Design & Wind Stability Analysis Of Horizontal Vee Assemblies

Panel Session PN23 Thursday April 24 8-12 am

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HORIZONTAL VEE LOADING.

Case No 1: Transverse Load "H" Due to Wind and or Line Angle Acting Towards Structure.

Load in Strut = "Y"

 $Y = -\frac{V \times \cos (\dot{\alpha} - \beta)}{\sin \dot{\alpha}} + -\frac{H \times \sin (\dot{\alpha} - \beta)}{\sin \dot{\alpha}}$

Load in Suspension = "X"

$$X = + \frac{V \cos \beta}{\sin \alpha} - \frac{H \sin \beta}{\sin \alpha}$$

HORIZONTAL VEE LOADING.

Case No 2: Transverse Load "H" Due to Wind and or Line Angle Acting Away From Structure.

Load in Strut = "Y"

 $Y = -\frac{V x \cos{(\alpha - \beta)}}{\sin{\alpha}} + \frac{H x \sin{(\alpha - \beta)}}{\sin{\alpha}}$

Load in Suspension = "X"

 $X = + \frac{V \cos \beta}{\sin \alpha} + \frac{H \sin \beta}{\sin \alpha}$













HORIZONTAL VEE STABILITY

T = (W Sinθ + H Cosθ) Tan ω

If $(W \sin\theta + H \cos\theta) > 0$ Assembly & System Are Stable.

If $(W \sin\theta + H \cos\theta) < 0$ System Stability is Dependent On

Line Parameters.

Horizontal Vee Wind Stability Analysis.

Computer program developed to evaluate system parameters.

Original program developed under EPRI Project No. 561. for determining longitudinal loads imposed on transmission line systems under broken conductor and/or unequal ice loading. (BRODI 1)

BRODI 1 program was modified to consider longitudinal loads caused by transverse wind loading on transmission line systems supported by Horizontal Vee insulator assemblies.

Line Parameters	<u>Horizontal Vee</u> <u>Ass'y Parameters</u>	Wind Load Input		
*Conductor =	Effective Length =	*Base Wind		
Weight =	Weight =	Magnitude		
Diameter =	Hinge angle =	Direction (15 Degrees)		
Area =	Projected Area =	*Gust Wind (Not Used)		
Modulus of Elasticity =		Magnitude		
Coefficient of Expansion =		Direction		
Number Of Conductors =				
Line Tension =				
*Span Lengths				
Number Of Spans =				
Angle effects				

Slide 17

MSOffice1 posed







DATA FILE A	:OG2.dat	CONTAINS '	THE FOLLOWING:		
Title: Moul	trie - N	Tifton 23	0/115 kV Line Se	ct2	
Number of to Area of com Bffective m Coeffecient Initial ten Effective in Bffective in	owers: 3 ductor = odulus = of linea sion = 98 nsulator nsulator	7 1.196 sq. 1.02E+07 p ar expansio 300 lbs.at length = 4 area = 290	in. Wei psi Dia on = .0000108 in temperature = 9 8.092 ft. Ins 6.64 sq. in. Hin	ber of spans: 38 ght of conductor meter of conduct /in./deg. F 0 deg. F ulator weight = ge angle = 25 de	= 1.737 lb./ft or = 1.424 in. 350 lbs. g.
Tor	wer #	Span #	Span length	Wind angle	Tower angle
	DR				
		1	702	15	
	1	2			0
	-	2	780	15	-
	2	-	-		0
	-	3	620	15	-
	3	2	-		0
		4	780	15	
4	1	-	-	-	0
		5	720	15	-
5	5	-	-	-	0
		6	600	15	-
6	5	-	-	-	0
		7	730	15	-
3	7	-	1.72		0
		8	730	15	-
8	3	-	-	-	0
		9	670	15	-
	2	-	-		0
5		10	750	15	-
2					0

Output File /4 MIPH							
		Moultrie	- N.Tifto	on 230/115	kV Line	Sect2	
	FINAL	DISPLACEM	IENTS AND	LOADS FOR	BASE WIN	D OF 74 MPH	I.
WIRE	TENSION	L. WIND	T. WIND	L. FORCE	WEIGHT	INSULATOR	DEGREE
1	11.718	0.003	1.042	0.000	0.618	1	-0.04
2	11.716	0.003	0.985	0.002	0.588	2	-0.31
3	11.714	0.003	0.985	0.001	0.588	3	-0.19
4	11.714	0.003	1.055	0.003	0.625	4	-0.47
5	11.714	0.003	0.928	0.004	0.559	5	-0.56
7	11 714	0.003	0.935	0.003	0.562	6	-0.41
8	11 715	0.003	0.995	0.004	0.610	6	-0.53
9	11.716	0.003	0.985	0.005	0.586	9	-0.68
10	11.716	0.003	1.055	0.006	0.625	10	-0.81
11	11.719	0.003	0.950	0.006	0.570	11	-0.98
12	11.722	0.003	0.928	0.005	0.559	12	-0.82
13	11.725	0.003	1.090	0.007	0.643	13	-0.91
10000		0 004	1 217	0 012	0 710	14	1 22

		Moultrie	- N.Tifto	on 230/115	kV Line	Sect2		
	FINAL	DISPLACEM	IENTS AND	LOADS FOR	BASE WIN	D OF 75 MPH	r	
MTDD	THE TON							
WIRE	TENSION	L. WIND	T. WIND	L. FORCE	WEIGHT	INSULATOR	DEGREES	
1	11.197	0.003	1.071	0.006	0.618	1	-0.75	
2	11.207	0.004	1.011	0.014	0.588	2	-1.91	
3	11.197	0.003	1.011	0.017	0.588	3	-2.31	
4	11.228	0.004	1.084	0.028	0.625	4	-3.44	
5	11.243	0.003	0.954	0.029	0.559	5	-4.22	
6	11.252	0.003	0.961	0.031	0.562	6	-4.51	
7	11.292	0.003	1.055	0.041	0.610	7	-5.28	
8	11.326	0.003	1.011	0.044	0.588	8	-6.00	
9	11.358	0.003	1.026	0.049	0.596	9	-6.43	
10	11.405	0.003	1.084	0.058	0.625	10	-7.15	
11	11.453	0.003	0.975	0.056	0.570	11	-7.80	
12	11.493	0.003	0.954	0.055	0.559	12	-7.89	
13	11.547	0.003	1.120	0.069	0.643	13	-8.29	
14	11.614	0.004	1.250	0.086	0.710	14	-9.08	
15	11.692	0.004	1.002	0 074	0 584	15	-10 09	

















Horizontal Vee Stability Analysis.

For further information on this subject refer to IEEE paper 81 TD 711-1 presented at IEEE PES 1981 Transmission and Distribution Conference and Exposition, Minneapolis, Minnesota, September 20 – 25, 1981.