# Enquiry

Bharat Heavy Electricals Limited
Transmission Business Group
Materials Management

## Project : NTPC NORTH KARANPURA

| Enquiry No | Enquiry Dt | Rev No | Rev Dt | PI No | Enquiry Type | Inspection by | Due Dt | Commercial Comments | Technical Comments | Signing Authority |
|---|---|---|---|---|---|---|---|---|---|---|
| 365E281 | 08-Jan-16 | 0 | | 342250282 | Package | | 05-Feb-16 | as per tender documents | as per tender documents & further clarifications | |

### Document Enclosed

- Technical Specifications
- Terms & Conditions for Indigenous Enquiry
- Activity Schedule
- Schedule of Information (checklist) to be furnished
- Schedule of Commercial Deviation
- Schedule of Technical Deviation

| SN | Equipment | Phy Unit | Qty | Unit Exworks | % CST | % VAT | Unit F&I | Plan Dt | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SHIELD WIRE 7/9 SWG | KM | 5.2 | | | | | | 1. SECTION-3 OF NORTH KARANPURA IS ENCLOSED. |

---

You are requested to submit your most competitive offer so as to reach us positively by the tender opening date & time. THE TENDERS NOT RECEIVED WITHIN SCHEDULED DATE AND TIME ARE LIKELY TO BE IGNORED. BHEL shall not be responsible for any postal delay.

**IN YOUR OWN INTEREST YOU ARE ADVISED TO CAREFULLY READ "THE INSTRUCTIONS TO BIDDERS". INCOMPLETE BIDS AND/OR BIDS NOT COMPLYING WITH TENDER CONDITIONS SHALL BE TREATED AS NON RESPONSIVE AND ARE LIKELY TO BE IGNORED.**

**In case Tender Documents are not received within 7 days of this E-mail message, intimate BHEL accordingly. If no intimation is received, it will be considered that you have received tender enquiry and delay in submission offer due to late receipt of tender documents will not be entertained.**

**YOU ARE REQUESTED TO SUBMIT YOUR MOST COMPETITIVE OFFER SO AS TO REACH US POSITIVELY BY 2 PM ON THE TENDER OPENING DATE AND TENDER WILL BE OPENED AT 2:30 PM WITH EFFECT FROM 15-SEP-09.**

**BHEL RESERVES THE RIGHT TO OPT FOR REVERSE AUCTION FOR OBTAINING BEST PRICES.**

**OFFERS THROUGH E-MAIL / FAX:**

**WHOSOEVER DESIRES TO SEND OFFERS ON THEIR OWN RISK (COMPLETE IN ALL RESPECTS) VIA E-MAIL or FAX HAVE TO SEND THE OFFERS TO THE COMMON E-MAIL ADDRESS tenderbox@bhel.in or 0120-6748581 FAX .**

**THE RECEIVED EMAIL OFFERS WILL BE PRINTED BY PURCHASE COORDINATOR AND PUT THEM INTO COVERS AS PER CONVENTIONAL METHOD FOR TENDER OPENING I.E., TECHNO COMMERCIAL & PRICE OFFER SHALL BE PUT INTO TWO SEPARATE COVERS AND BOTH THE COVERS ARE KEPT IN THIRD COVER DULY SUPER SCRIBING ENQY. NO. AND DUE DATE.**

**OFFERS SENT TO ANY OTHER E-MAIL ID or FAX NO AND INCOMPLETE OFFERS SHALL NOT BE CONSIDERED FOR EVALUATION PURPOSE.**

It is suggested that the bidders are advised to send the files with 'password protection'. procedure for giving a password to a file has been given below:

**For saving Excel file with password**

Steps to be followed:

1. Click on the FILE option in XP system and Start sign in Vista system then go to SAVE AS option.
2. Select the location to save and Click on the TOOLS box and go to GENERAL OPTION.
3. It will ask for the password, type the password into open or modify box or both as required.
4. Then click on the OK button it will ask for reenter of the password.
5. After reentering the password click on the save box.

**For saving Word file with password**

Steps to be followed:

1. Click on the FILE option in XP and Start sign in Vista then go to SAVE AS option.
2. Select the location to save and Click on the TOOLS box and go to SECURITY OPTION in XP system and GENERAL OPTION in Vista system.
3. It will ask for the password, type the password into open or modify box or both as required.
4. Then click on the OK button it will ask for reenter of the password.
5. After reentering the password click on the save box.

The venders who has sent offers with password,the passwords are to be forwarded to another email id:supplierinfo@bhelindustry.com

**MSME STATUS**

**"THOSE INDUSTRIES WHO HAVE FILED A MEMORANDUM WITH THE CONCERNED AUTHORITIES AND REGISTERED AS MICRO & SMALL ENTERPRISE UNDER MICRO, SMALL AND MEDIUM ENTERPRISES DEVELOPMENT ACT 2006, HAVE TO SUBMIT A COPY OF SUCH REGISTRATION CERTIFICATE / MEMORANDUM TO BHEL FOR NECESSARY COMPLIANCES OF THE ABOVE ACT".**

Please acknowledge the receipt of tender enquiry and fax back this letter by ticking the appropriate item below.

for BHARAT HEAVY ELECTRICALS LTD

---

**We acknowledge the receipt of tender.**

(a) The offer against subject enquiry shall be submitted by the scheduled date and time.

(b) We regret to quote. The item in reference is out of our manufacturing range.

(c) We regret because of our prior commitments.

(d) Any other reason.

To
Dibyendu Ghosh
Sr Manager
BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP
TOWER-A,5th Floor,
Advant Navis IT Business Park,
Plot No-7,Sector-142,Expressway Noida
Noida-201305
Distt. Gautam BudhNagar,U.P

Ph: 0120-6748458
Fax: 0120-6748581

**Signature and Seal of Tenderer**

**Enquiry No :** 365E281 **Enquiry Dt :** 08-Jan-16

BHEL/TBG/GTC/02-07

**(TRANSMISSION BUSINESS GROUP)**
**BHARAT HEAVY ELECTRICALS LTD.**
**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 | Terms & Conditions (GTC) |
|---|---|
| **1.** | 1. 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 may be rejected.<br><br>2. Bidder must ensure that their quotation is received / dropped in the tender box on or before ~~10.00 AM~~ of the due date of opening in<br>**Material Management Division,**<br>**5th Floor, Plot No 7 , Tower A , Advant Navis IT Business Building ,**<br>**Sector 142 ,Noida-Greater Noida Expressway,**<br>**Noida-201305(U.P.)**<br><br>3. The same shall be opened at ~~10.30 AM~~ 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.<br><br>4. Bids are to be submitted in Two parts:<br>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.<br><br>ii) 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 will prevail over figure.<br><br>Both Part I and Part II bids are to be sealed in separate envelope and both envelops to be kept in another common envelope. Each envelope should be sealed and super scribed with enquiry no., item / package name, project name and due date of opening.<br><br>5. For any Technical clarification, please contact<br>Mr. Vikram Singh Meena, Engineer (TBEM)/ Mr. Dipak Kumar Mandal, DGM(TBEM)<br>5th Floor, Plot No 7 , Tower A ,<br>Advant Navis IT Business Building ,<br>Sector 142 ,Noida-Greater Noida Expressway,<br>Noida-201305 , Phone No: 0120-6748541/134<br><br>e-mail : vsmeena@bhel.in/dipak.mandal@bhel.in<br><br>For any commercial clarification please contact person issuing enquiry. |

| | |
|---|---|
| | 6. Price bid should not contain any information / description / terms & condition other than given in Part-I of the bid except prices, otherwise bid is liable for rejection.<br><br>**7. 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. With-drawl of quotation by the bidder, at any stage after its opening, may entail blacklisting of vendor.**<br><br>**8. Enquiry condition for where the scope against this tender includes Installation and Commissioning of the equipment / material**<br>There will be separate contract awarded for Supply portion and Site execution portion. For Supply portion General Terms and Conditions mentioned here shall be applicable for Site execution portion, Terms and conditions for Installation services shall be applicable. However, any breach in either of the contract shall be deemed as the breach of other contract also. |
| **2.** | **PRICES:**<br><br>**<RELEVANT OPTION TO BE SELECTED BEFORE ISSUE OF ENQUIRY>**<br><br>**A.1.** Unless specifically indicated, all prices shall be **FIRM.** No enhancement of rate for whatever cause unless and until asked by BHEL will be allowed.<br><br>**A.2. PVC (if indicated)**<br>The prices to be quoted are with **PVC** with following formula.<br><br><*Formula*><br><br>The base indices in the formula shall be of first notification of ---------- of the --------- month.<br>The date of delivery shall be PO delivery date or date of actual despatch, whichever is earlier.<br><br>**B** The prices shall be quoted by the vendors considering following.<br><br>**B.1.** Unless specifically indicated, the prices shall be on **Domestic basis.**<br><br>**B.2. Deemed export (if indicated)**<br>i) Prices are to be quoted considering following benefits:<br>1. ----------<br>2. ----------<br>3. ----------<br><br>ii) For availing above benefits, BHEL shall provide following documents.<br>1. ----------<br>2. ----------<br><br>iii) In case of import benefit in deemed export projects, bidder to indicate import content (CIF value) in the price bid. |
| | **B.3. Physical export (if indicated)**<br>i) Prices are to be quoted considering following benefits<br>1. ----------<br>2. ---------- |
| | ii) For availing above benefits BHEL shall provide following documents<br>1. |

| | |
|---|---|
| | 2.<br><br>**C**. The prices are to be quoted on FOR (Destination) basis. The break-up of price shall be as under:-<br><br>**a) Ex-works Price:** Ex- works price including packing & forwarding charges.<br><br>**b) Excise duty:** ED as applicable is to be quoted as percentage in both un-price and price bid.<br><br>**c) Sales Tax:** ST / VAT /CST (against C-form) to be quoted as percentage in un-price and price bid. In case of interstate sale-in-transit supplier have to provide E1/E2 form.<br><br>**e) Entry tax / Octroi Charges:** Any Entry tax / Octroi applicable at destination / destination state shall be paid extra on proof of such payment.<br><br>**f) Freight & Insurance:** Freight and Transit Insurance for door delivery up to destination/store is to be quoted.<br><br>**g) 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.<br><br>**h) Erection / Commissioning supervision charges:** If asked in the technical specification, to be quoted separately along with taxes and duties applicable on them.<br><br>Note: The purchase order shall be placed on Ex-works basis. |
| **3.** | **TERMS OF PAYMENT :**<br><br>**<RELEVANT OPTION TO BE SELECTED BEFORE ISSUE OF ENQUIRY>**<br><br><u>For BOIs (non package items)</u><br><br>100% payment along with taxes, duties, Freight & Insurance within 60 days from the date of receipt of invoice. The invoice must contain following documents in 3 sets (Original + 2 copies).<br>- ~~Receipted~~ LR (refer Annexure to GTC)<br>- Excise invoice (where ED re-imbursement is required)<br>- Delivery Challan / Packing list (casewise)<br>- Transit insurance certificate from under writers or Copy of Intimation of Transit Insurance duly endorsed by under writers,<br>- Despatch Clearance given by BHEL,<br>- Guarantee certificate,<br>- All Test reports and inspection reports,<br>- ~~Performance Bank Guarantee copy.~~<br><br><u>For BOPs : Air-Conditioning & Ventilation, Fire Protection, Illumination, Oil handling system where ETC is in scope of bidder</u><br>a. 90% of Ex-works value alongwith 100% taxes, duties, Freight & Insurance within 60 days from the date of receipt of invoice. The invoice must contain following documents in 3 sets (Original + 2 copies)<br>- Receipted LR / RR<br>- Excise invoice (where ED re-imbursement is required)<br>- Delivery Challan / Packing list (casewise) |

| | |
|---|---|
| | - Transit insurance certificate from under writers or Copy of Intimation of Transit Insurance duly endorsed by under writers,<br>- Despatch Clearance given by BHEL,<br>- Guarantee certificate,<br>- All Test reports and inspection reports,<br>- Performance Bank Guarantee copy.<br><br>b. 5% of Ex-works value on completion of supplies as per billing breakup.<br><br>c. 5% of Ex-works value on successful completion of Erection, Testing, Commissioning (To be certified by BHEL site) and final documentation (Against proof of submission to Engineering)<br><br>Note: When ETC is not in scope last 5% as per (c) above shall be paid alongwith (b).<br><br><u>Terms of payment for Type test charges:</u><br>100% payment with taxes and duties on acceptance of test reports by BHEL on certification by BHEL engineering within 60 days from the date of receipt of clear invoice.<br><br><u>Terms of payment for Supervision charges:</u><br>100% payment against completion with taxes and duties on certification by BHEL site within 60 days from the date of receipt of clear invoice. |
| **4.** | **INTEREST LIABILITY**<br>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 delivery or 12 months from the date of commissioning, which ever is earlier. The defective material / component shall be replaced free of cost at site.<br><br>**<FOLLOWING TO BE DELETED IN ALL ENQUIRY OTHER THAN ILLUMINATION PACKAGE>**<br><br>However for Illumination system after commissioning Lamps, Tubes, Ballast, Starters, Capacitors, Fuses will not be covered in Guarantee. |
| **6.** | **PERFORMANCE BANK GUARANTEE : NOT APPLICABLE**<br><br>**<PBG CLAUSE TO BE REMOVED BEFORE ISSUE OF ENQUIRY FOR ITEMS FOR WHICH PBG IS NOT REQUIRED>** |
| | ~~Bidder shall furnish along with first invoice Performance BG / deposit as per one of following 3 options.~~<br><br>~~Option A~~<br>~~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.~~<br><br>~~Option B~~<br>~~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.~~<br><br>~~Option C~~<br>~~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.~~<br><br>Note : For Shield wire, Earthing material, Cable gland, Cable Trench material, GI/PVC pipe, Hardwares, Al tube, MS Rod, Lable & phase colour disc, HG Fuse, Ferrule, Lug, Marker, Stationary, Office eqpt. and any petty / sundry purchase no Performance bank guarantee is required.<br><br>~~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 Nationalised Bank. The original BG should be sent by issuing Bank directly to AGM(Finance), TBG, BHEL.~~ |
| **7.** | **FINAL ENGINEERING DOCUMENTATION:**<br>Final documentation as called in the specification is to be submitted within 3 months from the date of despatch of material. In case of default, the Performance BG is liable to be en-cashed. |
| **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.<br><br>Supplier shall send inspection call on prescribed format (web site) only, with an advance notice of 15 days. |
| **9.** | **DESPATCH DOCUMENTS :** |
| | Following despatch documents are to be immediately sent to purchaser on despatch.<br>- Copy of LR<br>- Copy of delivery challan / packing list<br>- Insurance certificate<br>- Guarantee certificate |
| **10.** | **DELIVERY PERIOD:** |
| | Bidder to specify delivery period in weeks from the date of LOI / PO.<br><br>Time for conduction of type test, if required, is to be separately indicated.<br><br>Note:<br>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 order Value per week or part there-of subject to maximum of 10% of total order value of P.O. will be withheld. |
| **12.** | **VALIDITY :** |
| | The offer shall be valid for 120 days from the due date of opening. |
| **13.** | **ACCEPTANCE / REJECTION OF TENDER :**<br>BHEL reserves the right to reject in full or part, any or all tender without assigning any reason thereof.<br><br>BHEL also reserves right to vary the quantities mentioned in the tender. |
| **14.** | **EVALUATION :**<br>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 :**<br>The bids having deviation(s) w.r.to tender are liable for rejection. However, BHEL, at its |

| | |
|---|---|
| | discretion, may load the prices for evaluation of offer with prior intimation to bidder. |
| **16.** | **ARBITRATION :** |
| | All cases of disputes emanating from and relating to this contract, the matter 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 contract act 1996'~~ and the rules there under 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 venue of arbitration shall be any Indian city as decided by BHEL. |
| **17.** | **LEGAL SETTLEMENT :** |
| | All suits/claims in respect of this contract shall be in the courts having jurisdiction at New Delhi |
| **18.** | **SUBCONTRACTING :**<br>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 (i.e. cost to BHEL) of the successful bidder. |
| **20.** | **ADJUSTMENT OF RECOVERY:**<br>Any amount payable by the supplier under any of the condition of this contract shall be liable to be adjusted against any amount payable to the supplier 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:**<br>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.** | Suspension of business dealings with suppliers/ contractors:-<br>'Guidelines for suspension of business dealings with suppliers/ contractors' are available on BHEL website www.bhel.com on "supplier registration page" |
| **23.** | Non-conformities / errors / discrepancies in quoted prices in price bids shall be dealt as follows :-<br>a) If, in the price structure quoted for the required goods / services / works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of BHEL there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.<br>b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected.<br>c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.<br><br>If there is such discrepancy in an offer as mentioned in (a), (b) & (c) above, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the BHEL, the bid is liable to be ignored. |

## Following clauses of General Terms and Conditions (BHEL/TBG/GTC/02-07) are to be read as follows:

**Clause 1:**

2. Bid submission time: upto 02:00 PM of the due date of opening.
3. Bid opening time: 02:00 PM on the same day.

**Clause 2: PRICES**

A.1.: **Applicable**
A.2.: Not applicable
B.1.: Not Applicable
**B.2.** Applicable
i) Prices are to be quoted considering following benefits:

1. Excise Duty – Exempted

ii) For availing above benefits, BHEL shall provide following documents:

1. Exempted against Project Authority Certificate issued by NTPC and Mega Power Status certificate issued by GOI.

Note: *Vendor shall be solely responsible for obtaining deemed export benefits from the concerned authorities and in case of failure to receive such benefits, BHEL will not compensate them in any manner, whatsoever.*

B.3. Not applicable

**Clause 3: TERMS OF PAYMENT**

Terms for BOP is not applicable
Terms for **BOI is applicable**

Documents for payment-
Original Endorsed LR and Material Receipt Certificate instead of Receipted LR
Dispatch clearance by BHEL means BHEL MICC

### Clause 11: Delayed Delivery

a) In case of delay in execution of order beyond the lot wise contractual delivery, an amount of ½ % of total order Value per week or part there-of subject to maximum of 10% of total order value of P.O. will be withheld.

**Clause 16: ARBITRATION**

The Arbitration shall be under "The Arbitration and Conciliation Act 1996". Place of Arbitration shall be New Delhi.
**All remaining terms which are not mentioned here shall remain unchanged as per General Terms and Conditions (BHEL/TBG/GTC/02-07).**

---

**Note:**

1. In case VAT is applicable, then Vendor has to give VAT invoice (irrespective of VAT benefit available or not).
2. **Delivery requirement:**.31.03.2016. However, vendor has to quote their best possible delivery plan in activity schedule.
3. **LOADING CRITERIA:**

   Permissible commercial deviation & Loading Criteria:

**TERMS OF PAYMENT:**

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 Clause. No. 3 of Terms & Conditions for Indigenous Tender Enquiry, 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. **Loading shall be done on total cost to BHEL.**

**b)** 60 days - No loading

Note- In case, techno commercial bid opening date gets extended due to any reason, then extended bid opening date will be considered for base rate of SBI.

**DELAYED DELIVERY:**

Loading on this clause shall be to the extent to which it is not agreed by the bidder.

Permissible Technical Deviations: No permissible Technical Deviation envisaged.

**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.

**REVERSE AUCTION:**

BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. All bidders to give their acceptance 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.
In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to

Participate in Reverse Auction will have to necessarily submit „online sealed bid in the Reverse Auction. Non-submission of „online sealed bid by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

If RA is done, then it will start around 12:00 Noon (IST).

**Pls refer Annexure-1 for Terms & Conditions of Reverse Auction.**

**OFFER EVALUATION:**

Evaluation will be done on total package cost to BHEL.

**PRE-QUALIFYING REQUIREMENTS:**

**"Pre-Qualifying Requirement**" are as follows:

01) Material required from manufacturer only.
02) Vendor must have supplied the shield wire for substation/switchyard/power transmission projects in last five years.

## SCHEDULE OF PRICE (INDIAN VENDOR)

(BIDDERS TO STRICTLY ENSURE SUBMITTING THE PRICE BIDS IN THIS FORMAT)

**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.**

Project: NTPC North Karanpura

Enquiry No : 365E281 dated 08/01/2016 due on 05/02/2016

| Sr. No. | Equipment | PHY UNIT | Total Qty | Unit Exworks | Total Exworks | .....%ED | Unit F&I | Total F&I | .....% CST/VAT | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SHIELD WIRE 7/9 SWG as per Technical Specification No. TB-xxx-316-021 & TB-316-369-xxx REV.00 | KM | 5.2 | | | Exempted | | | | |

Note 1: Kindly mention the rate of all applicable taxes and duties (ED & CST/VAT) in both price and un-priced bid.

Note 2: Kindly refer technical specification for details.

Note 3: F&I Charges quoted by bidders shall be inclusive of taxes and duties (if applicable).

Tenderer

**Enquiry No : 365E281 dated 08/01/2016 due on 05/02/2016**



## ACTIVITY SCHEDULE

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

| SL. NO. | ACTIVITY | | ACTIVITY TIME IN WEEKS | CUMULATIVE TIME IN WEEKS FROM LOI/PO DATE | REMARKS IF ANY |
|---|---|---|---|---|---|
| 1. | Receipt of P.O | | | | |
| 2. | Submission of P.O Acceptance | Max 1 week (7 days) | | | |
| 3. | Submission of documents necessary for getting manufacturing clearance like Drawings, date sheet etc. | | | | |
| 4. | Review and Approval of documents and issue of manufacturing clearance | **'BY BHEL (3 weeks)"** | | | |
| 5. | Manufacturing Time | A | | | |
| 6. | Inspection | **'BY BHEL (2 weeks)"** | | | |
| 7. | Issue of MICC and other documents like Road Permits etc. | **'BY BHEL (1 week)"** | | | |
| 8. | Dispatch | | | | |
| 9. | Transit time upto Site. | | | | |

Note : 1) For item at Sl. No. 4) Vendor to reply to all queries within 3 days.

2) For Sl. No. 5) 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. 6.

3) 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.

4) Inspection call should be given in the prescribed format only. Inspection calls not in the prescribed format shall not be entertained.

5) 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.

Signature & Seal of Supplier

Date:

# SCHEDULE OF COMMERCIAL DEVIATION

**Enquiry No : 365E281 dated 08/01/2016 due on 05/02/2016**

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

| SL.NO. | CLAUSE NO. OF GENERAL TERMS AND CONDITIONS | 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 : 1.** Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

**2 Deviation mentioned in this schedule shall only be considered.**

**This Format is to be submitted in original duly signed by bidder. Reproduction of the same in any sort is not acceptable.**

Signature of the authorised representative of

Place: ……

Date : …….

Bidder's name :……

Designation:……..

Company Seal:……

# SCHEDULE OF TECHNICAL DEVIATION

**Enquiry No : 365E281 dated 08/01/2016 due on 05/02/2016**

**The following are the devitions/ variations exception from the Technical Specifications:**

| SL.NO. | CLAUSE NO. OF GENERAL TERMS AND CONDITIONS | STATEMENT OF DEVIATION |
|---|---|---|
| 1 | | |
| | | |

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 Technical Specifications,

If there is NIL deviation,even then the format to be filled as NIL DEVIATION.

**Note : 1.** Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

**2** Devition mentioned in this schedule shall only be considered.

**This Format is to be submitted in original duly signed by bidder. Reproduction of the same in any sort is not acceptable.**

Signature of the authorised representative of

Place: ……

Date : …….

Bidder's name :……

Designation:……..

Company Seal:……

BHEL/TBG/SO1/01

## CHECKLIST

## SCHEDULE OF INFORMATION TO BE FURNISHED WITH THE OFFER

**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.**

Put a tick mark on "YES" if the information is enclosed with the offer or put a tick mark on "NO" if the information is not enclosed or write "NOT APPLICABLE" if the information is not applicable.

| | | |
|---|---|---|
| 1. | Technical offer with detailed schedule of equipment / material and spares enclosed. | YES / NO |
| 2. | Guaranteed Technical Particulars as per Section – 4 enclosed. | YES / NO |
| 3. | Schedule of deviation, if any, clause wise with respect to Technical Specification enclosed. | YES / NO |
| 4. | Standard Manufacturing Quality Plan enclosed. | YES / NO |
| 5. | GA Drawings with dimensions and weights & foundation / fixing details enclosed. | YES / NO |
| 6. | Drawing and Data submission schedule enclosed. | YES / NO |
| 7. | Type Test Reports enclosed. | YES / NO |
| 8. | Bar Chart showing the schedule indicating time required for design, manufacture, test and inspection, transport, erection, site testing and commissioning enclosed. | YES / NO |
| 9. | Makes of all components as per technical Specification enclosed. | YES / NO |

The above checklist is verified for:-

Offer Ref. :

Equipment :

Submitted by :

Project Reference. :

Signed with Seal ……..

Date ……..

## Terms & Conditions of Reverse Auction

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.

2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit 'online sealed bid' in the Reverse Auction. Non-submission of 'online sealed bid' by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.

4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.

5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.

6. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.

7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.

8. Reverse auction will be conducted on scheduled date & time.

9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.

10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.

11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.

12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the 'Business Rules of Reverse Auction', which will be communicated before the Reverse Auction.

13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.

14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.

15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

## 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 for .....Micro / Small **(Strike off which is not applicable)** Category under MSMED Act 2006.

Date:

(Signature)

Name -

Membership number -

Seal of Chartered Accountant

# BHARAT HEAVY ELECTRICALS LIMITED
## TRANSMISSION BUSINESSS GROUP
### MATERIAL RECEIPT CERTIFICATE

a) Site:
b) LR No. with date:
c) Vehicle no.:
d) Date of receipt of material at site:
e) Material details (as mentioned below):

| S.no. | Item Description | Type of Packages | Unit (MT/KM/ NO.) | Qty as per packing list | Qty Received | Remarks |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Other Remarks:

Signature with date: _____

Name & Designation: _____
(With Seal)

**Important Remarks:**

1. LR endorsement Format-
"LR no./ Date: _____ Endorsed in favour of (Customer Name) and the transporter is instructed to deliver the goods to (Site name)".

For Example-
LR no./ Date: 22126/ dt. 30/04/15
Endorsed in favour of TANTRANSCO and the transporter is instructed to deliver the goods to TANTRANSCO, Anikadavu substation.

(sign and stamp with name & designation)

2. LR will only be endorsed as per the given Format and strictly not be receipted.

3. Material receiving will only be given through the MRC (Format attached).

## SECTION II

## STANDARD SPECIFICATION

### 2.0 GENERAL

This section covers the standard technical specification for GI Shield Wire.

**TECHNICAL REQUIREMENTS:**

| Sl.No | Parameter | 7/8 SWG | 7/9 SWG |
|---|---|---|---|
| 1 | Stranding and wire diameter | 7/4.0 mm steel | 7/3.66 mm steel |
| 2 | Strand Arrangement | | |
| | Steel core | 1 | 1 |
| | Outer Steel Layer | 6 | 6 |
| 3 | Total sectional area | 90.62 mm2 | 73.65 mm2 |
| 4 | Overall diameter | 12.0 mm | 10.98 mm |
| 5 | Approximate weight | 687 kg/km | 583 kg/km |
| 6 | Calculated d.c. resistance at 200 | 2.09 ohms/km | 2.5 ohms/km |
| 7 | Minimum ultimate tensile strength | 77.7 kN | 68.4 kN |
| 8 | Direction of lay of outer layer | Right hand | Right hand |
| 9 | Standard Drum Length | 250/500/1000/2000/4000 meter | |
| 10 | Protective coating for storage | Boiled linseed oil to avoid wet storage stains. | |

### 2.1 EQUIPMENT SPECIFICATION

This section covers the general technical requirements of the Galvanised Steel Wire. In case of any discrepancies between the requirements mentioned in this section and those specified in other sections of this specification, this shall prevail after Section 1 and shall be treated as binding requirements.

### 2.2 APPLICABLE STANDARDS

The Galvanised Steel Wire shall strictly conform to the following Indian and International standards, as appropriate:

| | |
|---|---|
| IS: 521(1991) | Method for tensile testing of steel wire |
| ISO/R89-1959 | |
| IS: 1778-1980 | Reels and drums for bare conductors |
| IS: 2629(1990) | Recommended practice for hot dip galvanizing on iron and steel. |
| IS: 2633(1992) | Method for testing uniformity of coating of zinc-coated articles |
| IS: 4826(1992) | Hot dip galvanized coatings on round steel wires |
| ASTMA-475-72a | |
| IS: 6745 (1990) | Methods for determination of mass of Zinc coating on zinc- coated iron and steel articles |

IS: 209(1992) Zinc ingot
IS 398 (Parts-I to V): 1992 Aluminium conductors for Overhead transmission purposes

## 2.3 TECHNICAL REQUIREMENT AND CONSTRUCTIONAL DETAILS

**2.3.1** The galvanized steel stranded wire shall generally conform to the specification of ACSR core wire as mentioned in IS 398 (Part- II):1976 except where otherwise Specified herein.

## 2.4 WORKMANSHIP

**2.4.1** All steel strands shall be smooth, uniform and free from all imperfections, such as spills and splits, die marks, scratches, abrasions and kinks after drawing and also after stranding.

**2.4.2** The finished material shall have minimum brittleness as it will be subjected to appreciable vibration while in use.

**2.4.3** The steel strands shall be hot dip galvanized (and shall have a minimum zinc coating of 275 $g/m^2$) after stranding of the uncoated wire surface. The zinc coating shall be smooth, continuous, of uniform thickness, free from imperfections and shall withstand three and a half dips after stranding in standard Preece test. The steel wire rod shall be of such quality and purity that, when drawn to the size of the strands specified and coated with zinc, the finished strands shall be of uniform quality and have the same properties and characteristics in ASTM designation B498-74.

**2.4.4** The steel strands shall be preformed and post-formed in order to prevent spreading of strands while cutting of composite stranded wire. Care shall be taken to avoid damage to galvanization during pre-forming and post-forming operation.

**2.4.5** To avoid susceptibility towards wet storage stains (white rust), the finished material shall be provided with a protective coating of boiled linseed oil.

## 2.5 JOINTS IN WIRES

There shall be no joint of any kind in the finished steel wire strand entering into the manufacture of the stranded wire. There shall be no strand joints or strand splices in any length of the completed stranded wire.

## 2.6 TOLERANCE

The manufacturing tolerances to the extent of the following limits only shall be permitted in the diameter of the individual steel strands and lay length of the stranded wire:

| | Standard | Maximum | Minimum |
|---|---|---|---|
| Diameter | 3.66mm | 3.75mm | 3.57mm |
| Lay length | 181mm | 198mm | 165mm |

## 2.7 MATERIALS

### 2.7.1 Steel

The steel wire strands shall be drawn from high carbon steel rods and shall conform to the following requirements as to the chemical composition:

| Element | % Composition |
|---|---|
| Carbon | Not more than 0.55 |
| Manganese | 0.4 to 0.9 |
| Phosphorous | Not more than 0.04 |
| Sulphur | Not more than 0.04 |
| Silicon | 0.15 to 0.35 |

### 2.7.2 Zinc

The zinc used for galvanizing shall be electrolytic High Grade Zinc of 99.95% purity. It shall confirm to and satisfy all the requirements of IS: 209-1979

## 2.8 STANDARD LENGTH

**2.8.1** The stranded wire shall be supplied in standard drum lengths generally in the range of 250/500/1000/2000/4000 m. However, drum lengths where required to be supplied in lengths different from standard lengths specified above shall be provided.

## 2.9 TESTS

**2.9.1** The G.S. Wire should have been type tested as per IEC/IS and shall be subjected to routine and acceptance tests in accordance with applicable IS specifications/ ISO/ ASTMA recommendations. Type test reports of the tests conducted earlier (not more than five years earlier) on similar material shall be submitted. If the valid type test reports are not available with the bidder then the tests shall be conducted by the bidder free of cost.

**2.9.2** If the purchaser insists to carry out the type test(s) afresh, the same shall be conducted on chargeable basis, for that the bidder shall submit the test charges in the price bid.

### 2.9.3 TYPE TESTS

In accordance with the stipulation of the specification the following type tests shall be conducted on the stranded wire.

a) UTS test ) As per Clause 2.10.1
b) DC resistance test ) As per Clause 2.10.2

### 2.9.4 ACCEPTANCE TESTS

a) Visual check for joints, scratches etc. and length of stranded wire (As per Clause 2.10.3)
b) Dimensional check(As per Clause 2.10.5)
c) Galvanizing test (As per Clause 2.10.7)
d) Lay length check (As per Clause 2.10.6)

e) Torsion test (As per Clause 2.10.4)
f) Elongation test (As per Clause 2.10.4)
g) Wrap test
h) DC resistance test ( IS 398(Part-III))1976
i) Breaking load test ( IS 398(Part-III))1976
j) Chemical Analysis of steel ( IS 398(Part-III))1976)

### 2.9.5 ROUTINE TESTS

a) Check that there are no cuts, fins etc. on the strands.
b) Check for correctness of stranding.

### 2.9.6 TESTS DURING MANUFACTURE

a) Chemical analysis of zinc used for galvanizing (As per Clause 2.10.8)
b) Chemical analysis of steel (As per Clause 2.10.9)

### 2.9.7 SAMPLE BATCH FOR TYPE TESTING

The Contractor shall offer material for sample selection for type testing, only after getting quality assurance program approved by the Owner. The samples for type testing shall be manufactured strictly in accordance with the quality Assurance Program approved by the Owner.

## 2.10 TESTING PROCEDURE FOR STRANDED GALVANISED STEEL WIRE

### 2.10.1 UTS Test

Circles perpendicular to the axis of the stranded wire shall be marked at two places on a sample of stranded wire of minimum 5 m length suitably compressed with dead end clamps at either end. The load shall be increased at a steady rate up to 34 kN and held for one minute. The circles drawn shall not be distorted due to relative movement of strands. Thereafter, the load shall be increased at a steady rate of 68.4 kN and held for one minute. The stranded wire sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

### 2.10.2 D.C Resistance Test

On a stranded wire sample of minimum five metres length, two contact clamps shall be fixed with a pre-determined Bolt torque. The resistance shall be measured by a Kelvin double-bridge by placing the clamps initially zero meter and subsequently one meter apart. The test shall be repeated at least five times and the average value recorded. The value obtained shall be corrected to the value at $20^0$C shall conform to the requirements of this specification.

### 2.10.3 Visual Check for Joints, Scratches etc. and length of Stranded wire

Stranded wire drums shall be rewound in the presence of the inspector. The inspector shall visually check for scratches, joints, etc. and see that the stranded wire generally conforms to the requirements of this specification. The length of stranded wire wound on the drum shall be measured with the help of counter meter during rewinding.

**2.10.4 Torsion and Elongation Tests**

The test procedures shall be as per relevant clause of IS 398 (Part V). The minimum number of twists which a single steel strand shall withstand during torsion test shall be eighteen for a length equal to 100 times the standard diameter of the strand In case the test sample length is less or more than 100 times the standard diameter of the strand, the minimum number of twists will be proportionate to the length and if number comes in the fraction then it will be rounded off to next higher whole number. In elongation test, the elongation of the strand shall not be less than 64% for a gauge length of 200 mm.

**2.10.5 Dimensional Check**

The individual strands shall be dimensionally checked to ensure that they conform to the requirements of this specification.

**2.10.6 Lay Length Check**

The lay length shall be checked to ensure that they conform to the requirements of this specification.

**2.10.7 Galvanizing Test**

The test procedure shall be as specified in IS: 4826-1968. The material shall conform to the requirements of this specification.

**2.10.8 Chemical Analysis of Zinc used for Galvanizing**

Samples taken from the zinc ingots shall be chemically/spectrographically analyzed. The same shall be in conformity to the requirements stated in this specification.

**2.10.9 Chemical Analysis of Steel**

Samples taken from the steel ingots/coils/strands shall be chemically/ spectrographically analyzed. The same shall be in conformity to the requirements stated in this specification.

**2.11** Following drawings/ documents shall be submitted for approval/ information for each project:

i) Guaranteed and other technical particulars
ii) Drum Drawing
iii) Type, Acceptance, sample and routine test reports

**--xx--**

# SECTION- 3

## PROJECT DETAILS AND GENERAL SPECIFICATIONS

### 3.0 GENERAL

This section stipulates the General Technical Requirements under the Contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipment and services covered under other sections of tender documents and are not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall prevail.

### 3.1 PROJECT DETAILS

| | **Particular** | **Details** |
|---|---|---|
| **a)** | Customer | NTPC Ltd. |
| **b)** | Engineer/Consultant/ Inspector | NTPC Ltd. |
| **c)** | Project Title | North Karanpura Super Thermal Power Project (3x660 MW) : 400/220kV Switchyard at NKSTPP end & 220kV Sub-station at Mine end |
| **d)** | Project Location | Place: Near Tandwa town<br>District: Hazaribagh & Chatra<br>State: Jharkhand |
| **e)** | Latitude & Longitude | **400/220kV S/s at NKSTPP:**<br>North: 23°50' to 23°52' and East: 84°59' to 85°2'<br><br>**220kV S/s at Chatti Bariatu & Kerandari-A mine:**<br>North: 23°52'35" and East: 85°05'25" |
| **f)** | Nearest Railway Station | Khalari Railway Station Ranchi-Garhwa section of Eastern Railways |
| **g)** | Distance of project location from the Railway station | 40 Km (approx.) |
| **h)** | Nearest Major Town | Hazaribagh city |
| **i)** | Distance of the town from the project site | 50 Km. |
| **j)** | Nearest commercial airport | Ranchi |
| **k)** | Distance of airport from the project site | 150 Km |
| | **SITE CONDITIONS** (for design purposes) | |
| **a)** | Design ambient temperature | 50°C |
| **b)** | Maximum Relative humidity | 95 % |
| **c)** | Height above mean sea level | Less than 1000 meters |
| **d)** | Pollution Severity | Heavily polluted (With Coal dust & Fly ash) and Highly Corrosive environment. |
| **e)** | Criteria for Wind Resistant design of structures and equipment | Standard Applicable - IS 875 (Part 3) 1987 |
| **f)** | Basic Wind speed "Vb" at ten meters | 39 m/ sec |

| | | |
|---|---|---|
| | above the mean ground level. | |
| **g)** | Category of terrain | Cat –2 |
| **h)** | Risk Coefficient "K1" | 1.06 |

3.1.1 **SYSTEM PARAMETERS:**

| Sl.No. | Parameters | 400 kV | 220 kV |
|---|---|---|---|
| 1 | Highest system voltage | 420 kV rms | 245 kVrms |
| 2 | Lightning Impulse voltage | ±1425kVp | ± 1050kVp |
| 3 | Switching impulse voltage | ±1050kVp | - |
| 4 | Power frequency withstand for 1 min (rms) | 630 kV(rms) | 460 kV(rms) |
| 5 | Max. fault level (1 sec.) | 50 kA | 40kA |
| 6 | Minimum creepage distance | 10500 mm | 6125mm |

3.1.2 **AUXILIARY POWER:**

| Sl.No. | Nominal Connection Voltage | Variations in Voltage | Frequency | Phase | Neutral |
|---|---|---|---|---|---|
| 1 | 415V | ±10% | 50 (+3% -5%) | 3Phase , 4 Wire | Solidly Earthed |
| 2 | 240V | ±10% | 50 (+3% -5%) | 1 phase | Solidly Earthed |

Combined variation of voltage and frequency shall be + 10%. Design fault level of 415V system shall be restricted to 50kA rms for 1 second.

The operational limits for variation of DC voltage are (+) 10% to (-) 15%.

**3.1.3** The various minimum heights of the switchyard shall be as given below from plinth level:

| Voltage | Equipment /1st Level | 2nd Level | 3rd Level | Peak |
|---|---|---|---|---|
| 220kV | 6000mm | 12000mm | 17000mm | 8500mm |
| 400kV | 8000mm | 16000mm | 23000mm | 8500mm |

The minimum vertical distance from the bottom of the lowest porcelain part of the bushing, porcelain enclosures or support insulators to the bottom of the equipment structure, where it rests on the foundation pad shall be 2550mm.

The minimum height of intermediate gantry tower for 400kV wherever required shall be 25 m and the peak (s) shall be of 8.5 m.

**3.1.4** The minimum clearances for 400kV & 220 kV switchyards shall be as given below:

| | **400kV** | **220kV** |
|---|---|---|
| Phase to earth clearance | 3500 mm | 2100mm |
| Phase to phase clearance | 4000 mm | 2100mm |
| Section clearance | 6500 mm | 5000mm |

**3.2 INSTRUCTION TO BIDDERS:**

The bidders shall submit the technical requirements, data and information as per the technical data sheets, provided in Section-4.

The bidders shall furnish catalogues, engineering data, technical information, design documents, drawings etc fully in conformity with the technical specification.

It is recognized that the bidders may have standardized on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar

equipment based on the manufacturer's standard practice will also be considered provided such proposals meet the specified designs, standard and performance requirements and are acceptable to the Purchaser. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously. All deviations from the specification shall be clearly brought out in the respective schedule of deviations. Any discrepancy between the specification and the catalogues or the bid, if not clearly brought out in the schedule, will not be considered as valid deviation.

Except for lighting fixtures, wherever a material or article is specified or defined 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. For lighting fixtures, makes shall be as defined in Section-Lighting System.

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, though they may not have been specifically detailed in the Technical Specifications unless included in the list of exclusions. Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the switchyard unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost. All similar standard components/parts of similar standard equipment under supply shall be inter-changeable with one another.

The bidder shall supply type tested (including special tests as per tech. specification) equipment and materials. The test reports shall be furnished by the bidder along with equipment/ material drawings. In the event of any discrepancy in the test reports, (i.e., if any test report is not acceptable due to any design/ manufacturing changes or due to non-compliance with the Technical Specification and/ or applicable standard), the tests shall be carried out without any additional cost implication to the BHEL. BHEL reserves the right to get any or all type/tests conducted/repeated.

## 3.3 CODES AND STANDARDS

The supplier is required to follow local statutory regulations stipulated in the latest amended Electricity Supply Act 1948 and Indian Electricity Rules 1956 (latest), and other local rules and regulations.

The equipment to be furnished under this specification shall conform to latest issue with all amendments of standards and/ or codes specified under respective section heads. The standards mentioned in the specification are not mutually exclusive or complete in them, but intended to complement each other. The supplier shall also note that list of standards presented in this specification is not complete. Whenever necessary the list standards shall be considered in conjunction with specific IS/IEC. When the specified requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.

Other internationally accepted standards which ensure equivalent or better performance that specified in the standards referred under section shall also be acceptable.

In case governing standards for the equivalent for the equipment is different from IS/ IEC, the salient points of difference shall be clearly brought out in additional information schedule along with English language version of standard of relevant extract of the same. The equipment conforming to standards other than IS/ IEC shall be subject to Purchaser’s approval.

The full names of the codes and standards mentioned in abbreviations under various equipment heads are as follows:

| | |
|---|---|
| BS | British Standards |
| IEC/ CISPR | International Electro-technical Commission |

| | |
|---|---|
| IS | Bureau of Indian Standards |
| ISO | International Organization for Standards |
| NEMA | National Electric Manufacturers Association |

**3.4 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED**

The 400 kV system is being designed to limit the power frequency over voltage of 1.5 p.u. and the switching surge over voltage to 2.5 p.u. In 400 kV system the initial value of temporary over voltage could be 2.0 p.u. for 1-2 cycles. All the equipment/materials covered in this specification shall perform all its function satisfactorily without undue strain, restrike etc. under such over voltage conditions. All equipment shall also perform satisfactorily under various other electrical, electromechanical and meteorological conditions of the site of installation. All equipment shall be able to withstand all external and internal mechanical, thermal and electromechanical forces due to various factors like wind load, temperature variation, ice & snow, (not applicable for this project) short circuit etc for the equipment .

The equipment shall also comply with the following:

a) All equipments shall be suitable for hot line washing.
b) To facilitate erection of equipment, all items to be assembled at site shall be "match marked".
c) Piping, if any, between equipment control cabinet or operating mechanism to marshalling box of the equipment shall bear proper identification to facilitate the connection at site.
d) All equipment shall be supplied with necessary inter-pole cabling, and its cost shall be included in the cost of equipment.

**3.5 ENGINEERING DATA**

**3.5.1 Drawings**

All drawings submitted by the supplier including those submitted at the time of bid 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, the external connections, fixing arrangement required. The dimensions required for installation and interconnections with other equipment and materials, clearances and spaces required for installation and interconnections between various portions of equipment and any other information specifically requested in the specifications.

Each drawing submitted by the Contractor (including those of sub-vendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

After the approval of the drawings, further work by the Contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Purchaser, if so required.

The review of these data by the purchaser will cover only general conformance of the data to the specification and documents, interfaces with the equipment provided under specification, external connections and of the dimensions which might affect plan layout. This review by the purchaser may not indicate a thorough review of the dimensions, quantities and details of the equipment, material, 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.

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.

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 work performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the purchaser in writing.

### 3.5.2 Approval Procedure

The following procedure for submission and review/approval of the drawings, data,reports, information, etc. shall be followed by Contractor:

a. All data/information furnished by Vendor in the form of drawings, documents, Catalogues or in any other form for NTPC's information/interface and/or review and approval are referred by the general term "drawings".

b. The 'Master drawings list' indicating titles, Drawing Number, Date of submission and approval etc. shall be finalised mutually between Contractor and Employer before the award of contract. This list shall be updated if required at suitable interval during detailed engineering.

c. All drawings (including those of subvendor's) shall bear at the right hand bottom corner the 'title plate' with all relevant information duly filled in. The Contractor shall furnish this format to his subvendor along with his purchase order for subvendor's compliance.

d. Contractor shall submit all the drawings in five (5) copies for review of Employer. Employer shall forward their comments within four (4) weeks of receipt of drawings.

e. Upon review of each drawings, depending on the correctness and completeness of the drawings, the same will be categorised and approval accorded in one of the following categories:

| | |
|---|---|
| CATEGORY I | Approved |
| CATEGORY II | Approved subject to incorporation of comments/modification as noted. Resubmit revised drawing incorporating the comments |
| CATEGORY III | Not approved. Resubmit revised drawings for Approval after incorporating comments/modifications as noted |
| CATEGORY IV | For information and records |

f. Contractor shall resubmit the drawings approved under Category II, III within one (1) week of receipt of comments on the drawings, incorporating all comments. Every revision of the drawing shall bear a revision index wherein such revisions shall be highlighted in the form of description or marked up in the drawing identifying the same with relevant revision number enclosed in a triangle (e.g 1.2.3. etc.).

g. In case Contractor does not agree with any specific comment, he shall furnish the explanation for the same to Employer consideration. In all such cases Contractor shall necessarily enclose explanations along with the revised drawing (taking care of balance comments) to avoid any delay and/or duplication in review work.

h. It is the responsibility of the Contractor to get all the drawings approved in the Category I or IV (as the case may be) and complete engineering activities within the agreed schedule. Any delay

arising out of submission and modification of drawings shall not alter the contract completion schedule.

i. Contractor shall not make any changes in the portion of the drawing other than those commented. If changes are required to be made in the portions already approved, the Contractor shall resubmit the drawings identifying the changes (along with reasons for changes) for Employer's review and approval. **Drawings resubmitted shall show clearly the portions where the same are revised marking the relevant revision numbers and Employer shall review only such revised portion of documents.**

j. Approval of drawings will not in any way relieve the Contractor of his obligations of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if such equipment is later found to be defective.

**3.5.3 Erection Drawings.**

a. Contractor shall furnish erection drawings for the guidance or commencement of erection or the first shipment, whichever is earlier. These shall generally comprise of fabrication/assembly drawings, various component/part details drawing, assembly, clearance data requirements, etc. The drawings shall contain details of components/ equipment with identification number, match marks, bill of materials, assembly procedures etc.

b. For all major equipment apart from above details, assembly sequence and instructions with check-lists shall be furnished in the form of erection manuals.

**3.5.4 Instruction Manual**

a. The Contractor shall submit to the Employer preliminary instruction manuals for all the equipments for review. The final instructions manuals incorporating Employer's comments and complete in all respect shall be submitted at least sixty (60) days before the first shipment of the equipment. The instruction manuals shall contain full details and drawings of all the equipments, the transportation, storage, installation, testing, operation and maintenance procedures, etc. separately for each component/equipment along with log record format. These instruction manuals shall be submitted in five (5) copies for approval.

b. If after commissioning and initial operation of the plant, the instruction manuals require any modifications/additions/changes, the same shall being corporate and the updated final instruction manuals shall be submitted.

c. The operating and maintenance instructions together with drawings (other than shop drawings) of the equipment, as completed, shall have sufficient details to enable the Employer to maintain, dismantle, reassemble and adjust all parts of the equipment. They shall give a step by step procedure for all operations likely to be carried out during the life of the plant/equipment, including erection, testing, commissioning, operation, maintenance dismantling and repair. Each manual shall also include a complete set of approved drawings together with performance/rating curves of the equipment and test certificates, wherever applicable. The contract shall not be considered completed for purpose of taking over until such instructions and drawings have been supplied to the Employer.

d. A separate section of the manual shall be for each size/type of equipment and shall contain a detailed description of construction and operation, together will all relevant pamphlets.

e. The manuals shall include the following

a) List of spare parts along with their drawing and catalogues and procedure for ordering spares.

b) Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation.

f. Where applicable, fault location charts shall be included to facilitate finding the cause of mal-operation or break down.

g. A collection of the manufacturer's standard leaflets will not accepted to be taken as a compliance of this clause. The manual shall be specifically compiled for the concerned project.

**3.5.5 Final Submission of drawings and documents:**

The Contractor shall furnish the following after approval of all drawings /documents and test reports:

a. List of drawings bearing the Employer's and Contractor's drawing number.
b. Two (2) bound sets alongwith 4 CD-ROMs of all drawing.
c. All documents/designs in two (2) copies as noted above.
d. Contractor shall also furnish six (6) bound sets of all as-built drawings including the list of all as-built drawings bearing drawing numbers. The Contractor shall also furnish two (2) sets of CD-ROMs/ DVD/Portable hard disk of all as-built drawings as decided by the Employer.
e. The Contractor shall also furnish four (4) copies of instruction/ operations & maintenance manuals (after approval) for all the equipments.

**3.5.6 TEST REPORTS**

Two (2) copies of all test reports shall be supplied for approval before shipment of Equipment. The report shall indicate clearly the standard value specified for each test to facilitate checking of the reports. After final approval six (6) bound copies of all type and routine test reports shall be submitted to Employer.

**3.6 MATERIAL /WORKMANSHIP**

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 and shall ensure satisfactory performance throughout the service life.

In case 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 Contractor.

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 Purchaser.

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.

The equipment offered in the bid only shall be accepted for supply, with the minimum modifications as agreed/accepted.

### 3.7 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 favorable to the growth of fungi and mildew. The indoor equipment located in non-air-conditioned areas shall also be of same type.

**SPACE HEATERS**

The heaters shall be suitable for continuous operation at 230 V as supply voltage. On –off switch and fuse shall be provided.

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.

The heaters shall be suitably designed to prevent any contact between the heater wire and the air and shall consist of coiled resistance wire centered in a metal sheath and completely encased in a highly compacted powder of magnesium oxide or other material having equal heat conducting and electrical insulation properties or they shall consist of resistance wire wound on a ceramic and completely covered with a ceramic material to prevent any contact between the wire and the air. Alternatively, they shall consist of a resistance wire mounted into a tubular ceramic body built into an envelope of stainless steel or the resistance wire is wound on a tubular ceramic body and embedded in vitreous glaze. The surface temperature of the heaters shall be restricted to a value which will not shorten the life of the heater sheaths or that of insulated wire or other component in the compartments.

**FUNGI STATIC VARNISH**

Besides the space heaters, special moisture and fungus resistance 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.

**Ventilation opening**

In order to ensure adequate ventilation, compartments shall have ventilation openings provided 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.

**Degree of Protection**

The enclosure 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 outdoor: 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-947 (Part-I) / IS 12063/IEC 529. Type test report for degree of protection test, on each type of the box shall be submitted for approval.

**PRESERVATIVE SHOP COATING**

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall be treated beforehand and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scales, oxides and other coatings and prepared in the shop. The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted as per the requirements covered in the relevant part of the Technical Specification.

Transformers and other electrical equipments, if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colors shall be as per manufacturer's standards, to be selected and specified by the Employer at a later date.

Shop primer for all steel surfaces which will be exposed to operating temperature below 95 degrees Celsius shall be selected by the Contractor after obtaining specific approval of the Employer regarding the quality of primer proposed to be applied. Special high temperature primer shall be used on surfaces exposed to temperature higher than 95 degrees Celsius and such primer shall also be subject to the approval of the Employer.

**3.8 RATING PLATES, NAME PLATES AND LABELS**

3.8.1 Each equipment shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturer’s name, equipment, type or serial number together with details of the ratings, service conditions under which the item of plant in question has been designed to operate, and such diagram plates as may be required by the Employer.

3.8.2 Such nameplates or labels shall be of white nonhygroscopic material with engraved black lettering or alternately, in the case of indoor circuit breakers, starters, etc. of transparent plastic material with suitably coloured lettering engraved on the back.

3.8.3 The rated current, extended current rating and rated thermal current shall be clearly indicated in the name plate in case of current transformer.

3.8.4 Rated voltage, voltage factor and intermediate voltage shall be clearly indicated on the nameplate in case of capacitor voltage transformer.

3.8.5 Each switch shall a clear inscription identifying its function. Switches shall also have a clear inscription of each position indication.

3.8.6 All segregated phases of conductors or bus ducts, indoor or outdoor, shall be provided with coloured phase plates to clearly identify the phase of the system.

3.8.7 All such plates, instruction plates, etc. 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.

**3.9 GALVANISING:**

3.9.1 The galvanised surface shall consist of a continuous film adhering to the steel. The finished surface shall be clean and smooth, and shall be free from defects like dissolved patches, base, spot, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surfaces, flaking or peeling off, etc. The presence of any of these defects shall render the material liable to rejection.

3.9.2 All exposed ferrous parts shall be hot dip galvanised as per IS:2629 & IS:2633, Galvanising shall be uniform, smooth continuous and free from acid spots. Should the galvanising of the sample be found defective, the entire batch of steel shall have to be re-galvanised at Contractor's cost. The amount of zinc deposit shall be not less than 610 gms. per sq.m. of surface area and in addition, the thickness of zinc at any spot shall not be less than 85 microns. The Employer reserves the right to measure the thickness of zinc deposit by Elkometer or any other instrument acceptable to Employer and reject any component which shows thickness of zinc at any location less than 85 microns. The testing on the galvanised materials shall be carried out as per IS:2633.

3.9.3 The amount of zinc deposit over threaded portion of the bolts, nuts and screws shall not be less than 300 gms. per sq. meter of surface area. The amount of zinc deposit on washers shall not be less than 340 gms. per sq. meter of surface area. The threads having extra deposit of zinc shall be removed by die cutting after the completion of galvanising. The removal of extra zinc shall be carefully done so that threads shall have minimum deposits of zinc on them as specified.

**3.10 PAINTING**

Unless explicitly stated in relevant chapters of the specification, the painting of all electrical equipment shall be as follows:
Epoxy based with suitable additives. The thickness of finish coat shall be minimum 50 microns (minimum total DFT shall be 100 microns). However in case electrostatic process of painting is offered for any electrical equipment, minimum paint thickness of 50 microns shall be acceptable for finish coat. Paint shade shall be as per technical specification.

**3.11 QUALITY ASSURANCE PROGRAMME**

3.11.1 The Contractor shall adopt suitable quality assurance programme to ensure that the equipment and services under the scope of contract whether manufactured or performed within the Contractor's works or at his subcontractor's premises or at the Employer's site or at any other place of work are in accordance with the specifications. Such programmes shall be outlined by the Contractor and shall be finally accepted by the Employer/authorised representative after discussions before the award of the contract. The QA programme shall be generally in line with ISO-9001/IS- 14001.

A quality assurance programme of the contractor shall generally cover the following:

i. His organisation structure for the management and implementation of the proposed quality assurance programme
ii. Quality System Manual
iii. Design Control System
iv. Documentation Data Control System
v. Qualification data for Bidder's key Personnel.
vi. The procedure for purchase of materials, parts, components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.
vii. System for shop manufacturing and site erection controls including process, fabrication and assembly.
viii. Control of non-conforming items and system for corrective actions and resolution of deviations.
ix. Inspection and test procedure both for manufacture and field activities.
x. Control of calibration and testing of measuring testing equipments.
xi. System for Quality Audits.
xii. System for identification and appraisal of inspection status.
xiii. System for authorising release of manufactured product to the Employer.
xiv. System for handling storage and delivery.

xv. System for maintenance of records, and

xvi. Furnishing quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component as per format enclosed as Annexure-I.

### 3.12 GENERAL REQUIREMENTS - QUALITY ASSURANCE

3.12.1 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the contractor for some of the major items is given in the respective technical specification. This is, however, not intended to form a comprehensive programme as it is the contractor's responsibility to draw up and implement such programme duly approved by the Employer. The detailed Quality Plans for manufacturing and field activities should be drawn up by the Bidder and will be submitted to Employer for approval. Schedule of finalisation of such quality plans will be finalised before award.

3.12.2 Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Contractor's/ Sub-contractor's/ sub-supplier's Quality Control Organisation, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing. The Quality Plan shall be submitted on electronic media e.g. floppy or E-mail in addition to hard copy, for review. Once the same is finalised, hard copies shall be submitted for approval. After approval the same shall be submitted in compiled form on CD ROM.

3.12.3 Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's site Quality Control Organisation, during various stages of site activities starting from receipt of materials/equipment at site.

3.12.4 The Bidder shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans along with Quality Plans. These Quality Plans and reference documents/standards etc. will be subject to Employer's approval without which manufacturer shall not proceed.

3.12.5 These approved documents shall form a part of the contract. In these approved Quality Plans, Employer shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the Employer's Project Manager or his authorised representative and beyond which the work will not proceed without consent of Employer/Authorised representative in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Employer along with technical justification for approval and dispositioning.

3.12.6 No material shall be despatched from the manufacturer's works before the same is accepted subsequent to pre-despatch final inspection including verification of records of all previous tests/inspections by Employer's Project Manager/Authorised representative and duly authorised for despatch by issuance of MDCC.

3.12.7 All material used for equipment manufacture including casting and forging etc. shall be of tested quality as per relevant codes/standards. Details of results of the tests conducted to determine the mechanical properties, chemical analysis and details of heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or agreed details.

3.12.8 All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the Employer.

3.12.9 All welding/brazing procedures shall be submitted to the Employer or its authorised representative for approval prior to carrying out the welding/brazing.

3.12.10 All brazers, welders and welding operators employed on any part of the contract either in Contractor's/his sub-contractor's works or at site or elsewhere shall be qualified as per ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the Employer.

3.12.11 Test results or qualification tests and specimen testing shall be furnished to the Employer for approval. However, where required by the Employer, tests shall be conducted in presence of Employer/authorised representative.

3.12.12 For all pressure parts and high pressure piping welding, the latest applicable requirements of the IBR (Indian Boiler Regulations) shall also be essentially complied with. Similarly, any other statutory requirements for the equipments/systems shall also be complied with. On all back-gauged welds MPI/LPI shall be carried before seal welding.

3.12.13 All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.

3.12.14 No welding shall be carried out on cast iron components for repair.

3.12.15 Unless otherwise proven and specifically agreed with the Employer, welding of dissimilar materials and high alloy materials shall be carried out at shop only.

3.12.16 All non-destructive examination shall be performed in accordance with written procedures as per International Standards. The NDT operator shall be qualified as per SNT-TC-IA (of the American Society of non-destructive examination). NDT shall be recorded in a report which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job.

In general all plates of thickness greater than 40mm & for pressure parts plates of thickness equal to or greater than 25mm shall be ultrasonically tested otherwise as specified in respective equipment specification. All bar stock/Forging of diameter equal to or greater than 50mm shall be ultrasonically tested.

The Contractor shall list out all major items/ equipment/ components to be manufactured in house as well as procured from sub-contractors (BOI). All the subcontractor proposed by the Contractor for procurement of major bought out items including castings, forging, semi-finished and finished components/equipment etc., list of which shall be drawn up by the Contractor and finalised with the Employer, shall be subject to Employer's approval. The contractor's proposal shall include vendor's facilities established at the respective works, the process capability, process stabilization, QC systems followed, experience list, etc. along with his own technical evaluation for identified subcontractors enclosed and shall be submitted to the Employer for approval within the period agreed at the time of pre-awards discussion and identified in "DR" category prior to any procurement. Such vendor approval shall not relieve the contractor from any obligation, duty or responsibility under the contract.

3.12.17 For components/equipment procured by the contractors for the purpose of the contract, after obtaining the written approval of the Employer, the contractor's purchase specifications and inquiries shall call for quality plans to be submitted by the suppliers. The quality plans called for from the subcontractor shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor's quality control

organisation, the relevant reference documents/standards used, acceptance level, inspection of documentation raised, etc.

3.12.18 Employer reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their sub vendor's quality management and control activities. The contractor shall provide all necessary assistance to enable the Employer carry out such audit and surveillance.

3.12.19 The contractor shall carry out an inspection and testing programme during manufacture in his work and that of his sub-contractors and at site to ensure the mechanical accuracy of components, compliance with drawings, conformance to functional and performance requirements, identity and acceptability of all materials parts and equipment. Contractor shall carry out all tests/inspection required to establish that the items/equipments conform to requirements of the specification and the relevant codes/standards specified in the specification, in addition to carrying out tests as per the approved quality plan.

3.12.20 Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the Employer to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets, drawings, etc.

3.12.21 For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.

3.12.22 Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Employer/ authorised representative.

**3.12.23 Environmental Stress Screening**

All solid state electronic system / equipment / sub assembly shall be free from infant mortile components. For establishing the compliance to this requirement, the contractor / sub – contractor should meet the following.

**1.** The Contractor / Sub – contractor shall furnish the established procedure being followed for eliminating infant mortile components. The procedure followed by the Contractor / Sub – contractor should be substantiated along with the statistical figures to validate the procedure being followed. The necessary details as required under this clause shall be furnished at the stage of QP finalization.

**Or**

In case the Contractor / Sub – contractor do not have any established procedure to eliminate infant mortile components then two or 10% whichever is less, most densely populated Panels shall be tested for Elevated Temperature Cycle Test as per the following procedure.

**Elevated Temperature Test Cycle**

During the elevated temperature test which shall be for 48 hours, the ambient temperature shall be maintained at 50° C. The equipment shall be interconnected with devices and kept under energized conditions so as to repeatedly perform all operations it is expected to perform in actual service with load on various components being equal to those which will be experienced in actual service.

During the elevated temperature test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature at 50° C.

In case of any failure during the test cycle, the further course of action should be mutually discussed for demonstrating the intent of the above requirement.

**Burn In Test Cycle**

The test shall be conducted on all the panels fully assembled and wired including the panels having undergone the above mentioned elevated temperature test.

The period of Burn in Test Cycle shall be 120 hrs and process shall be similar to the elevated temperature test as above except that the temperature shall be reduced to the ambient temperature prevalent at that time.

During the above tests, the process I/O and other load on the system shall be simulated by simulated inputs and in the case of control systems, the process which is to be controlled shall also be simulated. Testing of individual components or modules shall not be acceptable.

During the Burn in Test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature.

The Contractor / Sub-contractor shall carry out routine test on 100% item at contractor / sub-contractor's works. The quantum of check / test for routine & acceptance test by employer shall be generally as per criteria / sampling plan defined in referred standards. Wherever standards have not been mentioned quantum of check / test for routine / acceptance test shall be as agreed during detailed engineering stage.

### 3.13 QUALITY ASSURANCE DOCUMENTS

The Contractor shall be required to submit two hard copies and two sets on CDROM of the following Quality Assurance Documents as identified in respective quality plan with tick ( √ ) mark.

Each QA Documentation shall have a project specific Cover Sheet bearing name & identification number of equipment and including an index of its contents with page control on each document.

The QA Documentation file shall be progressively completed by the Supplier's sub-supplier to allow regular reviews by all parties during the manufacturing.

The final quality document will be compiled and issued at the final assembly place of equipment before dispatch. However CD-Rom may be issued not later than three weeks.

3.13.1 Typical contents of Quality Assurance Document are as below:-

i) Quality Plan,
ii) Material mill test reports on components as specified by the specification and approved Quality Plans.
iii) Manufacturer / works test reports/results for testing required as per applicable codes and standard referred in the specification and approved Quality Plans.

iv) Non-destructive examination results /reports including radiography interpretation reports. Sketches/drawings used for indicating the method of traceability of the radiographs to the location on the equipment.
v) Heat Treatment Certificate/Record (Time- temperature Chart)
vi) All the accepted Non-conformance Reports (Major/Minor) / deviation, including complete technical details / repair procedure).
vii) CHP / Inspection reports duly signed by the Inspector of the Employer and Contractor for the agreed Customer Hold Points.
viii) Certificate of Conformance (COC) whoever applicable.
ix) MDCC

3.13.2 Similarly, the contractor shall be required to submit two hard copies and two sets on CD ROM of Quality Assurance Documents ( in line with above) pertaining to field activities as per Approved Field Quality Plans and other agreed manuals/ procedures, prior to commissioning of individual system.

3.13.3 Before dispatch/ commissioning of any equipment, the Supplier shall make sure that the corresponding quality document or in the case of protracted phased deliveries, the applicable section of the quality document file is completed. The supplier will then notify the Inspector regarding the readiness of the quality document (or applicable section) for review.

i) If the result of the review carried out by the Inspector of the Quality document (or applicable section) is satisfactory. The Inspector shall stamp the quality document (or applicable section) for release.
ii) If the quality document is unsatisfactory, the Supplier shall endeavour to correct the incompleteness, thus allowing finalizing the quality document (or applicable section) by time compatible with the requirements as per contract documents. When it is done, the quality document (or applicable section) is stamped by the Inspector.
i) If a decision is made for dispatch, whereas all outstanding actions cannot be readily cleared for the release of the quality document by that time, the supplier shall immediately, upon shipment of the equipment, send a copy of the quality document Review Status signed by the Supplier Representative to the Inspector and notify of the committed date for the completion of all outstanding actions & submission. The Inspector shall stamp the quality document for applicable section when it is effectively completed. The submission of QA documentation package shall not be later than 3 weeks after the dispatch of equipment.

**3.14 TRANSMISSION OF QUALITY DOCUMENTS**

As a general rule, two hard copies of the quality document and Two CD ROMs shall be issued to the Employer after the delivery date for the corresponding equipment. One set of quality document shall be forwarded to Corporate Quality Assurance Department and other set to respective Site.
For the particular case of phased deliveries, the complete quality document to the Employer shall be issued not later than 1 month after the date of the last delivery similarly as stated above.

**3.15 INSPECTION, TESTING & INSPECTION CERTIFICATE**

3.15.1 The word 'Inspector' shall mean the Project Manager and/or his authorised representative and/or an outside inspection agency acting on behalf of the Employer to inspect and examine the materials and workmanship of the works during its manufacture or erection.

3.15.2 The Project Manager or his duly authorised representative and/or an outside inspection agency acting on behalf of the Employer shall have access at all reasonable times to inspect

and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Project Manager 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.

3.15.3 The Contractor shall give the Project Manager/Inspector fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector's. The Project Manager/Inspector, unless the witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days of the date on which the equipment is noticed as being ready for test/inspection failing which the contractor may proceed with 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 test reports in two (2) copies.

3.15.4 The Project Manager or Inspector shall within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the Project Manager/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.

3.15.5 When the factory tests have been completed at the Contractor's or subcontractor's works, the Project Manager /Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Project Manager /Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Project Manager /Inspector. Project Manager /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 certificates shall not bind the Employer to accept the equipment should it, on further tests after erection be found not to comply with the contract.

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

3.15.7 The inspection by Project Manager / Inspector 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.

3.15.8 To facilitate advance planning of inspection in addition to giving inspection notice, the Contractor shall furnish quarterly inspection programme indicating schedule dates of inspection at Customer Hold Point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.

3.15.9 All inspection, measuring and test equipments used by contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by NTPC. Wherever asked specifically, the contractor shall re-calibrate the measuring/test equipments in the presence of Project Manager / Inspector.

## 3.16 PACKAGING & TRANSPORTATION

**Items shall be packed & dispatched separately to respective sites i.e. to 400/220kV S/s at NKSTPP end & to 220kV S/s at Chatti Bariatu & Kerandari-A mine end.**

### 3.16.1 Packing, Marking and shipping

The packing and shipping shall be carried out in accordance with the standard practice of Contractor and with the following additional requirements:

a) The equipment shall be prepared in such a manner as to protect the equipment from damage or deterioration during shipping or storage. The shipments can be exposed to heavy rains, hot sun, high humidity and sudden extreme changes of temperature. The equipment shall be packed and shipped so as to protect it from all such conditions and any other abnormal conditions, generally expected during shipping & storage.

b) The metallic containers, if any, shall be considered as the property of the Contractor and he will be allowed to remove them from site once the contents are unpacked, inspected, documented and placed in temporary storage or in final position.

c) The equipment shall be shipped in such a manner as to facilitate unloading, handling and storage enroute and at the site. The Contractor shall provide lifting lugs and special lifting devices for proper handling and erection.

d) The Contractor shall be liable for any damage or loss resulting due to careless, improper, poor or insufficient packing and handling.

e) Spare parts and spare equipment shall be packed separately in containers adequate for long term storage, plainly marked “Spare Parts Only”. They shall be crated individually or in kits to be used in one single renewal or overhaul operation. Other spare part kits shall not be disturbed when using one set or kit.

f) The Contractor shall at all times protect and preserve from damage, loss, corrosion and all other forms of damage, all parts of the works.

### 3.16.2 Transportation

a) The Contractor shall make a careful examination of access rail/roadways to the site in order to confirm the practical maximum transport weight and dimensions as well as a careful examination of the ports of disembarkation particularly with respect to the capacity of the cranes installed and access roads.

b) All instruments and computer/microprocessor based equipment imported into India from overseas for the purpose of this contract shall be air freighted to the nearest possible point and further by rail/road taking due precautions as per manufacturer’s recommendations. Employer shall have the right to decide the items that should be air freighted and Employer’s decision shall be binding on Contractor.

### 3.16.3 Insurance

a) The Contractor shall insure all shipments and works at his own expense for not less than the full replacement cost plus any additional cost for accelerated manufacturing of the replacement parts.

b) Loss or the damage to equipment during shipping or transportation to the site(s) or otherwise

shall not constitute groups for claims for extension in time or for extra payment.

### 3.17 CLAMPS AND CONNECTORS INCLUDING TERMINAL CONNECTORS

3.17.1 The material of clamps and connectors shall be Aluminium alloy casting conforming to designation A6 of IS:617 for connecting to equipment terminals and conductors of aluminium. In case the terminals are of copper, the same clamps/connectors shall be used with 2mm thick bimetallic liner.

3.17.2 The material of clamps and connectors shall be Galvanised mild steel for connecting to shield wire.

3.17.3 Bolts, nuts and plain washers shall be hot dip galvanised mild steel for sizes M12 and above. For sizes below M12, they shall be electro-galvanised mild steel. The spring washers shall be electro-galvanised mild steel.

3.17.4 All castings shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be rounded off to meet specified corona and radio interference requirements.

3.17.5 They shall have same current rating as that of the connected equipment. All current carrying parts shall be at least 10 mm thick. The connectors shall be manufactured to have minimum contact resistance.

3.17.6 Flexible connectors, braids or laminated strips shall be made up of copper/aluminium.

3.17.7 Current rating and size of terminal/conductor for which connector is suitable shall be put on a suitable sticker on each component which should last atleast till erection time.

### 3.18 BUSHINGS, HOLLOW COLUMN INSULATORS, SUPPORT INSULATORS, AND DISC INSULATORS

3.18.1 Bushings shall be manufactured and tested in accordance with IS: 2099 & IEC: 137 while hollow column insulators shall be manufactured and tested in accordance with IEC 233/IS 5284. The support insulators shall be manufactured and tested as per IS: / IEC 168/IEC 273. The insulators shall also conform to IEC 815 as applicable.
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.

3.18.2 Porcelain used shall be homogenous, 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. Hollow porcelain should be in one integral piece in green & fired stage.

3.18.3 Glazing of the porcelain shall be uniform brown in colour, free form blisters, burns and other similar defects.

3.18.4 When operating at normal rated voltage there shall be no electric discharge between conductor and insulators which would cause corrosion or injury to conductors or when operating at normal rated voltage.

3.18.5 The design of the insulator shall be such that stresses due to expansion and contraction in any part of the insulator shall be lead to deterioration. All ferrous parts shall be hot dip galvanised.

3.18.6 Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service. The design and location of clamps, 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.

3.18.7 All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued, 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.

3.18.8 Insulator shall also meet requirement of IEC - 815 as applicable, having alternate long & short sheds.

**3.19 CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES & MARSHALLING BOXES FOR OUTDOOR EQUIPMENT.**

3.19.1 All types of control cabinets, junction boxes, marshaling boxes, lighting panels, terminal boxes, operating mechanism boxes, Kiosks etc. shall generally conform to IS:5039, IS:8623 and IEC:439 as applicable.

3.19.2 **Mechanism Box/ Control Cabinet/ Kiosks:** A sheet steel (atleast 2.5 mm thick), dust and vermin proof M.Box/CCC/CMB shall be provided with proper lighting and thermostatically controlled space heaters. The degree of protection shall be IP 55. One dummy terminal block in between each trip wire terminal shall be provided. At least 20% spare terminals shall be provided on each panel. The gasket used shall be of neoprene rubber.

Painting of boxes shall be as follows,

- External surface : Chemical resistant epoxy zinc phosphate primer, MIO (Micaceious iron oxide) as intermediate paint followed by polyurethane finish paint **(RAL 5012 Blue)**
- Internal surface : Chemical resistant epoxy zinc phosphate primer followed by chemical & heat resistant **epoxy enamel white paint**.

3.19.3 **Junction Boxes:** The junction boxes shall be made of minimum 2 mm thick sheet steel. Gland plates shall be removable type and made of 3 mm thick sheet steel. The boxes shall be provided with detachable cover or hinged door with captive screws. Top of the box shall be arranged to slope towards the rear of the box. The box shall be **hot dip galvanised** and shall be provided with suitable neoprene gaskets to achieve requisite degree of protection. Adequate spacing shall be provided to terminate the external cables. The boxes shall be suitable for mounting on various types of steel structures. The terminal blocks provided shall be of 650 V grade, rated for 10 A for control cables. Suitable numbering for terminal blocks shall be done. In case of junction box for power cable, the box shall be rated for maximum current carrying capacity. Terminal blocks shall be of one piece, Klippon RSF-1 or ELMEX CSLT-1 type with insulating barriers.

3.19.4 The cabinets/boxes/kiosks/panels shall be free standing or wall mounting or pedestal mounting type. They shall have hinged doors with padlocking arrangement. All doors, removable covers and plates shall be gasketed all around with neoprene gaskets.

3.19.5 The degree of protection of of all the outdoor boxes shall not be less than IP 55 as per IS 2147.

3.19.6 The cable entry shall be from bottom, for which removable gasketed cable gland plates shall be provided.

3.19.7 Suitable 240V, single phase, 50Hz ac heaters with thermostats controlled by switch and fuse shall be provided to maintain inside temperature 10deg. above the ambient.

3.19.8 The size of enclosure and the layout of equipment inside shall provide generous clearances. Each cabinet/box/kiosk/panel shall be provided with a 15A, 240V ac, 2 pole, 3 pin industrial grade receptacle with switch. For incoming supply, MCB of suitable rating shall be provided. Illumination of each compartment shall be with door operated incandescent lamp. All control switches shall be of rotary switch type.

3.19.9 Each cabinet/box/kiosk/panel shall be provided with two earthing pads to receive 75mmx12mm GS flat. The connection shall be bolted type with two bolts per pad. The hinged door shall be connected to body using flexible wire. The cabinets/boxes/kiosks/panels shall also be provided with danger plate, and internal wiring diagram pasted on inside of the door. The front label shall be on a 3mm thick plastic plate with white letters engraved on black background

**3.20 TERMINAL BLOCKS**

3.20.1 They shall be non-disconnecting stud type of extensible design equivalent to Elmex type CAT-M4.

3.20.2 The terminal blocks shall be of 650 V grade, and rated to continuously carry maximum expected current. The conducting part shall be tinned or silver plated.

3.20.3 They shall be of moulded, non-inflammable thermosetting plastic. The material shall not deteriorate with varied conditions of temperature and humidity. The terminal blocks shall be fully enclosed with removable covers of transparent, non deteriorating plastic material. Insulating barriers shall be provided between the terminal blocks so that the barriers do not hinder the wiring operation without removing the barriers.

3.20.4 The terminals shall be provided with marking tags for wiring identification.

3.20.5 Unless otherwise required (expected current rating) or specified, terminal blocks shall be suitable for connecting the following conductors on each side:
All CT & VT circuits - Min. four 2.5 sq.mm. copper flexible conductor
AC & DC power supply -Two 16 sq.mm. Aluminium conductor
Other control circuits - Min. two 2.5 sq.mm. copper flexible conductor.

3.20.6 The terminal blocks for CT and VT secondary leads shall be provided with test links and isolating facilities. CT secondary leads shall also be provided with short circuiting and earthing facilities.

**3.21 Wiring**

3.21.1 All wiring shall be carried out with 1100 V grade stranded copper wires. The minimum size of the stranded conductor used for internal wiring shall be as follows:
a) All circuits except CT circuits 2.5 sq.mm
b) CT circuits 4 sq. mm (minimum number of strands shall be 3 per conductor).

3.21.2 All internal wiring shall be securely supported, neatly arranged readily accessible and connected to equipment terminals and terminal blocks.

3.21.3 Wire terminations shall be made with solderless crimping type of tinned copper lugs which firmly grip the conductor and insulation. Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with the wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wires

shall not fall off when the wires and shall not fall off when the wire is disconnected from terminal blocks.

3.21.4 All wires directly connected to trip circuit breaker shall be distinguished by the addition of a red coloured unlettered ferrule. Number 6 & 9 shall not be included for ferrules purposes.

3.21.5 All terminals including spare terminals of auxiliary equipment shall be wired upto terminal blocks. Each equipment shall have its own central control cabinet in which all contacts including spare contacts from all poles shall be wired out. Interpole cabling for all equipment's shall be carried out by the Contractor.

**3.22 CABLE GLANDS AND LUGS**

3.22.1 Cable glands shall be Double compression type, tinned/Nicked plated (coating thickness not less than 20 microns in case of tin and 10 to 15 microns in case of nickel) brass cable glands for all power and control cables. They shall provide dust and weather proof terminations. They shall comprise of heavy duty brass casting, machine finished and tinned to avoid corrosion and oxidation. Rubber components used in cable glands shall be neoprene and off tested quality. Required number of packing glands to close unused openings in gland plates shall also be provided.

3.22.2 The cable glands shall be tested as per BS:6121. The cable glands shall also be duly tested for dust proof and weather proof termination.

3.22.3 Cables lugs for power cables shall be tinned copper solder less crimping type conforming to IS:8309 and 8394 suitable for aluminum or copper conductor (as applicable). Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipmentsThe cable lugs shall suit the type of terminals provided. The cable lugs shall be of Dowell make or equivalent.

**3.4 CONDUITS, PIPES AND ACCESSORIES**

3.4.1 The bidder shall supply and install all rigid conduits, mild steel pipes, flexible conduits, hume pipes, etc. including all necessary sundry materials, such as tees, elbows, check nuts, bushing reduces, enlargers, wooden plugs, coupling caps, nipples, gland sealing fittings, pull boxes, etc.

3.4.2 Rigid conduits shall be flow-coat metal conduits of Nagarjuna Coated Tubes or equivalent make. The outer surface of the conduits shall be coated with hot-dip zinc and chromate conversion coatings. The inner surface shall have silicone epoxy ester coating for easy cable pulling. Mild steel pipes shall be hot-dip galvanised. All rigid conduits/ pipes shall be of a reputed make.

3.4.3 Flexible conduits shall be heat-resistant lead coated steel, water-leak, fire and rust proof, and be of PLICA make or equivalent.

**3.5 MOTOR CONTROL CENTRE**

3.5.1 The 415 Volt motor control centres (if provided separately) shall conform to the requirements for boxes/cabinets/kiosks. They shall be fixed type, shall be fully sectionalised and shall be equipped with load break switches. Motor feeders shall be provided with isolating switch fuse unit and Contractor with thermal overload relay and single phase protection. The motor Contractor shall have one normally open auxiliary contact for alarm purposes. The motor control circuit shall be independent from all other control circuits.

3.5.2 Isolating Switches

The incoming power supply isolating switch operation handle shall be interlocked with the control cabinet door as to prevent opening of door when main switch is closed. Device for by passing the door interlock shall also be provided. Switch handle shall have provision for locking in both fully open and fully closed positions.

3.5.3 Fuses

All fuses shall be of the HRC cartridge type, conforming to IS: 2208 and suitable to mount on plug-in type of fuse bases. Fuses shall be provided with visible operation indicators to show that they have operated. All accessible live connections shall be adequately shrouded, and it shall be possible to change fuses with the circuit alive, without danger of contact with live conductor. Insulated fuse pulling handle shall be supplied with each control cabinet.

**3.6 MOTORS**

3.6.1 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 conform to type tests and shall be subjected to routine tests as per applicable standards.

3.6.2 Enclosures

a) For motors to be installed outdoor, the motor enclosure shall have degree of protection IP: 55. For motors to be installed indoor, i.e. inside a box, the motor enclosure shall be dust proof equivalent to IP: 54.
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 condensation or other causes from all pockets in the motor casing.

3.6.3 Operational Features :

a) Continuous motor ratings (name plate rating) shall be at least suitable for the driven equipment at design duty operating point of driven equipment that will arise in service.
b) Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously in the given system.

3.6.4 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.
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 given in IS:325.
d) Motors when started with driven equipment imposing full staring torque and supply voltage conditions specified shall be capable of withstanding at least 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 a least two seconds or 15% of the accelerating time whichever is greater. In case it is not possible to meet the above requirement, the Contractor shall offer centrifugal type speed switch mounted on the motor shaft which shall remain closed for speeds lower

than 20% and open for speeds above 20% of the rated. The speed switch shall be capable of withstanding 120% of the rated speed in either directions of rotation.

3.6.5 The maximum permissible temperature rise over the ambient temperature shall be within the limits specified in IS: 325 (for 3 phase induction motors) after adjustment due to increased ambient temperature specified.

3.6.6 The double amplitude of motor vibration shall be within the limits specified in IS:729. Vibration shall also be within the limits specified by the relevant standard for the driven equipment when measured at the motor bearings.

3.6.7 All the induction motors shall be capable of running at 80% of rated voltage for a period of 5 minutes.

**3.7 AUXILIARY SWITCH**

The auxiliary switch shall conform of following type tests:

a) Electrical endurance test - A minimum of 1000 operations for 2A. D.C. with a time constant greater than or equal to 20 milliseconds with a subsequent examination of mV drop/ visual defects/ temperature rise test.
b) Mechanical endurance test - A minimum of 5000 operations with a subsequent checking of contact pressure test/ visual examination
c) Heat run test on contacts
d) IR/HV test, etc.

**3.8 LAMPS AND SOCKETS**

3.8.1 Lamps:

All incandescent lamps shall use a socket base as per IS-1258, except in the case of signal lamps.

3.8.2 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.

3.8.3 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.

**3.9 SWITCHES & FUSES:**

Each control panel shall be provided with necessary arrangements for receiving, distributing, isolating and fusing of DC and AC supplies for various control, signaling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with switch-fuse 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.

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.

All control switches shall be of rotary type. Toggle/piano switches shall not be accepted.

### 3.10 TYPE, ROUTINE & ACCEPTANCE TESTS:

All equipments to be supplied shall be of type tested design. During contract stage, bidder shall submit for Owner's approval the reports of all the type tests listed in this specification and carried out within last ten years from the date **28.11.2013**. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the tests should have been either conducted at an independent laboratory or should have be witnessed by a client.

However if contractor is not able to submit report of the type tests conducted within ten years from the date **28.11.2013** or in the case of type test reports are not found to be meeting the specification requirements, the bidder shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/ owners representative and submit the reports for approval.

All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

### 3.11 CORONA AND RIV TESTS AND SEISMIC WITHSTAND TEST:

a) The corona (for 400kV only) and RIV tests shall confirm to the requirements as per Annexure A.
b) The seismic withstand test for 400kV shall conform to requirements as per Annexure B.

### 3.12 Enclosures:

1. ANNEXURE- A - CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST
2. ANNEXURE- B - SEISMIC WITHSTAND TEST
3. ANNEXURE- I – MQP (NTPC format)