

POWERGRID CORPORATION OF INDIA LTD.

THIS DRAWING IS ALSO TO BE USED FOR 400 KV S/C
VINDHYACHAL-PARTABPUR -KORBA TRANS. LINE AGAINST
SPECN. NO. C-32107-L195A-3 (PACKAGE-A1) & C-32108-L195A-3
(PACKAGE-A2)

अभियंत्रिकी / पारिषण लाईन / पावरग्रिड
ENGG.-TL POWERGRID
निर्माण हेतु जारी
RELEASED FOR CONSTRUCTION

TOWER SPOTTING DATA

JUN 2004

FOR

नियंत्रित
CONTROLLED

400 KV S/C HYDERABAD-KURNOOL-GOOTY T.L

&

400 KV S/C KHAMMAM-NAGARJUNSAGAR T.L

FOR WIND ZONE-3 (44 M/Sec)

DRG.No. TSD/H-K-G & K-N/1

REV: 1 No. OF PAGES : 4

Revision	Date	Description	By	Checked By	Approved By
1	07.02.2002	Extra ground clearance for Eq. Span between 350 to 400 deleted in Sh. No. 4 of 4.	<i>J.Ayas</i>	<i>शिवराम जी</i>	<i>D.Chowdhury</i>

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POWER GRID CORPORATION OF INDIA LTD
TOWER SPOTTING DATA FOR
400kV S/C HYDERABAD-KURNOOL-GOTTY & KHAMMAM-NAGARJUNSAGAR TRANS. LINE FOR WIND ZONE (44m/sec)

SL NO	DESCRIPTION	A		B		C		D	
		DOWNWARDS MAX	UPWARDS MIN	DOWNWARD MAX	UPWARD MIN	DOWNWARD MAX	UPWARD MIN	DOWNWARD MAX	UPWARD MIN
1	MAXIMUM ANGLE OF DEVIATION	2 DEGREE		0-15 DEGREE		15-30 DEGREE		30-60 DEGREE	
2	VERTICAL LOAD LIMITATION ON WEIGHT SPAN (FOR BOTH GW & CONDUCTOR) (I) ON BOTH SPANS (m) (II) ONE SPAN (m)	600 360	200 100	600 360	0 -200	600 360	0 -200	600 360	0 -300
3	PERMISSIBLE SUM OF ADJACENT SPANS IN METERS FOR VARIOUS DEVIATION ANGLES (SUBJECT TO AVAILABILITY OF MINIMUM SPECIFIED LIVE METAL CLEARANCES). PERMISSIBLE ONE SPAN FOR VARIOUS DEVIATION ANGLES SHOULD NOT EXCEED 50% OF THE VALUE SHOWN FOR SUM OF ADJACENT SPANS.	DEVN ANGLE 0°	SPAN 800	DEVN ANGLE 15° 14° 13° 12° 11° 10° 9° 8° 7°	SPAN 800 847 894 941 988 1035 1082 1129 1176	DEVN ANGLE 30° 29° 28° 27° 26° 25° 24° 23° 22°	SPAN 800 846 892 938 984 1031 1076 1122 1168	DEVN ANGLE 60° 59° 58° 57° 56° 55° 54° 53° 52° 51°	SPAN 800 841 882 923 964 1005 1046 1087 1128 1169

NOTE: Max. conductor temperature has been considered 85 deg.C for 400 KV D/C Hyderabad-Kurnool-Gotty & Khammam-Nagarjunsagar line. As the tower has been designed considering Max. temperature of conductor 75 deg.C. Therefore, tower can be spotted at normal span if required ground clearance is available, other wise span shall be reduced accordingly.

4. +18/+25m Extn. For Tower type A.

a. Max. wind span =300 M

b. Deviation angle =0 deg.

5. +18/+25m Extn. For Tower type D.

PERMISSIBLE SUM OF ADJACENT SPANS IN METERS FOR VARIOUS DEVIATION ANGLES (SUBJECT TO AVAILABILITY OF MINIMUM SPECIFIED LIVE METAL CLEARANCES). PERMISSIBLE ONE SPAN FOR VARIOUS DEVIATION ANGLES SHOULD NOT EXCEED 50% OF THE VALUE SHOWN FOR SUM OF ADJACENT SPANS.	DEVN ANGLE	SPAN
		50°
	49°	762
	48°	804
	47°	846
	46°	888
	45°	930
	& below	

I. General Details

Normal Span : 400

Design Wind Span (m)

	A	B	C	D
NC	400	400	400	400
BWC	240	240	240	240

II. ELECTRICAL CLEARANCE FOR RAILWAY CROSSING:

- Prior approval of Railway Authority is to be obtained.
- Minimum Clearance between lowest point of 400kV line Conductor and Rail level shall be 17.9m. However approval of railway crossing from railway authority has to be obtained in each case.
- The crossing span shall be limited to 300 M.
- The crossing shall normally be at right angle to the railway track.
- Crossing should be done with D type tower.

III. Minimum Clearance for Power line crossing

For 400kV : 5490 mm

For 220kV : 5490 mm

For 132kV : 5490 mm

IV. TELECOMMUNICATION LINE CROSSING:

The angle of crossing shall be as near to 90 deg. as possible. However, deviation to the extent of 30 deg. May be permitted under exceptionally difficult situations.

- V. The number of consecutive spans between the section points shall not exceed 15 or 5 Km. in plain terrain, and 10 spans or 3 Km. in hilly terrain. A section point shall comprise of tension point with DB/B type or DC/C type or DD/D type towers as applicable.
- VI. Minimum ground clearance required : 8840mm
- VII. For all National Highway crossing, tension tower is to be used and the crossing span is not to exceed 250meters.
- VIII. Way leave clearance : 26 M either side from the C.L. of the tower.
- IX. Maximum Span of Adjacent Spans for various Angles of deviation are subject to the condition that Minimum specified Live Metal Clearance & Minimum Ground Clearance are available.
- X. Tower type "C" shall be used for transposition with 0 deg. Deviation with modification of cross arms.
- XI. Maximum deviation of line for dead end tower shall be 15 deg. both side i.e. line side and substation side (slack span side).
- XII. Vertical load of individual spans are acting downwards for suspension towers.
- XIII. Broken wire Conditions :

Suspension Tower (A)	Any ground wire broken or both sub-conductors of a bundle in one phase only.
Small/Medium Angle Towers (B,C)	Breakage any one phase or any one earthwire on same span.
Large angle/Dead End towers (D/DE)	Breakage of all three phases and earthwire on same span or breakage of any one phase or any one earthwire on same span.

XIV. Design Load Tensions :

For Ground Wire : 1212 kgs (32° & NW) (For TT "A")
2956 kgs (32° & FW)

Deviation Angle	0°	2°	15°	30°	60°
Tension (kgs)	2956	2956	2930	2855	2559

For Conductor : 3614.16 kgs (32° & NW) (For TT "A")
7006 kgs (32° & FW)

Deviation Angle	0°	2°	15°	30°	60°
Tension (kgs)	7006	7006	6946	6767	6067

TABLE FOR EXTRA GROUND CLEARANCE TO BE PROVIDED FOR EQUIVALENT SPAN IS LESS THAN THE 350 METERS

Sl.No.	Equivalent span	Tension as per string chart 85 deg.c in kg. (T ₁)	Tension as per sag template at 85 deg.c in kg. (T ₂)	Formula for calculating extra ground clearance for all individual span in meter
1.	340	2881	3022	$(2.004 / 8) \times (\text{SPAN})^2 \times (1/T_1 - 1/T_2)$
2.	330	2854	3022	
3.	320	2825	3022	
4.	310	2794	3022	
5.	300	2762	3022	
6.	290	2729	3022	
7.	280	2693	3022	
8.	270	2656	3022	
9.	260	2617	3022	
10.	250	2575	3022	
11.	240	2532	3022	
12.	230	2486	3022	
13.	220	2437	3022	
14.	210	2386	3022	
15.	200	2332	3022	

Note: Intermediate values may be linearly interpolated.

400 kV S/C, W2-2 for
~~V. K. S. R.~~ K. S. R. R. R. R.
 (Lib of Khadke - Project)

Sag-Tension Calculation of ACSR MOOSE

(Brajesh Kumar, Engg-T/L)

Conductor Properties

ACSR MOOSE
 Conductor Name 16428
 UTS (Kg) 597
 Area of Conductor (sqmm) 2.004
 Wt. Of Conductor (Kg/m) 31.77
 Dia. Of Conductor (mm) 7034
 Modulus of Elasticity (Kg/sqmm) 0.0000193
 Coeff. Of linear Expansion (per deg C)

Initial Condition

Normal Span (m) 400
 Wind Pressure on Cond.(Kg/sqm) 102.17
 Initial Cond. temp.(deg C) 32
 Initial Wind % 0
 Initial Cond. tension at above temp, and wind condition (% of UTS OR value in Kg) 22

Note: The tension should be below 22% of UTS in day to day condition and should not exceed 70% of UTS in any condition.
 22% of UTS = 3614.16 Kg 70% of UTS = 11499.6 Kg

Initial Sag, Ten at 32 deg C, 0% Wind	
Ten (% of UTS)	Ten (kg)
22.00	3614.16
	Sag (mts)
	11.09

Standard Conditions				Any other condition
Temperature (deg C)	0	32	75	85
Pressure (% of full wind)	0	0	0	0
Resultant Tension (Kg)	4144.81	3614.16	3114.26	3022.04
Resultant Sag (mts)	9.67	11.09	12.87	13.26
			#	#
			4629.57	6068.67
			0	32
			36	100

- Tension WITHIN Indian Standard limits

Sag-Tension Calculation of Earthwire

(Braiesh Kumar, Engg-T/L)

Conductor Properties

Conductor Name	Earthwire
UTS (Kg)	6972
Area of Conductor (sqmm)	73.65
Wt. of Cond (Kg/m)	0.583
Dia of Cond. (mm)	10.98
Mod. of Elasticity (Kg/sqmm)	19361
Coeff. of linear expansion (per deg C)	0.0000115

Initial Condition.

Normal Span (m)	400
Wind Pressure on Cond.(Kg/sqm)	129
Initial Cond. temp.(deg C)	0
Initial Wind %	0
Initial Cond. tension at above temp.and wind condition (% of UTS OR value in Kg)	1339.94

Note: The tension should be below 20% of UTS in day to day condition and should not exceed 70% of UTS in any condition.

20% of UTS = 1394.4 Kg	70% of UTS = 4880.4 Kg
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Initial Sag, Ten at 0 deg C, 0% Wind	
Ten (% of UTS)	Sag (mts)
19.22	8.70

Standard Conditions				Any other condition
Temperature (deg C)	0	32	75	53
Pressure (% of full wind)	0	0	0	0
Resultant Tension (Kg)	1339.94	1212.69	1080.10	1143.26
Resultant Sag (mts)	8.70	9.61	10.80	10.20
			#	#

- Tension WITHIN Indian Standard limits

400 KVS/C V'Chat - Korba
WL-3

Sag-Tension Calculation of ACSR MOOSE

(Brajesh Kumar, Engg-T/L)

Conductor Properties

Conductor Name	ACSR MOOSE
UTS (Kg)	16428
Area of Conductor (sqmm)	597
Wt. Of Conductor (Kg/m)	2.004
Dia. Of Conductor (mm)	31.77
Modulus of Elasticity (Kg/sqmm)	7034
Coeff. Of linear Expansion (per deg C)	0.0000193

Initial Condition

Normal Span (m)	400
Wind Pressure on Cond.(Kg/sqm)	129.87
Initial Cond. temp.(deg C)	32
Initial Wind %	0
Initial Cond. tension at above temp.and wind condition (% of UTS OR value in Kg)	22

Note: The tension should be below 22% of UTS in day to day condition and should not exceed 70% of UTS in any condition.	
22% of UTS = 3614.16 Kg	70% of UTS = 11499.6 Kg

Initial Sag, Ten at 32 deg C, 0% Wind		
Ten (% of UTS)	Ten (kg)	Sag (mts)
22.00	3614.16	11.09

Standard Conditions					Any other condition	
Temperature (deg C)	0	32	75	0	32	85
Pressure (% of full wind)	0	0	0	36	100	0
Resultant Tension (Kg)	4144.81	3614.16	3114.26	4888.78	7006.21	3022.04
Resultant Sag (mts)	9.67	11.09	12.87	#	#	13.26

- Tension WITHIN Indian Standard limits

Sag-Tension Calculation of Earthwire

(Brajaesh Kumar, Engg-T/L)

Conductor Properties

Conductor Name	Earthwire
UTS (Kg)	6972
Area of Conductor (sqmm)	73.65
Wt. of Cond (Kg/m)	0.583
Dia of Cond. (mm)	10.98
Mod. of Elasticity (Kg/sqmm)	19361
Coeff. of linear expansion (per deg C)	0.0000115

Initial Condition

Normal Span (m)	400
Wind Pressure on Cond. (Kg/sqm)	165
Initial Cond. temp. (deg C)	0
Initial Wind %	0
Initial Cond. tension at above temp. and wind condition (% of UTS OR value in Kg)	1339.94

Note: The tension should be below 20% of UTS in day to day condition and should not exceed 70% of UTS in any condition.

20% of UTS = 1394.4 Kg 70% of UTS = 4880.4 Kg

Initial Sag, Ten at 0 deg C, 0% Wind		
Ten (% of UTS)	Ten (kg)	Sag (mts)
19.22	1339.94	8.70

Standard Conditions						Any other condition
Temperature (deg C)	0	32	75	0	32	53
Pressure (% of full wind)	0	0	0	36	100	0
Resultant Tension (Kg)	1339.94	1212.69	1080.10	1795.91	2956.06	1143.26
Resultant Sag (mts)	8.70	9.61	10.80	#	#	10.20

- Tension WITHIN Indian Standard limits