

## **CALCULATION OF LOADS FOR 220 KV D/C MONOPOLE OF TYPE "2P3/DE (0 - 15deg)"**

### **INPUT DATA:**

1. Wind pressure on Conductors in Kg/Sq.m .	[ Pc ] =	106.5
2. Wind pressure on Ground wire in Kg/Sq.m	[ Pgw ] =	133
3. Wind pressure on Insulator Kg/Sq.m	[ Pi ] =	133.5

4. Wind span in mtrs for NC	[ WSNC ] =	120
5. Wind span in mtrs for BWC	[ WSBWC ] =	100
6. Weight Span in mtrs for NC (max).	[ W1 ] =	256
7. Weight Span in mtrs for NC (min).	[ W2 ] =	-256
8. Weight Span in mtrs for BWC (max).	[ W3 ] =	154
9. Weight Span in mtrs for BWC (min) .	[ W4 ] =	-154

10. Power Conductor Used.	<b><u>AAAC MOOSE</u></b>
11. Diameter of Conductor in mtrs.	[ Dc ] = 0.03195
12. Weight of Conductor in Kg/m .	[ Wc ] = 1.666
13. Number of Conductor.	[ Nc ] = 1
14. Tension of Coductor at 32 deg.C & FW .	[ CT1 ] = 5213
15. Tension of Coductor at 32 deg.C & NW .	[ CT2 ] = 4074

16. Ground Wire Used.	<b><u>48F OPGW</u></b>
17. Diameter of Ground Wire in mtrs.	[ Dgw ] = 0.0122
18. Weight of Ground wire in Kg/m.	[ Wgw ] = 0.451
19. Tension of Ground Wirer at 32 deg.C & FW .	[ GT1 ] = 1263
20. Tension of Ground Wirer at 32 deg.C & NW.	[ GT2 ] = 456

21. No.of Insulator Strings.	[ NI ] = 2
22. Length of Insulator String in Mtrs.	[ LI ] = 3.35
22. Diameter of the Insulator in Mtrs.	[ DI ] = 0.255
23. Weight of Insulator String in Kg. (Max).	[ Wimax ] = 300
25. Weight of Insulator String in Kg. (Min).	[ Wimin ] = 150

26. Angle of Deviation in degrees.	[ THETA ] = 15
27. Angle of Deviation in Radians.	[ THETA ] = 0.261799

28. Angle of Wind Direction (θ) in deg	[THEETA]= 0
29. Angle of Wind Direction (θ) in radians	[THEETA]= 0

## I. RELIABILITY REQUIREMENT

### A. TRANSEVERSE LOADS.

#### POWER CONDUCTOR

a) Wind on conductor $[P_c \cdot \sin^2 \Omega \cdot W_{SNC} \cdot DC] \cdot N_c$	=	408	
b) Wind on Insulators $[P_i \cdot L_i \cdot D_i \cdot N_i \cdot 0.5] \cdot \cos(\theta)$	=	114	
c) Due to Deviation $[1 \cdot CT1 \cdot \sin(\theta)] \cdot N_c$	=	1349	
		1872	

#### GROUND WIRE.

a) Wind on Ground wire $[P_{gw} \cdot \sin^2 \Omega \cdot W_{SNC} \cdot D_{gw}]$	=	195	
c) Due to Deviation $[1 \cdot GT1 \cdot \sin(\theta)]$	=	327	
		522	

### B. LONGITUDINAL LOADS

a) CONDUCTOR $[CT1 \cdot \cos(0)]$	=	5213	
b) Wind on Insulators $[P_i \cdot L_i \cdot D_i \cdot N_i \cdot 0.5] \cdot \sin(\theta)$	=	0	
		5213	

a) GROUND WIRE $(1 \cdot GT1 \cdot \cos(0))$	=	1263	
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### C. VERTICAL LOADS.

#### CONDUCTOR

		<u>Max.</u>	<u>Min.</u>
a) Weight of Conductor $[W_c \cdot W1, W_c \cdot W2] \cdot N_c$	=	426	-426
b) Weight of Insulator string $[W_{lmax}, W_{lmin}] \cdot N_i$	=	600	300
		1026	-126

#### GROUND WIRE

a) Wght. of Ground Wire $[W_{gw} \cdot W1, W_{gw} \cdot W2]$	=	115	-115
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## **II SECURITY REQUIREMENTS**

### **A. TRANSEVERSE LOADS.**

#### **CONDUCTOR**

		<b><u>BRKN</u></b>	<b><u>INTACT</u></b>
a) Wind on conductor $[P_c * WSNC / WSBWC * DC] * N_c$	=	340	408
b) Wind on Insulators $[P_i * L_i * D_i * N_i * 0.5]$	=	114	114
c) Due to Deviation $[1 * CT_1 * \sin(\theta)] * N_c$	=	0	1349
		454	1872

#### **GROUND WIRE**

a) Wind on Ground wire $[P_{gw} * WSNC / WSBWC * D_{gw}]$	=	162	195
b) Due to Deviation $[1 * GT_1 * \sin(\theta)] * N_i$	=	0	327
		162	522

### **B. LONGITUDINAL LOADS**

a) CONDUCTOR $[CT_1 * \cos(\theta)]$	=	0	5213
b) GROUND WIRE $[GT_1 * \cos(\theta)]$	=	0	1263

### **C. VERTICAL LOADS.**

#### **CONDUCTOR.**

		<b><u>MAX.</u></b>	<b><u>MIN.</u></b>
a) Weight of Conductor $[W_c * W_3 / W_1, W_c * W_4 / W_2] * N_c$	=	257	-257
b) Weight of Insulator string $[W_{lmax}, W_{lmin}] * N_i$	=	600	300
		857	43

#### **GROUND WIRE**

a) Weight of Ground wire $[W_{gw} * W_3, W_{gw} * W_4]$	=	69	-69
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### III. SAFETY REQUIREMENT (NORMAL CONDITION)

#### A. TRANSEVERSE LOADS.

##### POWER CONDUCTOR

a) Wind on conductor $[0 * WSNC * DC] * Nc$	=	0	
b) Wind on Insulators $[0 * LI * DI * NI * 0.5] * COS(\theta)$	=	0	
c) Due to Deviation $[1 * CT2 * SIN(THETA)] * Nc$	=	1054	
		<hr/>	
		1054	
		<hr/>	

##### GROUND WIRE.

a) Wind on Ground wirer $[Pgw * SIN^2\Omega * WSNC * Dgw]$	=	0	
c) Due to Deviation $[1 * GT2 * SIN(THETA)]$	=	118	
		<hr/>	
		118	
		<hr/>	

#### B. LONGITUDINAL LOADS

a) CONDUCTOR $[CT2 * COS(0)]$	=	4074	
a) GROUND WIRE $[GT2 * COS(0)]$	=	456	

#### C. VERTICAL LOADS.

##### CONDUCTOR.

		<u>MAX.</u>	<u>MIN.</u>
i) Weight of Conductor $[2 * Wc * W1, 2 * Wc * W2] * Nc$	=	853	-853
ii) Weight of Insulator $[Wimax * NI * 2]$	=	1200	1200
iii) Weight of line man with tools.	=	150	0
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		2203	347
		<hr/>	

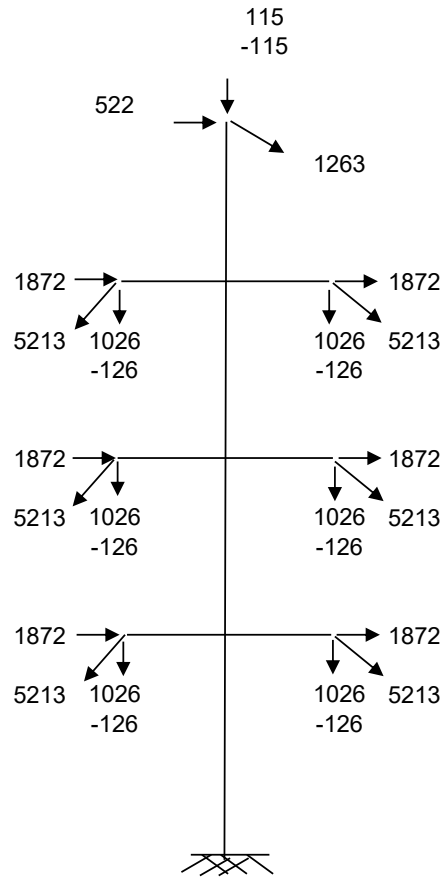
##### GROUND WIRE.

ii) Weight of Ground Wire $[Wgw * W3 * 2, Wgw * W1 * 2]$	=	231	-231
iii) Weight of line man with tools.	=	150	0
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		381	-231
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**LOADING TREES FOR 220 KV D/C MONOPOLE OF TYPE "2P3/DE (0 - 15deg)"**

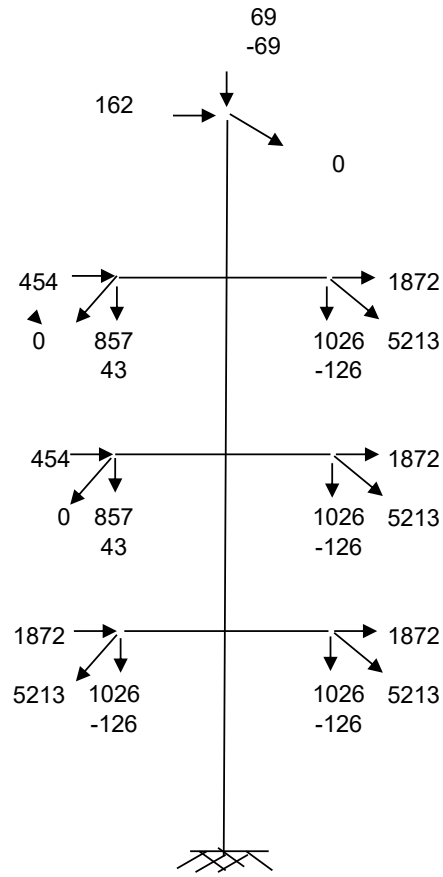
**(ANGLE OF DEVIATION: 15 Deg & WIND ANGLE: 0 Deg)**

**1 - RELIABILITY CONDITION**

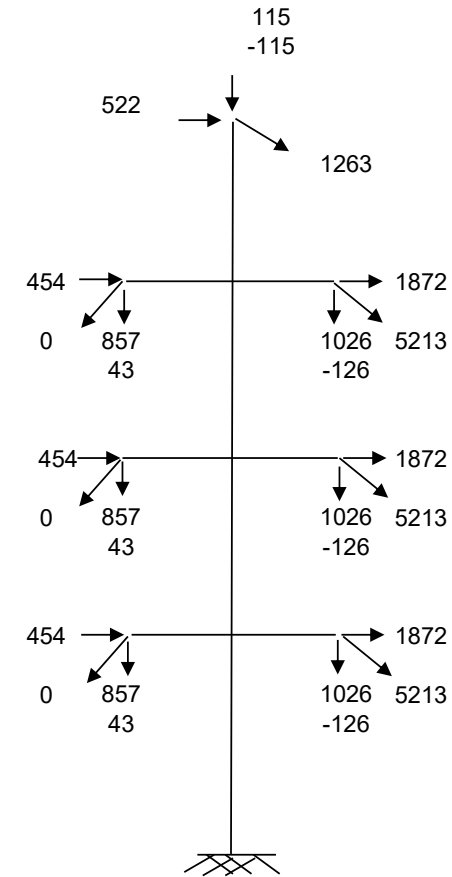


**NORMAL CONDITION**

**2 - SECURITY CONDITION**



**1GW+ 2PC BROKEN CONDITION**

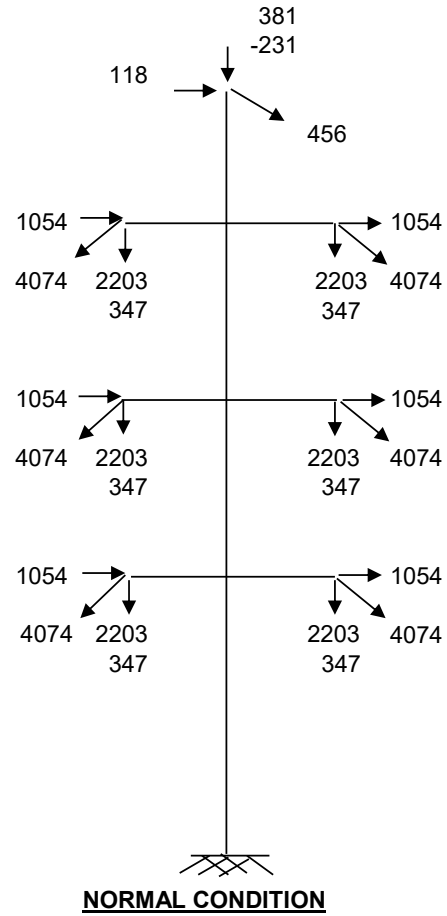


**3PC BROKEN CONDITION**

### LOADING TREES FOR 220 KV D/C MONOPOLE OF TYPE "2P3/DE (0 - 15deg)"

**(ANGLE OF DEVIATION: 15 Deg & WIND ANGLE: 0 Deg)**

### 3 - SAFETY CONDITION



### NORMAL CONDITION