$$D = (6.78 \times P \times H^3)/ (E \times d_g^3 \times d_t)$$ **Equation-9.4**

Where: D = Deflection in inches
P = Load in pounds
H = Height of pole from ground line to the point where the load is applied
E = Modulus of Elasticity
d_g = Diameter of pole at ground level line
d_t = Diameter of pole at the point where load is applied

Table- 9.12
Deflection of SYP Pole for 150 feet span

(Md. Mozibur Rahman)
Consultant, TAPP, BREB

(Md. Nozammel Huq)
Consultant, TAPP, BREB

(Md. Abdul Khaleque)
Consultant TAPP, BREB

৬২১ তম বোর্ড সভায় অনুমোদিত সিদ্ধান্ত নং ১৭৭০০

(Md. Ahsanul Haque)
Consultant, TAPP BREB

(Debasish Chakraborty)
PD, TAPP, BREB

(Kamrul Ahsan Mollik)
Asst. Secy. (Board), BREB

Item No. & Pole Size	Moment due to wind on pole for Grosbeak & Mallard ft-lbs	BM at GL for Transverse load for Grosbeak	BM at GL for Transverse load for Mallard	BM at GL for Transverse & wind load for Grosbeak ft-lbs	BM at GL for Transverse & wind load for Mallard ft-lbs	Allowable pole deflection in inch	Total load for Grosbeak, P	H for Grosbeak in inch	Total load for Mallard, P	H for Mallard in inch	Pole deflection for Grosbeak in inch	Pole deflection for Mallard in inch
1	2	3	4	5	6	7	8	9	10	11	12	13
R-43; 35′-N6	2241.98	10171	11402	12412	13643.5	12.344	465.64	319.88	521.33	314	11.645	12.34
R-44; 35′-N5	2459.5	10171	11402	12630	13861.1	11.030	467.37	324.28	523.06	318	8.6121	9.089
R-45; 40′-N5	3587.7	12406	13916	15994	17503.6	12.210	472.88	405.87	528.57	397	11.362	11.92
R-46; 40′-N4	3771.7	12406	13916	16178	17687.6	14.053	473.79	409.76	529.48	401	10.786	11.29
R-47; 45′-N4	4913.6	14419	16179	19332	21092.4	18.744	477.98	485.35	533.67	474	16.254	16.93
R-48; 50′-N4	6226.6	16431	18442	22658	24668.4	23.948	482.33	563.70	538.02	550	23.164	24.03
R- ; 55′-N3	8343.0	18443	20705	26786	29047.6	27.103	489.98	656.02	545.67	639	24.902	25.60
R-49; 60′-N2	10890	20456	22968	31346	33857.9	30.481	498.37	754.77	554.06	733	26.879	27.41
35′-N4	2677.0	10171	11402	12847	14078.6	10.023	469.10	328.65	524.79	322	6.5427	6.879
35′-N3	2896.1	10171	11402	13067	14297.7	9.166	470.85	333.01	626.54	326	5.066	5.307
40′-N3	4070.6	12406	13916	16477	17986.5	13.055	475.81	415.55	531.50	406	8.5106	8.872
40′-N2	4369.6	12406	13916	16776	18285.5	12.188	477.84	421.29	533.53	411	6.8364	7.101
45′-N3	5327.7	14419	16179	19746	21506.5	16.85	480.54	493.10	536.23	481	12487	12.96
45′-N2	5708.7	14419	16179	20127	21887.5	15.907	482.82	500.25	538.51	488	10.171	10.51
50′-N3	6740.0	16431	18442	23171	25181.7	21.763	485.17	573.10	540.86	559	18.042	18.63
50′-N2	7253.3	16431	18442	23684	25695.0	19.931	488.01	482.39	543.70	567	14.34	14.75
55′-N2	8988.6	18443	20705	27412	29673.3	24.991	493.11	667.08	548.80	649	19.977	20.46
60′-N2	10890	20456	22968	31346	33857.9	30.481	498.37	754.77	554.06	733	26.879	27.41

Table- 9.13
Deflection of SYP Pole for 200 feet span

(Md. Mozibur Rahman)
Consultant, TAPP, BREB

(Md. Duhidul Islam)
Consultant, TAPP, BREB

(Md. Mozammel Huq)
Consultant, TAPP, BREB

(Md. Abdul Khaleque)
Consultant, TAPP, BREB

(Md. Ahsanul Haque)
Consultant TAPP BREB

(Debasish Chakraborty)
PD, TAPP, BREB.

(Kamrul Ahsan Mollik)
Asst. Secy. (Board), BREB.

৬২১ তম বোর্ড সভায় অনুমোদিত সিদ্ধান্ত নং ১৭৭০০

Item No. & Pole Size	Moment due to wind on pole for Grosbeak & Mallard ft-lbs	BM at GL for Transverse load for Grosbeak	BM at GL for Transverse load for Mallard	BM at GL for Transverse & wind load for Grosbeak ft-lbs	BM at GL for Transverse & wind load for Mallard ft-lbs	Allowable pole deflection in inch	Total load for Grosbeak, P	H for Grosbeak in inch	Total load for Mallard, P	H for Mallard in inch	Pole deflection for Grosbeak in inch	Pole deflection for Mallard in inch
1	2	3	4	5	6	7	8	9	10	11	12	13
R-43; 35′-N6	2241.98	13302	14943	15544	17185	12.344	603.00	309.33	677.25	305	13.637	14.61
R-44; 35′-N5	2459.5	13302	14943	25762	17403	11.030	604.73	312.76	678.98	308	9.9976	10.68
R-45; 40′-N5	3587.7	16225	18237	19812	21825	12.210	610.24	389.60	684.49	283	12.969	13.78
R-46; 40′-N4	3771.7	16225	18237	19996	22009	14.053	611.15	392.64	685.40	385	12.241	12.98
R-47; 45′-N4	4913.6	18855	21202	23769	26116	18.744	615.34	463.53	689.59	454	18.228	19.25
R-48; 50′-N4	6226.6	21486	24167	27712	30393	23.948	619.69	536.63	693.94	526	25.676	27.01
R- ; 55′-N3	8343.0	24116	27131	32459	35474	27.103	627.34	620.89	701.59	607	27.03	28.21
R-49; 60′-N2	10890	26747	30096	37637	40986	30.481	635.73	710.43	709.98	693	28.593	29.61
35′-N4	2677.0	13302	14943	15979	17620	10.023	606.46	316.18	680.71	311	7.5316	8.02
35′-N3	2896.1	13302	14943	16198	17840	9.166	608.21	319.59	682.46	314	5.7841	6.14
40′-N3	4070.6	16225	18237	20295	22308	13.055	613.17	397.19	687.42	389	9.5768	10.12
40′-N2	4369.6	16225	18237	20594	22607	12.188	615.20	401.71	789.45	393	7.6303	8.036
45′-N3	5327.7	18855	21202	24183	26530	16.845	617.90	469.55	692.15	460	13.872	14.60
45′-N2	5708.7	18855	21202	24564	26911	15.907	620.18	475.29	694.43	465	11.205	11.75
50′-N3	6739.96	21486	24167	28226	30907	21.763	622.53	544.08	696.78	532	19.808	20.76
50′-N2	7253.28	21486	24167	28739	31420	19.931	625.37	551.46	699.62	539	15.602	16.29
55′-N2	8968.64	24116	27131	33085	36100	24.991	630.47	629.72	704.72	615	21.486	22.34
60′-N2	10890.4	26747	30096	37637	40986	30.481	635.73	710.43	709.98	693	28.593	29.61

Each cell of column-7 is higher than column-12 or column-13 for 150 ft. span i.e. Grosbeak or Mallard is okay for 150 ft span. For 200 ft. span R-43 is not suitable for Mallard. All other pole are okay for both Grosbeak & Mallard conductor as regard for deflection which is within the tolerable range.

10. Angle Structure or Angle Pole

When survey is conducted to select the route for construction of distribution or transmission line, for various reason the line route is not straight and line angle is required. When there is

(Md. Mozibur Rahman)
Consultant, TAPP, BREB

(Md. Duhidul Islam)
Consultant, TAPP, BREB

(Md. Mozammel Huq)
Consultant, TAPP, BREB

(Md. Abdul Khaleque)
Consultant, TAPP, BREB

(Md. Ahsanul Haque)
Consultant, TAPP, BREB

(Debasish Chakraborty)
PD, TAPP, BREB

(Kamrul Ahsan Mollik)
Asst. Secy. (Board), BREB

৬২১ তম বোর্ড সভায় অনুমোদিত সিদ্ধান্ত নং ১৭৭০০

line angle the horizontal tension of the conductor of both side of the pole are not in line, thus not balance by themselves and make a resultant pull inward of the angle. It then forms the case of cantilever beam and tends to deflect or break the pole. This may also be happened due to deadends, long spans, slack spans, changing of conductors or changing of ruling spans. Guys and anchors are generally used to take the pull of the conductor.

For angles between 10 and 45 degrees, bisector guys are generally used. Above 45 degrees and for double deadends head & back guys are used. For large angle structures, the transverse load due to conductor's tension is a heavy permanent load, so, head & back guys will be more effective.

Guys and anchors are used at deadends, angle, long spans where pole strength is exceeded or unbalanced conductor tension condition e.g. for changing of ruling span or slack span and where the soil condition is not good.

To determine the resultant conductor tension at the point of conductor attachment due to line angle and wind loading, the resultant conductor tension for each conductor at the point of conductor attachment due to line angle and wind load on each conductor are to be calculated. So the total tension due to line angle and due to wind for each conductor can be calculated by the equation given below-

$$R = (2T(\text{Sin}(\text{Ø}/2))\ F_c + W_c(\text{Cos}(\text{Ø}/2))F_w((S_1 + S_2)/2) \qquad \text{Equation- 10.1}$$

Where: R = Resultant tension of each conductor due to angle at the point of conductor attachment in

T = Maximum design tension on each conductor in lns.

Ø = Line angle.

(Md. Mozibur Rahman) Consultant, TAPP, BREB

(Md. Duhidul Islam) Consultant, TAPP, BREB

(Md. Mozammel Huq) Consultant, TAPP, BREB

(Md. Abdul Khaleque) Consultant, TAPP, BREB

৬২১ তম বোর্ড সভায় অনুমোদিত সিদ্ধান্ত নং ১৭৭০৫

(Md. Ahsanul Haque) Consultant TAPP BREB

(Debasish Chakraborty) PD, TAPP, BREB

(Kamrul Ahsan Molla) Asst. Secy. (Board), BREB

W_c = Wind loading on conductor in lbs/fr^2

S_1 = Back span in ft.

S_2 = Forward span in ft.

F_c = OCF for conductor tension.

F_w = OCF for wind load.

The tension of each conductor is to be balanced or overcome by installing guy. To determine the pull on the guy wire, the horizontal pull on the guy is to be determined which can be calculated by taking moment about ground line. Following equation is used to determine the horizontal pull on guy attachment-

$$\mathbf{P_{GH} = ((R_A \times H_A + R_B \times H_B + R_C \times H_C + R_{OG} \times H_{OG})/H_{GA})} \qquad \textbf{Equation- 10.2}$$

Where: P_{GH} = Horizontal pull on guy attachment due to line angle and wind load for all conductor and OHGW

H_A = Height from ground line to the attached point of conductor A at pole

H_B = Height from ground line to the attached point of conductor B at pole

H_C = Height from ground line to the attached point of conductor C at pole

H_{OG} = Height from ground line to the attached point of OHGW at pole

H_{GA} = Height from ground line to the attached point at pole

Wind load on pole may also act along the direction of the resultant tension of conductor. The resultant wind load at pole and the point of acting the wind load may have from Table- 9.1A or 9.1B Column- 8 & 9 for SPC pole and Table- 9.8 column-9 for SYP pole. This will be found by the following equation-

$$\mathbf{P_{WP} = ((M_P \times F_W)/H_{GA})} \qquad \textbf{Equation- 10.3}$$

(Md. Mozibur Rahman) Consultant, TAPP, BREB

(Md. Dunidul Islam) Consultant, TAPP, BREB

(Md. Mozammel Huq) Consultant, TAPP, BREB

(Md. Abdul Khaleque) Consultant, TAPP, BREB

(Md. Ahsanul Haque) Consultant, TAPP, BREB

(Debasish Chakraborty) PD, TAPP, BREB

(Kamrul Ahsan Mollik) Asst. Secy. (Re...

৬২১ তম বোর্ড সভায় অনুমোদিত সিদ্ধান্ত নং ১৭৭০০