महाराष्ट्र शासन
महसुल व वन विभाग
प्रधान मुख्य वनसंरक्षक (वनबल प्रमुख), महाराष्ट्र राज्य, नागपूर यांचे कार्यालय.
O/o Principal Chief Conservator of Forests (HoFF), Maharashtra State
प्रधान मुख्य वनसंरक्षक (वन्यजीव), महाराष्ट्र राज्य
Principal Chief Conservator of Forests (Wildlife), Maharashtra State
"Van Bhavan"3rd Floor, Ramgiri Road, Civil Lines, Nagpur 440 001
Phone - 0712-2549563
E-mail - pccfwlngp@mahaforest.gov.in
Website - www.mahaforest.gov.in

स्वातंत्र्याचा अमृत महोत्सव

पत्र-ईमेल क्रमांक:-कक्ष-२३(२)/वजी/सर्व्हे/प्र.क्र.१७७/२३६६ /२०२३-२४, दिनांक:-२७ /१०/२०२३

प्रति,

कार्यकारी अभियंता,
अउदा प्रकल्प विभाग,
म.रा.वि.पा.कं. मर्या. बंगाली कॅम्प,
मुल रोड, चंद्रपूर
Email : ee4630@mahatransco.in
ehvconstchd@gmail.com

विषय- प्रस्तावित १३२ के. व्ही. मुल ते सिकॉम चंद्रपूर व्दिपथ वीज वाहिनीकरीता राज्य व राष्ट्रीय वन्यजीव मंडळाची मान्यतेकरीता.

संदर्भ - १. या कार्यालयाचे पत्र क्रमांक कक्ष-२३(२)/वजी/सर्व्हे/प्र.क्र.१७७/२३८, दि. २४/०४/२०२३.
२. दिनांक १६/१०/२०२३ रोजी संपन्न झालेली राज्य वन्यजीव मंडळाची २२ वी बैठक.

संदर्भीय पत्र १ अन्वये विषयांकित प्रकरणीचा प्रस्ताव राज्य वन्यजीव मंडळाचे निर्णयार्थ ठेवण्यासाठी राज्य शासनास सादर करण्यात आलेला होता. राज्य वन्यजीव मंडळाची २० वी बैठक दिनांक ०२/०५/२०२३ रोजी संपन्न झाली होती. सदर बैठकीमध्ये प्रस्तुत प्रस्तावाचे अनुषंगाने, मंडळाने मुख्य वन्यजीव रक्षक, महाराष्ट्र राज्य यांनी घालून दिलेल्या अटी व शर्तीच्या अधिन राहून सदर प्रस्ताव राष्ट्रीय वन्यजीव मंडळाकडे सादर करण्याची मंडळाने शिफारस करण्यात आलेली होती. सदर अटींमध्ये १ (ब) अट खालीलप्रमाणे नमूद करण्यात आलेली होती.

१. ब) दोन कंडक्टर (वायर) मधील अंतर ८ मीटर पेक्षा जास्त ठेवावा जेणेकरून पक्षी अडणार नाही.

वरील अटीचे अनुषंगाने प्रकल्प यंत्रणेने दि. २१/०७/२०२३ रोजीच्या पत्रान्वये सदर अटीचे अनुषंगाने खालीलप्रमाणे निवेदन सादर केले होते.

"सदर १३२ केव्ही मुल ते सिकॉम द्विपथ वाहिनी ही १३२ के. व्ही. एवढया अति उच्च दाबाकरीता अभिकल्पित करण्यात आली आहे व या दाबाकरीता लागणारे मनोरे हे सुध्दा त्यानुसारच ठरविलेले असतात. सदर १३२ के.व्ही मनो-याचे अभिकल्प या पत्रासोबत आपल्या अवलोकनासाठी जोडले आहे.

त्यानुसार असे दिसून येते की सदर वाहिनीच्या दोन कंडक्टर मधील अंतर हे किमान ३.९ मीटर एवढे असणार आहे. अशाप्रकारचेच मनोरे हे संपूर्ण महाराष्ट्रात वर्षानुवर्ष कार्यरत असून त्यामध्ये पक्षी अडकण्याची घटना घडत नसल्याचेही निदर्शनास येते. तरी दोन कंन्डक्टर मधील अंतर ८ मिटर ऐवजी ३.९० मिटर ठेवण्याबाबत अटीमध्ये सुधारणा करण्यात यावी."

वरील निवेदनाचे अनुषंगाने प्रस्तुत बाब राज्य वन्यजीव मंडळाचे दिनांक १६/१०/२०२३ रोजीच्या २२ व्या बैठकीत अट सुधारणा करणेबाबत मंडळाच्या निर्णयार्थ सादर करण्यात आले होते. मंडळाने प्रकल्प यंत्रणेच्या वरील निवेदनानुसार अट सुधारणा करण्यास मान्यता प्रदान करण्यात केलेली आहे.

(महिपाल गुप्ता)
प्रधान मुख्य वनसंरक्षक (वन्यजीव),
महाराष्ट्र राज्य

प्रतिलिपी :- अपर प्रधान मुख्य वनसंरक्षक तथा केंद्रस्थ अधिकारी यांना माहिती व योग्य त्या कार्यवाहीस अग्रेषित.
प्रतिलिपी :- अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव) पूर्व, नागपूर यांना माहिती व योग्य त्या कार्यवाहीस अग्रेषित.
प्रतिलिपी :- मुख्य वनसंरक्षक (प्रादेशिक), चंद्रपूर यांना माहिती व योग्य त्या कार्यवाहीस अग्रेषित.
प्रतिलिपी :- वनसंरक्षक तथा क्षेत्र संचालक, ताडोबा अंधारी व्याघ्र प्रकल्प, चंद्रपूर यांना माहिती व योग्य त्या कार्यवाहीस अग्रेषित.
प्रतिलिपी :- विभागीय वन अधिकारी, चंद्रपूर वनविभाग, चंद्रपूर यांना माहिती व योग्य त्या कार्यवाहीस अग्रेषित.

		MAHATRANSCO CIN No. U40109MH2005SGC153646
Name of office	:	**Office of the Executive Engineer, EHV Projects Division, M.S.E.T.C.L.,**
Office address	:	Bangali Camp Mul Road, Chandrapur.
Contact No.	:	07172-260062 (O), 8554993283
Email Id	:	ee4630@mahatransco.in & ehvconstchd@gmail.com
Website	:	"http://www.mahatransco.in"

Ref. No.: EE/EHV/Projects./DN/CHD/Tech/717 Date : 06.09.2023

To,
Divisional Forest Officer,
Forest Division Chandrapur.

Sub:- Diversion of 44.0397 ha forest land under the forest (Conservation) Act, 1980 for laying of 132 KV D/C Mul-SICOM Chandrapur transmission line.

..... Request to move the proposal to REC, Nagpur through Government of Maharashtra for reconsideration of the condition no. xii stipulated in Stage-I approval thereof..

Ref:-

1) Stage-I approval FC-III/MH-47/2022-NGP/9660 Dt. 02.05.2022
2) T.O.L. no. EE/EHV/Proj/Dn/Tech/298 Dt. 13.04.2023 compliance submission of Stagg-I Approval
3) PCCF (WL) letter No. Desk 23 (2) WL/Survey/Case No124/790/2023-24 dt.19.06.2023
4) The Regional Officer (Central), Integrated Regional office, MoEF&CC, Nagpur letter No. FC- III/MH-47/2022-NGP/11752 Dt. 26.06.2023.
5) T.O.L. no. EE/EHV/Proj/Dn/Tech/ No. 617 Dt. 21.07.2023
6) Letter No SE/EHV/Proj/Circle/NGP/Tech/1019 Dt. 28.07.2023
7) Letter No CE/EHV/PC/O&M/Zone/NGP/Tech/ 1532 Dt. 07.08.2023.
8) T.O.L. no. EE/EHV/Proj/Dn/Tech/ No. 708 Dt. 05.09.2023
9) T.O.L. no. EE/EHV/Proj/Dn/Tech/ No. 716 Dt. 06.09.2023
10) LOA No. MSETCL/CO/DC&M/SS/Pre-tender/2664 Dt. 12.03.2018.
11) LOA No. MSETCL/CO/C&M/Pretender/LINES/T-2002/Supply, ETC & Civil/Phoenix/4704 Dt. 09.11.2020.

Respected Sir,

In context to the above subject, it is to inform that the Stage-I approval for diversion of 44.0397 ha forest land under the forest (Conservation) Act, 1980 for laying of 132 KV D/C Mul-SICOM Chandrapur transmission line has been received vide letter under ref. (1). Accordingly, as per the conditions in the approval, the demand of Rs. 31.05 Crores has already been deposited to the concerned offices on dt. 29.03.2023. Also, vide letter under ref (2), this office has already submitted the compliance report of Stage-I approval. In addition to this The Principle Chief Conservator of forest (HoFF), M.S. Nagpur had issued the demand note of 2% Project cost of ESZ & Tiger corridor i.e. amount Rs. 0.1922 Cr. as per condition no. 8 vide letter under ref (3) to deposit in the name of "Executive Director, Tadoba Andhari Tiger Reserve Conservation Foundation, Chandrapur" this office has already been deposited to the concerned offices on dt. 26.07.2023.

Now, as per the Stage-I approval, the condition no. xii is stipulated that **"The minimum clearance at any point of entire transmission line including sag and swing shall be 8 meters and in case of transmission lines passing through identified elephant corridors, additional clearances of at least 6 m shall be provided over and above minimum clearance (as stipulated under Electricity Authority Measures relating to safety & electricity supply) Regulations, 2010) in identified corridors of Elephant in area."**

In Stage-I compliance report submitted by this office vide under ref (2), MSETCL has given the undertaking that the minimum clearances at any point of entire transmission line including sag and swing is to be considered 6.10 meters as per the condition 4 of section 77 in the Indian Electricity Rules, 1956 and in

case of transmission lines passing through identified elephant corridors, additional clearances of at least 6.0 meters shall be provided over and above minimum clearance (as stipulated under Electricity Authority (measures relating to safety & electricity supply) Regulations, 2010).

Further, the proposal for wildlife clearances was discussed in 20th SBWL meeting held on 02.05.2023. Minutes of Meeting (MOM) of the said was received to this office vide letter under ref (3). Condition no. 1 of the said MOM is stipulated that;

(a) Ground clearance of lowest (bottom) conductor (wire) should be more than 9 meters
(b) Spacing between two conductors (wire) should be more than 8 meters so that birds could not be entangled within.

Accordingly, MSETCL vide letters under ref (5, 6 & 7) has submitted the proposal to PCCF (wildlife) for reconsideration of minimum ground clearance of 6.10 meters instead of 9 meters from the bottom conductor and distance between any two conductors (wire) of 3.9 meters instead of 8 meters.

The above issue was also discussed in the review meeting of forest proposal held on 28.08.2023 under the chairmanship of Principal Secretory (Forest) in the presence of Chairman & Managing Director & various authorities of MSETCL along with forest authorities of Govt. of Maharashtra. During the meeting, it was decided to submit the proposal to REC for reconsideration of minimum ground clearance of 6.10 meters instead of 9 meters from the bottom conductor and distance between any two conductors (wire) of 3.9 meters instead of 8 meters.

Now, we wish to draw your kind attention towards the fact that 132kV tower design that is used in Maharashtra by MSETCL have the standard ground clearance of minimum 6.10 meters and spacing between the two conductors shall be 3.90 meters. The standard Key Diagram of 132kV Tower is enclosed herewith for your ready reference. Further, as per Indian Electricity Rule 1956 and Electricity Authority Regulation 2010, the minimum ground clearance for 132kV Transmission Line should not be less than 6.10 meters. As such, our standard design of 132kV Towers obeys the guidelines issued by Central & State Government. Further, the query was raised on the spacing of 3.90 meters between two conductors citing the reason of entanglement of birds. It is to be noted that practice of spacing between two conductors 3.90 meters apart is followed throughout the Maharashtra by MSETCL and no such incident of bird entanglement is happened till date.

The scheme for establishment of 132kV Level creation by installing 1x100 MVA, 220/132kV ICT at 220/132kV Sicom substation & construction of 132kV DC line from Sicom – Mul substation was sanctioned vide BR No. 119/11 dt. 05.08.2017 at an estimated cost of Rs. 5634.60 Lakhs (Including IDC) and accordingly MSETCL has awarded the contract for the construction of 132kV DC line from Sicom – Mul substation vide letter under ref. (10) & (11).

In the graveness of matter elaborated above, it is now once again requested to consider our request of maintaining minimum 6.10 meters of ground clearance and, the distance between two conductors is 3.9 meters instead of 8 meters & Compliances of the other conditions of Forest Department related to this 132kV D/C Mul-SICOM Line will be complied by MSETCL.

In addition to above, it is kindly requested to move our request for kind consideration of final approval under section-2 Forest (Conservation) Act, 1980 by MoEF & CC through Chief Conservator of Forest (Regional), Chandrapur so that working permission for said transmission line work can be received as soon as condition xii will be reconsidered as per MSETCL request.

This is for kind information & further necessary action at your end please

Encl: – 1. 132kV Tower Key Diagram
2. CEA Regulation 2010 / CBIP/ IS5613 manual

Thanks & Regards

06/09/23

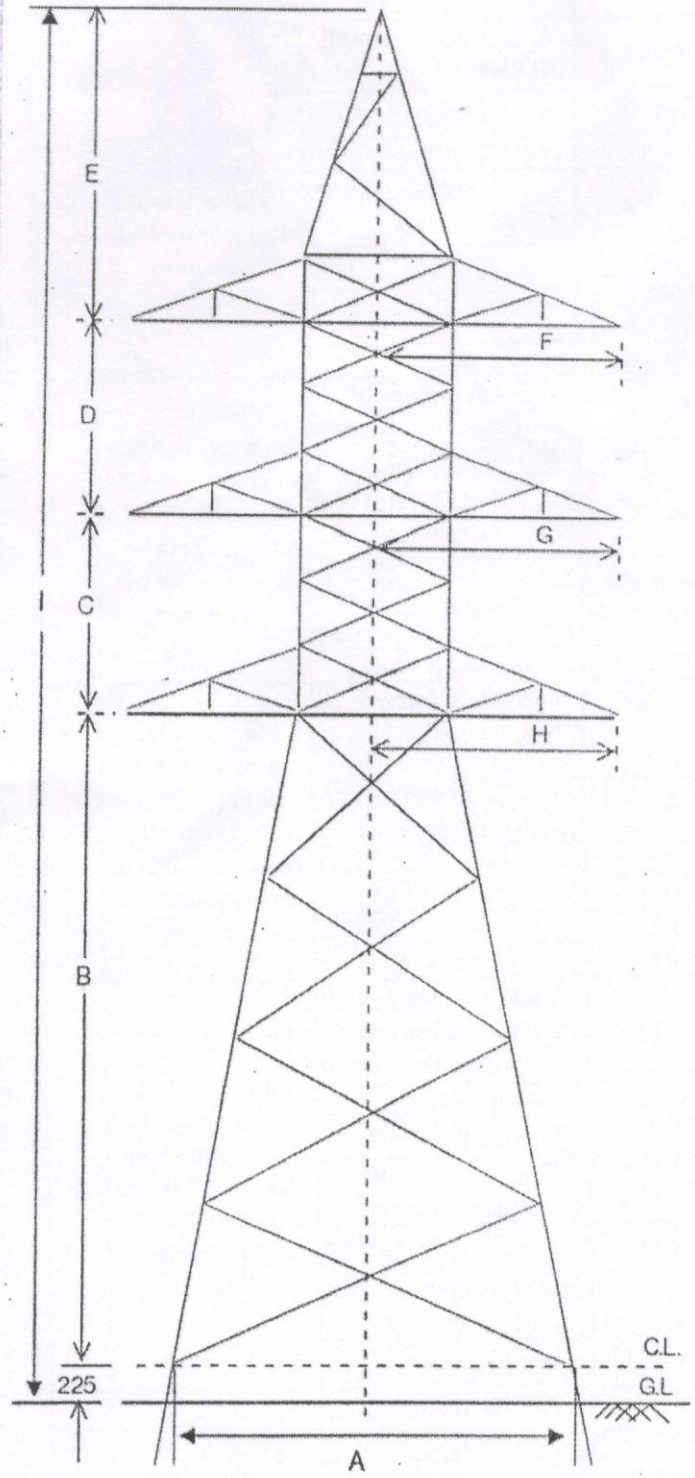
(Ganesh N Kukde)
Executive Engineer (I/C)

Copy s.w.r.s to:

1. The Chief Engineer, EHV PC O&M Zone, MSETCL, Nagpur.
2. The Chief Conservator of Forest, Chandapur Circle, Chandrapur.
3. The Superintending Engineer, EHV Projects Circle, MSETCL, Nagpur.

132 KV Tower Key Diagram

[T - 1409 M/S KEC & TPC MAKE]



Tower Type	2° 'P' KEC	15° 'Q' KEC	30° 'R' KEC	60° 'S'D/E TPC
A	4500	6000	6900	9100
B	16002	13652	13652	13652
C	4110	3900	3900	3900
D	4080	3900	3900	3900
E	3960	5900	6100	6900
F	3400	3430	3520	4000
G	3470	3430	3560	4325
H	3610	3560	3960	5171
I	28377	27617	27777	28577

TOTAL WEIGHT OF TOWER [B.G.SHIRKE]

STEEL	2517.750	3266.570	3488.104	4596.0
N/B	96.620	132.110	136.630	160.28
TOTAL	2614.370	3398.680	3624.734	4756.3

3 M.EXTN.

STEEL	385.440	585.010	682.000	1234.00
N/B	15.890	31.886	25.000	41.00
TOTAL	401.330	616.896	707.000	1275.00

6 M.EXTN.

STEEL	805.280	1027.250	1250.280	2008.00
N/B	29.911	33.220	34.930	48.00
TOTAL	835.191	1060.470	1285.210	2056.00

9 M.EXTN.

STEEL	1415.000	1912.000	2256.000	2978.00
N/B	54.000	75.000	87.000	97.00
TOTAL	1469.000	1987.000	2343.000	3075.00

TOTAL WEIGHT OF STUB & CLEATS

STEEL	123.200	202.680	229.320	303.04
N/B	2.227	2.070	2.070	2.39
TOTAL	125.427	204.750	231.390	305.43

TEMPLATE

STEEL	347.00	653.80	793.80	974.0
N/B	16.00	24.72	28.09	41.0
TOTAL	363.00	678.52	821.89	1015.0

W/T OF STUB & CLE. FOR EXTN.

		50 'SH'	50 'SD'
STEEL	132.200	1601.000	2024.39
N/B	5.549	99.000	122.65
TOTAL	137.749	1700.000	2147.04

NOTE: - ALL DIAMENSION ARE IN MM.

MAHATRANSCO	EXECUTIVE ENGINEER

Clearances as per CEA regulations 2010 / CBIP / IS 5613 /APTRANSCO Manual						
Sl. No	Description	Nominal System voltage ----------> | Code |	400kV	220kV	132kV	Remarks if any
1)	Minimum Ground Clearance from the bottom most condutor	IE Rules 1956 & CEA safety Regulations 2010	8.8000	7.0000	6.1000	with nominal system voltage
		CBIP 269-1995	8.8000	7.0000	6.1000	
		IS 5613 of 1997 & 1999	8.8400	7.0000	6.1000	
		APTRANSCO Technical manual Vol-II	8.8400	7.05 / 7.015	6.1000	Chapter-1 & 3 differs
		GETCO	8.8000	7.0150	6.1000	
		UPPTRANSCO	8.8400	7.0000	6.1000	
		RVPNL	8.8400	7.0000	6.1000	
		Proposed	8.8400	7.0000	6.1000	
2)	Vertical clearance form the top of the buildings / bridges etc., from the bottom most condutor	IE Rules 1956 & CEA safety Regulations 2010	7.300	5.800	4.900	with nominal system voltage
		IS 5613 of 1997 & 1999	Not given	5.49	4.58	
		APTRANSCO Technical manual Vol-II	7.26	5.46	4.56	
		UPPTRANSCO	7.318	5.488	4.573	
		GETCO	7.3	5.5	4.6	
		Proposed	7.3000	5.8000	4.9000	
3)	Horizantal clearance form the top of the buildings / bridges etc., from the bottom most condutor	IE Rules 1956 & CEA safety Regulations 2010	5.600	3.800	2.900	with nominal system voltage
		IS 5613 of 1997 & 1999	Not given	3.66	2.75	
		APTRANSCO Technical manual Vol-II	5.6	3.8	2.9	
		GETCO	5.6	3.8	2.9	
		UPPTRANSCO	5.489	3.659	2.744	
		RVPNL	5.6	3.8	2.9	
		Proposed	5.6000	3.8000	2.9000	
4)	National highway crossings (4.75 mtrs restrictions as per Motor act) and verticle clearance as per sl. No. 2	Derived from IE Rules by taking maxmum height of trucks 5.2 mtrs +VC	12.500	11.000	10.100	Max height of vechicle is 4.75 mt as per Motor Act. NH Under pass Vertical height 5 mtrs.
		Transco Circular No 155 DT 30-08-2008	12.500	12.500	12.500	
		APTRANSCO Technical manual Vol-II	12.200	12.200	12.200	
		RVPNL	11.840	10.000	9.100	additional 3mtrs more than normal GC
		IRC: 32 -1969 of Indian Road Congress.	6.500	6.500	6.500	Minimum
		Proposed	12.500	11.000	10.100	
5)	Power Line crossing (clearance of Higher Voltage among crossing lines shall be considered)	IE Rules 1956 & CEA safety Regulations 2010	5.49	4.58	3.05	
		CBIP 269-1995	5.49	4.58	3.05	
		IS 5613 of 1997 & 1999	Not given	4.58	3.05	
		APTRANSCO Technical manual Vol-II	5.49	4.58	3.05	
		Proposed	5.49	4.58	3.05	
		For crossing 500kV Direct Current line 6.79 mtr clearance to be maintained				

Annexure- II

रजिस्ट्री सं० डी० एल०-33004/99

REGD. NO. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

असाधारण
EXTRAORDINARY
भाग III—खण्ड 4
PART III—Section 4
प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 211] नई दिल्ली, शुक्रवार, अगस्त 20, 2010/श्रावण 29, 1932
No. 211] NEW DELHI, FRIDAY, AUGUST 20, 2010/SHRAVANA 29, 1932

CENTRAL ELECTRICITY AUTHORITY

NOTIFICATION

New Delhi, the 20th August, 2010

No. CEA/TETD/MP/R/01/2010.—In exercise of the powers conferred by sub-section (2) of Section 177 of the Electricity Act, 2003, the Central Electricity Authority hereby makes the following regulations namely :—

1. Short Title and Commencement.—(1) These regulations may be called the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. Definitions.—(1) In these regulations, unless the context otherwise requires,

(a) "Act" means the Electricity Act, 2003;

(b) "Authority" means the Central Electricity Authority established under sub-section (2) of Section 70 of the Act;

(c) "Base Load Operation" means operation at maximum continuous rating (MCR) or its high fraction;

(d) "Basic Insulation Level (BIL)" means reference voltage level expressed in peak (crest) voltage with standard 1.2/50 μs lightning impulse wave. Apparatus should be capable of withstanding test wave of basic insulation level or higher;

(e) "Black Start" means the start up of a generating unit or gas turbine or internal combustion (IC) engine based generating set without use of external power following grid failure;

(f) "Boiler Maximum Continuous Rating (BMCR)" means the maximum steam output, the steam generator (boiler) can deliver continuously at rated parameters;

Chapter VII

Safety requirements for overhead lines, underground cables and generating stations

55. **Material and strength.-** (1) All conductors of overhead lines other than those specified in regulation 68 shall have a breaking strength of not less than 350 kg.

(2) Where the voltage does not exceed 250 V and the span is of less than fifteen metres and is drawn through the owner's or consumer's premises, a conductor having an actual breaking strength of not less than 150 kg may be used.

56. **Joints.-** (1) No conductor of an overhead line shall have more than one joint in a span and joints between conductors of overhead lines shall be mechanically and electrically secure under the conditions of operation.

(2) The ultimate strength and the electrical conductivity of the joint shall be as per relevant Indian Standards.

57. **Maximum stresses and factors of safety.-** (1) The load and permissible stresses on the structural members, conductors and ground wire of self supporting steel lattice towers for overhead transmission lines shall be in accordance with the specifications laid down, from time to time, by the Bureau of Indian Standards.

(2) Overhead lines not covered in sub-regulation (1) shall have the following minimum factors of safety, namely:-

(i)	for metal supports	-	1.5
(ii)	for mechanically processed concrete supports	-	2.0
(iii)	for hand-moulded concrete supports	-	2.5
(iv)	for wood supports	-	3.0

(3) The minimum factors of safety shall be based on such load as may cause failure of the support to perform its function, assuming that the foundation and other components of the structure are intact.

(4) The load shall be equivalent to the yield point stress or the modulus of rupture, as the case may be, for supports subject to bending and vertical loads and the crippling load for supports used as strut.

(5) The strength of the supports of the overhead lines in the direction of the line shall not be less than one-fourth of the strength required in the direction transverse to the line.

(6) The minimum factor of safety for stay-wires, guard-wires or bearer-wires shall be 2.5 based on the ultimate tensile strength of the wire.

(7) The minimum factor of safety for conductors shall be two, based on their ultimate tensile strength, in addition, the conductor's tension at 32^0 C, without external load, shall not exceed the following percentages of the ultimate tensile strength of the conductor:-

(i) Initial unloaded tension ..... 35 per cent
(ii) Final unloaded tension ..... 25 per cent

Provided that for the conductors having a cross section of a generally triangular shape, such as conductors composed of 3-wires, the final unloaded tension at 32^0 C shall not exceed thirty per cent of the ultimate tensile strength of such conductor.

(8) For the purpose of calculating the factors of safety in sub-regulation (2), the following conditions shall be observed, namely:-

(i) the maximum wind pressure shall be as specified in the relevant Indian Standards;

(ii) for cylindrical bodies the effective area shall be taken as full projected area exposed to wind pressure; and

(iii) the maximum and minimum temperatures shall be such as specified in the relevant Indian Standards.

(9) Notwithstanding anything contained in sub-regulation (2) to (8) in localities where overhead lines are liable to accumulations of ice or snow, the load and permissible stresses on the structural members, conductors and ground wire of self supporting steel lattice towers for overhead transmission lines shall be in accordance with the specifications laid down, from time to time, by the Bureau of Indian Standards or as specified by Appropriate Government, by order in writing.

58. **Clearance above ground of the lowest conductor of overhead lines.-** (1) No conductor of an overhead line, including service lines, erected across a street shall at any part thereof be at a height of less than-

(i) for lines of voltage not exceeding 650 Volts - 5.8 metres
(ii) for lines of voltage exceeding 650 Volts but not exceeding 33 kV - 6.1 metres

(2) No conductor of an overhead line, including service lines, erected along any street shall at any part thereof be at a height less than-

(i) for lines of voltage not exceeding 650 Volts - 5.5 metres
(ii) for lines of voltage exceeding 650 Volts but not exceeding 33 kV - 5.8 metres

(3) No conductor of an overhead line including service lines, erected elsewhere than along or across any street shall be at a height less than -

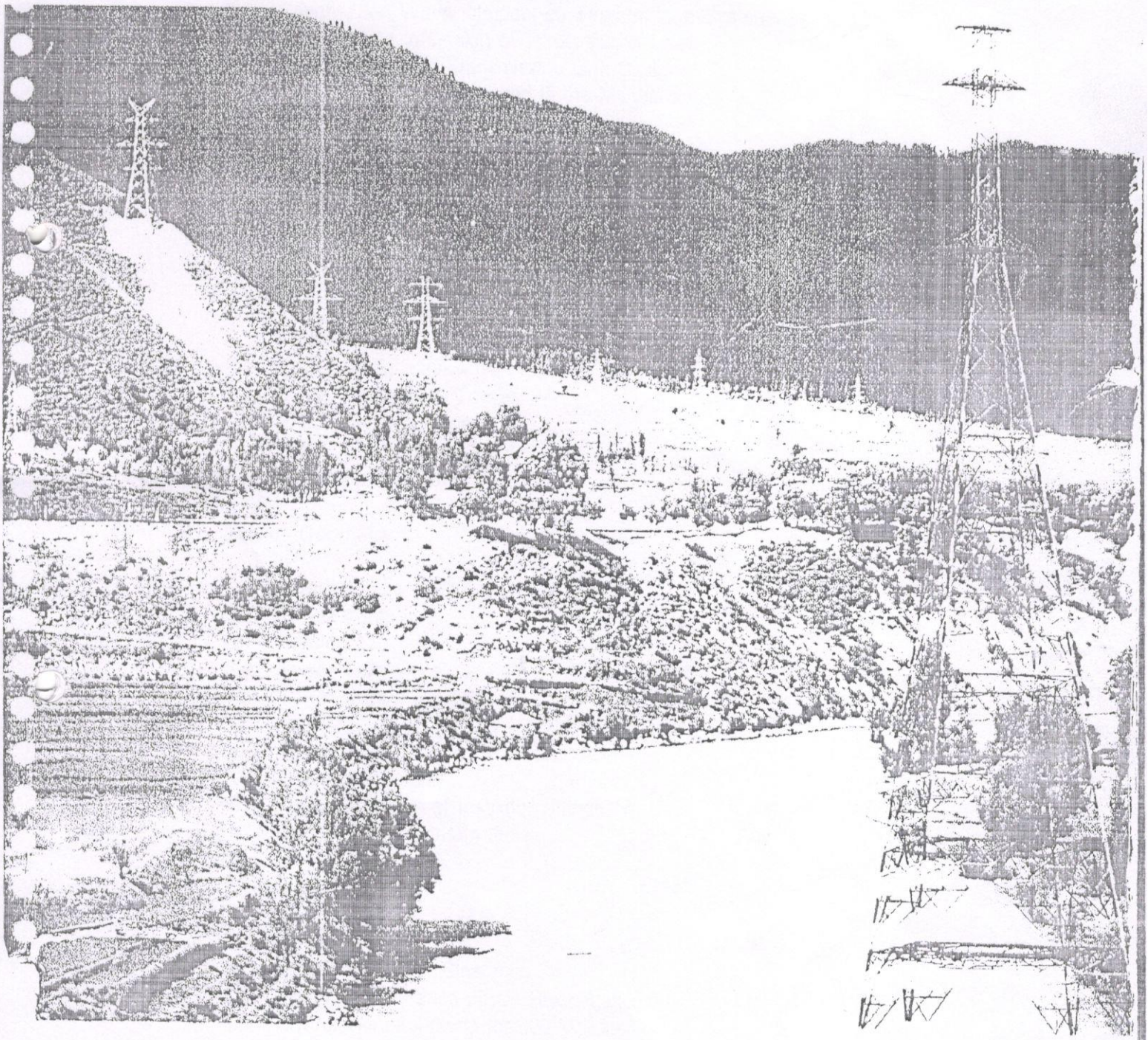
(i) for lines of voltage upto and including 11,000 Volts,if bare - 4.6 metres
(ii) for lines of voltage upto and including 11,000 Volts, if insulated - 4.0 metres
(iii) for lines of voltage exceeding 11,000 Volts but not exceeding 33 kV - 5.2 metres

Annexure III

TRANSMISSION LINE MANUAL

Publication No. 268

Central Board of Irrigation and Power
Malcha Marg, Chanakyapuri, New Delhi - 110 021



CBI&P Panel of Experts on Transmission Lines

Editor

Chairman

Transmission Line Manual

Chapter 4

Electrical Clearances

ELECTRICAL CLEARANCES

4.1 Introduction

The design of a transmission line tower is distinctly classified into mechanical design and electrical design. The parameters which affect the design of a tower are discussed in Chapter-V, whereas loadings and mechanical design of a tower are discussed in Chapters 6 & 7 of the Manual. In this chapter, the aspects leading to electrical design of a tower are, therefore discussed. The electrical design of tower, infact, involves fixation of external insulation against different electrical phenomena. The external insulation comprises self restoring air and solid insulation in the form of insulator strings consisting of disc insulators, long rod insulators etc. The electrical insulation of a tower is a function of steady state operating voltage of the system and various events that occur in the system (energisation, re-energisation, fault occurrence and its clearance, lightning strokes etc.). For system upto and including 300 kV voltage rating, the tower insulation is determined from the power frequency voltage and lightning impulse requirement whereas for system above 300 kV rating, the power frequency and switching impulse voltages are the governing criteria. The other factors which affect the electrical insulation are climatic conditions - altitude, relative humidity, pollution, etc. The various factors and statutory regulations which affect the electrical design of a tower are discussed as hereunder.

4.2 Minimum Ground Clearance

The minimum clearance above ground as per sub rule 4 of Rule 77 of I.E.Rules 1956 (latest revision) for AC system and for ± 500 kV HVDC system as adopted in India are as under:

Voltage (kV) Nominal	66	132	220	400	--	--
Highest (System)	72	145	245	420	800	± 500
Minimum ground clearance (mm)	5500	6100	7000	8800	12400	12500

To the above clearance, an additional clearance of 150 mm is added to provide for uneven ground profile and possible sagging error.

4.3 Minimum Clearance above Rivers/Lakes

In case of accessible frozen rivers/lakes, the minimum clearance above frozen rivers/lakes should be equal to the minimum ground clearance given in 4.2 above.

The minimum clearance of Power Conductor over the highest flood level in case of non navigable rivers shall be as follows:

System Voltage (kV)	Minimum clearance above highest flood level (mm)*
72	3650
145	4300
245	5100
420	6400
800	9400
± 500	6750

*(The maximum height of an object over the highest flood level of non-navigable rivers is considered as 3000 mm)