MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO. LTD.
CIN No. U40109MH2005SGC153646

Name of Office : EXECUTIVE ENGINEER, EHV PROJECTS DIVISION-II, PUNE
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Ref.No.EE/EHV/Projects/DN-II/PN/No. 232 **Date: 21.03.2022**

TO WHOM SO EVER IT MAY CONCERN

Subject:- E-enquiry in r/o calling budgetary offer of special type monopole for 220 kV D/C line from 400kV Talegaon (PGCIL) S/S to 220kV Chakan Ph-II S/S under EHV Projects Div.II Pune.

This office intends to carry out the work of 220 kV D/C line from 400kV Talegaon (PGCIL) S/S to 220kV Chakan Ph-II S/S in the area of Talegaon – Chakan MIDC, Pune (line length : 3.9 km).

The conditions are :

- 220kV DC Line has to be erected along divider of width 1500 mm. Thus OD of Monopole base along with base plate / Transition bench should be less than 1500mm (1.5mtr)
- Monopole should be of embedded type i.e pipe type foundation to be used to avoid damage to the asphalt road.
- The spans between two poles ranges between 170-200 mtrs.
- High Ampacity conductor (HTLS) equivalent to 0.4 ACSR (Zebra) conductor will be used for line.

SCHEDULE 'A'

A. Supply Part :

Sr. No.	Description of Material	Unit	Rate in Rs per Unit Excluding taxes
1	Supply of CTT embedded Monopole equivalent to 220 kV D/C narrow base tower (60°+6)	No.	
2	Supply of embedded Monopole equivalent to 220 kV D/C narrow base tower (30°+6)	No.	
3	Supply of embedded Monopole equivalent to 220 kV D/C narrow base tower (60°+6)	No.	

B. Erection Part

Sr. No.	Description of work	Unit	Rate in Rs per Unit Excluding taxes
1	Erection of CTT embedded Monopole equivalent to 220 kV D/C narrow base tower (60°+6) .	No.	
2	Erection of embedded Monopole equivalent to 220 kV D/C narrow base tower (30°+6).	No.	
3	Erection of embedded Monopole equivalent to 220 kV D/C narrow base tower (60°+6).	No.	

C. Civil (Foundation) Part

Sr. No.	Description of work	Unit	Rate in Rs per Unit Excluding taxes
1	Foundation of CTT embedded Monopole equivalent to 220 kV D/C narrow base tower (60°+6) along with Soil test, Excavation, Civil work etc	No.	
2	Foundation of embedded Monopole equivalent to 220 kV D/C narrow base tower (30°+6) along with Soil test, Excavation, Civil work etc	No.	
3	Foundation of embedded Monopole equivalent to 220 kV D/C narrow base tower (60°+6) along with Soil test, Excavation, Civil work etc.	No.	

Note:-

1. Above rates are excluding of all taxes.
2. The bidder should specify all taxes & statutory cess as extra specifically with their offer.
3. The supply & fixing of tower accessories namely Danger board, circuit plate, phase plate, Number Plate, anti-climbing devices, ladder etc. shall be a part of above schedule.
4. All interested bidders are requested to submit their best reasonable offer for above said work on e-mail: ee6620@mahatransco.in on or before **27.03.2022.** along with SAC codes and applicable rate of GST & LC if applicable for above work at the earliest
5. MSETCL has already issued guidelines regarding technical specifications of monopoles vide circular No. 0543 dtd 16.01.2019. The bidder will be bound to accept in general the terms & conditions mentioned in it.
6. This budgetary offer is invited only for estimation purpose and same will not be considered for any bidding OR other activity.

S/d
(V. D.Bhujbal)
Executive Engineer
EHV Project Dn II,Pune

MAHATRANSCO
Maharashtra State Electricity Transmission Co. Ltd.

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO. LTD.
OFFICE OF THE CHIEF ENGINEER, DESIGN DEPTT.
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CIN NO. U40109MH2005SGC153646

Ref.No.MSETCL/CO/Design/D&E-S2/Lines/Technical /Monopole/ Dt. 16 JAN 2019

No 0543

To
The Chief Engineer,
EHV PC O&M Zone
MSETCL
Amravati/Aurangabad /Karad/Nagpur/Nashik/Pune/Vashi

Sub: Circulation of QR & Technical Specification for Monopole up to 220kV level along with budgetary offer

Ref.: 1) O.N. No. CMD/MSETCL/No.1314 Dt.11.01.2019

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In connection with the above subject please find attached herewith the copy QR & Technical Specification for Monopole up to 220kV level duly approved by the competent authority vide above reference O.N. no. CMD/MSETCL/No.1314 Dt.11.01.2019; along with budgetary offer submitted to this office by M/s Valmont and M/s Bajaj Ltd. for your reference and further necessary action.

(S.N.Bhopale)
Chief Engineer (Design)

Encl: A/A attached in PDF format in the email

Copy to

The S.E. Project Circle:
Amravati/Aurangabad/Kolhapur/Nagpur/Nashik/Pune/Kalwa
---For information please

MAHATRANSCO
Maharashtra State Electricity Transmission Co. Ltd.

MAHARASHTRA STATE ELECTRICITY TRANSMISSION COMPANY LIMITED

(CIN No.U40109MH2005SGC153646)

TECHNICAL SPECIFICATION FOR MONOPOLE

GENERAL TECHNICAL REQUIREMENTS

1.0 SYSTEM PARAMETERS

Following are the salient parameters of the electrical and environmental systems:

a.	Nominal System Voltage	:220/132 KV
b.	Frequency	:50 Hz
c.	System highest voltage	: 245/145 KV
d.	Maximum ambient temperature	: 50 °C
e.	Minimum ambient temperature	: 0 °C
f.	Maximum daily average temperature	: 32 °C
g.	Maximum relative humidity (in %)	: 90
h.	Maximum annual rain fall (in mm)	: 1500 to 3800
i.	Number of rainy days/year	: 90
j.	Average number of thunder storm (days per annum)	: 50
k.	Pollution level category	: Moderately polluted as per IEC:71-2

1.0 Transmission Mono Pole structure, General information and scope

1.01 a) General

The transmission line pole steel structures are self-supporting hot dip galvanized structures, made up mainly of steel plates and designed to carry the line conductors with necessary insulators, earth wires/OPGW and hardware fittings under all loading conditions.

The pole structure shall be fabricated using mild steel or/and high tensile steel plates/sections as specified in this specification.

b) Scope

Design, optimization, fabrication, proto assembly and testing of pole structures for 132kV / 220kV DC voltage level (Both Suspension and tension/dead end towers) along with cross arms, earth wire /OPGW peaks (base plates and anchor bolts for fixing the pole in the test bed) including preparation of Structural drawings, Shop drawings, Bill of Materials etc. The scope of work shall also include supply of required fasteners i.e bolts, nuts, spring washers etc. and other accessories including hangers, D-shackles /fixtures etc. as may be required for satisfactory erection & testing of pole structure. The Pole structure designed and fabricated by Contractor shall be proto type tested by Contractor in presence of the Owner. The owner shall depute their representative to witness the tests their expenses will be borne by contractor. The responsibility for design and successful proto type testing shall solely lie with the Contractor. At the time of proto-assembly and/ or proto testing, if any modification is required to be carried out, the same shall be carried out by the Contractor. These modifications if any, shall also be incorporated on the fabrication shop drawings and/ or on the structural drawings After completion of testing, the revised structural drawings, bills of materials and shop drawings shall be submitted to the Owner within 15 days of completion of testing of poles for their approval. After approval, Contractor has to submit 6 copies of drawings/BOMs and 1 set of shop drawings. Softcopies of Structural & Shop drawings and BOM's shall also be submitted in Compact Disk(CD) for computer use.

1.0.2 Type of Pole structures

1.0.2.1 The Pole structures for the transmission lines are classified as given in Table 1 :

1.0.3 **Extensions**

1.0.3.1 The Double Circuit /Single circuit pole structure shall be designed so as to be suitable for adding 3M, 6M, 9M extensions for maintaining adequate ground clearances without reducing the specified factor of safety in any manner.

1.0.3.2 All above extensions provisions to pole structures shall be treated as part of normal structure only.

1.0.4 **Spans and Clearances**

1.0.4.1 Normal Span

The normal ruling span for the line shall be 300 meters for double circuit 132KV/ 220kV D/C circuit suspension pole/tension/dead end pole.

1.0.4.2 Wind Span

The wind span is the sum of two half spans adjacent to the support under consideration. For normal horizontal spans this equals to normal ruling span.

1.0.4.3 Weight Span

The weight span is the horizontal distance between the lowest points of the conductors on the two spans adjacent to a pole structure. For design of structures, maximum weight span limits given in table below shall be

Table -1

Sr. No.	Line Data Description	132kV		220kV	
1	Conductor	0.2 inch^2		0.4 inch^2	
2	Code Name & type	ACSR Panther or		ACSR Zebra	
		AL59 Panther Weight Equivalent or ACSS Panther Weight Equivalent or Carbon Composite core HTLS Panther Weight Equivalent		AL59 ZEBRA Weight Equivalent or ACSS ZEBRA Weight Equivalent. or Carbon Composite core HTLS ZEBRA Weight Equivalent	
3	Number of Conductor per phase	One		One	
4	No. of Earth wires	One,7/3.15 mm GI Earth wire		One, OPGW 11.70 mm Dia.	
5	Phase Configuration	Vertical		Vertical	
6	Terrain	2		2	
7	Reliability level	1		1	
8	Wind Speed	39 m/sec	44 m/sec	39 m/sec	44 m/sec
9	Pole Type	P (0°-2°)	PM (0°-2°)	A (0°-2°)	AM (0°-2°)
			Q (2°-15°)		B (2°-15°)
			R (15°-30°)		C (15°-30°)
			S (30°-60°/ DE 0°-2°)		D (30°-60°/ DE 0°-2°)
10	Normal SPAN	300 meter		300 meter	
	Wind Span	NC	BW	NC	BW
		300	180	300	180
11	Weight Span in meter suspension	450 Max 75min		450 Max 75min	
	Angle Tower	450 Max -450 min		450 Max -450 min	
12	Deflection	5 % of total height at ultimate load		5 % of total height at ultimate load	
13	Body Extension	3m, ,6m,9m		3m, ,6m,9m	

1.0.5 Electrical Clearances

1.0.5.1 Ground Clearance

The minimum ground clearance from the bottom conductor shall not be less than 7010 mm for 220 KV D/C and 6100 mm for 132KV D/C line at the maximum sag conditions i.e at 85°C and still air

1.0.5.2 An allowance of 150mm shall be provided to account for sag errors.

1.0.5.3 Live Metal Clearance

The minimum live metal clearance to be provided between the live parts and steel work of superstructure shall be as per IE Rule 1956

1.03.4 Bidder shall adopt same cross arm design where jumper is projecting outside of cross-arm for PD/PS type pole structure to be used as dead end and angle pole structure.

1.0.5.5 For computing the live metal clearances, the dimensions of insulator strings as indicated in technical specifications Book -II shall be considered.

1.0.5.6 Cross arm projections for Dead end pole structures shall be fixed in such away that it can accommodate a condition of 0 degree to 15 degree deviation both on line side and substation side (slack side).

1.0.5.7 Angle of Shielding

The angle of shielding is defined as the angle formed by the line joining the centre lines of the earth wire and outer power conductor, in still air, at pole structure supports, to the vertical line through the centre line of the earth wire/OPGW. Bidders shall design the pole structure in such a way that the angle of shielding does not exceed 30° for 220KVand 132 D/C line. The drop of the earth wire clamp, which is Contractor's supplied items, should be considered while calculating the minimum angle of protection. For estimating the minimum angle of protection the drop of earth wire suspension clamp along with shackle shall be taken as 150mm.

1.0.5.8 Mid Span Clearance

The minimum vertical mid span clearance between any of the earth wires/OPGW and the nearest power conductor shall not be less than as mentioned in IS 5613 for 220KV D/C and 132KV D/C line which shall mean the vertical clearance between earth wire /OPGW and the nearest conductor under all temperatures and still air condition in the normal ruling span. Further, the tensions of the earth wires and power conductors shall be so co-ordinated that the sag of earth wires shall be at least 10% less than that of conductor sag under all temperature conditions.

1.0.5.9 Phase to Phase Spacing

The phase to phase spacing shall be governed by the live metal clearances to be maintained as per the specifications and dimensions of the structures/components. However, the minimum phase to phase clearance shall be as follows:

Sr. No	Minimum Phase to Phase Clearance	Tower type	220kV Line	132kV Line
1	Vertical	For angle pole with Tension string	5000 mm	3900 mm
2	Vertical	For suspension pole with single /double suspension string	5350 mm	4100 mm

1.0.5.10 Electrical System Data

1.0.5.10.1 220 kV transmission line

1.0 ELECTRICAL SYSTEM DATA

a)	Nominal System Voltage	132KV	220KV
b)	Frequency	50 Hz	50 Hz
c)	System highest voltage	145KV	245KV
d)	Number of conductors per phase	Single	Single
e)	Conductor type and size	As mention in Table -1	As mention in Table -1
f)	Phase Configuration	Vertical	Vertical
h)	Ruling design span	300 meters	300 meters
i)	No. of earth wires, type and size	1 nos., 7/3.15mm Galvanized steel earth wire/11.7mm dia OPGW.	1 nos., 7/3.15mm Galvanized steel earth wire/11.7mm dia OPGW.

1.0.5.10.3 **DETAILS OF LINE MATERIALS**

a. The Conductor / Earth Wire/OPGW Properties to be used for loading calculation:
Details of Conductor and earth wire/opgw please refer Technical specification Book -II

b. Details of insulator strings
Insulator string drawings please refer Technical specification Book -II

1.0.6 Design of Pole structures

The following clauses specify the minimum requirements for design of pole structures for 132kV /220kV voltage level:

Type of 132kV Monopole	Type of 220kV Monopole	Deviation Limit	Typical Use
PP or PPM (DC)	PA or PAM (DC)	0 -2 deg	Mono pole with single Suspension/double suspension insulator string
PQ (DC)	PB (DC)	2 – 15 deg	a) Angle mono pole with single tension/double tension insulator string b) Also to be designed for anti-cascading condition.
PR (DC)	PC (DC)	15-30 deg	a) Angle mono pole with single tension/double tension insulator string b) Also to be designed for anti-cascading condition.
PS (DC)	PD (DC)	30-60 deg	a) Angle mono pole with single tension/double tension insulator string b)Dead end with no angle of deviation on the mono pole on line side and up to 15 deg angle on slack span (gantry) side with or without extra cross arm. c)Complete dead end.

1.0.6.1 Design Criteria

The pole structure shall be designed to meet design requirements & design criteria stipulated in IS:802:2016 (latest), ASCE Manuals and reports on Engineering practice No. 72 and ASCE-48-11 "Design of Steel Transmission Pole Structures", & CBIP Manual as applicable except otherwise specified in this specification. The following parameters shall be considered for wind loading and other loads on pole

Basic wind speed : 39 m/sec
For 132kv Pole type P (2°) and 220kV pole A (2°)
Basic wind speed : 44m/sec
For 132kv Pole type PM (2°),Q(2°-15°) , R(15°-30°) and S(30°-60°)/DE and
220kV Pole type AM (2°),B(2°-15°) , C(15°-30°) and D(30°-60°)/DE
Reliability Level : 1
Terrain category : 2
Angle of incidence of wind : As per IS 802(latest)

1.0.6.3 Design Temperatures

i) Minimum temperature : 0 deg.
ii) Every day temperature : 32 deg.
iii) Max. temperature of
a) Conductor : 85 deg.
b) Earth wire/OPGW exposed to sun : 53 deg.

1.0.6.4 Conductor and Earth wire Configuration

Double circuit pole structure shall be in vertical formation. The phase to phase spacing shall not be less than the values specified as per 1.0.5.9.

1.0.6.5 Maximum Tension

Maximum tension shall be based on either
a) at 0 deg C with 36% full wind pressure, or
b) at 32 deg C with full wind pressure whichever is more stringent.
Sag tensions calculations are to be carried out by the contractor considering conductor & earth wire parameters & specified conditions and spans. The initial tension at 32°C and without wind shall be 22% of the ultimate tensile strength for the conductor and less than 20% of the ultimate tensile Strength for the earth wire/OPGW.
The maximum tension of conductor and earth wire shall not exceed 70 percent of the ultimate tensile strengths. Similarly the maximum tension of OPGW shall not exceed 40 per cent of the ultimate tensile strengths.

As per Clauses of IS 802:2016,

1.0.6.6 The cross section and polygon of the structure shall be so selected that it offer optimum weight of the structure using specified materials and also ease of fabrication and erection. For cross arms also, Polygonal Sections shall be used.

1.0.7 Loading Conditions

The Contract or shall calculate loads at structure, conductor & earth wire points under different loading conditions viz. Reliability Conditions (Normal) Condition along with Oblique 30degrees/45 degrees), Security Conditions(Broken Wire Condition), Safety Conditions, Anti-cascading condition etc.as per IS-802:2016 (latest) considering various combinations of design temperatures, wind loads and prepare loading trees/diagrams/charts. The loading trees/diagrams/charts shall be submitted to Employer for approval. The pole structure designs shall be developed by the contractor as per the approved loading trees/charts/diagram.

1.1 Design and Drawings

1.1.1 The following design calculation and drawings are required to be furnished to the Employer:

A) ALONGWITH THE BID:

Sample/Indicative design calculations and drawings all pole structures for both 132 and 220kVpole structures.

B) AFTER AWARD OF CONTRACT:

The Contractor shall submit detailed design of pole structures with all extension duly vetted /approved (in context to MSETCL Tender & requirement) from third party govt. accredited agency/lab viz. CPRI/IIT/Regional Engineering College The bidder/contractor shall borne the expenses for the same. The pole structure design shall be submitted along with the stress diagram / computer output together with sample calculations etc., Anchor Bolt templates and loading / rigging arrangement of pole structure testing to enable the Employer to make a preliminary check regarding structural stability of pole structure before fabrication.

1.1.2 After design of pole structures and subsequent approval of design ,drawings and bill of materials the Contractor shall furnish further copies to the Employer:

a) Detailed design calculation and drawing for pole structures.
b) Detailed structural drawings indicating section size, length of members ,sizes of plates along with hole to hole distance & joint details etc.
c) Bill of materials, indicating cutting and bending details against each member.
d) All the drawings for the pole structure accessories.
e) After successful testing of the pole, proto type test report, final structural drawings, BOM's and shop sketches need to be submitted to the Employer.

1.1.3 As the pole structure being designed for specific loading requirements (viz. wind zone, spans, angle of deviations, extensions etc) shall also be used in other wind zones as well as for other spans, angle of deviation, extensions; the contractor shall also submit spotting data limits for use of extensions in various designed and tested pole structure in other cases along with supporting detailed design calculations.

1.1.4 The contractor shall also submit foundation designs & drawings (along with detailed design calculation) of foundations. duly vetted /approved (in context to MSETCL Tender & requirement) from third party govt. accredited agency/lab viz. CPRI/IIT/Regional Engineering College The bidder/contractor shall borne the expenses for the same. The foundation for pole structures considering standard soil conditions viz. Dry, Wet, PS,FS, WBC, DFR, WFR, SFR. Parameters for designing the foundations shall be intimated to the contractor during detailed engineering stage

1.1.5 All the drawings shall have a proper name plate clearly displaying the name of EMPLOYER /OWNER on right hand bottom corner. The exact format of the nameplate shall be handed over to the successful bidder for incorporation of the same on all the drawings. Also all the drawings shall carry the following statement and shall be displayed conspicuously on the drawing: WARNING: THIS IS PROPRIETORY ITEM AND DESIGN RIGHT IS STRICTLY RESERVED WITH MSETCL. UNDER NO CIRCUMSTANCES THIS DRAWING SHALL BE USED BY ANYBODY WITHOUT PRIOR PERMISSION FROM THE EMPLOYER/OWNER IN WRITING.

1.1.6 The Contractor is required to submit four copies of the drawings for Employer's approval. While submitting the structural drawings, bill of materials, shop drawings and any other drawings pertaining to the subject poles, the Contractor shall clearly indicate on each drawing MSETCL Specification No., Name of the specific Pole type letter reference no. and date on which the submission are made. The same practice is also to be followed while submitting distribution copies.

1.1.7 The drawings submitted by the Contractor shall be approved /commented by the Employer as the case may be within fifteen (15) days of receipt of drawings in his office. If the designs/drawings are commented by the Employer, the Contractor shall submit revised design/drawings duly incorporating all comments within fifteen (15) days of date of issue of comments. The Contractor shall submit 4 copies of all pole structure drawings, BOM etc. for further distribution by the Employer.

1.1.8 Other than the items indicated above some other drawings and documents, such as BOM, Shop drawings, structural drawings for pole structures/extensions, which are required for the project, shall also be developed by the Contractor. However, no extra cost on this account shall be payable to the Contractor.

1.2 Materials

1.2.1 Pole structure Steel Sections

Steel of tested quality in conformity with IS: 2062:2011 are to be used in, Pole structures. Not more than two grades of steel shall be permitted for use. The quality of steel shall be BR/BO. The Contractor can use other equivalent grade of steel plates conforming to latest International Standards. However, use of

steel grade having designated yield strength more than that of IS:2062 grade E450 BR/ EN 10025 grade S450 JO / ASTM 572 grade 65 (designated yield strength 450 MPa) is permitted, unless otherwise indicated in this specification. Steel plates below 6mm size exclusively used for packing plates/packing washers produced as per IS : 1079 (Grade-0) are also acceptable. However, if below 6mm size plate are used as load bearing plates viz gusset plates ,joint splices etc. the same shall conform to IS : 2062 or equivalent standard meeting mechanical strength/metallurgical properties corresponding to selected grade Flats of equivalent grade meeting mechanical strength/metallurgical properties may also be used in place of plates for packing plates/ packing washers. SAILMA 350HI grade plate can also be accepted in place of HT plates (EN 410025 grade S355 JR/JO / IS 2062:2011 — grade E350, as applicable) provided SAILMA 350HI grade plate meet all the mechanical properties of plate as per EN 10025 grade S355 JR/JO (designated yield strength 355MPa) / IS 2062: 2011 — grade E350.

1.2.2 Fasteners: Bolts, Nuts and Washers.

1.2.2.1 All hexagonal bolts and nuts shall conform to IS-12427. They shall have hexagonal head and nuts, the heads being forged out of the solid, truly concentric, and square with the shank, which must be perfectly straight.Atrl_l_b_olt5 and nuts shall be galvanized as per IS:1367 (Part-13)/IS:2629.

1.2.2.2 The bolt shall be of 16/24 mm diameter and of property class 5.6 or 8.8 as specified in IS:1367 (Part-III) and matching nut of property class as specified in IS:1367 (Part-VI).

1.2.2.3 Bolts up to M16 and having length up to 10 times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain—good and reliable mechanical properties and effective dimensional control. The shear strength of bolts shall be as per applicable standard. Bolts should be provided with washer face in accordance with IS:1363 (Part-I) to ensure proper bearing.

1.2.2.4 Nuts for he3ssonal bolts should be double chamfered as per the requirement of IS:1363 Part-III. It should be ensured by the manufacturer that nuts should' not be over tapped beyond 0.4mm oversize on effective diameter for size up to M16.

1.2.2.5 Fully threaded bolts shall not be used. The length of bolts shall be such that the threaded portion will not extend into the place of contact of the members.

1.2.2.6 All bolts shall be threaded to take the full depth of the nuts and threaded for enough to permit firm gripping of the members, but not further. It shall be ensured that the threaded portion of each bolt protrudes not less than 3mm and not more than 8mm when fully tightened. All nuts shall fit tight to the point where the shank of the bolt connects to the head.

1.2.2.7 Flat and tapered washers shall be provided wherever necessary. Spring washers shall be provided for insertion under all nuts. These washers shall be steel electro galvanised, positive lock type and 3.5mm in thickness for 16mm diameter bolt and 4.5mm for 24mm bolt.

1.2.2.8 To avoid bending stress in bolts or to reduce it to minimum, no bolt shall connect aggregate thickness of members more than three (3) times its diameter.

1.2.2.9 The bolt positions in assembled pole structures shall be as per structural drawing.

1.2.2.10 Bolts at the joints shall be so staggered that nuts shall be tightened with spanners without fouling.

1.2.2.11 To ensure effective in-process Quality control it is desirable that the manufacturer should have in house testing facility for all tests like weight of zinc coating, shear strength and other tests etc. The manufacturer should also have proper Quality Assurance System which should be in line with the

requirement of this specification and IS: 9001 series Quality System Standard.

1.2.2.12 **Anchor bolts**

Anchor bolts shall generally conform to IS: 5624. The size, grade & numbers of anchor bolts and its thread and nuts selection should be compatible with the required strength as per design.

1.3 Pole structure Accessories

Arrangement shall be provided for fixing of all pole structure accessories to the pole structure at a height between 2.5 meters and 3.5 meters above the ground level. Suitable provision of cleat / plate to be provided on Suspension pole structure facilitating installation of bird guard.

1.3.1 Step Bolts & Ladders

Each pole structure shall be provided with step bolts as per drawing enclosed in the section of drawing. The step bolts conforming to IS:10238 of not less than 16mm diameter and 175mm long shall be provided, spaced not more than 450mm apart and extending from 2.5 meters above the ground level to the top of the pole structure. However, the head diameter shall be 35mm as indicated in the enclosed drawing. The step bolt shall be fixed on two sides of polygon of the pole structures in alternate step arrangement. Each step bolt shall be provided with two nuts on one end to fasten the bolt securely to the pole structure and button head at the other end to prevent the feet from slipping away. The step bolts shall be capable of withstanding a vertical load not less than 1.5 KN. As an alternate to step bolts, ladders of suitable design may also be provided by the contractor. For horizontal access on cross arms, suitable designed hooks shall also be provided. Detailing for providing step bolts/hooks/ladders etc. shall be done so that all parts of pole structures are accessible and installation & maintenance of insulators, hardware assemblies, conductors etc. is possible.

1.3.2 Insulator Strings and Earth wire Clamps Attachments

a) For the attachment of suspension Insulator string, if required a suitable dimensioned swinging hanger on the pole structure shall be provided so as to obtain specified clearances under respective swinging condition of the strings. The hanger, extensions links, D-shackles etc. as required shall be of same rating/strength as that of corresponding rating/ Ultimate tensile Strength of Insulator string.

b) At tension pole structures, strain plates of suitable dimensions under each cross-arm tip, shall be provided for taking the hooks or D-shackles of the tension insulator strings. Full details of the attachments shall be provided by the contractor. To achieve requisite clearances, if the design calls for providing extra D-shackles, link plate etc. before connecting the insulator string, the provision for the same shall be provided by the Contractor. These item shall be of same rating/strength as that of corresponding rating/ Ultimate tensile Strength of Insulator string.

1.4 Pole structure Fabrication

1.4.1 The Pole Structure along with cross arms, earth wire peaks, base plate and joints shall be fabricated by the Contractor as per the design prepared by the contractor and approved by the by the Employer. The fabrication of Pole structure shall be in conformity with the following:

1.4.2 Except where hereinafter modified, details of fabrication shall conform to industry practices and relevant standards.

1.4.3 Joints shall be so designed and fabricated that eccentricity is avoided as far as possible. In case of connections by means of slip joints, minimum overlap shall be as per applicable ASCE standard.

1.4.4 The cross arms shall be connected to the pole by means of suitable flanges welded on the body and cross arms.

1.4.5 The Pole structures shall be accurately fabricated to connect together easily without any undue strain on the structure.

1.4.6 No sharp/rough edges shall be permitted in the entire structure.

1.4.7 On slip-in joints, diameter of the inner and outer part of the pole shall be controlled to ensure smooth assembly of the pole structure and its correct height after erection.

1.4.8 The structure shall be designed so that all parts shall be accessible for inspection and cleaning. Drain holes shall be provided at all points where pockets of depression are likely to hold water. The top end of the pole, earth wire peaks and cross arms shall be suitably sealed with cover plate welded to the structure.

1.4.9 The length of any individual segment shall be such that it can be easily transported and erected. All similar parts shall be made strictly interchangeable. Pole segments, as far as possible, shall be fabricated in single piece. In case of restriction due to the size of hot dip galvanising bath, pole segments having outer diameter more than 1 m may be fabricated in two halves and seamlessly welded after galvanising.

1.4.10 Suitable provisions shall be kept in the design and detailing of pole structures for easy erection at site using conventional as well as mechanized methods.

1.4.11 Design and detailing for providing step bolts/hooks/ladders etc. shall be done so that on provision of these, all parts of pole structures are accessible and installation & maintenance of insulators, hardware assemblies, conductors etc. is possible. Design detailing for provision of other accessories viz. , Danger plate, Number, Phase plate etc. shall also be done.

1.4.12 **Material Cutting, Forming & Bending**

1.4.12.1 The required material cutting, forming and bending operations shall be carried out generally in accordance with the relevant sections of ASCE Manuals and reports on Engineering practice No. 72 and ASCE-48-11"Design of Steel transmission Pole Structures".

1.4.12.2 Before any cutting work is started, all steel shall be carefully straightened and trued by pressure and not by hammering. They shall again be trued after cutting & welding etc.

1.4.13 Drilling and Punching

1.4.13.1 Holes for bolts shall be drilled or punched with a jig but drilled holes shall be preferred. The tolerances regarding punch holes are as follows:

a) Holes must be perfectly circular and no tolerance in this respect is permissible.

b) The maximum allowable difference in diameter of the holes on the two sides of plates or angle is 0.8mm i.e. the allowable taper in a punched hole should not exceed 0.8mm on diameter

c) Holes must be square with the plates or angles and have their walls parallel.

1.4.13.2 All burrs left by drills or punch shall be removed completely. When the pole structure members are in position the holes shall be truly opposite to each other. Drilling or reaming to enlarge holes shall not be permitted.

1.4.14 Welding

1.4.14.1 All welding shall be in accordance with the latest revision of American Welding Society Structural Welding Code (ANSUAWS D1.1) or other equivalent National/International standards. Welding terms and symbols should comply with the AWS definitions and symbols.

1.4.14.2 Care should be exercised with respect to welding procedures, qualification of welders, operators and procedures, electrodes, preheat, notch toughness and minimum yield of the electrodes to ensure conformance with the requirements of the ANSUAWS D1.1 code. Preheating shall be done according to the ANSUAWS code or the steel producers' recommendations, or both.

1.4.15 Erection mark

1.4.15.1 Each individual member shall have erection mark conforming to the component number given to it in the fabrication drawings. The mark numbers shall be marked with marking dies of 16mm size before galvanising and shall be legible after galvanising,

1.4.15.2 Erection Mark shall be A-BB-CC-DDD
A = Employer's code assigned to the Contractors- Alphabet
BB = Contractor's Mark-Numerical
CC = Pole structure Type Alphabet.
DDD = Number mark to be assigned by Contractor - Numerical.
Erection mark for high tensile steel members shall be prefixed by the letter " H"

1.5 Quantities and weights

1.5.1 Though fully galvanised pole structure parts are to be supplied, the weight of pole structure shall mean the weight of pole structure calculated by using the black sectional (i.e. un galvanised) weight of steel members of the size indicated in the approved fabrication drawings and bill of materials, without taking into consideration the reduction in weights due to holes, notches and bevel cuts etc. but taking into consideration the weight of the **D** shackles, hangers, strain plates, pack plates, gusset plates, extension link/plates and pack washers etc. The weight of strain plates, pack plates, extension link and gusset plates shall mean the weight of its circumscribing rectangle, without taking into considerations the reductions in weight due to holes, notches etc. The weight of D-shackles, hangers and pack washers shall be net actual weight taking into consideration reduction due to holes. For bolts and nuts along with spring washers and step bolts, the weight per pole structure shall be calculated from the bolt schedule applicable to each type of pole structures and body extensions as approved by the Employer. The rate quoted by the bidder for pole structure/pole structure parts supply, is deemed to be inclusive of galvanising charges including the cost of zinc.

1.5.2 Payment of the pole structures shall be made on per structure basis as per the unit rates in the contract irrespective of any change in weight of structure estimated by the bidder at the time of the bidding vis-a-vis weight of structure as per actual tested and approved design.

1.6 Galvanising

1.6.1 **Fabricated Pole structure Parts**

The pole structure parts shall be hot dip galvanized .The galvanization shall be done as per requirements of IS 4759 after all fabrication work is completed. The contractor shall also take, guidelines from the recommended practices for hot dip galvanizing laid down in IS 2629 while deciding and implementing galvanizing procedure. The mandatory requirements however, are specified herein. The fabricated pole structure parts shall have a minimum overall Zinc coating of 610 gms per sq. m of surface area except for plates & sections below 5mm which shall have Zinc coating of 460 gms per sq. m of surface area. The average zinc coating for all sections and plates 5mm & above shall be maintained as 87 microns and that for plates & sections below 5mm shall The zinc coating shall be adherent, reasonably uniform, smooth, continuous and free from imperfections such as black/ bare spots, ash rust strains, bulky white deposits / wet storage strains and blisters. The surface preparation for fabricated pole structure parts and-stubs for hot dip galvanizing shall be carried out as indicated herein below:

(i) Degreasing& Cleaning of Surface: Degreasing and cleaning of surface, wherever required, shall be carried out in accordance with clause 4.1 of IS 2629-1985.After degreasing the article shall be thoroughly rinsed. However, if acidic degreasers are used rinsing is not required.

(ii) Pickling: Pickling shall be done using either hydrochloric or sulphuric acid as recommended at clause 4.3 of IS 2629 -1985. The actual concentration of the acids and the time duration of immersion shall be determined by the Contractor depending on the nature of material to be pickled. Suitable inhibitors also shall be used with the acids to avoid over pickling. The acid concentration, inhibitors used, and maximum allowable iron content shall form part of plant standard to be formulated and submitted to employer along with Quality Assurance Program.

(iii) Rinsing: After pickling, the material shall be rinsed, preferably in running water to remove acid traces, iron particles or any other impurities from the surface. Two rinse tanks are preferable, with water cascading from the second tank to the first to ensure thorough cleaning. Wherever single tank is employed, the water shall be periodically changed to avoid acid contamination, and removal of other residue from the tank.

(iv) Fluxing: The rinsed article shall be dipped in a solution of Zinc ammonium chloride. The concentration and temperature of the flux solution shall be standardized by the contractor depending on the article to be galvanized and individual circumstances. These shall form part of plant standard to be formulated and submitted to employer along with Quality Assurance Program. The specific gravity of the flux solution shall be periodically monitored and controlled by adding required quantity of flux crystals to compensate for drag-out losses. Free acid content of the flux solution also shall be periodically checked and when it is more than two (2) grams of free acid per litre of the solution, it shall be neutralized. Alternatively, Ph value should be monitored periodically and maintained between 5.0 to 5.5.

(v) Drying: When dry galvanizing is adopted the article shall be thoroughly dried after fluxing. For the purpose of drying, the contractor may use hot plate, air oven or any other proven method ensuring complete drying of the article after fluxing and prior to dipping in the molten zinc bath. The drying process shall be such that the article shall not attain a temperature at which the flux shall get decomposed. The article thus dried shall be galvanized before the flux coating picks up moisture from the atmosphere or the flux layer gets damaged or removed from the surface. The drying procedure, time duration, temperature limits, time lag between fluxing, drying, galvanizing etc shall form part of plant standard to be formulated and submitted to employer along with Quality Assurance Program.

(vi) Quality of Zinc: Any one or combination of the grades of zinc specified in IS 209 or IS 13229 or other comparable international standard shall be used for galvanizing. The contractor shall declare the grade(s) of zinc proposed to be used by them for galvanizing. The molten metal in the zinc bath shall contain minimum 98.5 % zinc by mass. It shall be periodically measured and recorded. Zinc aluminium alloy shall be added as per IS 2629.

(vii) Dipping Process: The temperature of the galvanizing bath shall be continuously monitored and controlled. The working temperature of the galvanizing bath shall be maintained at 450+/- 10 degree C .The article should be immersed in the bath as rapidly as possible without Compromising on safety aspects. The galvanizing bath temperature, immersion angle & time, time duration of immersion, rate of withdrawal etc shall be monitored and controlled depending upon the size , shape, thickness and chemical composition of the article such that the mass of zinc coating and its uniformity meets the specified requirements and the galvanized surface is free from imperfections and galvanizing defects.

(viii) Post Treatment: The article shall be quenched in water. The quench water is to be changed / drained periodically to prevent corrosive salts from accumulating in it. If water quenching is not

done then necessary cooling arrangements should be made. The galvanized articles shall be dipped in dichromate solution containing sodium dichromate and sulphuric acid or chromic acid base additive at a predetermined concentration and kept at room temperature to retard white rust attack. The temperature of the chromate solution shall not exceed 65 degree C. The articles shall not be stacked immediately after quenching and dichromating. It shall be ensured that the articles are dry before any further handling operation.

(ix) Storing, Packing and Handling: In order to prevent white rust formation sufficient care should be exercised while storing handling and transporting galvanized products. The articles shall be stored in an adequately ventilated area. The articles shall be stored with spacers in between them and kept at an inclination to facilitate easy drainage of any water collected on the articles. Similar care is to be taken while transporting and storing the articles at site. The Contractor shall prepare a detailed galvanizing procedure including Flow Chart with control parameters and all plant standards as required above and submit to MSETCL for approval as part of Quality Assurance Plan.

In case, galvanizing of any portion of pole structures is permitted in two parts/halves, Zinc Metallizing / cold galvanizing or Zinc Rich Paint, (Pre- mixed type paint, based on organic/inorganic binders specially formulated for steel surfaces may be used after welding of parts/halves so as to have equivalent thickness of specified zinc coating. The dried film of Zinc Rich Paint should contain a minimum of 92 percent Zinc Dust by mass.) is allowed as per Section -11of American Welding Society standard AWS WZC/D19.0-72

1.6.2 Fasteners.

For fasteners, the galvanizing shall conform to IS-1367(Part-13). The galvanizing shall be done with centrifuging arrangement after all mechanical operations are completed. The nuts, may however be tapped (threaded) or rerun after galvanizing and the threads oiled .The threads of bolts & nuts shall have a neat fit and shall be such that they can be turned with finger throughout the length of the threads of bolts and they shall be capable of developing full strength of bolts. Spring washers shall be electro galvanized as per Grade-IV of IS-1573.

1.7 Type Testing of Pole Structure

1.7.1 The scope of work covers the type testing of all proto-type pole structures with +9mtr extension: For design of other extensions of pole structures, the factor of safety in the design shall not be less than the factor of safety considered in the design of above proto tested pole structures.

1.7.2 The Pole structures shall be proto type tested by the contractor at any testing station having facilities to test the structures. The proto type pole structures after inspection by employer shall be transported to the test bed by the Contractor. Testing of Pole structure shall generally conform to IS:802 (Part-III). The employer shall depute their representative to witness the tests The bidder/contractor shall borne the expenses for the same.. The responsibility for design and successful proto type testing shall solely lie with the Contractor. At the time of proto assembly and/ or proto testing, if any modification is required to be carried out, the same shall be carried out by the Contractor. These modifications, if any, shall also be incorporated on the fabrication shop drawings and/ or on the structural drawings.

1.7.3 A non-galvanized pole structure of each type complete with specified extension shall be subjected to design and destruction tests by first applying test loads applied in a manner approved by the Employer, The pole structure shall withstand these tests" without showing any sign of failure or permanent distortion in any part. Thereafter, the pole structure shall be subjected to destruction by increasing the loads further in an approved manner till it fails. The pole structure shall be tested for all the conditions considered for the design of pole structure. The Contractor shall submit to the Employer, for approval, the detailed programme and proposal for testing the pole structures

showing the methods of carrying out the tests and manner of applying the loads. After the Employer has approved the test procedures and programmes the Contractors will intimate the Employer about carrying out the tests at least 15 days in advance of the scheduled date of tests during which the Employer will arrange to depute his representative to be present at the time of carrying out the tests. Three copies of the test reports shall be submitted. The Contractor shall submit one set of bill of materials at the time of prototype pole structure testing for checking the pole structure material. Further at the time of submitting test report on successful completion of testing, the contractor has to submit the final structural drawings, shop drawings and Bill of materials for Employer's reference and record. The type testing charges shall be borne by contractor/bidder

.

1.7.4 In case of premature failure the pole structure shall be retested and steel already used in the earlier test shall not be used again. However, in case of minor failures, the contractor can replace the members with higher section and carry out the testing. The Contractor shall provide facilities to the Employer or their representatives for inspection of materials during manufacturing stage and also during testing of the same. In case of any premature failure even during waiting period, the pole structure is to be retested with rectified members. However, if the failure are major in nature and considerable portion of pole structure is to be re-erected, in such cases all the tests which has been carried out earlier are required to be reconducted again in compliance with Specification.

1.7.5 Each type of pole structure to be tested shall be a full scale prototype non galvanized pole structure and shall be erected vertically on rigid foundation. The pole structure erected on test bed shall not be out of plumb by more than 1 in 360.

1.7.6 All the measuring instruments shall be calibrated in systematic / approved manner with the help of standard weight / device. Calibration shall be done before commencing the test of each pole structure up to the maximum anticipated loads to be applied during testing.

1.7.7 The tension pole structure is to be tested with strain plate as per approved design / drawings.

1.7.8 The sequence of testing shall be decided by the Employer at the time of approving the rigging chart I test data sheet.

1.7.9 The Employer may decide to carry out the tensile test, bend test etc. as per the relevant IS/DIN on few members of the test pole structure after completion of the test or in case of any premature failure. The Contractor shall make suitable arrangement for the same without any extra cost to the Employer.

1.7.10 Prefix 'T' shall be marked on all members of test pole structure in addition to the Mark No. already provided.

1.7.11 **Method of Load Application**

1.7.11.1 Loads shall be applied according to the approved rigging arrangement through normal wire attachments angles on bent plates.

1.7.11.2 The various types of loads, transverse, vertical and longitudinal shall be applied in such a way that there is no impact loading on the pole structure due to jerks from the winches.

1.7.11.3 All the loads shall be measured through a suitable arrangement of strain devices or by using weights. Positioning of the strain devices shall be such that the effect of pulley friction is eliminated. In case the pulley friction cannot be avoided, the same will be measured by means of standards weights and accounted for in the test loads.

1.7.12 Pole structure Testing Procedure

The procedure for conducting the pole structure test shall be as follows:

1.7.12.1 **Bolt Slip Test**

In a bolt slip test, the test loads shall be gradually applied up to the 50% of design loads under normal condition, kept constant for two (2) minutes at that loads and then released gradually. For measurement of deflection the initial and final readings on the scales(in transverse & longitudinal directions) before application and after the release of Loads respectively shall be taken with the help of theodolite. The difference between readings gives the values of the bolt slip.

1.7.12.2 **Normal Broken Wire Load Tests**

All the loads, for a particular load-combination test, shall be applied gradually up to the full design loads in the following steps and shall also be released in the similar manner :

25 percent,
50 percent,
75 per cent,
90 percent,
95 percent and
100 percent

1.7.12.3 **Observation Periods**

Under normal and broken wire load tests, the pole structure shall be kept under observation for sign of any failure for two minutes (excluding the time of adjustment of loads) for all intermediate steps of loading up to and including 95 percent of full design loads. For normal, as well as broken wire tests, the pole structure shall be kept under observation for five (5) minutes (excluding the time for adjustment of loads) after it is loaded up to 100 percent of full design loads. While the loading operation are in progress, the pole structure shall be constantly watched, and if it shows any tendency of failure anywhere, the loading shall be immediately stopped, released and then entire pole structure shall be inspected. The reloading shall be started only after the corrective measures are taken. Full design loads for five (5) minutes, with no visible local deformation after unloading (such as bowing, buckling etc.) and no breakage of elements or constitute parts. The structure shall be considered to be satisfactory, if it is able to support the specified full design loads for five (5) minutes, with no visible local deformation after unloading (such as bowing, buckling etc.) and no breakage of elements or constituent parts). Ovalization of holes and permanent deformation of bolts shall not be considered as failure.

1.7.12.4 Recording

The deflections of the pole structure in transverse and longitudinal directions shall be recorded at each intermediate and final stage of normal load and broken wire load tests by means of a theodolite and graduated scale. The scale shall be of about one metre long with marking up to 5 mm accuracy.

1.7.12.5 Destruction Test

The destruction test shall be carried out under normal condition or broken wire condition. Under which load condition the destruction test is to be carried out shall sheet be intimated to the contractor at the time of approving rigging chart I test data. The procedure for application of load for normal/broken wire test shall also be applicable for destruction test. However, the load shall be increased in steps of five (5) per cent after the full design loads have been reached.

1.8 Standards

1.8.1 The design, fabrication, galvanizing and testing of pole structures shall conform to the following Indian Standards (IS)/International Standards which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification. In the event of supply of material conforming to Standards other than specified, the Bidder shall confirm in his bid that these Standards are equivalent to those specified. In case of award, salient features of comparison between

the Standards proposed by the Bidder and those specified in this document will be provided by the Contractor to establish their equivalence.

1.8.2 The material and services covered under these specifications shall be performed as per requirements of the relevant standard code referred hereinafter against each set of equipment and services. Other internationally acceptable standards which ensure equal or higher performance than those specified shall also be accepted.

Sr. No.	Indian Standard		International Standard
1	**IS:209-1992**	Specification for Zinc	ISO/R/752 , ASTM B6
2	IS 800-1991	Code of practice for General Building Construction of Steel	CSA 516.1
3	(a)IS:802(Part 1) Sec 1-2016 Sec 2-1992	Code of Practice for use of Structural Steel in Overhead Transmission Line Towers: Materials, loads and Permissible Stresses Section 1 Materials and loads Section 2 Permissible stresses.	ASCE 52 IEC 826 BS 8100
	b)IS:802-1990 (Part 2)	Code of Practice for use of structural steel in overhead Transmission Line: Fabrication, Galvanizing, Inspection and Packing	ASCE 52
	c)IS:802-1990(Part 3)	Code of practice for use of Structural Steel in Overload Transmission Line Towers & Testing	ASCE 52 IEC 652
4	IS:808-1991	Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections.	
5	IS:875-1992	Code of Practice for Design Loads (other than Earthquakes) for Buildings and Structures.	
6	IS:1363-1992	Hexagon Nuts (size range M5 to M36)	
7	IS:1367-1992	IS:1367-1992 Technical Supply Conditions for Threaded Steel/ Fasteners	
8	IS:1573-1991	Electro-Plated Coatings of zinc on iron And Steel	
9	IS:1852-1993	Rolling and Cutting Tolerances of Hot Rolled Steel Products	
10	IS-1893-1991	Criteria for Earthquake Resistant Design of Structures	IEEE 693
11	IS:2016-1992	Plain Washers	ISO/R887 ANSIB18-22.1
12	IS:2062-1992	Steel for general structural purposes	
13	IS:2629-1990	Recommended Practice for Hot Dip Galvanizing of iron and steel.	ASTM A123 CSA G 164
14	IS:2633-1992	Method of Testing Uniformity of Coating of Zinc Coated Articles	ASTM A123 1 CSA G164
15	IS:3063-1994	Single coil Rectangular section Spring Washers for Bolts, Nuts Screws	DIN-127
16	IS:3757-1992	High Strength Structural Bolts	
17	IS:4759-1990	Specification for Hot zinc coatings on structural steel and other Allied	

		products	
18	IS:5369-1991	General Requirements for Plain Washers	
Sr. No.	Indian Standard		International Standard
19	IS:5613-1993	Code of Practice for Design installation and Maintenance of Overhead Power Lines Section 1 Design Part 2, Section 2 Installation and Maintenance	
20	IS:6610-1991	Specification for Heavy Washers for Steel structures.	
21	IS:6623-1992	High Strength Structural Nuts	
22	IS:6639-1990	Hexagon Bolts for Steel Structure.	ASTM A394 CSA B334
23	IS:6745-1990	Method for Determination of weight of Zinc coated iron and Steel Articles.	ASTM A90
24	IS:8500-1.992	Specification for Weldable Structural Steel (Medium & High Strength Qualities)	
25	IS:10238-1989	Step Bolts for Steel Structures	
26	IS:12427-1988	Bolts for Transmission Line Towers	
27	ASCE 48-11	Design of Steel Transmission Pole Structures	
28	ASCE Manuals and reports on Engineering practice No. 72	Design of Steel Transmission Pole Structures.	

The standards mentioned above are available from

Sr. No.	Reference Abbreviation	Name and Address
1	BIS/IS	Beureau Of Indian Standards, Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi - 110001 India
2	ISO	International Organisation for Standardization. Danish Board of Standardization Danish Standardizing Sraat, Aurehoegvej-12 DK-2900, Heeleprup, DENMARK.
3	CSA	Canadian Standard Association 178, Rexadale Boulevard, Rexdale (Ontario) Canada, M9W 1R3
4	DIN	Deutsches Institute fur Normung, Burggrafenstrassee 4-10 Post Farh 1107 D-1000, Berlin 30 GERMANY
5	ASTM	American Society for testing and Material 1916 Race Street Philadelphia. PA 1903-1187 USA
6	Indian electricity Rules Regulation for electricity crossing of railway Tracks	Kitab Mahal Baba Kharak singh Marg New Delhi-110001 India
7	ASCE	American Society of civil Engineers 345 East 47th Street New York, NY 10017-2398 USA
8	IEEE	Institute of Electrical and Electronics Engineers 445 Hoes LanePiscataway, NJ 0085-1331, USA
9	IEC	International Electro technical Commission, Bureau Central de la Commission, electro Technique international, I Rue de verembe, Geneva, SWITZERLAND

Qualifying Requirements Upto 220 KV Tr. Lines with Monopoles	
Cl. No.	**Proposed Qualifying Requirements for Bidder**
Note:	The original colored scan copy should be uploaded as bid documents in support of Technical Qualifying Criteria. The Attested/Notarized photocopies of the same will not be entertained. Detailed communication address, e-mail ID & contact numbers of end users should be furnished for cross verification.
3.3	FINANCIAL QUALIFYING CRITERIA
3.3.1	The Bidder should have the Minimum Annual Average Turnover* (MAAT) of at least 100% of estimated cost of tender offered in the last three years i.e. 36 months. In case of JV, the members of JV shall individually meet the financial criteria as follows: In case of JV, Lead member shall meet not less than 70% and the other member not less than 45% of the Minimum Annual Average Turnover. Audited balance sheets for the specified last three years duly certified by Chartered Accountant only to be submitted.
3.3.2	The Bidder should have a positive Net worth of last financial year. The original CA certified copy of the same has to be uploaded with bid documents. AND The bidder shall submit audited balance sheets for the specified last three years duly certified by Chartered Accountant.
Note:	1. The original colored scan copy should be uploaded as bid documents in support of Financial Qualifying Criteria. The Attested/Notarized photocopies of the same will not be entertained. 2. The duly audited, verified & certified figures from Chartered Accountant will be considered for Annual Turnover & Net worth. The provisional certificates (if any) will not be entertained.
3.4	OTHER MANDATORY DOCUMENTS FOR VALID BID
3.4.1	Original colour scan copy of duly signed/sealed schedules given in Book-I (GTC).
3.4.2	Bid Security Deposit (BSD) for an amount equal to 1% (one percent) of the estimated cost of tender in the form of Bank Guarantee from Scheduled/Nationalized Bank in the prescribed format annexed in the tender specifications as schedule 'F', along with the offer. The validity of Bank Guarantee should at least be for six (6) months from the originally scheduled date of techno-commercial bid opening.

Qualifying Requirements Upto 220 KV Tr. Lines with Monopoles	
Cl. No.	**Proposed Qualifying Requirements for Bidder**
3.1	STATUTORY QUALIFYING CRITERIA Statutory Licences/Registration
3.1.1	The bidder or his associate should have a valid Govt. Electrical Contractor's License.
3.1.2	The lead bidder should be registered under GST Act under GOI as well as for other various taxes in force. The bidder should have returns of all above said taxes for preceding 3 financial years.
Note:	The original colored scan copy should be uploaded as bid documents in support of Statutory Qualifying Criteria i.e. Statutory Licenses / Registration. The Attested/Notarized photocopies of the same will not be entertained.
3.2	TECHNICAL QUALIFYING CRITERIA
3.2.1	Bidder can be an EPC Contractor who has executed EHV Transmission lines(including monopole) or a Manufacturer of Monopoles. In case, the bidder is not a manufacturer, the bidder should have to submit an Authorization letter of a manufacturer of steel Monopole as proof for tying up with the manufacturer for all technical support like design, manufacturing, erection/erection supervision, testing and commissioning of Monopole transmission line, etc whichever is required for the smooth execution of the contract.
3.2.2	The bidder should have, in last 3 years executed the EHV Transmission line work on turnkey basis including supply of material, erection, testing & commissioning as mentioned at (i),(ii) and (iii) below
(i)	The Manufacturer should be an approved vendor of MSETCL or PGCIL and should have fabricated and supplied at least 20 numbers or 50% of tender quantity of Monopole (of tendered voltage class or higher voltage class)whichever is higher cumulatively in last three years
(ii)	The Manufacturer should have designed in-house the Monopole of tendred voltage class or higher voltage class . Further, the manufacturer should have type tested the similar Monopole in any NABL accredited Test Bed in India or in internationally accredited Test Bed (accreditation based on ISO/IEC vide 25/17025 or EN 45001 by the National accreditation body of the country where Test bed is located,please refer Annexure -I attached). Similar means Highest degree for the tendered voltage or higher voltage class monopole.
3.2.3	The bidder should submit the user's certificate in support of Monopole supplies executed in last three years and end user's certificate for completed works issued by the concerned ordering authority indicating therein name of the line constructed, its voltage class, route length, configuration of conductor, date of completion and period taken for completion etc.Perfonce certificate indicating succcesful operation atleast for 1 year should be submitted
3.2.4	The owner reserves the right to accept / reject the Bid.

Budgetary offer 132 kV D/C Monopole

		Bajaj	valmont		Bajaj	valmont		Bajaj	valmont
Sr.No	Pole Type	Supply cost			Erection cost			Fdn cost	
		EX- Works						Normal Dry Soil	
1	P (0°-2°)	1,503,183	1,199,138		193,959	239,828		1,227,771	799,425
	3mtr extn	1,633,895	1,470,600		210,825	294,120		1,292,390	980,400
	6mtr extn	1,797,284	1,665,113		231,908	333,023		1,389,251	1,110,075
	9mtr extn	1,977,012	1,665,113		255,098	333,023		1,493,636	1,256,902
2	PM (0°-2°)	1,736,176	1,262,250		224,023	252,450		1,252,326	841,500
	3mtr extn	1,887,148	1,548,000		243,503	309,600		1,318,238	1,032,000
	6mtr extn	2,075,863	1,752,750		267,853	350,550		1,417,036	1,168,500
	9mtr extn	2,283,449	1,984,582		294,639	396,916		1,523,508	1,323,055
3	Q (2°-15°)	1,917,433	1,726,995		247,411	345,399		1,395,192	1,151,330
	3mtr extn	2,084,166	2,088,302		268,925	417,660		1,468,623	1,392,201
	6mtr extn	2,292,583	2,322,648		295,817	464,530		1,579,177	1,548,432
	9mtr extn	2,521,841	2,583,292		325,399	516,658		1,698,350	1,722,195
4	R (15°-30°)	2,179,154	1,845,974		281,181	369,195		1,555,234	1,230,649
	3mtr extn	2,368,645	2,311,405		305,632	462,281		1,637,088	1,540,936
	6mtr extn	2,534,451	2,611,283		327,026	522,257		1,760,859	1,740,855
	9mtr extn	2,737,207	2,950,068		353,188	590,014		1,894,313	1,966,712
5	S (30°-60°) /DE (0°-2°)	2,259,662	2,419,391		291,569	483,878		1,734,605	1,612,927
	3mtr extn	2,456,154	3,013,954		316,923	602,791		1,825,900	2,009,303
	6mtr extn	2,750,893	3,420,956		354,954	684,191		1,964,537	2,280,638
	9mtr extn	3,108,509	3,882,920		401,098	776,584		2,114,056	2,588,613

Budgetary offer 220 kV D/C Monopole

		Bajaj	valmont		Bajaj	valmont		Bajaj	valmont
Sr.No	Pole Type	Supply cost			Erection cost			Foundation cost	
		EX- Works						Normal Dry soil	
1	A (0°-2°)	2,016,997	2,099,778		260,258	419,956		1,834,630	1,399,852
	3mtr extn	2,192,388	2,511,391		282,889	502,278		1,931,190	1,674,261
	6mtr extn	2,411,626	2,780,707		311,178	556,141		2,078,417	1,853,805
	9mtr extn	2,652,789	3,078,904		342,295	615,781		2,237,255	2,052,603
2	AM (0°-2°)	2,329,631	2,210,293		300,598	442,059		1,871,323	1,473,528
	3mtr extn	2,532,208	2,643,570		326,736	528,714		1,969,814	1,762,380
	6mtr extn	2,785,428	2,927,061		359,410	585,412		2,119,985	1,951,374
	9mtr extn	3,063,971	3,240,952		395,351	585,412		2,282,001	2,160,635
3	B (2°-15°)	2,572,844	2,813,304		331,980	562,661		2,089,570	1,875,536
	3mtr extn	2,796,570	3,347,345		360,848	669,469		2,199,547	2,231,563
	6mtr extn	3,076,227	3,658,520		396,933	731,704		2,367,953	2,439,014
	9mtr extn	3,383,850	3,998,623		436,626	799,725		2,549,687	2,665,749
4	C (15°-30°)	2,924,026	3,171,903		377,294	634,381		2,334,585	2,114,602
	3mtr extn	3,178,289	3,859,128		410,102	771,826		2,457,458	2,572,752
	6mtr extn	3,400,769	4,254,522		438,809	850,904		2,646,406	2,836,348
	9mtr extn	3,672,831	4,690,427		473,914	938,085		2,850,357	3,126,952
5	D (30°-60°) /DE (0°-2°)	3,032,053	4,038,512		391,233	807,702		2,609,784	2,692,342
	3mtr extn	3,295,710	5,059,049		425,253	1,011,810		2,747,141	3,372,699
	6mtr extn	3,691,195	5,633,633		476,283	1,126,727		2,959,238	3,755,756
	9mtr extn	4,171,050	6,273,477		538,200	1,254,695		3,188,233	4,182,318

	ANNEXURE – 1
List of National / International Accredited Laboratories.	
1	CPRI, India
2	CESI, Italy
3	KEEMA, Holland
4	F.G.H., Germany
5	CERL, UK
6	EDS, France
7	Hydro-Quebec, Canada
8	KERI, Korea.
9	CRIEPI, Japan
10	EDF, France
11	IPH, Germany
12	STRI, Sweden
13	Kinectrics International Inc., Canada.
14	Structural Engineering Research Centre SERC Chennai