

BHARAT HEAVY ELECTRICALS LTD.**(TRANSMISSION BUSINESS GROUP)****TERMS AND CONDITIONS FOR INDIGENOUS TENDER ENQUIRY**

This Format is to be submitted in original duly signed by bidder. Deviation, if any, is to be brought out clearly in Schedule of Commercial Deviation giving clause-wise deviation. Any condition / clarification / deviation mentioned elsewhere may not be accepted.

Sr. No.	Standard Terms & Conditions TENDER ENQUIRY NO. DATED : 23 – APRIL - 2018 DUE DATE : 18 – MAY - 2018
1.	INSTRUCTION TO BIDDERS: a) Sealed quotations are invited for the items mentioned in the enquiry. Quotations should be typed and free from over writing and erasures. Corrections or additions must be clearly written both in words and figures and attested, otherwise offer shall be liable for rejection. b) Bidder must ensure that their quotation is received / dropped in the tender box on or before 14:00 Hrs of the due date of opening. <u>Location of Tender Box:</u> Bharat Heavy Electricals Limited, Transmission Business Group, Advant Navis Business park, Tower A 5 th Floor, 7 , Sector- 142, Greater Noida Expressway, UP -201305 c) The same shall be opened at 14.30 Hrs. on the same day. Tenders received late may be rejected. Bidders sending tenders by courier or post, to ensure that it is delivered one day before as same day delivery may not reach above office by due time. d) Bids are to be submitted in Two parts: i) Techno-commercial bid (Part-I): To be submitted in duplicate. A copy of price bid (Part-II) “without prices” is also to be enclosed in Part-I bid. ii) Bidder to strictly ensure submitting the price bids in BHEL format of Rate Contract or as per project requirement. iii) Price bid (Part-II): To be submitted only in one copy in a separate sealed envelope. This should not contain any Technical or Commercial Terms. The rates should be quoted both in figures and words. In case of any difference between figures and words, the quoted rate in words shall prevail over figure. Further in case of difference between unit rate & total price, unit rate in words shall prevail over total price. Both Parts-I and Part-II bids are to be sealed in separate envelope and both envelopes to be kept in another common envelope. Each envelope should be sealed and superscribed with enquiry no., item / package name, project name (if any) and due date of opening. e) “BHEL reserves the right to go for Reverse Auction instead of Opening the submitted sealed bid, which will be decided after technical evaluation”.

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	f) For any technical clarification please contact : JAI KUMAR (TBEM), TBG, BHEL, Advant Navis Business park, Tower A 5th Floor, Sector- 142, Greater Noida Expressway, UP -201305 Email : jaik@bhel.in Tel No 0120-6748534 For any commercial clarification please contact official below : Smt. Rashmi Prasad, Dy. Manager (TBMM), TBG, BHEL, Advant Navis Business park, Tower A 5 th Floor, 7 , Sector- 142, Greater Noida Expressway, UP -201305 Email: skjain@bhel.in, rashmi.prasad@bhel.in Tel No 0120- 6748137, 8486 g) Price bid should contain only rates / prices, otherwise bid shall be liable for rejection. h) Price bid submitted along with the bid shall remain valid up to validity of offer. Unsolicited Supplementary / Revised price bid submitted during validity period of offer, unless asked by BHEL, shall not be considered. Withdrawal of quotation by the bidder, at any stage after its opening, may entail blacklisting of vendor. i) Enquiry condition for where the scope against this tender includes Installation and Commissioning of the equipment / material: NOT APPLICABLE
2.	PRICES: A. <u>Prices shall be on FIRM basis.</u> B. The prices shall be quoted on domestic basis. C. The prices are to be quoted on Ex-works basis. The break-up of prices shall be as under : - a) Ex-works Price: Ex-Works price including packing & forwarding Charges. b) Excise Duty: ADB Funded. Excise Duty exempted against EDEC. c) Sales Tax: ST / VAT / CST (against C form) as applicable to be quoted extra as percentage in un-priced and price bid. In case of inter-state sale-in-transit supplier/vendor will have to provide E1/E2 form. d) Entry tax / Octroi Charges: Any Entry tax / Octroi applicable at destination / destination state shall be paid extra on proof of such payment. e) Freight & Insurance: Freight and Transit Insurance for door delivery up to destination/store is to be quoted. f) Type Test charges: If asked in the technical specification, is to be quoted separately for each Test along with taxes and duties applicable on them. g) Erection / Commissioning supervision charges: If asked in the technical

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	specification, to be quoted separately along with taxes and duties applicable on them. Note: The purchase order shall be placed on Ex-works basis.
3.	TERMS OF PAYMENT: 100% payment along with taxes, duties, Freight & Insurance within 60 days from the date of receipt of complete invoice in TBG, BHEL with following documents in 3 sets (Original + 2 copies). • LR Endorsed in favor of Customer & Material Receipt Confirmation (MRC) from site • Excise invoice (where ED re-imburement is required) • Packing List (Case-wise) • Copy of Contract Performance Bank Guarantee • Transit insurance Certificate from insurance Co or intimation of Transit Insurance duly endorsed by insurance Co. • MICC issued by BHEL • Guarantee Certificate
4.	INTEREST LIABILITY: In case of any delay in payment due to any reason, BHEL shall not pay any interest on delayed payment.
5.	GUARANTEE: The equipment / material shall be guaranteed for 18 months from the date of material receipt at destination or 12 months from the date of commissioning, whichever is earlier. The defective material / component shall be replaced free of cost at site.
6.	PERFORMANCE BANK GUARANTEE: Bidder shall furnish along with first invoice Performance BG / deposit as per one of following 3 options. <u>Option A</u> A single rolling Bank Guarantee of Rs 20 lakhs initially valid for one year for all the orders being executed for Transmission Business Group, BHEL. <u>Option B</u> BG for 10% of the total Ex-works PO value, valid for 24 months from the date of first delivery. PO value at the time of first invoice for the particular order shall be considered for calculation of BG amount. <u>Option C</u> Retention of 10% of the total Ex-works PO value by BHEL from the first bill in lieu of Performance Bank Guarantee, to be released after expiry of 24 months from the date of first delivery. The Bank guarantee shall be from State Bank of India / State bank of Hyderabad / State Bank of Travancore / State Bank of Mysore / Canara Bank / Bank of Baroda / Punjab National Bank / Deutsche Bank / HDFC Bank / Standard Chartered Bank / CITI Bank / ICICI Bank / IDBI Bank / HSBC / any other Nationalized Bank. The original BG should be sent by issuing Bank directly to AGM (Finance), TBG, BHEL

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7.	FINAL ENGINEERING DOCUMENTATION: Final documentation as called in the specification is to be submitted within 3 months from the date of dispatch of material.
8.	INSPECTION: BHEL / customer / third party shall inspect equipment / material before despatch. Stage inspection during manufacturing may also be carried out. Material to be despatched only after getting Despatch Clearance from BHEL. Supplier shall send inspection call on prescribed format or website only, with an advance notice of 15 days. Vendor shall forward all inspection and test reports for issue of MICC by BHEL. Road Permit Form request should also be given along with Inspection call.
9.	DESPATCH DOCUMENTS: Following despatch documents are to be immediately sent to purchaser on despatch: • Copy of Invoice and LR • Packing List (Case-wise) • Insurance Certificate
10.	DELIVERY PERIOD: Bidder to specify delivery period in weeks from the date of LOI/PO. Note: LR date or Invoice date whichever is later shall be considered as delivery date.
11.	DELAYED DELIVERY: In case of delay in execution of order beyond the lot wise contractual delivery, an amount of ½ % of total Ex-Works Value per week or part thereof subject to maximum of 10% of total Ex-Works Value of P.O. will be levied.
12.	VALIDITY: The offer shall be valid for 120 days from the due date of opening.
13.	ACCEPTANCE / REJECTION OF TENDER: BHEL reserves the right to reject in full or part, any or all tenders without assigning any reason thereof. BHEL also reserves right to vary the quantities mentioned in the tender.
14.	EVALUATION: Comparative statement shall be prepared based on overall quantity basis unless otherwise indicated in the enquiry. Evaluation of offers shall be done on the basis of delivered cost to BHEL.
15.	DEVIATION: The bids having deviation(s) w.r.t. tender are liable for rejection. However, BHEL, at its discretion, may load the prices for evaluation of offer as per Loading Criteria for identified deviations mentioned in clause No. 22.

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16.	ARBITRATION: All cases of disputes emanating from and relating to this contract shall be referred to the sole arbitration of Unit Head / GM, BHEL or any other person (including an employee of BHEL, even though he had to deal with the matter relating to this contract in any manner) nominated by him to act as sole arbitrator. The arbitration shall be under 'The Arbitration and Conciliation Act 1996' and the rules thereunder as amended from time to time. The arbitrator may from time to time with the consent of the parties enlarge the time for making and publishing the award. The arbitrator shall give a reasoned award. The decision of the arbitrator shall be final & binding upon both the parties. The venue of arbitration shall be Delhi.
17.	LEGAL SETTLEMENT: All suits/claims in respect of this contract shall be in the courts having jurisdiction at Delhi.
18.	SUBCONTRACTING : In case further subcontracting of BHEL order or part thereof is envisaged by supplier, the same can be done after written permission is obtained from BHEL. However it shall not absolve the supplier of the responsibility of fulfilling BHEL purchase order requirements.
19.	RISK PURCHASE: In case the successful bidder fails to supply or fails to comply with the terms & conditions of the purchase order, BHEL reserves the right to source such material / component / equipment / system from any other agency at the risk and cost of the successful bidder.
20.	ADJUSTMENT OF RECOVERY: Any amount payable by the supplier / vendor under any of the condition of this contract shall be liable to be adjusted against any amount payable to the supplier / vendor under any other works / contract awarded to him by any BHEL unit. This is without prejudice to any other action as may be deemed fit by BHEL.
21.	FORCE MAJEURE CONDITION: If by reason of war, civil commotion, act of god, Government restrictions, strike, lockout which are not in control of supplier the deliveries are delayed, supplier shall not be held responsible.
22.	LOADING CRITERIA FOR DEVIATIONS TAKEN BY BIDDER ON: <u>22.1.TERMS OF PAYMENT:</u> If a bidder asks for payment within specified no. of days from the date of receipt of invoice with complete documents as per "Terms of Payment" at sr. No. 3 above, loading to be done as follows: a) Base rate of SBI (as applicable on the date of techno commercial bid opening) + 6 % shall be considered for loading for the period of relaxation sought by the bidder. b) 60 days - No loading <u>22.2. DELAYED DELIVERY / PENALTY DUE TO DELAYED DELIVERY:</u> Loading for not accepting this clause / accepting only on un delivered portion shall be the maximum amount specified in this clause. <u>22.3 GUARANTEE:</u> Normally BHEL will not accept deviation against this clause and offer may be ignored on this deviation, however If the offered guarantee period is less than the tender guarantee period the ex- works prices shall be loaded for the difference in the period (higher of the difference with respect to guarantee required from date of delivery and date

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	of commissioning) @ 2.5 % per year for number of months(fractional months to be rounded off to next higher).
23.	QUANTITY VARIATION: Quantity may change to the order of +/- 20% during contract stage as well as completion of execution of purchase order.
24.	TECHNICAL SPECIFICATION : TB-384-316-141
25.	INTENDED BENEFITS FOR MSE SUPPLIERS: MSE suppliers can avail the intended benefits only if they submit along with offer, attested copies of either EM II certificate having deemed validity (Two years from the date of issue of acknowledgement in EM-II) or valid NSIC certificate or EM II certificate along with CA certificate (Format enclosed as per Annexure I) applicable for the year, certifying quantum of investment in plant & machinery within the permissible limit as per the act for relevant status (Micro or Small) where the deemed validity of EM II is over. Date to be reckoned for determining the deemed validity will be the last date of technical bid submission. Non submission of such documents will lead to consideration of their bids at par with other bidders and MSE status of such suppliers shall be shifted to Non MSE supplier till the supplier submits these documents.
26.	PRE QUALIFYING CRITERIA FOR OPEN TENDER : Bidder must meet following requirements : 1. As per technical specification TB-384-316-141 2. Documentary evidence to have a minimum experience of 5 (Five) Years for supply of respective item 3. Performance certificate for equipments to be in operation for a period of two years as on the * date of opening of Bid indicating Order No. & Date, Ordered quantity and the quantity for which performance certificate issued from Electricity Boards/ Power Grid/ Transmission utility. 4. 100% quantity covered in the contract have been manufactured and supplied in any one year during the past three years by the vendor. 5. The supplier has to submit the Quality Plan. * <u>Date of opening of Bid is 18.05.18.</u>
27.	Approval from Customer shall be sought only for Techno-Commercially acceptable Vendors who conform to the Pre-Qualifying Criteria detailed in Clause 26 of NIT. Only those Techno-Commercially acceptable Vendors will be considered for Reverse Auction/ Price bid opening whose approval is obtained from Customer. It shall be the responsibility of respective bidder to provide the requisite documents in line with Pre-Qualifying Criteria & as required by customer for vendor approval after techno-commercial evaluation of the bids.

Seal of the bidder

Signature of the bidder

COPYRIGHT & CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED THIS MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY MANNER DETRIMENTAL TO THE INTEREST OF THE COMPANY	 BHARAT HEAVY ELECTRICALS LIMITED TRANSMISSION BUSINESS ENGINEERING MANAGEMENT NEW DELHI																																																																			
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SECTION – 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENT AND QUANTITIES

1. SCOPE:-

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of Sag Compensating Springs.

This section covers the scope and quantities of Sag Compensating Springs. The offered equipment shall also comply with the General Technical Requirements for the project as detailed under section-3 of this specification. For environmental conditions, refer Section-3 carefully.

The specification comprises of following sections:

Section-1: Scope, specific technical requirements & Bill of Quantities.

Section-2: Equipment specifications

Section-3: General technical requirements for all equipment under the project.

Section-4: Guaranteed Technical Particulars

In case of any conflict between various sections, order of precedence shall be in the same order as listed above.

The equipment is required for the following projects:

Customer: Power Grid Corporation of India Ltd.

Project: Substation Package – SS02 for Construction of 765/400/220kV **Banaskantha S/S** and Extension of 400kV Sankhari (GETCO) S/S including 400kV Transformer and Reactor associated with Green Energy Corridors: Inter-State Transmission Scheme (ISTS) – Part B

2. SPECIFIC TECHNICAL REQUIREMENTS: - Bidder to design sag tension spring in such a way to achieve maximum differential sag within 300mm.

Refer Section-2 for details.

3. BILL OF QUANTITIES: - @ Sankhari Site

Sl.	Description	Unit	Qty	Remark
1.	Sag Compensating Springs suitable for mounting with existing double tension string hardware of quad moose conductor	Nos.	12	2 No Sag Compensation spring has been considered for 1 double tension string arrangement.
2	Sag Compensating Springs suitable for mounting with existing double tension string hardware of twin high ampacity conductor.	Nos.	6	2 No Sag Compensation spring has been considered for 1 double tension string arrangement.

NOTE:-

- 1) The quantities indicated above are subject to change by $\pm 30\%$.
- 2) Sag compensating spring shall be suitable for string insulator hardware. Drawing of the string insulator hardware shall be provided at contract stage.

4. TYPE TESTING:- (As applicable)

Bidder shall submit valid type test reports (as per relevant IEC/IS Standard) for approval. The type test reports submitted shall be of tests conducted within last 10 years prior to the date of bid opening i.e. dated **24.02.2015**. The bidder should have conducted type test on identical or similar equipment/ components to those offered. In case type test reports are found to be technically unacceptable to BHEL/PGCIL, the type test shall be conducted without cost and delivery implication to BHEL.

5. TECHNICAL QUALIFYING REQUIREMENT :-

- (1.) Bidder should be manufacturer and supplied similar item to POWERGRID/GETCO as ultimate customer or to BHEL.**
- (2.) Also bidder should have approved Drawing & GTP from POWERGRID/ GETCO / BHEL.**

Bidder to submit above documents along with technical bid for evaluation.

6. INSPECTION & TESTING: -

Before being fitted on the equipment, all components shall be subjected to routine tests at the Contractors factory, as per the relevant IEC/IS standards. A detailed test report proving the successful passing of such tests shall be provided.

Prior to dispatch, the routine & acceptance tests shall be carried out on equipment in accordance with the applicable IEC /IS and the material shall be offered for final inspection to BHEL and MPPTCL in accordance with agreed quality plan with 3 weeks advance information.

7. QUALITY PLAN:-

Bidder to follow valid PGCIL/GETCO Quality Plan as per PGCIL/GETCO procedure. In case the bidder don't have valid PGCIL/GETCO approved QP, it will be the bidder's responsibility to get its QP approved directly from the ultimate customer.

SECTION – II
TECHNICAL SPECIFICATION FOR SAG COMPENSATING SPRINGS

1.0 SCOPE -

This scope of this specification covers design, manufacturing supply of Sag Compensating Springs for EHV substations as per Section-I. The bidder mentioned in the Section of Technical specification means "Original Equipment Manufacturer (OEM)". The purchaser means the "BHEL".

In case bidder is not OEM, sole responsibility of offering equipment / material of manufacturer as per this specification requirement shall rest on the bidder.

1.1 STANDARDS -

Applicable standards for offered equipment / material shall be as per Section-3.

1.2 CLIMATIC CONDITIONS -

Applicable climatic conditions shall be as per Section-3.

1.3 SYSTEM PARTICULARS -

Applicable system particulars shall be as per Section-3.

2. DESCRIPTION AND STANDARD TECHNICAL PARTICULARS OF SAG COMPENSATING SPRINGS.

- 2.1 The Sag Compensating Springs are used to compensate the differential sag of **quadruple "MOOSE" main string and twin high ampacity Al conductor of transfer bus bars due to temperature variations over a range from 0° C to 80° C so that it is within the contact zone of 300 mm of pantograph isolators used.** The main frame of the spring shall be designed for heavy-duty operation for which it is intended. The main frame assembly comprises of end plates, guide rod, bolts, nuts, eyes or clevises for anchoring and sheet metal housing.
- 2.2 The spring shall be helical and made of high quality spring steel rods formed by centre-less grinding. The spring shall be pre-compressed, so that under all conditions the spring will work under compression. The ends of the spring shall be flat, closed and rounded.

- 2.3 The spring steel shall have low average stresses to ensure long and maintenance free life.
- 2.4 The tension rods and guide rod shall be made of stainless steel. There shall be three numbers guide rods arranged in triangular configuration, so that stresses developed due to the load coming on the spring is equally distributed on all the bolts. These rods are provided to ensure that the springs remain "Buckle Proof" in all the combination to ensure that no bolt loosens or gives way under working conditions.
- 2.5. The springs shall be manufactured by hot coiling method and "Shot peened " to induce compressive stresses in the spring to overcome fatigue. It shall be guaranteed that under complete compression of the spring the permissible stress will not be exceeded.
- 2.6. The springs shall be based in an approved manner to relieve hydrogen embrittlement.
- 2.7. The springs being intended for outdoor use shall be coated with chlorinated rubberized paint over a lead oxide base.
- 2.8. The coiling shall normally be right wound and the total number of coils shall be determined by the design considerations to give the specified performance.
- 2.9. Since the spring is intended for outdoor use, it shall be ensured that the spring is not affected by weathering conditions changing with time. It shall have an over all outer sheet metal enclosure, the thickness of sheet being at least 3mm. The enclosure shall be electro-galvanized and be provided with drain holes to drain the rainwater that may collect.
- 2.10. Adequately designed eyes/hooks as required shall be provided on both sides and on the end plates of the spring so that the spring can be attached to the insulator assembly easily at the time of anchoring the spring.
- 2.11. The Sag Compensating Springs shall be provided with a copper strip of sufficient length designed for specified short circuit current in parallel with the entire spring assembly to avoid the fault current flowing through the spring and thus damaging it subsequently.
- 2.12. The EHV System is subjected to heavy short circuits and under the influence of the increasing short circuit forces, the springs will get

compressed till they are boxed. Any further increase in the force will only stress the anchoring hooks and plates and guide rods. These shall therefore have sufficient strength to sustain the maximum dynamic force. The spring shall be designed a factor of safety of 2.5 tension loadings. There should be one set or two springs per phase attached at any one side of the span.

- 2.13 Each Compensating Springs shall be tested individually and bidder shall submit the test reports.
- 2.14. Tenderer shall furnish basic calculations to establish the suitability of the spring constant in Kg/Cm (f-Kg/Cm) in keeping the sag within the maximum and minimum limits as indicated in the Technical Parameters.
- 2.15 The Bidder shall submit following information/ drawing for Sag Compensating Spring with their Bid:-
 - (i) Fully Dimensional Drawing giving as assembly and detailed Bill of Material and Weight.
 - (ii) Technical details with descriptive literature / catalog and photographs of offered item.
 - (iii) The material used for various parts shall be clearly specified in the drawing.
 - (iv) Total assembled weight.
 - (v) Any other Technical Parameters.

1.4 TECHNICAL REQUIREMENT

a. LAYOUT TECHNICAL PARAMETERS -

- 1. Conductor – Quad Moose For Main Bus 1 & 2 and Twin High Ampacity Al conductor for transfer bus
- 2. Tension String – Double tension polymer type
- 3. Span between C/L of gantries – 54 meter
- 4. Fault Level – 40kA for 3 Sec**
- 5. Springs required- 2 numbers in each phase.
- 6. Mounting arrangement - one side of bus bar only.
- 7. Hardware required - To suit mounting of spring in existing double tension string hardware, complete in all respect

b. TECHNICAL REQUIREMENT

1. Spring constant (suggestive only)	60 kg/cm (minimum)
2. Max. working temp.	80°C
3. Minimum working tension of spring	1,000 kG
4. Maximum working tension of spring	2,000 kG
5. Minimum withstand load of assembly	11,500 kG

c. PERFORMANCE REQUIREMENT

1. Maximum permissible differential sag to be Limited by spring w.r.t. Panto Isolator.	:	300 mm
2. Temp. at site in shade and temp. at site in sun	:	50 ⁰ C & 65 ⁰ C 40 KA per phase, 3 Sec.
3. Short circuit current & short circuit duration	:	
4. Maximum dynamic force for which accessory is to be designed.	:	7500 Kg.
5. Temp. Variation Min /Max.	:	0 ⁰ C / 80 ⁰ C

d. High Ampacity Conductor details – refer conductor datasheet

ENCLOSED

- 1. Erection Key Diagram**
- 2. Panto Isolator OGA**
- 3. High Ampacity conductor datasheet**

To be submitted on contract stage

SECTION - 4

GUARANTEED TECHNICAL PARTICULARS FOR SAG COMPENSATING SPRINGS

Sl. No.	Parameters	
1.	Max/Min static tension per spring for a spring Constant of 60 Kg/Cm	
2.	Maximum permissible sag.	
3.	Maximum permissible differential sag to be limited by spring.	
4.	Temp. at site in shade and temp. at site in sun	
5.	Short circuit current & short circuit duration	
6.	Maximum dynamic force for which accessory is to be designed	
7.	Temp. Variation Min /Max.	

ANNEXURE - A
SCHEDULE OF TECHNICAL DEVIATIONS

Bidder shall list below all technical deviation clause wise w.r.t. tender specifications:

S.No.	Page No.	Clause No.	Deviation	Reason / Justification
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Any deviation not specifically brought out in this section shall not be admissible for any commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications irrespective of any such deviation indicated / taken elsewhere in the submitted offer.

Date:

Tenderer's Stamp & Signature

TECHNICAL SPECIFICATION FOR AL59 CONDUCTORS**1.0 SCOPE**

- 1.1 This specification provides for design, manufacture, testing, inspection, packing and dispatch, to destination of (AL59), specified herein for their satisfactory operation in various lines and substations of the State."
- 1.2 These conductors are to be used as power conductors on single circuit and / or double circuit 220kV transmission lines and / or sub-stations of the purchaser.

2.0 STANDARDS

The conductor shall conform to the following International/Indian Standards, which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification.

In the event of the supply of conductor 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 Supplier and those specified in this document will be provided by the Supplier to establish their equivalence.

Sl. No.	International /Indian Standard	Title
1.	SS 4240814	Aluminium alloy stranded Conductors for overhead lines Al59 specifications
2.	SS 4240813	Aluminium alloy wire for stranded Conductors for overhead lines- Al 59 wires

3.0 CLIMATIC CONDITIONS

- i) Location : In the State of Gujarat.
- ii) Maximum Ambient Air Temperature. Degree Celsius. : 50
- iii) Minimum Ambient Air Temperature. Degree Celsius. : 0
- iv) Average daily ambient Air Temperature Degree Celsius. : 35
- v) Maximum relative humidity, - % : 95
- vi) Average rainfall per annum. (mm) : 1150
- vii) Maximum altitude above mean sea level – Mtrs : 1000

- viii) Isokeraunic level i.e. Average number of Thunder storm - Days/annum : 15
- ix) Maximum wind pressure. (Kg/Sq. meters) : 200
- ix) Seismic level i.e. Earthquake Acceleration
- a) Horizontal Seismic Co-efficient (Acceleration) – g (Zone – 5) : 0.08
- b) Vertical Seismic Co-efficient (Acceleration) – g (Zone – 5) : 0.84

4.0 **PRINCIPAL PARAMETERS**

4.1 FOR Same Diameter

Sr. No	Description	Details	
		AL59 Equivalent to ACSR ZEBRA/MOOSE	
		AL59-ZEBRA	AL59- MOOSE
		Same Diameter	Same Weight
1)	Standard according to which the conductor will be manufactured and tested	SS 4240814 SS 4240813	SS 4240814 SS 4240813
2)	Quality of material & standard to which conform	SS 42 40814 & IS-9997	SS 42 40814 & IS-9997
3)	Number of strands and wire diameter in mm	61/3.18	61/3.50
5)	Number Of Strands – Nos.	61	61
6)	Diameter Of Strand – mm.		
	I) Strands		
	a) Nominal	3.18	3.50
	b) Maximum	3.21	3.53
	c) Minimum	3.15	3.47
	II) Overall Of Conductor	28.62	31.50
7)	Cross Sectional Area Of – Sq. mm.		
	a) Whole Conductor	484	587
	b) Each Strand	7.94	9.62
8)	Laying Of Strands – Nos.		
	a) Centre wire	1	1
	b) First Layer	6	6
	c) Second Layer	12	12
	d) Third Layer	18	18
	e) Fourth Layer	24	24
9)	Weight (Excl. Wt. Of Grease) – Kg / Km.		
	a) Whole Conductor	1336	1618
	b) Strand (At Nominal Dia.)	21.43	25.96

10)	Calculated D.C. resistance at 20 °C - Ohms / Km a) Whole Conductor b) Strand	0.06250 3.762	0.05070 3.100
11)	Ultimate Tensile Stress – KN a) Whole Conductor b) Strand i) Before Stranding ii) After Stranding	121.02 1.98 1.88	141.12 2.31 2.19
12)	Modulus of Elasticity – MPA	68000	68000
13)	Coefficient of linear expansion - per deg. C.	23.0×10^{-6}	23.0×10^{-6}
14)	Chemical Composition	The wire material shall be an aluminium alloy meeting the requirements on Resistivity, tensile strength etc.	The wire material shall be an aluminium alloy meeting the requirements on Resistivity, tensile strength etc.
15)	Resistivity – Ohms Sq.mm / Mtr.	Max.0.02930	Max.0.02930
16)	a) Continuous maximum current rating of conductor in still air at ambient Temperature (40Deg.C) b) Temperature rise for the above 55 degree C	1063 55	1204 55
17)	Maximum continuous current rating of conductor at 95 degree C corresponding of ambient temperature of 40 degree C	1063	1204
18)	Lay Ratios a) First Layer i) Maximum ii) Minimum b) Second Layer i) Maximum ii) Minimum c) Third Layer i) Maximum ii) Minimum d) Fourth Layer i) Maximum ii) Minimum	17 10 16 10 15 10 14 10	17 10 16 10 15 10 14 10
3.19)	Minimum tensile strength of the finished strand with joint if any made in base rod or semi finished wire a) Aluminium Alloy	Joints not allowed in outermost layer but Joints allowed in inner layers and	Joints not allowed in outermost layer but Joints allowed in inner layers and

		tensile strength of joint wire is at least 90% of the value required for a un joint wire.	tensile strength of joint wire is at least 90% of the value required for a un joint wire.
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* - The lay ratios of the outer aluminium alloy shall not be greater than lay ratio of Aluminium alloy layer immediately beneath it.

5.0 **GENERAL TECHNICAL REQUIREMENT**

5.1 The AL59 conductor shall be suitable for being installed directly in air supported on suspension insulator strings or anchored through tension insulator strings at the power cross arms of single circuit, double circuit or multi circuit transmission line towers.

5.2 The conductor shall therefore be suitable for satisfactory operation under the tropical climatic conditions listed in the relevant clause. The applicable design particulars of the conductor to be used on these lines are furnished in Annexure - I. "System Particulars".

5.3 **Physical Constants of Materials**

5.3.1 The AL59 should be as per SS 4240814 and its latest amendments. The material offered shall be of the best quality and workmanship. The AL59 shall have accurate chemical composition of Alloy so as to offer excellent corrosion resistance, better strength to weight ratio and improved conductivity. The solution treatment shall be done in a very sophisticated and advanced technology furnace with automatic quenching system.

5.3.1.1 Resistivity:

The resistivity of AL59 depends upon its purity and its physical condition. However as per the specified value of purity in this specification the maximum value permitted is 0.02930 ohm. Sq. mm / mtr at 20 Deg. C, and this value shall be used for calculation of the maximum permissible value of resistance. This value may be checked from the measured value of the resistance.

5.3.1.2 Density:

At a temperature of 20Degree Celsius the density of AL59 shall be 2.70 g/cm³.

5.3.2 **Constant-Mass Temperature Co-efficient of Resistance**

5.3.2.1 At a temperature of 20Degree Celsius the constant-mass temperature co-efficient of resistance of AL59 measured between two potential points rigidly fixed to the wire, the metal being allowed to expand freely, has been taken as 0.0039 per degree Celsius.

5.3.3 **Co-efficient of Linear Expansion:**

5.3.3.1 The co-efficient of linear expansion of AL59 at 0 Degree Celsius has been taken as 23.0×10^{-6} per Degree Celsius. This value holds good for all practical purposes

over the range of temperature from 0 Degree Celsius to highest safe operating temperature.

5.4 Materials

5.4.1 Aluminium alloy

The aluminium alloy wire shall be an aluminium alloy meeting the mechanical strength and resistance of the wire properties as mentioned in the GTP

5.4.2 The bidder should specify the source of raw materials along with the proof of last purchases made. The GETCO may reject the tender of the Bidders whose raw material suppliers are found to be supplying any poor quality or Non standard materials, to the GETCO or any other purchaser.

5.5 Freedom from Defects

5.5.1 The wires shall be smooth and free from all imperfections such as spills, splits, slag inclusion, die marks, scratches, fittings, blow-holes, projections, looseness, overlapping of strands, chipping of aluminium layers etc. and all such other defects which may hamper the mechanical & electrical properties of the conductor as also the installation of the conductor at the site etc. Special care should be taken to keep away dirt, grit etc. during stranding.

5.6 Wire Sizes

5.6.1 Nominal Size and Tolerances

The aluminium wires for the stranded conductor covered by this standard shall have diameters specified in clause 4.1 and shall be within the tolerances indicated therein.

5.7 Joints in Wires

5.7.1 Aluminium Wires

5.7.1.1 Joints shall be permitted in the aluminium wires in the outermost layer as well as inner layer of the AL59 conductor but tensile strength of joint wire should be at least 90% of the value required for an un joint wire., but no two such joints shall be less than 15 mtr. Apart in the complete stranded conductor. Such joints shall be made by cold pressure butt-welding.

5.8 Stranding

5.8.1 The wires used in the construction of AL59 conductor shall before stranding and after stranding shall satisfy all the relevant requirements as per the standards indicated or any other standards with due justification.

NOTE: Lithium soap grease corresponding to Grade II of IS:7623-1974 (Specification for lithium soap greases) is suitable for such application.

5.8.2 The lay ratio of the different layers shall be within the limits given in Table above.

5.8.3 In all constructions, the successive layers shall have opposite directions of lay, the outermost layer being right-handed. The wires in each layer shall be evenly and closely stranded.

5.8.4 In conductors having multiple layers of aluminium wires, the lay ratio of any aluminium layer shall not be greater than the lay ratio of the aluminium layer immediately beneath it.

5.9 Standard Length

5.9.1 The standard length of the conductor shall be 500 meter. A tolerance of +/-5% on the standard length shall be permitted. All lengths outside this limit of tolerance shall be treated as random lengths.

5.9.2 Random lengths will be accepted provided no length is less than 70% of the standard length specified and the total quantity of such random lengths shall not be more than 5% of the total quantity ordered.

5.9.3 Bidder shall also indicate the maximum single length, above the standard length, he can manufacture in the guaranteed technical particulars. This is required for special stretches like river crossing etc. The purchaser reserves the right to place orders for the above length to the extent of 50% of the total ordered quantity on the same terms and conditions applicable for the standard lengths during the tendency of the contract.

5.9.4 For specification of standard length mentioned at 5.10.1 may be specified as under for AL59 Moose, Zebra, Panther and Dog Conductor :

Sr. No.	Type of Conductor	Standard length in Meter	Tolerance.
1	AL59 Moose (61/3.50 mm)	500	— — + 5% x 1 ± 5% x 1 —

SECTION-3

PROJECT DETAILS & GENERAL SPECIFICATION

SITE INFORMATION

	Particular	Details
a)	Owner	POWERGRID
b)	Customer	POWERGRID
c)	Project Title	765kV/400kV/220kV Banaskantha (New) Substation and Extn. of 400kV Sankhari (GETCO) Substation
d)	Location for Banaskantha site.	Village – MUDETHA , Near BHILDI - 385530 Taluka – Deesa, Dist. Banaskantha (Gujarat)
e)	Location for Sankhari site	Village – VELODA, Near Melusan Dist. Patan (Gujarat)
f)	Transport Facilities	RAOD/TRAIN, For both Site Nearest Rail Head: Palanpur
SITE CONDITIONS		
a)	Max. ambient air temp.	50°C
b)	Min. ambient air temp.	0°C
c)	Max. design ambient temp.	50°C
d)	Design reference temp.	50°C
e)	Average Humidity	Max. 100%
f)	Special corrosion conditions	No
g)	Solar Radiation	1.2kW/sqmtr
h)	Atmospheric UV radiation	High
i)	Altitude above sea level	Less than 1000meter
j)	Pollution Severity	High Polution (25mm/kV)
k)	Seismic Zone	As per the seismic zone defined in the relevant BIS but not less than 0.3g horrrizontal
WIND DATA		
	Wind velocity	As per IS
	Average No. of thunderstorm days per annum	As per IS

	Main Electrical Parameters:	
	Fault Levels:	For Banaskantha 765kV: 50kA for 1 sec 400kV: 63kA for 1 sec 220kV: 40kA for 1 sec For Sankhari 400kV: 40kA for 3 sec
	Creepage Distance	25mm/kV

1.0 GENERAL

This Chapter covers Technical Requirements and requirements of auxiliary items.

- Equipment furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or needed for erection, completion and safe operation of the equipment as required by applicable codes unless included in the list of exclusions.
- Material and components not specifically stated in this specification but which are necessary for satisfactory operation of the equipment and accessories specified in this specification shall be deemed to be included unless specifically excluded and shall be supplied at no extra cost.
- Whenever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific name mentioned shall be understood as establishing type, function and quality and not as limiting competition.
- In case any Deviation Schedule, Bid Proposal Sheet, Schedule of Data Requirements (DRS), test reports or any other document/information are not furnished along-with the bid, the bid is liable to be rejected. Unless brought out clearly, the Bid will be deemed to conform to the specification scrupulously. All deviations from the specification shall be clearly brought out in the respective deviation schedule.

Auxiliary supplies as described below would be available at site.

Normal	Variation	Frequency	Phase	Neutral
Voltage	in voltage	(Hz)		connection

(Volts)

415	+ 10 %	50 + 5 %	3 Ph- 4wire	Solidly earthed
240	+ 10 %	50 + 5 %	1 Ph-2wire	Solidly earthed
220	+ 10 %	DC		Isolated(2 wire system)
48		DC		Isolated(2 wire system)
				(+ Earthed)

- f) The Bidder shall clearly indicate in the bid, the specific standards in accordance with which the works will be carried out.
- g) The equipment must be new, of highest grade, the best quality of their kind, to best engineering practice and latest state of art, and in accordance with purpose for which they are intended and ensure satisfactory performance throughout the service life.
- h) All similar parts of the equipment shall be made to gauge and shall be interchangeable with and shall be made of same materials and workmanship as the corresponding parts of the equipment. Where feasible, common components, units shall be employed in different pieces of equipment in order to optimize the spare part stock-up and utilization.
- i) The requirement regarding external RIV as specified for equipment shall include the terminal fittings and the equipment shall have been tested preferably with fittings, if any.

2.0 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED

- a) The equipment furnished under this specification shall perform all its functions and operate satisfactorily without showing undue strain, restrike etc.
- b) The equipment shall be able to withstand forces due to wind load, short circuit, system over voltages, fluctuations, frequency variations etc., all forces considered together.

3.0 SUPPORT STRUCTURES (If in the scope of Bidder)

- a) The support structures should be hot dip galvanised with minimum 610 gram/m² net of zinc.
- b) The design calculations taking into account the environmental conditions of the substations shall be furnished for sizing of the structures.

4.0 STANDARDS

- a) The equipment to be furnished under this specification shall conform to latest issue with all amendments of standard specified under respective Chapters of this Specification. The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to compliment each other. The bidder shall also note that list of standards presented in this specification is not complete. Whenever necessary the list of standards shall be considered in conjunction with specific IS/IEC. When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.
- b) Other internationally accepted standards which ensure equivalent or better performance than that specified in the standards referred shall also be accepted.
- c) In case governing standards for the equipment is different from IS or IEC, the salient points of difference shall be clearly brought out in additional information schedule alongwith English language version of standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to POWERGRID's approval.

5.0 ENGINEERING DATA AND DRAWINGS

- 5.1 The list of drawings/documents which are to be submitted to the Purchaser shall be discussed and finalised by the Purchaser at the time of award. The supplier shall necessarily submit all the drawings/ documents unless anything is waived.
- 5.2 The Contractor shall submit 4 (four) sets of drawings/ design documents /data / detailed bill of quantity and 1 (one) set of test reports for the approval of the Purchaser. The contractor shall also submit the softcopy of the above documents in addition to hardcopy.
- 5.3 Drawings
 - 5.3.1 All drawings submitted by the Contractor shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, dimensions, internal & the external connections, fixing arrangement required and any other information specifically requested in the specifications.
 - 5.3.2 Drawings submitted by the Contractor shall be clearly marked with the name of the Purchaser, the unit designation, the specifications title, the specification number and the name of the Project. POWERGRID has standardized a large number of drawings/documents of various make including type test reports which can be used for all projects having similar requirements and in such cases no project specific approval (except for list of applicable drawings alongwith type test reports) is required. However, distribution copies of standard drawings/documents shall be submitted as per provision of the contract. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in SI units.

5.3.3 The review of these data by the Purchaser will cover only general conformance of the data to the specifications and documents, interfaces with the equipment provided under the specifications, external connections and of the dimensions which might affect substation layout. This review by the Purchaser may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicated or the accuracy of the information submitted. This review and/or approval by the Purchaser shall not be considered by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.

5.4 All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Purchaser. Approval of Contractor's drawing or work by the Purchaser shall not relieve the contractor of any of his responsibilities and liabilities under the Contract.

5.5 All engineering data submitted by the Contractor after final process including review and approval by the Purchaser shall form part of the Contract Document and the entire works performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the Purchaser in Writing.

5.7 Approval Procedure

The scheduled dates for the submission of the drawings as well as for, any data/information to be furnished by the Purchaser would be discussed and finalised at the time of award. The following schedule shall be followed generally for approval and for providing final documentation.

- | | | |
|------|--|---|
| i) | Approval/comments/
Purchaser on initial
submission | As per agreed by
schedule |
| ii) | Resubmission
(whenever
required) | Within 3 (three) weeks
from date of comments |
| iii) | Approval or comments | Within 3 (three) weeks of
receipt of resubmission. |
| iv) | Furnishing of distribution
copies (5 hard copies per
substation and one scanned
copy (pdf format) for Corporate
Centre) | 2 weeks from the date
of approval |
| v) | Furnishing of distribution copies of test reports | |
| (a) | Type test reports
(one scanned softcopy in
pdf format per substation plus one for corporate centre
& one hardcopy per substation) | 2 weeks from the date
of final approval |
| (b) | Routine Test Reports
(one copy for each substation) | -do- |

- | | |
|--|----------------------------------|
| vi) Furnishing of instruction/ manuals (2 copies per substation and one softcopy (pdf format) for corporate centre & per substation) | As per agreed schedule operation |
| (vii) As built drawings (two sets of hardcopy per substation & one softcopy (pdf format) for corporate centre& per substation) | On completion of entire works |

NOTE :

- (1) The supplier may please note that all resubmissions must incorporate all comments given in the earlier submission by BHEL/POWERGRID or adequate justification for not incorporating the same must be submitted failing which the submission of documents is likely to be returned.
- (2) All drawings should be submitted in softcopy form, however substation design drawings like SLD, GA, all layouts etc. shall also be submitted in AutoCAD Version. SLD, GA & layout drawings shall be submitted for the entire substation in case of substation extension also.
- (3) The instruction Manuals shall contain full details of drawings of all equipment being supplied under this contract, their exploded diagrams with complete instructions for storage, handling, erection, commissioning, testing, operation, trouble shooting, servicing and overhauling procedures.
- (4) If after the commissioning and initial operation of the substation, the instruction manuals require any modifications/ additions/changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by the supplier to BHEL/POWERGRID.
- (5) The manufacturer shall furnish to the Purchaser catalogues of spare parts.
- (6) All As-built drawings/documents shall be certified by site indicating the changes before final submission.

6.0 MATERIAL WORKMANSHIP

6.1 General Requirement

6.1.1 Where the specification does not contain references to workmanship, equipment,

materials and components of the covered equipment, it is essential that the same must be new, of highest grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended.

6.1.2 Incase where the equipment, materials or components are indicated in the specification as “similar” to any special standard, the Purchaser shall decide upon the question of similarity. When required by the specification or when required by the Purchaser the Contractor shall submit, for approval, all the information concerning the materials or components to be used in manufacture. Machinery, equipment, materials and components supplied, installed or used without such approval shall run the risk of

subsequent rejection, it being understood that the cost as well as the time delay associated with the rejection shall be borne by the supplier.

- 6.1.3 The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general, screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the BHEL/POWERGRID.
- 6.1.4 Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.
- 6.1.5 All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be considered as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, levelling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances, instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacturer's limits suitable guards shall be provided for the protection of personnel on all exposed rotating and / or moving machine parts and shall be designed for easy installation and removal for maintenance purposes. The spare equipment(s) shall be installed at designated locations and tested for healthiness.
- 6.1.6 The supplier shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The supplier shall apply all operational lubricants to the equipment installed by him.
- 6.1.7 All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Contractor has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help POWERGRID in establishing equivalent Indian make and Indian Contractor. The same shall be applicable

to other consumables too.

- 6.1.8 Corona and radio interference voltage test and seismic withstand test (for 132kV and above voltage level) procedures for equipments shall be in line with the procedure given at Annexure-A and B respectively.

6.2 Provisions For Exposure to Hot and Humid climate

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

6.2.1 Space Heaters

- 6.2.1.1 The heaters shall be suitable for continuous operation at 240V as supply voltage. On-off switch and fuse shall be provided.
- 6.2.1.2 One or more adequately rated thermostatically connected heaters shall be supplied to prevent condensation in any compartment. The heaters shall be installed in the compartment and electrical connections shall be made sufficiently away from below the heaters to minimize deterioration of supply wire insulation. The heaters shall be suitable to maintain the compartment temperature to prevent condensation.
- 6.2.1.3 Suitable anti condensation heaters with the provision of thermostat shall be provided.

6.2.2 FUNGI STATIC VARNISH

Besides the space heaters, special moisture and fungus resistant varnish shall be applied on parts which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interfere with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application of the varnish.

6.2.3 Ventilation opening

Wherever ventilation is provided, the compartments shall have ventilation openings with fine wire mesh of brass to prevent the entry of insects and to reduce to a minimum the entry of dirt and dust. Outdoor compartment openings shall be provided with shutter type blinds and suitable provision shall be made so as to avoid any communication of air / dust with any part in the enclosures of the Control Cabinets, Junction boxes and Marshalling Boxes, panels etc.

6.2.4 Degree of Protection

The enclosures of the Control Cabinets, Junction boxes and Marshalling Boxes, panels etc. to be installed shall provide degree of protection as detailed here under:

- a) Installed out door: IP- 55
- b) Installed indoor in air conditioned area: IP-31
- c) Installed in covered area: IP-52
- d) Installed indoor in non air conditioned area where possibility of entry of water

is limited: IP-41.

e) For LT Switchgear (AC & DC distribution Boards) : IP-52

The degree of protection shall be in accordance with IS:13947 (Part-I) / IEC-60947(Part-I) / IS 12063 / IEC-60529. Type test report for degree of protection test, shall be submitted for approval.

6.3 RATING PLATES, NAME PLATES AND LABELS

Each main and auxiliary item of substation is to have permanently attached to it in a conspicuous position a rating plate of non-corrosive material upon which is to be engraved manufacturer's name, year of manufacture, equipment name, type or serial number together with details of the loading conditions under which the item of substation in question has been designed to operate, and such diagram plates as may be required by the Purchaser. The rating plate of each equipment shall be according to IEC requirement.

All such nameplates, instruction plates, rating plates of transformers, reactors, CB, CT, CVT, SA, Isolators, C & R panels and PLCC equipments shall be bilingual with Hindi inscription first followed by English. Alternatively two separate plates one with Hindi and the other with English inscriptions may be provided.

6.4 FIRST FILL OF CONSUMABLES, OIL AND LUBRICANTS

All the first fill of consumables such as oils, lubricants, filling compounds, touch up paints, soldering/brazing material for all copper piping of circuit breakers and essential chemicals etc. which will be required to put the equipment covered under the scope of the specifications, into successful Operation, shall be furnished by the supplier unless specifically excluded under the exclusions in these specifications and documents.

7.0 DESIGN IMPROVEMENTS / COORDINATION

- 7.1 The bidder shall note that the equipment offered by him in the bid only shall be accepted for supply. However, the Purchaser or the Contractor may propose changes in the specification of the equipment or quality thereof and if the Purchaser & contractor agree upon any such changes, the specification shall be modified accordingly.
- 7.2 If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any change in the price and/or schedule of completion before the Contractor proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.
- 7.3 The supplier shall be responsible for the selection and design of appropriate equipments to provide the best co-ordinated performance of the entire system. The basic design requirements are detailed out in this Specification. The design of various components, sub-assemblies and assemblies shall be so done that it facilitates easy field assembly and maintenance.
- 7.4 The supplier has to coordinate designs and terminations with the agencies (if any) who are Consultants/Contractor for the Purchaser. The names of agencies shall be intimated to the successful bidders.
- 7.5 The supplier will be called upon to attend design co-ordination meetings

with the Engineer, other Contractor's and the Consultants of the Purchaser (if any) during the period of Contract. The Contractor shall attend such meetings at his own cost at POWERGRID Corporate Centre, Gurgaon (Haryana) or at mutually agreed venue as and when required and fully cooperate with such persons and agencies involved during those discussions.

8.0 QUALITY ASSURANCE PROGRAMME

8.1 To ensure that the equipment and services under the scope of this Contract whether manufactured or performed within the supplier's Works or at his Sub-contractor's premises or at the Purchaser's site or at any other place of Work are in accordance with the specifications, the supplier shall adopt suitable quality assurance programme to control such activities at all points necessary. The detailed programme shall be submitted by the contractor after the award for reference. A quality assurance programme of the supplier shall generally cover the following:

- (a) His organisation structure for the management and implementation of the proposed quality assurance programme;
- (b) Documentation control system;
- (c) Qualification data for bidder's key personnel;
- (d) The procedure for purchases of materials, parts components and selection of sub-Contractor's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
- (e) System for shop manufacturing and site erection controls including process controls and fabrication and assembly control;
- (f) Control of non-conforming items and system for corrective actions;
- (g) Inspection and test procedure both for manufacture and field activities.
- (h) Control of calibration and testing of measuring instruments and field activities;
- (i) System for indication and appraisal of inspection status;
- (j) System for quality audits;
- (k) System for authorising release of manufactured product to the Purchaser.
- (l) System for maintenance of records;
- (m) System for handling storage and delivery; and
- (n) A quality plan detailing out the specific quality control measures and procedures adopted for controlling the quality characteristics relevant to each item of equipment furnished and/or services rendered.

POWERGRID/BHEL or his duly authorised representative reserves the right to carry out quality audit and quality surveillance of the system and procedure of the supplier/his vendor's quality management and control activities.

8.2 Quality Assurance Documents

The supplier would be required to submit all the Quality Assurance Documents as stipulated in the Quality Plan at the time of POWERGRID/BHEL inspection of equipment/material

9.0 TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE

9.1 All equipment being supplied shall conform to type tests as per technical specification and shall be subject to routine tests in accordance with requirements stipulated under respective sections.

9.2 The reports for all type tests as per technical specification shall be furnished by the supplier alongwith equipment / material drawings. However, type test reports of similar equipments/ material already accepted in POWERGRID shall be applicable for all project with similar requirement. The type tests conducted earlier should have either been conducted in accredited laboratory (accredited based on ISO / IEC Guide 25 / 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by POWERGRID or representative authorized by POWERGRID or Utility or representative of accredited test lab or reputed consultant.

The test reports submitted shall be of the tests conducted within last 10 (ten) years prior to the date of bid opening i.e. 24.02.15. In case the test reports are of the test conducted earlier than 10 (ten) years prior to the date of bid opening, the contractor shall repeat these test(s) at no extra cost to BHEL.

However, in case of instrument transformers, the following type tests should have been conducted within 5 (five) years prior to the date of bid opening.

- i) Lightning Impulse Test
- ii) Switching Impulse Test
- iii) Multiple Chopped Impulse Test (For CT)
- iv) Chopped Impulse Test (For CVT)

In case the test reports are of these tests (for instrument transformers) as mentioned above are conducted earlier than 5 (five) years prior to the date of bid opening i.e. 24.02.15, the contractor shall repeat these test(s) at no extra cost to the purchaser.

Further, in the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the Technical Specification or any/all type tests not carried out, same shall be carried out without any additional cost implication to the Purchaser.

The supplier shall intimate the BHEL/POWERGRID the detailed program about the tests atleast two (2) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies.

Further, in case type tests are required to be conducted/repeated and the deputation of Inspector/Purchaser's representative is required, then all the expenses shall be borne by the supplier.

9.3 The Purchaser intends to repeat the type tests on Power Transformer and Shunt

Reactor except Dynamic short circuit tests on transformers, for which test charges shall be payable as per provision of contract. The price of conducting type tests shall be included in Bid price and break up of these shall be given in the relevant schedule of Bid Proposal Sheets. These Type test charges would be considered in bid evaluation. In case Bidder does not indicate charges for any of the type tests or does not mention the name of any test in the price schedules, it will be presumed that the particular test has been offered free of charge. Further, in case any Bidder indicates that he shall not carry out a particular test, his offer shall be considered incomplete and shall be liable to be rejected. BHEL/POWERGRID reserves the right to witness any or all the type tests. The BHEL/POWERGRID also reserves the right to waive the repeating of type tests partly or fully and in case of waiver, test charges for the same shall not be payable.

The Purchaser shall bear all expenses for deputation of purchaser's representative(s) for witnessing the type tests under this clause except in the case of re-deputation if any, necessitated due to no fault of the purchaser.

For outdoor receptacles, trefoil clamps, diesel engine, alternator, motors, cable glands, lighting fixtures, ACSR/AAC conductor, IPS aluminum tube and junction boxes, type test reports are not required to be submitted for the makes indicated at Annexure-E /POWERGRID approved list of subvendors. For the new makes(other than those indicated at Annexure-E / POWERGRID approved list of subvendors), type test reports as per relevant standard shall be submitted for POWERGRID's approval.

- 9.4 The Purchaser, his duly authorised representative and/or outside inspection agency acting on behalf of the Purchaser shall have at all reasonable times free access to the Contractor's/sub-vendors premises or Works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the Works during its manufacture or erection if part of the Works is being manufactured or assembled at other premises or works, the Contractor shall obtain for the Engineer and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works. Inspection may be made at any stage of manufacture, despatch or at site at the option of the Purchaser and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.
- 9.5 The supplier shall give the Purchaser /Inspector fifteen (15) days written notice for on-shore and six (6) weeks notice for off-shore material being ready for joint testing including contractor and POWERGRID. Such tests shall be to the Contractor's account except for the expenses of the Inspector. The Purchaser/inspector, unless witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days of the date of which the equipment is notified as being ready for test/inspection, failing which the Contractor may proceed alone with the test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Inspector duly certified copies of tests in triplicate.
- 9.6 The Purchaser or Inspector shall, within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Contractor, of any objection to any drawings and all or any equipment and workmanship which

in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the Purchaser /Inspector giving reasons therein, that no modifications are necessary to comply with the Contract.

9.7 When the factory tests have been completed at the Contractor's or Sub- Contractor's works, the Purchaser/inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Purchaser /Inspector, the certificate shall be issued within fifteen (15) days of receipt of the Contractor's Test certificate by the Engineer/Inspector. Failure of the Purchaser /Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the Works. The completion of these tests or the issue of the certificate shall not bind the Purchaser to accept the equipment should, it, on further tests after erection, be found not to comply with the Contract. The equipment shall be dispatched to site only after approval of test reports and issuance of CIP by the Purchaser.

9.8 In all cases where the Contract provides for tests whether at the premises or at the works of the Contractor or of any Sub-Contractor, the Contractor except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Purchaser /Inspector or his authorised representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Purchaser /Inspector or to his authorised representative to accomplish testing.

9.9 The inspection by Purchaser and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed quality assurance programme forming a part of the Contract.

9.10 The Purchaser will have the right of having at his own expenses any other test(s) of reasonable nature carried out at Contractor's premises or at site or in any other place in addition of aforesaid type and routine tests, to satisfy that the material comply with the specification.

9.11 The Purchaser reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipments for these tests shall be provided by the Purchaser.

10.0 TESTS

10.1 Pre-commissioning Tests

On completion of erection of the equipment and before charging, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Purchaser and the Contractor for correctness and completeness of installation and acceptability for charging, leading to initial pre-commissioning tests at Site. The list of pre-commissioning tests to be performed are given in respective chapters and shall be included in the Contractor's quality assurance programme.

10.2 Commissioning Tests

- 10.2.1 The available instrumentation and control equipment will to be used during such tests and the Purchaser will calibrate, all such measuring equipment and devices as far as practicable.
- 10.2.2 Any special equipment, tools and tackles required for the successful completion of the Commissioning Tests shall be provided by the Contractor, free of cost.
- 10.2.3 The specific tests requirement on equipment have been brought out in the respective chapters of the technical specification.
- 10.3 The Contractor shall be responsible for obtaining statutory clearances from the concerned authorities for commissioning the equipment and the switchyard. However necessary fee shall be reimbursed by POWERGRID on production of requisite documents.

11.0 PACKAGING & PROTECTION

- 11.1 All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the Purchaser, the Contractor shall also submit packing details/associated drawing for any equipment/material under his scope of supply, to facilitate the Purchaser to repack any equipment/material at a later date, in case the need arises. While packing all the materials, the limitation from the point of view of availability of Railway wagon sizes in India should be taken into account. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor. Purchaser takes no responsibility of the availability of the wagons.
- 11.2 All coated surfaces shall be protected against abrasion, impact, discolouration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves and pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.

12.0 FINISHING OF METAL SURFACES

- 12.1 All metal surfaces shall be subjected to treatment for anti-corrosion protection. All ferrous surfaces for external use unless otherwise stated elsewhere in the specification or specifically agreed, shall be hot-dip galvanized after fabrication. High tensile steel nuts & bolts and spring washers shall be electro galvanized to service condition 4. All steel conductors including those used for earthing/grounding (above ground level) shall also be galvanized according to IS:2629.
- 12.2 HOT DIP GALVANISING
 - 12.2.1 The minimum weight of the zinc coating shall be 610 gm/sq.m and minimum average thickness of coating shall be 86 microns for all items having thickness 6mm and above. For items lower than 6mm thickness requirement of coating thickness shall be as per relevant ASTM. For surface which shall be embedded in concrete, the zinc coating shall be 610 gm/sq. m minimum.

12.2.2 The galvanized surfaces shall consist of a continuous and uniform thick coating of zinc, firmly adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surface, flaking or peeling off, etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

12.2.3 After galvanizing, no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

12.2.4 The galvanized steel shall be subjected to six one minute dips in copper sulphate solution as per IS-2633.

12.2.5 Sharp edges with radii less than 2.5 mm shall be able to withstand four immersions of the Standard Preece test. All other coatings shall withstand six immersions. The following galvanizing tests should essentially be performed as per relevant Indian Standards.

- Coating thickness
- Uniformity of zinc
- Adhesion test
- Mass of zinc coating

12.2.6 Galvanised material must be transported properly to ensure that galvanised surfaces are not damaged during transit. Application of zinc rich paint at site shall not be allowed.

12.3 PAINTING

12.3.1 All sheet steel work shall be degreased, pickled, phosphated in accordance with the IS-6005 "Code of practice for phosphating iron and sheet". All surfaces, which will not be easily accessible after shop assembly, shall beforehand be treated and protected for the life of the equipment. The surfaces, which are to be finished painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer. Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

12.3.2 After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying. The phosphate coating shall be sealed with application of two coats of ready mixed, stoving type zinc chromate primer. The first coat may be "flash dried" while the second coat shall be stoved.

12.3.3 After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. The second finishing coat shall be applied after inspection of first coat of painting.

12.3.4 The exterior and interior colour of the paint in case of new substations shall preferably be RAL 7032 for all equipment, marshalling

boxes, junction boxes, control cabinets, panels etc. unless specifically mentioned under respective sections of the equipments. Glossy white colour inside the equipments /boards/panels/junction boxes is also acceptable. The exterior colour for panels shall bematching with the existing panels in case of extension of a substation. Each coatof primer and finishing paint shall be of slightly different shade to enable inspection of the painting. A small quantity of finishing paint shall be supplied for minor touching up required at site after installation of the equipments.

12.3.5 In case the Bidder proposes to follow his own standard surface finish and protection procedures or any other established painting procedures, like electrostatic painting etc., the procedure shall be submitted alongwith the Bids for Purchaser's review & approval.

12.3.6 The colour scheme as given below shall be followed for Fire Protection and Air Conditioning systems

S.No.	PIPE LINE	Base colour	Band colour
Fire Protection System			
1	Hydrant and Emulsifier system pipeline	FIRE RED	-
2	Emulsifier system detection line – water	FIRE RED	Sea Green
3	Emulsifier system detection line – Air	FIRE RED	Sky Blue
4	Pylon support pipes	FIRE RED	
Air Conditioning System			
5	Refrigerant gas pipeline – at compressor suction	Canary Yellow	-
6	Refrigerant gas pipeline – at compressor discharge	Canary Yellow	Red
7	Refrigerant liquid pipeline	Dark Admiralty Green	-
8	Chilled water pipeline	Sea Green	-
9	Condenser water pipeline	Sea Green	Dark Blue

12.3.7 For aluminium casted surfaces, the surface shall be with smooth finish. Further, in case of aluminium enclosures the surface shall be coated with powder (coating thickness of 60 microns) after surface preparation for painting.

13.0 HANDLING, STORING AND INSTALLATION

13.1 In accordance with the specific installation instructions as shown on manufacturer's drawings or as directed by the Purchaser or his representative, the Contractor shall unload, store, erect, install, wire, test and place into commercial use all the equipment included in the contract. Equipment shall be installed in a neat, workmanlike manner so that it is level, plumb, square and properly aligned and oriented. Commercial use of switchyard equipment means completion of all site tests specified and energisation at rated voltage.

- 13.2 Contractor may engage manufacturer's Engineers to supervise the unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. Contractor shall unload, transport, store, erect, test and commission the equipment as per instructions of the manufacturer's supervisory Engineer(s) and shall extend full cooperation to them.
- 13.3 The contractor shall have to ensure that the hard and flat indoor and outdoor storage areas are in place prior to commencement of delivery of material at site. Contractor shall also ensure availability of proper unloading and material handling equipment like cranes etc. and polyester/nylon ropes of suitable capacity to avoid damage during unloading and handling of material at site. All indoor equipments shall be stored indoors. Outdoor equipment may be stored outdoors but on a hard and flat raised area properly covered with waterproof and dustproof covers to protect them from water seepage and moisture ingress. However, all associated control panels, marshalling boxes operating boxes etc. of outdoor equipments are to be stored indoors only. Storage of equipment on top of another one is not permitted if the wooden packing is used. Material opened for joint inspection shall be repacked properly as per manufacturer's recommendations. During storage of material regular periodic monitoring of important parameters like oil level / leakage, SF6 / Nitrogen pressure etc. shall be ensured by the contractor.
- 13.4 In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the Purchaser. Contractor shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.
- 13.5 Where assemblies are supplied in more than one section, Contractor shall make all necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning. Any equipment damaged due to negligence or carelessness or otherwise shall be replaced by the Contractor at his own expense.
- 13.6 Supplier shall be responsible for examining all the shipment and notify the Purchaser immediately of any damage, shortage, discrepancy etc. for the purpose of Purchaser's information only. The Contractor shall submit to the Purchaser every week a report detailing all the receipts during the weeks. However, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection of the equipment at Site. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor.
- 13.7 The supplier shall be fully responsible for the equipment/material until the same is handed over to the Purchaser in an operating condition after commissioning. Contractor shall be responsible for the maintenance of the equipment/material while in storage as well as after erection until taken

over by Purchaser, as well as protection of the same against theft, element of nature, corrosion, damages etc.

13.8 Where material / equipment is unloaded by Purchaser before the Contractor arrives at site or even when he is at site, Purchaser by right can hand over the same to Contractor and there upon it will be the responsibility of Contractor to store the material in an orderly and proper manner.

13.9 The Contractor shall be responsible for making suitable indoor storage facilities, to store all equipment which requires indoor storage.

13.10 The words 'erection' and 'installation' used in the specification are synonymous.

13.11 Exposed live parts shall be placed high enough above ground to meet the requirements of electrical and other statutory safety codes.

13.12 Equipment Bases

A cast iron or welded steel base plate shall be provided for all rotating equipment which is to be installed on a concrete base unless otherwise agreed to by the Purchaser. Each base plate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have threaded drain connections.

14.0 TOOLS AND TACKLES

The Contractor shall supply with the equipment one complete set of all special tools and tackles for the erection, assembly, dis-assembly and maintenance of the equipment. However, these tools and tackles shall be separately, packed and brought on to Site.

15.0 AUXILIARY SUPPLY

15.1 The sub-station auxiliary supply is normally met through a system indicated under section "Electrical & Mechanical Auxiliaries" having the following parameters. The auxiliary power for station supply, including the equipment drive, cooling system of any equipment, air-conditioning, lighting etc shall be designed for the specified Parameters as under. The DC supply for the instrumentation and PLCC system shall also conform the parameters as indicated in the following.

Normal Voltage	Variation in Voltage	Frequency in HZ	Phase/Wire	Neutral connection
415V	± 10%	50 ± 5%	3/4 Wire	Solidly Earthed.
240V	± 10%	50 ± 5%	1/2 Wire	Solidly Earthed.
220V	190V to 240V	DC	-	Isolated 2 wire System
48V	—	DC	—	2 wire system (+) earthed

Combined variation of voltage and frequency shall be limited to ± 10%.

16.0 SUPPORT STRUCTURE (If in the scope of supplier)

16.1 The equipment support structures shall be suitable for equipment connections

at the first level i.e 14.0 meter, 8.0 meter and 5.9 meter from plinth level for 765 kV, 420 kV and 245 kV substations respectively. All equipment support structures shall be supplied alongwith brackets, angles, stools etc. for attaching the operating mechanism, control cabinets & marshalling box (wherever applicable) etc.

16.2 Support structure shall meet the following mandatory requirements:

16.2.1 The minimum vertical distance from the bottom of the lowest porcelain part of the bushing, porcelain enclosures or supporting insulators to the bottom of the equipment base, where it rests on the foundation pad shall be 2.55 metres.

17.0 CLAMPS AND CONNECTORS INCLUDING TERMINAL CONNECTORS

17.1 All power clamps and connectors shall conform to IS:5561 & NEMA CC1 and shall be made of materials listed below :

- | | | |
|----|--|---|
| a) | For connecting ACSR conductors | Aluminum alloy casting, conforming to designation A6 of IS:617 and all test shall conform to IS:617 |
| b) | For connecting equipment terminals made of copper with ACSR conductors | Bimetallic connectors made from aluminum alloy casting, conforming to designation A6 of IS:617 with 2mm thick bimetallic liner and all test shall conform to IS:617 |
| c) | For connecting G.I | Galvanised mild steel shield |
| d) | i) Bolts, nuts & Plain, washers | i) Electrogalvanised for sizes below M12, for others hot dip galvanised. |
| | ii) Spring washers for items 'a' to 'c' | ii) Electro-galvanised mild steel suitable for atleast service condition-3 as per IS:1573 |

17.2 Necessary clamps and connectors shall be supplied for all equipment and connections. The requirement regarding external corona and RIV as specified for any equipment shall include its terminal fittings. If corona rings are required to meet these requirements they shall be considered as part of that equipment and included in the scope of work.

17.3 Where copper to aluminum connections are required, bi-metallic clamps shall be used, which shall be properly designed to ensure that any deterioration of the connection is kept to a minimum and restricted to parts which are not current carrying or subjected to stress.

17.4 Low voltage connectors, grounding connectors and accessories for grounding all equipment as specified in each particular case, are also included in the scope of Work.

17.5 No current carrying part of any clamp shall be less than 10 mm thick. All ferrous parts shall be hot dip galvanised. Copper alloy liner of minimum 2 mm thickness shall be cast integral with aluminum body or 2 mm thick bi-metallic strips shall be provided for Bi-metallic clamps.

- 17.6 All casting shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be blurred and rounded off.
- 17.7 Flexible connectors, braids or laminated straps made for the terminal clamps for bus posts shall be suitable for both expansion or through (fixed/sliding) type connection of 4" IPS AL. tube as required. In both the cases the clamp height (top of the mounting pad to centre line of the tube) should be same.
- 17.8 Clamp shall be designed to carry the same current as the conductor and the temperature rise shall be equal or less than that of the conductor at the specified ambient temperature. The rated current for which the clamp/connector is designed with respect to the specified reference ambient temperature, shall also be indelibly marked on each component of the clamp/connector, except on the hardware.
- 17.9 All current carrying parts shall be designed and manufactured to have minimum contact resistance.
- 17.10 Clamps and connectors shall be designed to be corona controlled.

17.11 Tests

- 17.11.1 Clamps and connectors should be type tested as per IS:5561 and shall also be subjected to routine tests as per IS:5561. Following type test reports shall be submitted for approval as per clause 9.2 above except for sl. no.(ii) & (iii) for which type test once conducted shall be applicable (i.e. the requirement of test conducted within last ten years shall not be applicable).
 - i) Temperature rise test (maximum temperature rise allowed is 35°C over 50°C ambient)
 - ii) Short time current test
 - iii) Corona (dry) and RIV (dry) test (for 220 KV and above voltage level clamps)
 - iv) Resistance test and tensile test

18.0 CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES & MARSHALLING BOXES FOR OUTDOOR EQUIPMENT

- 18.1 All types of boxes, cabinets etc. shall generally conform to & be tested in accordance with IS-5039/IS-8623, IEC-60439, as applicable, and the clauses given below:
- 18.2 Control cabinets, junction boxes, Marshalling boxes & terminal boxes shall be made of sheet steel or aluminum enclosure and shall be dust, water and vermin proof. Sheet steel used shall be atleast 2.0 mm thick cold rolled or 2.5 mm hot rolled or alternately 1.6 mm thick stainless steel can also be used. The box shall be properly braced to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. In case of aluminum enclosed box the thickness of aluminum shall be such that it provides adequate rigidity and long life as comparable with sheet steel of specified thickness.
- 18.3 A canopy and sealing arrangements for operating rods shall be

provided in marshalling boxes / Control cabinets to prevent ingress of rain water.

- 18.4 Cabinet/boxes shall be provided with double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. The quality of the gasket shall be such that it does not get damaged/cracked during the operation of the equipment.
- 18.5 All doors, removable covers and plates shall be gasketed all around with suitably profiled EPDM/Neoprene gaskets. The gasket shall be tested in accordance with approved quality plan, IS:11149 and IS:3400. Ventilating Louvers, if provided, shall have screen and filters. The screen shall be fine wire mesh made of brass.
- 18.6 All boxes/cabinets shall be designed for the entry of cables from bottom by means of weather proof and dust-proof connections. Boxes and cabinets shall be designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet. Suitable cable gland plate above the base of the marshalling kiosk/box shall be provided for this purpose along with the proper blanking plates. Necessary number of cable glands shall be supplied and fitted on this gland plate. Gland plate shall have provision for some future glands to be provided later, if required. The Nickel plated glands shall be dust proof, screw on & double compression type and made of brass. The gland shall have provision for securing armour of the cable separately and shall be provided with earthing tag. The glands shall conform to BS:6121.
- 18.7 A 240V, single phase, 50 Hz, 15 amp AC plug and socket shall be provided in the cabinet with ON-OFF switch for connection of hand lamps. Plug and socket shall be of industrial grade.
- 18.8 For illumination, a fluorescent tube or CFL of approximately 9 to 15 watts shall be provided. The switching of the fittings shall be controlled by the door switch. .
For junction boxes of smaller sizes such as lighting junction box, manual operated earth switch mechanism box etc., plug socket, heater and illumination is not required to be provided.
- 18.9 All control switches shall be of MCB/rotary switch type and Toggle/piano switches shall not be accepted.
- 18.10 Positive earthing of the cabinet shall be ensured by providing two separate earthing pads. The earth wire shall be terminated on to the earthing pad and secured by the use of self etching washer. Earthing of hinged door shall be done by using a separate earth wire.
- 18.11 The bay marshalling kiosks shall be provided with danger plate and a diagram showing the numbering/connection/earthing by pasting the same on the inside of the door.
- 18.12
 - a) The following routine tests along with the routine tests as per IS:5039 shall also be conducted:
 - i) Check for wiring
 - ii) Visual and dimension check
 - b) The enclosure of bay marshalling kiosk, junction box, terminal box shall conform to IP-55 as per IS:13947 including application of, 2.5 KV rms for 1

(one) minute, insulation resistance and functional test after IP-55 test.

19.0 Deleted.

20.0 TERMINAL BLOCKS AND WIRING

- 20.1 Control and instrument leads from the switchboards or from other equipment will be brought to terminal boxes or control cabinets in conduits. All interphase and external connections to equipment or to control cubicles will be made through terminal blocks.
- 20.2 Terminal blocks shall be 650V grade and have continuous rating to carry the maximum expected current on the terminals and non breakable type. These shall be of moulded piece, complete with insulated barriers, stud type terminals, washers, nuts and lock nuts. Screw clamp, overall insulated, insertion type, rail mounted terminals can be used in place of stud type terminals. But preferably the terminal blocks shall be non-disconnecting stud type of Elmex or Phoenix or Wago or equivalent make.
- 20.3 Terminal blocks for current transformer and voltage transformer secondary leads shall be provided with test links and isolating facilities. The current transformer secondary leads shall also be provided with short circuiting and earthing facilities.
- 20.4 The terminal shall be such that maximum contact area is achieved when a cable is terminated. The terminal shall have a locking characteristic to prevent cable from escaping from the terminal clamp unless it is done intentionally.
- 20.5 The conducting part in contact with cable shall preferably be tinned or silver plated however Nickel plated copper or zinc plated steel shall also be acceptable.
- 20.6 The terminal blocks shall be of extensible design.
- 20.7 The terminal blocks shall have locking arrangement to prevent its escape from the mounting rails.
- 20.8 The terminal blocks shall be fully enclosed with removable covers of transparent, non-deteriorating type plastic material. Insulating barriers shall be provided between the terminal blocks. These barriers shall not hinder the operator from carrying out the wiring without removing the barriers.
- 20.9 Unless otherwise specified terminal blocks shall be suitable for connecting the following conductors on each side.
- | | | |
|----|------------------------------------|--|
| a) | All circuits except CT/PT circuits | Minimum of two of 2.5 sq mm copper flexible. |
| b) | All CT/PT circuits | Minimum of 4 nos. of 2.5 sq copper flexible. |
- 20.10 The arrangements shall be in such a manner so that it is possible to safely connect or disconnect terminals on live circuits and replace fuse links when the cabinet is live.
- 20.11 Atleast 20 % spare terminals shall be provided on each panel/cubicle/box and these spare terminals shall be uniformly distributed on all terminals rows.
- 20.12 There shall be a minimum clearance of 250 mm between the First/bottom row of terminal block and the associated cable gland plate for outdoor ground mounted marshalling box and the clearance between two rows of

terminal blocks shall be a minimum of 150 mm.

20.13 The supplier shall furnish all wire, conduits and terminals for the necessary interphase electrical connections (where applicable) as well as between phases and common terminal boxes or control cabinets. For equipments rated for 400 kV and above the wiring required in these items shall be run in metallic ducts or shielded cables in order to avoid surge overvoltages either transferred through the equipment or due to transients induced from the EHV circuits.

20.14 All input and output terminals of each control cubicle shall be tested for surge withstand capability in accordance with the relevant IEC Publications, in both longitudinal and transverse modes. The Contractor shall also provide all necessary filtering, surge protection, interface relays and any other measures necessary to achieve an impulse withstand level at the cable interfaces of the equipment.

21.0 LAMPS & SOCKETS

21.1 Sockets

All sockets (convenience outlets) shall be suitable to accept both 5 Amp & 15 Amp pin round Standard Indian plugs. They shall be switched sockets with shutters.

21.2 Hand Lamp:

A 240 Volts, single Phase, 50 Hz AC plug point shall be provided in the interior of each cubicle with ON-OFF Switch for connection of hand lamps.

21.3 Switches and Fuses:

21.3.1 Each panel shall be provided with necessary arrangements for receiving, distributing, isolating and fusing of DC and AC supplies for various control, signalling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with miniature circuit breaker / switchfuse units. Selection of the main and Sub-circuit fuse ratings shall be such as to ensure selective clearance of sub-circuit faults. Potential circuits for relaying and metering shall be protected by HRC fuses.

21.3.2 All fuses shall be of HRC cartridge type conforming to IS:9228 mounted on plug-in type fuse bases. Miniature circuit breakers with thermal protection and alarm contacts will also be accepted. All accessible live connection to fuse bases shall be adequately shrouded. Fuses shall have operation indicators for indicating blown fuse condition. Fuse carrier base shall have imprints of the fuse rating and voltage.

22.0 Bushings, Hollow Column Insulators, Support Insulators:

22.1 Bushings shall be manufactured and tested in accordance with IS:2099 & IEC- 60137 while hollow column insulators shall be manufactured and tested in accordance with IEC-62155/IS:5621. The support insulators shall be manufactured and tested as per IS:2544/IEC-60168 and IEC-60273. The insulators shall also conform to IEC-60815 as applicable. The bidder may also offer composite hollow insulators, conforming to IEC-61462.

22.2 Support insulators, bushings and hollow column insulators shall be manufactured from high quality porcelain. Porcelain used shall be homogeneous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified tough and impervious to moisture.

- 22.3 Glazing of the porcelain shall be uniform brown in colour, free from blisters, burrs and similar other defects.
- 22.4 Support insulators/bushings/hollow column insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used.
- 22.5 When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action. No radio interference shall be caused by the insulators/bushings when operating at the normal rated voltage.
- 22.6 Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service. The design and location of clamps and the shape and the strength of the porcelain flange securing the bushing to the tank shall be such that there is no risk of fracture. All portions of the assembled porcelain enclosures and supports other than gaskets, which may in any way be exposed to the atmosphere shall be composed of completely non hygroscopic material such as metal or glazed porcelain.
- 22.7 All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued up porcelain parts by grinding and metal parts by machining. Insulator/bushing design shall be such as to ensure a uniform compressive pressure on the joints.

22.8 Tests

In bushing, hollow column insulators and support insulators shall conform to type tests and shall be subjected to routine tests in accordance with IS: 2099 & IS:2544 & IS : 5621.

23.0 MOTORS

Motors shall be "Squirrel Cage" three phase induction motors of sufficient size capable of satisfactory operation for the application and duty as required for the driven equipment and shall be subjected to routine tests as per applicable standards. The motors shall be of approved make.

23.1 Enclosures

- a) Motors to be installed outdoor without enclosure shall have hose proof enclosure equivalent to IP-55 as per IS: 4691. For motors to be installed indoor i.e. inside a box, the motor enclosure, shall be dust proof equivalent to IP-44 as per IS: 4691.
- b) Two independent earthing points shall be provided on opposite sides of the motor for bolted connection of earthing conductor.
- c) Motors shall have drain plugs so located that they will drain water resulting from condensation or other causes from all pockets in the motor casing.
- d) Motors weighing more than 25 Kg. shall be provided with eyebolts, lugs or other means to facilitate lifting.

23.2 Operational Features

- a) Continuous motor rating (name plate rating) shall be at least ten (10)

percent above the maximum load demand of the driven equipment at design duty point and the motor shall not be over loaded at any operating point of driven equipment that will rise in service.

- b) Motor shall be capable at giving rated output without reduction in the expected life span when operated continuously in the system having the particulars as given in Clause 15.0 of this Section.

23.3 Starting Requirements:

- a) All induction motors shall be suitable for full voltage direct-on-line starting. These shall be capable of starting and accelerating to the rated speed alongwith the driven equipment without exceeding the acceptable winding temperature even when the supply voltage drops down to 80% of the rated voltage.
- b) Motors shall be capable of withstanding the electrodynamic stresses and heating imposed if it is started at a voltage of 110% of the rated value.
- c) The locked rotor current shall not exceed six (6) times the rated full load current for all motors, subject to tolerance as given in IS:325.
- d) Motors when started with the driven equipment imposing full starting torque under the supply voltage conditions specified under Clause 15.0 shall be capable of withstanding atleast two successive starts from cold condition at room temperature and one start from hot condition without injurious heating of winding. The motors shall also be suitable for three equally spread starts per hour under the above referred supply condition.
- e) The locked rotor withstand time under hot condition at 110% of rated voltage shall be more than starting time with the driven equipment of minimum permissible voltage by at least two seconds or 15% of the accelerating time whichever is greater. In case it is not possible to meet the above requirement, the Bidder shall offer centrifugal type speed switch mounted on the motor shaft which shall remain closed for speed lower than 20% and open for speeds above 20% of the rated speed. The speed switch shall be capable of withstanding 120% of the rated speed in either direction of rotation.

23.4 Running Requirements:

- a) The maximum permissible temperature rise over the ambient temperature of 50 degree C shall be within the limits specified in IS:325 (for 3 - phase induction motors) after adjustment due to increased ambient temperature specified.
- b) The double amplitude of motor vibration shall be within the limits specified in IS: 4729. Vibration shall also be within the limits specified by the relevant standard for the driven equipment when measured at the motor bearings.
- c) All the induction motors shall be capable of running at 80% of rated voltage for a period of 5 minutes with rated load commencing from hot condition.

23.5 TESTING AND COMMISSIONING

An indicative list of tests is given below. Contractor shall perform any additional test based on specialities of the items as per the field

Q.P./Instructions of the equipment Contractor or Purchaser without any extra cost to the Purchaser. The Contractor shall arrange all instruments required for conducting these tests alongwith calibration certificates and shall furnish the list of instruments to the Purchaser for approval.

- (a) Insulation resistance.
- (b) Phase sequence and proper direction of rotation.
- (c) Any motor operating incorrectly shall be checked to determine the cause and the conditions corrected.

ANNEXURE-A

CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST

1. General

Unless otherwise stipulated, all equipment together with its associated connectors, where applicable, shall be tested for external corona (for 400kV & above) both by observing the voltage level for the extinction of visible corona under falling power frequency voltage and by measurement of radio interference voltage (RIV) for 132kV and above.

2. Test Levels:

The test voltage levels for measurement of external RIV and for corona extinction voltage are listed under the relevant clauses of the specification.

3. Test Methods for RIV:

- 3.1 RIV tests shall be made according to measuring circuit as per International Special-Committee on Radio Interference (CISPR) Publication 16-1(1993) Part -1. The measuring circuit shall preferably be tuned to frequency with 10% of 0.5 Mhz but other frequencies in the range of 0.5 MHz to 2 MHz may be used, the measuring frequency being recorded. The results shall be in microvolts.
- 3.2 Alternatively, RIV tests shall be in accordance with NEMA standard Publication No. 107-1964, except otherwise noted herein.
- 3.3 In measurement of, RIV, temporary additional external corona shielding may be provided. In measurements of RIV only standard fittings of identical type supplied with the equipment and a simulation of the connections as used in the actual installation will be permitted in the vicinity within 3.5 meters of terminals.
- 3.4 Ambient noise shall be measured before and after each series of tests to ensure that there is no variation in ambient noise level. If variation is present, the lowest ambient noise level will form basis for the measurements. RIV levels shall be measured at increasing and decreasing voltages of 85%, 100%, and 110% of the specified RIV test voltage for all equipment unless otherwise specified. The specified RIV test voltage for 765kV, 400 kV, 220 KV is listed in the detailed specification together

with maximum permissible RIV level in microvolts.

- 3.5 The metering instruments shall be as per CISPR recommendation or equivalent device so long as it has been used by other testing authorities.
- 3.6 The RIV measurement may be made with a noise meter. A calibration procedure of the frequency to which noise meter shall be tuned shall establish the ratio of voltage at the high voltage terminal to voltage read by noise meter.

4. Test Methods for Visible Corona

The purpose of this test is to determine the corona extinction voltage of apparatus, connectors etc. The test shall be carried out in the same manner as RIV test described above with the exception that RIV measurements are not required during test and a search technique shall be used near the onset and extinction voltage, when the test voltage is raised and lowered to determine their precise values. The test voltage shall be raised to 110% of specified corona extinction voltage and maintained there for five minutes. In case corona inception does not take place at 110%, test shall be stopped, otherwise test shall be continued and the voltage will then be decreased slowly until all visible corona disappears. The procedure shall be repeated at least 4 times with corona inception and extinction voltage recorded each time. The corona extinction voltage for purposes of determining compliance with the specification shall be the lowest of the four values at which visible corona (negative or positive polarity) disappears. Photographs with laboratory in complete darkness shall be taken under test conditions, at all voltage steps i.e. 85%, 100%, and 110%. Additional photographs shall be taken at corona inception and extinction voltages. At least two views shall be photographed in each case using Panchromatic film with an ASA daylight rating of 400 with an exposure of two minutes at a lens aperture of f/5.6 or equivalent. The photographic process shall be such that prints are available for inspection and comparison with conditions as determined from direct observation. Photographs shall be taken from above and below the level of connector so as to show corona on bushing, insulators and all parts of energised connectors. The photographs shall be framed such that test object essentially, fills the frame with no cut-off.

For recording purpose, modern devices utilizing UV recording methods such as image intensifier may also be used.

- 4.1 The test shall be recorded on each photograph. Additional photograph shall be taken from each camera position with lights on to show the relative position of test object to facilitate precise corona location from the photographic evidence.
- 4.2 In addition to photographs of the test object preferably four photographs shall be taken of the complete test assembly showing relative positions of all the test equipment and test objects. These four photographs shall be taken from four points equally spaced around the test arrangement to show its features from all sides. Drawings of the laboratory and test set up locations shall be provided to indicate camera positions and angles. The precise location of camera shall be approved by Purchaser's

inspector, after determining the best camera locations by trial energisation of test object at a voltage which results in corona.

- 4.3 The test to determine the visible corona extinction voltage need not be carried out simultaneously with test to determine RIV levels.
- 4.4 However, both test shall be carried out with the same test set up and as little time duration between tests as possible. No modification on treatment of the sample between tests will be allowed. Simultaneous RIV and visible corona extinction voltage testing may be permitted at the discretion of Purchaser's inspector if, in his opinion, it will not prejudice other test.

5. Test Records:

In addition to the information previously mentioned and the requirements specified as per CISPR or NEMA 107-1964 the following data shall be included in test report:

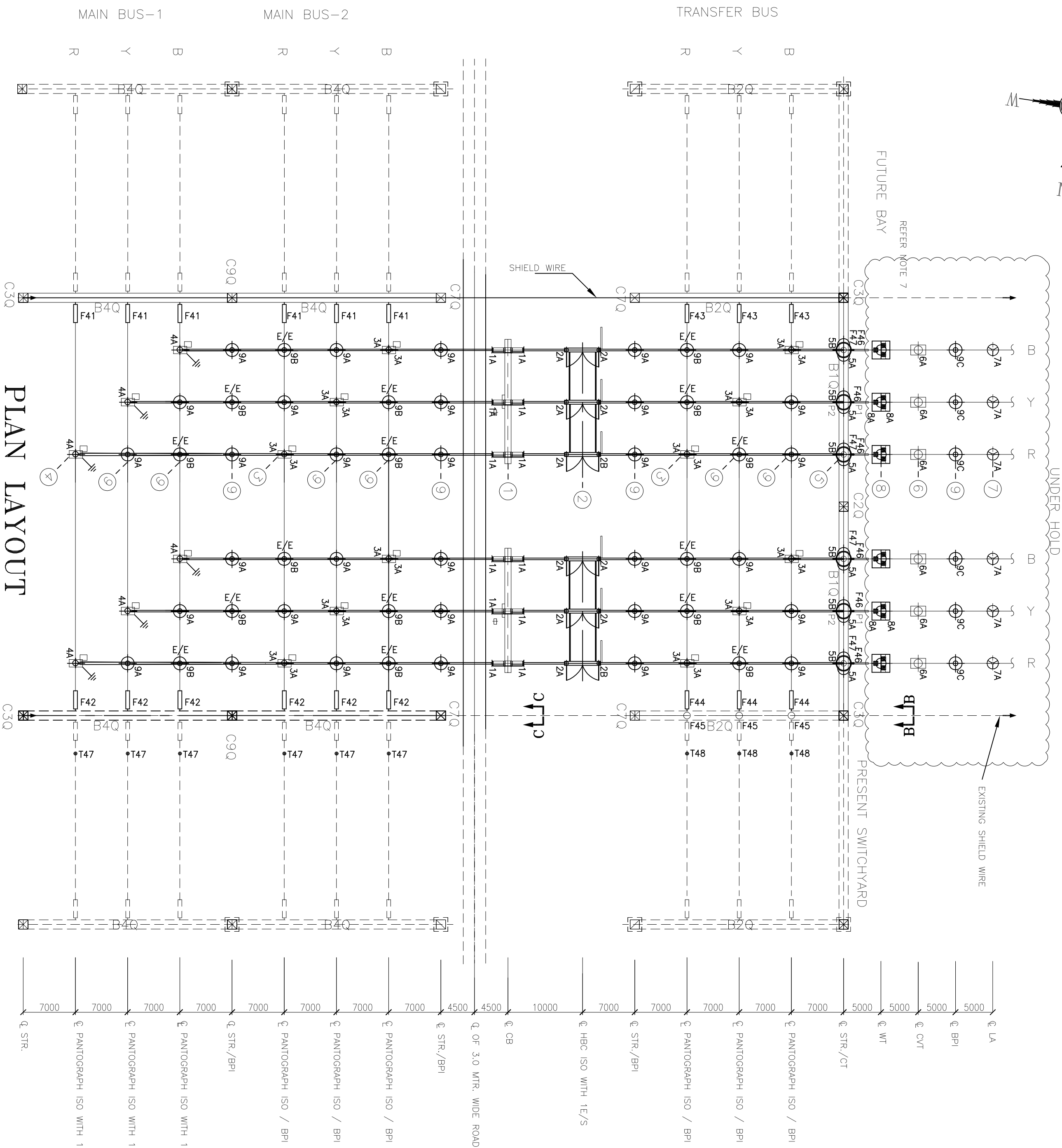
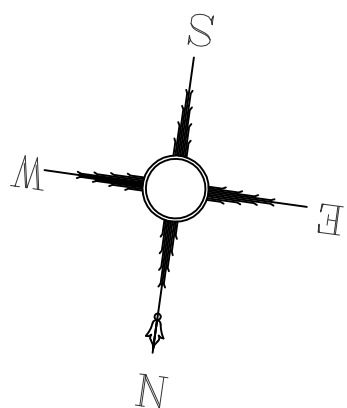
- a) Background noise before and after test.
- b) Detailed procedure of application of test voltage.
- c) Measurements of RIV levels expressed in micro volts at each level.
- d) Results and observations with regard to location and type of interference sources detected at each step.
- e) Test voltage shall be recorded when measured RIV passes through 100microvolts in each direction.
- f) Onset and extinction of visual corona for each of the four tests required shall be recorded.

ANNEXURE-B

SEISMIC WITHSTAND TEST PROCEDURE

The seismic withstanding test on the complete equipment (for 132kV and above) shall be carried out along with supporting structure.

The Bidder shall arrange to transport the structure from his Contractor's premises/POWERGRID sites for the purpose of seismic withstand test only. The seismic level specified shall be applied at the base of the structure. The accelerometers shall be provided at the Terminal Pad of the equipment and any other point as agreed by the Purchaser. The seismic test shall be carried out in all possible combinations of the equipment. The seismic test procedure shall be furnished for approval of the POWERGRID.



BILL OF QTY. FOR 400KV MAIN EQUIPMENTS:

SL.NO	DESCRIPTION	RATING	QTY. (PART-1)	SYMBOL	SCOPE OF SUPPLY
01	SF6 CIRCUIT BREAKER WITHOUT CR WITH/OUT CSD (3-PH)	3150A	2		BHEL
02	ISOLATOR WITH ONE E/S/V (3 PH) HORIZONTAL CENTRE BREAK	2000A	2		BHEL
03	ISOLATOR WITHOUT E/S/V (3 PH) PANTOGRAPH TYPE	2000A	4		BHEL
04	ISOLATOR WITH ONE E/S/V (3 PH) PANTOGRAPH TYPE	2000A	2		BHEL
05	CURRENT TRANSFORMER (1 PH) WITH 120% EXTENDED CURRENT RATING.	3000A	6		BHEL
06	CVT (1 PH)	4400SF	6		BHEL
07	SURGE ARRESTER (1 PH)	336 kV	6		BHEL
08	WAVE TRAP (1 PH) PEDISTAL TYPE.	0.5MH, 2000A	2		BHEL
09	420KV POST INSULATOR		54		BHEL

CLEARANCE TABLE :-

MINIMUM CLEARANCE TABLE	400KV
PHASE TO PHASE (PP)	4000mm
PHASE TO EARTH (PE)	3500mm
SECTION CLEARANCE (SS)	6500mm
HEIGHT OF TUBE CENTRE LINE OF FIRST LEVEL (MIN) (FROM PLINTH LEVEL)	8000mm
GROUND CLEARANCE TO NEAREST PART NOT AT EARTH POTENTIAL OF AN INSULATOR SUPPORTING LIVE CONDUCTOR	2500mm

STRINGING DETAILS :-

PERICULARS	CONDUCTOR
MAIN BUS I & II	QUAD MOOSE
TRANSFER BUS	TWIN HIGH AMPACITY AL
ALL EQUIPMENT INTERCONNECTION	4" IPS AL/TWIN MOOSE
SUB CONDUCTOR SPACING FOR QUAD 450 mm	
SUB CONDUCTOR SPACING FOR TWIN 450 mm	
EARTH WIRE	10.96MM DIA GS WIRE

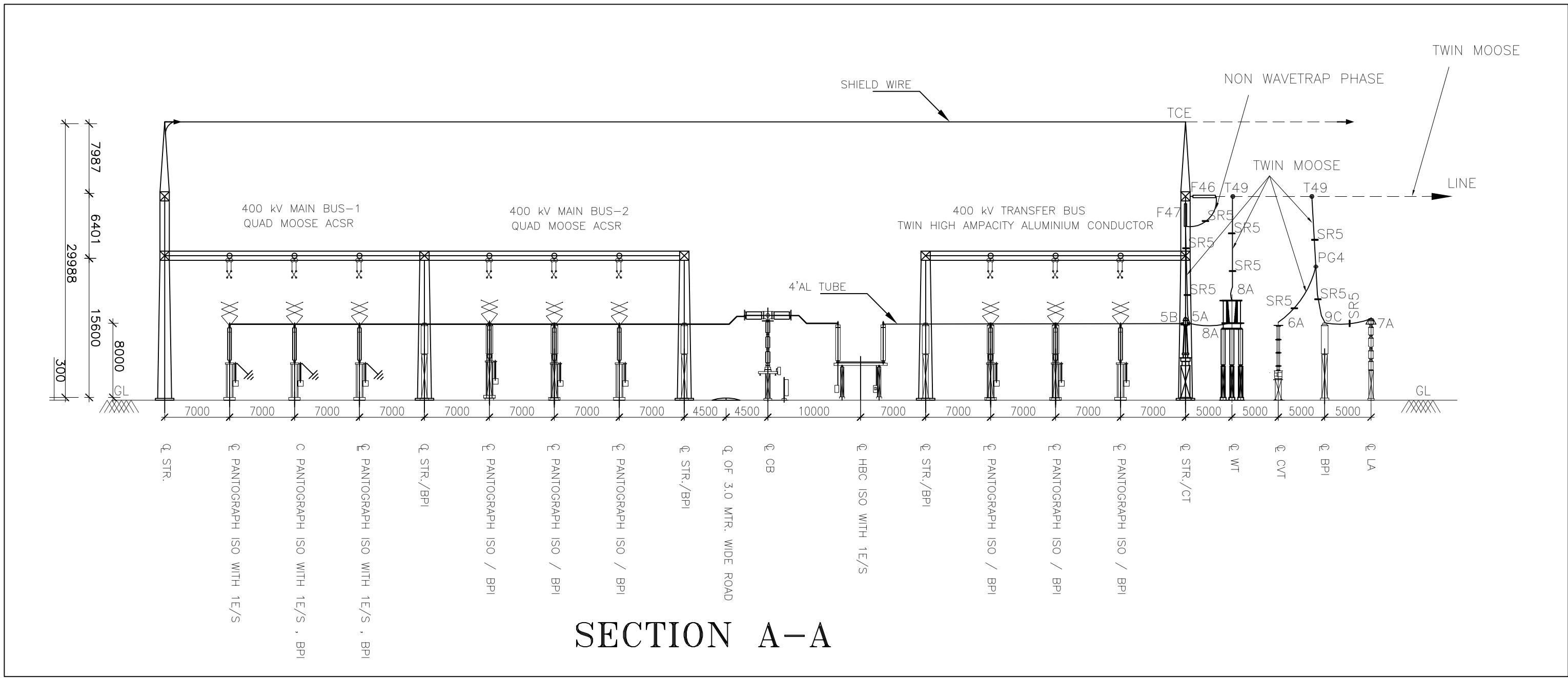
INSULATOR DATA :-

INSULATOR DATA	25NOS. 120KN
400KV DOUBLE TENSION STRING	
400KV SINGLE SUSPENSION STRING	25NOS. 120KN

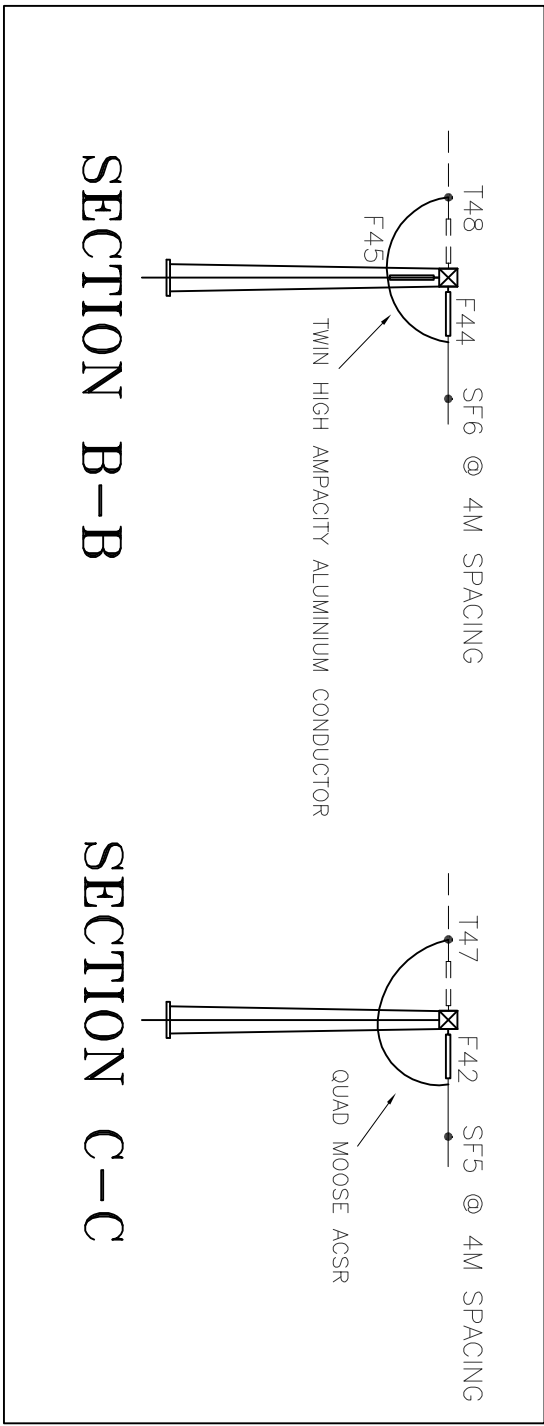
LEGEND TABLE :-	
PRESENT SCOPE	
PRESENT/FUTURE/NOT IN BHEL SCOPE	
SHIELD WIRE	

REFERENCE DWG :-

DWG. NO.	TITLE
TB-384-510-021	SINGLE LINE DIAGRAM FOR 400KV SS SANMARI EXTN.
5427NOS.-SM-E-SPO-AR-0001 R03	LIMIT PLAN OF 400/220/66KV SANMARI (VOLDAM) SS
TB-384-510-022 Rev.01	ELECTRICAL PLAN LIMIT - 400KV SS SANMARI (GTCO)



SECTION A-A



SECTION B-B

SECTION C-C

SL. No.	ID	DESCRIPTION	Unit	Qty
1	1A	400KV, 3150A EXPANSION TYPE TERMINAL CONNECTOR FOR CIRCUIT BREAKER SUITABLE FOR 4" IPS AL TUBE WITH HORIZONTAL APPROACH	Nos	12
2	2A	400KV, 3150A RIGID TYPE TERMINAL CONNECTOR FOR HCB ISOLATOR SUITABLE FOR 4" IPS AL TUBE WITH HORIZONTAL APPROACH	Nos	10
3	2B	400KV, 3150A EXPANSION TYPE TERMINAL CONNECTOR FOR HCB ISOLATOR SUITABLE FOR 4" IPS AL TUBE WITH HORIZONTAL APPROACH	Nos	2
4	3A	400KV, 3150A RIGID TYPE TERMINAL CONNECTOR FOR PANTOGRAPH ISOLATOR SUITABLE FOR 4" IPS AL TUBE WITH HORIZONTAL APPROACH	Nos	24
5	4A	400KV, 3150A RIGID TYPE TERMINAL CONNECTOR FOR PANTOGRAPH ISOLATOR WITH I/S SUITABLE FOR 4" IPS AL TUBE WITH HORIZONTAL APPROACH	Nos	6
6	5A	400KV, 3150A RIGID TYPE TERMINAL CONNECTOR FOR 400KV CT SUITABLE FOR TWIN WITH MOOSE/ACSR HORIZONTAL APPROACH	Nos	6
7	5B	400KV, 3150A FLEXIBLE TYPE TERMINAL CONNECTOR FOR 400KV CT SUITABLE FOR 4" IPS AL TUBE WITH HORIZONTAL APPROACH	Nos	6
8	6A	TERMINAL CONNECTOR FOR 400KV CVT SUITABLE FOR TWIN MOOSE/ACSR WITH VERTICAL APPROACH	Nos	6
9	7A	TERMINAL CONNECTOR FOR 336kV ALA SUITABLE FOR TWIN MOOSE/ACSR WITH HORIZONTAL APPROACH	Nos	6
10	8A	400KV, 2000A TERMINAL CONNECTOR FOR 400KV Wave Trap SUITABLE FOR TWIN MOOSE/ACSR WITH HORIZONTAL CLIM VERTICAL APPROACH SLIDING (THROUGH) TYPE TERMINAL CONNECTOR FOR 400KV POST INSULATORS SUITABLE FOR 4" IPS AL TUBE WITH HORIZONTAL APPROACH	Nos	4
11	9A	400KV, 3150A EXPANSION TYPE TERMINAL CONNECTOR FOR 400KV POST INSULATORS SUITABLE FOR 4" IPS AL TUBE WITH HORIZONTAL APPROACH	Nos	32
12	9B	400KV, 3150A EXPANSION TYPE TERMINAL CONNECTOR FOR 400KV POST INSULATORS SUITABLE FOR 4" IPS A TUBE WITH HORIZONTAL APPROACH	Nos	16
13	9C	TERMINAL CONNECTOR FOR 400KV POST INSULATORS SUITABLE FOR TWIN MOOSE/ACSR CONDUCTOR WITH HORIZONTAL APPROACH	Nos	6
14	CA	400KV CORONA BELL SUITABLE FOR 4" IPS AL TUBE	Nos	0
15	SA	400KV FLEXIBLE TYPE SPACER SUITABLE FOR QUAD MOOSE/ACSR (400KV)	Nos	130
16	SB	400KV FLEXIBLE TYPE SPACER SUITABLE FOR TWIN HIGH AMPACITY AL CONDUCTOR (400KV)	Nos	66
17	SB4	RIGID TYPE SPACER SUITABLE FOR TWIN HIGH AMPACITY CONDUCTOR (400KV)	Nos	24
18	SC4	RIGID TYPE SPACER SUITABLE FOR TWIN HIGH AMPACITY CONDUCTOR (400KV)	Nos	12
19	SR5	RIGID TYPE SPACER SUITABLE FOR TWIN ACSR MOOSE CONDUCTOR (400KV)	Nos	34
20	TCE	TENSION CLAMPS FOR 10.98 MM DIA GS WIRE	Nos	6
21	PGC	TWO WAY PARALLEL GROOVE CLAMPS FOR 10.98 MM DIA G WIRE (PG CLAMP)	Nos	8
22	EL	CLAMPS FOR 10.98 MM DIA G WIRE ON LATTICE STRUCTURE	Nos	50
23	GWP	CLAMP FOR CONNECTING 10.98 MM G WIRE TO 75-12 MM EARTHING STRIP	Nos	4
24	GSL	CLAMPS FOR 75-12 MM EARTHING STRIP ON LATTICE/PIPE STRUCTURE	Nos	600
25	ASL	AL SLEEVE TO SUIT 4" standard IPS AL Tube	Nos	28
26	T47	TIE CONNECTORS (C-Wedge Type) FOR QUAD MOOSE THROUGH, QUAD MOOSE TIE OFF (400KV)	Set	6
27	T48	TIE CONNECTORS (C-Wedge Type) FOR TWIN HIGH AMPACITY ALUMINIUM CONDUCTOR THROUGH, TWIN HIGH AMPACITY ALUMINIUM CONDUCTOR TIE OFF (400KV)	Set	3
28	T49	TIE CONNECTORS (C-Wedge Type) FOR TWIN MOOSE THROUGH, TWIN MOOSE TIE OFF (400KV)	Set	12
29	PG4	PG CLAMP SUITABLE (C-Wedge Type) FOR PARALLEL CLAMPING OF TWIN MOOSE TO TWIN MOOSE (400KV)	Set	6
30	F41	400KV DOUBLE TENSION POLYMER LONGROD INSULATOR WITH TURN BUCKLE SUITABLE FOR QUAD MOOSE/ACSR (THROUGH TYPE) (CREEPAGE 31MM/KV)	Nos	6
31	F42	400KV DOUBLE TENSION POLYMER LONGROD INSULATOR W/O TURN BUCKLE SUITABLE FOR QUAD MOOSE/ACSR (THROUGH TYPE) (CREEPAGE 31MM/KV)	Nos	6
32	F43	400KV DOUBLE TENSION POLYMER LONGROD INSULATOR WITH TURN BUCKLE SUITABLE FOR TWIN HIGH AMPACITY ALUMINIUM CONDUCTOR (AL 59) (THROUGH TYPE) (CREEPAGE 31MM/KV)	Nos	3
33	F44	400KV DOUBLE TENSION POLYMER LONGROD INSULATOR W/O TURN BUCKLE SUITABLE FOR TWIN HIGH AMPACITY ALUMINIUM CONDUCTOR (AL 59) (THROUGH TYPE) (CREEPAGE 31MM/KV)	Nos	3
34	F45	400KV SUSPENSION POLYMER LONGROD INSULATOR WITH THROUGH CLAMP SUITABLE FOR TWIN HIGH AMPACITY ALUMINIUM CONDUCTOR (AL 59) (450MM SPACING) (CREEPAGE 31MM/KV)	Nos	3
35	F46	400KV DOUBLE TENSION POLYMER LONGROD INSULATOR WITH TURN BUCKLE SUITABLE FOR TWIN ACSR MOOSE (ON LINE SIDE) (THROUGH TYPE) (CREEPAGE 31MM/KV)	Nos	6
36	F47	400KV SUSPENSION POLYMER LONGROD INSULATOR WITH DROP CLAMP SUITABLE FOR TWIN ACSR MOOSE (CREEPAGE 31MM/KV) (ON LINE SIDE)	Nos	4



TENDER ENQUIRY NO. 838E033 DATE : 23 – APRIL – 2018 DUE DATE : 18 – MAY - 2018

SCHEDULE OF COMMERCIAL DEVIATION

The following are the deviations/ variations exception from the General Terms and Conditions:

SL. NO.	CLAUSE NO. OF GENERAL TERMS AND CONDITION	STATEMENT OF DEVIATION

- In case, this schedule is not submitted, it will be presumed that the equipment/ material to be supplied under this contract is deemed to be in compliance with the General Terms and Conditions.
- If there is NIL deviation, even then the format to be filled as **NIL DEVIATION**.

Note: Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this scheduled.

Place: -

Date: -

Signature of the authorized representative of

Bidder's name:.....

Designation.....

Company Seal:.....

SCHEDULE OF TECHNICAL DEVIATION

The following are the deviations/ variations exception from the Specification:

SECTION	CLAUSE NO. / PAGE NO.	STATEMENT OF DEVIATION/ VARIATIONS/EXCEPTIONS

- In case, this schedule is not submitted, it will be presumed that the equipment/ material to be supplied under this contract is deemed to be in compliance with the General Terms and Conditions.
- If there is NIL deviation, even then the format to be filled as **NIL DEVIATION**.

Note: Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this scheduled.

Signature of the authorized representative of

Place: -

Bidder's Name:.....

Date: -

Designation:.....

Company Seal:.....

ACTIVITY SCHEDULE**(To be filled – up by the supplier)**

NOTE: This format is to be submitted in original only, duly filled in. Reproduction of this format on bidder's letter head or on other paper is not acceptable.

SL. NO.	ACTIVITY		ACTIVITY TIME IN WEEKS	CUMULATIVE TIME IN WEEKS FROM LOI/PO DATE	REMARKS IF ANY
1.	Submission of P.O Acceptance	Max 1 week			
2.	Submission of documents necessary for getting manufacturing clearance like Drawings, date sheet etc.				
3.	Review and Approval of documents and issue of manufacturing clearance	‘BY BHEL’			
4.	Manufacturing Time				
5.	Inspection	‘BY BHEL’			
6.	Issue of MICC and other documents like Road Permits etc.	‘BY BHEL’			
7.	Dispatch				

- Note :
- 1) For Sl. No. 4) Inspection call for entire lot to be issued 2 weeks in advance. Date given in call for inspection should be within the period indicated in “A” for completion of activity at Sl. No. 5.
 - 2) Supplier must ensure the completeness and correctness of the requisite documents before submission for approval. Delay in approval on account of incomplete / inadequate information shall be the responsibility of supplier.
 - 3) Inspection call should be given in the prescribed format only. Inspection calls not in the prescribed format shall not be entertained.
 - 4) Qty to be offered for inspection should be in accordance within Delivery-schedule – lot. BHEL reserves the right not to entertain multiple inspection calls for a Delivery – lot and delay on this account shall be the responsibility of Supplier.
 - 5) Delivery is required by JUNE 2015. However, Bidders to quote their best Delivery Plan in this schedule.

Signature & Seal of

Supplier

Date:

Certificate by Chartered Accountant on letter head

This is to Certify that M/S
(hereinafter referred to as 'company') having its registered office at
is registered under MSMED Act 2006, (Entrepreneur
Memorandum No (Part-II) dtd:.....,
Category: (Micro/Small)). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as on
date..... as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost
excluding land and building and the items specified by the Ministry of Small Scale Industries vide its
notification No.S.O.1722(E) dated October 5, 2006 :
Rs.....Lacs
2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and
furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED
Act, 2006:
Rs.....Lacs

The above investment of Rs.....Lacs is within permissible limit of
Rs.....Lacs forMicro / Small (~~Strike off which is not applicable~~)
Category under MSMED Act 2006.

Date:

(Signature)

Name -

Membership number -

Seal of Chartered Accountant

ANNEXURE TO GTC OF ENQUIRY NO. 838E033 DATED 23 – APRIL - 2018
DUE ON 18 – MAY - 2018

REVERSE AUCTION GUIDELINES

“BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit ‘Process compliance form’ (to the designated service provider) as well as ‘Online sealed bid’ in the Reverse Auction. Non-submission of ‘Process compliance form’ or ‘Online sealed bid’ by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

*The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. **The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.***

If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).”

As a reminder to the bidders, system will flash following message (in RED Color) during the course of ‘online sealed bid’ :

“Bidders to submit online sealed bid less than or equal to their envelope sealed bid already submitted to BHEL”

PRICE BID

Enquiry No 838E033 Dated 23 - APRIL -2018
(BIDDERS TO STRICTLY ENSURE SUBMITTING THE PRICE BIDS IN THIS FORMAT)

Due on 18 - MAY - 2018

PGCIL BANASKANTHA SANKHARI

S.No.	Description of item.	CHHEGAON	UNIT PRICE EX. WORKS (Rs. / No.)	TOTAL EX. WORKS (Rs.)	UNIT FREIGHT & INSURANCE UP TO SITE (Rs. / Nos.)	TOTAL FREIGHT & INSURANCE UP TO SITE (Rs.)	EXCISE DUTY (Rs.)	CST/VAT/ST @.....% OF COL 6 (Rs.) AGAINST FORM "C"	F.O.R. DESTINATION PRICE (Rs.) COL (6 + 8 + 9)
		Qty. (Nos)							
1	2	3	4	5 = 3 * 4	6	7 = 6 * 3	8	9	10
1	Sag Compensating Spring suitable for mounting with existing double tension string hardware of quad moose conductor.	12							
2	Sag Compensating Spring suitable for mounting with existing double tension string hardware of twin high ampacity conductor.	6							

NOTE:

- PLEASE NOTE THAT UNPRICED COPY OF PRICE BID (i.e. WITH ALL PRICES BLANKED) SHALL BE FURNISHED ALONG WITH TECHNO-COMMERCIAL BID.
- REQUIRED COPIES OF FORMAT BE MADE & DETAILS MAY BE ANNEXED.
- THE PRICES MUST BE QUOTED IN THE PRESCRIBED UNIT ONLY.
- SALES TAX RATE AS APPLICABLE FOR SPECIFIED DESTINATION SHALL BE QUOTED. IN CASE OF CST, RATE AGAINST "C" FORM SHALL BE QUOTED.
- IN CASE OF VARIED ED SLAB RATES, CONFIRM YOUR OPTION FOR "X" OR "Y". (STRIKE OFF WHICH IS NOT APPLICABLE)
IF NO OPTION IS MENTIONED "X" SHALL BE TAKEN.

- THE VENDORS MUST INDICATE THE APPLICABLE TARIFF NOS. UNDER WHICH ED AND / OR CST WOULD BE PAID BY THEM TO THE TAX AUTHORITIES.
- IF A VENDOR SUBMITS AN OFFER WITH REDUCED ED AND OR CST APPLICABLE THAN NORMALLY PAID ON SUCH ITEMS, THEY SHOULD SUBMIT NECESSARY DOCUMENTARY PROOF FOR THE SAME.

"X" THE MAXIMUM ED SLAB RATE BE CONSIDERED FOR PRICE COMPARISON.
IN THE EVENT OF ORDER ED AT ACTUAL BE PAID.

"Y" THE QUOTED ED RATE BE CONSIDERED FOR PRICE COMPARISON.
IN THE EVENT OF ORDER ED AT ACTUAL RATE LIMITED TO QUOTED RATE BE PAID.
SIGNATURE & SEAL OF TENDERER

UNPRICED BID**Enquiry No 838E033 Dated 23 - APRIL -2018****Due on 18 - MAY - 2018****(BIDDERS TO STRICTLY ENSURE SUBMITTING THE PRICE BIDS IN THIS FORMAT)****PGCIL BANASKANTHA SANKHARI**

S.No.	Description of item.	CHHEGAON	UNIT PRICE EX. WORKS (Rs. / No.)	TOTAL EX. WORKS (Rs.)	UNIT FREIGHT & INSURANCE UP TO SITE (Rs. / Nos.)	TOTAL FREIGHT & INSURANCE UP TO SITE (Rs.)	EXCISE DUTY (Rs.)	CST/VAT/ST @.....% OF COL 6 (Rs.) AGAINST FORM "C"	F.O.R. DESTINATION PRICE (Rs.) COL (6 + 8 + 9)
1	2	Qty. (Nos)	4	5 = 3 * 4	6	7 = 6 * 3	8	9	10
1	Sag Compensating Spring suitable for mounting with existing double tension string hardware of quad moose conductor.	12							
2	Sag Compensating Spring suitable for mounting with existing double tension string hardware of twin high ampacity conductor.	6							

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SIGNATURE & SEAL OF TENDERER