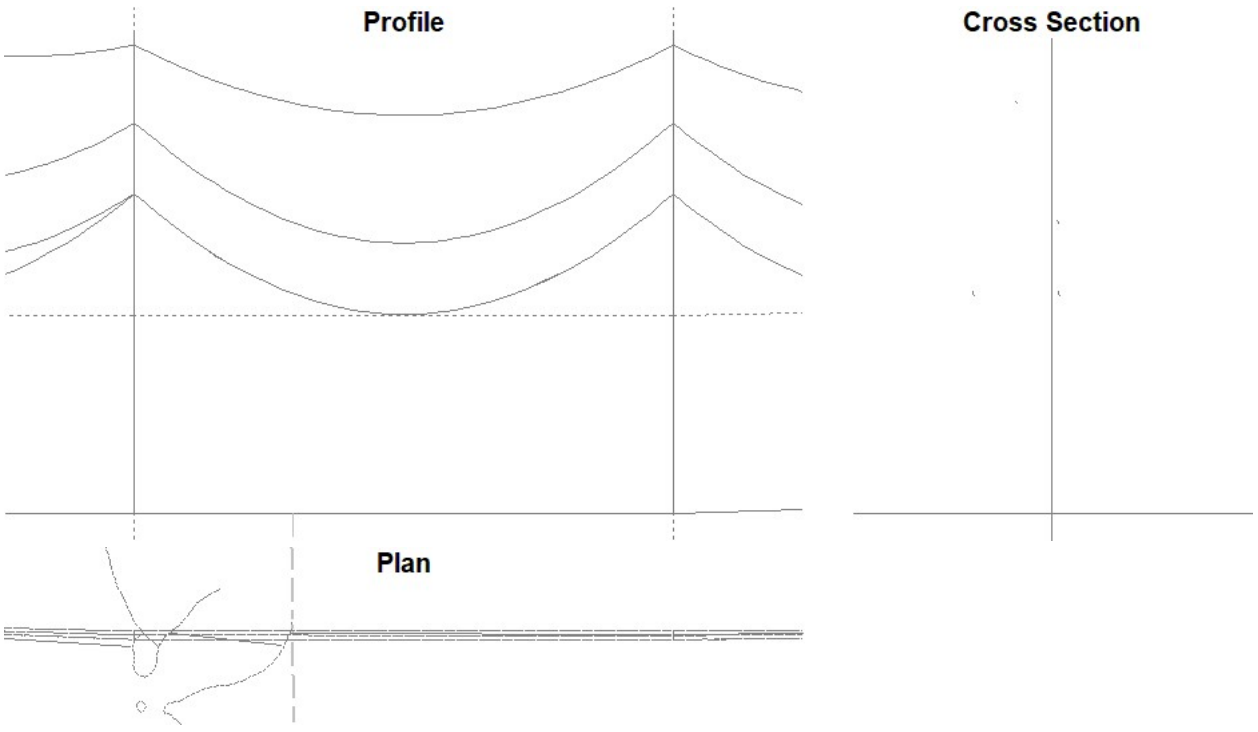




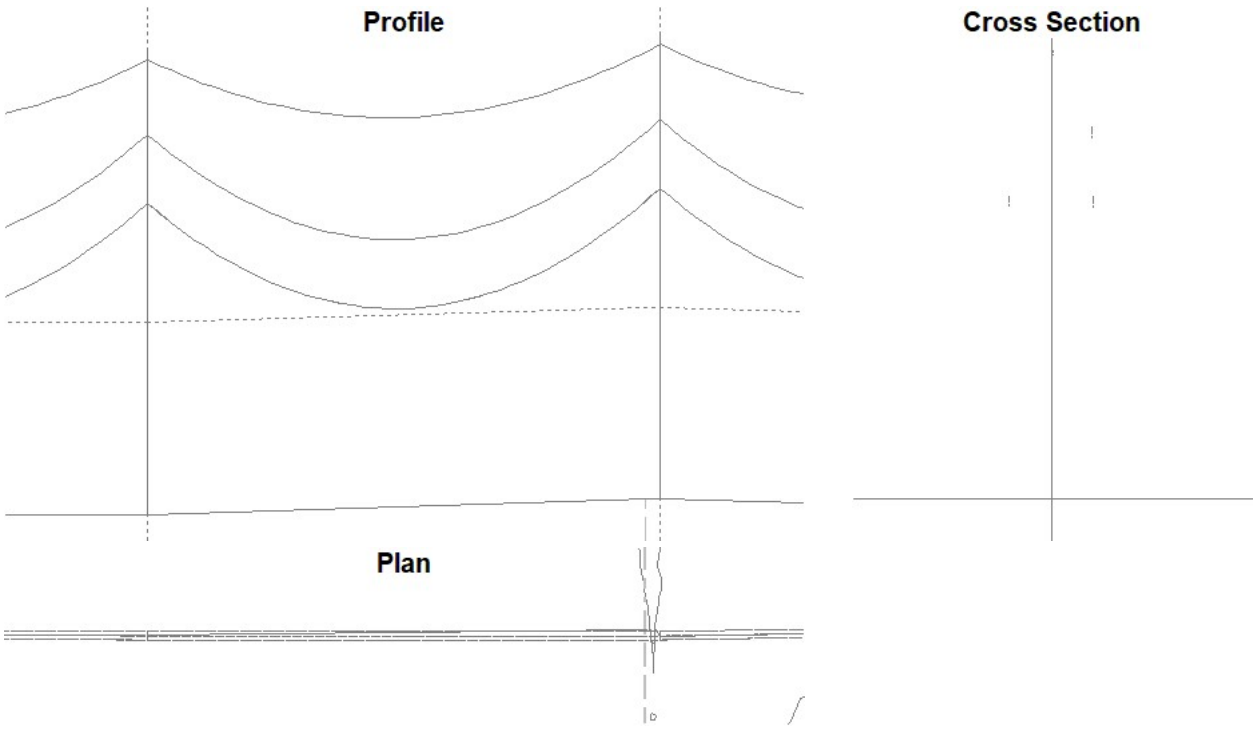
Span from structure 2 to 3 and cross section at station 432.17 (ft) X=2125679.87 Y=1441314.43 (ft)



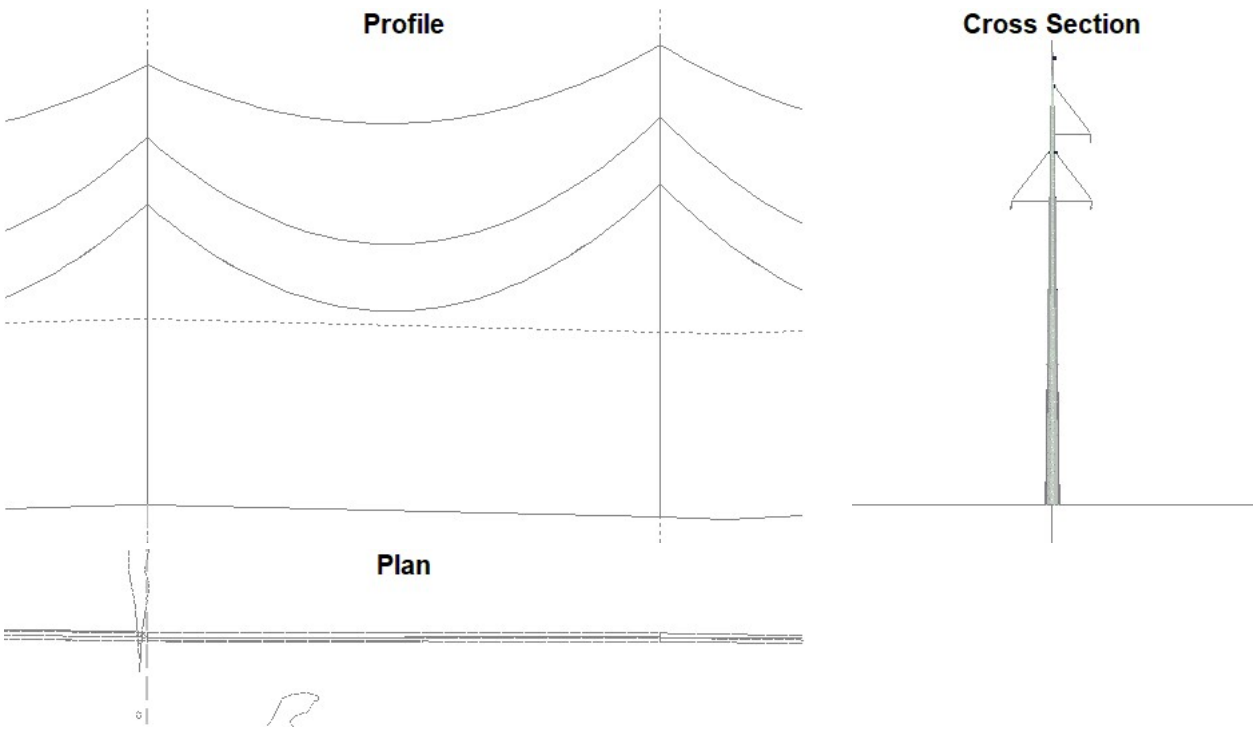
Span from structure 3 to 4 and cross section at station 1187.19 (ft) X=2126431.53 Y=1441256.13 (ft)



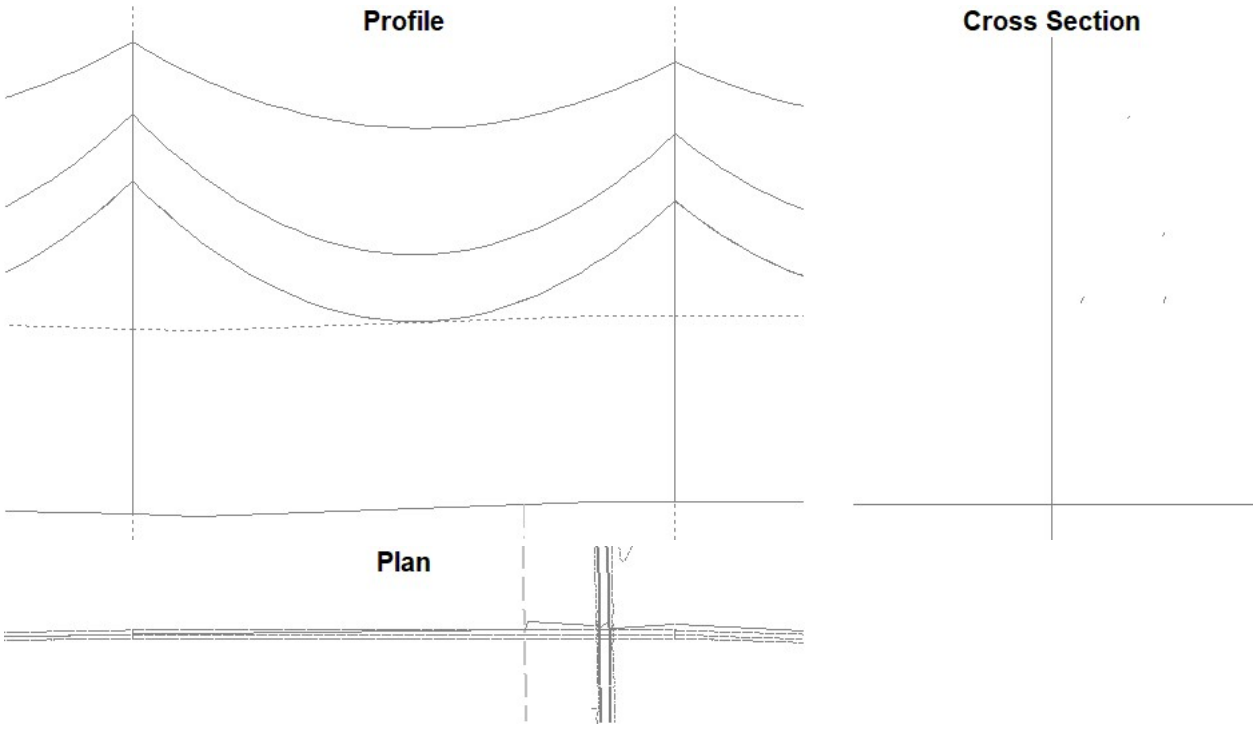
Span from structure 4 to 5 and cross section at station 2319.70 (ft) X=2127564.39 Y=1441281.54 (ft)



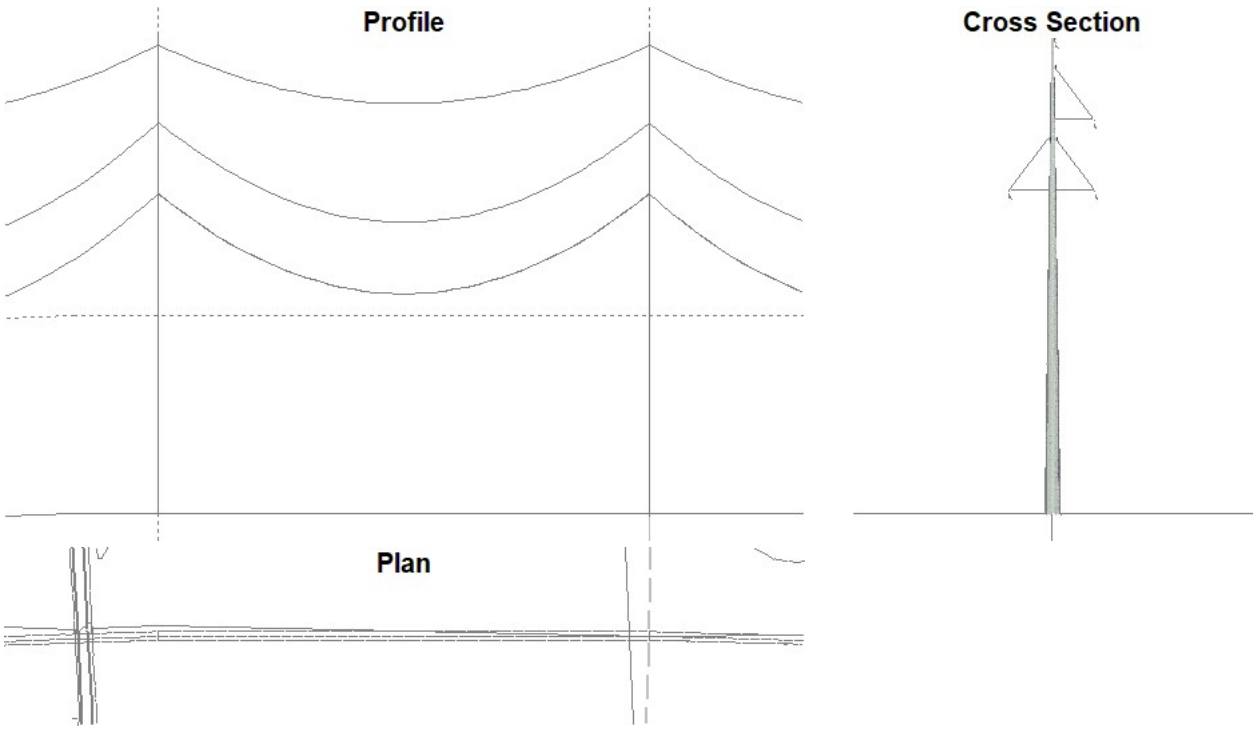
Span from structure 5 to 6 and cross section at station 2339.45 (ft) X=2127583.25 Y=1441280.50 (ft)



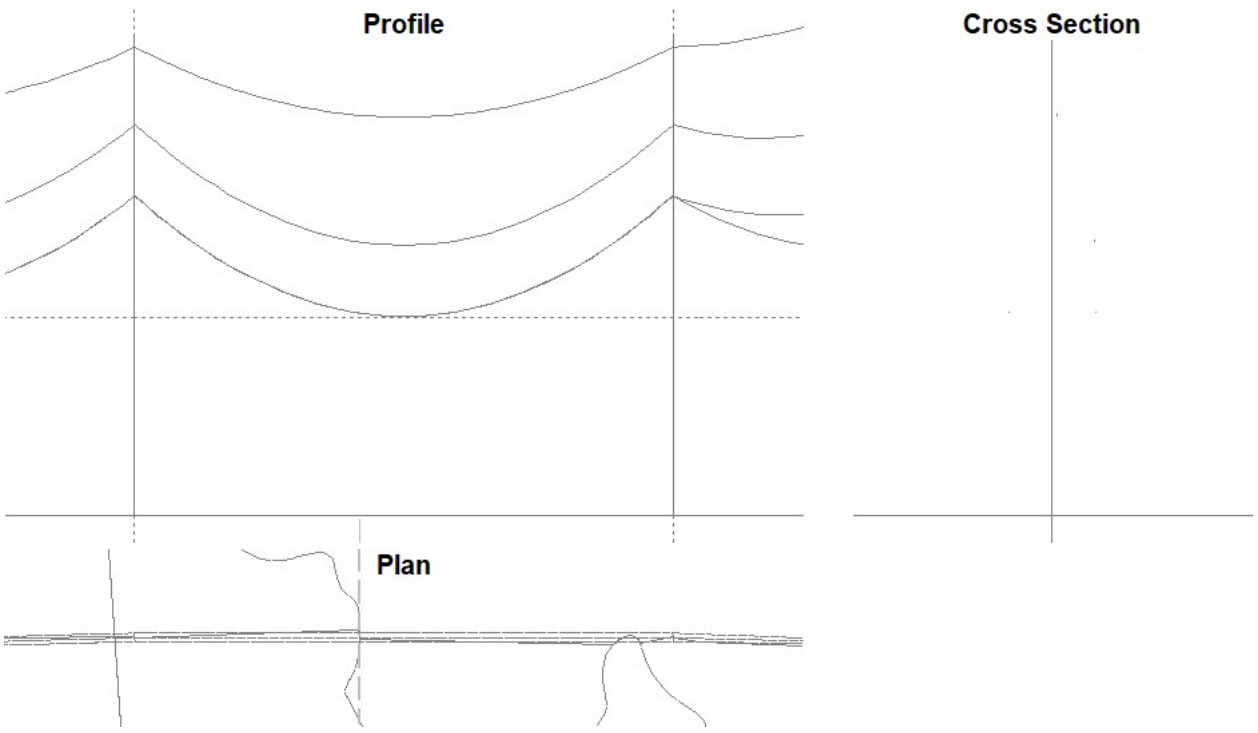
Span from structure 6 to 7 and cross section at station 3564.46 (ft) X=2128808.65 Y=1441234.06 (ft)



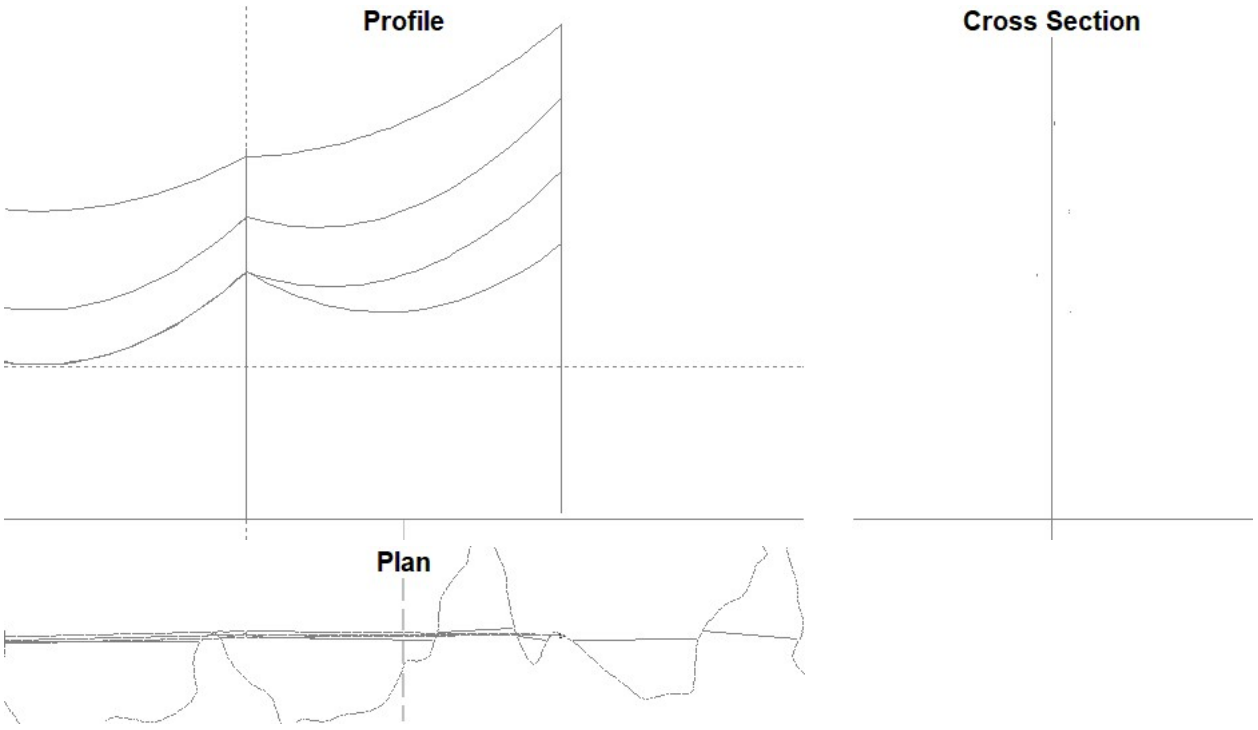
Span from structure 7 to 8 and cross section at station 4390.32 (ft) X=2129633.28 Y=1441200.99 (ft)



Span from structure 8 to 9 and cross section at station 4675.93 (ft) X=2129917.94 Y=1441177.14 (ft)



Span from structure 9 to 10 and cross section at station 5331.50 (ft) X=2130567.05 Y=1441079.30 (ft)



C-M ANALYSIS REPORT 11

Mines 138KV Transmission Line Galloping Report

Galloping Criteria
  Weather case for swing angle: 9 GALLOP-2#,1/2",32deg Load RS
  Weather case for sag: : 10 GALLOP-0#,1/2",32deg Load RS
  Galloping amplitude safety factor (multiplies major axis for all methods): 1.00
  Required separation between ellipses: 0.00 (ft)
  Overlap between ellipses that triggers a violation: 0.0 %
  Checking single loop (Davison)
  Checking double loop (Toye)
  Switching from single to double loop galloping for spans greater than 600.00 (ft)

  Note that any given galloping ellipse is only checked against other ellipses that
    share the same start and stop structures (those that do not will be marked as N/A below).

Galloping ellipse report

  Single loop galloping with wire spacing at mid span for wires starting on structure #1 with wind from Right

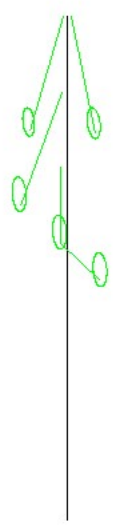
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
2	1	298.8	2.80	0.0	-13.4	4.5	1.8	0.7
3	1	297.4	3.15	0.0	-15.7	4.9	2.0	0.8
10	1	299.2	3.57	0.0	-9.5	5.5	2.2	0.9
10	2	298.0	3.53	0.0	-9.5	5.4	2.2	0.9
10	3	297.5	3.51	0.0	-9.5	5.4	2.2	0.9

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	2:1	3:1	10:1	10:2	10:3
2:1		8.42	6.75	13.26	21.39
3:1	8.42		13.07	13.37	18.10
10:1	6.75	13.07		5.06	13.53
10:2	13.26	13.37	5.06		5.08
10:3	21.39	18.10	13.53	5.08	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	2:1	3:1	10:1	10:2	10:3
2:1		0.00	0.00	0.00	0.00
3:1	0.00		0.00	0.00	0.00
10:1	0.00	0.00		0.00	0.00
10:2	0.00	0.00	0.00		0.00
10:3	0.00	0.00	0.00	0.00	



  Single loop galloping with wire spacing at mid span for wires starting on structure #1 with wind from Left

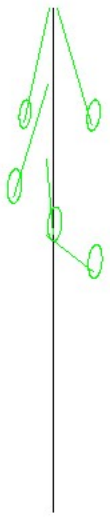
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
2	1	298.8	2.80	0.0	13.4	4.5	1.8	0.7
3	1	297.4	3.15	0.0	15.7	4.9	2.0	0.8
10	1	299.2	3.57	0.0	9.5	5.5	2.2	0.9
10	2	298.0	3.53	0.0	9.5	5.4	2.2	0.9
10	3	297.5	3.51	0.0	9.5	5.4	2.2	0.9

  Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	2:1	3:1	10:1	10:2	10:3
2:1		8.96	6.62	13.46	21.68
3:1	8.96		13.00	13.29	18.11
10:1	6.62	13.00		5.55	14.05
10:2	13.46	13.29	5.55		5.58

```
10:3   21.68  18.11  14.05   5.58

 % area overlap between ellipses (Set:Phase)(0% = no violation)
         2:1    3:1   10:1   10:2   10:3
 2:1           0.00   0.00   0.00   0.00
 3:1    0.00          0.00   0.00   0.00
10:1    0.00   0.00          0.00   0.00
10:2    0.00   0.00   0.00          0.00
10:3    0.00   0.00   0.00   0.00
```



```
  Skipped 3 checks of 'Double loop galloping with wire spacing at one quarter of span' with wind from Right starting on
structure 1 because of span limit
  Skipped 3 checks of 'Double loop galloping with wire spacing at one quarter of span' with wind from Left starting on structure
1 because of span limit
  Skipped 3 checks of 'Double loop galloping with wire spacing at three quarters of span' with wind from Right starting on
structure 1 because of span limit
  Skipped 3 checks of 'Double loop galloping with wire spacing at three quarters of span' with wind from Left starting on
structure 1 because of span limit


Galloping ellipse report
  Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Right starting on structure 2 because
of span limit
  Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Left starting on structure 2 because
of span limit

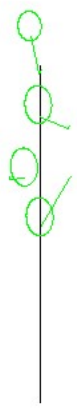

  Double loop galloping with wire spacing at one quarter of span for wires starting on structure #2 with wind from Right

    Structure   Ahead     Mid  Insul   Span  Major  Minor  Dist.
    Set Phase    Span    Span  Swing  Swing   Axis   Axis    'B'
      #     #     Len     Sag  Angle  Angle   Len.   Len.   Len.
                 (ft)    (ft)  (deg)  (deg)   (ft)   (ft)   (ft)
    ---------------------------------------------------------
     12     1   687.9   12.29  -30.3  -13.4    5.3    4.2    1.1
     13     1   688.1   16.53  -23.3   -9.5    6.9    4.8    1.4
     13     2   687.5   16.50  -18.0   -9.5    6.8    4.8    1.4
     13     3   687.9   16.51  -20.7   -9.5    6.8    4.8    1.4



    Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)
           12:1   13:1   13:2   13:3
   12:1           8.18  19.38  28.39
   13:1    8.18          4.90  13.40
   13:2   19.38   4.90          2.72
   13:3   28.39  13.40   2.72

    % area overlap between ellipses (Set:Phase)(0% = no violation)
           12:1   13:1   13:2   13:3
   12:1           0.00   0.00   0.00
   13:1    0.00          0.00   0.00
   13:2    0.00   0.00          0.00
   13:3    0.00   0.00   0.00
```



Double loop galloping with wire spacing at one quarter of span for wires starting on structure #2 with wind from Left

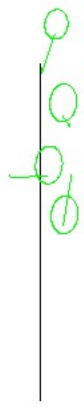
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
12	1	687.9	12.29	1.5	13.4	5.3	4.2	1.1
13	1	688.1	16.53	-2.1	9.5	6.9	4.8	1.4
13	2	687.5	16.50	3.4	9.5	6.8	4.8	1.4
13	3	687.9	16.51	-1.8	9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	12:1	13:1	13:2	13:3
12:1		8.18	19.34	28.37
13:1	8.18		4.72	13.41
13:2	19.34	4.72		2.95
13:3	28.37	13.41	2.95	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	12:1	13:1	13:2	13:3
12:1		0.00	0.00	0.00
13:1	0.00		0.00	0.00
13:2	0.00	0.00		0.00
13:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #2 with wind from Right

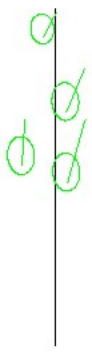
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
12	1	687.9	12.29	-30.3	-13.4	5.3	4.2	1.1
13	1	688.1	16.53	-23.3	-9.5	6.9	4.8	1.4
13	2	687.5	16.50	-18.0	-9.5	6.8	4.8	1.4
13	3	687.9	16.51	-20.7	-9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	12:1	13:1	13:2	13:3
12:1		7.74	17.19	20.14
13:1	7.74		6.82	5.91
13:2	17.19	6.82		3.61
13:3	20.14	5.91	3.61	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	12:1	13:1	13:2	13:3
12:1		0.00	0.00	0.00
13:1	0.00		0.00	0.00
13:2	0.00	0.00		0.00
13:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #2 with wind from Left

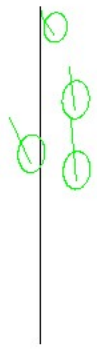
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
12	1	687.9	12.29	1.5	13.4	5.3	4.2	1.1
13	1	688.1	16.53	-2.1	9.5	6.9	4.8	1.4
13	2	687.5	16.50	3.4	9.5	6.8	4.8	1.4
13	3	687.9	16.51	-1.8	9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	12:1	13:1	13:2	13:3
12:1		7.67	17.10	20.06
13:1	7.67		6.48	5.92
13:2	17.10	6.48		3.77
13:3	20.06	5.92	3.77	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	12:1	13:1	13:2	13:3
12:1		0.00	0.00	0.00
13:1	0.00		0.00	0.00
13:2	0.00	0.00		0.00
13:3	0.00	0.00	0.00	



Galloping ellipse report
Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Right starting on structure 3 because of span limit
Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Left starting on structure 3 because of span limit

Double loop galloping with wire spacing at one quarter of span for wires starting on structure #3 with wind from Right

Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	683.0	12.11	-15.6	-13.4	5.3	4.1	1.1
3	1	683.0	16.28	-11.2	-9.5	6.8	4.8	1.4

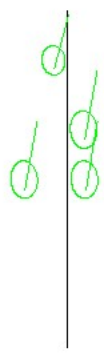
3	2	683.0	16.28	-11.2	-9.5	6.8	4.8	1.4
3	3	683.0	16.28	-11.2	-9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.78	16.32	16.25
3:1	7.78		8.62	2.26
3:2	16.32	8.62		6.09
3:3	16.25	2.26	6.09	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at one quarter of span for wires starting on structure #3 with wind from Left

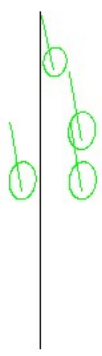
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	683.0	12.11	11.5	13.4	5.3	4.1	1.1
3	1	683.0	16.28	8.1	9.5	6.8	4.8	1.4
3	2	683.0	16.28	8.1	9.5	6.8	4.8	1.4
3	3	683.0	16.28	8.1	9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.67	16.25	16.15
3:1	7.67		8.30	2.26
3:2	16.25	8.30		6.07
3:3	16.15	2.26	6.07	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #3 with wind from Right

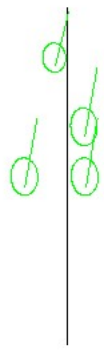
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	683.0	12.11	-15.6	-13.4	5.3	4.1	1.1
3	1	683.0	16.28	-11.2	-9.5	6.8	4.8	1.4
3	2	683.0	16.28	-11.2	-9.5	6.8	4.8	1.4
3	3	683.0	16.28	-11.2	-9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.72	16.30	16.19
3:1	7.72		8.64	2.25
3:2	16.30	8.64		6.10
3:3	16.19	2.25	6.10	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #3 with wind from Left

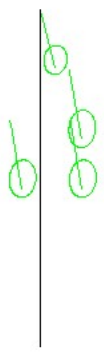
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	683.0	12.11	11.5	13.4	5.3	4.1	1.1
3	1	683.0	16.28	8.1	9.5	6.8	4.8	1.4
3	2	683.0	16.28	8.1	9.5	6.8	4.8	1.4
3	3	683.0	16.28	8.1	9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.66	16.28	16.14
3:1	7.66		8.32	2.26
3:2	16.28	8.32		6.09
3:3	16.14	2.26	6.09	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Galloping ellipse report
  Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Right starting on structure 4 because of span limit
  Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Left starting on structure 4 because of span limit

  Double loop galloping with wire spacing at one quarter of span for wires starting on structure #4 with wind from Right

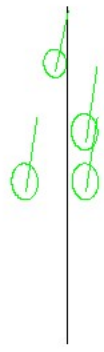
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	669.7	11.64	-19.5	-13.4	5.1	4.1	1.0
3	1	669.7	15.65	-14.3	-9.5	6.5	4.7	1.3
3	2	669.7	15.65	-14.4	-9.5	6.5	4.7	1.3
3	3	669.7	15.65	-14.3	-9.5	6.5	4.7	1.3

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.79	16.38	16.26
3:1	7.79		8.77	2.47
3:2	16.38	8.77		6.20
3:3	16.26	2.47	6.20	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



  Double loop galloping with wire spacing at one quarter of span for wires starting on structure #4 with wind from Left

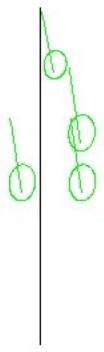
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	669.7	11.64	7.0	13.4	5.1	4.1	1.0
3	1	669.7	15.65	4.7	9.5	6.5	4.7	1.3
3	2	669.7	15.65	4.6	9.5	6.5	4.7	1.3
3	3	669.7	15.65	4.7	9.5	6.5	4.7	1.3

  Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)
  1:1 3:1 3:2 3:3

1:1		7.73	16.38	16.23
3:1	7.73		8.48	2.48
3:2	16.38	8.48		6.20
3:3	16.23	2.48	6.20	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #4 with wind from Right

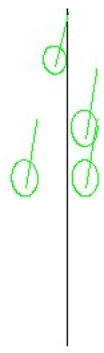
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	669.7	11.64	-19.5	-13.4	5.1	4.1	1.0
3	1	669.7	15.65	-14.3	-9.5	6.5	4.7	1.3
3	2	669.7	15.65	-14.4	-9.5	6.5	4.7	1.3
3	3	669.7	15.65	-14.3	-9.5	6.5	4.7	1.3

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.80	16.38	16.27
3:1	7.80		8.77	2.47
3:2	16.38	8.77		6.20
3:3	16.27	2.47	6.20	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #4 with wind from Left

Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	669.7	11.64	7.0	13.4	5.1	4.1	1.0
3	1	669.7	15.65	4.7	9.5	6.5	4.7	1.3

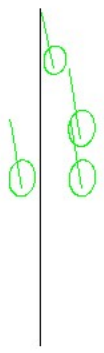
3	2	669.7	15.65	4.6	9.5	6.5	4.7	1.3
3	3	669.7	15.65	4.7	9.5	6.5	4.7	1.3

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.74	16.37	16.23
3:1	7.74		8.48	2.48
3:2	16.37	8.48		6.20
3:3	16.23	2.48	6.20	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Galloping ellipse report
Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Right starting on structure 5 because of span limit
Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Left starting on structure 5 because of span limit

Double loop galloping with wire spacing at one quarter of span for wires starting on structure #5 with wind from Right

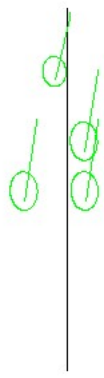
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	694.9	12.53	-7.2	-13.4	5.4	4.2	1.1
3	1	694.9	16.85	-4.9	-9.5	7.0	4.9	1.4
3	2	694.9	16.85	-4.8	-9.5	7.0	4.9	1.4
3	3	694.9	16.85	-4.9	-9.5	7.0	4.9	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.61	16.25	16.08
3:1	7.61		8.59	2.05
3:2	16.25	8.59		6.07
3:3	16.08	2.05	6.07	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at one quarter of span for wires starting on structure #5 with wind from Left

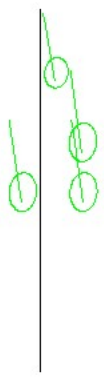
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	694.9	12.53	18.0	13.4	5.4	4.2	1.1
3	1	694.9	16.85	13.3	9.5	7.0	4.9	1.4
3	2	694.9	16.85	13.4	9.5	7.0	4.9	1.4
3	3	694.9	16.85	13.3	9.5	7.0	4.9	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.58	16.23	16.06
3:1	7.58		8.26	2.06
3:2	16.23	8.26		6.07
3:3	16.06	2.06	6.07	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #5 with wind from Right

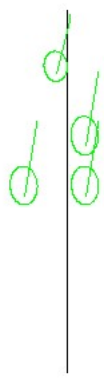
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	694.9	12.53	-7.2	-13.4	5.4	4.2	1.1
3	1	694.9	16.85	-4.9	-9.5	7.0	4.9	1.4
3	2	694.9	16.85	-4.8	-9.5	7.0	4.9	1.4
3	3	694.9	16.85	-4.9	-9.5	7.0	4.9	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.55	16.30	16.03
3:1	7.55		8.70	2.05
3:2	16.30	8.70		6.17
3:3	16.03	2.05	6.17	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #5 with wind from Left

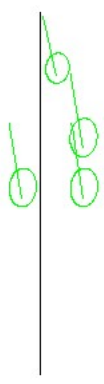
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	694.9	12.53	18.0	13.4	5.4	4.2	1.1
3	1	694.9	16.85	13.3	9.5	7.0	4.9	1.4
3	2	694.9	16.85	13.4	9.5	7.0	4.9	1.4
3	3	694.9	16.85	13.3	9.5	7.0	4.9	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.55	16.31	16.04
3:1	7.55		8.37	2.06
3:2	16.31	8.37		6.17
3:3	16.04	2.06	6.17	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Galloping ellipse report
Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Right starting on structure 6 because of span limit
Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Left starting on structure 6 because of span limit

Double loop galloping with wire spacing at one quarter of span for wires starting on structure #6 with wind from Right

Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	733.9	13.98	-0.5	-13.4	5.9	4.4	1.2
3	1	733.9	18.80	0.1	-9.5	7.7	5.2	1.5

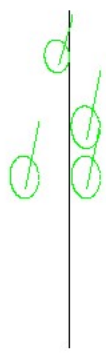
3	2	733.9	18.80	0.3	-9.5	7.7	5.2	1.5
3	3	733.9	18.80	0.2	-9.5	7.7	5.2	1.5

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.24	16.08	15.71
3:1	7.24		8.38	1.37
3:2	16.08	8.38		5.95
3:3	15.71	1.37	5.95	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at one quarter of span for wires starting on structure #6 with wind from Left

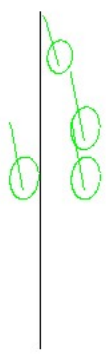
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	733.9	13.98	25.5	13.4	5.9	4.4	1.2
3	1	733.9	18.80	19.0	9.5	7.7	5.2	1.5
3	2	733.9	18.80	19.1	9.5	7.7	5.2	1.5
3	3	733.9	18.80	19.0	9.5	7.7	5.2	1.5

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.30	16.09	15.77
3:1	7.30		7.99	1.37
3:2	16.09	7.99		5.95
3:3	15.77	1.37	5.95	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #6 with wind from Right

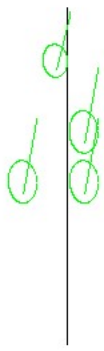
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	733.9	13.98	-0.5	-13.4	5.9	4.4	1.2
3	1	733.9	18.80	0.1	-9.5	7.7	5.2	1.5
3	2	733.9	18.80	0.3	-9.5	7.7	5.2	1.5
3	3	733.9	18.80	0.2	-9.5	7.7	5.2	1.5

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.22	16.09	15.70
3:1	7.22		8.38	1.37
3:2	16.09	8.38		5.95
3:3	15.70	1.37	5.95	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #6 with wind from Left

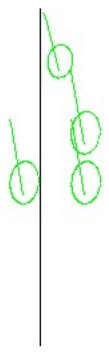
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	733.9	13.98	25.5	13.4	5.9	4.4	1.2
3	1	733.9	18.80	19.0	9.5	7.7	5.2	1.5
3	2	733.9	18.80	19.1	9.5	7.7	5.2	1.5
3	3	733.9	18.80	19.0	9.5	7.7	5.2	1.5

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.30	16.12	15.78
3:1	7.30		7.99	1.37
3:2	16.12	7.99		5.95
3:3	15.78	1.37	5.95	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Galloping ellipse report
  Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Right starting on structure 7 because of span limit
  Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Left starting on structure 7 because of span limit

  Double loop galloping with wire spacing at one quarter of span for wires starting on structure #7 with wind from Right

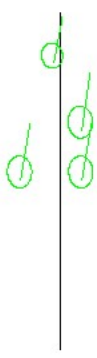
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	622.0	10.04	-1.9	-13.4	4.6	3.8	0.9
3	1	622.1	13.50	-0.9	-9.5	5.8	4.4	1.2
3	2	622.1	13.50	-1.1	-9.5	5.8	4.4	1.2
3	3	622.1	13.50	-1.0	-9.5	5.8	4.4	1.2

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.96	16.76	16.47
3:1	7.96		9.39	3.23
3:2	16.76	9.39		6.68
3:3	16.47	3.23	6.68	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



  Double loop galloping with wire spacing at one quarter of span for wires starting on structure #7 with wind from Left

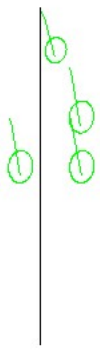
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	622.0	10.04	23.8	13.4	4.6	3.8	0.9
3	1	622.1	13.50	17.7	9.5	5.8	4.4	1.2
3	2	622.1	13.50	17.6	9.5	5.8	4.4	1.2
3	3	622.1	13.50	17.6	9.5	5.8	4.4	1.2

  Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)
  1:1 3:1 3:2 3:3

1:1		7.96	16.86	16.50
3:1	7.96		9.16	3.24
3:2	16.86	9.16		6.68
3:3	16.50	3.24	6.68	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #7 with wind from Right

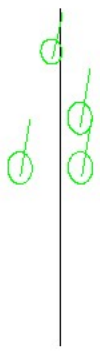
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	622.0	10.04	-1.9	-13.4	4.6	3.8	0.9
3	1	622.1	13.50	-0.9	-9.5	5.8	4.4	1.2
3	2	622.1	13.50	-1.1	-9.5	5.8	4.4	1.2
3	3	622.1	13.50	-1.0	-9.5	5.8	4.4	1.2

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.98	16.70	16.49
3:1	7.98		9.28	3.23
3:2	16.70	9.28		6.58
3:3	16.49	3.23	6.58	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #7 with wind from Left

Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	622.0	10.04	23.8	13.4	4.6	3.8	0.9
3	1	622.1	13.50	17.7	9.5	5.8	4.4	1.2

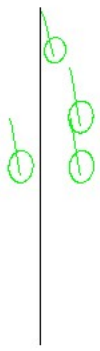
3	2	622.1	13.50	17.6	9.5	5.8	4.4	1.2
3	3	622.1	13.50	17.6	9.5	5.8	4.4	1.2

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.98	16.80	16.52
3:1	7.98		9.05	3.24
3:2	16.80	9.05		6.58
3:3	16.52	3.24	6.58	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Galloping ellipse report
Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Right starting on structure 8 because of span limit
Skipped 2 checks of 'Single loop galloping with wire spacing at mid span' with wind from Left starting on structure 8 because of span limit

Double loop galloping with wire spacing at one quarter of span for wires starting on structure #8 with wind from Right

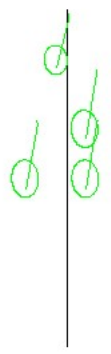
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	683.0	12.11	-3.4	-13.4	5.3	4.1	1.1
3	1	683.0	16.28	-5.7	-9.5	6.8	4.8	1.4
3	2	683.0	16.28	3.4	-9.5	6.8	4.8	1.4
3	3	683.0	16.28	-4.7	-9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.59	16.30	16.09
3:1	7.59		8.61	2.25
3:2	16.30	8.61		6.06
3:3	16.09	2.25	6.06	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at one quarter of span for wires starting on structure #8 with wind from Left

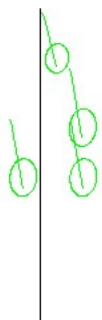
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	683.0	12.11	33.3	13.4	5.3	4.1	1.1
3	1	683.0	16.28	18.4	9.5	6.8	4.8	1.4
3	2	683.0	16.28	25.3	9.5	6.8	4.8	1.4
3	3	683.0	16.28	15.2	9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.64	16.39	16.16
3:1	7.64		8.30	2.26
3:2	16.39	8.30		6.06
3:3	16.16	2.26	6.06	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #8 with wind from Right

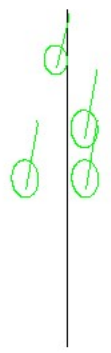
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	683.0	12.11	-3.4	-13.4	5.3	4.1	1.1
3	1	683.0	16.28	-5.7	-9.5	6.8	4.8	1.4
3	2	683.0	16.28	3.4	-9.5	6.8	4.8	1.4
3	3	683.0	16.28	-4.7	-9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.59	16.29	16.09
3:1	7.59		8.57	2.25
3:2	16.29	8.57		6.03
3:3	16.09	2.25	6.03	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Double loop galloping with wire spacing at three quarters of span for wires starting on structure #8 with wind from Left

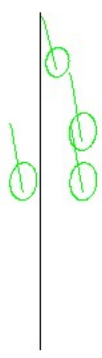
Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	683.0	12.11	33.3	13.4	5.3	4.1	1.1
3	1	683.0	16.28	18.4	9.5	6.8	4.8	1.4
3	2	683.0	16.28	25.3	9.5	6.8	4.8	1.4
3	3	683.0	16.28	15.2	9.5	6.8	4.8	1.4

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		7.64	16.43	16.18
3:1	7.64		8.27	2.27
3:2	16.43	8.27		6.02
3:3	16.18	2.27	6.02	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	



Galloping ellipse report

Single loop galloping with wire spacing at mid span for wires starting on structure #9 with wind from Right

Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	517.3	6.95	0.0	-13.4	9.7	3.9	1.7
3	1	517.1	9.33	0.0	-9.5	12.7	5.1	2.3
3	2	518.2	9.37	0.0	-9.5	12.7	5.1	2.3
3	3	517.4	9.34	0.0	-9.5	12.7	5.1	2.3

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		1.69	12.18	17.82
3:1	1.69		2.78	3.92
3:2	12.18	2.78		0.53
3:3	17.82	3.92	0.53	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	

Single loop galloping with wire spacing at mid span for wires starting on structure #9 with wind from Left

Structure Set #	Phase #	Ahead Span Len (ft)	Mid Span Sag (ft)	Insul Swing Angle (deg)	Span Swing Angle (deg)	Major Axis Len. (ft)	Minor Axis Len. (ft)	Dist. 'B' Len. (ft)
1	1	517.3	6.95	0.0	13.4	9.7	3.9	1.7
3	1	517.1	9.33	0.0	9.5	12.7	5.1	2.3
3	2	518.2	9.37	0.0	9.5	12.7	5.1	2.3
3	3	517.4	9.34	0.0	9.5	12.7	5.1	2.3

Minimum clearances between ellipses (Set:Phase)(0 clearance means ellipses intersect)

	1:1	3:1	3:2	3:3
1:1		2.51	11.95	18.07
3:1	2.51		1.56	3.96
3:2	11.95	1.56		1.31
3:3	18.07	3.96	1.31	

% area overlap between ellipses (Set:Phase)(0% = no violation)

	1:1	3:1	3:2	3:3
1:1		0.00	0.00	0.00
3:1	0.00		0.00	0.00
3:2	0.00	0.00		0.00
3:3	0.00	0.00	0.00	

Skipped 2 checks of 'Double loop galloping with wire spacing at one quarter of span' with wind from Right starting on structure 9 because of span limit
Skipped 2 checks of 'Double loop galloping with wire spacing at one quarter of span' with wind from Left starting on structure 9 because of span limit
Skipped 2 checks of 'Double loop galloping with wire spacing at three quarters of span' with wind from Right starting on structure 9 because of span limit
Skipped 2 checks of 'Double loop galloping with wire spacing at three quarters of span' with wind from Left starting on structure 9 because of span limit

Galloping ellipse report

No sections starting on structure 10 to check for galloping ??
No sections starting on structure 10 to check for galloping ??
No sections starting on structure 10 to check for galloping ??
No sections starting on structure 10 to check for galloping ??
No sections starting on structure 10 to check for galloping ??
No sections starting on structure 10 to check for galloping ??

Galloping Ellipses Summary

Structure #	Set #	Phase #	Ahead Span Length (ft)	Set #	Phase #	Galloping Ellipse Method	Distance (ft)	Overlap %	Wind From	Mid-Span Sag (ft)	Minimum Clearance Swing Angle (deg)	Insulator Swing Angle (deg)	Span Length (ft)	Major Axis Length (ft)	Minor Axis Length (ft)	B Distance (ft)
1	2	1	298.8	10	1	Single mid span	6.62	0.0	Left	2.80	0.0	13.4	4.5	1.8	0.7	
	3	1	297.4	2	1	Single mid span	8.42	0.0	Right	3.15	0.0	-15.7	4.9	2.0	0.8	
	10	1	299.2	10	2	Single mid span	5.06	0.0	Right	3.57	0.0	-9.5	5.5	2.2	0.9	
	10	2	298.0	10	1	Single mid span	5.06	0.0	Right	3.53	0.0	-9.5	5.4	2.2	0.9	
	10	3	297.5	10	2	Single mid span	5.08	0.0	Right	3.51	0.0	-9.5	5.4	2.2	0.9	
2	12	1	687.9	13	1	Double 3/4 span	7.67	0.0	Left	12.29	1.5	13.4	5.3	4.2	1.1	
	13	1	688.1	13	2	Double 1/4 span	4.72	0.0	Left	16.53	-2.1	9.5	6.9	4.8	1.4	
	13	2	687.5	13	3	Double 1/4 span	2.72	0.0	Right	16.50	-18.0	-9.5	6.8	4.8	1.4	
	13	3	687.9	13	2	Double 1/4 span	2.72	0.0	Right	16.51	-20.7	-9.5	6.8	4.8	1.4	
3	1	1	683.0	3	1	Double 3/4 span	7.66	0.0	Left	12.11	11.5	13.4	5.3	4.1	1.1	
	3	1	683.0	3	3	Double 3/4 span	2.25	0.0	Right	16.28	-11.2	-9.5	6.8	4.8	1.4	
	3	2	683.0	3	3	Double 1/4 span	6.07	0.0	Left	16.28	8.1	9.5	6.8	4.8	1.4	
	3	3	683.0	3	1	Double 3/4 span	2.25	0.0	Right	16.28	-11.2	-9.5	6.8	4.8	1.4	
4	1	1	669.7	3	1	Double 1/4 span	7.73	0.0	Left	11.64	7.0	13.4	5.1	4.1	1.0	
	3	1	669.7	3	3	Double 3/4 span	2.47	0.0	Right	15.65	-14.3	-9.5	6.5	4.7	1.3	
	3	2	669.7	3	3	Double 1/4 span	6.20	0.0	Right	15.65	-14.4	-9.5	6.5	4.7	1.3	
	3	3	669.7	3	1	Double 3/4 span	2.47	0.0	Right	15.65	-14.3	-9.5	6.5	4.7	1.3	
5	1	1	694.9	3	1	Double 3/4 span	7.55	0.0	Right	12.53	-7.2	-13.4	5.4	4.2	1.1	
	3	1	694.9	3	3	Double 1/4 span	2.05	0.0	Right	16.85	-4.9	-9.5	7.0	4.9	1.4	
	3	2	694.9	3	3	Double 1/4 span	6.07	0.0	Right	16.85	-4.8	-9.5	7.0	4.9	1.4	
	3	3	694.9	3	1	Double 1/4 span	2.05	0.0	Right	16.85	-4.9	-9.5	7.0	4.9	1.4	
6	1	1	733.9	3	1	Double 3/4 span	7.22	0.0	Right	13.98	-0.5	-13.4	5.9	4.4	1.2	
	3	1	733.9	3	3	Double 3/4 span	1.37	0.0	Right	18.80	0.1	-9.5	7.7	5.2	1.5	
	3	2	733.9	3	3	Double 3/4 span	5.95	0.0	Right	18.80	0.3	-9.5	7.7	5.2	1.5	
	3	3	733.9	3	1	Double 3/4 span	1.37	0.0	Right	18.80	0.2	-9.5	7.7	5.2	1.5	
7	1	1	622.0	3	1	Double 1/4 span	7.96	0.0	Right	10.04	-1.9	-13.4	4.6	3.8	0.9	
	3	1	622.1	3	3	Double 3/4 span	3.23	0.0	Right	13.50	-0.9	-9.5	5.8	4.4	1.2	
	3	2	622.1	3	3	Double 3/4 span	6.58	0.0	Left	13.50	17.6	9.5	5.8	4.4	1.2	
	3	3	622.1	3	1	Double 3/4 span	3.23	0.0	Right	13.50	-1.0	-9.5	5.8	4.4	1.2	
8	1	1	683.0	3	1	Double 3/4 span	7.59	0.0	Right	12.11	-3.4	-13.4	5.3	4.1	1.1	
	3	1	683.0	3	3	Double 1/4 span	2.25	0.0	Right	16.28	-5.7	-9.5	6.8	4.8	1.4	
	3	2	683.0	3	3	Double 3/4 span	6.02	0.0	Left	16.28	25.3	9.5	6.8	4.8	1.4	
	3	3	683.0	3	1	Double 1/4 span	2.25	0.0	Right	16.28	-4.7	-9.5	6.8	4.8	1.4	
9	1	1	517.3	3	1	Single mid span	1.69	0.0	Right	6.95	0.0	-13.4	9.7	3.9	1.7	
	3	1	517.1	3	2	Single mid span	1.56	0.0	Left	9.33	0.0	9.5	12.7	5.1	2.3	
	3	2	518.2	3	3	Single mid span	0.53	0.0	Right	9.37	0.0	-9.5	12.7	5.1	2.3	
	3	3	517.4	3	2	Single mid span	0.53	0.0	Right	9.34	0.0	-9.5	12.7	5.1	2.3	

C-M ANALYSIS REPORT 12

PLS-CADD Version 16.51x64 11:17:58 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #3 from structure #1 to structure #2, start set #10 'Conductor - Ahead', end set #13 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 235.131
Sagging data: Catenary (ft) 4388.39, Horiz. Tension (lbs) 4800.9 Condition I Temperature (deg F) 60
Clearance checked for weather case NESC HV-4#,1/2",0deg, condition L, wind normal to span.

Section #3 from structure #1 to structure #2, start set #10 'Conductor - Ahead', end set #13 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 235.131
Sagging data: Catenary (ft) 4388.39, Horiz. Tension (lbs) 4800.9 Condition I Temperature (deg F) 60
Clearance checked for weather case COLD-0#,0",0deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
1	10	1	107.17	-7.68	107.45	1	10	2	107.56	0.04	107.45	Right	Right	9.98	OK
1	10	1	100.18	-6.74	100.40	1	10	2	100.53	0.04	100.40	Left	Left	8.97	OK
1	10	1	74.51	-9.39	75.10	1	10	3	74.99	8.90	75.10	Right	Right	21.80	OK
1	10	1	75.03	-8.19	75.48	1	10	3	75.44	8.88	75.48	Left	Left	20.83	OK
1	10	2	80.93	-0.56	80.93	1	10	1	80.56	-8.47	80.93	Right	Right	10.17	OK
1	10	2	81.64	0.62	81.65	1	10	1	81.33	-8.43	81.65	Left	Left	11.11	OK
1	10	2	60.22	-0.48	60.22	1	10	3	60.52	9.69	60.22	Right	Right	11.51	OK
1	10	2	63.86	0.54	63.86	1	10	3	64.09	9.50	63.86	Left	Left	10.63	OK
1	10	3	65.54	8.90	66.14	1	10	1	65.08	-9.33	66.14	Right	Right	21.75	OK
1	10	3	63.59	10.04	64.38	1	10	1	63.24	-9.43	64.38	Left	Left	22.63	OK
1	10	3	48.38	9.94	49.39	1	10	2	48.09	0.02	49.39	Right	Right	11.34	OK
1	10	3	41.57	11.11	43.03	1	10	2	41.33	0.01	43.03	Left	Left	12.06	OK

C-M ANALYSIS REPORT 13

PLS-CADD Version 16.51x64 10:51:29 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #3 from structure #1 to structure #2, start set #10 'Conductor - Ahead', end set #13 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 235.131
Sagging data: Catenary (ft) 4388.39, Horiz. Tension (lbs) 4800.9 Condition I Temperature (deg F) 60
Clearance checked for weather case MOT, condition L, wind normal to span.

Section #3 from structure #1 to structure #2, start set #10 'Conductor - Ahead', end set #13 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 235.131
Sagging data: Catenary (ft) 4388.39, Horiz. Tension (lbs) 4800.9 Condition I Temperature (deg F) 60
Clearance checked for weather case EVERYDAY-0#,0",60deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Set #	Phase #	Minimum Clearance Point Station (ft)	Offset (ft)	Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Set #	Phase #	Minimum Clearance Point Station (ft)	Offset (ft)	Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
1	10	1	117.20	-6.46	117.38	1	10	2	117.53	0.04	117.38	Right	Right	8.41	OK
1	10	1	117.20	-6.46	117.38	1	10	2	117.53	0.04	117.38	Left	Left	8.41	OK
1	10	1	83.38	-8.32	83.80	1	10	3	83.76	8.42	83.80	Right	Right	20.47	OK
1	10	1	83.38	-8.32	83.80	1	10	3	83.76	8.42	83.80	Left	Left	20.47	OK
1	10	2	59.03	0.02	59.03	1	10	1	58.87	-9.67	59.03	Right	Right	11.39	OK
1	10	2	59.03	0.02	59.03	1	10	1	58.87	-9.67	59.03	Left	Left	11.39	OK
1	10	2	76.71	0.03	76.71	1	10	3	76.92	8.79	76.71	Right	Right	10.37	OK
1	10	2	76.71	0.03	76.71	1	10	3	76.92	8.79	76.71	Left	Left	10.37	OK
1	10	3	55.85	9.95	56.73	1	10	1	55.62	-9.85	56.73	Right	Right	22.80	OK
1	10	3	55.85	9.95	56.73	1	10	1	55.62	-9.85	56.73	Left	Left	22.80	OK
1	10	3	33.83	11.16	35.62	1	10	2	33.63	0.01	35.62	Right	Right	12.07	OK
1	10	3	33.83	11.16	35.62	1	10	2	33.63	0.01	35.62	Left	Left	12.07	OK

C-M ANALYSIS REPORT 14

PLS-CADD Version 16.51x64 11:17:58 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #3 from structure #1 to structure #2, start set #10 'Conductor - Ahead', end set #13 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 235.131
Sagging data: Catenary (ft) 4388.39, Horiz. Tension (lbs) 4800.9 Condition I Temperature (deg F) 60
Clearance checked for weather case NESC HV-4#,1/2",0deg, condition L, wind normal to span.

Section #3 from structure #1 to structure #2, start set #10 'Conductor - Ahead', end set #13 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 235.131
Sagging data: Catenary (ft) 4388.39, Horiz. Tension (lbs) 4800.9 Condition I Temperature (deg F) 60
Clearance checked for weather case COLD-0#,0",0deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
1	10	1	107.17	-7.68	107.45	1	10	2	107.56	0.04	107.45	Right	Right	9.98	OK
1	10	1	100.18	-6.74	100.40	1	10	2	100.53	0.04	100.40	Left	Left	8.97	OK
1	10	1	74.51	-9.39	75.10	1	10	3	74.99	8.90	75.10	Right	Right	21.80	OK
1	10	1	75.03	-8.19	75.48	1	10	3	75.44	8.88	75.48	Left	Left	20.83	OK
1	10	2	80.93	-0.56	80.93	1	10	1	80.56	-8.47	80.93	Right	Right	10.17	OK
1	10	2	81.64	0.62	81.65	1	10	1	81.33	-8.43	81.65	Left	Left	11.11	OK
1	10	2	60.22	-0.48	60.22	1	10	3	60.52	9.69	60.22	Right	Right	11.51	OK
1	10	2	63.86	0.54	63.86	1	10	3	64.09	9.50	63.86	Left	Left	10.63	OK
1	10	3	65.54	8.90	66.14	1	10	1	65.08	-9.33	66.14	Right	Right	21.75	OK
1	10	3	63.59	10.04	64.38	1	10	1	63.24	-9.43	64.38	Left	Left	22.63	OK
1	10	3	48.38	9.94	49.39	1	10	2	48.09	0.02	49.39	Right	Right	11.34	OK
1	10	3	41.57	11.11	43.03	1	10	2	41.33	0.01	43.03	Left	Left	12.06	OK

C-M ANALYSIS REPORT 15

PLS-CADD Version 16.51x64 10:52:50 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case MOT, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case EVERYDAY-0#,0",60deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
3	60	1	1014.98	5.32	196.64	3	60	2	1014.68	-5.49	196.64	Right	Right	12.58	OK
3	60	1	1014.98	5.32	196.64	3	60	2	1014.68	-5.49	196.64	Left	Left	12.58	OK
3	60	1	1016.98	5.32	198.64	3	60	3	1016.69	5.49	198.64	Right	Right	6.42	OK
3	60	1	1016.98	5.32	198.64	3	60	3	1016.69	5.49	198.64	Left	Left	6.42	OK
3	60	2	818.32	-5.45	5.45	3	60	1	819.04	5.32	5.45	Right	Right	14.03	OK
3	60	2	818.32	-5.45	5.45	3	60	1	819.04	5.32	5.45	Left	Left	14.03	OK
3	60	2	818.48	-5.45	5.45	3	60	3	818.49	5.45	5.45	Right	Right	10.90	OK
3	60	2	818.48	-5.45	5.45	3	60	3	818.49	5.45	5.45	Left	Left	10.90	OK
3	60	3	818.49	5.45	5.45	3	60	1	819.18	5.32	5.45	Right	Right	8.97	OK
3	60	3	818.49	5.45	5.45	3	60	1	819.18	5.32	5.45	Left	Left	8.97	OK
3	60	3	818.49	5.45	5.45	3	60	2	818.48	-5.45	5.45	Right	Right	10.90	OK
3	60	3	818.49	5.45	5.45	3	60	2	818.48	-5.45	5.45	Left	Left	10.90	OK

C-M ANALYSIS REPORT 16

PLS-CADD Version 16.51x64 11:19:37 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case NESC HV-4#,1/2",0deg, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case COLD-0#,0",0deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
3	60	1	1029.01	1.77	210.61	3	60	2	1028.69	-5.49	210.61	Right	Right	11.30	OK
3	60	1	818.82	5.33	5.35	3	60	2	818.32	-5.45	5.35	Left	Left	14.03	OK
3	60	1	888.66	3.71	70.34	3	60	3	888.13	5.46	70.34	Right	Right	8.67	OK
3	60	1	896.68	7.09	78.59	3	60	3	896.16	5.46	78.59	Left	Left	8.62	OK
3	60	2	818.32	-5.45	5.45	3	60	1	818.89	5.32	5.45	Right	Right	14.03	OK
3	60	2	818.32	-5.45	5.45	3	60	1	818.89	5.32	5.45	Left	Left	14.03	OK
3	60	2	818.32	-5.45	5.45	3	60	3	818.49	5.45	5.45	Right	Right	10.90	OK
3	60	2	1111.15	-1.61	292.74	3	60	3	1111.22	5.51	292.74	Left	Left	7.91	OK
3	60	3	818.49	5.45	5.45	3	60	1	819.04	5.32	5.45	Right	Right	8.98	OK
3	60	3	818.49	5.45	5.45	3	60	1	819.04	5.32	5.45	Left	Left	8.98	OK
3	60	3	1111.00	1.61	292.59	3	60	2	1111.08	-5.51	292.59	Right	Right	7.91	OK
3	60	3	818.49	5.45	5.45	3	60	2	818.48	-5.45	5.45	Left	Left	10.90	OK

C-M ANALYSIS REPORT 17

PLS-CADD Version 16.51x64 11:05:17 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case MOT, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case EVERYDAY-0#,0",60deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
3	60	1	1014.98	5.32	196.64	3	60	2	1014.68	-5.49	196.64	Right	Right	12.58	OK
3	60	1	1014.98	5.32	196.64	3	60	2	1014.68	-5.49	196.64	Left	Left	12.58	OK
3	60	1	1016.98	5.32	198.64	3	60	3	1016.69	5.49	198.64	Right	Right	6.42	OK
3	60	1	1016.98	5.32	198.64	3	60	3	1016.69	5.49	198.64	Left	Left	6.42	OK
3	60	2	818.32	-5.45	5.45	3	60	1	819.04	5.32	5.45	Right	Right	14.03	OK
3	60	2	818.32	-5.45	5.45	3	60	1	819.04	5.32	5.45	Left	Left	14.03	OK
3	60	2	818.48	-5.45	5.45	3	60	3	818.49	5.45	5.45	Right	Right	10.90	OK
3	60	2	818.48	-5.45	5.45	3	60	3	818.49	5.45	5.45	Left	Left	10.90	OK
3	60	3	818.49	5.45	5.45	3	60	1	819.18	5.32	5.45	Right	Right	8.97	OK
3	60	3	818.49	5.45	5.45	3	60	1	819.18	5.32	5.45	Left	Left	8.97	OK
3	60	3	818.49	5.45	5.45	3	60	2	818.48	-5.45	5.45	Right	Right	10.90	OK
3	60	3	818.49	5.45	5.45	3	60	2	818.48	-5.45	5.45	Left	Left	10.90	OK

C-M ANALYSIS
REPORT 18

PLS-CADD Version 16.51x64 11:19:55 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case NESC HV-4#,1/2",0deg, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case COLD-0#,0",0deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
4	60	1	1808.47	1.90	388.55	4	60	2	1808.80	-5.49	388.55	Right	Right	11.43	OK
4	60	1	2012.12	5.34	592.22	4	60	2	2012.59	-5.45	592.22	Left	Left	14.02	OK
4	60	1	1946.64	3.82	526.73	4	60	3	1947.17	5.46	526.73	Right	Right	8.70	OK
4	60	1	1938.63	6.98	518.75	4	60	3	1939.15	5.46	518.75	Left	Left	8.65	OK
4	60	2	2012.59	-5.45	592.69	4	60	1	2012.04	5.32	592.69	Right	Right	14.02	OK
4	60	2	2012.59	-5.45	592.69	4	60	1	2012.04	5.32	592.69	Left	Left	14.02	OK
4	60	2	2012.59	-5.45	592.69	4	60	3	2012.59	5.45	592.69	Right	Right	10.90	OK
4	60	2	1724.44	-1.72	304.52	4	60	3	1724.36	5.51	304.52	Left	Left	7.97	OK
4	60	3	2012.69	5.45	592.82	4	60	1	2012.17	5.32	592.82	Right	Right	8.98	OK
4	60	3	2012.69	5.45	592.82	4	60	1	2012.17	5.32	592.82	Left	Left	8.98	OK
4	60	3	1724.31	1.72	304.39	4	60	2	1724.23	-5.51	304.39	Right	Right	7.97	OK
4	60	3	2012.69	5.45	592.82	4	60	2	2012.59	-5.45	592.82	Left	Left	10.90	OK

C-M ANALYSIS REPORT 19

PLS-CADD Version 16.51x64 11:06:18 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case MOT, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case EVERYDAY-0#,0",60deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
4	60	1	1824.49	5.32	404.60	4	60	2	1824.79	-5.49	404.60	Right	Right	12.65	OK
4	60	1	1824.49	5.32	404.60	4	60	2	1824.79	-5.49	404.60	Left	Left	12.65	OK
4	60	1	1820.48	5.32	400.59	4	60	3	1820.78	5.49	400.59	Right	Right	6.57	OK
4	60	1	1820.48	5.32	400.59	4	60	3	1820.78	5.49	400.59	Left	Left	6.57	OK
4	60	2	2012.59	-5.45	592.69	4	60	1	2011.90	5.32	592.69	Right	Right	14.01	OK
4	60	2	2012.59	-5.45	592.69	4	60	1	2011.90	5.32	592.69	Left	Left	14.01	OK
4	60	2	2012.59	-5.45	592.69	4	60	3	2012.59	5.45	592.69	Right	Right	10.90	OK
4	60	2	2012.59	-5.45	592.69	4	60	3	2012.59	5.45	592.69	Left	Left	10.90	OK
4	60	3	2012.69	5.45	592.82	4	60	1	2012.03	5.32	592.82	Right	Right	8.97	OK
4	60	3	2012.69	5.45	592.82	4	60	1	2012.03	5.32	592.82	Left	Left	8.97	OK
4	60	3	2012.59	5.45	592.70	4	60	2	2012.59	-5.45	592.70	Right	Right	10.90	OK
4	60	3	2012.59	5.45	592.70	4	60	2	2012.59	-5.45	592.70	Left	Left	10.90	OK

C-M ANALYSIS REPORT 20

PLS-CADD Version 16.51x64 11:20:16 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case NESC HV-4#,1/2",0deg, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case COLD-0#,0",0deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
5	60	1	2204.79	2.20	192.15	5	60	2	2204.51	-5.51	192.15	Right	Right	11.73	OK
5	60	1	2013.01	5.33	5.34	5	60	2	2012.59	-5.45	5.34	Left	Left	14.03	OK
5	60	1	2072.72	4.00	60.20	5	60	3	2072.24	5.47	60.20	Right	Right	8.76	OK
5	60	1	2078.72	6.80	66.42	5	60	3	2078.26	5.47	66.42	Left	Left	8.72	OK
5	60	2	2012.59	-5.45	5.45	5	60	1	2013.08	5.32	5.45	Right	Right	14.03	OK
5	60	2	2012.59	-5.45	5.45	5	60	1	2013.08	5.32	5.45	Left	Left	14.03	OK
5	60	2	2012.59	-5.45	5.45	5	60	3	2012.69	5.45	5.45	Right	Right	10.90	OK
5	60	2	2290.79	-1.95	278.14	5	60	3	2290.84	5.53	278.14	Left	Left	8.13	OK
5	60	3	2012.69	5.45	5.45	5	60	1	2013.15	5.32	5.45	Right	Right	8.99	OK
5	60	3	2012.69	5.45	5.45	5	60	1	2013.15	5.32	5.45	Left	Left	8.99	OK
5	60	3	2290.73	1.95	278.08	5	60	2	2290.77	-5.53	278.08	Right	Right	8.12	OK
5	60	3	2012.69	5.45	5.45	5	60	2	2012.68	-5.45	5.45	Left	Left	10.90	OK

C-M ANALYSIS REPORT 21

PLS-CADD Version 16.51x64 11:06:39 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case MOT, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case EVERYDAY-0#,0",60deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Minimum Clearance (ft)	OK Notes
5	60	1	2186.78	5.37	174.21	5	60	2	2186.50	-5.50	174.21	Right	Right	12.85	OK
5	60	1	2186.78	5.37	174.21	5	60	2	2186.50	-5.50	174.21	Left	Left	12.85	OK
5	60	1	2194.79	5.38	182.21	5	60	3	2194.52	5.50	182.21	Right	Right	6.84	OK
5	60	1	2194.79	5.38	182.21	5	60	3	2194.52	5.50	182.21	Left	Left	6.84	OK
5	60	2	2012.59	-5.45	5.45	5	60	1	2013.22	5.32	5.45	Right	Right	14.03	OK
5	60	2	2012.59	-5.45	5.45	5	60	1	2013.22	5.32	5.45	Left	Left	14.03	OK
5	60	2	2012.68	-5.45	5.45	5	60	3	2012.69	5.45	5.45	Right	Right	10.90	OK
5	60	2	2012.68	-5.45	5.45	5	60	3	2012.69	5.45	5.45	Left	Left	10.90	OK
5	60	3	2012.69	5.45	5.45	5	60	1	2013.29	5.32	5.45	Right	Right	8.98	OK
5	60	3	2012.69	5.45	5.45	5	60	1	2013.29	5.32	5.45	Left	Left	8.98	OK
5	60	3	2012.69	5.45	5.45	5	60	2	2012.68	-5.45	5.45	Right	Right	10.90	OK
5	60	3	2012.69	5.45	5.45	5	60	2	2012.68	-5.45	5.45	Left	Left	10.90	OK

C-M ANALYSIS REPORT 22

PLS-CADD Version 16.51x64 11:20:32 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case NESC HV-4#,1/2",0deg, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case COLD-0#,0",0deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Minimum Clearance (ft)	OK Notes
6	60	1	2897.17	1.40	308.21	6	60	2	2897.21	-5.62	308.21	Right	Right	15.11	OK
6	60	1	3111.26	7.61	522.34	6	60	2	3111.89	-5.62	522.34	Left	Left	20.08	OK
6	60	1	2897.17	1.40	308.21	6	60	3	2897.21	5.62	308.21	Right	Right	14.03	OK
6	60	1	2897.17	9.59	308.35	6	60	3	2897.21	5.62	308.35	Left	Left	13.96	OK
6	60	2	3205.14	-5.62	616.19	6	60	1	3204.15	5.50	616.19	Right	Right	20.28	OK
6	60	2	3205.14	-5.62	616.19	6	60	1	3204.15	5.50	616.19	Left	Left	20.28	OK
6	60	2	3205.14	-5.62	616.19	6	60	3	3205.14	5.62	616.19	Right	Right	11.24	OK
6	60	2	2897.18	-1.52	308.22	6	60	3	2897.17	5.62	308.22	Left	Left	8.01	OK
6	60	3	3205.34	5.62	616.35	6	60	1	3204.31	5.50	616.35	Right	Right	16.97	OK
6	60	3	3205.34	5.62	616.35	6	60	1	3204.31	5.50	616.35	Left	Left	16.97	OK
6	60	3	2897.02	1.52	308.06	6	60	2	2897.01	-5.62	308.06	Right	Right	8.01	OK
6	60	3	2589.05	5.62	5.62	6	60	2	2589.05	-5.62	5.62	Left	Left	11.24	OK

C-M ANALYSIS REPORT 23

PLS-CADD Version 16.51x64 11:07:18 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case MOT, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case EVERYDAY-0#,0",60deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Minimum Clearance (ft)	OK Notes
6	60	1	2897.17	5.50	308.25	6	60	2	2897.21	-5.62	308.25	Right	Right	15.50	OK
6	60	1	2897.17	5.50	308.25	6	60	2	2897.21	-5.62	308.25	Left	Left	15.50	OK
6	60	1	2897.17	5.50	308.25	6	60	3	2897.21	5.62	308.25	Right	Right	10.81	OK
6	60	1	2897.17	5.50	308.25	6	60	3	2897.21	5.62	308.25	Left	Left	10.81	OK
6	60	2	3205.14	-5.62	616.19	6	60	1	3203.87	5.50	616.19	Right	Right	20.26	OK
6	60	2	3205.14	-5.62	616.19	6	60	1	3203.87	5.50	616.19	Left	Left	20.26	OK
6	60	2	3204.84	-5.62	615.89	6	60	3	3204.84	5.62	615.89	Right	Right	11.24	OK
6	60	2	3204.84	-5.62	615.89	6	60	3	3204.84	5.62	615.89	Left	Left	11.24	OK
6	60	3	3205.34	5.62	616.35	6	60	1	3204.03	5.50	616.35	Right	Right	16.95	OK
6	60	3	3205.34	5.62	616.35	6	60	1	3204.03	5.50	616.35	Left	Left	16.95	OK
6	60	3	2589.33	5.62	5.63	6	60	2	2589.33	-5.62	5.63	Right	Right	11.24	OK
6	60	3	2589.33	5.62	5.63	6	60	2	2589.33	-5.62	5.63	Left	Left	11.24	OK

C-M ANALYSIS REPORT 24

PLS-CADD Version 16.51x64 11:20:55 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case NESC HV-4#,1/2",0deg, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case COLD-0#,0",0deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Minimum Clearance (ft)	OK Notes
7	60	1	3592.34	2.07	387.12	7	60	2	3592.61	-5.51	387.12	Right	Right	11.59	OK
7	60	1	3790.22	5.34	585.03	7	60	2	3790.62	-5.45	585.03	Left	Left	14.02	OK
7	60	1	3726.68	3.90	521.48	7	60	3	3727.16	5.47	521.48	Right	Right	8.73	OK
7	60	1	3720.67	6.90	515.50	7	60	3	3721.13	5.47	515.50	Left	Left	8.69	OK
7	60	2	3790.62	-5.45	585.43	7	60	1	3790.15	5.32	585.43	Right	Right	14.02	OK
7	60	2	3790.62	-5.45	585.43	7	60	1	3790.15	5.32	585.43	Left	Left	14.02	OK
7	60	2	3790.62	-5.45	585.43	7	60	3	3790.63	5.45	585.43	Right	Right	10.90	OK
7	60	2	3510.18	-1.84	304.96	7	60	3	3510.13	5.53	304.96	Left	Left	8.06	OK
7	60	3	3790.99	5.44	585.66	7	60	1	3790.38	5.32	585.66	Right	Right	8.99	OK
7	60	3	3790.99	5.44	585.66	7	60	1	3790.38	5.32	585.66	Left	Left	8.99	OK
7	60	3	3507.93	1.84	302.72	7	60	2	3507.89	-5.53	302.72	Right	Right	8.06	OK
7	60	3	3790.99	5.44	585.66	7	60	2	3790.62	-5.45	585.66	Left	Left	10.90	OK

C-M ANALYSIS REPORT 25

PLS-CADD Version 16.51x64 11:07:47 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case MOT, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case EVERYDAY-0#,0",60deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
7	60	1	3610.38	5.37	405.20	7	60	2	3610.66	-5.50	405.20	Right	Right	12.76	OK
7	60	1	3610.38	5.37	405.20	7	60	2	3610.66	-5.50	405.20	Left	Left	12.76	OK
7	60	1	3604.37	5.38	399.19	7	60	3	3604.63	5.50	399.19	Right	Right	6.69	OK
7	60	1	3604.37	5.38	399.19	7	60	3	3604.63	5.50	399.19	Left	Left	6.69	OK
7	60	2	3790.62	-5.45	585.43	7	60	1	3790.01	5.32	585.43	Right	Right	14.01	OK
7	60	2	3790.62	-5.45	585.43	7	60	1	3790.01	5.32	585.43	Left	Left	14.01	OK
7	60	2	3790.62	-5.45	585.43	7	60	3	3790.63	5.45	585.43	Right	Right	10.90	OK
7	60	2	3790.62	-5.45	585.43	7	60	3	3790.63	5.45	585.43	Left	Left	10.90	OK
7	60	3	3790.99	5.44	585.66	7	60	1	3790.24	5.32	585.66	Right	Right	8.98	OK
7	60	3	3790.99	5.44	585.66	7	60	1	3790.24	5.32	585.66	Left	Left	8.98	OK
7	60	3	3790.63	5.45	585.44	7	60	2	3790.62	-5.45	585.44	Right	Right	10.90	OK
7	60	3	3790.63	5.45	585.44	7	60	2	3790.62	-5.45	585.44	Left	Left	10.90	OK

C-M ANALYSIS
REPORT 26

PLS-CADD Version 16.51x64 11:21:10 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case NESC HV-4#,1/2",0deg, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case COLD-0#,0",0deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
8	60	1	3994.99	1.92	204.26	8	60	2	3994.66	-5.49	204.26	Right	Right	11.48	OK
8	60	1	3790.98	5.32	5.32	8	60	2	3790.62	-5.45	5.32	Left	Left	14.04	OK
8	60	1	3856.98	3.82	66.36	8	60	3	3856.45	5.46	66.36	Right	Right	8.71	OK
8	60	1	3862.98	6.93	72.58	8	60	3	3862.46	5.46	72.58	Left	Left	8.66	OK
8	60	2	3790.62	-5.45	5.45	8	60	1	3791.04	5.32	5.45	Right	Right	14.04	OK
8	60	2	3790.62	-5.45	5.45	8	60	1	3791.04	5.32	5.45	Left	Left	14.04	OK
8	60	2	3790.74	-5.45	5.45	8	60	3	3790.99	5.44	5.45	Right	Right	10.90	OK
8	60	2	4078.93	-1.75	288.20	8	60	3	4079.00	5.50	288.20	Left	Left	7.98	OK
8	60	3	3790.99	5.44	5.45	8	60	1	3791.53	5.32	5.45	Right	Right	8.98	OK
8	60	3	3790.99	5.44	5.45	8	60	1	3791.53	5.32	5.45	Left	Left	8.98	OK
8	60	3	4076.42	1.75	285.69	8	60	2	4076.50	-5.50	285.69	Right	Right	7.97	OK
8	60	3	3790.99	5.44	5.45	8	60	2	3790.98	-5.44	5.45	Left	Left	10.89	OK

C-M ANALYSIS REPORT 27

PLS-CADD Version 16.51x64 11:08:26 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case MOT, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case EVERYDAY-0#,0",60deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Minimum Clearance (ft)	OK Notes
8	60	1	3978.99	5.32	188.33	8	60	2	3978.68	-5.48	188.33	Right	Right	12.68	OK
8	60	1	3978.99	5.32	188.33	8	60	2	3978.68	-5.48	188.33	Left	Left	12.68	OK
8	60	1	3980.99	5.32	190.33	8	60	3	3980.68	5.48	190.33	Right	Right	6.61	OK
8	60	1	3980.99	5.32	190.33	8	60	3	3980.68	5.48	190.33	Left	Left	6.61	OK
8	60	2	3790.62	-5.45	5.45	8	60	1	3791.18	5.32	5.45	Right	Right	14.03	OK
8	60	2	3790.62	-5.45	5.45	8	60	1	3791.18	5.32	5.45	Left	Left	14.03	OK
8	60	2	3790.98	-5.44	5.45	8	60	3	3790.99	5.44	5.45	Right	Right	10.89	OK
8	60	2	3790.98	-5.44	5.45	8	60	3	3790.99	5.44	5.45	Left	Left	10.89	OK
8	60	3	3790.99	5.44	5.45	8	60	1	3791.67	5.32	5.45	Right	Right	8.97	OK
8	60	3	3790.99	5.44	5.45	8	60	1	3791.67	5.32	5.45	Left	Left	8.97	OK
8	60	3	3790.99	5.44	5.45	8	60	2	3790.98	-5.44	5.45	Right	Right	10.89	OK
8	60	3	3790.99	5.44	5.45	8	60	2	3790.98	-5.44	5.45	Left	Left	10.89	OK

C-M ANALYSIS
REPORT 28

PLS-CADD Version 16.51x64 11:22:53 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case NESC HV-4#,1/2",0deg, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case COLD-0#,0",0deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Minimum Clearance (ft)	OK Notes
9	60	1	4773.63	1.73	392.88	9	60	2	4773.96	-5.56	392.88	Right	Right	11.24	OK
9	60	1	4990.61	5.52	609.87	9	60	2	4991.10	-5.55	609.87	Left	Left	14.21	OK
9	60	1	4917.81	3.75	537.06	9	60	3	4918.35	5.55	537.06	Right	Right	8.63	OK
9	60	1	4911.80	7.30	531.09	9	60	3	4912.33	5.55	531.09	Left	Left	8.59	OK
9	60	2	4991.10	-5.55	610.36	9	60	1	4990.52	5.49	610.36	Right	Right	14.20	OK
9	60	2	4991.10	-5.55	610.36	9	60	1	4990.52	5.49	610.36	Left	Left	14.20	OK
9	60	2	4991.10	-5.55	610.36	9	60	3	4991.10	5.55	610.36	Right	Right	11.11	OK
9	60	2	4687.62	-1.53	306.86	9	60	3	4687.54	5.56	306.86	Left	Left	7.92	OK
9	60	3	4991.96	5.55	611.17	9	60	1	4991.33	5.49	611.17	Right	Right	8.98	OK
9	60	3	4991.96	5.55	611.17	9	60	1	4991.33	5.49	611.17	Left	Left	8.98	OK
9	60	3	4684.80	1.53	304.05	9	60	2	4684.73	-5.56	304.05	Right	Right	7.94	OK
9	60	3	4381.17	5.56	5.57	9	60	2	4381.16	-5.56	5.57	Left	Left	11.12	OK

C-M ANALYSIS
REPORT 29

PLS-CADD Version 16.51x64 11:09:12 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case MOT, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case EVERYDAY-0#,0",60deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Clearance (ft)	OK Notes
9	60	1	4785.65	5.43	404.92	9	60	2	4785.93	-5.56	404.92	Right	Right	12.62	OK
9	60	1	4785.65	5.43	404.92	9	60	2	4785.93	-5.56	404.92	Left	Left	12.62	OK
9	60	1	4787.65	5.43	406.92	9	60	3	4787.94	5.56	406.92	Right	Right	6.25	OK
9	60	1	4787.65	5.43	406.92	9	60	3	4787.94	5.56	406.92	Left	Left	6.25	OK
9	60	2	4991.10	-5.55	610.36	9	60	1	4990.38	5.49	610.36	Right	Right	14.18	OK
9	60	2	4991.10	-5.55	610.36	9	60	1	4990.38	5.49	610.36	Left	Left	14.18	OK
9	60	2	4989.32	-5.55	608.58	9	60	3	4989.32	5.55	608.58	Right	Right	11.11	OK
9	60	2	4989.32	-5.55	608.58	9	60	3	4989.32	5.55	608.58	Left	Left	11.11	OK
9	60	3	4991.96	5.55	611.17	9	60	1	4991.18	5.49	611.17	Right	Right	8.97	OK
9	60	3	4991.96	5.55	611.17	9	60	1	4991.18	5.49	611.17	Left	Left	8.97	OK
9	60	3	4991.11	5.55	610.38	9	60	2	4991.10	-5.55	610.38	Right	Right	11.11	OK
9	60	3	4991.11	5.55	610.38	9	60	2	4991.10	-5.55	610.38	Left	Left	11.11	OK

C-M ANALYSIS REPORT 30

PLS-CADD Version 16.51x64 11:23:09 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case NESC HV-4#,1/2",0deg, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case COLD-0#,0",0deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Minimum Clearance (ft)	OK Notes
10	60	1	5236.64	-0.52	245.14	10	60	2	5236.69	-3.31	245.14	Right	Right	9.04	OK
10	60	1	5380.47	5.37	389.01	10	60	2	5380.84	-2.00	389.01	Left	Left	12.80	OK
10	60	1	4992.42	5.47	5.54	10	60	3	4991.96	5.55	5.54	Right	Right	8.99	OK
10	60	1	4992.43	5.49	5.57	10	60	3	4991.96	5.55	5.57	Left	Left	8.99	OK
10	60	2	4991.24	-5.55	5.56	10	60	1	4991.95	5.48	5.56	Right	Right	14.26	OK
10	60	2	5053.85	-3.52	62.45	10	60	1	5054.13	4.90	62.45	Left	Left	13.89	OK
10	60	2	4991.77	-5.56	5.57	10	60	3	4991.96	5.55	5.57	Right	Right	11.11	OK
10	60	2	5169.28	-0.69	177.78	10	60	3	5169.11	3.87	177.78	Left	Left	6.23	OK
10	60	3	4991.96	5.55	5.57	10	60	1	4992.22	5.48	5.57	Right	Right	9.00	OK
10	60	3	4991.96	5.55	5.57	10	60	1	4992.22	5.48	5.57	Left	Left	9.00	OK
10	60	3	5076.44	2.87	84.99	10	60	2	5076.65	-4.77	84.99	Right	Right	9.15	OK
10	60	3	4991.96	5.55	5.57	10	60	2	4992.06	-5.54	5.57	Left	Left	11.09	OK

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PLS-CADD Version 16.51x64 11:09:34 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Clearances measured for the selected span of the following two sections

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case MOT, condition L, wind normal to span.

Section #5 from structure #2 to structure #11, start set #3 '', end set #3 ''
Cable 'C:\Users\Public\Documents\PLS\pls_cadd\examples\cables\drake', Ruling span (ft) 594.995
Sagging data: Catenary (ft) 4256.76, Horiz. Tension (lbs) 4656.9 Condition I Temperature (deg F) 60
Clearance checked for weather case EVERYDAY-0#,0",60deg, condition I, wind normal to span.

Section Clearance Report

Required clearance (ft) 4.97

Wire 1 Back Attachment Str. #	Wire 1 Back Attachment Set #	Wire 1 Back Attachment Phase #	Wire 1 Minimum Clearance Point Station (ft)	Wire 1 Minimum Clearance Point Offset (ft)	Wire 1 Minimum Clearance Point Horiz. Distance To Back Str. (ft)	Wire 2 Back Attachment Str. #	Wire 2 Back Attachment Set #	Wire 2 Back Attachment Phase #	Wire 2 Minimum Clearance Point Station (ft)	Wire 2 Minimum Clearance Point Offset (ft)	Wire 2 Minimum Clearance Point Horiz. Dist. To Back Str. (ft)	Wind From Wire 1	Wind From Wire 2	Minimum Clearance (ft)	OK Notes
10	60	1	5306.89	2.55	315.40	10	60	2	5307.05	-2.67	315.40	Right	Right	8.67	OK
10	60	1	5306.89	2.55	315.40	10	60	2	5307.05	-2.67	315.40	Left	Left	8.67	OK
10	60	1	4992.71	5.47	5.61	10	60	3	4991.96	5.55	5.61	Right	Right	8.97	OK
10	60	1	4992.71	5.47	5.61	10	60	3	4991.96	5.55	5.61	Left	Left	8.97	OK
10	60	2	4991.23	-5.55	5.56	10	60	1	4991.95	5.48	5.56	Right	Right	14.27	OK
10	60	2	4991.23	-5.55	5.56	10	60	1	4991.95	5.48	5.56	Left	Left	14.27	OK
10	60	2	5227.40	-3.39	235.92	10	60	3	5227.30	3.32	235.92	Right	Right	7.74	OK
10	60	2	5227.40	-3.39	235.92	10	60	3	5227.30	3.32	235.92	Left	Left	7.74	OK
10	60	3	4991.96	5.55	5.57	10	60	1	4992.37	5.48	5.57	Right	Right	8.99	OK
10	60	3	4991.96	5.55	5.57	10	60	1	4992.37	5.48	5.57	Left	Left	8.99	OK
10	60	3	5026.48	5.22	35.37	10	60	2	5026.71	-5.22	35.37	Right	Right	10.77	OK
10	60	3	5026.48	5.22	35.37	10	60	2	5026.71	-5.22	35.37	Left	Left	10.77	OK

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REPORT 32

PLS-CADD Version 16.51x64 11:38:44 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Notes on the clearance calculations:

1) Distances reported are true minimum 3D distances unless the horizontal or vertical methods have been selected.
2) In the report "All Minima" mode, minimum distances from source voltage wires in the current span will be reported to the target voltage wires in the ahead and back spans (which may result in additional minima being reported at every structure location from the source wire in the current span to the target wire in the ahead or back span).
3) Source and target wires that cannot come within the required minimum separation distance of each other will not be reported on even in report all minimums mode.
4) Required separation increase per NESC 2002 is interpreted to be 0.368 * sqrt(S) where S is the maximum sag of the two wires at the point of minimum distance in meters. Note: NESC assumes 15 deg C (60 deg F) at final condition with no wind for this formula, so this option may not be applicable for checks at other conditions.
5) Ice jumping assumes that the conductor will jump as far up as the difference between its position with ice and without. This delta is then added to the without ice position and establishes an envelope of possible jumped positions, not a definitive final configuration.
6) The set numbers reported are from the start structure and may not correspond to those of the end structure.

Input Parameters:
Considering spans starting on structures 1 to 11
Source Weather Case: NESC HV-4#,1/2",0deg
Source Wind From: Both
Source Condition: Max Sag RS
Source Voltage: 0
Source Ice Jumping: No
Source Check At: Entire span

Target Weather Case: COLD-0#,0",0deg
Target Wind From: Both
Target Condition: Initial RS
Target Voltage: 138
Separation Increase Option: None
Required Separation Parallel: 4.970 Crossing: 4.970 (ft)
Measure Clearances: True 3d (radial)
Report Violations Only

Sections Evaluated

Circuit Label	Section Number	Start Structure Set	End Structure Set	Ruling Span (ft)	Insulator Clipped	Section Notes	Cable File Name	Voltage (kV)	Bundle Shape (# Wires)	Bundle Spacing (in)
	1	1:2	2:11	234.9	No		3_8ehs	0	None (1)	0.000000
	2	1:3	2:12	233.5	No		brugg_49ay85acs-2c_a.wir	0	None (1)	0.000000
	3	1:10	2:13	235.1	No		drake	138	None (1)	0.000000
	4	2:1	11:1	595.0	No		3_8ehs	0	None (1)	0.000000
	5	2:3	11:3	595.0	No		drake	138	None (1)	0.000000

Wire Clearance Results:

Source Start Structure	Source End Structure	Source Set	Source Phase	Source Wind	Target Start Structure	Target End Structure	Target Set	Target Phase	Target Wind	Station At Min. (ft)	Source Sag At Min. (ft)	Target Sag At Min. (ft)	Required Distance At Min. (ft)	Minimum Distance Horz. Comp. (ft)	Minimum Distance Vert. Comp. (ft)	Comment

Calculations completed.

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REPORT 33

PLS-CADD Version 16.51x64 11:30:34 AM Monday, April 12, 2021
Colorado School of Mines
Project Name: 'C:\Users\Public\Documents\PLS\pls_cadd\examples\projects\MinesTranmissionLIne.don'
Line Title: 'Everyday'
Notes on the clearance calculations:

1) Distances reported are true minimum 3D distances unless the horizontal or vertical methods have been selected.
2) In the report "All Minima" mode, minimum distances from source voltage wires in the current span will be reported to the target voltage wires in the ahead and back spans (which may result in additional minima being reported at every structure location from the source wire in the current span to the target wire in the ahead or back span).
3) Source and target wires that cannot come within the required minimum separation distance of each other will not be reported on even in report all minimums mode.
4) Required separation increase per NESC 2002 is interpreted to be 0.368 * sqrt(S) where S is the maximum sag of the two wires at the point of minimum distance in meters. Note: NESC assumes 15 deg C (60 deg F) at final condition with no wind for this formula, so this option may not be applicable for checks at other conditions.
5) Ice jumping assumes that the conductor will jump as far up as the difference between its position with ice and without. This delta is then added to the without ice position and establishes an envelope of possible jumped positions, not a definitive final configuration.
6) The set numbers reported are from the start structure and may not correspond to those of the end structure.

Input Parameters:
Considering spans starting on structures 1 to 11
Source Weather Case: MOT
Source Wind From: Both
Source Condition: Load RS
Source Voltage: 0
Source Ice Jumping: No
Source Check At: Entire span

Target Weather Case: EVERYDAY-0#,0",60deg
Target Wind From: Both
Target Condition: Initial RS
Target Voltage: 138
Separation Increase Option: None
Required Separation Parallel: 4.970 Crossing: 4.970 (ft)
Measure Clearances: True 3d (radial)
Report Violations Only

Sections Evaluated

Circuit Label	Section Number	Start Structure Set	End Structure Set	Ruling Span (ft)	Insulator Clipped	Section Notes	Cable File Name	Voltage (kV)	Bundle Shape (# Wires)	Bundle Spacing (in)
	1	1:2	2:11	234.9	No		3_8ehs	0	None (1)	0.000000
	2	1:3	2:12	233.5	No		brugg_49ay85acs-2c_a.wir	0	None (1)	0.000000
	3	1:10	2:13	235.1	No		drake	138	None (1)	0.000000
	4	2:1	11:1	595.0	No		3_8ehs	0	None (1)	0.000000
	5	2:3	11:3	595.0	No		drake	138	None (1)	0.000000

Wire Clearance Results:

Source Start Structure	Source End Structure	Source Set	Source Phase	Source Wind	Target Start Structure	Target End Structure	Target Set	Target Phase	Target Wind	Station At Min. (ft)	Source Sag At Min. (ft)	Target Sag At Min. (ft)	Required Distance At Min. (ft)	Total Horz. Comp. (ft)	Vert. Comp. (ft)
Minimum Distance				Comment											
				From					From						

Calculations completed.

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3J2LM Engineering
MINES 138KV TRANSMISSION LINE
PROJECT DESIGN CRITERIA MEMORANDUM (PDM) – APPENDIX A
TAPERED TUBULAR STEEL POLE DESIGN CRITERIA

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MINES 138KV TRANSMISSION LINE
PROJECT DESIGN CRITERIA MEMORANDUM (PDM) – APPENDIX A
TAPERED TUBULAR STEEL POLE DESIGN CRITERIA

1.0 Loading

This document describes the tapered tubular steel pole design criteria for use on the Mines 138kV Transmission Line.

Each load case shall be considered independently to determine the maximum stress in any member. Structures shall be analyzed for the simultaneous application of vertical, transverse, and longitudinal wire loads, structure wind loads, and structure dead load with load factors.

Loads and structure geometry will be developed by 3J2LM. The selected steel pole supplier is responsible for the design of the steel poles and the development of the PLS-POLE models for use in the PLS-CADD transmission line design and analysis.

1.1 *Spans/Line Angles*

Structure Description	Line Angle		Wind Span (ft)	Weight Span (ft)	Ruling Span (ft)
	Min	Max			
Tangent	0º	2º	725	775	700
Deadend	0º	90º	500	700	700

1.2 *Wire Sizes*

	138 KV	Shield Wire	OPGW
Bundle Size	2	1	1
Code Name	Drake	7/16” EHS	AFL DNO-10484
Type	ACSR/AW	Steel Strand	OPGW
Size	795 kcmil	7-Strand	48 fibers
RTS	30,500 lbs.	20,800 lbs.	18,003 lbs.
Diameter	1.107 in.	0.435 in.	.506 in.
Weight	1.040 lbs/ft	0.399 lbs/ft	.365 lbs/ft

1.3 *Load Case Summary*

Load Name	Radial Ice (in)	Wind Pressure (psf)	Wire Temp (°F)	Wire Condition	Vertical OLF	Wind OLF	Tension OLF
Rule 250B NESC Heavy	0	4	30	Initial	1.5	2.5	1.65
Rule 250C High Wind	0	55.2 wires 55.2 struct	60	Initial	1.1	1.1	1.1
Rule 250D Ice + Wind	0.5	2.3 wires 2.8 struct	15	Initial	1.0 wires 1.25 struct	1.0	1.0
Construction: Snub	0	4	20	Initial	1.5 wires 1.1 struct	1.5	1.5
Maintenance	0	4	20	Final	2.0 wires 1.1 struct	1.5 wires 1.0 struct	1.5 wires 1.0 struct
Failure Containment (Broken Wire)	0	9	60	Final	1.0 wires 1.1 struct	1.0	1.0

1.4 *Wire Tensions*

Load Name	Tangent Wire Tensions (lbs)		Deadend Wire Tensions (lbs)	
	Cond	SW/OPGW	Cond	SW/OPGW
Rule 250B NESC Heavy	9,400	6,900	8,700	5,600
Rule 250C High Wind	6,800	4,800	9,600	4,000
Rule 250D Ice + Wind	12,600	9,300	10,300	6,600
Construction: Snub	n/a	n/a	6,600	4,400
Maintenance	4,700	3,500	n/a	n/a
Failure Contain. (Broken Wire) (1)	6,700 (1)	5,100	n/a	n/a

(1) Residual static tension for broken subconductors to be based on 70% of conductor tension.

1.5 *Description of Load Cases*

1.5.1 NESC Rule 250B – District Loading

NESC District Loading shall be in accordance with NESC 2017 Rule 250B.

Use the following criteria for the NESC district load:

- NESC Heavy: 4 psf wind and 0.50-inch radial ice at 32ºF.
- NESC Constant = 0.30 lbs/ft.
- Vertical load factor = 1.5; Transverse load factor for wind = 2.5; Transverse load factor for wire tension = 1.65; Longitudinal load factor for wire tension = 1.65.
- Deadload vertical structure overload factor of 1.5.
- Determine point loads according to initial tensions.

1.5.2 NESC Rule 250C – High Wind

Wind loads shall be based on a 3-second gust wind speed in accordance with NESC 2017 and can occur at any direction to the transmission line. Structures shall be designed for the wind direction that causes the maximum stress in any member. The project shall be designed assuming a 90 mph wind and a typical wire height.

Use the following criteria for wind loads:

- A basic wind speed, 3 second gust, (V) of 90 mph and exposure category C.
- Temperature = 60ºF.
- Vertical, transverse, and longitudinal load factors = 1.1. These factors exceed the NESC minimums of 1.0.
- Determine point loads according to initial tensions.

1.5.3 NESC Rule 250D – Extreme Ice with Wind

Extreme Ice with Concurrent Wind loading shall be in accordance with NESC 2017 Rule 250D. Use the following for wind and ice loads:

- Basic ice thickness (I) of 0.25 inches.
- Radial ice thickness of 0.50 inches. (confirmed from Table 230 -1)
- Basic wind speed (V_I) of 90 mph (psf) and exposure category C.
- Ice density = 57 pcf.
- Temperature = 15ºF.
- Vertical, transverse, and longitudinal load factors equal 1.0.
- Deadload vertical structure overload factor of 1.1.
- Determine point loads according to initial tensions.

The radial ice thickness provided above was computed by adjusting the basic ice thickness (1), per ASCE Manual No. 74, for the effects of height (+20%) and 250yr/50yr relative reliability (+67%). This is a conservative approach compared to the NESC code.

1.5.4 Construction (Snub) – Deadend Structures Only

Construction loads are based on ASCE Manual No. 74, Guidelines for Electrical Transmission Line Loading but utilize a more conservative wind speed and wire temperature. This load case shall be applied to deadend and strain structures with arms.

Use the following criteria for construction loads:

- A 4 psf wind at 20ºF.
- The vertical load is computed assuming a 20° snub off angle.
- Vertical, transverse, and longitudinal load factors equal 1.5 on the wires.
- Transverse and longitudinal load factors equal 1.5 on the structures.
- Deadload vertical structure load factor of 1.1.
- Determine point loads according to initial tensions.

1.5.5 Maintenance

Maintenance loads are based on ASCE Manual No. 74, Guidelines for Electrical Transmission Line Loading but utilize a more conservative wind speed and wire temperature.

Use the following criteria for maintenance loads:

- A 4 psf wind at 20ºF
- The vertical load is equal to the weight span.
- On wires: Vertical load factor = 2.0; Transverse and longitudinal load factors = 1.5.
- On structures: Vertical load factor = 1.1; Transverse and longitudinal load factors = 1.0.
- Determine point loads according to tensions at final after creep.

1.5.6 Failure Containment (Broken Wire) – Suspension Structures Only

Failure containment loads are based on ASCE Manual No. 74, Guidelines for Electrical Transmission Line Loading.

Residual static loads are applied for failure containment. The residual static load is the wire load that remains at a wire support point after breakage or removal of a subconductor and/or ground wire.

For single circuit structures, any one ground wire or subconductor shall be considered broken or removed. For double circuit structures, both ground wires or any one ground wire and any one subconductor shall be considered broken or removed.

Broken wire loads for different support points shall be applied in the same direction.

Use the following criteria for failure containment loads:

- A 4 psf wind at 60ºF.
- For a broken subconductor on suspension structures, assume the residual static tension is equal to 70 percent of the subconductor tension.
- For overhead ground wires, assume the residual static tension is equal to 100 percent of the ground wire tension.
- Vertical, transverse, and longitudinal load factors equal 1.0.
- Dead load vertical structure overload factor of 1.1.
- Determine point loads according to final tensions.

1.5.7 Camber Loads – Deadend Structures Only

Not using Camber in this project

1.5.8 Dead End OPGW/Shield Wire Loading

All dead end structures shall be designed to withstand the loads from having two OPGW / Shield Wire back or ahead spans attached to one pole. This load case is included to account for situations where a single circuit line transitions from a double circuit structure to a single circuit dead end monopole at which point the shield wire would be terminated and only the OPGW would continue to the next span. Similarly, this load case is included to account for two shield wires going from a deadend pole to a substation H-frame.

2.0 Load Combinations

Load combinations shall be per the table below.

Load Case	Suspension:	Deadends:
1. Rule 250B NESC Heavy– Intact Circuit	☒	☒
2. Rule 250B NESC Heavy– Full Dead End	☐	☒
3. Rule 250C High Wind – Intact Circuits	☒	☒
4. Rule 250C High Wind – Full Dead End	☐	☒
5. Rule 250D Ice/Concurrent Wind – Intact Circuits	☒	☒
6. Rule 250D Ice/Concurrent Wind – Full Dead End	☐	☒
7. Construction (Snub) – All wires snubbed	☐	☒
8. Maintenance – Intact Circuits	☒	☐
9. Broken Wire – Up to Two Wires Broken at One Time	☒	☐

3.0 Steel Pole Geometry

The structure geometry shall be such that the wire to pole clearance, conductor to OPGW/shield wire clearance, and the phase to phase clearance criteria from the PDM is maintained. The structure geometry varies depending on the structure type, the wind and weight span, and the design line angle.

Our general configuration for the transmission line will be a delta configuration. As a result, we will need to account for rolling phase-to-phase clearances with our deadend structures. The insulator type will be braced post insulators. Phase spacing will be 5.6’ for vertical clearances and 4.8’ for horizontal clearnaces. The tangent structures will be a single monopole and the deadends will be H-frames using a horizontal configuration.

For the deadend structures, one jumper post insulator bracket shall be provided below each conductor level on the transverse axis on the inside of the line angle. The provisions shall consist of: (1) A deadend conductor vang on the transverse axis on the outside of the line angle; and (2) Jumper post insulator brackets located approximately 60° circumferentially either side of the additional conductor vang.

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MINES 138KV TRANSMISSION LINE
PROJECT DESIGN CRITERIA MEMORANDUM (PDM) – APPENDIX B
FOUNDATION DESIGN CRITERIA

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MINES 138KV TRANSMISSION LINE
PROJECT DESIGN CRITERIA MEMORANDUM (PDM) – APPENDIX B
FOUNDATION DESIGN CRITERIA

1.0 General

This document describes the foundation design criteria for use on the Mines 138kV Transmission Line.

1.1 Foundation Criteria

Foundations for all transmission line structures along the line route will be designed as laterally loaded and moment resisting drilled pier reinforced concrete foundations unless soil conditions dictate otherwise.

1.2 Geotechnical Data

Foundations shall be designed using soil parameters taken from the nearest boring(s) using parameters determined by the Geotechnical Engineer. It is anticipated that borings from the two substations will be utilized.

2.0 Steel Pole Foundations

Foundation designs shall be developed for each structure based on specific structure loads and site conditions. For the purpose of this project only one foundation will be designed due to time constraints.

2.1 *Loads*

A foundation safety factor shall be applied to the maximum foundation reactions extracted from the vendor calculations for input into the foundation design software. B&V design standards recommend using foundation safety factors of 1.10 to 1.25 for tangent and light angle structures and from 1.25 to 1.50 for heavy angle and deadend structures based on the certainty of the design data. Since substation borings are expected to be near the deadend locations and since tangents are further from the substation borings, a foundation safety factor of 1.25 shall be used for all structures on this project.

2.2 *Design of Steel Pole Foundations*

This section describes the methods to be used in the design of steel pole foundations. EPRI's MFAD software shall be used to perform a lateral analysis of each foundation and to determine the maximum bending moment and shear in each foundation.

The steel pole piers shall be analyzed and designed as follows:

1. The maximum reveal depth for the steel poles will be 1 foot.

2. The upper 5 feet of soil below grade will be neglected for skin friction due to the potential disturbance of the soil during installation and construction. A soil unit weight will be input and minimum parameters will be input for the rest of the soil properties.
3. The minimum foundation diameter for a structure will be determined based on the diameter of the anchor bolt cage and minimum clear cover. The anchor bolt cages will be provided by the steel vendor.

2.2.1 *MFAD Parameters*

The main control parameters in MFAD shall be as follows:

Structure Type:	Single Pole
Solution Type:	Design
Loading Type:	High Eccentricity Moment (MFAD)
Foundation Type:	Straight Sided Drilled Shaft
Soil Profile:	Soil Only

The general data set parameters within MFAD shall be as follows:

Side Shear Spring:	On
Base Shear Spring:	On
Base Moment Spring:	On
Bending Stiffness:	FAD will calculate EI
Shaft Design Type:	Diameter
Convergence Criteria:	.1
Stick-up Above Ground Level:	Maximum Reveal (1’)

2.2.2 *Performance Criteria*

The Design Performance Criteria parameters for the top of the pier shall be as follows:

Total Deflection:	4”
Total Rotation:	3°
Non-Recoverable Deflection:	3”
Non-Recoverable Rotation:	3°

3.0 Structural Design

This section describes the structural design of the foundation. The concrete design of foundations shall be in accordance with the latest ACI 336.3R code which specifies load factors of 1.4 for dead loads and 1.7 for live loads. The combination of conservative base loads for extreme cases, structure overload factors, and foundation design factors result in blended overload factors that exceed the ACI requirements. Therefore the maximum shear and moment from MFAD shall be used for concrete design without any additional factoring.

Reinforcement will use a hooped rebar design as a configuration for the foundations for ease of construction. Where applicable, shear ties will be reduced to 12 inch spacing for ease of constructability.

Foundations shall be considered as compressive elements, therefore the 1% minimum reinforcement is applicable. Vertical steel requirements shall be analyzed for the internal moments as provided by MFAD. Shear shall be analyzed with uplift load, where applicable, reducing the shear capacity of the pier per ACI 318.

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MINES 138KV TRANSMISSION LINE
PROJECT DESIGN CRITERIA MEMORANDUM (PDM)

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1.0 General

This document contains information regarding design criteria for all aspects of design including conductor and wire criteria, clearance criteria, insulation criteria, right-of-way criteria, structural loading criteria, foundation criteria, and PLS-CADD modeling criteria for the138kV Mines Transmission Line.

1.1 *Circuit Ratings*

Required ratings per circuit were developed from system studies and are as follows:

Nominal Voltage:	138 kV	
Design Voltage:	145 kV	
Continuous Rating:	1814 amps	(433 MVA)
Emergency Rating:	2030 amps	(485 MVA)

1.2 *Design References*

The design criteria for this project are a composite of standards and code requirements. The following documents were referenced in the development of these criteria and/or will be applied to the design of these facilities:

- National Electric Safety Code (NESC-C2-2017).
- American Society of Civil Engineers (ASCE/SEI Standard 48 (2011), "Design of Steel Transmission Pole Structures."
- American Society of Civil Engineers Manual No. 74, "Guidelines for Electrical Transmission Line Structural Loading, Third Edition"
- American Concrete Institute (ACI 318 2014).
- American Institute of Steel Construction (AISC) Steel Construction Manual, 14th Edition
- Occupational Safety and Health Administration (OSHA) rules and regulations.
- Federal Aviation Administration (FAA) Circular 77.

Other standards and codes may be used as design guidelines when they do not conflict with the above listed codes and standards.

2.0 Conductor and Wire Criteria

2.1 *Conductor Rating Parameters*

The Mines transmission line conductor rating parameters are shown below.

Ambient Temperature	15°C (60°F)
Wind Velocity:	2.0 ft/sec (1.4 mph)
Wind Angle (degrees to conductor)	90
Coefficient of Emissivity	0.5
Coefficient of Solar Absorption	0.5
Maximum Project Elevation	3500 ft. MSL
Conductor Temperature at "Continuous Static Line Capacity"	100°C (212°F)
Conductor Temperature at Emergency Summer Rating	100°C (212°F)

2.2 *Tension Limits*

Conductor tension criteria were determined using a combination of code requirements and local utility practice. Two tension cases, Maximum Allowable Tension and Self Damping Tension, will be analyzed. (RTS = Rated Tensile Strength)

The NESC code requirements are (Rule 261H1a&b):

NESC 250B	Initial	60% RTS
NESC 250C	Initial	80% RTS
NESC 250D	Initial	80% RTS
Normal 60°F	Initial	35% RTS
Normal 60°F	Final	25% RTS

Controlling Criteria:

NESC 250B (Light)	Initial	50% RTS
NESC 250C (High Wind)	Initial	60% RTS
NESC 250D (Extreme Ice w/Wind)	Initial	70% RTS
Normal 60°F	Initial	~15.3% RTS
Normal 60°F	Final	~13.4% RTS

Shield Wire (OHGW, OPGW) tensions will be limited by the above criteria.
Additional tension limits based on the above controlling criteria at a 500 - 750 foot ruling span are tabulated below and are the basis for structure design.

Project Cable Tension Limits (lbs)		
Wire Type	NESC Heavy Tension Initial	High Wind Tension Initial
795 kcmil "Drake" ACSR/AW	3,800	8,900
7/16" 7-Strand EHS Steel	2,100	4,700
48 Strand OPGW	2,100	4,700

Substation approach span tensions will be limited to the values tabulated below for 140 mph high wind initial tensions per subconductor, shield wire, and OPGW.

Substation Approach Span Tension Limits (lbs)	
Wire Type	Substation
795 kcmil "Drake" ACSR/AW	5,000
7/16" 7-Strand EHS Steel	5,000
48 Strand OPGW	5,000

2.3 *Wire Sizes*

Wire sizes were determined from system capacity requirements and local utility practice, per the initial Mines 138kV installation. The line will be designed for the installation of the following wires, with the shield wire only on substation approach spans:

	138 KV	Shield Wire	OPGW
Bundle Size	2	1	1
Code Name	Drake	7/16" EHS	AFL DNO-10484
Type	ACSR/AW	Steel Strand	OPGW
Size	795 kcmil	7-Strand	48 fibers
RTS	30,500 lbs.	20,800 lbs.	18,003 lbs.
Diameter	1.107 in.	0.435 in.	.506 in.
Weight	1.040 lbs/ft	0.399 lbs/ft	.365 lbs/ft

3.0 Clearance Criteria

Minimum clearances for design are provided below. These clearances either meet or exceed minimum NESC requirements seen in Section 23 of the NESC 2017 code. Some clearances exceed NESC minimums to provide an additional design margin for audible noise, radio and TV interference, survey tolerance, construction tolerance, and uncertainties including changes in ground elevation or public policy in future years. The design clearances listed below may be reduced during construction to mitigate issues that arise, but the actual clearances provided shall always meet NESC minimum requirements.

3.1 *Vertical Clearances*

The vertical clearances tabulated in Appendix C are based on a maximum operating temperature of 212° F with the conductor in the final sag condition plus a 3' vertical buffer. Wire crossing clearances shall be checked with the top circuit at MOT °F final tension and the wire crossing at 32°F initial tension condition. For spotting structures, the vertical buffer of 3' shall be added to all vertical clearances. The vertical buffer allows for construction tolerances and structure relocations.

3.2 *Clearance at Structures*

Design clearances to the supporting structure are indicated below.

Description	**138 kV**
1. No Wind 60°F, 0 psf wind	74" to structure body 58" to structure arms
2. Lightning/Switching Surge 60°F, 4 psf wind	50"
3. Moderate Wind 60°F, 6 psf wind	40" (vs. 32" by code)
4. High Wind 60° F, 20.7 psf (90 mph) wind	18"

3.3 *Galloping*

Galloping conductors apply and will be analyzed for this project.

3.4 *Horizontal Conductor Blow Out to Edge of Right-of-Way Clearances*

The horizontal clearance to the edge of the right-of-way (ROW) is based on conductor blowout under wind and 60°F conditions. According to NESC Rule 234C1b the conductor under 6 psf wind blow out conditions should maintain a horizontal clearance of 6.5' to all installations. Since any installation may be built on the edge of the right of way, a design clearance of 6.5' will be maintained to the edge of the ROW. Additionally, a design clearance of 1.5' under 140 mph high wind conditions will be maintained to the edge of the ROW.

3.5 *Wire to Wire Clearances for the Same Circuit*

Wire to wire clearance will be measured as a minimum total radial distance accounting for both the horizontal and vertical clearance requirements. The clearances specified below represent the typical controlling weather cases.

1. **OPGW/Shield Wire to Conductor Clearance**

The controlling weather case for the OPGW and the shield wire to conductor clearance occurs when the OPGW or shield wire is coated with 1/2" thick ice at 32°F and the conductor is bare at 32°F as the current flowing through the line at the time of the ice storm prevented ice from accumulating on the conductor only. NESC Rule 235C2b specifies the minimum vertical clearance between zero-voltage line conductors and 138kV conductors as 4.97'. The required clearance with 1/2" ice at 32°F on the OPGW or shield wire and 32°F bare on the conductor should be at least 4.66'.

2. **Same Circuit Phase to Phase Clearance**

For same circuit phase to phase clearance, NESC does not directly address clearance requirements for lines over 50kV. For this project the minimum horizontal and vertical phase-phase clearance for the same circuit will be no less than the requirements for line conductors of different circuits with a phase difference of 120°.

The vertical clearance between phases should be checked with the top phase coated with 1/2" thick ice at 32°F and the bottom phase bare at 0°F. The bottom phase is assumed bare at 0°F as a result of the ice falling off of the bottom phases only. NESC Rule 235C2b 3specifies the minimum vertical clearance between two 138kV conductors with a 120° phase difference supported on the same structure as 4.97' when adjusted for altitude. The required phase to phase vertical clearance with 1/2" ice at 32°F on the top phase and 0°F bare on the bottom phase should be at least 9.914'.

The horizontal clearance between phases should be checked with the conductors displaced under the 6psf blow out conditions with wind acting on the conductor equally. NESC Rule 235B1 specifies the minimum horizontal clearance between 138kV line conductors with a 120° phase difference displaced by 6psf wind as 5.59'. In order to account for some rotation of the vertical bundle under 6psf blowout conditions the required clearance between phases of the same circuit should be 6.5'.

4.0 Insulation Criteria

4.1 *Polymer Insulators*

The 138 kV insulators shall be non-ceramic (i.e., polymer) type. Due to high contamination conditions, leakage specifications shall be increased to approximate 161/230 kV requirements. The insulators will be selected to maintain the following electrical characteristics:

Braced Post	138 kV	
Minimum 60 Hz Dry Flashover (kV)	590	
Minimum 60 Hz Wet Flashover (kV)	415	
Minimum Positive Critical Impulse Flashover (kV)	945	
Minimum Negative Critical Impulse Flashover (kV)	930	
Minimum Dry Arc Distance (inches)	61	
Minimum Leakage Distance (inches)	240	

4.2 *Shielding and Lightning Performance*

Shielding design will be based on a maximum shielding angle of 30 degrees from vertical for the outside phases and 45 degrees from vertical for the inside phases unless site specific parameters accommodate a deviation.

5.0 Right-of-Way Criteria

The Right-of-Way (ROW) widths chosen for the project shall be based upon both electrical clearance and environmental criteria. Based upon anticipated spans, the minimum Right-of-Way widths for the project are expected to be 30 ft, except where local circumstances dictate otherwise. This was concluded by analysing the blowout report of the PLS CADD model at extreme weather conditions.

5.1 *Environmental Criteria*

There are no mandated limits for magnetic and electric field strengths in the State of Kansas. Prudent avoidance techniques shall be utilized to minimize EMF exposure when doing so can be done at a moderate cost.

There are no mandated limits for audible noise emanating from the transmission lines under fair weather conditions, however, the Mines Line should meet the following requirements for noise measured 25 feet from the edge of the right-of-way:

Zone	Day Limit (7:00 am to 7:00 pm)	Night Limit (7:00 pm to 7:00 am)
Residential	55 dB(A)	50 dB(A)
Commercial	60 dB(A)	55 dB(A)
Light Industrial	70 dB(A)	65 dB(A)
Industrial	80 dB(A)	75 dB(A)

6.0 Structural Loading Criteria

Each load case shall be considered independently to determine the maximum stress in any member. Structures shall be analyzed for the simultaneous application of vertical, transverse, and longitudinal wire loads, structure wind loads, and structure dead load with load factors.

6.1 *NESC Rule 250B – District Loading*

NESC District Loading shall be in accordance with NESC Rule 250B.

Use the following criteria for the NESC district load:

- NESC Heavy: 4 psf wind and 0.50-inch radial ice at 32°F.
- NESC Constant = 0.30 lbs/ft.
- Vertical load factor = 1.5; Transverse load factor for wind = 2.5; Transverse load factor for wire tension = 1.65; Longitudinal load factor for wire tension = 1.65.
- Deadend vertical structure overload factor of 1.5.
- Determine point loads according to initial tensions.

6.2 *NESC Rule 250C - High Wind*

Wind loads shall be based on a 3-second gust wind speed in accordance with NESC Rule 250C and can occur at any direction to the transmission line. Structures shall be designed for the wind direction that causes the maximum stress in any member. The project shall be designed assuming a 90 mph wind and a typical wire height.

Use the following criteria for wind loads:

- A basic wind speed, 3 second gust, (V) of 90 mph and exposure category C.
- Temperature = 60°F.
- Vertical, transverse, and longitudinal load factors = 1.1. These factors exceed the NESC minimums of 1.0.
- Determine point loads according to initial tensions.

PLS-CADD should be used to determine wind pressures based on actual spans and heights. Table 6.2.1 shows typical wind pressures, using the above criteria. The factored wind pressure on structures does not include a force coefficient.

Table 6.2.1. Typical Wind Pressures.

Voltage (kV)	Structure Height (ft)	Avg. Wire Height (ft)	Wind Span (ft)	Factored Wind Pressure on Wires (psf)	Factored Wind Pressure on Structure (psf)
138	60-75	70	600	55.2	55.2

6.3 *NESC Rule 250D – Extreme Ice with Wind*

Extreme Ice with Concurrent Wind loading shall be in accordance with NESC Rule 250D.

Use the following for ice and wind loads:

- Basic ice thickness (I) of 0.25 inches.
- Radial ice thickness of 0.50 inches. (confirmed from Table 230 -1)
- Basic wind speed (V_I) of 90 mph (psf) and exposure category C.
- Ice density = 57 pcf.
- Temperature = 15ºF.
- Vertical, transverse, and longitudinal load factors equal 1.0.
- Deadload vertical structure overload factor of 1.1.
- Determine point loads according to initial tensions.

The radial ice thickness provided above was computed by adjusting the basic ice thickness (I), per ASCE Manual No. 74, for the effects of height (+20%) and 250yr/50yr relative reliability (+67%). This is a conservative approach compared to the NESC code.

6.4 *Construction (Snub) – Deadend Structures Only*

Construction loads are based on ASCE Manual No. 74, Guidelines for Electrical Transmission Line Loading, but utilize a more conservative wind speed and wire temperature. This load case shall be applied to deadend and strain structures with arms.

Use the following criteria for construction loads:

- A 4 psf wind at 20ºF.
- The vertical load is computed assuming a 20° snub off angle.
- Vertical, transverse, and longitudinal load factors equal 1.5 on the wires.
- Transverse and longitudinal load factors equal 1.5 on the structures.
- Deadload vertical structure overload factor of 1.1.
- Determine point loads according to initial tensions.

6.5 *Maintenance*

Maintenance loads are based on ASCE Manual No. 74, Guidelines for Electrical Transmission Line Loading, but utilize a more conservative wind speed and wire temperature.

Use the following criteria for maintenance loads:

- A 4 psf wind at 20ºF
- The vertical load is equal to the weight span.
- On wires: Vertical load factor = 2.0; Transverse and longitudinal load factors = 1.5.
- On structures: Vertical load factor = 1.1; Transverse and longitudinal load factors = 1.0.
- Determine point loads according to tensions at final after creep.

6.6 *Failure Containment (Broken Wire) - Suspension Structures Only*

Failure containment loads are based on ASCE Manual No. 74, Guidelines for Electrical Transmission Line Loading.

Residual static loads are applied for failure containment. The residual static load is the wire load that remains at a wire support point after breakage or removal of a subconductor and/or ground wire.

For single circuit structures, any one ground wire or subconductor shall be considered broken or removed. For double circuit structures, both ground wires or any one ground wire and any one subconductor shall be considered broken or removed.

Broken wire loads for different support points shall be applied in the same direction.

Use the following criteria for failure containment loads:

- A 4 psf wind at 60ºF.
- For a broken subconductor on suspension structures, assume the residual static tension is equal to 70 percent of the subconductor tension.
- For overhead ground wires, assume the residual static tension is equal to 100 percent of the ground wire tension.
- Vertical, transverse, and longitudinal load factors equal 1.0.
- Deadload vertical structure overload factor of 1.1.
- Determine point loads according to final tensions.

6.7 *Camber Loads for Heavy Duty Steel Pole Structures - Deadend Structures Only*

Camber will not be used for this project.

7.0 Structure Design Criteria

7.1 *General*

Structures shall be designed in accordance with section 6.0 Structural Loading Criteria and the requirements of this section:

- **Suspension Structures.** Use intact loads (ahead and back spans attached to the structure) for all load cases except as provided in Failure Containment Loads (Broken Wire).
- **Deadend Structures.** Use all load cases, except Failure Containment Loads and Stringing Deadend Loads (since these will be less than the other deadend loads). Use intact loads and any or all wires in one span removed for each load case.
- **All Structures**. Structure heights shall be limited to 199 ft. For structures 200 ft or taller lighting and marking shall be provided in accordance with FAA requirements.

7.2 *Steel Pole Structures*

- Design structures in accordance with ASCE/SEI Standard 48 (2011), "Design of Steel Transmission Pole Structures". Perform a second order (geometrically nonlinear) elastic analysis.
- Deadend structures shall be self-supporting hollow tubular steel structures.
- Tangent structures shall be direct embed hollow tubular steel structures.
- Climbing and maintenance ladders shall be provided.
- All structures shall be base plated and anchor-bolted with steel reinforced concrete piers.
- Reference Appendix A: Steel Pole Design Criteria Memoranda

7.3 *Materials*

- Steel pole structure finishes shall be galvanized or metalized. Weathering steel shall not be used.
- Steel: ASTM A 36, ASTM A 572, ASTM A 633, ASTM A 871, or ASTM A 588. Specified yield strength shall not exceed 65 ksi.
- The minimum member thickness for steel poles is 3/16 inch. Hollow tubular steel and plates shall have a minimum longitudinal impact strength of 15 foot-pounds at minus 20 ⏩F as determined by the Charpy "V" Notch Impact Test in accordance with ASTM A 673.
- Connection Bolts:
  - Galvanized or Metalized Steel Pole Structures: ASTM A 325 or ASTM A 354 Grade BC.
  - Minimum bolt diameter shall be $^{5}/_{8}$ inch.
- Anchor Bolts for Heavy Duty Steel Poles: A 615, Grade 75 from 18J reinforcing bar. Anchor bolt material shall have minimum longitudinal impact strength of 15 foot-pounds at minus 20 ⏩F as determined by the Charpy "V" Notch Impact Test in accordance with ASTM A 673.
- Galvanized Structural Tubing: ASTM A 345 or ASTM A 501.

8.0 Foundation Criteria

Foundations for steel poles with base plates shall be drilled piers (steel reinforced concrete) unless soil conditions dictate otherwise. Refer to Appendix B, Foundation Design Criteria Memorandum, for drilled pier foundation design criteria.

3.

9.0 Hardware and Accessories

Hardware will be used to connect the OPGW and overhead ground wire to the structures, the conductor to the insulators and the insulators to the structures. Accessories consist of sleeves, splices, dampers, and spacers.

The following design criteria shall be followed:

- Hardware shall be suitable for hot line maintenance.
- Conductor deadends shall be made with compression fittings.
- Hardware and accessories shall be made from steel, malleable iron or aluminum.
- Steel and malleable iron fittings shall be galvanized after fabrication.
- Sleeves and splices shall develop the strength of the wire being spliced.
- Stockbridge dampers shall be used on 138 kV conductors.
- Spiral vibration dampers shall be used on OPGW and shield wire.
- The number and location of dampers shall be according to the conductor, shield wire, or OPGW manufacturers' recommendations.
- Per NESC Rule 277, NESC Heavy working loads without overload factors shall not exceed 50% of the SML strength of polymer suspension insulators or 50% of the SCL strength for polymer post insulators. Factored loads imposed from the other load cases shall not exceed the full SML/SCL insulator strengths.
- Per NESC Rule 260B1, factored loads shall not exceed the ultimate strength of hardware.

10.0 PLS-Cadd Modeling Criteria

The criteria file (.CRI) will contain information regarding weather conditions, load cases, sagging criteria, and information regarding line design checks.

Survey information will be provided by BLACK & VEATCH. All survey data will be collected in the Kansas Regional Coordinate System, and more specifically Zone 1, laying in Great Bend County. BLACK & VEATCH will provide a feature code file, coordinate information and photo imagery. The data received from B&V will include a PLS-CADD .xyz file, raw data text files, DXF background files, and ortho imagery files in both .ECW and .TIF formats.

Each structure will be identified by the mile number and structure number within that mile.

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LONG LEAD TIMES - BILL OF MATERIALS

	Mark #	Latest Issue	Stock/PO Number	QTY	Description	Cost Estimate					
						Structure Weight	Anchor Bolt Cage Weight (Conservative Estimate)	Units	Historic Price of Structural Steel	Historic Price of Anchor Bolt Cage	Total Price
STEEL POLE STRUCTURES	100			2	80 ft. Steel Poles, Deadend Structure	20086.6	3012.99	per lb	1.97	1.65	$44,542.04
	101			6	70 ft. Steel Poles, Tangent Structure	13461	2019.15	per lb	1.97	1.65	$29,849.77
	102			1	75 ft. Steel Poles, Tangent Structure	3647.5	547.125	per lb	1.97	1.65	$8,088.33
	103										
	104										
TRANSFORMERS	105			1	TL-MPT PVT Service Transfomer						
	106				138 kV						
	107				34.5 kV						
TURBINES	108			26	Vestas 2.0 MW						
	109			20	GE 2.52 MW						
SUBSTATION STEEL STRUCTURE	110			1	H - Frame Strcuture						

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Transmission Line Bill of Materials

	Mark #	Latest Issue	Stock/PO Number	QTY	Description	Model Total (ft)	2-3% contigency (ft)	ESTIMATED COST		
						From PLS-CADD model	For construction purposes	Units	Historic Price	Total Price
CONDUCTORS	100			24000 linear ft	Conductor, 795 KCM ASCR, 26/7 Strand ASCR "Drake"	18432	24000	per linear foot	$2.28	$54,720.00
CABLES	101			8100 linear ft	OPGW , Brugg 49AY85ACS-2C 0.591"	6193	8100	per linear foot	$2.64	$21,384.00
	102			1200 linear ft	Shield Wire , 3/8 7-Strand EHS Steel	897.9	1200	per linear foot	$0.73	$876.00
INSULATORS	**Braced Post Insulator Assembly (MacLean Power Systems, B291-XL Series) - 12 degree upswing - B291090AL99F**							**Braced Post Insulator Assembly (MacLean Power Systems, B291-XL Series)**		
	103			21	2.5 " Line Post Insulator			per piece	$227.79	$4,783.59
	104			21	25klb MX Suspension Insulator			per piece	$378.89	$7,956.69
	Braced Post Assembly							**Braced Post Assembly**		
HARDWARE	105		SA16	21	Eye Socket			per piece	incl. in suspension clamp assembly	N/A
	106			21	Suspension Clamp Assembly			per piece	$149.18	$3,132.78
	107		ARA795-26	42	Armor Rod			per piece	$31.01	$1,302.42
	108		AS25LBNK	42	Anchor Shackle			per piece	$20.64	$866.88
	109			42	Bolt, NACH SQ. W/SQ, NUT 7/8"			per piece	incl. in suspension clamp assembly	N/A
	110			42	Flat Round Washer, 7/8" Bolt			per piece	incl. in suspension clamp assembly	N/A
	111			21	Locknut, Galv SQ. Head 7/8"			per piece	incl. in suspension clamp assembly	N/A
	112		SYC-56	42	Y-Clevis Ball , Hot Line			per piece	$33.29	$1,398.18
	113			42	26 K Turnbuckle					
	Shield Wire DE Assembly							**Shield Wire DE Assembly**		
	114		ASH-66-BC	2	Anchor Shackle			per piece	$20.64	$41.28
	115		E4514,778T	2	Compression Deadend Assmebly Vertical Eye			per piece	$114.11	$228.22
	116		5174,43B	4	Jumper Terminal Compression 2 Hole Pad			per piece	$24.84	$99.36
	117									
	Post Jumper Assembly							**Post Jumper Assembly**		
	118		YCA	4	Single Conductor Jumper Support			per piece	$87.43	$349.72
	119		P250043S1020	4	Insulator			per piece		
	120		LN-G	4	Line Guard			per piece	$21.01	$84.04
	121			16	Bolt, NACH SQ. W/SQ, NUT 3/4"			per piece	incl. in post jumper assembly	N/A
	122			24	Flat Round Washer, 3/4" Bolt			per piece	incl. in post jumper assembly	N/A
	123			16	Locknut, Galv SQ. Head 3/4"			per piece	incl. in post jumper assembly	N/A
	OPGW DE Assembly							**OPGW DE Assembly**		
	124		ASH - 66 BC	42	Anchor Shackle			per piece	$20.64	$866.88
	125		CL - 6	21	Chain Link			per piece	$15.97	$335.37
	126		0DELP10	21	Link Plate 10"			per piece	$56.50	$1,186.50
	127		ODES590/599G10	21	Bolted Deadend			per piece		
	128		BWCU - 50H - 48	21	Copper Bonding Wire Assembly (3 to 4 ft)			per piece	$38.40	$806.40
	DE Strain Insulator Assembly							**DE Strain Insulator Assembly**		
	129		ASH - 66 - BC	42	Anchor Shackle			per piece	$20.64	$866.88
	130		SYC - 87	21	Y Clevis Socket, Hot Line			per piece	$40.03	$840.63
	131		SEDA5724SSAC	21	Compression Deadend Assembly w/Jumper Terminal - Oval Eye			per piece	$283.10	$5,945.10
	OPGW Suspension Assembly									
	132		SE - SC	21	Socket Eye					
	133		YCBS	21	Y - Clevis Ball					
	134		SFOSB - WP - 14	21	Shield Wire Support Bracket					
	135			21	Suspension Clamp Assembly					

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***************************************************************************
*                                                                         *
*                              PLS-POLE                                   *
*                    POLE AND FRAME ANALYSIS AND DESIGN                   *
*               Copyright Power Line Systems 1999-2020                    *
*                                                                         *
***************************************************************************
```

Project Name : 138kV, SC, Steel, 1-Pole, Polymer, Dead-End (Hvy Ang), Vert. Conf., Self-Supotng
Project Notes: Created Sept 2012
Project File : C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\cs18-2440_eng_089_1-1.pol
Date run : 10:21:11 AM Tuesday, February 23, 2021
by : PLS-POLE Version 16.51
Licensed to : Colorado School of Mines

Successfully performed nonlinear analysis

The model has 0 warnings.

Modeling options:
  Offset Arms from Pole/Mast: Yes
  Offset Braces from Pole/Mast: Yes
  Offset Guys from Pole/Mast: Yes
  Offset Posts from Pole/Mast: Yes
  Offset Strains from Pole/Mast: Yes
  Use Alternate Convergence Process: No
  Steel poles and tubular arms checked with ASCE/SEI 48-05

Soil Properties

Layer	Type	Thickness (ft)	Depth at Top of Layer (ft)	CU (psf)
1	Clay	2.00	0.00	
2	Clay	4.00	2.00	1000.0
3	Clay	4.00	6.00	750.0
4	Clay	22.00	10.00	750.0
5	Clay	13.00	32.00	3000.0
6	Clay	5.00	45.00	4500.0

Foundation Strength:

Run CAISSON Design and Analysis	Pier/Pole Diameter (ft)	Maximum Pole Diameter (ft)	Anchor Bolt Cage Diameter (ft)	Pier Reveal (ft)	Pier/Hole Depth (ft)	Rebar Type	Rebar Qty
Yes	7.000	3.716		2.00			

Project Name : 138kV, SC, Steel, 1-Pole, Polymer, Dead-End (Hvy Ang), Vert. Conf., Self-Supotng
Project Notes: Created Sept 2012
Project File : C:\Users\Public\Documents\PLS\pls_pole\PLS Pole BAK Files\Components\cs18-2440_eng_089_1-1.pol
Date run : 10:25:32 AM Tuesday, February 23, 2021
by : PLS-POLE Version 16.51
Licensed to : Colorado School of Mines

Successfully performed nonlinear analysis

The model has 0 warnings.

Loads from direct link to PLS-CADD

*** Analysis Results:

Maximum element usage is 51.11% for Steel Pole "pol" in load case "Stringing - FULL DE AHEAD-OW,L NA-"
Maximum insulator usage is 85.44% for Strain "I1B" in load case "INSULATOR-NESC MD-OW,L NA-"
Maximum foundation usage is 99.91% for Foundation Design "pol:g" in load case "Stringing - FULL DE AHEAD-OW,L NA-"
Maximum pole deflection usage is 13.41% for "pol" in load case "Deflection Limit DE-OW,L NA-"

Foundation Design Forces For All Load Cases:

Note: loads are factored.

Load Case	Foundation Description	Axial Force (kips)	Shear Force (kips)	Bending Moment (ft-k)	Foundation Usage %
NESC Medium (Rule 250B),L NA+	pol:g	22.33	4.76	312.98	96.35
NESC Medium (Rule 250B)-OW,L NA-	pol:g	22.34	6.84	431.32	96.23
NESC Light, (Rule 250B),L NA+	pol:g	20.91	8.36	440.08	90.14
NESC Light (Rule 250B)-OW,L NA-	pol:g	20.92	10.29	562.53	99.33
NESC Extreme Wind (Rule 250C),L NA+	pol:g	14.20	8.36	355.21	90.10
NESC Extreme Wind (Rule 250C)-OW,L NA-	pol:g	14.21	9.74	456.32	94.07
NESC Wind+Ice (Rule 250D),L NA+	pol:g	16.56	0.68	80.98	59.35
NESC Wind+Ice (Rule 250D)-OW,L NA-	pol:g	16.56	2.18	150.94	78.55
ASCE Extreme Wind,L NA+	pol:g	14.21	8.25	359.76	94.44
ASCE Extreme Wind-OW,L NA-	pol:g	14.22	9.64	461.40	93.08
50 mph Wind+Ice MD,L NA+	pol:g	17.04	2.52	158.35	90.71
50 mph Wind+Ice MD-OW,L NA-	pol:g	17.04	4.26	264.59	86.22
Heavy Ice MD,M NA+	pol:g	18.51	1.56	75.74	92.00
Uplift,L NA+	pol:g	14.33	8.44	551.29	90.99
Maintenance Load 3:1,L NA+	pol:g	14.56	1.10	106.38	65.17
Maintenance Load 3:1-OW,L NA-	pol:g	14.56	1.62	127.29	95.76
Deflection Limit DE,L NA+	pol:g	13.46	1.14	111.89	66.95
Deflection Limit DE-OW,L NA-	pol:g	13.46	1.41	121.99	83.24
Stringing - FULL DE AHEAD,L NA+	pol:g	12.68	25.30	1609.32	99.86
Stringing - FULL DE AHEAD-OW,L NA-	pol:g	12.68	25.31	1610.16	99.91
Stringing - FULL DE BACK,L NA+	pol:g	12.42	23.70	1448.87	96.98
Stringing - FULL DE BACK-OW,L NA-	pol:g	12.42	23.72	1449.44	97.06

Summary of Joint Support Reactions For All Load Cases (data omitted at user request)

Summary of Tip Deflections For All Load Cases (data omitted at user request)

Pole Deflection Usages For All Load Cases (data omitted at user request)

Tubes Summary (data omitted at user request)

*** Overall summary for all load cases - Usage = Maximum Stress / Allowable Stress

Summary of Steel Pole Usages (data omitted at user request)

*** Maximum Stress Summary for Each Load Case

Summary of Maximum Usages by Load Case:

Load Case	Maximum Usage %	Element Label	Element Type
NESC Medium (Rule 250B),L NA+	96.35	pol:g	Foundation Desi
NESC Medium (Rule 250B)-OW,L NA-	96.23	pol:g	Foundation Desi
NESC Light, (Rule 250B),L NA+	90.14	pol:g	Foundation Desi
NESC Light (Rule 250B)-OW,L NA-	99.33	pol:g	Foundation Desi
NESC Extreme Wind (Rule 250C),L NA+	90.10	pol:g	Foundation Desi
NESC Extreme Wind (Rule 250C)-OW,L NA-	94.07	pol:g	Foundation Desi
NESC Wind+Ice (Rule 250D),L NA+	59.35	pol:g	Foundation Desi
NESC Wind+Ice (Rule 250D)-OW,L NA-	78.55	pol:g	Foundation Desi
ASCE Extreme Wind,L NA+	94.44	pol:g	Foundation Desi
ASCE Extreme Wind-OW,L NA-	93.08	pol:g	Foundation Desi
50 mph Wind+Ice MD,L NA+	90.71	pol:g	Foundation Desi
50 mph Wind+Ice MD-OW,L NA-	86.22	pol:g	Foundation Desi
Heavy Ice MD,M NA+	92.00	pol:g	Foundation Desi
Uplift,L NA+	90.99	pol:g	Foundation Desi
Maintenance Load 3:1,L NA+	65.17	pol:g	Foundation Desi
Maintenance Load 3:1-OW,L NA-	95.76	pol:g	Foundation Desi
INSULATOR-NESC MD,L NA+	0.00	pol	Steel Pole
INSULATOR-NESC MD-OW,L NA-	0.00	pol	Steel Pole
Deflection Limit DE,L NA+	66.95	pol:g	Foundation Desi
Deflection Limit DE-OW,L NA-	83.24	pol:g	Foundation Desi
Stringing - FULL DE AHEAD,L NA+	99.86	pol:g	Foundation Desi
Stringing - FULL DE AHEAD-OW,L NA-	99.91	pol:g	Foundation Desi
Stringing - FULL DE BACK,L NA+	96.98	pol:g	Foundation Desi
Stringing - FULL DE BACK-OW,L NA-	97.06	pol:g	Foundation Desi

Summary of Steel Pole Usages by Load Case (data omitted at user request)

Summary of Foundation Design Usages:

Joint Label	Maximum Usage %	Load Case
pol:g	99.91	Stringing - FULL DE AHEAD-OW,L NA-

US Rebar Requirements for Foundation Designs:

Joint	----#4-----		----#5-----		----#6-----		----#7-----		----#8-----		----#9-----		---#10-----		---#11-----		---#14-----		---#18-----		---#18J----	
Label	Qty	Spacing (in)	Qty	Spacing (in)	Qty	Spacing (in)	Qty	Spacing (in)	Qty	Spacing (in)	Qty	Spacing (in)	Qty	Spacing (in)	Qty	Spacing (in)	Qty	Spacing (in)	Qty	Spacing (in)	Qty	Spacing (in)
pol:g	139	1.67	90	2.58	63	3.69	47	4.95	36	6.46	28	8.30	22	10.57	18	12.92	13	17.88	7	33.21	7	33.21

Summary of Insulator Usages (data omitted at user request)

*** Weight of structure (lbs):

Weight of Steel Poles:	9911.3
Weight of Strains:	132.0
Total:	10043.3

*** End of Report

*** Analysis Results for Load Case No. 22 "Stringing - FULL DE AHEAD-OW,L NA-" - Number of iterations in SAPS 12

Equilibrium Joint Positions and Rotations for Load Case "Stringing - FULL DE AHEAD-OW,L NA-":

Joint Label	X-Displ (ft)	Y-Displ (ft)	Z-Displ (ft)	X-Rot (deg)	Y-Rot (deg)	Z-Rot (deg)	X-Pos (ft)	Y-Pos (ft)	Z-Pos (ft)
pol:g	0	0	0	0.0000	0.0000	0.0000	0	0	0
pol:t	-0.2083	-2.088	-0.03669	2.6536	-0.2693	0.0874	-0.2083	-2.088	79.96
pol:gwa	-0.2049	-2.053	-0.03588	2.6529	-0.2692	0.0868	-0.2049	-2.053	79.21
pol:gwb	-0.2018	-2.022	-0.03515	2.6508	-0.2690	0.0864	-0.2018	-2.022	78.54
pol:i1a	-0.1539	-1.543	-0.02417	2.5066	-0.2557	0.0811	-0.1539	-1.543	67.98
pol:i1b	-0.151	-1.514	-0.02352	2.4929	-0.2544	0.0799	-0.151	-1.514	67.31
pol:i2b	-0.1096	-1.1	-0.01484	2.2162	-0.2261	0.0661	-0.1096	-1.1	57.32
pol:i2a	-0.1045	-1.049	-0.01385	2.1731	-0.2216	0.0647	-0.1045	-1.049	55.99
pol:i3b	-0.0739	-0.7429	-0.008327	1.8561	-0.1880	0.0499	-0.0739	-0.7429	47.32
pol:i3a	-0.06349	-0.6386	-0.006659	1.7234	-0.1740	0.0453	-0.06349	-0.6386	43.99
gwca:O	-0.209	-2.089	-0.02238	2.6536	-0.2693	0.0874	-0.8585	-1.714	79.98
gwcb:O	-0.209	-2.087	-0.01628	2.6536	-0.2693	0.0874	0.4406	-1.712	79.98
I1A:O	-0.1546	-1.545	-0.007604	2.5066	-0.2557	0.0811	-0.9515	-1.084	67.99
I2A:O	-0.1052	-1.051	0.003171	2.1731	-0.2216	0.0647	-1.049	-0.5056	56
I3A:O	-0.06404	-0.6397	0.00898	1.7234	-0.1740	0.0453	-1.156	-0.009491	44.01
I1B:O	-0.1547	-1.542	-0.0004904	2.5066	-0.2557	0.0811	0.6422	-1.082	68
I2B:O	-0.1052	-1.049	0.01047	2.1731	-0.2216	0.0647	0.839	-0.5035	56.01
I3B:O	-0.06405	-0.638	0.01561	1.7234	-0.1740	0.0453	1.028	-0.007764	44.02

Foundation Designs for Load Case "Stringing - FULL DE AHEAD-OW,L NA-":

Joint Label	Applied Shear (kips)	Soil Shear Capacity (kips)	Soil Shear Usage (%)	Applied Moment (ft-k)	Soil Moment Capacity (ft-k)	Soil Moment Usage (%)	End Bearing Pressure: Applied Axial (ksf)	Pier Weight (ksf)	Total (ksf)	Soil Strength (ksf)	Soil Usage (%)	Pier Design: Diam. (ft)	Embed. Depth (ft)	Length (ft)	Rebar Type	Rebar Qty	Rebar Spacing (in)	Steel Area (%)	Weight (kips)	Max. Shear (kips)	Max. Moment (ft-k)	Moment Capacity (ft-k)	Moment Usage (%)	Max. Usage (%)
pol:g	25.31	25.52	99.2	1610.16	1611.54	99.9	0.33	2.50	2.83	6.00	47.2	7.00	14.50	16.50	(see tables)			0.50	96.33	277.74	1719.42	4246.71	40.5	99.91

Joint Support Reactions for Load Case "Stringing - FULL DE AHEAD-OW,L NA-":

Joint Label	X Force (kips)	X Usage %	Y Force (kips)	Y Usage %	H-Shear Usage %	Z Force (kips)	Comp. Usage %	Uplift Usage %	Result. Force (kips)	Result. Usage %	X Moment (ft-k)	X-M. Usage %	Y Moment (ft-k)	Y-M. Usage %	H-Bend-M Usage %	Z Moment (ft-k)	Z-M. Usage %	Max. Usage %
pol:g	2.68	0.0	25.17	0.0	0.0	-12.68	0.0	0.0	28.31	0.0	-1602.07	0.0	161.2	0.0	0.0	-18.62	0.0	99.9

Detailed Steel Pole Usages for Load Case "Stringing - FULL DE AHEAD-OW,L NA-":

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Trans. Defl. (in)	Long. Defl. (in)	Vert. Defl. (in)	Trans. Mom. (Local Mx) (ft-k)	Long. Mom. (Local My) (ft-k)	Tors. Mom. (ft-k)	Axial Force (kips)	Tran. Shear (kips)	Long. Shear (kips)	P/A (ksi)	M/S. (ksi)	V/Q. (ksi)	T/R. (ksi)	Res. (ksi)	Max. Usage %	At Pt.
pol	pol:t	Origin	0.00	-25.05	-2.50	-0.44	0.36	0.08	1.4	-0.63	-7.74	0.69	-0.04	0.01	0.89	0.10	1.72	2.6	5
pol	pol:gwa	End	0.75	-24.64	-2.46	-0.43	-5.45	0.59	1.4	-0.63	-7.74	0.69	-0.03	0.09	0.88	0.10	1.69	2.6	5
pol	pol:gwa	Origin	0.75	-24.64	-2.46	-0.43	-5.45	0.59	1.4	-0.67	-7.74	0.69	-0.04	0.09	0.88	0.10	1.69	2.6	5
pol	pol:gwb	End	1.42	-24.26	-2.42	-0.42	-10.64	1.05	1.4	-0.67	-7.74	0.69	-0.04	1.23	0.62	0.10	1.78	2.7	3
pol	pol:gwb	Origin	1.42	-24.26	-2.42	-0.42	-10.64	1.05	1.4	-0.85	-7.75	0.70	-0.05	1.23	0.62	0.10	1.78	2.7	3
pol	Tube 1	End	6.42	-21.51	-2.15	-0.36	-49.38	4.57	1.4	-0.85	-7.75	0.70	-0.04	6.07	0.22	0.08	6.14	9.4	2
pol	Tube 1	Origin	6.42	-21.51	-2.15	-0.36	-49.38	4.57	1.4	-1.12	-7.76	0.72	-0.06	6.07	0.22	0.08	6.15	9.5	2
pol	Tube 1	End	9.21	-20.00	-2.00	-0.32	-71.03	6.59	1.4	-1.12	-7.76	0.72	-0.05	7.95	0.21	0.08	8.02	12.3	2
pol	Tube 1	Origin	9.21	-20.00	-2.00	-0.32	-71.03	6.59	1.4	-1.33	-7.77	0.74	-0.06	7.95	0.21	0.08	8.03	12.4	2
pol	pol:i1a	End	12.00	-18.52	-1.85	-0.29	-92.70	8.65	1.4	-1.33	-7.77	0.74	-0.06	9.48	0.20	0.07	9.56	14.7	2
pol	pol:i1a	Origin	12.00	-18.52	-1.85	-0.29	-92.33	9.10	6.4	-2.04	-13.61	1.48	-0.09	9.46	0.36	0.33	9.63	14.8	2
pol	pol:i1b	End	12.67	-18.16	-1.81	-0.28	-101.45	10.09	6.4	-2.04	-13.61	1.48	-0.09	10.18	0.35	0.32	10.34	15.9	2