

SOUTHCO UTILITY

E-TENDER NOTICE NO.

SOUTHCO UTILITY/ BGJY-33KV LINE/2 Dt.12.07.2016

FOR THE WORK

**“33KV FEEDER FOR LINKING OF 220/33KV MALKANGIRI
GRID SUB-STATION AT DANIGUDA TO 33/11KV PRIMARY
S/S MALKANGIRI, KALIMELA & PANDRIPANI UNDER
BGJY SCHEME, MALKANGIRI”**

**Issue of online tender documents (bid sheets):- From dt- 13.07.2016 (10.01 AM) up to 04.08.16
(1.00 PM)**

Last date of submission of online tender: - Up to dt.- 04.08.2016 (5.00 PM)

Submission of Tender (Hard Copy) - Up to dt-05.08.2016 (1.00 PM)

Opening of Techno-commercial bid (Part-I): - On Dt. 05.08.2016 at 3.00 PM

SOUTHCO UTILITY

Corporate Office:

Courtpeta Berhampur – 760004

Ph. No. 9437570141, EMAIL ID-rewing.southco@ Southcoodisha.com

E-TENDER NOTICE NO: SOUTHCO UTILITY/ BGJY-33KV LINE/2 Dt.12.07.2016

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E-TENDER NOTICE NO: SOUTHCO UTILITY/ BGJY-33KV LINE/2 Dt.12.07.2016

For and on behalf of SOUTHCO UTILITY, the undersigned invites sealed bids in two part bidding system from qualified and eligible bidders for the work “33KV feeders for linking of 220/33 KV Malkangiri Grid Sub-Station at Daniguda to 33/11 KV Primary S/S at Malkangiri, Kalimela & Pandripani under BGJY scheme, Malkangiri” who comply with the terms and conditions for the following packages to be executed in the licensed area in the State of Odisha.

Name of Work	Estimated Cost of Tender (in Rs.)	Earnest Money Deposit (in Rs)	Last date/time for submission of bids	Date and time of opening of bid	Non refundable Tender processing fee	Non refundable Cost of Bid document
Construction of New 33 KV feeder for linking of Malkangiri Grid at Daniguda to 33/11 KV Primary S/S at Malkangiri (33 KV Malkangiri feeder).	11554786/-	115550/-	04.08.2016 , 5.00 PM	05.08.2016 , 3.00 PM	Rs 5750/-	10000/- + 5% VAT= 10500/-
Construction of New 33 KV feeder for linking of Malkangiri Grid at Daniguda through MV-7 village to Kalimela (33KV Kalimela feeder).	12827923/-	128280/-			Rs 5750/-	10000/- + 5% VAT= 10500/-
Construction of New 33 KV feeder for linking of Malkangiri Grid at Daniguda to 33/11 KV Primary S/S at Pandripani (33 KV Pandripani feeder).	14001731/-	140020/-			Rs 5750/-	10000/- + 5% VAT= 10500/-

Any addendum / corrigendum to this e-Tender Notice shall be uploaded in the website only.

Issue of online tender documents (bid sheets):- From dt- 12.07.2016(10.01 AM) up to 04.08.16 (1.00 PM)

Last date of submission of online tender: - Up to dt- 04.08.2016 (5.00 PM)

Submission of Tender (Hard Copy) - Up to dt-05.08.2016 (1.00 PM)

Opening of Techno-commercial bid (Part-I): - On Dt. 05.08.2016 at 3.00 PM

SOUTHCO reserves the right to alter the tendered quantity and reject / accept any or all tenders or split the tender among tenders without assigning any reason thereof.

(Authorised Signatory)
RURAL ELECTRIFICATION CELL

The interested bidders would be required to enroll themselves on the tender portal www.tenderwizard.com/SOUTHCO. Complete set of bidding documents are available in www.tenderwizard.com/SOUTHCO portal from **Dt.13.07.2016 /10.01 AM** onwards (as per the e-tender schedule). Interested bidders may visit SOUTHCO's official web site www.southcoodisha.com or www.tenderwizard.com/SOUTHCO for detail specification.

Any addendum / corrigendum to this e-Tender Notice shall be uploaded in the website only.

The bidders can view the tender documents from www.southcoodisha.com website free of cost.

(i) The bidders who want to submit bid shall have to pay the Rs. 10500.00 per package towards tender cost (non-refundable which is inclusive VAT @ 5%), in the form of Demand draft only, drawn in favour of Administrator, SOUTHCO Utility, payable at Berhampur.

(ii) The bidders shall have to submit the non-refundable tender processing fee of Rs. **5750/- (including service tax 14.5%) per package** in form of **e-payment** mode only.

(NOTE: For tender processing fee to K.S.E.D.C. Ltd. Bangalore, the bidder can use various modes of e-payment facility available through Tender wizard Portal, i.e. by **Credit Card, Debit Card, Net Banking**).

(iii)The bidders shall scan the Demand Draft / Bank guarantee, towards EMD and Tender Cost against the tender and upload the same in the prescribed form in .pdf or .jpg format in addition to sending the original as stated above.

(iv) The prospective bidders are advised to register their user ID, Password, company ID from website www.tenderwizard.com/SOUTHCO by clicking on hyper link "**Register Me**".

(v) Any clarifications regarding the scope of work and technical features can be had from the undersigned during office hours.

NB: All subsequent addendum/Corrigendum to the tender shall be hoisted in SOUTHCO's official web site www.southcoodisha.com and www.tenderwizard.com/SOUTHCO only

(Authorised **Signatory**)

RURAL ELECTRIFICATION CELL

For detail procedure to be followed for submission of Bid, please refer Clause No. 8 & 9 of ITB (page no.14 to 16)

SECTION – I

INVITATION FOR BIDS (IFB) E-TENDER NOTICE NO.

SOUTHCO UTILITY/ BGJY-33KV LINE/2 Dt.12.07.2016

1.0 SOUTHCO UTILITY invites sealed tenders from reputed Electrical Contractors with required license, either in individual capacity or as part of a joint venture agreement / consortium for carrying out various Electrical Installation works on ‘Turnkey’ basis in the jurisdiction of the licensed area. The bidder must fulfill all the qualification requirements as specified in clause 2.0 stated below. The sealed envelopes shall be duly super scribed as “**TENDER NOTICE No: SOUTHCO UTILITY/ BGJY-33KV LINE/2 Due date of opening 05.08.2016**”.

Name of Work	Estimated Cost	Earnest Money Deposit	Last date/time for submission of bids	Date and time of opening of bid	Non refundable Cost of Bid document*
1	2	3	4	5	6
As per tender Notice above	As per tender Notice above	As per tender Notice above	04.08.2016 up to 5.00 PM	05.08.2016 at 3.00 PM	Rs. 10,000.00 + 5% VAT = Rs. 10,500.00

2.0 Bidders to be considered as eligible (to bid) should meet the following qualifications;

- (a) Bidder must quote for the entire quantum of works specified in each Line.
- (b) The bidder should have installed and commissioned the quantum of work as specified with respect to qualifying criteria (Work experience)

TABLE – A**PART WISE SCOPE OF WORK & MINIMUM QUALIFYING REQUIREMENTS –
SOUTHCO UTILITY**

Sl. No.	Particulars of work	Quantum of work			Qualifying Work Experience
		Malkangiri	Kalimela	Pandripani	
I.	Construction of 33KV DP Structure inside GSS using 13mtr Long 150x150 GI Joist.	1 No.	1 No.	1 No.	100 %
II.	Installation of 33 KV Line AB Switch with DP Structure using 15 mtr long GI Joist.	1 No.	1 No.	1 No.	100 %
III.	Construction of 4-Pole Structure with switching arrangement for feeding from Dual Grid S/S.	1 No.	1 No.	2 No.	100 %
IV	Construction of 33 KV 3 PH 3 W Line using 100 mm² AAC	14 CKM	16 CKM	12 CKM	100 %
V	Installation 33 KV Line AB Switch with 11mtr GI Joist DP Structure	3 No.	4 No.	5 No.	100 %
VI.	33KVLine Road Crossing DP using 11mtr GI Joist.	10 No	10 No.	8 No.	100 %
VII.	Installation of 33 KV OD VCB	1 No	1 No	2 No	100 %
VIII.	Guarding for Road crossing/33KV line Crossing/11KV line crossing/River / Canal crossing	5 No.	5 No.	4 No.	100 %
IX.	Renovation of Existing 33KV Feeder (22KM from Malkangiri to Pandripani. 7 Nos. intermediate pole/KM.)	-	-	22 Km	100 %

"The bidder must have executed the quantum of work as mentioned in the Table A above during the last three financial years preceding to the year of tender notification and should have successful operation of minimum period of one year. Bidder must enclose copies of the relevant work orders along with client certified copies of Final Invoices and/or Performance Certificates dully signed by the competent authority of the client and/or Final Inspection certificate issued by Electrical Inspector in proof of having executed the desired quantum of works during the last three financial years."

(c) The minimum average Annual Turnover of the bidder in any best three financial years out of last five financial years **should not be less than 100% of the estimated value** of the tender.

(d) Bidder shall be financially sound and stable having liquid assets as stated in the enclosed format and/or access to credit facility of not less than one fifth of estimated cost of the tender value.

NB: 1) Only cash at bank / in hand & fixed deposit mentioned in the audited balance sheet of last FY shall be considered for accessing the Liquid Asset.

2) The average unutilized credit limit during the month prior to the month of bidding shall be considered to access the credit facility.

(f) Two or more like minded contractor(s) and/or manufacturer(s) of electrical items, which are under scope of supply of the contractor as per this tender specification, may form a joint venture/ consortium agreement amongst themselves and apply against this tender specification, provided they qualify the criteria.

NOTE: 1) Joint Venture/Consortium Partner shall be limiting to 04 (Four) Members.

2) One of the Members shall be an Electrical Contractor having valid HT License.

3) Work Order shall be issued in favour of the Lead Partner only

However, if the bidder is quoting against in his individual capacity, he cannot be a part of joint venture / consortium agreement to participate in **same** tender as notified against this tender specification & vice versa.

(g) If the work experience of one partner is not meeting the entire qualifying criteria, the work experience of the other partner (s) specified in the scope of work shall be added for qualifying the bid in total.

Lead Partner shall have minimum 50% of total average turn Over requirement & 50% of work experience and other partner(s) together shall have balance 50% Turn over & Work experience.

(h) One of the partners shall be nominated as Lead Partner and the lead partner shall be authorized to incur liabilities and receive instructions for and on behalf of all partners of the joint venture / consortium and entire execution of the contract including receipt of payments shall be done exclusively through the lead partner. This authorization shall be evidenced by submitting by a Power of Attorney signed by legally authorized signatories of all partners.

(i) All partners of joint venture / consortium shall be liable jointly and severally for the execution of contract in accordance with the contract terms and a copy of the agreement entered into by the joint venture / consortium partners having such a provision shall be submitted with the Bid. A statement to this effect shall be included in the authorization

mentioned as above as well as in the Bid form and in Contract form (in case of a successful bid).

(J) a) In addition to above the bidder(s)/Lead Partner of the bidder(s) should submit the following documents in part-I bid as qualifying terms.

- i. Service Tax Registration along with last month self attested Challan copy.
- ii. Labour License.
- iii. Registration under Building & other construction workers welfare cess.
- iv. Last 3 yrs. Audited annual reports for companies & partnership firm. In case of individuals, Income Tax returns with audited annual P/L & B/S.
- v. EPF & ESI: Registration along with last month self attested challan copy.
- vi. Valid electrical (HT) license for electrical works.
- vii. PAN & TIN No. with VAT Clearance.
- viii. User's Certificate for work experience along with W/O copy/Invoice.
- ix. Electrical Inspection Report for work executed.

Note: As and when required, the bidders are required to present original document for verification.

b) The bidder(s)/Lead Partner of the bidder(s) shall have to furnish service tax registration, ESI and Labor license within 45 days of receipt of the order.

(k) The bidders who have earlier failed to execute the work order(s) of SOUTHCO shall not be eligible to participate in this tender.

- (1) SOUTHCO UTILITY reserves the right to waive minor deviation, if they do not materially affect the capacity of the bidder to perform the contract.

3. E.M.D & TIME SCHEDULES:

SL. NO.	DESCRIPTION	SCHEDULE
1	Cost of Tender document	Rs 10500/- (Rupees Ten thousand five hundred) only for each package. (To be paid in shape of DD, in favour of "Administrator, SOUTHCO Utility, payable at Berhampur)
2	Bid security (EMD)	As mentioned in Tender Notice at page -3 in shape of DD in favour of "Administrator, SOUTHCO Utility, payable at Berhampur or in shape of BG in favour of "Administrator, SOUTHCO Utility, encashable at Berhampur branch of BG issuing Bank.
3	Tender processing fee	As mentioned in Tender Notice at page -4. (To be paid to K.S.E.D.C.Ltd, Bangalore on e-payment mode. NOTE: For tender processing fee the bidder can use various modes of e-payment facility available through Tender wizard Portal, i.e. by Credit Card, Debit Card, Net Banking).
5	Issue of bid document	FROM : 12.07.2016 , 10.01AM onwards
6	Last date of submission of online tender	Up to 04.08.2016 (5.00 PM)
7	Last date and time of receipt of bid. (Hard Copy)	ON Dt. 05.08.2016 UP TO 01.00 PM
8	Opening of Techno-commercial bid (Part-I)	ON Dt. 05.08.2016 at 03.00 PM

7.0 All correspondence with regard to the above shall be made to the following address:

Rural Electrification CELL, SOUTHCO UTILITY
Corporate Office, Courtpeta
Berhampur – 760004
Ph. No. 9437570141
Email: [rewing.southco@ Southcoodisha.com](mailto:rewing.southco@Southcoodisha.com)

SECTION –II

INSTRUCTION TO BIDDERS (ITB)

**E-TENDER NOTICE NO:-
SOUTHCO UTILITY/ BGJY-33KV LINE/2 Dt.12.07.2016**

SECTION –II

INSTRUCTION TO BIDDERS (ITB)

1. SOURCE OF FUNDS:
 - 1.1 SOUTHCO hereinafter referred to as the “Owner” is desirous of Executing the work for **33KV feeders for linking of 220/33 KV Malkangiri Grid Sub-Station at Daniguda to 33/11 KV Primary S/S at Malkangiri, Kalimela & Pandripani under BGJY scheme, Malkangiri** under SOUTHCO from the funds available under “BGJY” scheme of Govt. of Odisha.
2. SCOPE OF WORK:
 - 2.1 **# Installation of 13 mtr. DP Structure inside GSS**
Installation of 33 KV Line AB Switch with 15 mtr DP Structure
Construction of 4-Pole Structure with switching arrangement for feeding from Dual Grid S/S

33KV Line 11mtr Road crossing DP
Installation of 33 KV OD VCB
Construction of 33 KV 3 PH 3 W Line using 100 mm² AAAC
Installation 33 KV Line AB Switch with 11mtr DP Structure
Guarding for Road crossing/33KV line Crossing/11KV line crossing/River / Canal crossing

Renovation of Existing 33KV Feeder
3. DISCLAIMER:
 - 3.1 This Document includes statements, which reflect various assumptions, which may or may not be correct. Each Bidder should conduct its own estimation and analysis and should check the accuracy, reliability and completeness of the information in this Document and obtain independent advice from appropriate sources in their own interest.
 - 3.2 Neither Owner nor its employees will have any liability whatsoever to any Bidder or any other person under the law or contract, the principles of restitution or unjust enrichment or otherwise for any loss, expense or damage whatsoever which may arise from or be incurred or suffered in connection with anything contained in this Document, any matter deemed to form part of this Document, provision of Services and any other information supplied by or on behalf of Owner or its employees, or otherwise arising in any way from the selection process for the Supply & Errection / provision of Services for the Project.

- 3.3 Though adequate care has been taken while issuing the Bid document, the Bidder should satisfy himself that documents are complete in all respects. Intimation of any discrepancy/ doubt shall be sent to the Owner address for speedy response.
- 3.4 This document and the information contained herein are Strictly Confidential and are for use of only the person (s) to whom it is issued/ downloaded from the website. It may not be copied or distributed by the recipient to third parties (other than in confidence to the recipient's professional advisors).
- 4 COST OF BIDDING:
- 4.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid and SOUTHCO will in no case be responsible or liable for those costs.
5. BIDDING DOCUMENTS:
- 5.1 The Scope of Work, Bidding Procedures and Contract Terms are described in the Bidding Documents. In addition to the covering Letter accompanying Bidding Documents, the Bidding documents include:
- (a) Invitation of Bids (IFB) - Section –I
 - (b) Instruction to Bidders (ITB) - Section –II
 - (c) General Conditions of Contract (GCC) - Section –III
 - (d) Technical Specification - Section –IV
 - (e) Annexure - Section –V
- 5.2 The Bidder is expected to examine the Bidding Documents, including all Instructions, Forms, Terms and Specifications. Failure to furnish all information required in the Bidding documents or submission of a Bid not substantially responsive to the Bidding Documents in every respect will / may result in the rejection of the Bid.
6. AMENDMENT OF BIDDING DOCUMENTS:
- 6.1 At any time prior to the deadline for submission of Bids, the Owner may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by way of issuing an corrigendum/addendum.
- 6.2 The corrigendum/ Addendum shall be part of the Bidding Documents, and it will be notified on the website only. Interested bidders may visit SOUTHCO's website www.southcoodisha.com or www.tenderwizard.com/SOUTHCO for detail enquiry.
- 6.3 In order to afford prospective Bidders reasonable time in which to take the amendment into account in preparing of their Bids, the Owner may, at its discretion, extend the deadline for the submission of Bids.

7. LANGUAGE OF BID:

The Bid, prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the Owner, shall be written in the English Language. Any printed literature furnished by the Bidder may be written in another Language, provided that the literature is accompanied by an English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.

8.0 SUBMISSION OF BID:

8.1 MODE OF SUBMISSION OF BID:-

The bidder shall submit the bid in Electronic Mode only i.e. in www.tenderwizard.com/SOUTHCO portal. The bidder must ensure that the bids are received in the specified website of the SOUTHCO by the date and time indicated in the Tender notice.

8.2 Bids submitted by telex/telegram will not be accepted.

8.3 The SOUTHCO reserves the right to reject any bid, which is not submitted in electronic mode and according to the instruction, stipulated above.

8.4 PARTICIPATION IN e-TENDER:-

8.4.1 ACQUISITION OF DIGITAL SIGNATURE CERTIFICATE

(i) For all the users it is mandatory to procure the Digital Signatures of Class III only.

(ii) Bidders / Contractors are requested to follow the below steps for registration.

8.4.2 REGISTRATION IN TENDER WIZARD PORTAL

(i) Log in www.tenderwizard.com/SOUTHCO Click "Register", fill the online registration Form.

(ii) Payment for an amount of Rs. 2290/- shall be made to KSEDCL, Bangalore for vendor registration in tender wizard portal in e-payment mode only.

The bidders/supplier who have already registered in e-tendering site of SOUTHCO, they need not to pay the registration amount to KSEDCL again for this tender.

(iii) As soon as the verification is being done the e-tender user id will be enabled/provided.

ON LINE REQUEST FOR e-tender DOCUMENTS.

8.4.3

After viewing Tender Notification in www.tenderwizard.com/SOUTHCO if bidder intends to participate in tender, he has to use his e-tendering User Id and Password which has been received after registration and acquisition of DSCs (Digital signature certificate). If any Bidder wants to participate in the tender he has to follow the instructions given below.

(i) Insert the PKI (which consist of your Digital Signature Certificate) in your System. (Note: Make sure that necessary software of PKI be installed in your system).

(ii) Click / Double Click to open the Microsoft Internet Explorer (This icon will be located on the Desktop of the computer).

(iii) Go to Start > Programs > Internet Explorer. Type www.tenderwizard.com/SOUTHCO in the address bar, to access the Login Screen.

(iv) Enter e-tender User Id and Password, click on "Go". Click on "Click here to login" for selecting the Digital Signature Certificate. Select the Certificate and enter DSC Password. Re-enter the e- Procurement User Id Password

(v) Click "Un Applied" to view / apply for new tenders.

(vi) Click on Request icon for online request. After making the request, bidder has to pay the requisite tender processing fee (as indicated in tender notice Page -3) through e-payment facility only available in the portal. Bidders will receive the Tender Documents which can be checked and downloaded by following the below steps.

(vi) Click to view the tender documents which are received by the user. Tender document screen appears.

(vii) Click "Click here to download" to download the documents.

NOTE: For vendor registration and payment of tender processing fee to KESDCL, the bidder can use various modes of e-payment facility available through Tender wizard Portal, i.e. by Credit Card, Debit Card, Net Banking.

9.0

ONLINE SUBMISSION OF BID

9.1

The bidder has to furnish the Tender cost, BID SECURITY (EMD) and a set of hard

copy of supporting documents uploaded in this tender except bid sheets (.xls) prior to last date and time of receipt of bids as specified in tender Notice. Tender processing fees is mandatory & to be paid on e-payment mode as stated elsewhere in the document.

9.2 PROPER FILLING UP OF THE PRICE SCHEDULE:

The bidder should fill up the Techno commercial and price schedule properly and fill in the bid sheets provided in .xls format and up-load the same without changing the file name. The tender may be rejected if the schedule of price is submitted in incomplete form.

NB: The bid sheets (.xls file) shall be uploaded in www.tenderwizard.com/SOUTHCO portal, prior to online closing of the tender. By no other means (except online) price bid shall be accepted for evaluation of tender.

(i) After completing all the formalities Bidders will have to submit the tender as specified NIT and they must take care of all instructions. Prior to submission, verify whether all the required documents have been attached and uploaded to the particular tender or not.

Note down / take a print of bid control number once it displayed on the screen

(ii) Tender Opening event can be viewed online.

(iii) Competitors bid sheets are available in the website for all participated bidders.

NOTES:

For any e-tendering assistant contact help desk number, 080- 40482000(Bangalore). SOUTHCO HELP DESK- 09937140591,

10.0 DEAD LINE FOR SUBMISSION OF BIDS

10.1 Soft copy of the bid shall be uploaded through the portal www.tenderwizard.com/SOUTHCO on or before the online submission time and date as stipulated in the bidding document. DD towards Tender cost, DD/BG towards Bid Security & a set of all required documents (except bid sheets in .xls format) must be received by SOUTHCO at the address specified not later than the time and date stated in the tender notification. In the event of the specified date for the submission of bids being declared a holiday for SOUTHCO, the bids will be received on the next working day as per the time indicated in tender notification.

10.2 SOUTHCO may, at its discretion, extend this deadline for submission of bids by

amending the Bidding Documents in accordance with ITB for the reasons specified therein at any time prior to opening of, in which case all rights and obligations of Employer and bidders will thereafter be subject to the deadline as extended.

11.0 LATE BIDS

11.1 (i) Soft part of the bid will not be uploaded on the portal after expiry of submission time and the bidder shall not be permitted to submit the same by any other mode. In such case, even if the bidder has submitted the specific documents in hard copy in original (viz., bid security, tender cost & any other document) within the stipulated deadline, its bid shall be considered as late bid. The hard copy submitted [specific documents (viz., bid security, tender cost.)] shall be returned unopened to the bidder.

11.2 (ii) Hard copy of the bid security of the bid received by SOUTHCO after the deadline for submission of bid prescribed by the GTCC will be considered as late bid even if the bidder has uploaded the soft part of the bid within the stipulated deadline. In such a case, the soft part of the bid uploaded on the portal shall be sent unopened to "Archive" and shall not be considered at all any further.

12.0 MODIFICATION AND WITHDRAWAL OF BIDS:-

12.1 Bidder may modify or withdraw its bids through the relevant provisions on the portal www.tenderwizard.com/SOUTHCO up to due date and time of submission of bid indicated in tender notification.

12.2 The Bidder's modifications shall be done and submitted as follows:

Modified Electronic form of the bid as per the provision of portal therein.

12.3 Bidder may withdraw its bid through the relevant provisions of portal only.

12.4 No bid shall be modified/ withdrawn subsequent to the dead line for submission of bids. Withdrawal/modification of bid before the expiry of bid validity shall result forfeiture of Bidder's bid security.

13.0 SEALING AND MARKING OF BID:-

13.1 (A) Hard copy of the followings should be submitted with SOUTHCO:

(i) Tender Cost

(ii) Tender processing fee acknowledgement copy.

(iii) Bid Security (EMD) in shape of DD/BG as described.

- (iv) Self attested copies of Work orders (All pages) as a proof of past Work experience.
- (V) Self attested copy of Labour License.
- (Vi) Self attested copy of Valid electrical (HT) license for electrical works.
- (vii) Self attested copy of performance certificate.
- (viii) Self attested copy of Inspection Report for the work experience submitted.
- (ix) Self attested copy of PAN Card, TIN registration certificate with VAT clearance.
- (x) Self attested copy of EPF & ESI: Registration along with last month self attested challan copy
- (xi) Self attested copy of Last 3 yrs. Audited annual reports for companies & partnership firm. In case of individuals, Income Tax returns with audited annual P/L & B/S.
- (xii) Self attested copy of Service Tax Registration along with last month self attested Challan copy
- (xii) All uploaded file except price bid .The same shall be uploaded in
- (Xiii) Registration under Building & other construction workers welfare cess. www.Tenderwizard.com / SOUTHCO portal only.

13.2 First Envelope

- (i) The Electronic Form/Template of the bid for First Envelope (Techno – Commercial bid), as available on the portal, shall be duly filled.
- (ii) Attachments –Scanned copy of documents in support of meeting the Minimum qualifying requirement of the tender (both technical and financial, files named as 1.pdf to 8.pdf).

13.3 Second Envelope:

The Electronic Form/Template of the Price bid (as available on the portal) shall be duly filled up in the xls. Format.

14.0 E.M.D:

- 14.1 The bidder shall submit E.M.D as a part of the bid in the prescribed manner for the amount mentioned in Clause No.4 of Section –I.

14.2 The E.M.D is required to protect the Owner against the risk of bidder's conduct, which would warrant the security's forfeiture.

14.3 The E.M.D shall be in the following form:

A/C payee demand draft in favour of "Administrator, SOUTHCO Utility" issued by a Schedule bank payable at Berhampur.

OR

Bank Guarantee in favour of "Administrator, SOUTHCO Utility" issued by a Schedule bank encashable at local branch at Berhampur only. The BG shall be strictly as per the format enclosed at Section – V, Annexure – XI (A).

NB: In case of any deficiency such as the ownership of the security bond (other than the issuing bank), deviation from the approved format, absence of signature of witness etc. found in the EMD Bank Guarantee, the same shall be liable for rejection upfront. The bidder will not be given any chance to rectify the same.

14.4 Unsuccessful bidder's E.M.D shall be refunded back as promptly as possible, but not later than thirty (30) days after the expiry of the period of bid validity. The successful bidder's E.M.D shall be discharged upon furnishing of the performance security.

14.5 The E.M.D may be forfeited due to following reasons:

- 1) If the bidder withdraws bid during the period of bid validity specified by the bidder in the bid form.
- 2) In case the successful bidder fails to sign the contract in specified time and / or fails to submit the requisite performance Bank guarantee.
- 3) In case of failure to execute the work during the contractual delivery period.

15.0 BID PRICE:

15.1 Bidders have to quote for the entire quantum of work covered under this specification strictly as per the enclosed .xls format. The total Bid Price shall also cover all the Contractor's obligations mentioned in or reasonably to be inferred from the Bidding Documents in respect of Supply, erection, testing, inspection, Transportation to site/stores, all in accordance with the requirement of Tender Documents. The Bidder shall complete the appropriate Price Schedules enclosed in .xls format stating the Unit Price for each item including livable taxes & duties, freight & insurance and thereby arriving at the total amount.

15.2 In case there is any increase or decrease in the Scope as compared to those mentioned in the IFB, the Contract Price shall be subject to increase

proportionately on pro-rata basis.

15.3 The Price offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during implementation of the contract.

15.4 Prices quoted by the Bidder shall be "Firm" and not subject to any price adjustment during the performance of the Contract. A Bid submitted with variable Price or an adjustable price clause shall be treated as non-responsive and rejected out rightly.

16.0 CONTRACT PRICE:

16.1 The Works Prices quoted for the Contract shall remain FIRM as per the above Parameters and Owner shall not compensate Bidder for any variations. However any variation in the taxes & duties within the schedule date of delivery shall be borne by the Owner, else the same shall be borne by the bidder.

17.0 BID CURRENCIES:

17.1 Prices shall be quoted in Indian Rupees Only.

18.0 ALTERNATIVE BIDS:

18.1 Bidders shall submit Bids, which comply with the Tender Documents. Alternative bids shall not be considered for evaluation.

19.0 ONE BID PER BIDDER:

19.1 Each Bidder shall submit only one Bid either by himself, or as a partner in a Joint Venture/Consortium. A Bidder who submits or participates in more than one Bid for the same , either individually or jointly, will cause all those Bids to be rejected out rightly.

20. CLARIFICATION OF BIDS:

To assist in the examination, evaluation and comparison of Bids, the Purchaser may, at its discretion, ask the Bidder for a clarification of its Bid. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted.

SECTION – III

**GENERAL CONDITIONS OF CONTRACT
(GCC)**

TENDER NOTICE NO: SOUTHCO UTILITY/ BGJY-33KV LINE /2

Date: 12.07.2016

1.0 GENERAL: -

SOUTHCO UTILITY hereinafter referred to as the “Owner” is desirous of “**33KV feeders for linking of 220/33 KV Malkangiri Grid Sub-Station at Daniguda to 33/11 KV Primary S/S at Malkangiri, Kalimela & Pandripani under BGJY scheme, Malkangiri**” in Malkangiri district on ‘turnkey’ basis in the licensed area in the state of Odisha as described below:

2.0 Scope of Work: -

2.01 # Installation of 13 mtr. DP Structure inside GSS

Installation of 33 KV Line AB Switch with 15 mtr DP Structure

Construction of 4-Pole Structure with switching arrangement for feeding from Dual Grid S/S

33KV Line 11mtr Road crossing DP

Installation of 33 KV OD VCB

Construction of 33 KV 3 PH 3 W Line using 100 mm² AAAC

Installation 33 KV Line AB Switch with 11mtr DP Structure

Guarding for Road crossing/33KV line Crossing/11KV line crossing/River / Canal crossing

Renovation of Existing 33KV Feeder

2.02 The scope shall include supply and installation of all materials & equipments to complete the works.

- i. Complete manufacture, including shop testing & supply of materials from the approved vendor (materials which are to be supplied by the bidder) on subsequent approval of the owner.
- ii. Providing Engineering drawing, data, operational manual, etc for the Owner’s approval;
- iii. Packing and transportation from the manufacturer’s works to the site.
- iv. Receipt, storage, preservation and conservation of equipment at the site.
- v. Pre-assembly, if any, erection testing and commissioning of all the equipment;
- vi. Reliability tests and performance and guarantee tests on completion of commissioning;
- vii. Loading, unloading and transportation as required.
- viii. Erection of equipments in Line & Sub-station including civil works.
- ix. Erection of lines of specified voltage.
- x. Testing, Commissioning of substations and lines / installations
- xi. Storing before erection
- xii. Getting the substations & lines inspected by Electrical Inspector after completion of work.

3.0 DEFINITION OF TERMS

- (i) The **‘Contract’** means the agreement entered into between the Owner and the Contractor as per the Contract Agreement signed by the parties, including all attachments and appendices there to and all documents incorporated by reference therein.
- (ii) **‘Owner’** shall mean SOUTHCO UTILITY and shall include its legal representatives, successors and assigns.
- (iii) **‘Contractor’** shall mean the Bidder whose bid will be accepted by the Owner for the award of the Works and shall include such successful Bidder’s legal representatives, successors and permitted assigns.
- (iv) **‘Sub-Contractor’** shall mean the person named in the Contract for any part of the works or any person to whom any part of the Contract has been sublet by the contractor with the consent in writing of the Owner and will include the legal representatives, successors and permitted assigns of such person.
- (v) **‘Engineer in Charge’** shall mean the officer appointed in writing by the Owner to act as Engineer from time to time for the purpose of the Contract.
- (vi) **‘Project Manager’** shall mean the Officer who Co-Ordinate all the works.
- (vii) **‘Specifications’** shall mean the specifications and Bidding Document forming a part of the Contract and such other schedules and drawings as may be mutually agreed upon.
- (viii) **‘Site’** shall mean and include the land and other places on, into or through which the works and the related facilities are to be erected or installed and any adjacent land, paths, street or reservoir which may be allocated or used by the Owner or Contractor in the performance of the Contract.
- (ix) **‘Inspector’** shall mean the Purchaser or any person nominated by the Owner from time to time, to inspect the equipment; stores or Works under the Contract and/or the duly authorized representative of the Owner.
- (x) **‘Notice of Award of Contract’/ ‘Letter of Award’** shall mean the official notice issued by the Owner notifying the Contractor that his bid has been accepted.
- (xi) **‘Date of Contract’** shall mean the date on which notice of Award of Contract/ Letter of Award has been issued.
- (xii) **‘Performance and Guarantee Tests’**, shall mean all operational checks and tests required to determine and demonstrate capacity, efficiency, and operating characteristics as specified in the Contract Documents.
- (xiii) The term **‘Final Acceptance’/ ‘Taking Over’** shall mean the Owner’s written acceptance of the works performed under the Contract, after successful commissioning/

completion of Performance and Guarantee Tests, as specified in the accompanying Technical Specifications or otherwise agreed in the contract.

- (xiv) **‘Commercial Operation’** shall mean the condition of operation in which the complete equipment covered under the Contract is officially declared by the Owner to be available for continuous operation at different loads up to and including rated capacity. Such declaration by the Owner, however, shall not relieve or prejudice the Contractor of any of his obligations under the Contract.
- (xv) Words imparting **‘Person’** shall include firms, companies, corporations and associations or bodies of individuals, whether incorporated or not.
- (xvi) Terms and expressions not herein defined shall have the same meaning as are assigned to them in the Indian Sale of goods Act (1930), failing that in the Indian Contract Act (1872) and failing that in the General Clauses Act (1897) including amendments thereof, if any.
- (xvii) In addition to the above the following definition shall also apply
 - a) **‘All equipment and materials’** to be supplied shall also mean **‘Goods’**
 - b) **‘Constructed’** shall also mean erected and installed.
 - c) **‘Contract Performance Guarantee’** shall also mean **‘Contract Performance Security’**.

4.0 EVALUATION OF BIDS & AWARD OF CONTRACT:

- 4.1 To assist in the examination, evaluation and comparison of Bids, the Owner may, at its discretion, ask the Bidder for a clarification of its Bid. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted.
- 4.2 Owner will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bids are generally in order.
- 4.3 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected. If there is a discrepancy between the Total Amount and the sum of the total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.

- 4.4 Prior to the detailed evaluation, Owner will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.
- 4.5 The Owner's evaluation of a Bid will take into account, in addition to the Bid price, the following factors, in the manner and to the extent indicated in this Clause:
- (a) Work Schedule
 - (b) Deviations from Bidding Documents
- 4.6 The Owner will award the Contract to the successful Bidder whose Bid has been determined to be the lowest - evaluated responsive Bid,, when the lowest bidders is not ready and/or capable to undertake the entire work envisaged, then the Owner may explore the possibility of the execution of works through other bidders if they are willing to execute at L₁ rate. Such exploration shall be carried out in a sequential order starting with L₂ bidder then with L₃ bidder and so on.
- 4.7 In case of omission of any item in the price bid or the price for the item has not been quoted by the firm, then zero cost shall be loaded to the bid and the contract shall be awarded with zero cost that means the firm will have to bear the cost of that item entirely as the item price shall be considered as inclusive anywhere in other items. The bidder shall have to give an undertaking to the effect that prices for any item not quoted shall be treated as free supply or to be done free of cost.

5.0 OWNER'S RIGHT TO VARY QUANTITIES AT TIME OF AWARD:

While placing orders and / or during execution of contract, Owner reserve the right to increase or decrease the quantity of goods and services specified in the Schedule of Requirement up to **20%** of the tender quantity without any change in price or other terms and conditions.

6.0 INSPECTION AND TESTING:-

- 6.1 All the materials shall be inspected by the Owner or any authorized representative of the Owner or jointly by the Owner/Owners Authorized Representatives with the Third Party Inspection Evaluation Agency (TPIEA) for the BGJY Programme as per relevant ISS at the Contractor's or its Sub-Vendors manufacturing works. They shall give the advance notice in

writing about the place of Inspection and or testing at least 15 days before the schedule date on which the materials will be ready for Inspection & Testing

- 6.2 The Engineer-in-charge shall be entitled at all reasonable times during manufacture / installation to inspect examine and test the materials at the contractor's premises / erection site about workmanship of the materials to be supplied under this contract. If the said materials are being manufactured in other premises, the contractor shall provide unhindered clearance, giving full rights to the purchaser to inspect, examine and test as if the materials were being manufactured in his premises. Such inspection / examination and testing shall not relieve the contractor of his obligations to execute the contract by letter and spirit. The contractor shall give the purchaser advance notice in writing of the Date and the Place at which the materials will be ready for testing. The inspecting officer coordinating office for the entire work shall be the Owner's authorized representative.

7.0 COMPLETION AND COMPLETENESS OF THE EQUIPMENT:-

- 7.01 Time being the essence of the contract; the work shall be completed within **3 (Three)** months from the date of issue of work order.
- 7.02 The work shall be treated as complete item wise when one item shall be complete in all respects with all mountings, fixtures and standard accessories which are normally supplied even though not specifically detailed in the specification. No extra payment shall be payable for such mounting, fittings, fixtures and accessories which are needed for safe operations of the equipment as required by applicable code of the country though this might not have included in the contract.
- 7.03 All similar components and/or parts of similar equipment supplied shall be inter-changeable with one another. Various equipments supplied under this contract shall be subject to Owner's approval.
- 7.04 Owner however reserves the right to re-schedule the completion period, if required.

8.0 REJECTION OF MATERIALS: -

In the event of the materials supplied by the contractor and/or the installation works are found to be defective in quality and the workmanship is poor or otherwise not in conformity with the requirements of the contract specification as per section-IV (Technical

specification), Owner shall reject such materials / services and ask the contractor in writing to replace / rectify the defects. The contractor on receipt of such notification shall rectify or replace the defective materials and/or re-install the work already executed, free of cost to the Owner. If the contractor fails to do so the Purchaser may at his option take the following actions which could be on concurrent basis.

- A) Replace or rectify such defective materials and recover the extra cost so involved plus 25% from the Contractor.
- B) Terminate the contract for balance supply and erection with enforcement of penalty as per contract.
- C) Acquire the defective materials at reduced price considered acceptable under the circumstances.
- D) Forfeit the Contract Performance Bank Guarantee.

9.0 EXPERIENCE OF BIDDERS: -

The bidders are required to furnish information regarding their experience on the following aspects as per format provided in Section – V, Annexure.

- i. Description of similar type of work with same or higher voltage level executed during the last three years with the name(s) of the party(s) to whom / where supplies / erection were made.
- ii. The list of testing equipments/ facilities available to execute the contract covering both OSM and supply by the Contractor himself. Also the area of access of the Contractor through other agency must be indicated.
- iii. Purchase / work orders details (P.O / W.O No. and date only) executed (construction work) during the last three years along with Electrical inspection report copies and copies of user's performance certificates.

Bids may not be considered if the past performance is found to be un-satisfactory.

10.0 DEVIATION FROM SPECIFICATION: -

The bidders are requested to study the specification and the attached drawings thoroughly before tendering so that if they make any deviations, the same are prominently brought on a separate sheet under the headings "Deviations" as per formats provided under Section V, Annexure. All such deviations to the technical & commercial terms of the specification shall

be indicated in a separate list as indicated above. In absence of such deviation schedule, it will be presumed that the bidder has accepted all the conditions stipulated in the tender specification, notwithstanding any deviations mentioned elsewhere in the Bid. However the acceptance of deviation is not binding on the Owner.

11.0 CONTRACTOR TO INFORM HIMSELF FULLY: -

The contractor shall examine the instructions, general conditions of the contract, specifications and the schedule of quantity and delivery to satisfy himself as to all the terms and conditions and circumstances affecting the contract price. He shall quote prices according to his own judgment and shall understand that no additional cost except as quoted shall only be considered.

12.0 PATENT RIGHT: -

The contractor shall indemnify the Owner against all claims, actions, suits and proceedings for the alleged infringement any patent design or copy right protected either in country of origin or in India by the use of any equipment supplied by the contractor but such indemnity shall not cover any use of the equipment other than for the purpose indicated by or reasonable to be informed from the specification.

13.0 GUARANTEE PERIOD: -

13.01 The materials to be supplied by the contractor shall be guaranteed for satisfactory operation against defects in design and workmanship for a period of **24 months** from the date of handing over the completed installations after commercial operation at required voltage level.

13.02 The above guarantee certificate shall be furnished in triplicate to the Owner for his approval. Any defects noticed during the above period should be rectified by the Contractor free of cost to the Utility provided such defects are due to faulty design, bad workmanship or bad materials used on receipt of written notice from the Owner. The Contractor as notified by the Owner shall rectify any such defects within one month failing which the Owner will set right the defects through other agency and recover the cost so incurred either from any pending Invoices or Bank Guarantee.

14.0 PENALTY FOR DELAY IN COMPLETION OF CONTRACT: -

- 14.01 If the contractor fails to complete the works by the scheduled period or any extension granted thereby, the contractor shall be liable for payment of penalty amounting to **0.5% (half percent)** of the contract price per week of un-finished works subject to the maximum of **5% (five percent)** of the total contract price and subject to force majeure conditions. After receipt of LOA, the Contractor shall sign a contract agreement with the Owner within 15 days along with the detail work plan through PERT chart/BAR chart. The penalty for liquidated damage as mentioned above will be levied if any deviation to be schedule on any item of work due to the fault of the contractor is observed.
- 14.02 Penalty amount can be realized from the proceeds of the Contract Performance Bank Guarantee, if the situation so warrants.
- 14.03 Extension of delivery period could be with / without levy of penalty with the discretion of Owner.

15.0 RIGHT OF WAY:

Right of way issues, if any, arising during execution of the works shall have no liability on the Owner. These issues shall be settled at the sole discretion of the Contractor. The Owner shall however extend all possible help to the Contractor including discussion with the local authorities for early resolution of these issues.

16.0 CONTRACTOR'S DEFAULT:

- 16.01 If the Contractor neglects to execute the works with due diligence and expedition or refuses or neglects to comply with any reasonable order given to him, in writing by the Engineer in connection with the works or contravenes the provisions or the contract, the Owner may give notice in writing to the Contractor to make good the failure, neglect or contravention complained of. Should the Contractor fail to comply with the notice within thirty (30) days from the date of serving the notice, the Owner shall be at liberty to employ other workmen and forthwith execute such part of the works as the contractor may have neglected to do or if the Owner thinks fit, without prejudice to any other right, he may have under the Contract to take the work wholly or in part out of the Contractor's hands and re-contract with any other person or persons to complete the works or any part thereof and in that event the Owner shall

have free use of all Contractor's equipment that may have been at the time on the Site in connection with the works without being responsible to the Contractor for fair wear and tear thereof and to the exclusion of any right of the Contractor over the same, and the Owner shall be entitled to retain and apply any balance which may otherwise be due on the Contract by him to the Contractor, or such part thereof as may be necessary, to the payment of the cost of executing the said part of works or of completing the works as the case may be. If the cost of completing of works or executing part thereof as aforesaid shall exceed the balance due to the Contractor, the Contractor shall pay such excess. Such payment of excess amount shall be independent of the liquidated damages for delay which the Contractor shall have to pay if the completion of works is delayed.

16.02 In addition, such action by the Owner as aforesaid shall not relieve the Contractor of his liability to pay liquidated damages for delay in completion of works.

16.03 Such action by the Owner as aforesaid the termination of the Contract under this clause shall not entitle the Contractor to reduce the value of the Contract Performance Guarantee nor the time thereof. The Contract Performance Guarantee shall be valid for the full value and for the full period of the Contract including guarantee.

17.0 TERMINATION OF CONTRACT ON OWNER'S INITIATIVE:

17.01 Owner reserves the right to terminate the Contract either in part or in full due to reasons other than those mentioned under clause entitled 'Contractor's Default'. The Owner shall in such an event give fifteen (15) days notice in writing to the Contractor of his decision to do so.

17.02 The Contractor upon receipt of such notice shall discontinue the work on the date and to the extent specified in the notice, make all reasonable efforts to obtain cancellation of all orders and Contracts to the extent they related to the work terminated and terms satisfactory or the Owner, stop all further sub-contracting or purchasing activity related to the work terminated, and assist Owner in maintenance, protection, and disposition of the works acquired under the Contract by the Purchaser. In the event of such a termination the Contractor shall be paid compensation, equitable and reasonable, dictated by the circumstance prevalent at the time of termination to be determined by the arbitrator without stopping the work but to carry out the left over work to other agency.

17.03 If the Contractor is an individual or a proprietary concern and the individual or the proprietor dies and if the Contractor is a partnership concern and one of the partners dies then unless the Owner is satisfied that the legal representatives of the individual Contractor or of the proprietor of the propriety concern and in the case of partnership, the surviving partners, are capable of carrying out and in the case of partnership, the surviving partners, are capable of carrying out and completing the Contract the Owner shall be entitled to cancel the Contract as to its uncompleted part without being in any way liable to payment of any compensation to the estate of deceased Contractor and /or to the surviving partners of the Contractor's firm on account of the cancellation of the contract. The decision of the Owner that the legal representatives of the deceased Contractor or surviving partners of the Contractor's firm cannot carry out and complete the contract shall be final and binding on the parties. In the event of such cancellation the Owner shall not hold the estate of the deceased Contractor and/or the surviving partners of the Contractor's firm liable to damages for not completing the Contract.

18.0 FORCE MAJEURE: -

The Contractor shall not be liable for any penalty for delay or for failure to perform the contract for reasons of Force Majeure such as "acts of God, acts of the Public enemy, acts of Govt., Fires, Flood, Epidemics, Quarantine restrictions, Strikes, Freight Embargos and provided that the Contractor shall within ten (10) days from the beginning of such delay notify the Owner in writing of the cause of delay. The Owner shall verify the facts and grant extension as facts justify.

19.0 EXTENSION OF TIME: -

If the delivery of the equipments / materials is delayed due to reasons beyond the control of the Contractor, the Contractor shall immediately inform within 3 days to the Owner in writing of his claim for an extension of time. The Owner on receipt of such notice may agree to extend the contract period as may be reasonable but without prejudice to other terms & conditions of the contract.

20.0 SAFETY PRECAUTIONS:-

The agency shall observe all applicable regulations regarding safety at the Site. Any compensation due on account of accident at site shall be to the contractor's account.

21.0 STORE:-

Storing of materials from supply to erection shall be arranged by the contractor at his own cost. No compensation shall be made by the Owner for any damage or loss of materials during storing, transit transportation and at the time of erection.

22.0 INSURANCE: - Contractor shall arrange adequate Transit-cum-storage-cum-erection policy and shall submit the copy of the same to the Owner. The policy shall initially remain valid for a period of sixty days over & above of the contractual guarantee period and shall be extended as required till handing over. Contractor shall be responsible for lodging of claim with the insurer as well as for all required follow up with the insurer for settlement of claim in case of loss/damage/theft of material during transit/storage/erection till the completed works is handed over to the Owner and is accepted by the authorized representative of the Owner in writing.

Contractor shall also arrange adequate cover for his employees / labourers engaged in the works as well as arrange third party insurance cover to indemnify any possible damages to public at large not connected with the works process. Any claim(s) pertaining to this shall be the responsibility of the Contractor.

The contractor shall undertake free replacement of the materials damaged or lost during transit, which will be intimated by the Consignee within 30 days of receipt of the materials at Owner's stores.

23.0 ENGINEER IN CHARGE:-

Concerned Divisional Head / authorized engineer of the Owner shall be the Engineer in charge for the Project.

23.01 Project Manager:-

Officer as appointed by the Owner shall be the project manager for the entire Project.

24.0 CONTRACT PERFORMANCE BANK GUARANTEE:-

- 24.01 Within 15 days of issue of the Work Order or Letter of Award, whichever is earlier, the Contractor shall submit Contract Performance Bank Guarantee issued by a scheduled Bank, in favour of the Owner, covering 10% of the total value of the work order,
- 24.02 The said Bank Guarantee shall be prepared in the prescribed proforma as attached in Section V, Annexure. The Bank Guarantee furnished shall be executed on Non-judicial Stamp paper worth of Rs 100/- (Rupees Hundred only), purchased in the name of

the issuing bank, as per the prevalent rules. **The Bank Guarantee so provided shall be encashable on the Berhampur branch of the issuing Bank.**

- 24.03 The Contract Performance Bank Guarantee shall remain valid for a period not less than 90 days over and above the guarantee period, basing on stipulated completion period in the W.O. towards security and acceptance thereof, failing which the work orders (W.O) will be liable for cancellation without any further notice with forfeiture of E.M.D.
- 24.04 No interest shall be allowed by the Owner on the above Performance Security Deposit.

25.0 TERMS OF PAYMENT:

- 25.01 80% (Eighty percent) of contract price on pro-rata basis along with taxes and duties shall be paid progressively for each completed items of work certified by the Jr. Manager, Asst. Manager/SDO concerned against each calendar month by first week of the succeeding months along with utilization certificate. No payment shall be released if the accounts for utilization of materials **unless** follow with proper certification by the concerned Jr. Manager, Asst. Manager/SDO/Engineer-in-charge within 30 days of submission of claim subject to certification by Owner's Project Manager on the basis of check points involved in such items of work.
- 25.02 Balance 20% (twenty percent) of contract price shall be paid after completion of all works, envisaged under this package including any additions and alterations, testing & commissioning, return of dismantled materials/ un-used free supply material, taking over certificate and entire stretch is fully ready for commercial operation. The payments shall be subjected to clearance from electrical inspectorate.

Note: In case of joint venture/consortium Performance Bank Guarantee shall be provided by the Lead Partner @ 10% and additional 1% by each JV Partner(s).

26.0 PAYING OFFICER:

Owner shall notify the paying officer for the project.

27.0 OWNER'S RIGHTS: -

The Owner reserves the right to accept any bid or reject any or all bids or cancel / withdraw invitation of bid or to vary the quantity for placement of order without assigning any reason to such decision. Such decision by the Owner shall bear no liability.

28.0 DISTINCT MARK ON EQUIPMENT AND MATERIALS:

All the equipments and materials required for the works shall have distinct mark of Owner either by way of punching on metal part(s) and/or in built during casting and/or painting as per common practice and/or as mutually agreed. This should be clearly visible in day light in naked eye.

29.0 DISPUTE RESOLUTION AND JURISDICTION: -

- (a) Any disputes arising out of this contract shall be referred to the Authorised Officer, Southco Utility who shall decide the case as sole Arbitrator.
- (b) For the purpose of dispute resolution, this agreement shall be governed by the provision of Arbitration and Conciliation Act, 1996.
- (c) All disputes shall be subjected to exclusive jurisdiction of the Courts at Berhampur and the writ jurisdiction of Hon'ble High Court of Odisha at Cuttack.

30.0 TRANSFER AND SUB-LETTING

The Contractor shall not sublet, transfer, assign or otherwise part with the Contract or any part thereof, either directly or indirectly, without prior written permission of the Owner.

31.0 FREE ISSUE OF MATERIALS

No free Issue of Material.

32.0 SUBMITTALS REQUIRED AFTER AWARD OF CONTRACT

- 32.01 Within 30 days of the effective date of contract the contractor shall provide three copies of an outline program of testing, delivery, survey, erection, pre-commissioning and commissioning in chart form. Included in the program will be the detailed schedule of drawing to be submitted.
- 32.02 The periodic progress report as required by the Owner shall be submitted by the contractor as per the format prescribed by the Engineer in Charge.

33.0 DRAWINGS

Within 15 days of contract commencement the contractor shall submit, for approval by the Engineer in Charge, a schedule of the drawings to be produced. The schedule shall also provide a program of drawing submission, for approval by the Engineer in Charge. All drawings and design should be submitted to Engineer-In-Charge within the period specified above.

34.0 APPROVAL PROCEDURE OF SUB VENDORS & DRAWINGS OF BOUGHT OUT MATERIALS

- 34.01 The contractor shall submit all drawings, documents and test reports, QAP, Name of Sub vendor, samples (as applicable) etc, to the engineer in charge within 15 days of award of LOA for approval. If modifications to be made if such are deemed necessary, the contractor has to resubmit them for approval without delaying the initial deliveries or completion of the contract work.
- 34.02 Three copies of all drawings, GTP, QAP shall be submitted for approval and three copies for any subsequent revision.
- 34.03 If the drawings will be as per the technical specifications, the **Project Manager** of the Purchaser will return the drawings & documents to the contractor marked with “Approved” stamp.

35.0 TAKING OVER

- 35.1 Upon successful completion of all the tests to be performed at site on equipment / materials supplied, erected and commissioned by the contractor, the supply engineer shall issue to the contractor a taking over certificate as a proof of the final acceptance of the equipment / materials on a written request within 10 days of commercial operation. Such certificate shall not be un-reasonably withheld nor will the engineer delay the issuance thereof on account of minor omission or defects, which do not affect the commercial operation and / or cause any serious to the equipment/material. The conditional Taking over Certificate can be issued if any minor omission or defects pointed by the Engineer-in-Charge/Supervising Officer/Electrical Inspector. The Contractor should rectify those defects within a month of conditional T.O.C failing which Owner will rectify those by replacing those materials or engaging other agencies. The amount so involved will be fully recovered from the Contractor's bill. Such certificate shall, however, not relieve the contractor of any of his obligations which otherwise survive by the terms & conditions of the contract after issuance of such certificate.
- 35.2 For the satisfaction of Owner about quality, the Owner shall have unreserved right for arrangement of testing of equipment/ materials and the complete system independently by self or any other agency chosen by the Owner. The contractor is expected to agree and extend necessary help during such test if necessary.

36.0 LATENT DEFECT WARRANTY

- 36.1 The period of latent defect warranty in terms of this bidding documents, shall be limited to five (05) years from the date of completion of Guarantee period.

37.0 EMBOSSING / PUNCHING / CASTING / PAINTING

- 37.1 The all equipments and materials supplied /erected under the BGJY Programme shall bear distinct mark of "Name of the Purchaser, BGJY Programme, W/O Order No. & Date" by a painting. This should be clearly visible to naked eye.

38.0 INDEMNIFY

38.1 The Contractor, its successor and assignee shall indemnify the Owner, its successor and assignee from all current & future liabilities that may arise out of Turn Key Contract(s) entered into between the Owner & the Contractor under this BGJY Programme. The Owner in term shall indemnify the GoO.

SECTION - IV

(TECHNICAL SPECIFICATIONS)

E-Tender Notification No.:
SOUTHCO/BGJY-33 KV Line/2
Dt. 12.07.2016

1.0 NATURE OF WORK

The work covered by this Specification is for 33 KV distribution lines as specified herein and in the attached Schedules. The overhead distribution lines will form part of the SOUTHCO's distribution System.

1.1 GENERAL PARTICULARS OF THE SYSTEM

The following are the general particulars governing the design and working of the complete system of which the Works will form a part —

- a) Electrical energy is transmitted from 132/33 KV or from 220/33 KV grid S/S of OPTCL to SOUTHCO's Primary 33/11 KV sub-stations as three-phase supply at a frequency of 50 Hz, and transmitted there from by means of overhead lines.
- b) The system will be in continuous operation during the varying atmospheric and climatic conditions occurring at all seasons.

1.2 SCOPE-

- (A) Construction of 33 KV New Lines and 2nos of road Crossing DP & Guarding.
- (B) Installation of 33 KV Line AB Switch with DP Structure
- (C) Installation of New 33/0.4 KV 500KVA Plinth Mounted S/S, DP Structure with Brick Machinery Boundary Wall & Plinth.
- (D) Installation of 33 KV Line AB Switch with DP Structure
- (E) DP Structure for Installation of 33 KV/110V, 5/5 A Metering Unit
- (F) Installation of 33 KV Metering Unit arrangement.

The department will provide 33 KV Metering Unit with accessories to be received from southco's store. All other items required for the construction of works are to be supplied by the contractor.

DISCLAIMER:

This Document includes statements, which reflect various assumptions, which may or may not be correct. Each Bidder/Bidding Consortium should conduct its own estimation and analysis and should check the accuracy, reliability and completeness of the information in this Document and obtain independent advice from appropriate sources in their own interest.

Neither Purchaser nor its employees will have any liability whatsoever to any Bidder or any other person under the law or contract, the principle of restitution or unjust enrichment or otherwise for any loss, expense or damage whatsoever which may arise from or be incurred or suffered in connection with anything contained in this Documents and mater deemed to form part of this documents, provision of services and any other information supplied by or on behalf of purchaser or its employees, or otherwise arising in any way from the selection process for the supply.

Though adequate care has been take while issuing the Bid document, the Bid document, the Bidder should satisfy itself that documents are complete in all respects. Intimation for any discrepancy shall be given to this office immediately.

2.0 SURVEY (detail & check, estimating of quantities)

Survey shall have to be carried out to establish the Route alignment by the contractor for new 33 KV lines. If the line is passing in any Municipal/ NAC areas permission from local bodies has to be obtained prior to execution of work. Suitable distance from the side of the road has to be made towards placement of line poles.

2.0.1 GENERAL: Preliminary route alignment in respect of the proposed 33KV transmission lines has been fixed by the employer subject to alteration of places due to way leave or other unavoidable constraints. The Right of way shall be solved by the contractor and all expenses there of shall be borne by him. However, SOUTHCO UTILITY shall render all helps in co-ordination with law and order department for solving the same. Involvement of Forest land should be restricted as far as possible.

2.0.2 The contractor shall undertake detailed survey on the basis of the tentative alignment fixed by the employer. The said preliminary alignment may, however, change in the interest of economy to avoid forest and hazards in work. While surveying the alternative route the following points shall be taken care by the contractor.

- (a) The line is as near as possible to the available roads in the area.
- (b) The route is straight and short as far as possible.

- (c) Good farming areas, religious places, forest, civil and defense installations, aerodromes, public and private premises, ponds, tanks, lakes, gardens, and plantations are avoided as far as practicable.
- (d) The line should be far away from telecommunication lines as reasonably possible. Parallelism with these lines shall be avoided as far as practicable.
- (e) Crossing with permanent objects are minimum but where unavoidable preferably at right angles.
- (f) Difficult and unsafe approaches are avoided.
- (g) The survey shall be conducted along the approved alignment only.
- (h) For river crossing/ Crossing of Nallas : Taking levels at 25 meter interval on bank of river and at 50 meter interval at bed of river so far as to show the true profile of the ground and river bed railway/road bridge, road The levels shall be taken at least 100 m. on either side of the crossing alignment. Both longitudinal and cross sectional shall be drawn preferably to a scale of 1:2000 at horizontal and 1:200 vertical.

After completing the detailed survey, the contractor shall submit the final profile and tower schedule/ pole schedule (with no. of stay or struct) for final approval of the employer. To facilitate checking of the alignment, suitable reference marks shall be provided. For this purpose, concrete pillars of suitable sizes shall be planted at all angle locations and suitable wooden/iron pegs shall be driven firmly at the intermediate points. The contractor shall quote his rate covering these involved jobs.

2.0.5 (a) Optimization of Pole Location

I. Pole Spotting

To optimize the line length, the contractor shall spot the poles in such a way so that the line is as close as possible to the straight line drawn between the start & end point of the line.

II. Crossings

Road Crossings:- At all road crossings, the double tension HW fittings should be used. There should absolutely no joints in the conductors in all road, power line and all other major crossing. The ground clearance from the road surfaces under maximum sag condition

shall be not less than 8.5mtr over roads. In National High way the minimum height of guarding at the maximum sagging point should be less than 8.5 mts.

Power Line Crossings-

Where the line is to cross over another line of the same voltage or lower voltage, provisions to prevent the possibility of their coming into contact with each shall be made in accordance with the Indian Electricity Rules.

III. Details En-route

After survey and finalization of route, the contractor shall submit detailed route map for each line. This would be including following details:

All poles on both sides of all the crossings shall be tension poles i.e. disc type insulators shall be used on these poles. At all the crossing described above the contractor shall use protective guarding as per REC Construction Standard A-1 to fulfill statutory requirements for 33 KV trunks & main spur line. 33 KV branch spur line, being in the village, protective guarding shall be used wherever it will be required.

Clearance from Ground, Building, Trees etc. – Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended up to date. The vendor shall select the height of the poles in order to achieve the prescribed electrical clearances.

IV. Final Schedule

The final schedule including Bill of quantity indicating location of poles specifically marking locations of failure containment pole/structure, DTs 11 KV line sectionalizes, line tapping points; angle of deviation at various tension pole locations, all type of crossings and other details shall be submitted for the approval of the owner. After approval, the contractor shall submit six more sets of the approved documents along with one set in reproducible form to purchaser for record purpose.

V. Danger Boards

The vendor shall provide & install danger plates on all 33kv DP structures , H pole structures and towers besides in all poles where DT is installed. The danger plates shall conform to REC specification No. 57/1993.

VI. Anti-climbing Devices

The vendor shall provide and install anti-climbing device on all 33kv DP structures, towers and at all poles as per CEA guide line. This shall be done with G.I. Barbed wire or modified spikes as specified. The barbed wire shall conform to IS-278 (Grade A1). The barbed wires shall be given chromatin dip as per procedure laid down in IS: 1340.

VII. Fittings Common to all Line

Pin Insulator Binding: The contractor shall use AL. Binding wire for binding shall be as per REC Construction Standards No. C-5 or better thereof.

Mid Span Compression Joint & Repair Sleeves: The contractor shall supply & install the Mid Span Compression Joint and Repair Sleeves as per IS: 2121 (Part II).

Guy/Stay wire Clamp: The contractor shall supply & install Guy/Stay wire Clamp as per REC Construction Standard G-1 or better here of as specified..

VIII. Stay/Guy Sets

- a) The Stay/Guys shall be used at the following pole locations;
 - At all the tapping points & dead end poles
 - At all the points where DT is to be installed
 - At all the points as per REC construction dwg. No. A-10 (for the diversion angle of 10-60 degree)
 - At every alternative pole for 33 KV line (two sets)
 - Both side poles at all the crossing for road, nallaha, railway crossings etc.
- b) The arrangement and number of stay sets to be installed on different pole structures shall be as per REC Construction Standards no. A-23 to A-27, G-5 & G-8. However, this shall be decided finally during erection, as per the advice of Engineer.
- c) The stay set to be installed complete in all respect and would broadly consist of following items:

7/8 SWG G.I. Stay wire for 33 kV lines as per REC Specification No.46/1986 Stay Insulator type C for 33 kV line as per REC Specification No. 21/1981, Turn Buckle. Anchor rod and plate (Hot Dipped galvanized). Thimbles and Guy Grip Complete stay set shall be as per REC Construction Standards no. G-1. The stay clamp is envisaged as GS structure along with other clamps brackets etc.

IX. Erection of stay sets

The contractor shall install the stay set complete in all respect. This includes excavation of pit in all kinds of soil with PCC in the ratio 1:2:4 as specified which shall be placed in the bottom of the pit.

The rest (upper half) of the pit shall be filled with excavated soil duly compacted layer by layer. An angle between 30 to 45 degrees shall be maintained between stay wire and the pole. The stay wire shall be used with a stay insulator at a height of 5 mts. above ground level with F.I. turn buckle.

X. Stringing and Installation of Line with Bare Conductors.

General

The scope of erection work shall include the cost of all labour, tools and plants such as tension stringing equipment and all other incidental expenses in connection with erection and stringing work. The Bidders shall indicate in the offer the sets of stringing equipment he would deploy exclusively for work under each package.

The stringing equipments shall be of sufficient capacity to string AAA conductor ACSR conductor.

The Contractor shall be responsible for transportation to site of all the materials to be provided by the Contractor as well as proper storage, insurance etc. at his own cost, till such time the erected line is taken over by the owner.

Contractor shall set up required number of stores along the line and the exact location of such stores shall be discussed and agreed upon with the owner.

Insulator Fixing

Pin insulators shall be used on all poles while strain insulators shall be used on all angle & dead end poles. The special type Pin Insulators should be used for conductors more than 80 mm². Damaged insulators and fittings, if any, shall not be used. Prior to fixing, all insulators shall be cleaned in a manner that shall not spoil, injure or scratch the surface of the insulator, but in no case shall any oil be used for this purpose. Torque wrench shall be used for fixing various line materials and components, such as suspension clamp for conductor, whenever recommended by the manufacturer of the same.

Running Out of the Conductors

The contractor shall be entirely responsible for any damage to the pole or conductors during stringing. The conductors shall be run out of the drums from the top in order to avoid damage to conductor

A suitable braking device shall be provided to avoid damaging, loose running out and kinking of the conductors. Care shall be taken to ensure that the conductor does not touch and rub against the ground or objects, which could scratch or damage the strands.

The sequence of running out shall be from the top to down i.e. the top conductor shall be run out first, followed in succession by the side conductors. Unbalanced loads on poles shall be avoided as far as possible.

Wherever applicable, inner phase off-line conductors shall be strung before the stringing of the outer phases is taken up.

When lines being erected run parallel to existing energized power lines, the Contractor shall take adequate safety precautions to protect personnel from the potentially dangerous voltage build up due to electromagnetic and electrostatic coupling in the pulling wire, conductors and earth wire during stringing operations.

The Contractor shall also take adequate safety precautions to protect personnel from potentially dangerous voltage build up due to distant electrical storms or any other reason.

Repairs to Conductors

The conductor shall be continuously observed for loose or broken strands or any other damage during the running out operations. Repair to conductors, if necessary, shall be carried out with repair sleeves and not more than one repair sleeve will be used in one span.

Repairing of the conductor surface shall be carried out free of cost only in case of minor damage, scuff marks, etc. The final conductor surface shall be clean, smooth and free from projections, sharp points, cuts, abrasions etc. After compression the sharp edges must be smoothed by filing.

The Contractor shall be entirely responsible for any damage to the poles, insulators etc during stringing.

Stringing of Conductor

The stringing of the conductor shall be done by the standard stringing method.

The Bidder shall submit complete details of the stringing method for owner's approval. Conductors shall not be allowed to hang in the stringing blocks for more than 96 hours before being pulled to the specified sag.

Derricks/ scaffoldings or other equivalent methods shall be used to ensure that normal services are not interrupted and any property is not damaged during stringing operations for roads, telecommunication lines, power lines and railway lines. However, shut-down shall be obtained when working at crossings of overhead power lines. The contractor shall make specific request for the same to the owner.

Jointing

When approaching the end of a drum length at least three coils shall be left in place when the stringing operations are stopped. These coils are to be removed carefully, and if another length is required to be run out, a joint shall be made as per the recommendations of the accessories manufacturer.

Conductor splices shall not crack or otherwise be susceptible to damage during stringing operation. The Contractor shall use only such equipment/methods during conductor stringing which ensures complete compliance in this regard.

All the joints on the conductor shall be of compression type, in accordance with the recommendations of the manufacturer, for which all necessary tools and equipment like compressors, dies etc., shall be arranged by the contractor. Each part of the joint shall be cleaned by wire brush till it is free of rust or dirt, etc. This shall be properly greased with anti-corrosive compound if recommended by the manufacturer, before the final compression is carried out with the compressors.

All the joints or splices shall be made at least 30 meters away from the pole. No joints or splices shall be made in spans crossing over main roads, railway line and Small River spans. Not more than one joint per conductor per span shall be allowed. The compression type fittings shall be of the self-centering type or care shall be taken to mark the conductors to indicate when the fitting is centered properly.

During compression or splicing operation, the conductor shall be handled in such a manner as to prevent lateral or vertical bearing against the dies. After compressing the joint, the Aluminium sleeve shall have all corners rounded; burrs and sharp edges removed and smoothed.

To avoid any damage to the joint, the contractor shall use a suitable protector for mid span compression joints in case they are to be passed over pulley blocks/aerial rollers. The pulley groove size shall be such that the joint along with protection can be passed over it smoothly.

In case of ACSR conductors the filler compound should be used during compression. In case AAAC is used each press should overlap 25% of the previous press.

Tensioning and Sagging Operations:

The tensioning and sagging shall be done in accordance with the approved stringing charts or sag tables.

The sag shall be checked in the first and the last section span for sections up to eight spans and in one additional intermediate span for sections with more than eight spans Tensioning and sagging operations shall be carried out in calm weather when rapid changes in temperature are not likely to occur.

Clipping In

Clipping of the conductors into position shall be done in accordance with the manufacturer's recommendations.

Jumpers at section and angle towers shall be formed to parabolic shape to ensure maximum clearance requirements. Pilot pin insulator shall be used, if found necessary, to restrict jumper swing & to ensure proper clearance to design values.

Fasteners in all fittings and accessories shall be secured in position. The security clip shall be properly opened and sprung into position.

Fixing of Conductors and Earth wire Accessories

Conductor and earth wire accessories supplied by the Contractor shall be installed by the Contractor as per the design requirements and manufacturer's instructions. While installing the conductor and earth wire accessories, proper care shall be taken to ensure that the

surfaces are clean and smooth and that no damage occurs to any part of the accessories or of the conductors.

Replacement:

If any replacements are to be effected after stringing and tensioning or during maintenance e.g. replacement of cross arms, the conductor shall be suitably tied to the pole at tension points or transferred to suitable roller pulleys at suspension points.

HT/LT/Road Crossing Guarding

The contractor shall provide & install protective guarding as per REC construction standard for both 33 and 11 kV line, The guarding shall be provided at all the crossing i.e. road, telecommunication & power lines, railway line, nallaha etc.

The contractor is required to follow local statutory regulations stipulated in Electricity (Supply) Act 1948, Indian Electricity Rules 1956 as amended and other local rules and regulations referred in these specifications.

Reference Standards

The codes and/or standards referred to in the specifications shall govern, in all cases wherever such references are made. In case of a conflict between such codes and/or standards and the specifications, latter shall govern. Such codes and/or standards, referred to shall mean the latest revisions, amendments/changes adopted and published by the relevant agencies unless otherwise indicated. Other internationally accepted standards which ensure equal or better performance than those specified shall also be accepted, subject to prior approval by the owner. In case no reference is given for any item in these specifications, latest REC specification & Construction Standards shall be referred to.

2.0.6 SPAN

1. The span should be as near as possible to the basic design span so that the minimum ground clearance should not less than 7.0 mts in cross country at maximum sag condition.(The span length should be applicable for both 33KV& 11 KV lines.)
2. In urban areas minimum in every Half KM one angle tower (Cut point) has to be provided.
3. In other areas in every 1.5 KM one angle tower (Cut point) may be provided.

2.0.7 WAY-LEAVE AND TREE CUTTING

Way-leave permission which may be required by the contractor shall be arranged at his cost. While submitting final-survey report for approval, proposals for way-leave right of way shall be submitted by the contractor. Employer may extend help to get the permission within a reasonable time as mutually agreed upon for which due notice shall be given by the contractor in such a way so that obtaining permission from appropriate authority do not hinder the continued and smooth progress of the work.

The employer shall not be held responsible for any claim on account of damage done by the contractor or his personnel to trees, crops and other properties.

The contractor shall take necessary precaution to avoid damage to any ripe and partially grown crops and in the case of unavoidable damage, the employer shall be informed and necessary compensation shall be paid by the contractor.

All the documents required for application to the statutory authorities must be prepared by the contractor & submitted to the employer for submission of the application towards approval of Railway Crossing etc. However, the responsibilities lie with the contractor to get the clearance.

Trimming of tree branches or cutting of a few trees en-route during survey is within the scope of survey to be done by the contractor. Contractor shall arrange for necessary way-leave and compensation in this regard. During erection of the line, compensation for tree cutting, damage caused to crops, actual cutting and falling of the trees including way-leave permission for such route clearance shall be arranged by the contractor at his cost. The contractor will identify the number of trees and detail of obstructions to be removed for erection of the line and intimate the employer well in advance in case of any help. Other related works like construction of temporary approach roads, etc. as required, shall be done by the contractor and the same will lie within the scope of contractor's work and such cost shall be considered to be included in the rates quoted by him.

3.0 CONDUCTOR

In normal practice AAAC conductors of 80 Sq mm will be used in 33 KV lines.

3.0.1 ROAD CROSSING (Cross country, Village pucca roads)

At all major road crossings, the angle towers/ poles shall be provided. The ground clearance above the roads should not be less than 8.5 mts. Double tension fittings should be provided in every road crossing span. Guarding should be provided in each road crossing.

3.0.2 POWER LINE CROSSINGS

Where the lines cross over another line of the same voltage or lower voltage, provisions to prevent the possibility of its coming into contact with other overhead lines shall be made in accordance with the Indian Electricity Rules, 1956 as amended from time to time. All the works related to the above proposal shall be deemed to be included in the scope of the Contractor.

3.0.3 TELECOMMUNICATION LINE CROSSINGS

- a) The angle of crossing shall be as near to 90 degree as possible. However, deviation to the extent of 20 degree may be permitted under exceptionally difficult situations. The existing line route may be changed where required.
- b) HT line shall be routed with requisite suppression with parallel telecom line to avoid inductance during faults.

3.0.4 DETAILS EN -ROUTE

All topographical details, permanent features, such as trees, telecommunication lines, building etc. 7.5 mtr (33 kV) and 3.5 mtr (11 kV) on either side of the alignment shall be detailed on the route plan before execution of work. However, any problems arising out of Right of way, shall be taken care of by the Contractor. The owner shall extend all possible Co-operation.

3.0.5 CLEARANCE FROM GROUND, BUILDING, TREES ETC.

3.0.5.1 Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended up to date. The bidder shall select the height of the poles such that all electrical clearances are maintained.

3.0.5.2 Guarding mesh shall be used in all electric line / telecom line / road / drain / canal crossing and at all points as per statutory requirements. The bidder shall provide & install anti

climbing devices and danger plates on all poles and DT stations. Where there is no such provision in the existing line.

3.0.5.3 Pole accessories like danger plates, and number plates shall be provided.

4.0 ERECTION WORK

When the survey is approved, the contractor shall submit to the employer a complete detail schedule of all materials to be used in the line. Size and length of conductor etc. are also to be given in the list. This schedule is very essential for finalizing the quantities of all line materials. The contractor shall furnish the same.

4.1 SCHEDULE OF ERECTION PROGRAMME

After due approval of the detailed and check survey, the contractor shall submit to the employer a complete detailed schedule of erection programme with a Bar-Chart for construction of the lines indicating there in the target date of completion

A. TECHNICAL SPECIFICATION FOR ALL ALUMINIUM ALLOY CONDUCTOR (AAAC)

1. SCOPE

This specification covers design, Engineering, Manufacture, Testing, Inspection before dispatch, forwarding, packing, transportation to sites, Insurance (both during transit & storage), storage, erection, supervision testing & commissioning of all sizes of All Aluminum Alloy Conductors of the aluminum – magnesium- silicon type for use in the distribution overhead power lines of SOUTHCO of Orissa.

The material offered shall have been successfully type testes and the design shall have been satisfactory operation for a period not less than two years on the date of bid opening. Compliance shall be demonstrated by submitting with the bid, (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

The scope of supply includes the provision of type test, Rates of type tests shall be given in the appropriate price schedule of the bidding document and will be considered for evaluation. The Purchaser reserves the right to waive type tests as indicated in the section on Quality Assurance, Inspection and Testing in the specification.

The Aluminum Alloy Conductor shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or materials, which, in his

judgment, is not in full accordance therewith.

2. STANDARDS

Except where modified by the specification, the Aluminum Alloy Conductor shall be designed, manufactured and tested in accordance with latest editions of the following standards.

IEC/ISO/ Other International Standard	IS	Subject
IEC :1089		Round wire concentric lay overhead electrical standard conductors
	IS 398	Aluminum Alloy Stranded Conductors
	IS 9997	Aluminum Alloy redraw rods for electrical purposes
IEC 502 : 1994		Extruded solid dielectric insulated power cables for rated voltages 1.0 KV up to 30 KV
IEC 104		Aluminum Magnesium Silicon alloy wire for overhead line conductors
	IS 1778	Reels and drums of bare conductor.
BS : 6485-1971		PVC covered conductors for overhead power lines.

This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the contractor of the necessity of providing the goods complying with other relevant standards or recommendations.

3. GENERAL

The wires shall be of heat treated aluminum, magnesium silicon alloy containing approximately silicon-0.5 to 0.9 %. magnesium-0.6 % to 0.9%, Fe-0.5% (maximum) , Copper- 0.1% (max) , mn-0.03% , Cr-0.03%, Zn-0.1%, B-0.06%, and having the mechanical and electrical properties specified in the table and be smooth and free from all imperfections, such as, spills, splits and scratches.

Neutral grease shall be applied between the layers of wires. The drop point temperature of the grease shall not be less than 120⁰ C.

3.1 Mechanical and Electrical Characteristics of Aluminium Alloy Wires used in the Construction of Stranded Aluminium Alloy Conductors

Nominal Diameter	Minimum Diameter	Max. Diameter	Cross Sectional Area	Mass	Minimum Breaking Load		Maximum Resistance at 20 ⁰ C
					Before stranding	After stranding	
1	2	3	4	5	6	7	8
Mm	Mm	mm	mm ²	Kg/km	KN	KN	ohms/km

3.15	3.12	3.18	7.793	21.04		2.29	4.290
3.81	3.77	3.85	11.40	30.78	3.52	3.34	2.938
4.26	4.22	4.30	14.25	38.48	4.40	4.18	2.345

Maximum resistance values given in column 8 have been calculated from the maximum values of the resistivity as specified and the cross sectional area based on the minimum diameter.

The minimum breaking load is calculated on nominal diameter at ultimate tensile strength of 0.309 KN / mm² for wire before stranding and 95% of the ultimate tensile strength after stranding.

4. PHYSICAL CONSTANTS FOR ALUMINIUM ALLOY WIRES

4.1 Resistivity :

For the purpose of this specification, the standard value of resistivity of aluminum alloy wire which shall be used for calculation is to be taken as 0.0325 ohm mm² /m at 20⁰ C. the maximum value of resistivity of any single wire shall not , however, exceed 0.0328 ohm. mm²/m at 20⁰ C

4.2 Density :

At a temperature of 20⁰ C, the density of aluminum alloy wire is to be taken as 2700 kg/m³.

4.3 Temperature Coefficient of Linear Expansion :

The temperature coefficient of linear expansion of aluminium alloy wire is to be taken as $23 \times 10^{-6} / ^{\circ}C$

4.4 Constant – Mass Temperature Coefficient

At a Temperature of 20⁰ C, the constant – mass temperature coefficient of resistance of aluminum alloy wires, measured between two potential points rigidly fixed to the wire, is taken as 0.00360/⁰ C

5. STANDARD SIZES

5.1 Nominal Sizes of Wires

The aluminum alloy wires for standard constructions covered by this specification shall have the diameters as specified in the table and a tolerance of ±1% shall be permitted on the nominal diameter.

5.2 Standard Conductors

The sizes, resistance and masses (excluding the mass of grease) of stranded aluminum alloy conductors shall be as given in table.

5.3 Mechanical and Electrical Characteristics of Aluminum Alloy Stranded

Conductors

Sl. No.	Actual Area	Stranding and Wire Dia	Approx. Overall Dia	Approx. Mass	Calculated Maximum Resistance at 20 ⁰ C	Approx Calculated Breaking Load
1	2	3	4	5	6	7
	Mm ²	mm	mm	kg/km	ohms/km	KN
1	55	7/3.15	9.45	149.20	0.9900	10.11
2	80	7/3.81	11.43	218.26	0.4250	23.41
3	100	7/4.26	12.78	272.86	0.3390	29.26

5.3.1 Increase in Length due to Stranding

When straightened out, each wire in any particular layer of a stranded conductor, except the central wire, is longer than the stranded conductor by an amount depending on the lay ratio of that layer.

5.3.2 Resistance and Mass of Conductor

The resistance of any length of stranded conductor is the resistance of the same length of any one wire multiplied by a constant as set out in the table below.

The mass of each wire in any particular layer of the stranded conductor, except the central wire, will be greater than that of an equal length of straight wire by an amount depending on the lay ratio of that layer. The total mass of any length of an aluminum stranded conductor is, therefore, obtained by multiplying the mass of an equal length of straight wire by an appropriate constant as mentioned below. In calculating the stranding constants as mentioned in the table below, the mean lay ratio, that is the arithmetic mean of the relevant minimum and maximum values in table for lay ratio has been assumed for each layer.

5.3.3 Calculated Breaking Load of Conductor

- For a conductor containing not more than 37 wires, 95% of the sum of strength of the individual wires calculated from the values of the minimum breaking load given in this specification.
- For a conductor containing more than 37 wires, 90% of the sum of the strengths of the individual wire calculated from the values of the minimum breaking load given in this specification.

5.3.4 Calculated Area and Maximum Resistance of Conductor

The actual area of a stranded conductor has been taken as the sum of the cross-sectional areas of the individual wires of nominal diameter.

Maximum resistance values of stranded conductor have been calculated on the basis of maximum

resistivity and the cross-sectional area based on the minimum diameter of wires.

5.4 Stranding Constants

Number of Wires in Conductor	Stranding Constants	
	Mass	Electrical Resistance
(1)	(2)	(3)
7	7.091	0.1447
19	19.34	0.05357

6. JOINTS IN WIRES

6.1 Conductor containing seven wires

There shall be no joint in any wire of a stranded conductor containing seven wires, except those made in the base rod or wire before final drawing.

6.2 Conductors containing more than seven wires

In stranded conductors containing more than seven wires, joints in individual wires are permitted in any layer except the outermost layer (in addition to those made in the base rod or wire before final drawing) but no two such joints shall be less than 15 m apart in the complete stranded conductor. Such joints shall be made by cold pressure butt welding. They are not required to fulfill the mechanical requirements for unjointed wires.

7. STRANDING

The wire used in the construction of a stranded conductor shall, before and after stranding, satisfy all the relevant requirements of this standard.

The lay ratio of the different layers shall be within the limits given in the table for lay ratio.

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

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

7.1 Lay Ratios for Aluminum Alloy Stranded Conductors

Number of Wires in Conductor	LAY RATIOS							
	3/6 Wire Layer		12 Wire Layer		18 Wire Layer		24 Wire Layer	
	Min	Max	Min	Max	Min	Max	Min	Max
7	10	14	---	---	---	---	---	---
19	10	16	10	14	---	---	---	---

NOTE: For the purpose of calculation the mean lay ratio shall be taken as the arithmetic mean of the relevant minimum and maximum values given in this table

8. LENGTHS AND VARIATIONS IN LENGTHS:

Unless otherwise agreed between the Employer and the Contractor, stranded aluminum alloy conductors shall be supplied in the manufacturer's usual production lengths to be indicated in the bid Schedule. The Employer reserves the right to specify particular lengths of conductor such that certain drum lengths will be shorter than others. There will in both cases be a permitted variation of $-0 + 5\%$ in the length of any one conductor length.

9. TESTS

9.1 Type Tests

The test sample shall be drawn from the 1st lot of conductor offered for inspection & shall be sent to CPRI/NABL Accredited Laboratory for testing .The following tests shall be carried out as per relevant ISS :

9.1.1 Ultimate Tensile Strength Test

This test is intended to confirm not only the breaking strength of the finished conductor but also that the conductor has been uniformly stranded.

A conductor sample of minimum 5 m length fitted with compression dead end clamps at either end shall be mounted in a suitable tensile test machine. Circles perpendicular to the axis of the conductor shall be marked at two places on its surface. Tension on the conductor sample shall be increased at a steady rate upto 50% of the minimum UTS specified and held for one minute. The circles drawn shall not be distorted due to relative movement of the individual strands. Thereafter the load shall be increased at a steady rate to the specified minimum UTS and held at that load for one minute. The conductor sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

9.1.2 D.C Resistance Test

On a conductor sample of minimum 5 m length two contact clamps shall be fitted with a pre-determined bolt torque. The resistance between the clamps shall be measured using a Kelvin double bridge by initially placing the clamps at zero separation 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 20⁰ C, which shall conform to the requirements of this specification.

9.2 Routine Tests

Measurement of Physical Dimensions: The samples should meet the desired dimensional requirements before conducting following Routine Tests as per relevant ISS.

9.2.1 Selection of Test Samples

Samples for the tests specified in this specification shall be taken by the manufacturer before stranding, from not less than 10% of the individual lengths of aluminium alloy wire included in any one final heat-treatment batch and which will be included in any one consignment of the stranded conductors to be supplied.

Alternatively, if desired by the SOUTHCO at the time of placing an order, that the tests be made in the presence of his representative, samples of wire shall be taken from length of stranded conductor.

Samples shall then be obtained by cutting 1.2 meters from the outer end of the finished conductor from not more than 10% of the finished reels or drums.

Tests for electrical and mechanical properties of aluminum alloy wire shall ordinarily be made before stranding since wires unlaidd from conductors may have different physical properties from those of the wire prior to stranding because of the deformation brought about by stranding and by straightening for test.

Spools offered for inspection shall be divided into equal lots, the number of lots being equal to the number of samples to be selected, a fraction of a lot being counted as s complete lot. One sample spool shall be selected at random from each lot.

9.2.2 Breaking Load Test

The breaking load of one specimen, cut from each of the samples taken shall be determined by means of a suitable tensile testing machine. The load shall be applied gradually and the rate of separation of the jaws of the testing machine shall be not less than 25 mm / min and not greater than 100mm /min.

9.2.3 Elongation Test

The elongation of one specimen cut from each of the samples taken shall be determined as follows:

The specimen shall be straightened by hand and an original gauge length of 200 mm shall be marked on the wire. A tensile load shall be applied as described above and the elongation shall be measured after the fractured ends have been fitted together. If the fracture occurs outside the gauge marks, or within 25 mm of either mark, and the required elongation is not obtained, the test shall be disregarded and another test should be made.

When tested before and after stranding, the elongation shall not be less than 4% on a gauge length of 200 mm.

9.2.4 D.C Resistance Test

The electrical resistance test of one specimen cut from each of the samples taken shall be measured at ambient temperature. The measured resistance shall be corrected to the value at 20⁰ C by means of the formula:

$$R_{20} = R_T \left[\frac{1}{1 + \alpha (T-20)} \right]$$

where ,

R_{20} = resistance corrected at 20⁰ C

R_T = resistance measured T⁰C

α = constant – mass temperature coefficient of resistance, 0.0036, and

T = ambient temperature during measurement.

The resistance corrected at 20⁰ C shall not be more than the maximum values specified.

9.2.5 Chemical Analysis of Aluminum Alloy

Samples taken from the alloy coils / strands shall be chemically / spectrographically analyzed. The results shall conform to the requirements stated in this specification. The contractor shall make available material analyses, control documents and certificates from each batch as and when required by the **Purchaser**.

Test should be conducted at the independent test house by the purchaser in the case of absence Of facility at manufacturer. However the cost of such testing shall be borne by the manufacturer.

9.2.6 Dimensional and Lay Length Check

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

Ten percent drums from each lot shall be rewound in the presence of the Purchaser or his representative to allow visual checking of the conductor for joints, scratches or other surface imperfections and to ensure that the conductor generally conforms to the requirements this specification. The length of conductor wound on the drum shall be re-measured by means of an approved counter / meter during the rewinding process.

9.2.7 Visual and dimensional Checks on the Conductor Drums.

The drums shall be visually and dimensionally checked to ensure that they conform to the requirements of this specification and of IS 1778: Specification for reels and drums of bare conductors. For wooden drums, a suitable barrel batten strength test procedure is required. The Bidder shall state in his bid the tests to be carried out on the drums and shall include those tests in the Quality Assurance Programme.

9.2.8 Acceptance Tests :

All tests required to confirm enclosed Guaranteed Technical Particulars (GTP) requirements of this specification needs to be conducted as Acceptance Tests.

10. REJECTION AND RETESTS

10.1 Type Tests

Should the conductor fail any of the type tests specified above, the Purchaser will not accept any conductor manufactured from the material, nor conductor made by the manufacturing methods used for the conductor which failed the test.

10.2 Routine Tests

Should any one of the test pieces first selected fail the requirements of the tests, two further samples from the same batch shall be selected for testings, one of which shall be from the length from which the original test sample was taken unless that length has been withdrawn by the manufacturer.

Should the test pieces from both these additional samples satisfy the requirements of the tests, the batch represented by these samples shall be deemed to comply with the standard. Should the test pieces from either of the two additional samples fail, the batch represented shall be deemed not to comply with the standard.

If checks on individual strand diameters, conductor lay lengths and conductor surface condition indicate non-compliance with the requirements of the specification, the particular drum will be rejected.

Inspection will then be carried out on two further drums within the same batch. If the conductor on either of the drums is non-complaint, the complete batch will be rejected.

The below schedule is to be duly signed by the bidder with seal and must enclose with part-1 bid document.

GUARANTEED TECHNICAL PARTICULARS FOR AAAC				
Sl. No.	Particulars	80mm ² AAAC	100 mm ² AAAC	55mm ² AAAC
1	Nominal Aluminium Alloy area of conductor in mm ²	80	100	55
2	No. of strands	7	7	7
3	Wire dia in mm.:			
	Nominal	3.81	4.26	3.15
	Minimum	3.77	4.22	3.18
	Maximum	3.85	4.3	3.12
4	Approximate overall dia of the conductor in mm.	11.43	12.78	9.45
5	Cross-sectional area of:			
	Individual wire in mm ²	11.4	14.25	
	Stranded conductor in mm ²	80	99.81	54.55
6	Approximate mass of :			
	Individual wire in Kg/Km	30.78	38.48	
	Stranded Conductor in Kg/Km	218.26	272.86	149.20
7	Minimum breaking load in KN			
	Individual wire	3.34	4.18	2.29
	Conductor (U.T.S.)	23.41	29.26	16.03
8	Calculated maximum DC resistance at 20 °C in Ohm/ Km			
	Individual wire	2.938	2.345	
	Conductor	0.425	0.339	0.621
9	Lay ratio for 7 wire conductor	Min	Max	
		10	14	
10	Direction of Lay	Right hand		
11	Modulus of Elasticity (Kg/cm ²) for 7 wire	0.6324 x 10 ⁶		
12	Co-efficient of linear expansion per ° C	23.0 x 10 ⁻⁶		
13	Standard length (Mtr.)	2000 ± 5%		

14	Size of drum in mm.	To be offered by the bidder	To be offered by the bidder	
15	No. of lengths in one drum	To be offered by the bidder	To be offered by the bidder	
16	No. of cold pressure butt welding	Nil		

B. PSC Pole (10mtr x 300Kg)

TECHNICAL SPECIFICATIONS

I. Qualification Criteria of Sub Vendor / Manufacturer:-

The prospective bidder may source PSC Poles from manufacturers who should have supplied at least the following quantity of PSC Poles to Electricity Supply Utilities / PSUs. The bidder should enclose Performance Certificates from the above users, issued in favour of the Sub Vendor / manufacturer, as proof of successful operation in field.

Sl. No.	Size	Minimum Past Supply Qty
1	9 Mtr. X 300 Kg	200
2	10 Mtr. X 300 Kg	200

Applicable Standard:

The Poles shall comply with latest standards as under:

REC Specification No. 15/1979, REC Specification No. 24/1983, IS 1678, IS 2905, IS 7321.

II. Materials :

Cement

Cement to be used in the manufacture of pre-stressed concrete poles shall be ordinary for rapid hardening Portland cement confirming to IS: 269-1976 (Specification for ordinary and low heat Portland cement) or IS: 8041 E-1978 (Specification for rapid hardening Portland cement).

Aggregates

Aggregates to be used for the manufacture of pre-stressed concrete poles shall confirm to IS: 383 (Specification for coarse and fine aggregates from natural sources for concrete) .The nominal maximum sizes of aggregates shall in no case exceed 12 mm.

Water

Water should be free from chlorides, sulphates, other salts and organic matter. Potable water will be generally suitable.

Admixture

Admixture should not contain Calcium Chloride or other chlorides and salts which are likely to promote corrosion of pre-stressing steel. The admixture shall conform to IS: 9103.

Pres-Stressing Steel

Pre-stressing steel wires including those used as un tensioned wires should conform to IS:1785 (Part-I) (Specification for plain hard-drawn steel wire for pre-stressed concrete, Part-I cold drawn stress relieved wire).IS:1785 (Part-II)(Specification for plain hard-drawn steel wire) or IS:6003 (Specification for indented wire for pre-stressed concrete).The type design given in the annexure are for plain wires of 4 mm diameter with a guaranteed ultimate strength of 160 kg/mm². All pre-stressing steel shall be free from splits, harmful scratches, surface flaw, rough, aged and imperfect edges and other defects likely to impair its use in pre-stressed concrete.

Concrete Mix

Concrete mix shall be designed to the requirements laid down for controlled concrete (also called design mix concrete) in IS: 1343-1980 (Code of practice for pre-stressed concrete) and IS: 456 – 1978 (Code of practice for plain and reinforced concrete) subject to the following special conditions:

Minimum works cube strength at 28 days should be at least 420 Kg/cm².

The concrete strength at transfer should be at least 210 Kg/cm².

The mix should contain at least 380 Kg of cement per cubic meter of concrete.

The mix should contain as low water content as is consistent with adequate workability. It becomes necessary to add water to increase the workability the cement content also should be raised in such a way that the original value of water cement ratio is maintained.

III. Design Requirements

The poles shall be designed for the following requirements:

The poles shall be planted directly in the ground with a planting depth as per IS: 1678. Wherever, planting depth is required to be increased beyond the specified limits or alternative arrangements are required to be made on account of ground conditions e.g. water logging etc., the same shall be in the scope of the bidder at no extra cost to owner. The bidder shall furnish necessary design calculations/details of alternative arrangements in this regard.

The working load on the poles should correspond to those that are likely to come on the pole during their service life.

The factor of safety for all poles 9.0Mts. Shall not be less than 2.0 and for 8.0 M poles, the factor of safety shall not be less than 2.5.

The average permanent load shall be 40% of the working load.

The F.O.S. against first load shall be 1.0.

At average permanent load, permissible tensile stress in concrete shall be 30 kg/cm².

At the design value of first crack load, the modulus of rupture shall not exceed 53.0kg/cm² for M-40.

The ultimate moment capacity in the longitudinal direction should be at least one fourth of that in the transverse direction.

The maximum compressive stress in concrete at the time of transfer of pre-stress should not exceed 0.8 times the cube strength.

The concrete strength at transfer shall not be less than half, the 28 days strength ensured in the design, i.e. $420 \times 0.5 = 210 \text{ kg/cm}^2$. For model check calculations on the design of poles, referred to in the annexure, a reference may be made to the REC “Manual on Manufacturing of solid PCC poles, Part-I-Design Aspects”.

IV. Dimensions and Reinforcements

The cross-sectional dimensions and the details of pre-stressing wires should conform to the particulars given in the enclosed drawing. The provisions of holes for fixing cross-arms and other fixtures should conform to the REC specification No.15/1979.

Manufacture

All pre-stressing wires and reinforcements shall be accurately fixed as shown in drawings and maintained in position during manufacture. The un-tensioned reinforcement as indicated in the drawings should be held in position by the use of stirrups which should go round all the wires.

All wires shall be accurately stretched with uniform pre-stress in each wire. Each wire or group of wires shall be anchored positively during casing. Care should be taken to see that the anchorages do not yield before the concrete attains the necessary strength.

V. Cover

The cover of concrete measured from the outside of pre-stressing tendon shall be normally 20 mm.

VI. Welding and Lapping of Steel

The high tensile steel wire shall be continuous over the entire length of the tendon. Welding shall not be allowed in any case. However, joining or coupling may be permitted provided the strength of the joint or coupling is not less than the strength of each individual wire.

VII. Compacting

Concrete shall be compacted by spinning, vibrating, shocking or other suitable mechanical means. Hand compacting shall not be permitted.

VIII. Curing

The concrete shall be covered with a layer of sacking, canvass, Hessian or similar absorbent material and kept constantly wet up to the time when the strength of concrete is at least equal to the minimum strength of concrete at transfer of pre-stress. Thereafter, the pole may be removed from the mould and watered at intervals to prevent surface cracking of the unit the interval should depend on the atmospheric humidity and temperature. The pre-stressing wires shall be de-tensioned only after the concrete has attained the specified strength at transfer (i.e. 200 or 210 kg/cm² as applicable). The cubes cast for the purpose of determining the strength at transfer should be cured, as far as possible, under condition similar to those under which the poles are cured. The transfer stage shall be determined based on the daily

tests carried out on concrete cubes till the specified strength indicated above is reached. Thereafter the test on concrete shall be carried out as detailed in IS: 1343 (code of practice for pre-stressed concrete). The manufacture shall supply, when required by the owner or his representative, result of compressive test conducted in accordance with IS: 456 (Code of practice for plain and reinforced concrete) on concrete cubes made from the concrete used for the poles. If the manufacture so desired, the manufacture shall supply cubes for test purpose and such cubes shall be tested in accordance with IS: 456 (Code of practice for plain and reinforced concrete).

IX. Holes for Cross Arms etc

Sufficient number of holes shall be provided in the poles for attachment of cross arms and other equipment's.

X. Stacking & Transportation

Stacking should be done in such a manner that the broad side of the pole is vertical. Each tier in the stack should be supported on timber sleeper located as 0.15 times the overall length, measured from the end. The timber supported in the stack should be aligned in vertical line.

XI. Earthing

(a) Earthing shall be provided by having length of 6 SWG GI wire embedded in Concrete during manufacture and the ends of the wires left projecting from the pole to a length of 100mm at 250 mm from top and 1000 mm below ground level.

(b) Earth wire shall not be allowed to come in contact with the pre-stressing wires

- 1 All the poles shall be provided with a RCC block base or MS base plate having dimensions as mentioned at 5.0.2 © as per the site requirement to be decided by Engineer in Charge. The decision of Engineer in Charge will be Final.

5.0.5.2 The poles shall then be lifted to the pit with the help of wooden supports. The pole shall then be kept in the vertical position with the help of 25 mm (min.) manila ropes, which will act as the temporary anchor. The verticality of the pole shall be checked by spirit level in both longitudinal & transverse directions. The temporary anchor shall be removed only when **poles set properly in the pit for foundation concreting & backfilling with proper compacting the soil. The backfilling should be done in layers (maxm. 0.5 mts at a time with sprinkling of water and by using wooden hammer. No stone more than 75 mm should be used during back filling.**

5.0.5.3 Suspension type H/W fittings in all tangent locations and Four pair bolted type tension H/W fittings should be used in all new 33&11 Kv lines. 45 KN & 70 KN normal B&S insulators will be used in suspension & tension locations respectively.

5.0.5.4 Concreting of foundation up to a minimum height of 1.8 mtrs from the bottom of the pit with a circular cross-section of radius 0.25 mtrs. (volume of 0.3 cu.mtr. per pole) in the ratio of 1:2:4 shall be done at the following locations: The **depth** has to be increased to 2mtr or as required at site condition if poles more than 11 Mts. are to be used.

- i) At all the tapping points and dead end poles.
- ii) At all the points as per REC construction dwg. No. A-10 (for the diversion angle of 10-60 degree) or **better there of as per the instruction of Engineer in charge. The decision of Engineer in charge will be final.**
- iii) Both side poles at all the crossing for road, Nallaha railway crossings etc.
- iv) Where Rail poles, Joist poles, double pole and four pole structures are to be erected.

6.0. Earthing of Support

6.0.1 Each pole shall be earthed with coil type earthing as per REC Construction Standard J-1.

6.0.2 All DP & Four pole structures & the poles on both sides of railway crossing shall be earthed by providing two nos. **pipe earthing as per Drawing provided by SOUTHCO.**

C. EARHTING COIL

TECHNICAL SPECIFICATION

I. Qualification Criteria of Manufacturer:-

The prospective bidder may source Earthing Coil from manufacturers who must qualify all the following requirements:

- a) The manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.
- b) The manufacturer should have supplied at least 1000 no's to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

II. SCOPE

The specification covers design, manufacture, testing and dispatch to the owner's stores of Earthing Coils for use in earthing of the HT & LT poles.

III. GENERAL REQUIREMENTS

Earthing coils shall be fabricated from soft GI Wire Hot Dip Galvanized. The Hot Dip galvanized wire shall have clean surface and shall be free from paint enamel or any other poor conducting material. The coil shall be made as per REC constructions standard.

The Hot Dip galvanizing shall conform to IS: 2629/1966, 2633/1972 and 4826/1969 with latest amendments.

IV. TESTS

Galvanizing Tests

Minimum Mass of Zinc

On GI Wire used 280 gm/m²

After Coiling-266 gm/m².The certificate from recognized laboratory shall be submitted towards mas of zinc.

Dip Test

Dip test shall stand 3 dips of 1 minute and one dip of ½ minute before coiling and 4 dips of 1 minute after coiling as per IS: 4826/1979

Adhesion Test

As per ISS 4826 – 1979.

V. DIMENSIONAL REQUIREMENT

Nominal dia of GI Wire -4 mm (Tolerance±2.5%)

Minimum no. of turns – 115 Nos.

External dia of Coil (Min) – 50 mm

Length of Coil (Min) – 460 mm

Free length of GI Wire at one end coil (Min.) – 2500 mm

The turns should be closely bound. Weight of one finished Earthing Coils (min.) – 1.850 Kg.

6.0.4 EXTENSION POLE

Pole with pole extension arrangement up to two **to three** meters (**in case** of 33 KV new **Mini base** GI tower structure) shall be used at low ground level locations for maintaining ground clearance and for road crossings for HT Lines.

7.0 PROVISION OF GUYS/STRUT POLES TO SUPPORTS

7.0.1 The arrangement for guys shall be made wherever necessary. Strut poles/flying guys wherever required shall be installed on various pole locations as per REC construction standards. In order to avoid guys/ Strut self-supported GI poles/ structures may be used.

7.0.2 In this work anchor type guy sets are to be used. These guys shall be provided at following locations where guys are damaged or not provided.

- (i) Angle locations
- (ii) Dead end locations
- (iii) T-off points
- (iv) Steep gradient locations.
- (v) Double Pole, & four pole

The stay rod should be placed in a position so that the angle of rod with the vertical face of the pit is 30^0 to 45^0 as the case may be maximum movement for tightening or loosening.

7.0.3 If the guy wire proves to be hazardous, it should be protected with suitable asbestos pipe filled with concrete of about 2 m length above the ground level, painted with white and black strips so that, it may be visible at night.

7.0.4 The guy insulator should have a minimum vertical clearance of 3.5 mtr from the ground.

D. HT STAY SETS

TECHNICAL SPECIFICATION

I. Qualification Criteria of Manufacturer:-

The prospective bidder may source Stay Sets from manufacturers only must qualify all the following requirements:

- a) Manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.
- b) The manufacturer should have supplied at least 1000 sets (both HT & LT taken together) to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

II. SCOPE

This specification covers design, manufacture, testing and dispatch of HT stay sets 20 mm dia.

III. GENERAL REQUIREMENTS

20 mm Dia Stays Sets for 33 Kv,11 KV Lines (Galvanized) HT Stay Set

The Stay Set (Line Guy Set) will consist of the following components:

Anchor Rod with one Washer and Nut

Overall length of Rod should be 1800mm to be made out of 20 mm dia GI rod one end threaded up to 40 mm length with a pitch of threads per cm. And provided with one square G.I Washer of Size 50x50x1.6mm and one GI Hexagonal nut conforming to IS: 1363:1967 & IS:1367:1967. Both washer and nut to suit the threaded rod of 20mm. The other end of the rod to be made into a round eye having an inner dia of 40mm with best quality of welding. Dimensional and other details are indicated and submitted by bidders for owner's approval before start of manufacturing.

Anchor Plate Size 300 x 300 x 8 mm

To be made out of G.S. Plate of 8 mm thickness. The anchor plate to have at its centre 22mm dia hole.

Turn Buckle, Eye Bolt with 2 Nuts.

To be made of 20 mm dia G.I Rod having an overall length of 450 mm. One end of the rod to be threaded up to 300 mm length with a pitch of 4 threads per cm. The 20 mm dia bolt so made shall be provided with two G.I Hexagonal nuts of suitable size conforming to IS: 1363:1967 & IS: 1367:1967. The other end of the rod shall be rounded into a circular eye of 40mm inner dia with proper and good quality of welding. Welding details are to be indicated by the bidder separately for approval.

Bow with Welded Channel:

To be made out of 16mm dia G.I Rod. The finished bow shall have an overall length of 995 mm and height of 450 mm. The apex or top of the bow shall be bent at an angle of 10R. The other end shall be welded with proper and good quality welding to a G.I Channel 200 mm long having a dimension of 100x50x4.7 mm. The Channel shall have 2 holes of 18 mm dia and 22 dia hole at its centre as per drawing No.3 enclosed herewith.

Thimble 2 Nos.

To be made of 1.5 mm thick G.I sheet into a size of 75x22x40mm and shape as per standard.

Galvanizing

The complete assembly shall be hot dip galvanized.

Welding

The minimum strength of welding provided on various components of 16mm and 20 mm dia stay sets shall be 3100 kg & 4900 kg respectively. Minimum 6mm fillet weld or its equivalent weld area should be deposited in all positions of the job i.e. at any point of the weld length. The welding shall be conforming to relevant IS: 823/1964 or its latest amendment.

Threading

The threads on the Anchor Rods, Eye Bolts and Nuts shall be as per specification IS; 4218:1967 (ISO Metric Screw Threads). The Nuts shall be conforming to the requirements of IS: 1367:1967 and have dimension as per IS 1363:1967. The mechanical property requirement of fasteners shall conform to the properly clause 4.6 each for anchor rods and Eye bolt and property clause 4 for nuts as per IS: 1367:1967.

Average weight of finished 20 mm Stays Set: 14.523 Kg.(Min) (Excluding Nuts Thimble & Washer) :15.569 Kg.(Max.)

IV. TESTS

The contractor shall be required to conduct testing of materials at Govt./Recognized testing laboratory during pre-dispatch inspection for Tensile Load of 3100 Kg/4900Kg. applied for one minute on the welding and maintained for one minute for 16 mm and 20mm dia stay sets respectively.

V. IDENTIFICATION MARK

All stay sets should carry the identification mark of the Purchaser (SOUTHCO) applicable. This should be engraved on the body of stay rods to ensure proper identification of the materials. The nuts should be of a size compatible with threaded portion of rods and there should be not play or slippage of nuts.

Welding wherever required should be perfect and should not give way after erection.

VI. TOLERANCES

The tolerances for various components of the stay sets are indicated below subject to the condition that the average weight of finished stay sets of 16mm dia excluding nuts, thimbles and washers shall not be less than the weight specified above:-

E. STAY WIRE (7/8SWG) & (7/10 SWG)

TECHNICAL SPECIFICATIONS

I. Qualification Criteria of Manufacturer:-

The prospective bidder may source Stay Wire from manufacturers only who must qualify all the following requirements :

a) The manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.

b) The manufacturer should have supplied at least 1000 Kg (all sizes taken together) to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

II. Application Standards

Except when they conflict with the specific requirements of this specification, the G.I Stay Stranded Wires shall comply with the specific requirements of IS: 2141-1979. IS: 4826-1979 & IS: 6594-1974 or the latest versions thereof.

III. Application and Sizes

The G.I. stranded wires covered in this Specification are intended for use on the overhead power line poles, distribution transformer structures etc.

The G.I stranded wires shall be of 7/8SWG 7/4 mm for 33 kv lines, 7/10SWG (7/3.15 mm for 11KV lines and 7/12 SWG 7/2.5 mm for LT lines standard sizes.

IV. Materials

The wires shall be drawn from steel made by the open hearth basic oxygen or electric furnace process and of such quality that when drawn to the size of wire specified and coated with zinc, the finished strand and the individual wires shall be of uniform quality and have the properties and characteristics as specified in this specification. The wires shall not contain sulphur and phosphorus exceeding 0.060% each.

Tensile Grade

The wires shall be of tensile grade 4, having minimum tensile strength of 700 N/mm² conforming to IS:2141.

General Requirements

The outer wire of strands shall have a right-hand lay.

The lay length of wire strands shall be 12 to 18 times the strand diameter.

Minimum Breaking Load

The minimum breaking load of the wires before and after stranding shall be as follows:

No. of Wires & Const.	Wire Dia (mm)	Min. breaking load of the Single wire before stranding	Min. breaking load of the standard wire (KN)
--------------------------------------	--------------------------	---	---

		(KN)	
7 (6/1)	2.5	3.44	21.40
7 (6/1)	3.15	5.46	34.00
7 (6/1)	4.0	8.80	54.9

V. Construction

The galvanized stay wire shall be of 7-wire construction. The wires shall be so stranded together that when an evenly distributed pull is applied at the ends of completed strand, each wire shall take an equal share of the pull. Joints are permitted in the individual wires during stranding but such joints shall not be less than 15 meters apart in the finished strands. The wire shall be circular and free from scale, irregularities, imperfection, flaws, splits and other defects.

VI. Tolerances

A tolerance of (+) 2.5% on the diameter of wires before stranding shall be permitted.

VII. Sampling Criteria

The sampling criteria shall be in accordance with IS :2141.

VIII. Tests on Wires before Manufacture

The wires shall be subjected to the following tests in accordance with IS :2141.
Ductility Test Tolerance on Wire Diameter

Tests on Completed Strand

The completed strand shall be tested for the following tests in accordance with IS:2141.
Tensile and Elongation Test: The percentage elongation of the stranded wire shall not be less than 6%.

Chemical analysis Galvanizing Test

The Zinc Coating shall conform to "Heavy Coating" as laid down in IS:4826

IX. Marking

Each coil shall carry a metallic tag, securely attached to the inner part of the coil bearing the following information:

- a) Manufacturers name or trade mark
- b) Lot number and coil number
- c) Size
- d) Construction
- e) Tensile Designation
- f) Lay
- g) Coating

- h) Length
- i) Mass
- j) ISI certification mark, if any

X. Packing

The wires shall be supplied in 75-100 Kg. coils. The packing should be done in accordance with the provisions of IS:6594

XI. Other Items:

For remaining items of stay sets mentioned in the enclosed drawing, relevant applicable Indian standards shall be applicable.

F. GI WIRE 6 SWG & GI WIRE 8 SWG

TECHNICAL SPECIFICATIONS

I. Qualification Criteria of Manufacturer:-

The prospective bidder may source GI Wire from manufacturers only who must qualify all the following requirements:

a) The manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.

b) The manufacturer should have supplied at least 1000 Kgs. (all sizes taken together) to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

II. SCOPE

This specification covers manufacture, testing and supply of hot dip galvanized MS solid wire of sizes 6 SWG (5 MM) & 8 SWG (4 MM) diameters.

III. APPLICABLE STANDARDS

ZINC

Zinc shall conform to grade Zen 98 specified in IS 209& IS: 4826-1979 with up to date amendments.

ZINC COATING

Zinc coating shall be in accordance with IS: 4826-1979 for heavily coated hard quality.

GALVANISING

Galvanizing shall be as per IS: 2629-1966, IS 4826-1979 with up to date amendments

UNIFORMITY OF ZINC COATING

Uniformity of zinc coating shall be as per IS: 2633-1972 with up to date amendments

TENSILE PROPERTIES

The tensile strength of the wire after galvanizing shall be between 55-95 Kg/sq.mm ensuring MS wire mechanical properties as per IS-28:1972 8.1 to 8.3.

FREEDOM FROM DEFECTS

As per IS: 2629-1966 & 4826-1979 & with up to date amendments be ensured

IV. MATERIAL

The mild steel wire shall have chemical composition maximum sulphur- 0.055%, phosphorous -0.055%, Carbon 0.25%.

V. TESTS

During the process of manufacturer/fabrication and all tests for chemical, mechanical, galvanizing as per IS- 280-1979, IS1521-1972, IS-1755-1961, IS: 6745-1972 & 4826-1979 shall be carried out. The certificate towards, chemical composition shall be submitted for each lot offered for inspection.

The following tests shall be conducted in presence of the representative of the purchaser:

Visual physical inspection and measurement of specified dimension

Coating test as per IS: 1755-1961, IS 2629-1966, IS: 2633-1972, IS: 4826-1969

Adhesion test as per IS: 1755-1961, IS: 2629-1966, IS: 2633-1972, IS: 4826-1969,& IS:6745-1972

Tensile strength and breaking load and elongation determined as per IS: 1521-1972 with up to date amendments

VI. PACKING & MARKING

Packing shall be as per IS: 280-1979 and each coil shall be between 50-100 kg. marking shall be as per IS:280-1972.

(G). EYE BOLT FOR GUARDING

TECHNICAL SPECIFICATIONS

GENERAL REQUIREMENTS:

M20 eye bolts (120 mm long) shall preferably be of drop forged manufacture and shall be supplied complete with full thread and two full nuts.

Eye bolt shall be manufactured from steel to ISO 272, 885, 888, 4759/1 and shall meet the requirements for mechanical properties detailed in ISO 272, 885, 888, 4759/1.

Where a welding process is used in manufacture, each eye bolt shall be individually proof tested by the manufacture in accordance with ISO 272, 885, 888, 4759/1 to 125% of its safe working tensile load that is to 48kN. The safe working tensile load shall be the ultimate axial tensile strength divided by the factor of safety of 2.5.

The eye shall be permanently and legibly stamped with the letter METRIC in letters not less than 3mm high. The safe working load of any eye bolt is that load which may be safely carried in an axial direction. If loaded in any other direction the safe working load is reduced and reference shall be made to the following table for safe working load of M20 eye bolts and eye nuts.

(H). ALUMINIUM BINDING WIRE

TECHNICAL SPECIFICATION

SCOPE:

Scope covers manufacture, testing and supply of 3.53 mm dia Aluminium Binding Wire as per IS 398.

MATERIALS:

The material comprising the wire shall have the following chemical composition:

Aluminium 99.5% minimum Copper, silicon and iron 0.5% maximum

The surface of the wire shall be smooth and free from all irregularities and imperfections. Its cross sections shall closely approximate that of true circle.

Characteristics of Aluminium Binding wire

Diameter of wire			Cross sectional area of nominal dia. Wires (mm)	Weight of wire kg/km	Breaking Load (kN)
Minimum	Nominal	Maximum			
3.15	3.53	3.55	9.787	26.45	1.57

Inspection and Tests

The following routine checks and tests shall be carried out on 10% of the coils of aluminium binding wire. If anyone sample fails to pass any one of the test nominated for that wire, then samples shall be taken from every coil in the consignment and any coil from which a sample

proves defective shall be rejected. On no account shall any rejected material be presented for test again unless with the written approval of, and under conditions determined by the Purchaser.

Physical properties

The surface of the finished wires shall be checked to ensure that it is smooth , free from all irregularities, imperfections and inclusions and that its cross section approximates closely that of true circle.

The wire shall be checked to ensure that its diameter and weight are within the values given I the table above characteristic of a aluminium binding wire.

Ultimate tensile strength

When tested on a standard tensile testing machine, the value obtained for the ultimate tensile stress shall not be less than 1.57kN

Wrapping test

The wire shall withstand one cycle of a wrapping test as follows:

The wire shall be closely wrapped round a wire of its own diameter form a close helix of eight turns. Six turns shall then be unwrapped and again closely rewrapped in the same direction as the first wrapping. The wire shall not break or crack when subjected to this test.

Packing & Delivery

The aluminium binding wire shall be delivered in 30m coils, with a permitted tolerance of +5%.Random or nonstandard lengths shall not be permitted.

Each coil shall be adequately guarded against damage due to transportation and handling and shall have an outer layer of tightly wound polythene tape or be contained in a suitable, transparent plastic bag.

The internal diameter of the wound coil shall not be such as to result in a permanent set in the conductor.

The coils shall be contained in non-returnable wooden cases, with a gross weight not in excess of 300 kg. The number of coils contained shall be marked on the outside of each case.

- (I). **33 KV “V” CROSS ARM, BACK CLAMP FOR “V”
CROSS ARM & POLE TOP BRACKET (F CLAMP)**

TECHNICAL SPECIFICATIONS

1.0 CROSS ARMS

Cross Arms should be made by using 100x50x6 mm MS. channel. For 33 KV system. Cross Arms made out of M.S. angle shall not be used.

1.0.1 Qualification Criteria of Manufacturer:-

The prospective bidder may source the above items from manufacturers who must qualify the following requirements:

The manufacturer should have supplied at least 1000 no.s (of each item) to electricity supply utilities / PSUs.

The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

a) MS Cross arms and Pole Top Brackets for both 33 KV construction at intermediate and light angle pole shall be fabricated from grade 43A mild steel of channel section and for heavy angle poles, end poles and section poles fabricated from grade 43A mild steel of angle section. The grades of structural steel shall conform to IS – 226: 1975.

b) The 33 KV ‘ V ’ Cross arm shall be made out of 100x 50x5.6. mm MS Channel of (9.56 kg/mtr weight) .

The Back Clamp for both 33 KV shall be made out of 75 x 10 MS Flat and shall be suitably designed to fit PSC Pole 10 mtr x300kg

c)The Pole Top Bracket (F Clamp) shall be made out of 75 x 10 MS Flat suitably designed to fit PSC Pole 10 mtr x300kg for 33 KV.

Except where otherwise indicated all dimensions are subject to the following tolerances:

dimensions up to and including 50mm: +1mm: and dimensions greater than 50mm: +2%

All steel members and other parts of fabricated material as delivered shall be free of warps, local deformation, unauthorized splices, or unauthorized bends. Bending of flat strap shall be carried out cold. Straightening shall be carried out by pressure and not by hammering.

Straightness is of particular importance if the alignment of bolt holes along a member is referred to its edges.

Holes and other provisions for field assembly shall be properly marked and cross referenced. Where required, either by notations on the drawing or by the necessity of proper identification and fittings for field assembly, the connection shall be match marked. A tolerance of not more than 1mm shall be permitted in the distance between the center lines of bolt holes.

The holes may be either drilled or punched and, unless otherwise stated, shall be not more than 2mm greater in diameter than the bolts. When assembling the components force may be used to bring the bolt holes together (provided neither members nor holes are thereby distorted) but all force must be removed before the bolt is inserted. Otherwise strain shall be deemed to be present and the structure may be rejected even though it may be, in all other respects, in conformity with the specification.

The back of the inner angle irons of lap joints shall be chamfered and the ends of the members cut where necessary and such other measures taken as will ensure that all members can be bolted together without strain or distortion. In particular, steps shall be taken to relieve stress in cold worked steel so as to prevent the onset of embitterment during galvanizing. Similar parts shall be interchangeable.

Shapes and plates shall be fabricated and assembled in the shop to the greatest extent practicable. Shearing flame cutting and chipping shall be done carefully, neatly and accurately. Holes shall be cut, drilled or punched at right angles to the surface and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges, and burrs resulting from drilling or reaming operations shall be removed with the proper tool.

Shapes and plates shall be fabricated to the tolerance that will permit field erection within tolerance, except as otherwise specified. All fabrication shall be carried out in a neat and workmanlike manner so as to facilitate cleaning, painting, galvanizing and inspection and to avoid areas in which water and other matter can lodge.

Contact surfaces at all connections shall be free of loose scale, dirt, burrs, oil and other foreign materials that might prevent solid seating of the parts.

1.0.6 Fixing of Cross Arms

After the erection of supports and providing guys, the cross-arms are to be mounted on the support with necessary clamps, bolts and nuts. The practice of fixing the cross arms before the pole erection should be followed.

2.0 INSTALLATION OF LINE MATERIALS

2.0.1 Insulator and Bindings - These materials are to be procured from the approved vendors only after type test subsequent to the design approval of CPIO,SOUTHCO

1. Suspension type H/W fittings (Single suspension normally to be used and in important X-ings double suspension fittings to be used) in all tangent locations. In S/S fittings 3 nos. 45 KN normal disc insulators, D/S fittings 6 nos. 45 KN normal disc insulators to **be used in 33 KV line.**
2. In angle locations single tension fittings to be used with 4 nos. 70 KN disc insulators. In all road X-ings and other important X-ings Double Tension H/W fittings 8 nos. 70 KN disc insulators to be used **in case of 33 KV line & in 11 KV line it should be 45 KN insulators 2 nos. & 4 nos. are to be used.**
3. Suitable pre formed armored rods should be used in all suspension fittings **in case of higher size Conductors.**

4. Guarding / pilot insulators at the sharp angle points has to be provided.
5. Four **pair** bolted type (**suitable for M-16 bolts**) tension fittings for AAA conductors and compression type tension fittings for ACSR conductors has to be used.
6. The “distribution tie “ meant for pin insulator binding should be of no. 6 size and that of soft annealed wire having a minimum length of 3 mtr.
7. **Compression type jointing sleeves should be used for jointing of conductors only.**

2.0.2 Checking of Suspension Fitting

- a) It shall be checked that there is no damage to any component of hardware fittings.
- b) It shall be verified that all nuts and bolts are tightened properly.
- c) It shall be made sure that all the necessary security pins (split pins) are fixed properly as per approved drawings.

2.0.3 Insulator hoisting

- a) Insulators shall be completely cleaned with soft and clean cloth.
- b) It shall be verified that there is no crack or any other damage to insulators.
- c) It is very important to ensure that ‘R’ clips in insulator caps are fixed properly. This is a security measure to avoid disconnection of insulator discs.
- d) Both Arcing horns (both at top & bottom) of each insulators string has to be provided.

Where change of insulators required, prior to fixing, all insulators shall be cleaned in a manner that will not spoil, injure or scratch surface of the insulator, but in no case shall any oil be used for that purpose.

OR (If specified in areas where tower structures cannot be used)

Pin insulators shall be used on all poles in straight line and disc insulators on angle and dead end poles. Damaged insulators and fittings, if any, shall not be used. The insulator and its pin should be mechanically strong enough to withstand the resultant force due to combined effect of wind pressure and weight of the conductor in the span.

The pins for insulators shall be fixed in the holes provided in the cross-arms and the pole top brackets. The insulators shall be mounted in their places over the pins and tightened. In the case of strain or angle supports, where strain fittings are provided for this purpose, one strap of the strain fittings is placed over the cross-arm before placing the bolt in the hole of

cross-arms. The nut of the straps shall be so tightened that the strap can move freely in horizontal direction.

All materials, which are to be supplied by the contractor should be procured from the approved Manufactures of SOUTHCO's only. Procurement from any suppliers will not be permitted. All the related drawings of materials have to be approved by department. All the materials has to be tested in presence of authorized representative of department as well as officers of third party engaged by Government if any also.

3.0 Handling of Conductor

The Conductor will be supplied by the department from the designated stores of SOUTHCO which the contractor has to lift for the work at their cost. All cares should be taken not to damage conductor surface during transit. Necessary tools and plants for the same have to be effectively used by the agency.

3.0.1 Running Out of the Conductors:

The contractor shall be entirely responsible for any damage to the pole or conductors during stringing. Care shall be taken that the conductors do not touch and rub against the ground or objects, which could scratch or damage the strands.

3.0.2 The sequence of running out shall be from the top to down i.e. the top conductor shall be run out first, followed in succession by the side conductors. Unbalanced loads on poles shall be avoided as far as possible. When lines being erected run parallel to existing energized power lines, the Contractor shall take adequate safety precautions to protect personnel from the potentially dangerous condition.

3.0.3 Monitoring of Conductors during Stringing

- a) The conductor shall be continuously observed for loose or broken strands or any other damage during the running out operations. Repair to conductors, if necessary, shall be carried out with repair sleeves. The final conductor surface shall be clean, smooth and free from projections, sharp points, cuts, abrasions, etc. The Contractor shall be entirely responsible for any damage to the poles during stringing.
- b) Conductor shall be checked constantly as it is unwound from Conductor drum for any broken, damage or loose strand. If any major defect is noticed then the defective portion has to be removed and mid span joint provided. However if the defect is of minor nature i.e.

number of damaged strands is not more than $1/6^{\text{th}}$ of the total strands in outer layer, a repair sleeve shall be provided.

- c) M.S. (mid span) Joint shall be provided at least 15 meters away from 33 KV line tower. All MS joints should be Compression type by providing suitable aluminium compression pipes. The compression joints should be continuous. In case of AAAC compression joints, minimum 25% over lapping with the previous compression should be done.
- d) There shall not be any Mid-Span joint over Rly / River / Main Road Crossing.
- e) Not more than one M.S. Joint shall be provided in one span for each conductor. Rough sagged conductors of one phase shall be simultaneously tightened by which machine fixed on tower till the desired final sag is achieved

Final Checking, Testing and Commissioning

After stringing have been done as approved by the Engineer in charge, to ensure that everything is complete in all respects, the works shall be thoroughly inspected keeping in view the following main points.

All the bolts and nuts should be of MS materials as per relevant IS.

4.0 CROSSINGS

- a) As far as possible all Railway line, telecommunication lines crossings shall be made at right angles. Scaffolding to be used during stringing operations where roads, channels, telecommunication lines, power lines and railway lines are crossing. The contractor shall co - ordinate with SOUTHCO for obtaining work permit and shut down of the concerned line. The Contractor shall be entirely responsible for the proper handling of the conductor and accessories in the field.
- b) Guarding shall be provided at major crossings, if not provided. The Guarding shall consist of GI guard cross arm of length 2.5 mtrs made out of 75x40 x6 mm channel & shall be hot dipped galvanized generally conforming to IS:2633/72. The clamps shall also be hot dipped galvanized generally conforming to IS: 2633/72. Guarding shall be erected with ground & line clearances as per the I.E. rules. The guarding shall be provided with GI wire 8 SWG for 33 KV.

4.0 PAINTING OF MATERIALS

All the metal parts except G.I. parts are to be painted with two coat of red oxide and one coat of aluminum paint.

- 4.0.1** At least two coats of cold galvanized zinc rich paint having 90% zinc contents shall be applied on the welding to avoid rusting.

5.0 STRINGING OF CONDUCTOR

- 5.0.1** The works include spreading of conductors without any damage and stringing with proper tension without any kinks/ damage Jumpering at cut points by using two nos., three bolted, PG claps has to be done. **No binding of two conductors with aluminium wires will be allowed.** In each and every joints three bolted very good quality PG clamps should be used wrapping of suitable aluminium tapes if required as per the decision of the EE/DE. The ground & line clearances at road crossings along roads other crossings shall be as mentioned in this specification.(which also should not be less than the relevant clearances mentioned in I.E. rules.)

- 5.0.2** While transporting conductors' drums to site, precautions are to be taken so that the conductor does not get damaged. The drum shall be mounted on cable drum support. The direction of rotation of the drum shall be according to the mark in the drum so that the conductor could be drawn. While drawing the conductor, it shall not rub against surface causing damage. The conductor shall be passed over poles on rubberized or aluminum snatch block (pulley) mounted on the poles for this purpose.

- 5.0.3** The conductor shall be pulled through come-along clamps to string the conductor between the tension locations.

- 5.0.4** Conductor splices shall not crack or otherwise be susceptible to damage in the stringing operation. The Contractor shall use only such equipment / methods during conductor stringing which ensures complete compliance in this regard. All the joints including mid span joints on the conductor shall be of the compression type, in accordance with the recommendations of the manufacturer.

- 5.0.5** All the joints or splices shall be made at least 15 meters away from the pole. No joints or splices shall be made in spans crossing over main roads, railways and small river spans. Not more than one joint per sub-conductor per span. After compressing the joint, the aluminum sleeve shall have all corners rounded; burrs and sharp edges removed and smoothened

The contractor shall remain fully responsible for the exact alignment of the line. If after erection, any tower is found to be out of alignment, the same shall have to be dismantled and re-erected after correction by the contractor at his own cost, risk and responsibility, including installation of fresh foundation, if felt necessary by the employer.

NB:- 0.5% is the non-accountable allowable wastage (for both sag & wastage) will be permitted

**(J). PIN INSULATOR & GI PIN
TECHNICAL SPECIFICATION**

- 1.0** 33 KV Pin Insulators.-IS-731/77 (Porcelain Insulator for O/H power lines with nominal voltage greater than 1000 volts.
- 2.0** 33 KV GI Pin: - Confirming to IS-2486 Part-I/1971.

K. MILD STEEL CHANNEL & ANGLE

TECHNICAL SPECIFICATIONS OF MILD STEEL CHANNEL & ANGLE

1.00 SCOPE

This specification covers design, manufacture, testing and dispatch to owner's stores of M.S. Channel & Angle for use in structures in distribution system.

2.00 APPLICABLE STANDARD

Materials shall conform to the latest applicable Indian standards. In case bidders offer steel section and supports conforming to any other international specifications which shall be equivalent or better than IS, the same is also acceptable.

Sl.No.	Standard No.	Title
1	IS: 2062 Grade 'A'	Quality Specification for M.S.Angles, M.S.Channel
2	IS: 2062	Chemical and Physical composition of material
3	IS: 1852	Rolling and Cutting Tolerances for Hot Rolled Steel products

3.00 GENERAL REQUIREMENTS

3.01 Raw material

The Steel Sections shall be re-rolled from the BILLETS/INGOTS of tested quality as per latest version of IS: 2830 or to any equivalent International Standard and shall be arranged by the bidder from their own sources.

The Chemical composition and Physical properties of the finished material shall be as per the equivalent standards.

Chemical Composition and Physical Properties of M.S. Angles, M.S. Channels, and M.S. Flat conforming to IS: Conforming to IS: 2062/84

3.02 **Chemical Composition**

3.02 **Chemical composition For Fe 410 WA Grade**

1 C - 0.23% MAX

2 Mn - 1.5% MAX

3 S - 0.050% MAX

4 P - 0.050% MAX

5 SI - 0.40% MAX6 CE

(Carbon Equivalent)- 0.42% MAX

3.03 **Mechanical Properties**

1. Tensile strength Kgf/mm² - 410

2. Yield stress Min. for thickness/diameter

< 20 mm - 26 Kgf/mm² OR 250 N/ mm²

20-40 mm - 24 Kgf/mm² OR 240 N/ mm²

> 40 mm - 23 Kgf/mm² OR 230 N/ mm²

3. Elongation % - 23%

4. Bend Test (Internal Dia) - Min-3t

(t-is the thickness of the material).

3.04 **Tolerance**

Variation in ordered quantity for any destination and overall ordered quantity be only to the extent of ±2%.

Rolling and weight tolerances shall be as per version of IS: 1852 or to any equivalent International Standard.

4.00 **TEST**

Steel Section shall be tested in IS approved Laboratory or Standard Laboratory the Bidder country having all facilities available for conducting all the test prescribed in

relevant IS or IEC or to any equivalent International Standard or any recognized and reputable International Laboratory or Institutions.

The bidders are required to specifically indicate that;

They hold valid IS (or equivalent IEC) License.

Steel Section offered are bearing requisite IS certification or equivalent marks.

The bidders are required to submit a copy of the valid IS (or equivalent IEC) License clearly indicating size and range of product against respective ISS or any equivalent International Standards along with their offer.

5.00 **MARKING**

It is desirable that the bidder should put his identification marks on the finished material. The mark shall be in “legible English letter” given with marking dies of minimum 18 mm size.

6.00 **INSPECTION AND TEST CERTIFICATES**

The material to be supplied will be subject to inspection and approval by the purchaser’s representative before dispatch and/or on arrival at the destination. Inspection before dispatch shall not however, relieve the bidder of his responsibility to supply the Steel Sections strictly in accordance with the specification.

The purchaser’s representative shall be entitled at all reasonable time during manufacture to inspect, examine and test at the bidder’s premises the materials and workmanship of the steel section to be supplied.

As soon as the steel Section are ready for testing, the bidder shall intimate the purchaser well in advance , so that action may be taken for getting the material inspected. The material shall not be dispatched unless waiver of inspection is obtained or inspected by the purchaser’s authorized representative.

Test certificates shall be in accordance with latest version of the relevant Indian Standards or any equivalent International Standard.

The acceptance of any batch/lot shall in no way relieve the bidder of any of his responsibilities for meeting all the requirements of the specification and shall not prevent subsequent rejection of any item if the same is later found defective.

SCHEDULE C - 4

CHECK FORMAT

- | | | |
|-----|---|----------------|
| 1. | PCC has been done as per approved drawing. | Yes/ No |
| 2. | All the GI bolts-nuts of required size with required spring washer has been provided. | Yes/ No |
| 3. | All the bolts-nuts has been properly tightened (after full tight 3 Nos. threads will be projected out) | Yes/ No |
| 4. | Cooping of required height (in case of Urban area it is 30 cm, in Cross country it is 75 cm) has been done. | Yes/ No |
| 5. | Painting of pole or structures has been done as per specification. | Yes/ No |
| 6. | Split pins & “I” clips has been provided in each H/W fittings & Insulator strings. | Yes/ No |
| 7. | All the accessories in each locations has been fixed properly. | Yes/ No |
| 8. | Anti climbing devices has been provided in each locations. | Yes/ No |
| 9. | All the jumpers has been properly tightened by providing Required nos. of PG clamps(2 nos. PG clamps has to be Provided per each side) | Yes/ No |
| 10. | All the insulators and H/W fittings used has been free from all Defects. | Yes/ No |
| 11. | Equal phase to phase clearance has been maintained. | Yes/ No |
| 12. | Minimum ground clearance from bottom most conductor (7 mts. in cross country & 9 mts. In road crossings) has been maintained in each span. | Yes/ No |
| 13. | Curing has been done for 28 days. | Yes/ No |
| 14. | Proper back filling has been done as per specification. | Yes/ No |
| 15. | Required earthing has done in every locations. | Yes/ No |
| 16. | Material utilization accounts has been furnished.(In each and every Bills should have material accounts of both departmental supply items And contractor’s supply items, except civil items, otherwise the bills Will not accepted). | Yes/ No |
| 17. | Stay | Yes/ No |
| 18. | Guarding at Road Crossing. | Yes/ No |
| 19. | Clearance with intercepting lines. | Yes/ No |
| 20. | Proper Jumpering. | Yes/ No |

TECHNICAL SPECIFICATION FOR 33KV OUTDOOR VACUUM CIRCUIT BREAKERS

L. TECHNICAL SPECIFICATION FOR 33KV OUTDOOR VACUUM CIRCUIT BREAKERS

1. SCOPE

- 1.1 This specification covers design, engineering, manufacture, testing, inspection before dispatch packing, forwarding, transportation, insurance during transit, delivery to site/ stores of 33KV Outdoor Vacuum Circuit Breakers for use the 33/11KV primary substations under the distribution networks of SOUTHCO.
- 1.2 All vacuum circuit breakers must be manufactured by ISO 9000 certified Organization and shall have been type tested at CPRI or any NABL Accredited laboratory/PHELA/KERI/KEMA/CESI within five years as on the date of bid opening and in satisfactory operation for a period not less than three years. The Bidder shall demonstrate compliance with this requirement by supplying with the bid, copies of the type test certificates together with performance certificates from purchasers/ users.
- 1.3 The scope of supply includes the provision of type tests at CPRI or any NABL Accredited laboratory/PHELA/KERI/KEMA/CESI within five years.
- 1.4 The scope also includes the circuit breaker and current and potential transformers, supporting structures, operating mechanism, local/ remote control cabinet, relay control panel, foundation bolts, all the accessories and auxiliary equipment mandatory spares and special tools for satisfactory installation and operation.
- 1.5 The circuit breakers shall conform in all respects to the highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the purchaser shall have the power to reject any work or materials, which, in his judgment, is not in full accordance therewith.

2. STANDARDS

Except where modified by this specification, the circuit breakers and the accessories shall be designed, manufactured and tested in accordance with latest editions of the following standards.

IEC/ISO/BS	IS	Subject
IEC: 56	IS : 13118	High voltage alternating current circuit breakers general requirement.
IEC: 694	IS: 12729	Common clauses of high voltage switch-gear and control gear

		standards (for voltage exceeding 1000 V).
IEC: 60	IS: 9135	High Voltage testing techniques.
IEC: 427	IS: 13516	Method of synthetic testing of HV .A.C circuit breakers.
IEC:1233		HV. AC. Circuit breakers- inductive load switching.
IEC: 17A/CD:474		HV. AC. Circuit breakers- capacitive switching.
IEC: 529	IS: 13947	Degree of protection provided by enclosure.
IEC: 137	IS: 2099	Insulating bushing for A.C. voltages above 1000V
IEC: 233	IS: 5621	Hollow insulators for use in electrical equipment & testing.
IEC: 273	IS: 5350	Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000V.
IEC: 815	IS: 13134	Guide for selection of insulators in respect of polluted conditions.
IEC: 34	IS: 996	A.C motors
ISO:1460 BS:729	IS: 2629	Hot dip galvanizing
	IS: 2633	Method of testing uniformity of zinc coated articles.
	IS: 5	Colour for ready missed paints and enamels
	IS: 6005	Code of practice for phosphating or iron and steel.
IEC: 227	IS:1554	P.V.C Insulated cables for voltages up to and including 1100 Volt.
IEC:269	IS: 13703	Low voltage fuses for voltages not exceeding 1000volt.
ISO: 800	IS: 1300	Phenolic moulding materials.
	IS: 13118	Guide for uniform marking and identification of conductors and apparatus terminals.
IEC:185	IS: 2705	Current transformers.
IEC:296	IS: 335	Specification for unused insulating oil for transformer and switchgear.
IEC: 186	IS: 3156	Potential transformers.
CBIP Technical Report No. 88 revised July, 1996 read with amendment issued (April, 99, September, 99 and also		Specification for AC Static Electrical Energy Meter.

any other amendment thereafter)	
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This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Supplier of the necessity of providing the goods and services complying with other relevant standards or recommendations.

3. REQUIREMENTS

The circuit breakers to be supplied against this specification shall be required to control the primary side of 33/11 KV power transformers in the primary sub-stations (incoming 33KV feeders) or Bus coupler or the outgoing feeders in these sub-stations. The circuit breakers shall be suitable for 3 phase 50Hz solidly grounded neutral system and shall have normal current carrying capacity and symmetrical short circuit current breaking capability as mentioned hereunder. The required 33KV Vacuum Circuit Breakers suitable for outdoor installations are to be quoted by Manufacturers only with a valid ISO 9000 certification.

3.1 BASIC TECHNICAL REQUIREMENTS:

The vacuum circuit breakers are required to meet the following basic technical requirements. (Reference standards IEC:56, IS:13118 and associated standards listed in this specification.

Basic Technical Requirements

SL.NO.	Particulars	Requirements
1	Service type	Outdoor
2	No. of Poles	3
3	Nominal system voltage	33KV
4	Highest system voltage	36KV
5	Rated normal current at 500C	
i)	For Bus-bar of Circuit Breaker	1250A
ii)	For Interrupter	2000A
iii)	For Outgoing Feeders	-
6	Rated short circuit breaking current (rms)	25KA
7	Rated short circuit making current (peak)	63KA
8	Rated short time current withstand capability for 1 sec.	25KA(PANEL)/ 25KA(INTERR

		UPTER)
9	Rated insulation level:	
i)	One minute power frequency withstand voltage to earth (wet and dry) rms	70KV
ii)	Impulse withstand voltage to earth with 1.2/50µsec, wave of +ve and –ve polarity (Peak)	170KV
10	First – pole – to clear factor	1.5
11	Rated operating sequence (for auto reclosing)	O-0.3 Sec- CO-3 min-CO
12	Maximum break time	3 cycles
13	Rated out of phase breaking current	25% of the symmetrical short circuit breaking current
14	Maximum pole scatter	10 mili seconds
15	Rated Auxiliary supply for spring charge motor, lamp & heater circuit.	230V A.C
16	Rated supply voltage for trip/close coil	24V D.C
17	Minimum creepage distance (mm)	900mm
18	Minimum protected creepage distance (mm)	580mm

4. SERVICE CONDITIONS:

The service conditions shall be as follows:

- ◆ Maximum a altitude above sea level 1,000m
- ◆ Maximum ambient air temperature 500C
- ◆ Maximum daily average ambient air temperature 350C
- ◆ Minimum ambient air temperature 5 0C
- ◆ Maximum temperature attainable by an object exposed to the sun 600C
- ◆ Maximum yearly weight average ambient temperature 320C
- ◆ Maximum relative humidity 100%
- ◆ Average number of thunderstorm days per annum (isokeraunic level) 70

◆ Average number of rainy days per annum	120
◆ Average annual rainfall	1500mm
◆ Maximum wind pressure	260Kg/m ²

5. 33 KV VACUUM CIRCUIT BREAKERS

5.1 General

The circuit breakers shall be structure mounted open type with vacuum as interrupting media incorporating separate interrupters of 2000 A rating for each phase mounted on single frame. There shall be a common drive mechanism actuating the interrupters, which must work in synchronism. These breakers shall be provided with suitable local control while provision shall be made for remote control.

The circuit breakers shall be fitted with spring mechanism. The inherent design of these circuit breakers shall be such that they shall satisfactorily perform all test duties and interrupt out-of-phase current and produce very low over voltage (<2.0p.u.) on all switching circuits, capacitive and inductive to IEC:56, IS:13118 and other associated standards mentioned in the clause of this specification.

The terminal pads shall have silver-plating of at least 50 micron thickness. The design of the circuit breakers shall be such that inspection and replacement of contacts, coils, vacuum bottles and any worn or damaged components can be carried out quickly and this ease. The contact gaps shall be adjustable to allow for wear.

The mechanism and the connected interrupters shall satisfy the mechanical endurance requirements of IEC: 56, IS: 13118 and all additional requirements specified herein.

5.2 Porcelain Insulator

External parts of the circuit breakers, which are under continuous electrical stress, shall be of hollow porcelain. The creepage and flashover distance of the insulators shall be dimensioned and the type and profile designed in accordance with IEC:815 or IS: 13134 and shall be suitable for the worst environmental conditions specified in this specification. The creepage distance across the interrupting chambers shall suite the outdoor service conditions mentioned in the relevant standards for heavily polluted atmosphere and shall be not less than 900 mm with protected creepage distance 50 percent of the total. Internal surfaces of hollow insulators shall also be glazed. The insulators shall comply with IS:5621 and tested in accordance with IEC:233.

All porcelain whether, used on the interrupting chamber or on the support insulator shall have the following properties: Higher strength, homogeneity, uniform glaze, free from cavities and other flaws and high quality uniform finish porcelain components and shall withstand the maximum expected static and dynamic loads to which the circuit breakers may be subjected during their service life.

5.3 Interrupting media

5.3.1 Vacuum:

In vacuum circuit breakers, facilities shall be provided for monitoring the contact erosion and any change in contact gap. The vacuum bottles shall be easily replaceable on site and the mechanism shall be conveniently adjustable to permit resetting the contact gap. The vacuum circuit breaker poles shall be sealed to prevent contamination of the spaces surrounding the interrupters. The Bidder shall demonstrate how this is achieved by supplying technical details with the bid.

5.4 Auxiliary contacts

12 auxiliary contacts (6N.O. + 6N.C.) of 24 Volt D.C grade and 10 amps DC rating shall be provided in each circuit breaker.

5.5 Indication

A mechanically operated circuit breaker position indicator of non corroding material shall be provided in a location visible from the operating side of the breaker without the necessity to open the mechanism door. The word 'OFF' in white letter on green background shall be used to indicate that the breaker is in the opening position and the word 'ON' in white letters on a red background to indicate that the breaker is in the closed position. The drive for the device shall be positive in both directions and provision shall be made for local and remote electrical indication. Indication of spring charging condition shall be provided as mentioned in this specification. Mechanical counters to record the number of closing operations shall be provided for each circuit breaker mechanism.

5.7 Operation and controls

The breaker shall normally be operated by remote electrical control with electrical tripping by shunt trip coil. Provision shall be made for local electrical operation and mechanical operation.

The following facilities shall be provided in the circuit breaker local control cabinet:

- LOCAL/ REMOTE selector switch of stay put type. The selection of 'local' operation shall inhibit the operation of the breaker from any remote source.
- ON/NEUTRAL/ OFF control switch or ON and OFF push buttons. The push buttons shall be momentary contact type with rear terminal connections. The close push button shall be of green colour and the open push button red colour.
- MECHANICAL EMERGENCY TRIP DEVICE: suitable for manual operation in the event of failure of electrical supplies. The device shall be accessible without opening any access doors and distinctly labeled. It shall be shrouded and protected against inadvertent operation.
- Means shall be provided for manual operation of these circuit breakers during failure of auxiliary power in addition to electrical operation.

- Means shall be provided to prevent the mechanism from responding to a close signal when the trip coil is energized or to reclosing from a sustained close signal either opening due to a trip signal or failure to hold in the closed position.

The circuit breaker shall be able to perform 10,000 operating cycles at no load in accordance with IEC:17A/474/CD for circuit breakers for auto reclosing duties.

6. CURRENT TRANSFORMERS

Current transformers, three per circuit breaker, shall be of outdoor, single phase oil immersed dead tank type and shall comply with IEC:185 and IS:2705, suitable for operation in hot and humid atmospheric conditions described in service condition. They shall be mounted on the bracket. The CT tank should be Hot Dip galvanized as per relevant ISS to prevent corrosion of all exposed metal parts.

6.1 Core

High grade non- ageing cold rolled grain oriented (CRGO M4 or better grade) silicon steel of low hysteresis loss and permeability shall be used for the core so as to ensure specified

accuracy at both normal and over currents. The flux density shall be limited to ensure that there is no saturation during normal service.

The instrument security factor of the core shall be low enough so as not to cause damage to the instruments in the event of maximum short circuit current.

6.2 Windings

The secondary windings shall be made of electrolytic copper with suitable insulation. The conductor shall be of adequate cross-section so as to limit the temperature rise even during short circuit conditions. The insulation of windings and connections shall be free from composition liable to soften, coze, shrink or collapse during service.

Polarity shall be indelibly marked on each current transformer and at the lead and termination at associated terminal blocks. CTs with multi ratio winding shall be clearly tabulated to show the connections required for different ratios. Similar numbers shall be marked on terminal block arrangement and wiring diagram. Apart from the above marking and those to be provided as per IEC 185 or IS 2705, other markings shall be provided in consultation with owner.

The continuous current rating of the primary winding shall be one hundred and fifty percent of the normal rated current. Secondary windings of current transformers shall be used for metering, instrumentation and protection and shall be rated for continuous current of one hundred and fifty percent of normal rated current of primary winding.

Secondary winding stud should be 6mm dia of length 15 mm. TB should be stud type with 3 nos. of nuts (min). The horizontal distance from studs should be 1.5 times the outside circular – dia of the nuts. Test tap should be with shorting arrangement.

6.3 Construction

The current transformer enclosures shall be made of high quality steel and shall be hot dip galvanized and shall be able to withstand stresses occurring during transportation and the terminal and mechanical stresses resulting from maximum short circuit current in service.

The primary winding and terminals shall be in a tank and supported by a hollow porcelain insulator. The secondary connection shall be conducted through the hollow insulator and terminated in a terminal box mounted on the base plate.

6.4 Hermetic sealing

Each current transformer shall be supplied filled with insulating oil complying with IEC: 296 or IS: 335 and shall be hermetically sealed to prevent atmosphere coming in contact with oil, avoiding frequent filtration and change of oil. Nitrogen or any oil inert gas above the oil level

shall be provided to permit expansion and contraction of oil without any contact with the atmosphere.

The current transformers shall have provision for draining and re-filling insulation oil after drying.

6.5 Insulating oil

The current transformer shall be complete with new insulating oil. The quantity of insulating oil for first filling of the equipment and complete specification of oil proposed to be used shall be stated in the bid. The oil shall conform to the requirements of latest issue of IEC: 296 or IS: 335.

6.6 Fittings and accessories

Fittings and accessories listed below shall be supplied with each current transformer:

- Oil level gauge;
- Oil filling hole and cap;
- Pressure relief device;
- HV terminal connectors;
- Two earthing terminals and strips with necessary nut, bolts and washers;
- Name and rating plate;
- Terminal box with LV terminal connections;
- Mounting nuts, bolts and washers;

Any other fittings deemed essential by the Supplier shall also be supplied with each current transformer.

The oil level gauge shall be mounted in such a way that the oil level can be clearly seen from ground level.

A dust, vermin and weather proof terminal box shall be provided at the lower end of the current transformer for terminating the secondary windings. The box shall have a bolted cover plate complete with gaskets. The terminal box shall have terminal blocks, cable gland plate and cable glands with shrouds suitable for different sizes of PVC insulated control cables 650/1100V grade as per IEC:227 or IS:1554. The terminal blocks shall have covering of molded insulation materials complete with brass studs, washers, nuts and lock nuts suitable for termination of 2X2.5 sqmm wires. The termination shall be made by crimping lugs or bare wire with insulating sleeves at ends.

The terminal box enclosure shall have protection as per class IP 55 as defined in IEC: 529 or IS: 13947.

6.7 CT Junction Box/Console Box

Each set of 3 current transformers for three phases shall be provided with a common junction box mounted on the circuit breaker supporting structure at a convenient position to accommodate the secondary wire of CT and other control cables of Purchaser. Separate terminals for testing the relays and instruments and short circuiting of each current transformer secondary wires shall be provided in it. The junction box enclosure shall have the same protection features as for the terminal box. It shall be provided with terminal blocks, gland plates and glands suitable for different sizes of cables. Facilities shall be provided for earthing the CT secondary wires in the junction box.

6.8 Hollow porcelain insulators

The insulators of the current transformers shall conform to latest edition of IS: 5621 and shall be subjected to and successfully pass the tests listed in this standard and in IEC: 233. The hollow porcelain insulators shall be brown glazed and shall meet the requirements indicated in this specification. The insulators shall be cemented with Portland cement to the flanges resulting in high mechanical, tensile and breaking strength.

6.9 Insulation level

The current transformers shall be designed to withstand impulse test voltages and power frequency test voltages as specified in this specification.

6.10 Terminal connections

The CTs shall be provided with bi-metallic solder less clamp and rigid type terminal connectors on the top tank for connection to the HV terminals. The other requirements shall be same as for the terminal connectors of the circuit breaker described in this specification. They shall be universal type suitable for both horizontal and vertical connections. Two earthing terminals complete with necessary hardware shall be provided on each CT for connecting to earth continuity conductor to be provided. The earthing terminals shall be identified by means of appropriate symbol marked in a legible and indelible manner adjacent to the terminals. The terminals shall be adequately sized to meet the full earth fault current envisaged.

6.11 Basic technical requirement

Ratings: The CTs shall conform to the following ratings and other particulars of the circuit breakers:

Technical Requirements – For 3 Core CT

SL.NO.	Particulars	Requirements
1	Function	To control the Primary side of 33/11 KV power transformers of ratings between 1.6MVA and 10MVA in primary substations.
2	Requirement	Core-1:Instrumentation and Metering Core-2:Combined over current and earth fault protection Core-3:Differential Protection
3	Transformation Ratio	200-100-50/1-1-1 A
4	Rated Burden (VA)	Core:1:15 Core:2:15 Core:3:PS
5	Class of Accuracy	Core- 1:0.5 Core- 2:5P Core-3: PS
6	Instrument Security Factor	Core- 1 < 5
7	Accuracy Limit Factor	Core-2 : 20 Core-3 : 20
8	Rated Voltage	36KV
9	Short Time Rating	25KA rms for 3 seconds
10	Creepage distance protected creepage distance	900mm minimum 450mm minimum
11	Insulation Level: -Impulse Voltage 1.2/50µs wave withstand level -Power frequency 1 min voltage withstand	170 KV 70KV

	level	
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Technical Requirements – For 2 Core CT

SL.NO.	Particulars	Requirements
1	Function	For 33 KV Feeder control in 33/11 KV primary substations.
2	Requirement	Core-1:Instrumentation and Metering Core-2:Combined over current and earth fault protection
3	Transformation Ratio	400-200-100 /1-1 A
4	Rated Burden (VA)	Core:1:15 Core:2:15
5	Class of Accuracy	Core- 1:0.5 Core- 2:5P
6	Instrument Security Factor	Core-1 < 5
7	Accuracy Limit Factor	Core-2 : 20
8	Rated Voltage	36KV
9	Short Time Rating	25KA rms for 3 seconds
10	Creepage distance protected creepage distance	900mm minimum 450mm minimum
11	Insulation Level: -Impulse Voltage 1.2/50µs wave withstand level -Power frequency 1 min voltage withstand level	170 KV 70KV

6.12 Tests and inspection

The CTs shall be tested in accordance with the requirements of the type tests and routine tests as per the latest issues IEC: 185 or IS: 2705.

The tests to be conducted shall include:

6.12.1 Type Tests:

- Lightning impulse voltage;
- Power frequency wet withstand voltage;
- Temperature rise;
- Short time current;
- Composite error;
- Accuracy test (for measuring core);
- Instrument security current (for measuring core);
- Current error and phase displacement (for protection core)

6.12.2 Routine tests

- Verification of terminal marking and polarity;
- Power frequency dry withstand test on primary windings;
- Power frequency dry withstand test on secondary windings;
- Power frequency dry withstand test between sections;
- Over voltage inter-turn test;
- Composite error;
- Turn ratio;
- Accuracy test (for measuring core);
- Current error and phase displacement (for protection core);
- Knee point voltage and magnetizing current test (for PS class);
- Secondary winding resistance (for PS class).
- Insulation Resistance Test.

7 POTENTIAL TRANSFORMER

7.1 BASIC TECHNICAL REQUIREMENTS

The 33KV outdoor voltage transformers (three per circuit Breaker) are required to meet the following basic technical requirements (Reference standards: IEC: 186, IS: 3156 and associated standards listed in the specification):

Sl. No	Particulars	Requirements
1	Type	Single Phase
2	Nominal system voltage, phase to phase	33KV
3	Application	Instrumentation, Metering and Protection
4	Number of secondary windings	1
5	Rated normal burden*	200VA
6	Rated primary voltage	33KV/ $\sqrt{3}$
7	Rated secondary voltage	110V/ $\sqrt{3}$
8	Class of accuracy	0.5
9	Rated insulation level: (Primary winding) (Phase to earth)	
i)	One minute power frequency withstand voltage to earth (wet and dry) rms	70KV
ii)	Impulse withstand voltage to earth with 1.2/50 μ sec wave of +ve and -ve polarity (peak)	170KV
10	One minute power	

	frequency withstand voltage of secondary winding (rms)	
i)	Between phase to earth	3KV
ii)	Between sections	3KV
11	Rated voltage factor	
i)	Continuous	1.2
ii)	For 30 seconds	1.5
12	Creepage distance to earth in mm per KV of highest phase to phase system voltage	25

* The burden indicated is the minimum acceptable to the Purchaser. The Supplier shall ensure that the rated output of the voltage transformers is adequate to meet at least 120 percent of the connected load (burden).

7.2 GENERAL

The voltage transformers to be supplied under this specification shall be of outdoor, single phase dead tank double wound, oil immersed type, complying with IEC:185 and IS:3156 suitable for operation in hot and humid atmospheric conditions described in this document. To prevent corrosion of the exposed surfaces, the tank should be not dip galvanized. They shall have separate HV and LV windings and shall be suitable for use as bus VTs in 33/11KV primary substations.

7.3 Duty requirement

33KV Voltage transformer for all the indicating instruments and measuring meters in the primary substation on 33KV side.

7.4 Porcelain Insulator

External parts of the voltage transformers which are under continuous electrical stress shall be of hollow porcelain insulators complying with latest edition of IS:6521 tested as per IEC:233. The creepage and flashover distance of the insulators shall be dimensioned and the type and profile designed in accordance with IEC:815 or IS:13134 and shall be suitable for the worst environmental conditions for heavily polluted atmosphere and shall be not less than 25mm per KV of highest phase to phase system voltage with protected creepage distance minimum 50 percent of the total. Internal surfaces of hollow insulators shall also be glazed.

The insulators shall be cemented with Portland cement to the flanges resulting in high mechanical, tensile and breaking strength.

All porcelain used on the voltage transformers shall have the following properties high strength, homogeneity, uniform glaze, free from cavities and other flaws and a high quality uniform finish porcelain components shall withstand the maximum expected static and dynamic loads to which the voltage transformers may be subjected during their service life.

The insulation of the hollow porcelain insulators shall be coordinated with that of the voltage transformers to ensure that any flash over occurs only externally.

7.5 Core

High grade non-ageing cold rolled grain oriented silicone steel of low hysteresis loss and permeability shall be used for core so as to ensure accuracy at both normal and over Voltages. The flux density shall be limited to 1.6 Tesla at normal voltage and frequency. There shall be no saturation at any stage during operation.

The instrument security factor of the core shall be low enough so as not to cause damage to the instruments in the event of maximum short circuit current or over voltages.

7.6 Windings

The primary and secondary windings shall be electrolytic copper of high purity and conductivity and covered with double paper insulation. The conductor shall be of adequate cross-section so as to limit the temperature rise even during maximum over voltages. The insulation of windings and connections shall be free from composition liable to soften, ooze, shrink or collapse during service.

The current rating of the primary winding shall be one hundred and fifty percent of the normal rated burden and the windings shall be suitable to withstand continuously the maximum system voltage.

The secondary windings of the voltage transformers shall also be suitable for continuous over voltage corresponding to the maximum system voltage at the primary winding. The winding supports shall be suitably reinforced to withstand normal handling and the thermal and dynamic stresses during operation without damage.

The voltage transformer secondary circuits will be taken out to form the star point and earthed at one point outside the voltage transformers.

Both primary and secondary winding terminals shall be clearly and indelibly marked to show polarity in accordance with IEC:186. The connections required for different secondary

windings in case of multi-winding voltage transformers shall be clearly indicated in terminal blocks and the wiring diagrams.

7.7 Tank

Both expansion chamber and tank of the voltage transformers shall be made of high quality steel and shall be hot dip galvanized and shall be able to withstand the stress occurring during transit and all thermal and mechanical stresses resulting from maximum short circuit current during operation.

7.8 Insulating Oil

The voltage transformers shall be supplied filled with new insulating oil. The oil shall conform to the requirements of latest issue of IEC:296 of IS:335. The quantity of insulating oil for first filling of the equipment and complete specification of oil proposed to be used shall be stated in the bid.

7.9 Hermetic Sealing

The voltage transformers shall be supplied filled with insulating oil and shall be hermetically sealed to prevent atmosphere coming in contact with oil, avoiding filtration and change of oil. Nitrogen or other inert gas shall be provided above the oil surface to permit expansion and contraction of oil. Provision shall be made for draining and re-filling the insulating oil.

7.10 Fitting and Accessories

Fittings and accessories listed below shall be supplied with each voltage transformer:

- Oil level gauge.
- Oil drain, sampling and filling hole with cap;
- Pressure relief device;
- HV terminals;
- Two earthing terminals with necessary nuts, bolts and washers;
- Name and rating plate;
- Secondary terminal box with LV terminal connections;
- Mounting nuts, bolts and washers;
- L.V HRC cartridge fuses for the protection of secondary winding; Any other fitting deemed essential by the contractor shall also be supplied along with each voltage transformer:

The oil level gauge shall be mounted in such a way that the oil level can be clearly seen from the ground level.

The name and rating plate shall contain all the particulars as provided in IEC:186 and also the name of the employer and year of manufacture. They shall comply with the clause termed label in this specification.

7.11 SECONDARY TERMINAL BOX

A dust, vermin and weather proof terminal box shall be provided at the lower end of each voltage transformer for terminating the secondary windings. The box shall have a bolted removable cover plate complete with gaskets. The terminal box shall have cable gland plate and cable glands with shrouds suitable for entry of 4 core x2.5mm² PVC insulated control cables as per IEC:227 or IS:1554.

For 33KV Voltage Transformer one 4 core 2.5mm²

The terminal box enclosure shall have protection of class IP 55 as defined in IEC:529 or IS:13947 and shall be painted or galvanized in accordance with specification of Surface Treatment.

7.12 Terminal blocks

Terminal blocks of brass studs rated for 10 Amps continuous current, 650 Volt grade enclosed in moulded insulating materials shall be provided with adequate electrical clearance for terminating the secondary wiring and outgoing connections. The terminal blocks shall be suitable for termination of 2.5mm² wires. The termination shall be made by crimping Jugs or bare wire with insulating sleeves at ends. All terminals must be marked with numbers and wire termination provided with numbered ferrules for identification.

7.13 Fuse protection

The secondary windings shall be protected by HRC cartridge fuses in fuse holder consisting of carriers and bases. The carriers and bases shall be of high grade flame retarding and non hygroscopic moulded insulating materials with hard glass surface. Each fuse shall be identified with engraved plastic label.

7.14 Circuit diagram

A durable copy of the circuit wiring diagram shall be affixed to the inner side of the terminal box cover. Labels shall be provided inside the cover to describe the functions of various items of equipments.

7.15 TERMINATION

The equipment shall be supplied with HV electrical connection terminals of a size and rating appropriate for all the duties, including overload duty specified for the equipment. The terminals shall be of the bi-metallic type, suitable for connection of all aluminium alloy conductor (AAAC) or aluminium conductor steel reinforced (ACSR). In general connections using palm type solderless sockets shall be preferred. The proposed method of connections shall be stated in the offer and shall be subject to approval by the DGM (Tech.), CSO. Where the terminals are of the clamp type, they shall be suitable for taking a range of conductors appropriate to the rating of the equipment. All nuts, bolts, washers and spring washers required to complete the connection shall be supplied with the equipment.

7.16 EARTHING TERMINAL

Two earthing terminals complete with necessary hardware shall be provided on each voltage transformer for connecting to earth continuity conductors of the Employer. They shall be of electroplated brass and of adequate size to carry the earth fault current. The earthing terminals shall be identified by means of appropriate symbol marked in a legible and indelible manner adjacent to the terminals.

7.17 TEST AND INSPECTIONS

The voltage transformers shall be tested in accordance with the requirements of the type tests and routine tests as provided in the latest issues of IEC:186 or IS:3516. The tests to be conducted shall include;

7.17.1 Type tests:

- Lightning impulse voltage test;
- High voltage power frequency wet withstand voltage;
- Temperature rise test;
- Short circuit withstand capability test;
- Determination of limits of voltage error and phase displacement.

7.17.2 Routine tests:

- Verification of terminal marking and polarity;
- Power frequency withstand tests on primary winding;
- Power frequency dry withstand tests on secondary winding;
- Power frequency withstand tests between sections;
- Determination of limits of voltage errors and phase displacement;
- Partial discharge measurement.

- Insulating Resistance measurement.

7.18 TEMPERATURE RISE

The temperature rise of any part of the voltage transformer under continuous operating and exposed in the direct rays of the sun shall not exceed the permissible limits as provided in IEC publication 186 or IS: 3156. These shall not be exceeded when corrected for the difference between the ambient temperature at site and the ambient temperature specified in the standard. The correction proposed shall be stated in the bid.

8 PROTECTIVE RELAY & CONTROL PANEL

Outdoor control panels with protective relay and meter shall be provided by the supplier suitable for above breakers. The equipment shall have protection scheme with the following relays:

- (i) Triple pole IDMTL type combined over current (2Nos) & Earth fault (1No) relay (Draw out type) preferably Non communicable numerical relay. Plug setting range of the over current and earth fault relays shall be 5% to 250%.
- (ii) 3 elements auxiliary relay for transformer fault, trip for Buchholz, winding temperature & oil temperature.
- (iii) Master trip relay for inter tripping.
- (iv) Differential relay.
- (v) One alarm bell scheme with bell (24V DC).

N.B:- The relays should be Schneider, Easun Rerolle, ABB or of any reputed make (subject to approval)

9. METERS:

The following meters shall be provided.

- i) Ammeter:- 1 No. , 0-100-200 A/ 1 Amp Preferable Make- IMP/ AE or any reputed make (Dial type or Digital).
- ii) Volt meter:- 1 No., 0- 40 KV (size :144mm x 144mm), make IMP/AE or any reputed make (Dial type or Digital).
- iii) Ammeter selector switch- 1 No. Make – Kaycee or any other reputed make.
- iv) Volt meter selector switch- 1No. Make- Kaycee or any other reputed make.
- v) 40 watt lamp with switch- 1 No.
- vi) Plug & Socket- 1 No.
- vii) Fuses & Links- 1 No.
- viii) Test terminal Blocks- Test terminal Block need be provided for testing relays & breakers.

- ix) Indication Lamp- (24V DC LED type)
- Red- Breaker 'ON'
 - Green Breaker 'OFF'
 - Amber- Breaker 'AUTO TRIP'
 - Blue- Spring charge indication.
 - White-Healthy Trip illuminated push bottom switch

10. OTHER EQUIPMENTS

10.1 Out Door Control- Relay Panel

10.1.1

1. General

The electrical controls, relays, instruments, meters, annunciation scheme shall be provided in a sheet steel enclosure conforming to IEC:298 or IS:3427 mounted on support base on the floor. The panel shall be free standing, dust, moisture and rodent and vermin proof suitable for outdoor installation. The panel shall have a high degree of protection for outdoor installation with relevant standard.

Each panel shall comprise of rigid welded structure frame enclosed completely by metal sheet of thickness not less than 2mm. The sheets shall be cold rolled with smooth finish leveled and free from flaws. The structural frame and all load bearing members of the enclosure shall have minimum thickness of 2.5mm.

The enclosure shall have hinged door at the front and back for access to the low voltage wiring. All door panels and removable covers shall be gasketed all round with neoprene bonded gasket. Ventilating louvers shall be provided to limit the temperature rise as provided in IEC: 694 and 298 or IS:12729 and 3427. They shall be provided with filters encased in fine wire screens for non-ferrous metal or stainless steel unaffected by moisture and rain water. A 230V AC heater with auto temperature control shall be provided in the cabinet to prevent moisture condensation.

The housing shall be surface treated and painted in accordance with the clause on Surface Treatment of this specification.

10.1.2 Panel wiring and accessories.

10.1.3 Wiring

Each panel shall be supplied with all internal wiring complete. Panel wiring shall be suitably bunched and clamped for neat appearance. The conductors used for wiring purpose shall be

PVC insulated 650/1100 volt grade semi-flexible heat resistant, flame retardant and vermin proof electrolytic copper cable conforming to IEC:227, 502 or IS:1554. The wiring shall be securely supported and taken through PVC troughs. Each wire shall be continuous from end to end without any joint in between. All panel wiring shall be capable of withstanding a voltage of 2KV AC 50Hz for one minute.

Cable and wire for connections within the switchgear and between the switchgear and terminal blocks shall have a minimum temperature rating of 90 degree Celsius. The size of the conductors for panel wiring shall be not less than 2.5mm². For CT secondary wiring, two such wires shall be used in parallel.

10.1.4 Panel wiring protection

The panels shall be equipped with links and HRC cartridge fuses conforming to IEC:269 or IS:13703 in 650 Volt grade phenolic moulded fuse holder consisting of fuse carrier and base or miniature circuit breakers conforming to IEC:947-2 or IS:13947-2 at appropriate locations. The carriers and bases shall be made of high grade flame retardant and non hygroscopic phenolic moulded material with hard glass surface. Each fuse or MCB shall be identified with engraved plastic label.

In general, fuses and MCBs shall be limited to the minimum required for safety. The protection scheme shall include fuses for VT secondary circuits and DC supply to each panel and fuses for MCB for spring charging motor and incoming AC supply.

10.1.5 Terminal blocks

Terminal blocks of brass studs rated for 10 amps continuous current, 650 volt DC grade covered by moulded insulating materials with adequate electrical clearances shall be provided for terminating the panel wiring and outgoing connections. The termination shall be made by crimping lugs or bare conductor with insulating sleeves at ends. The arrangement can be horizontal or vertical as per standard practice adopted by the manufacturer. All terminals must be numbered and wire termination provided with numbered ferrules for identification. All numbering and marking including those in wiring diagram shall follow the guidelines provided in IS:11353. All circuit breaker auxiliary contacts including spare contacts shall be wired to the terminal blocks. Ten percent spare terminals shall be provided. The CT Terminal Box should be bolted Type with stud dia 6mm & length 15mm with 3nos.of nuts. The distance from stud to stud be 1.5times the outside circular dia of nuts.

10.1.6 Colour and numbering

The wiring used for 230V AC supply for illumination lamp, panel heater and other devices shall be coloured red for phase wire and black for the neutral. The colour of wires connecting directly to Earth shall be black. All other panel wires shall be of one colour to be approved. Engraved core identification plastic ferrules marked to correspond with the panel wiring diagram shall be fixed at both ends of each wire. Ferrules shall fit tightly on the wire and shall not fall off when the wire is disconnected from the terminal block. Numbers 6 and 9, if used shall be under scored to enable differentiation.

10.1.7 Circuit diagram

A durable copy of the circuit wiring diagram shall be affixed to the inner side of the door of the switchgear compartment. Labels shall be provided inside the compartment to describe the functions of the various items of equipment.

The scope of the supply shall include the panel mounting base plate and all special equipment, bolts, nuts and washers necessary for making the supporting.

10.2 Supporting Structure

The supply of the material shall be complete with mounting structures of mild steel sections conforming to IS: 226 or equivalent ISO. The supporting structure shall be designed and constructed to withstand the maximum combined effects of the circuit breaker dead weight, its maximum dynamic load and maximum effect of wind loading. The supporting structure shall be hot dip galvanized as per clause on surface treatment of this specification.

10.3 CT and PT mounting bracket

The supporting structure shall be fitted with a bracket for supporting the three oil filled 33KV single phase current transformers and 3 nos. 33KV (1 Phase)PTs. The support bracket shall be provided opposite the circuit breaker poles and shall ensure adequate clearance between the breaker poles and the CTs as well as between the CTs and PTs. The CTs & PTs shall be supplied by the Supplier as per specification above and is included in the scope. The drawings of the structure with bracket shall be subject to Purchaser's approval before fabrication. The CT and PT mounting bracket shall be hot dip galvanized as per clause on surface treatment of this specification.

10.4 Local control cabinet

The operating mechanism, local controls and monitoring shall be provided in a metal clad control cabinet fitted to the same structure supporting the breaker and mounted at a convenient height for safe operation from ground level or from platform to be supplied under the contract.

The cabinet shall be made of minimum 2 mm sheet steel and shall be constructed as a dust, weather and vermin proof outdoor housing with protection of IP-54 class as defined in IEC:529 or IS:13947. It shall have single door and transparent windows for reading the circuit breaker ON or OFF position and spring charge position without opening the door. The door and any removable covers shall be gasketed all round with neoprene bonded gaskets. A ventilating louver shall be provided with fine wire non-ferrous metal or stainless steel screen and filter. A 230V AC heater with auto temperature control shall be provided in the cabinet to prevent moisture condensation and also a 230 volt lamp for internal illumination with door operated switch.

The local control cabinet shall be subjected to surface treatment and painting as per clause on surface treatment of this specification.

10.5 Panel wiring and accessories

Panel wiring shall be suitably bunched and clamped for neat appearance. The conductor used for wiring purpose shall be PVC insulated 650 volt/ 1100V grade semi-flexible copper cable conforming to IEC:227 or IS:1554, heat resistant, flame, vermin and rodent proof. The wiring shall be securely supported and taken through PVC troughs. All panel wiring shall be capable of withstanding a voltage of 2KV AC 50Hz for 1 minute. Each wire shall be continuous from end to end without any joint in between.

The sizes of the control cable for wiring in the cabinet shall be not less than 2.5mm² . CT secondary wiring shall be though two such wires in parallel.

10.5.1 Fuse protection

The cabinet shall be equipped with links and HRC cartridge fuses in 650 volt grade fuse holders consisting of fuse carrier and base. The holders shall be made of high grade, flame retardant and non hygroscopic phenolic moulded material of dark brown colour with hard glass surface. Each fuse shall be identified with engraved plastic labels.

10.5.2 Terminal blocks

Terminal blocks rated for 10 amps continuous current, 650 volt grade covered by moulded insulating materials with adequate electrical clearances shall be provided for terminating the panel wiring and outgoing connections. The termination shall be made by crimping lugs or bare wire with insulating sleeves at ends. The arrangement can be horizontal or vertical as per standard practice adopted by the manufacturer. All terminals must be numbered and wire termination provided with numbered ferrule for identification. All numbering and marking

include those in wiring diagram shall follow the guidelines provided in IS: 11353. Ten percent spare terminals shall be provided.

10.5.3 Colours

The wiring used for AC supply for illumination lamp and heater shall be differently coloured from control wiring so that these can be distinguished from each other. The colour of all earth wire shall be black.

10.6 Circuit diagram

A durable copy of the circuit wiring diagram shall be affixed to the inner side of the control cabinet. Labels shall be provided inside the cabinet to describe the functions of the various items of equipment.

10.7 Cable Entry

A removable gland plate shall be provided at the bottom of the cabinet for entry of Purchaser's control and auxiliary power cables in the cabinet. Required number of electroplated brass cable glands of appropriate sizes with shrouds shall be provided in consultation with the Purchaser in the gland plate for the control and power cables. Provision shall be made for earthing of the cable armours in the gland.

11 OPERATING MECHANISM

11.1 General

The operating mechanism of the circuit breaker shall be motor wound spring charged type. It shall be electrically and mechanically trip free with anti pumping device (as per IEC:694 definition). All working parts in the mechanism shall be of corrosion resistant material. Self lubricating, wearing resistant bearings shall be provided in the mechanism. The mechanism shall fully close the circuit breaker and sustain it in the closed position against the forces of the rated making current and shall fully open the circuit breaker without undue contact bounce at a speed commensurate with that shown by tests to be necessary to achieve the rated breaking capacity in accordance with IEC:56 or IS:13118. The mechanism shall be capable of being locked in either the open or closed position. The mechanism shall be capable of fully closing and opening again after the auto-reclose time interval specified as 0.3 second in this specification.

11.2 Spring mechanism

The spring operating mechanism shall be with spring charging motor, opening and closing springs with limit switches and all accessories necessary for automatic charging. In normal operation, recharging of the operating springs shall commence immediately and

automatically upon completion of the closing operation so that a complete sequence of closing and opening operation should be possible.

It shall be possible to hand charge the operating spring with the circuit breaker in either the open or closed position conveniently from the ground level. Closure whilst a spring charging operation is in progress shall be prevented and release of the springs shall not be possible until they are fully charged.

The state of charge of the operating springs shall be indicated by a mechanical device showing 'SPRING CHARGED' when closing spring is fully charged and operation is permissible and 'SPRING FREE' when closing spring is not fully charged and the operation is not possible. Provision shall be made for remote electrical indication of 'Spring Charged' and 'Spring Free' conditions.

The operating mechanism shall be such that the failure of any auxiliary spring shall not cause tripping or closing the circuit breaker but shall not prevent tripping against trip command. Closing action of the circuit breaker shall charge the opening spring ready for tripping. From the close position with spring charged, one open-close-open operation shall be possible without recharging the spring.

11.3 Motor

The motor for spring charging shall be single phase 230 Volt A. C motor. Continuous motor rating shall be at least ten percent above the maximum load demand of the driven equipment. It shall remain within its rated capacity at all operating points that will arise in service. It shall be protected by H.R.C cartridge fuses or MCB. The motor shall comply with IEC: 34 or IS:996.

12. AUXILIARY POWER SUPPLY

The operating mechanism shall be suitable to operate with the following auxiliary power supplies.

a) 230V,50Hz Single phase A.C For spring charging motor

b) DC supply 24 Volts- For close and open coils, indication & Alarm (Power pack input supply: 230V & 110V AC and Output: 24V DC)

The DC supply shall be from a Power Pack. The Input to Power Pack is 110V from PT and 230V from main supply. The power pack should be capable for minimum 3 Trippings even if input to power pack is failed.

The mechanism shall be designed to operate satisfactorily despite fluctuations of auxiliary power supplies as under:

- AC supply: Voltage From 115% to 85% of normal voltage
 Frequency From 105% to 95% of normal frequency
 Combined From 115% to 85% of normal
 voltage and
 frequency variation
- DC supply: Voltage From 120% to 70% of normal voltage

13. INTERLOCKS

The circuit breaker shall be capable of being mechanically and electrically interlocked with the associated line isolator so that the isolator cannot be operated with the breaker in the closed position.

All doors or shutters which give access to live parts shall be interlocked in such a way that these cannot be opened unless the circuit breaker is in the open position. Other interlocks shall be provided as deemed necessary for safety.

14. PROTECTION AND METERING

Protective relays and metering will be provided in a control panel by separate agency in Purchaser's control room. The circuit breaker shall be particularly suitable for the following protection schemes:

- Inter-tripping for simultaneous tripping other circuit breaker.

15. TERMINAL CONNECTOR

Suitable terminal connectors of bi-metallic type suitable for both horizontal and vertical connection shall be provided on the terminal pad both on the incoming and the outgoing side for connection of jumpers of ACSR or AAAC conductor. The size of the conductor may vary between 50mm² and 232mm² depending upon the location of the circuit breaker. The terminal connection drawing and details are to be approved by the Purchaser before fabrication. The terminal connectors shall be bi-metallic type to avoid bi-metallic corrosion.

16. INSULATION AND CLEARANCE

a) The insulation to ground, the insulation between open contacts and insulation between phases of the circuit breaker shall be capable of satisfactorily withstanding dielectric test voltages.

b) The minimum clearance in open air shall be as follows:

- Between poles - 460mm
- Phase to earth - 400mm
- Ground clearance for live part - 3700mm

17. TEMPERATURE RISE

The temperature rise and the maximum temperature of any part of the circuit breaker under continuous load condition and exposed in the direct rays of the sun shall not exceed the permissible limits as provided in Table V of IEC publication 694 or table 4 of IS:12729. These limits shall not be exceeded when corrected for the difference between the ambient temperature at site and the ambient temperature specified in the standard. The correction proposed shall be stated in the tender.

18. TESTS

18.1 Type and routine tests

The circuit breakers shall be subjected to routine and type tests in accordance with the standards listed in this specification including the following IEC and IS standards with the latest amendments:

- Circuit breaker IEC: 56 and IS:13118 and relevant other standards
- Porcelain insulator IEC: 233 and IS:5621 and relevant other standards

The tests shall include but not limited to the following:

18.2 Short circuit tests

The circuit breaker shall satisfactorily perform the out of phase and short circuit duties specified in IEC: 56, IEC: 17A(Sect.) and IEC:17A/CD/474, IS-13118 and IS:13516. The circuit breaker shall be capable of performing at least twenty five (25) open operations at the rated short circuit current before maintenance or inspection is required.

18.3 Capacitive current switching

Capacitive switching tests shall be performed in accordance with IEC:56 or IS:13118 and IEC:17A/CD/474 at 1.3U preferably by direct test method or alternatively using synthetic method to IEC:427 or IS:13516. The test circuits shall simulate the most onerous site conditions.

18.4 Reactor Switching

In addition to the capacitive current switching tests to IEC:56 or IS:13118 and IEC:17A/CD/474, the circuit breakers shall be tested for shunt reactor switching in accordance with IEC:1233, Examination of the interrupter after the tests shall not show any evidence of surface tracking or erosion of contacts.

18.5 Dielectric tests

At zero gauge loss of vacuum inside the interrupter chamber, the open contacts shall withstand continuously, the rated phase to ground voltage and it shall be possible to break normal current in these conditions. During the dielectric type tests, no flashover external or internal shall be acceptable.

The circuit breakers shall be subjected to a power frequency AC voltage test for one minute in dry and wet conditions and there shall be no external flash over to earth.

18.6 Mechanical endurance

In addition to the requirements of IEC:56, an extended mechanical endurance test is required to show that the circuit breaker is capable of at least 10,000 operations at no load in accordance with IEC:17A/474/CD. Between the specified test series in IEC: 17A/474/CD, some maintenance such as lubrication and mechanical adjustment is allowed and shall be performed in accordance with manufacturer's instructions. Change of contacts is not permitted.

18.7 Low current switching

The circuit breakers shall produce very low over voltage (<2.0 pu) on all switching circuits inductive current including reactor switching to IEC-1233 and capacitive current switching to IEC:17A (Secretariat) 438 and IEC 17A/CD/474 the circuit breaker shall be re-ignition or restrike free for all duties.

18.8 Duty requirement tests

Apart from auto-reclosing and the other duties mentioned above, the breakers shall be able to perform the following duties for which type tests are to be conducted as per IEC:56 or IS:13118.

1. Breaking the steady and the transient magnetizing current of the transformer.
2. Breaking 25% of rated fault current at twice the rated voltage as per IEC/IS.
3. Cable charging breaking current.
4. Back-to-back capacitor bank breaking current.
5. Single capacitor bank breaking current.

6. Capacitor bank in rush making current. Test for the resistance of the main circuit shall also be conducted.

18.9 Temperature rise test

Temperature rise test is to be conducted on the circuit breaker and the accessories in accordance with IEC:56 or IS:13118. The temperature rise shall be limited as per this specification.

19. PERFORMANCE REQUIREMENTS

The supplier shall declare the circuit breaker opening and closing times at 120 percent, 100 percent and 70 per cent of the rated voltage of the opening and closing devices when measured at the terminals of the trip and closing coils. The minimum make break time at rated voltage and total break time of the CB shall be stated. The total break time must not exceed 60m.sec.

20. EARTHING

All metal parts not intended for carrying current or not alive shall be connected to duplicate earthing system and suitable electroplated brass earthing terminals shall be provided on each circuit breaker in conformity with IEC:56 or IS:13118. Suitable identification mark for the earth terminals shall be provided adjacent to the terminal. Earth continuity conductors shall be provided down to the ground level for earth connection to purchaser’s earthing grid. It shall have sufficient cross sectional area to afford a low resistance path for the full fault current envisaged. Such conductor shall also be provided for the CTs up to the ground level.

The size of the earth continuity conductor shall be large enough to reduce the potential rise of the metal frame of the breaker in the even of fault to minimum but in any case not more than 10V. The size of the conductor shall also be adequate to restrict the temperature rise without causing any damage to the earth connection in the case of fault. No riveted joints in the earth conducting path shall be permissible and only bolted joints of adequate size shall be provided with nuts, bolts and plain and spring washers. The surfaces to be jointed shall be perfectly flat without any unevenness to ensure that there is no contact resistance.

21. Mandatory Spare Parts for 33KV VCB

The supplier shall provide the mandatory spares as follows:

Sl.No.	Description	Qty. required for 33 nos. of
--------	-------------	------------------------------

		VCB (Nos.)
1	Complete pole assembly of the circuit breaker	4
2	Vacuum interrupter bottle (for vacuum type only)	4
3	Tripping coils	6
4	Closing coils	6
5	Insulated drive rod	6
6	Spring charging motor	4
7	Set of spring charging limit switches	4
8	Set for gaskets complete for one circuit breaker	4
9	Upper Housing assembly	4
10	Lower Housing assembly	4

22. Bolts and nuts

All bolts, studs, screw threads, bolt heads and nuts shall comply with the appropriate national standards for metric threads, or the technical equivalent.

All nuts and pins shall be adequately locked.

Head of the bolt in bolt and nut assembly in the horizontal plane must remain in the top. All bolts, nuts shall be treated to prevent corrosion, by hot dip galvanising and washers are to be electro galvanized.

M. DISC INSULATORS

1.1 SCOPE.

This specification provides for design, manufacture, engineering, inspection and testing before dispatch packing and delivery FOR (destination) for Indian manufacturers of disc. Insulators & Post Insulators as per technical requirements furnished in this specification.

These insulators are to be used in suspension and tension insulators strings for the suspension and anchoring of the bus-bar conductors.

Following is the list of documents constituting this package.

- (i) Technical specification.
- (ii) Technical data sheet.
- (iii) Drawings of insulators

All the above volumes along with amendments there of shall be read and interpreted together. However, in case of a contradiction between the “Technical Specification” and any other volume, the provisions of this volume will prevail.

The insulators shall conform in all respects to high standards of engineering, design workmanship and latest revisions of relevant standards at the time of offer and purchaser shall have the power to reject any work or material which in his judgment, is not in full accordance therewith.

1.2 STANDARDS:

1.2.1 Except as modified in this specification, the disc insulators shall conform to the following Indian Standards, which shall mean latest revisions and amendments. Equivalent International and Internally recognized standards to which some of these standards generally correspond are also listed below.

Sl. No.	Indian Standard	Title.	International Standard
1.	IS: 206	Method for Chemical Analysis of Slab Zinc.	
2.	IS: 209	Specification for Zinc.	BS: 3436
3.	IS: 731	Porcelain insulators for overhead power lines with a normal voltage greater than 1000V	BS: 137(I&II); IEC 274 IEC 383
4.	IS: 2071 Part-(I) Part-(II) Part-(III)	Method of High Voltage Testing.	
5.	IS: 2121 (Part-I)	Specification of Conductors and Earth wire Accessories for Overhead Power lines. Armour Rods, Binding wires and tapes for conductor.	
6.	IS: 2486	Specification for Insulator fittings for overhead power lines with a nominal voltage greater than 1000V.	
	Part – I	General Requirement and Tests.	BS: 3288
	Part – II	Dimensional Requirements.	IEC: 120
	Part – III	Locking devices.	IEC: 372
7.	IS: 2629	Recommended practice for Hot Dip Galvanisation for iron and steel.	
8.	IS: 2633	Testing for Uniformity of Coating of Zinc coated articles.	
9.	IS: 3138	Hexagonal Bolts & Nuts.	ISO/R 947 & ISO/R 272
10.	IS: 3188	Dimensions for Disc Insulators.	IEC: 305
11.	IS: 4218	Metric Screw Threads	ISO/R 68-1969 R 26-1963, R 262-1969 & R965-1969
12.	IS: 6745	Determination of weight of zinc	

		coating on zinc coated iron and steel articles.	
13	IS: 8263	Methods of RIV Test of HV insulators.	IEC 437 NEMA Publication No.107/1964 CISPR
14	IS: 8269	Methods for switching impulse test on HV insulators.	IEC: 506
15		Thermal mechanical performance test and mechanical performance test on string insulator units.	IEC: 575
16	IEC	Long Rod Insulators	IEC-433

1.2.2 The standards mentioned above are available from:

Reference.	Abbreviation.	Name & Address:
BS		British Standards, British Standards Institution, 101, Pentonville Road, N-19 ND,U
IEC / CISPR		International Electro technical commission Electro Technique International. 1, Rue de verembe Geneva SWITZERLAND.
IS		Bureau of Indian Standards, Manak Bhavan, 9 Bahadurshah Zafar Marg, New Delhi-110001
ISO		International Organisation for Standardization. Danish Board of Standardization Dansk Standardizing Sraat Aurehoegvej-12 DK-2900 Hellestrup DENMARK.
NEMA		National Electric Manufacturers Association 1`55, East 44 th . Street New York, NY 10017 USA

1.3 (A) PRINCIPAL PARAMETERS.

1.3.1 DETAILS OF DISC INSULATORS:

The Insulator strings shall consist of standard discs for use in three phases, 50 Hz 33/11KV S/s of SOUTHCO in a moderately polluted atmosphere. The discs shall be cap and pin, ball and socket type, radio interference and have characteristics as shown in Table-I and all ferrous parts shall be hot dip galvanized as per the latest edition of IS 2629. The zinc to be used for making sleeves shall be 99.95 % pure.

The size of disc insulator, minimum creepage distance the number to be used in different type of strings, their electromechanical strength and mechanical strength of insulator string along with hardware shall be as follows:

Sl. No	Type of String.	Size of disc. Insulator (mm)	Minimum creepage distance of each disc(mm)	No. of standard discs 33KV	Electro-mechanical strength of insulator string fittings (KN)
1.	Single suspension	255x145	430	1x3	45
2.	Double suspension	-do-	-do-	2x3	2x45
3.	Single Tension	280x170	-do-	1x4	70
4.	Double Tension	-do-	-do-	2x4	2x70

1.3.2 SPECIFICATION DRAWINGS:

The specification in respect of the disc insulators are described. These specification for information and guidance of the Bidder only. The drawings to be furnished by the supplier shall be as per his own design and manufacture and in line with the specification.

1.3 (B) GENERAL TECHNICAL REQUIREMENTS:

1.3.1 Porcelain:

The porcelain used in the manufacture of the shells shall be ivory white nonporous of high dielectric, mechanical and thermal strength, free from internal stresses blisters, laminations, voids, forgone matter imperfections or other defects which might render it in any way unusable for insulator shells. Porcelain shall remain unaffected by climatic conditions ozone, acid, alkalis, zinc or dust. The manufacturing shall be by the wet process and impervious character obtained by through verification.

The insulator shall be made of highest grade, dense, homogeneous, wet-process porcelain, completely and uniformly vitrified throughout to produce uniform mechanical and electrical strength and long life service. The porcelain shall be free from warping, roughness, cracks, blisters, laminations, projecting points foreign particles and other defects, except those within the limits of standard accepted practice. Surfaces and grooves shall be shaped for easy cleaning. Shells shall be substantially symmetrical.

1.3.2 Porcelain glaze:

Surface to come in contact with cement shall be made rough by stand glazing. All other exposed surfaces shall be glazed with ceramic materials having the same temperature coefficient of expansion as that of the insulator shell. The thickness of the glaze shall be uniform throughout and the colour of the glaze shall be down. The Glaze shall have a visible luster and smooth on surface and be capable of satisfactory performance under extreme tropical climatic weather conditions and prevent ageing of the porcelain. The glaze shall remain under compression on the porcelain body throughout the working temperature range.

1.4 METAL PARTS:

(i) Cap and Ball Pins:

Ball pins shall be made with drop forged steel caps with malleable cast iron. They shall be in one single piece and duly hot dip galvanized. They shall not contain parts or pieces joined together welded, shrink fitted or by any other process from more than one piece of materials. The pins shall be of high tensile steel, drop forged and heat-treated. The caps shall be cast with good quality black heart malleable cast iron and annealed. Galvanizing shall be by the hot dip process with a heavy coating of zinc of very high purity. The bidder shall specify the grade composition and mechanical properties of steel used for caps and pins. The cap and pin shall be of such design that it will not yield or distort under the specified mechanical load in such a manner as to change the relative spacing of the insulators or add other stresses to the shells. The insulator caps shall be of the socket type provided with nonferrous metal or stainless steel cotter pins and shall provide positive locking of the coupling.

(ii) Security Clips:

The security clips shall be made of phosphor bronze or of stainless steel.

1.5 FILLER MATERIAL:

Cement to be used, as a filler material be quick setting, fast curing Portland cement. It shall not cause fracture by expansion or loosening by contraction. Cement shall not react chemically with metal parts in contact with it and its thickness shall be as small and as uniform as possible.

1.6 MATERIALS DESIGN AND WORKMANSHIP:

1.6.1 GENERAL:

All raw materials to be used in the manufacture of these insulators shall be subject to strict raw material quality control and to stage testing/ quality control during manufacturing stage to ensure the quality of the final end product. Manufacturing shall conform to the best engineering practices adopted in the field of extra high voltage transmission. Bidders shall therefore offer insulators as are guaranteed by them for satisfactory performance on Transmission lines.

The design, manufacturing process and material control at various stages be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish elimination of sharp edges and corners to limit corona and radio interference voltages.

1.6.2 INSULATOR SHELL:

The design of the insulator shells shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. Shells with cracks shall be eliminated by temperature cycle test followed by mallet test. Shells shall be dried under controlled conditions of humidity and temperature.

1.6.3 METAL PARTS:

- 1) The pin and cap shall be designed to transmit the mechanical stress to the shell by compression and develop uniform mechanical strength in the insulator. The cap shall be circular with the inner and outer surfaces concentric and of such design that it will not yield or distort under loaded conditions. The head portion of the pinball shall be suitably designed

so that when the insulator is under tension the stresses are uniformly distributed over the pinhole portion of the shell. The pinball shall move freely in the cap socket either during assembly of a string or during erection of a string or when a string is placed in position.

- i) Metal caps shall be free from cracks, seams, shrinks, air holes, blowholes and rough edges. All metal surfaces shall be perfectly smooth with no projecting part or irregularities, which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stress uniformly. Pins shall not show any microscopically visible cracks, inclusions and voids.

1.6.4 GALVANIZING:

All ferrous parts, shall be hot dip galvanized in accordance with IS: 2629. The zinc to be used for galvanizing shall conform to grade Zn 99.5 as per IS: 209. The zinc coating shall be uniform, smoothly adherent, reasonably light, continuous and free from impurities such as flux, ash, rust stains, bulky white deposits and blisters. Before ball fittings are galvanized, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the designed dimensional requirements.

1.6.5 CEMENTING:

The insulator design shall be such that the insulating medium shall not directly engaged with hard metal. The surface of porcelain and coated with resilient paint to offset the effect of difference in thermal expansions of these materials. High quality Portland cement shall be used for cementing the porcelain to the cap & pin.

1.6.6 SECURITY CLIPS (LOCKING DEVICES)

The security clips to be used as locking device for ball and socket coupling shall be 'R' shaped hump type to provide for positive locking of the coupling as per IS: 2486 (Part-IV). The legs of the security clips shall allow for spreading after installation to prevent complete withdrawal from the socket. The locking device shall resilient corrosion resistant and of sufficient mechanical strength. There shall be no possibility of the locking device to be displaced or be capable of rotation, which placed in position, and under no circumstances shall it allow separation of insulator units and fittings. 'W' type security clips are also acceptable. The hole for the security clip shall be counter sunk and the clip shall be of such design that the eye of the clip may be engaged by a hot line clip puller to provide for disengagement under energized conditions. The force required for pulling the clip into its unlocked positions shall not be less than 50 N (5 kg.) or more than 500 N (50 kgs.).

1.6.7 MARKING:

Each insulator shall have the rated combined mechanical and electrical strength marked clearly on the porcelain surface. Each insulator shall also bear symbols identifying the manufacturer, month, and year of manufacture. Marking on porcelain shall be printed, not impressed, and shall be applied before firing.

1.6.8 BALL AND SOCKET DESIGNATION:

The dimensions of the ball and sockets for 70 and 90 KN discs shall be of 16 mm and for 120 KN and 160 KN discs shall be of 20 mm designation in accordance with the standard dimensions stated in IS: 2486 (Part-II).

1.6.9 DIMENSIONAL TOLERANCE OF INSULATOR DISCS:

It shall be ensured that the dimensions of the disc insulators are within the limits specified below:

a) Diameter of Disc (mm)	Standard	Maximum	Minimum
45 KN Disc	255	266	244
70 KN Disc	280	293	267
b) Ball to Ball spacing Between Discs (mm)	Standard	Maximum	Minimum
45 KN Disc	145	149	141
70 KN Disc	170	175	165

1.6.10 INTERCHANGEABILITY:

The insulators inclusive of the ball and socket fittings shall be of standard design suitable for use with hardware fittings of any make conforming to relevant Indian Standards.

1.6.11 FREEDOM FROM DEFECTS:

Insulators shall have none of the following defects:

- 1) Ball pin shake.
- 2) Cementing defects near the pin like small blow holes, small hair cracks lumps etc.
- 3) Sand fall defects on the surface of the insulator.

1.7 INSULATOR STRINGS:

1.7.1 TYPE AND RATING:

The insulator strings shall be formed with standard discs described in this specification for use on 3 phases 33 KV 50 Hz effectively earthed systems in an atmosphere with pollution level as indicated in project synopsis. Suspension insulator strings for use with suspension/tangent supports are to be fitted with discs 45 KN EMS rating while tension insulator strings for use with Anchor / Tension towers are to be fitted with discs of 70 KN KN EMS level rating.

1.7.2 STRING SIZE:

The sizes of the disc insulator, the number to be used in different types of strings, their electro-mechanical strength and minimum nominal creep age distance shall be as given in this specification.

1.7.3 Insulator units after assembly shall be concentric and coaxial within limits as permitted by Indian Standards.

1.7.4 The strings design shall be such that when units are coupled together there shall be contact between the shell of one unit and metal of the adjacent unit.

1.8 DIMENSIONAL TOLERANCE OF INSULATORS DISCS

It shall be ensured that the dimensions of the long rod insulators are within the limits as per relevant IEC/ISS.

1.9 TESTS (FOR DISC INSULATORS) :

The following tests shall be carried out on the insulator string and disc insulators.

1.9.1 TYPE TEST:

This shall mean those tests, which are to be carried out to prove the design, process of manufacture and general conformity of the material and product with the intents of this specification. These tests shall be conducted on a representative number of samples prior to commencement of commercial production. The Bidder shall indicate his schedule for carrying out these tests.

1.9.2 ACCEPTANCE TESTS:

This shall mean these tests, which are to be carried out on samples taken from each lot offered for pre-dispatch inspection for the purpose of acceptance of the lot.

1.9.3 ROUTINE TESTS:

This shall mean those tests, which are to be carried out on each insulator to check the requirements, which are likely to vary during production.

1.9.4 TESTS DURING MANUFACTURE:

Stage tests during manufacture shall mean those tests, which are to be carried out during the process of manufacture to ensure quality control such that the end product is of the designed quality conforming to the intent of this specification.

1.9.5 TEST VALUE:

For all type and acceptance tests the acceptance values shall be the value guaranteed by the bidder in the guaranteed technical particulars of the acceptance value specified in this specification of the relevant standard whichever is more stringent for that particular test.

1.9.6 TEST PROCEDURE AND SAMPLING NORMS:

The norms and procedure of sampling for the above tests shall be as per the relevant Indian Standard or the internationally accepted standards. This will be discussed and mutually agreed to between the supplier and purchaser before placement of order. The standards and normal according to which these tests are to be carried out are listed against each test. Where a particular test is a specific requirement of this specification, the norms and procedure for the same shall be as mutually agreed to between the supplier and the purchaser in the quality assurance programme.

1.9.7 TYPE, ROUTINE & ACCEPTANCE TESTS:

The following type test shall be conducted on a suitable number of individual unit components, materials or complete strings.

1. On complete insulator string with hardware fittings	Standards
a) Power frequency voltage withstand test with corona control rings and under wet condition.	BS:137(Part-I)
b) Impulse voltage withstand test under dry condition.	IEC: 383
c) Mechanical strength test.	As per this specification.
2. On Insulators:	
a) Verification of dimensions.	IS: 731
b) Thermal mechanical performance test:	IEC:575
c) Power frequency voltage withstand and flashover (I) dry (ii) wet.	BS: 173
d) Impulse voltage withstand flashover test (dry)	: IEC: 383
e) Visible discharge test (dry)	: IS:731
All the type tests given under clause No.5.14 above shall be conducted on single suspension and Double Tension insulator string along with hardware fittings.	
3. ACCEPTANCE TESTS:	
For insulator:	
a) Visual examination	: IS:731
b) Verification of dimensions.	: IS:731
c) Temperature cycle test.	: IS:731
d) Galvanizing test.	: IS:731
e) Mechanical performance test.	: IEC:575
f) Test on locking device for ball and socket coupling.	: IEC:372
g) Eccentricity test.	As per this specification.
h) Electro-mechanical strength test.	:
i) Puncture test.	: IS:731
j) Porosity test.	: IS:731
4. ROUTINE TESTS:	
For insulators:	
a) Visual inspection.	: IS:731
b) Mechanical routine test.	:
c) Electrical routine test.	: IEC:383
5. TEST DURING MANUFACTURE:	
Chemical analysis, hardness test and magnetic particle inspection for forgings.	: As per this specification.

1.9.8 ADDITIONAL TESTS:

The purchaser reserves the right for carrying out any other tests of a reasonable nature at the works of the supplier/ laboratory or at any other recognized laboratory/ research institute in addition to the above mentioned type, acceptance and routine tests at the cost of the purchaser to satisfy that the material complies with the intent of this specification.

1.9.9 CO-ORDINATION FOR TESTING:

For insulator strings, the supplier shall arrange to conduct testing of their disc insulators with the hardware fittings to be supplied to the purchaser by other suppliers. The supplier is also required to guarantee overall satisfactory performance of the disc insulator with the hardware fittings.

NOTE:

In respect of electrical tests on a complete string consisting of insulators and hardware guarantee of values of responsibility of testing shall be with hardware manufacturer of RIV corona and voltage distribution test and with insulator manufacturer for all other tests.

1.10 TEST CHARGES AND TEST SCHEDULE:

1.10.1 TYPE TEST:

The insulator offered shall be fully type tested as per this specification. In case the equipment of the type and design offered, has already been type tested in an independent test laboratory. The bidder shall furnish four sets of type test reports along with the offer. These tests must not have been conducted earlier than five years. The purchaser reserves the right to demand repetition of some or all type tests in the presence of purchasers' carrying representative. For this purpose the bidder may quote unit rates for carrying out each type test. These prices shall be taken into consideration for bid evaluation. For any change in the design/type already type tested and the design/type offered against this specification, purchaser reserves the right to demand repetition of tests without any extra cost.

1.10.2 ACCEPTANCE AND ROUTINE TEST:

All acceptance and routine tests as stipulated herein shall be carried out by the supplier in the presence of purchaser's representative.

1.10.3 Immediately after finalization of the programme of type/ acceptance/ routine testing, the supplier shall give sufficient advance intimation to the purchaser to enable him to depute his representative for witnessing the tests.

1.10.4 For type tests involving tests on a complete insulator string with hardware fittings, the purchaser will advise the supplier of the hardware fittings to provide the necessary fittings to the place of the test.

1.10.5 In case of failure of the complete string in any type tests, the supplier whose product has failed in the tests shall get the tests repeated at his cost. In case of any dispute, assessment of the purchaser as to the items that has caused the failure in any of the type tests shall be final and binding.

1.10.6 VOLTAGE DISTRIBUTION TEST:

- a) The voltage across each insulator unit shall be measured by sphere gap method. The result obtained shall be converted into percentage and proportionate correction be applied as to give a total of 100% distribution.
- b) The complete insulator string along with its hardware fitting excluding arcing horn corona controlling/grading ring and suspension assembly/dead end assembly shall be subject to a

load equal to 50% of the specified minimum ultimate tensile strength (UTS) which shall be increased already rate to 68% of the minimum UTS specified. The load shall be held for five minutes and then removed. After removal of the load, the string components shall not show any visual deformation and it shall be possible to disassemble them by hand,. Hand tools may be used to remove cotter pins and loosen the nuts initially. The string shall then be reassembled and loaded to 50% of UTS and the load shall be further increased at a steady rate till the specified minimum UTS and held for one minute. No fracture should occur during this period. The applied load shall then be increased until the failing loads reached and the value recorded.

1.10.7 VIBRATION TEST:

The suspension string shall be tested in suspension mode, and tension string in tension mode itself in laboratory span of minimum 30 meters. In the case of suspensions string a load equal to 600 Kg. shall be applied along with the axis of the suspensions string by means of turn buckle. The insulators string along with hardware fittings and two sub conductors throughout the duration of the test vibration dampers shall not be used on the test span. Both the sub-conductors shall be vertically vibrated simultaneously at one of the resonance frequencies of the insulator string (more than 10Hz) by means of vibration inducing equipment. The amplitude of vibration at the antipode point nearest to the string shall be measured and the same shall not be less than 120.4 being the frequency of vibration. The insulator strings shall be vibrated for five million cycles then rotated by 90 deg and again vibrated for 5 million cycles without any failure, after the test, the disc insulators shall be examined for looseness of pins and cap or any crack in the cement. The hardware fittings shall be examined to fatigue fatter and mechanical strength test. There shall be no deterioration of properties of hardware components and disc insulators after the vibration test. The disc insulators shall be subjected to the following tests as per relevant standards.

Test.	Percentage of disc to be tested
a) Temperature cycle test followed by Mechanical performance test.	60 40
b) Puncture test (for porcelain insulator only)	

1.11 INSPECTION:

- i. Purchaser and its representative shall at all times be entitled to have access to the works and to all places of manufacturer where insulators are manufactured and the supplier shall afford all facilities to them for unrestricted inspection of the works, inspection of materials, inspection of manufacturing process of insulators and for conducting necessary tests as specified herein.
- ii. The supplier shall keep the purchaser informed in advance of the time of starting and of progress of manufacture of insulators in its various stages so that arrangements could be made for inspection.
- iii. No material shall be dispatched from its point of manufacture unless the materials has been satisfactorily inspected and tested.
- iv. The acceptance of any quantity of insulators shall in no way relieve the supplier of his responsibility for meeting all the requirement of this specification and shall not prevent subsequent rejection, if such insulators are later found to be defective.

1.12 IDENTIFICATION MARKING:

- a) Each unit of insulator shall be legibly and indelibly marked with the trade mark of the supplier, the year of manufacture, the guaranteed combined mechanical and electrical strength in kilo-Newton abbreviated by 'KN' to facilitate easy identification and proper use.
- b) The marking shall be on porcelain for porcelain insulators. The marking shall be printed and not impressed and the same shall be applied before firing.

1.13 QUALITY ASSURANCE PLAN:

The bidder hereunder shall invariably furnish following information along with his offer, failing which the offer shall be liable for rejection.

- a. Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw material are tested, list of tests normally carried out on raw materials in presence of bidder's representative, copies of test certificates.
- b. Informations and copies of test certificates as in (i) above in respect of bought out materials.
- c. List of manufacturing facilities available.
- d. Level of automation achieved and lists of area where manual processing exists.
- e. List of areas in manufacturing process, where stage inspections are normally carried out in quality control and details of such tests and inspection.
- f. Special features provided in the equipment to make it maintenance free.
- g. List of testing equipping available with the bidder for final testing of equipment specified and test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in schedule of deviations from specified test requirements.

The supplier shall within 30 days of placement of order submit the following information to the owner.

List of raw material and the names of sub-suppliers selected from those furnished along with the offer.

1.14 CHEMICAL ANALYSIS OF ZINC USED FOR GALVANIZING.

Samples taken from the zinc ingot shall be chemically analyzed as per IS: 209. The purity of zinc shall not be less than 99.95%.

1.15 TESTS FOR FORGINGS:

The chemical analysis hardness tests and magnetic particle inspection for forgings will be as per the internationally recognized procedures for these tests. The sampling will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the supplier and purchaser in quality assurance programme.

1.16 TESTS ON CASTING:

The chemical analysis mechanical and metallographic tests and magnetic particle inspection for castings will be as per the internationally recognized procedures for these tests. The samplings will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the supplier and purchaser in quality assurance programme.

1.17 HYDRAULIC INTERNAL PRESSURE TEST ON SHELLS:

The test shall be earned out on 100% shells before assembly. The details regarding test will be as discussed and mutually agreed to by the suppliers and purchaser in Quality Assurance Programme.

1.18 THERMAL MECHANICAL PERFORMANCE TEST:

The thermal mechanical performance test shall be carried out on minimum 15 number of disc insulators units as per the procedure given in IEC 575. The performance of the insulator unit shall be determined by the same standard.

1.19 ECCENTRICITY TEST:

The insulator shall be vertically mounted on a fixture using dummy pin and socket. A vertical scale with horizontal slider shall be used for the axial run out. The pointer shall be positioned in contact with the bottom of the outermost petticoat of the disc. The disc insulators shall be rotated with reference to the fixture and the slider shall be allowed to move up and down on the scale but always maintaining contact with the bottom of the outer most petticoats. After one full rotation of the disc the maximum and minimum position the slider has reached on the scale can be found out. Difference between the above two readings shall satisfy the guaranteed value for axial run out.

Similarly using a horizontal scale with vertical slider the radial run out shall be measured. The slider shall be positioned on the scale to establish contact with the circumference of the disc insulator and disc insulator rotated on its fixture always maintaining the contact. After one full rotation of the disc the maximum and minimum position the slider has reached on the scale can be found out. Difference between the above two readings shall satisfy the guaranteed value for axial run out.

1.20 CRACK DETECTION TEST:

Crack detection test shall be carried out on each ball and pin before assembly of disc unit. The supplier shall maintain complete record of having conducted such tests on each and every piece of ball pin. The bidder shall furnish full details of the equipment available with him for crack test and also indicate the test procedure in detail.

N. HARDWARES

1.0 TECHNICAL SPECIFICATION FOR HARDWARE FITTINGS

2. SCOPE

This Specification covers design manufacture, testing at manufacturer's Works, supply and delivery of power conductor accessories, insulator and hardware fittings for string insulators suitable for use in 33 KV Over-head transmission lines and sub-stations of SOUTHCO.

3 STANDARDS

The materials covered under this Specification shall comply with the requirement of the latest version of the following standards as amended up to date, except where specified otherwise.

- i) IS:2486 Part-II & III Insulator fitting for overhead power lines with a nominal voltage greater than 1,000 volts.
- ii) IS:2121 Part I & II Conductor & earth wire accessories for overhead power lines.
- iii) IS:9708 Stock Bridge Vibration Dampers on overhead power lines.
- iv) IS:2633 Method of testing of uniformity of coating on zinc coated articles
- v) IS:209 Specification for Zinc.
- vi) BS:916 Specification for Hexagonal bolts and nuts.

4 MATERIALS AND DESIGN

Aluminium and aluminium alloys, malleable iron and forged steel, having required mechanical strength, corrosion resistance and much inability depending on the types of application for which accessories / fittings are needed, shall be employed.

In manufacturer of the accessories / fittings, the composition of the aluminium alloys used shall be made available to Employer if required for verification.

The materials offered shall be of first class quality, workmanship, well finished and approved design. All castings shall be free from blow-holes, flaws, cracks of other defects and shall be smooth, close grained and true forms and dimensions. All machined surfaces should be free, smooth and well finished.

Metal fittings of specified material for conductor and earth wire accessories and string insulator fittings are required to have excellent mechanical properties such as strength, toughness and high resistance against corrosion. All current carrying parts shall be so designed and manufactured that contact resistance is reduced to the minimum.

All bolts, nuts, bolt-heads shall be the white worth's standard thread. Bolt heads and nuts shall be hexagonal. Nuts shall be locked in an approved manner. The treads in nuts and tapped holes shall be cut after galvanizing and shall be well fabricated and greased. All other treads shall be cut before galvanizing. The bolt treads shall be undercut to take care of increase in diameter due to galvanizing.

All nuts shall be made of materials to Clause 4.8 of IS:1367 (latest edition) with regard to its mechanical properties.

The general design conductor and earth wire accessories and insulator fittings shall be such as to ensure uniformity, high strength, free from corona formation and high resistance against corrosion even in case of high level of atmosphere pollution.

All hooks, eyes, pins, bolts, suspension clamps and other fittings for attaching to the tower or to the line conductor or to the earth wire shall be so designed that the effects of vibration, both on the conductor and the fittings itself, are minimized.

Special attention must be given to ensure smooth finished surface throughout. Adequate bearing area between fittings shall be provided and point or line contacts shall be avoided. All accessories and hard wares shall be free from cracks, shrinks, slender air holes, burrs or rough edges.

The design of the accessories and hard wares shall be such as to avoid local corona formation or discharge likely to cause interference to tele-transmission signals of any kind.

5 GALVANISING :

All ferrous parts of conductor and ground wire accessories and insulator hard wares shall be galvanized in accordance with IS: 2629-Recommended Practice for hot dip galvanizing of iron and steel or any other equivalent authorities' standards. The weight of zinc coating shall be determined as per method stipulated in IS: 2633 for testing weights, thickness and uniformity of coating of hot dip galvanized articles or as per any other equivalent authoritative standards. The zinc used or galvanization shall conform to grade zn 98 of IS: 209. The galvanized parts shall withstand four (4) dips of 1 minute each time while testing uniformity of zinc coating as per IS: 2633. Spring washers shall be electro galvanized.

6. TENSION CLAMPS

The Tension Clamps shall be made out of aluminium alloy and of 4 **pair** bolted (**M-16**) type conductor (**In case of lines it will be suitable for 80mm²100 mm² 150 mm²**)The tension clamps shall not permit slipping or damage to failure of the complete conductor or any part thereof at a load less than 90% of the ultimate strength of conductor. The mechanical efficiency of tension / clamps shall not be affected by method of erection involving come / along or similar clamps or tension stringing operation during or after assembly and erection of tension clamp itself. The tension clamp shall be of a design that will ensure unrestricted flow of current without use of parallel groove clamps.

The clamps shall be as light as possible.

7 ARCING HORNS

Each hardware assembly shall have provision for attaching arcing horns of both adjustable and non/adjustable type across the suspension and tension strings or tower side. However each hardware assembly shall be provided with arching horn of fixed type on line side only.

8 TESTS, TEST CERTIFICATE AND PERFORMANCE REPORTS

The fittings and accessories for the power conductor, insulator and hardware shall be tested in accordance with IS:2121, IS:2486, BS:916 for hexagonal bolts and nuts or any other authoritative equivalent standards. Six sets of type and routine test certificates and performance reports are to be submitted by the bidder.

The Employer however, reserves the right to get all the tests performed in accordance with the relevant I.S. Specification as Acceptance Test in presence of Employer-s representatives. The bidder shall clearly state the testing facilities available in the laboratory at his Works and his ability to carry out the tests in accordance with this Specification. All the specified tests shall be carried out without any extra cost.

Acceptance Test for power conductor accessories.

- a) Visual examination
- b) Dimensional verification
- c) Failing load test
- d) Slip strength test (for clamps)
- e) Electrical resistance test
- f) Fatigue test (for vibration dampers)
- g) Mass pull off test (for vibration dampers)
- h) Galvanizing test.

9 ACCEPTANCE TEST FOR HARDWARES

- i) Dimensional verification.
- ii) Ultimate tensile test.
- ii) Slip strength test.
- iii) Electrical resistance test.
- iv) Heating cycle test
- v) Breaking strength of full string assembly.
- vi) Galvanizing test.

10 BONDING PIECES:

- a) material : flexible copper bond (37/7/0.417 mm. tinned copper flexible stranded cable).
- b) Length : Not less than 750 mm.
- c) Bolt size : 16mm x 40 mm.
- d) Copper area. : 34 sq.mm.
- e) Thickness of long : 6 mm.
- f) Material for connecting socket : Tinned Brass

11 FASTENERS: Bolts, Nuts & Washers

1. All bolts and nuts shall conform to IS-6639 – 1972. All bolts and nuts shall be galvanized. All bolts and nuts shall have hexagonal heads, the heads being truly concentric, and square with the shank, which must be perfectly straight.
2. Bolts up-to M16 and having length up-to ten times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain good and reliable mechanical properties and effective dimensional control. The shear strength of bolt for 5.6

grades should be 310 Mpa minimum as per IS-12427. Bolts should be provided with washer face in accordance with IS-1363 Part-I to ensure proper bearing.

3. Fully threaded bolts shall not be used. The length of the bolt shall be such that the threaded portion shall not extend into the place of contact of the component parts.
4. All bolts shall be threaded to take the full depth of the nuts and threaded enough to permit the firm gripping of the component parts but not further. It shall be ensured that the threaded portion of the bolt protrudes not less than 3 mm and not more than 8 mm when fully tightened. All nuts shall fit and be tight to the point where shank of the bolt connects to the head.
5. Flat washers and spring washers shall be provided wherever necessary and shall be of positive lock type. Spring washers shall be electro-galvanized. The thickness of washers shall conform to IS-2016-1967.
6. The bidder shall furnish bolt schedules giving thickness of components connected, the nut and the washer and the length of shank and the threaded portion of the bolts and size of holes and any other special details of this nature.
7. To obviate bending stress in bolt, it shall not connect aggregate thickness more than three time its diameter.
8. Bolts at the joints shall be so staggered that nuts may be tightened with spanners without fouling.
9. Fasteners of grade higher than 8.8 are not to be used and minimum grade for bolts shall be 5.6.

12 GENERAL:

1. All ferrous parts including fasteners shall be hot dip galvanized, after all machining has been completed. Nuts may however be tapped (threaded) after galvanizing and the threads oiled. Spring washers shall be electro-galvanized. The bolt threads shall be undercut to take care of the increase in diameter due to galvanizing. Galvanizing shall be done in accordance with IS-2629-1985 and shall satisfy the tests mentioned in IS: 2633-1986. Fasteners shall withstand four dips while spring washers shall withstand three dips of one-minute duration in the standard Preece test. Other galvanized materials shall be guaranteed to withstand at least six successive dips each lasting one minute under the Standard Preece test for galvanizing.
2. The zinc coating shall be perfectly adherent of uniform thickness, smooth, reasonably bright, continuous and free from imperfections such as flux, ash, rust stains, bulky white deposits and blisters. The zinc used for galvanizing shall be of grade Zn 99.95 as per IS 209-1979.
3. Pin balls shall be checked with the applicable "G" gauges in at least two directions, one of which shall be across the line of die flashing and the other 90 deg. to this line. 'NO GO' gauges shall not pass in any direction.
4. Socket ends, before galvanizing shall be of uniform contour. The bearing surface of socket ends shall be uniform about the entire circumference without depressions or high spots. The internal contours of socket ends shall be concentric with the axis of the fittings as per IS 2486/IEC-120. The axis of the bearing surfaces of socket ends shall be coaxial with the axis of the fittings. There shall be no noticeable tilting of the bearing surfaces with the axis of the fittings.
5. All current carrying parts shall be so designed and manufactured that contact resistance is reduced to minimum.
6. Welding of aluminum shall be by inert gas shielded tungsten arc or inert gas, shielded metal arc process. Welds shall be clean, sound, smooth, and uniform without overlaps, properly fused and completely sealed. There shall be no cracks, voids incomplete penetration, incomplete fusion, under-cutting or inclusions Porosity shall be minimized so that

mechanical properties of the aluminum alloys are not affected. All welds shall be properly finished as per good engineering practices.

13 Electrical Design:

The normal duty and heavy duty suspension, light duty, normal duty and heavy duty tension insulator sets shall all comply with the technical requirements and satisfy the test requirements

14 Mechanical design:

The mechanical strength of the insulators and corresponding insulator fittings must match .The design shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to the development of defects.

Insulating material shall not engage directly with hard metal. All fixing materials shall be of approved quality, shall be applied in an approved manner and shall not enter into chemical action with the metal parts or cause fracture by expansion in service. Where cement is used as a fixing medium, cement thickness shall be as small and even as possible and proper care shall be taken to correctly centre and locate the individual parts during cementing.

15 Technical Specification for Design, Supply and Testing of Hard ware fittings.

16 Type tests:

The following type tests shall be conducted on hardware fittings.

A. On suspension hardware fittings only.

- (i) Magnetic power loss test.
- (ii) Clamp slip strength Vs torque
- (iii) Mechanical strength test.
- (iv) On one test on elastomer.

B. On Tension hard ware fittings only.

- (i) Electrical resistance test for Dead end assembly. IS 2486 (Part-I) 1971
- (ii) Heating cycle test for dead end assembly. -do-
- (iii) Slip strength test for dead end assembly. IS 2486 (Part-I)
- (iv) Mechanical strength test.

C. On both suspension and tension hardware fittings.

- (i) Visual examination. IS-2486 (Part-I) 1971
- (ii) Verification of dimension. -do-
- (iii) Galvanizing / electroplating test. -do-
- (iv) Mechanical strength test of each component (including corona control ring/grading ring and arcing horn)
- (v) Mechanical strength test of welded joint.
- (vi) Mechanical strength test for corona control ring/grading ring and arcing horn. BS-3288 (Part-I)
- (vii) Test on locking device for ball and socket coupling. IEC – 3721984

- (viii) Chemical analysis, hardness tests, grain size, inclusion rating and magnetic particle inspection for forging/casting.

D. On suspension hardware fittings only.

- (i) Clamp slip strength ver as torque test for suspension clamp.
- (ii) Shore hardness test of elastomer cushion for AG suspension clamp.
- (iii) Bend test for armour rod set. IS-2121 (Part-I)
- (iv) Resilience test for armour rod set. -do-
- (v) Conductivity test for armour rod set. -do-

All the acceptance tests stated at clause shall also be carried out on composite insulator unit, except the eccentricity test at clause. In addition to these, all the acceptance tests indicated in IEC 1109 shall also be carried out without any extra cost to the employer.

E. For hardware fittings.

- (a) Visual examination. IS-2121 (Part-I)
- (b) Proof & test.

F. Tests on conductor accessories.

G. Type tests.

H. Mid span compression joint for conductor and earth wire.

- (a) Chemical analysis of materials.
- (b) Electrical resistance tests. IS-2121 (Part-II) 1981 clause 6.5 & 6.6
- (c) Heating cycle test. -do-
- (d) Slip strength test. -do-

O. SURGE ARRESTERS

TECHNICAL SPECIFICATION FOR SURGE ARRESTERS

1. SCOPE

- 2. This Specification provides for the design, manufacture, inspection and testing before dispatch, packing and delivery F.O.R. (destination) of metal oxide (gapless) Surge Arresters with discharge counters, insulating base, terminal connectors and other accessories as specified here in.

Following is the list of documents constituting this Specification. :

(i)	Technical Specification (TS)	
(ii)	Check-List.	Annexure-B
(iii)	Calibration Status of testing equipments and meters/ Instruments.	Annexure-C
(iv)	Check-list towards Type Test Reports.	Annexure-D

Note : Annexure-B,C,& D are to be filled up by the Bidder.

All the above along with amendments thereof shall be read and interpreted together. However, in case of a contradiction between the Technical Specification and any other volume, the provisions of this volume will prevail.

3. The Surge Arrester shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of offer and purchaser shall have the power to reject any work or materials, which in his judgment is not in full accordance therewith.

4 STANDARDS:-

Except to the extent modified in the Specification, the Surge Arrester shall conform to the latest editions and amendments of the standards listed hereunder.

Sl. No.	Standard Ref. No.	Title.
1	IEC-99-4	Specification for Surge Arresters without gap for AC System.
2	IS:2147	Degree of protection, provided by enclosures for low voltage switchgear and control.
3	IS:2629	Recommended practice for hot dip galvanization of iron and steel.
4	IS:2633	Method for testing uniformity of coating on zinc coated articles.
5	IS:3070	Specification for surge arresters for alternating current system.
6	IS:5621 & IEC-621155	Specification for large hollow porcelain for use in electrical installation.
7	IEC-60-1	High-Voltage Test technique.
8	IEC-270	Partial discharge measurements.
9	IEC-99-1	Non-linear resistor type gapped arresters for a.c. systems.
10		Indian Electricity Rules, 1956.
11	IEC-60815	Shed profile of hollow porcelain Insulator.

- 5 Surge Arresters with the requirement of other authoritative standards, which ensure equal or better quality than the standards, mentioned above shall also be acceptable. Where the equipment offered by the supplier conforms to other standards, salient points of difference between the standards adopted and the specified standards shall be clearly brought out in the offer. 4 (Four) copies of the reference standards in English language shall be furnished along with the offer.

6.0 GENERAL TECHNICAL REQUIREMENTS:

6.1 The Surge Arrester shall confirm the technical requirements

6.2 The energy handling capability of each rating of Arrester offered, supported by calculations, shall be furnished with the offer.

6.3 The Surge Arresters shall be fitted with pressure relief devices and arc diverting paths and shall be tested as per the requirements of IEC for minimum prospective symmetrical fault current as specified in Appendix-I.

6.4 A grading ring shall be provided if required, (for attaining all the relevant technical parameters) on each complete Surge Arrester.

7 PROTECTIVE LEVELS:

Surge Arresters shall be capable of providing protection to sub-station equipments, designed for the withstand levels, given in the following table.

Sl. No.	Equipment to be protected	Insulation Level of 36KV System
		L.I. Level (KVP)
1	Power Transformers.	170□
2	Instrument Transformers.	170□
3	Reactors	170□
4	Circuit Breakers/Isolators.	
(i)	Phase to ground.	170□

Surge arrester shall be suitable for the following duty cycles of circuit breaker at the following system voltages:

36 KV Circuit Breaker 0-0.3 sec-co-3 min-co

8 DUTY REQUIREMENT:

8.1 Surge Arresters shall be of heavy-duty station class and gapless type without any series or shunt gaps.

- i. Surge Arresters shall be capable of discharging over voltages occurring during switching of un-loaded transformers, lines, capacitors and reactors.
- ii. The Surge Arresters shall be capable of discharging lightning and switching surges and temporary power frequency over-voltages.
- iii. The Surge Arresters shall be capable of discharging the energy equivalent to class 3 of IEC-99-4.

8.2 The reference current of the arrester shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage. The supplier shall submit values and the supporting evidence along with calculations on above.

8.3 Surge Arresters shall be fully stabilized thermally to give a life expectancy as per standard under site conditions.

- 8.2.1 Surge Arresters shall be able to withstand maximum wind load of 260 Kg./sq.m.
- 8.2.2 Surge Arresters shall be capable of withstanding effects of direct solar radiation
- 8.2.3 Surge arresters shall be capable of spark over on severe switching Surges and multiple strokes.
- 8.2.4 The Surge Arrester should be adequately designed to operate satisfactorily under temporary power frequency over-voltage as given in specific technical requirements, after discharging two shots of respective long duration surges.
- 8.2.5 Unless otherwise brought out separately by the Bidder in the schedule of deviations, the Surge Arresters, offered shall conform to the specification scrupulously. All deviations from the specification shall be brought out in the schedule of deviations. The discrepancies between the specification and the catalogues or literature, submitted as part of the offer shall not be considered as valid deviations unless specifically brought out in the schedule of deviations.

9 CONSTRUCTION:

- 9.1 Non linear blocks shall be sintered metal oxide material. These shall be provided in such a way as to obtain robust construction with excellent electrical and mechanical properties even after repeated operations.
- 9.2 All the units of arresters of same rating shall be inter-changeable without adversely affecting the performance.
- 9.2 The Surge Arresters shall be suitable for pedestal type mounting.
- 9.2.1 All the necessary flanges, bolts, nuts, clamps etc. required for assembly of complete arrester with accessories and mounting on support structure to be supplied by the purchaser, shall be included in supplier's scope of supply.
- 9.2.2 The drilling details for mounting the Arrester on owner's support shall be supplied by the supplier.
- 9.2.3 The minimum permissible separation between the Surge Arrester and any earthed object shall be indicated by the Bidder in his offer.
- 9.2.4 Surge Arresters shall be designed to incorporate pressure relief devices and arc diverting paths to prevent shattering of the blocks or the porcelain housing, following prolonged current flow or internal flash over and providing path for flow of rated fault currents in the event of arrester failure.

- 9.2.5 Surge Arresters shall incorporate anti-contamination feature to prevent arrester failure, caused by uneven voltage gradient across the stack, resulting from contamination of the arrester porcelain.
- 9.2.6 Seals shall be provided in such a way that these are always effectively maintained even when discharging rated lightning current.
- 9.2.7 The heat treatment cycle details along with necessary quality checks used for individual blocks along with insulation layer, formed across each block are to be furnished. Metalised coating thickness for reduced resistance between adjacent discs is to be furnished along with the procedure for checking the same. Details of thermal stability test for current distribution of current on individual disc is to be furnished.
- 9.2.8 Each individual unit of Surge Arresters shall be hermetically sealed and fully protected against ingress of moisture. The hermetic seal shall be effective for the entire lifetime of the arrester and under the service conditions as specified. The supplier shall furnish sectional view of the arrester showing details of sealing employed.
- 9.2.9 The Surge Arresters shall be suitable for hot line washing.

10 PORCELAIN HOUSING :

- 10.1 All porcelain Housings shall be free from lamination cavities or other flaws, affecting the maximum level of mechanical and electrical strengths.
- 10.2 The porcelain shall be well vitrified and non-porous.
- 10.3 The minimum creep age distance of the arrester housing shall be as per CI 7.21 of the TS.
- 10.4 The porcelain petticoat shall be preferably of self-cleaning type (Aerofoil design). The details of the porcelain housing such as height, angle of inclination, shape of petticoats, gap between the petticoats, diameter (ID and OD) etc. shall be indicated by the Bidder in his offer in the form of detailed drawing.
- 10.5 Porcelain housings shall be so co-coordinated that external flash over will not occur due to application of impulse or switching Surge voltages up to the maximum design value for arrester.

11 GALVANISATION, NICKEL PLATING ETC.:

- 11.1 All ferrous parts exposed to atmosphere shall be hot dip galvanized as per IS: 2629, as amended from time to time. Tinned copper/brass lugs shall be used for internal wiring of discharge counter. Screws used for electrical connections shall be either made of brass or shall be nickel-plated.
- 11.2.1 Ground terminal pads and nameplate brackets shall be hot dip galvanized.

11.2.2 The material shall be galvanized only after completing all shop operations

12 ACCESSORIES AND FITTINGS:

12.1 Surge Counters

12.2 A self- contained Surge counter, suitably enclosed for outdoor use and requiring no auxiliary of battery supply for operation shall be provided for each unit. The surge counter shall be operated by the discharge current, passed by the surge arrester and shall be suitable for mounting on the support structure of the Arrester.

12.3 Surge counters shall be of the Electro-mechanical type and designed for continuous service.

12.4 The cyclometer counter shall be visible through an inspection window from ground level. The counter terminals shall be robust and adequate size and shall be so located that the incoming and outgoing connections are made with minimum possible bends.

12.5 Internal parts shall be unaffected by atmospheric conditions at site. Alternatively, a weather proof housing to IP 55 shall be provided and this shall be designed to allow the recording device to be read from ground level without exposing the internal parts to the atmosphere.

12.6 The Surge Counter shall be connected in the main earth lead from the arrester in such a manner that the direction of the earth lead is not changed or its surge impedance materially altered. A bolted link shall be provided so that the surge counter may be short circuited and removed without taking the arrester out of service.

12.7 All necessary accessories and earthing connection leads between the bottom of the Arrester and discharge counter shall be in the supplier's scope of supply.

13 LEAKAGE CURRENT METERS: (In case of 33 Kv surge arrester only)

13.1 Leakage current meters (suitable milli-ammeter) shall be connected in the earthing path of the surge arresters to measure the resistor grading leakage current. Meters shall be designed for continuous service.

13.2 The ammeter shall be suitable for mounting on the support structure of the arrester. The push buttons shall be mounted such that it can be operated from the ground level.

13.3 The internal parts shall be fully weather - proof to IP 55 or better with a transparent cover to provide an unobstructed view of the ammeter..

13.4 Arresters shall be complete with insulating base having provision for bolting to flat surface of the structure.

13.5 The grounding terminals shall be suitable for accommodating purchaser's grounding connection to steel earth mat.

- 13.6** The Bidder has to quote unit rates of the insulating base and the surge counter separately. The purchaser reserves its option to procure insulating base and surge counter.
- 13.7** Clamp type terminal connector, suitable for 33KV-AAA Panther-up Conductor shall be provided having both horizontal and vertical take-off.
- 13.8** Two clamp type ground terminal connectors, suitable for G. I. Strip (50 x 6) or (50 x 8) should be provided.
- 13.9** All interconnecting hardware such as nuts, bolts, spring washers etc. with 5% spares shall be supplied for different units
- 13.10 Pollution** Shunt (Copper braid) shall be supplied along with each surge Arrester for by-passing the surface current..

Other standard accessories, which are specifically not mentioned, but are usually provided with Surge Arrester of such type and rating for efficient and trouble free operation should be supplied.

14 NAME PLATE:

Each single pole Arrester shall be provided with non-corrosive legible name plate, at the base bearing thereon, voltage rating of the complete pole and the number of demountable sections with the following data, indelibly marked

- i) SOUTHCO
- ii) Purchase order No. & Date.
- iii) Name of device.
- iv) Manufacturer's name and trademark and identification no. of the arrester being supplied.
- v) Year of manufacture
- vi) Rated voltage
- vii) Rated Frequency
- viii) Maximum continuous operating voltage.
- ix) Type
- x) Nominal discharge current.
- xi) Long duration discharge class.
- xii) Pressure relief current in KA(rms)
- xiii) Energy discharge capability (KJ / KV rating).

15 TEST :

15.1 Type Tests:

The surge Arrester offered should have been subjected to the following type tests in an independent Government approved test laboratory. The bidder shall furnish four sets of type test reports along with the offer. These tests must not have been conducted earlier than five years from the date of opening of technical bid. For any change in the design, type already type tested and the design type offered against this specification, the purchaser reserves the right to demand repetition of some or all type tests without any extra cost to SOUTHCO in the presence of Purchaser's representative at the cost of the supplier.

- | | |
|-----|--|
| 1 | Insulation withstands tests : |
| (a) | Lightning Impulse Voltage Test. |
| 2 | Residual voltage tests. |
| 3 | Long duration current impulse withstands tests. |
| 4 | Operating duty tests. |
| 5 | Pressure relief tests. |
| (a) | High current test. |
| (b) | Low current test. |
| 6 | Power frequency voltage vs. time curve.
(Temporary over voltage test) |
| 7 | Contamination test. (Artificial pollution test). |
| 8 | Seismic withstand test. |
| 9 | IP-55 test on surge counter. |
| 10 | Minimum current operation tests of the surge counter. |
| 11 | Maximum current withstand test of the surge counter. |
| 12 | Mechanical terminal load test on bushing. |
| 13 | Partial discharge test. |

N.B. :-Even if the condition i.e. the dry arcing distance or the sum of the partial dry arcing distances is larger than the test voltage divided by 500 KV/m', the lightning impulse voltage test must have been conducted or is to be conducted without any financial liability to SOUTHCO.

Even if the type test reports are found to be valid as per this specification, the purchaser reserves the right to demand the repetition of some or all the type tests in the presence of purchaser's representative. For this purpose, the bidder shall quote unit rates for carrying out each type test. These prices, if necessary, will be taken into consideration for bid evaluation.

15.2 ROUTINE TESTS:

The following routine tests shall be conducted at the supplier's cost on each surge arrester and shall be submitted along with or before offering for inspection for purchaser's approval.

- | | |
|-----|--|
| (a) | Measurement of reference voltage. |
| (b) | Residual voltage tests. |
| (c) | Measurement for partial discharge and contact noise. |
| (d) | Sealing test for units with sealed housings. |

15.3 ACCEPTANCE TESTS:

The following tests, considered as acceptance tests, shall be conducted in the presence of purchasers representative for which no charges will be payable by SOUTHCO. The acceptance tests, whenever possible shall be conducted on the complete arrester unit. The

number of samples to be subjected to acceptance test shall be decided by the purchaser at the time of actual testing.

- I Temperature Cycle Test on Housing.
- II Measurement of Power Frequency Voltage at the reference current.
- III Measurement of leakage current and capacitive current at M.C.O.V.
- IV Lightning Impulse Residual Voltage Test at N.D.C., 50% of N.D.C. & 200% of N.D.C.
- V Partial Discharge Tests on complete arresters/units at 1.05 times M.C.O.V.
- VI Special Thermal stability test.
- VII Porosity test on porcelain components.
- VIII Galvanization test on metal parts.
- IX The functional (operational) test on the Surge Counter by way of checking its operation at following nominal discharge currents :
 - a) 100 Amps with 8/20 micro second wave shape.
 - b) 10 KA with 8/20 micro second wave shape.
- X Check of calibration of leakage current meters.

16 INSPECTION:

- I The purchaser shall have access at all time to the works and all other places of manufacture, where the Surge Arresters are being manufactured and the supplier shall provide all facilities for unrestricted inspection of the supplier's works, raw materials, manufacture of all the accessories and for conducting the necessary tests.
- II The supplier shall keep the purchaser informed in advance of the time of starting and the progress of manufacture of equipment in its various stages so that arrangements could be made for inspection.
- III No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected tested and dispatch schedule attached to this specification.
- IV The acceptance of any quantity of equipment shall in no way relieve the supplier of his responsibility for meeting all the requirements of this specification and shall not prevent subsequent rejection, if such equipments are later found to be defective.

17 QUALITY ASSURANCE PLAN:

- 17.1** The Bidder shall invariably furnish following information along with his offer, failing which the offer shall be liable for rejection.

- (i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests, normally carried out on raw materials in presence of Bidder's representative, copies of test certificates.
- (ii) Information and copies of test certificates as in (I) above in respect of bought-out items.
- (iii) List of manufacturing facilities available.
- (iv) Level of automation, achieved and list of areas where manual processing exists.
- (v) List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of such tests and inspections.
- (vi) Special features provided in the equipment to make it maintenance free.
- (vii) List of testing equipments, meters available with Bidder for final testing of equipment, specified and test plant limitation, if any, vis-à-vis the type, acceptance and routine tests, specified in the relevant standards and this specification. These limitations shall be very clearly brought out in the offer.
- (viii) All the testing equipments, meters etc. should have been calibrated in a Government approved laboratory. The Bidder must submit the list of testing equipments and meters test-wise as per Annexure-C of this Technical Specification.

17.2 The suppliers, within 30 days of placement of order submit the following information to the purchaser.

- (i) List of raw materials as well as bought out accessories and the names of the materials as well as bought-out accessories and the names of sub-suppliers, selected from those, furnished along with the offer.
- (ii) Type test certificates of the raw material and bought out accessories.
- (iii) Quality Assurance Plan (QAP) with hold points for the purchaser's inspection. The QAP and hold points shall be discussed between the purchaser and the supplier before the QAP is finalized.

17.3 The supplier shall submit the routine test certificates of bought out item and raw material at the time of acceptance testing of the fully assembled equipment.

18 DOCUMENTATION:

7.17.1 All drawings shall conform to relevant Indian Standard as per relevant IS. All drawings shall be in ink and suitable for microfilming. All dimensions and data shall be in S.I. Units.

7.17.2 The supplier shall furnish four sets of following drawings / documents along with his offer.

- (i) General outline drawings of the complete Arrester with technical parameters.

- (ii) Drawings showing clearance from grounded and other line objects and between adjacent poles of Surge Arresters, required at various heights of Surge Arresters.
- (iii) Drawings showing details of pressure relief devices.
- (iv) Detailed drawing of discharge counters along with the wiring and schematic drawing of discharge counter and meter.
- (v) Outline drawing of insulating base.
- (vi) Details of grading rings, if used.
- (vii) Mounting details of Surge Arresters.
- (viii) Details of line terminal and ground terminals.
- (ix) Volt-time characteristics of Surge Arresters.
- (x) Details of galvanization being provided on different ferrous parts.
- (xi) The detailed dimensional drawing of porcelain Housing such as ID, OD, thickness and insulator details such as height, profile of petticoats, angle of inclination and gap between successive petticoats, total creepage distance etc.
- (xii) Cross-sectional view of the Surge Arrester Units showing all components.

19 TEST REPORTS:

- (i) Four copies of type test reports shall be furnished to the purchaser with the tender specification. Copies of acceptance test reports and routine test reports shall be furnished to the purchaser. One copy will be returned duly certified by the purchaser and only thereafter shall the materials be dispatched.
- (ii) All records of routine test reports shall be maintained by the supplier at his works for periodic inspection by the purchaser.
- (iii) All test reports of tests, conducted during manufacture shall be maintained by the supplier. These shall be produced for verification as and when requested for by the purchaser.

20 PACKING AND FORWARDING:

- 20.1** The equipment shall be packed in suitable crates so as to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement of lifting such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.

20.2 Each consignment shall be accompanied by a detailed packing list containing the following information:

- (a) Name of the consignee :
- (b) Details of consignment :
- (c) Destination :
- (d) Total weight of consignment :
- (e) Sign showing upper/lower side of the crate :
- (f) Handling and unpacking instructions :
- (g) Bill of materials indicating contents of each package :

The supplier shall ensure that the bill of materials is approved by the purchaser before dispatch.

21 QUANTITY AND DELIVERY REQUIREMENT:

The scope of supply shall include a supply of 2.5% extra quantity of bolts, nuts, washers, split pins, cotter pins and such other small loose items free of cost.

TECHNICAL REQUIREMENTS FOR METAL OXIDE (GAPLESS)

22 SURGE ARRESTERS

22.1 The Surge Arrester under this Specification shall conform to the parameters given below:-

Sl. No	Particulars.	Technical Parameters for Surge Arrestors
		30 KV
1	Nominal system voltage (phase to phase) (KV rms).	33
2	Highest system voltage (phase to phase) (KV rms).	36
3	System Frequency (HZ).	50 ±5%
4	System Neutral earthing.	Effectively earthed
5	Installation.	Outdoor
6	Class.	Station class, 10 KA, heavy duty type.
7	Type of construction for 10 KA rated arrester.	Single column, single phase
8	No. of phases.	Three

9	Maximum duration of earth fault (Sec.)	3
10	Maximum prospective symmetrical fault current at arrester location (KA rms.)	40
11	Rated arrester voltage (KV rms)	30
12	Nominal discharge current (KAP) Discharge current at which insulation co-ordination will be done	10 KA of 8/20 μ sec Wave.
13	Minimum energy discharge capability (KJ/KV)	As per relevant ISS/IEC
14	Maximum continuous operating voltage at 50° C (KV rms)	25
15	Maximum switching surge residual voltage (KVP)	72 at 500A
16	Maximum residual voltage at 8/20 micro second(KVP)	
	(i) 5 KA.	85
	(ii) 10 KA Nominal discharge current.	90
	(iii) 20 KA.	100
17	Long duration discharge class	2
18	High current short duration test value (KAP) (4/10 Micro-second wave).	100
19	Current for pressure relief test (KA-rms)	40
20	Minimum total creepage distance (mm).	900
21	One minute dry and wet power frequency withstand voltage of Arrester housing (KV-rms).	70
22	Impulse withstand voltage of arrester housing with 1.2/ 50 micro-second wave (KVP).	110.5
	(a)	
	b) Switching Impulse Voltage (Wet) (KVP)	-
23	Pressure relief class.	A

24	Corona extinction voltage (KV-rms).	-
25	RIV at 92 KV rms.	Less than 500 micro volts
26	Partial discharge at 1.05 times continuous over-voltage.	Nor more than 50 PC
27	Seismic acceleration.	0.3g horizontal 0.15g vertical
28	Reference ambient temperature.	50°C
29	(a) IR at MCOV.	Less than 400 micro amperes
	(b) IC at MCOV.	Less than 1200 micro amperes
30	a) Reference Current (mA)	1 to 5 mA
	b) Reference voltage at reference current.	Greater than rated voltage.
31	Maximum steep current Impulse RDV (KVP). at KAP	100
32	Maximum cantilever strength of the arresters (KGM).	325
33	TOV(KVP).	
	(i) 0.1 sec.	53
	(ii) 1.0 sec.	51
	(iii) 10.0 sec.	49
	(iv) 100.0 sec.	47

P. AB SWITCHES

TECHNICAL SPECIFICATIONS FOR AB SWITCHES

1. SCOPE:-

This specification covers manufacturing testing and supply of 3 Pole, 400 AMP, 50 Hz, Single break, 33 KV class Air Break switches for outdoor installations to be used at 33/0.4KV Sub-stations and for incoming & outgoing Lines suitable for operation under off load conditions.

2 DESCRIPTION OF THE MATERIALS:-

The A.B. Switch sets shall confirm to the following parameters:-

Sl. No.	Description	Parameters of AB Switch
		33 KV
i)	Number of poles	3
ii)	Number of Post insulator per pole	4 nos. 22/24 KV class
iii)	Nominal system voltage (KV)	33
iv)	Highest System Voltage (KV)	36
v)	Rated frequency	50HZ
vI)	System earthing	Effectively earthed.
vII)	Rated nominal current Amp.	400
viii)	Altitude of installation	Not exceeding 1000 M

The post insulators used in the A.B. Switches shall have the following ratings

Sl. No.	Description	Parameters P.I. of AB Switches for
		33 KV
i)	Power frequency withstand voltage (dry) KV (RMS)	95
ii)	Power frequency withstand voltage (wet) KV (RMS)	75
iii)	Impulse withstand voltage (dry) KV (Peak)	170
iv)	Power frequency puncture withstand voltage	1.3 times the actual dry flashover voltage of the unit

3 STANDARDS:- The AB Switch Set shall conform to the following standards:-

- i) IS-9920 (Part-I to V.)
- ii) IS-2544/1973 (for porcelain post insulators)
- iii) Is-2633 (for galvanization of ferrous parts.) or its latest amendments if any.

4. INSULATORS:-

12 KV class (for 11 KV AB Switches) and 22 KV / 24 KV class (for 33 KV AB Switches) Post Insulators complete with pedestal cap duly cemented to be used in the AB Switch Set conforming to IS-2544/1973

The bidder shall furnish the type test certificate of the post insulators from their manufacturer for reference.

The bidder shall mention make, type of insulation materials, metal fittings, Creep age distance, protected Creep age distance, tensile strength, compression strength, torsion strength and cantilever strength.

5 CLIMATIC CONDITIONS:-

The A.B. Switch set shall be suitable for operation under the following climatic conditions.

1.	Maximum ambient air temperature.	45 ⁰ C
2.	Maximum daily average air temperature	35 ⁰ C
3.	Maximum yearly average ambient air temperature	30 ⁰ C
4.	Maximum temperature attainable by a body exposed to the sun.	50 ⁰ C
5.	Minimum ambient air temperature	0 ⁰ C
6.	Maximum relative humidity.	100%
7.	Minimum number of rainy days per annum	70
8.	Average number of rainy days per annum	120
9.	Average annual rain fall.	150 cm.
10.	Number of months of tropical monsoon conditions	4
11.	Maximum wind pressure.	260 Kg./ mm ²
12.	Degree of exposure to atmospheric pollution.	Normally polluted atmosphere.

6 TECHNICAL DETAILS:-

- 6.1** The 33 KV A.B. Switch Set shall be gang operated (**with double tandem pipe**) single air break outdoor type horizontal mounting having 4 nos. 22/24 KV post insulator per phase. The operating mechanism shall be suitable for manual operation from the ground level and shall be so designed that all the three phases shall open or close simultaneously. The Switches shall be robust in construction, easy in operation and shall be protected against over

travel or straining that might adversely affect any of its parts. The required base M.S. Channel, phase coupling rod, operating rod with intermediate guide braided with flexible electrolytic copper, tail piece of required current carrying capacity and operating mechanism with 'ON' & 'OFF' positions shall be provided. The operating rod shall be medium gauge of 32mm diameter nominal bore G.I. pipe single piece 6 meters. The phase coupling rod for gang operation shall medium gauge 25mm dia nominal bore G.I. Pipe. Rotating post insulators shall be provided with suitable bearing mounted on a base channel with 6 mm thick thrust collar and 6mm split pin made out of stainless steel. The operating down rod shall be coupled to the spindle (minimum dia - 32mm) for gang operation through another suitable bearing by two numbers 10mm dia through stainless steel bolts with double nuts. The post insulators should be fixed with the base channel using Galvanized Nuts and Bolts.

All the bearings shall be provided with grease nipple. All ferrous parts shall be galvanized and polished. The pipes shall be galvanized in accordance with IS-4736/1968.

6.2 Mounting: - The A.B. Switches shall be suitable for horizontal mounting in all type of sub-station structures.

6.3 Switching Blades: - It shall be made out of electrolytic copper with silver plated. The approximate size shall be 250mm x 50 x 8mm for 11 KV. The switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation

6.4 Fixed Contracts:- The fixed jaw type female contracts (50x8x95)mm for 11 KV shall be made of electrolytic copper (minimum 95 % copper composition) duly electroplated controlled by Phosphor bronze high pressure spring housed in robust G.I. Cover.

It is essential that provision shall be made in fixed female contracts to take the shock arising from the closing of moving contract blade without the same being transmitted to the post insulator. The arrangement made in this regard shall be specifically shown in the drawing.

6.5 Arcing Horn:- As the switches are generally meant for isolating transmission line and distribution transformers, suitable arcing horns shall be provided for breaking the charging current horn shall be made of 10 mm dia G.I. Rod with spring assisted operation.

6.6 Terminal Connectors:- Terminal connectors shall be robust in design. The size of fixed connector shall be (80 x 50 x 8 mm) and size of movable connector shall be of (80 x 50) x (80 x 50) x 8 mm of copper casting with uniform machine finishing duly silver plated made out of minimum 95 % copper composition with 2 nos. 12 mm dia holes provided with suitable brass bolts and double nuts, flat washers & 2 nos. bimetallic solderless sockets suitable up to ACSR Panther or AAAC 232 mm² conductor.

6.7 Spacing:- The minimum clearance between phase to the switch shall be 1200 mm. The operating down rod shall be at a transverse distance of 300 mm from the outer limb of the switch. The centre spacing between two post insulators of the same phase shall be 560 mm. In the open position of the A.B. Switches the moving blade shall rotate through an angle of 90⁰. This shall be exhibited in the drawing.

7. TESTS & TEST CERTIFICATE

7.1 Type Test:- Certificates for the following type tests conducted within five years preceding to the date of opening of tender on prototype set of A.B Switch in a Govt. Approved Testing Laboratory preferably at CPRI, Bhopal/ Bangalore shall have to be submitted for reference and scrutiny.

- i. Impulse voltage dry test
- ii. Power frequency voltage dry test
- iii. Power frequency voltage wet test
- iv. Temperature of resistance.
- v. Measurement of resistance.
- vi. Test to prove the capability of carrying the rated peak short circuit current and the rated short time current.
- vii. Mainly active load breaking capacity test.
- viii. Transformer off-load breaking test.
- ix. Line charging breaking capacity test.
- x. Operation tests.
- xi. Mechanical endurance test.
- xii. Mechanical strength test for the post insulator as per IS-2544/1973.
- xiii. Test for galvanization of metal (ferrous) parts as perm IS-2633/1973.

Besides, mechanical endurance test will have to be conducted on one set in the presence of our authorized person who shall be deputed to carry out acceptance tests before delivery of the materials.

8. Routine Tests: - The following routine tests shall have to be conducted on each set and results are to be furnished for consideration of deputed inspecting officer for inspection and conducting testing of the materials.

1. Power frequency voltage dry test
2. Measurement of resistance of main circuit
3. Tests to prove satisfactory operation.
4. Dimension check
5. Galvanization test.

9 GUARANTEED TECHNICAL PARTICULARS:-

The Bidder shall furnish the guaranteed technical particulars duly filled in the format at Appendix-I along with the tender.

10 COMPLETENESS OF EQUIPMENT:-

Any fittings, accessories for apparatus which may not have been specifically mentioned in this specification but which are usual or necessary in equipment of similar plant shall be deemed to be included in the specification and shall be supplied by the Tender without extra charge. All plant and equipment shall be completed in all details whether such details are mentioned in the specification or not.

a. **INSPECTION:-**

Routine and acceptance tests shall be conducted at the place of manufacturer. The bidder are requested to furnish details of equipment which will be used for testing along with tender. The bidder of those manufacturers who do not have adequate testing facilities for conducting routine and acceptance test are liable for cancellation. The successful bidder has to furnish routine test certificate and guaranteed certificate for approval prior to offer of materials for inspection for each consignment of offer.

APPENDIX - I

GUARANTEED TECHNICAL PARTICULARS FOR 33KV, 400A, 50 HZ, 3 POLE, SINGLE BREAK TYPE

Sl. No	Particulars	Desired values	Bidder's offer
1	2	3	4
1.	Maker's name and country of origin	To be specified by the tenderer	
2.	Type of Switch	Rotating type only	
3.	Suitable for mounting	Horizontal only	
4.	Number of supporting post insulators per phase	4 nos.22 KV / 24 KV Post Insulators per phase as per ISS-2544/1973.	
5.	Post Insulator.		
a)	Maker's name and country of origin	To be specified by the tenderer	
b)	Type of cementing	To be quoted for original cemented only & as per IS-2544-1973 & relevant IEC.	
c)	One minute power frequency withstand voltage Dry	95 KV RMS.	
d)	One minute power frequency withstand voltage Wet	75 KV RMS.	
e)	Visible discharge voltage	27 KV RMS.	
f)	Dry Flashover Voltage	To be specified by the tenderer	
g)	Power frequency puncture with stand voltage	1.3 times of actual dry flash over voltage	
h)	Impulse withstand voltage (switch in position)	170 KV (peak)	
i)	Creepage distance (mm)	380 mm minimum. (actual creepage distance for which type test have been conducted is to be specified by the tenderer	
6.	Impulse withstand voltage for positive and negative polarity 1.2 / 50 micro-second wave		

a)	Across the isolating distance	195 KV (peak)	
b)	To earth & between poles	170 KV (peak)	
7.	One minute power frequency withstand voltage		
a)	Across the isolating distance	80 KV (RMS)	
b)	To earth & between poles	70 KV (RMS)	
8.	Rated normal current and rated frequency	400 amps. 50 Hz	
9.	Rated short time current.	16 KA (RMS)	
10.	Rated short circuit making capacity	25 KA (RMS)	
11.	Rated peak withstand current	40 KA (Peak)	
12.	Rated cable charging breaking capacity	40 KA (RMS)	
13.	Rated Transformer off load breaking capacity	16 Amp (RMS)	
14.	Rated line charging breaking capacity	5.3 Amps (RMS)	
15.	Minimum clearance between adjacent phases		
a)	Switch Closed (centre to centre)	1200 mm	
b)	Switch Opened (centre to edge of blade)	640 mm	
16.	Temperature rise		
a)	Temperature rise shall not exceed the maximum limit as specified below at an ambient temperature not exceeding in 40 ⁰ C		
b)	Copper contacts in air	65 ⁰ C	

c)	Terminal of switch intended to be connected to external conductor by bolts	50 ⁰ C	
17.	Vertical Clearance from top of insulator cap to mounting channel	508 mm (minimum)	
18.	Type of Contact: -	a) Self aligned, high pressure jaw type fixed contacts of electrolytic copper of size 80 mm x 50 mm x 8 mm duly silver plated. Each contact should be revetted with three nos. Copper rivets with a bunch (minimum 3 mm thick) consisting of copper foils, each may vary from 0.15 mm to 0.25 mm. These total thickness of copper foils per jaw should be 6 mm. Jaw assemblies are to be bolted through stainless steel bolts and nuts with stainless steel flat and spring washer.	
		b) Solid rectangular blade type moving contact of electrolytic copper size 250 mm x 50 mm x 8 mm duly silver plated ensuring a minimum deposit of 10 micron of silver on copper contacts or as may be prescribed under relevant ISS / IEC.	
		c) Pressure spring to be used in jaw contacts shall be Stainless Steel having 8 nos of turn x 28 mm height x 14.4 mm diameter with 14 SWG wire (minimum six nos springs shall be used)	
19.	Connectors:-	Terminal connectors for both movable and fixed should be of copper flats of same size similar to that of moving contact blades (minimum 95% copper composition). The fixed connector shall of size 80 mm x 50 x 8 mm and the size of movable connector shall be size 80 x 50 x 8 mm with machine finishing duly silver plated with 2 nos. of 3/8" stainless steel bolts, nuts, plain washers & spring washers should be provided along with 2 nos solder less bimetallic sockets for each connector suitable sockets for each connector suitable up to 232 mm ² AAA conductor.	

20.	Moving Contacts:-	Movable contact is to be supported by galvanized angle of 50 x 50 x 5 mm in each phase and the moving contact are to be bolted through 2 no stainless steel bolts and nuts with suitable stainless steel flat and spring washers.			
21.	Galvanization	a) Iron parts shall be dip galvanized as per IS-2633/1972.			
		b) b) The pipe shall be galvanized as per IS-4736/1968.			
22.	Details of Phase				
a)	Coupling Rod	25 mm nominal bore G.I. pipe medium gauge.			
b)	Operating Rod	32 mm nominal bore G.I. pipe medium gauge single length 6 mtrs. The detailed dimension of the G. I. pipe as per IS-1239 (Pt. I) as mentioned below :-			
		Nominal base (mm)	Outside diameter (mm)		Diameter thickness (mm)
			Max	Min	
		25	34.2	33.3	3.25
		32	42.9	42	3.25
c)	Arcing Horns	10 mm dia G.I. rod with spring assisted operation.			
d)	Force of Fixed contact spring	To be specified by the tenderer.			
e)	Copper braided flexible tapes:-	450 mm length of flexible electrolytic copper tape or braided chord (with tin coated) having minimum weight 450 gms per meter and both ends shall be crimped with copper sockets through brass bolts and nuts with brass flat washers. Two nos of suitable copper sockets shall be used at both ends. The minimum no. of flexible wires should be 1536 of 36 SWG for each flexible chord.			
f)	Quick break device	Lever mechanism.			
g)	Bearings	4 nos. self-lubricated bearing to be provided with grease nipple including 4th bearing being a thrust bearing.			

h)	Locking arrangement	Pad Lock & Key arrangement at both 'ON' & 'OFF' position.	
i)	Earth Terminal:	To be provided at base channels.	
23.	Supporting Channels	100 mm x 50 mm M.S. Channel hot dip galvanized.	
24.	Weight of each pole complete	To be specified by the tender	

Q. TECHNICAL SPECIFICATION FOR 33KV 400A, 3 POLE HG FUSES

9.0 SCOPE

This specification covers the design manufacture, shop testing, loading, transportation and delivery at sub-station site of 33KV, 400Amp, 3Pole H.G. Fuse Sets for outdoor installations to be used at 33/0.4 KV Sub-stations suitable for operation under off load conditions.

9.1 DESCRIPTION OF THE MATERIALS:-

9.1.1 The 33KV. 400Amps, 3 Pole H.G Fuse Sets shall confirm to the following parameters:-

- | | |
|---------------------------------|-------------------------------------|
| i) Number of Poles:- | 3 |
| ii) No. of insulator per pole:- | 4nos. 22/24KV Post Insulator/ Phase |
| iii) Nominal system voltage | 33 KV |
| iv) Highest system voltage:- | 36KV |
| v) Rated frequency:- | 50 Hz |
| vi) System earthing:- | Effectively earthed |
| vii) Rated normal current | 400 Amps |
| viii) Altitude of installation | Not exceeding 1000 M. |

The post insulator used in the H.G. Fuse set shall have the following ratings:-

- | | |
|---|--------------------------------|
| i) Power frequency withstand voltage (dry) | 95KV (RMS) |
| ii) Power frequency withstand voltage (wet) | 75 KV (RMS) |
| iii) Impulse withstand voltage (dry) | 170 KV (Peak) |
| iv) Power frequency puncture withstand voltage 1.3 times the actual dry | flashover voltage of the unit. |

9.3 INSULATORS:-

The 12KV & 22KV/ 24KV post insulators complete with pedestal cap duly cemented to be used in the H.G. Fuse sets confirming to IS-2544/1973.

The bidder shall mention make, type of insulation materials, metal fittings, Creepage distance, protected Creepage distance, tensile strength compression strength, torsion strength and cantilever strength.

The bidder shall furnish the type test certificate of the post insulators from their manufacturer for reference & scrutiny.

9.4 CLIMATIC CONDITIONS: - The H.G. Fuse Set shall be suitable for operation under the following climatic conditions:-

i) Maximum ambient air temperature	49 ⁰ C
ii) Maximum daily average air temperature	35 ⁰ C
iii) Maximum yearly average ambient air temperature	30 ⁰ C
iv) Maximum temperature attainable by a body Exposed to the sun.	50 ⁰ C
v) Minimum ambient air temperature	10 ⁰ C
vi) Maximum relative humidity.	100%
vii) Minimum number of rainy days per annum	70
viii) Average number of rainy days per annum	120
ix) Average annual rain fall.	150 cm.
x) Number of months of tropical monsoon conditions	4
xi) Maximum wind pressure.	260 Kg./ mm ²
xii) Degree of exposure to atmospheric pollution.	Normally polluted atmosphere.

9.5 TECHNICAL DETAILS:-

The H.G. Fuses shall have adjustable arcing horns made of solid copper rod having 8.23 mm dia. The horns shall be fitted with screwing devices with flynuts for fixing and tightening the fuse wire. It shall have robust terminal connector 5s of size 80mm x50 mm x 8 mm made of copper casting (95% minimum copper composition) duly silver plated with two numbers of 12mm dia brass bolts and double nuts with flat brass washers. The connector should be capable of connecting crimp able conductor up to 232 Sq.mm. size (ACSR/ AAAC) with

bimetallic solder less sockets .The H.G. Fuse Set shall suitable for horizontal mounting on sub-station structures. The minimum clearance between the adjacent phases of the fuse set shall be 1200 mm and the centre to centre (distance between two post insulators of the same phase) shall be 760 mm. All metal (ferrous) parts shall be galvanized and polished. Only post insulator (original cemented and not pin insulators shall be used for the H.G. Fuse Set.

9.6 DRAWIING & LITERATURES:-

Three copies of drawings of each item of 33KV. 400Amp, 3 Pole H.G. Fuse shall be furnished along with the tender for reference. The details of construction and materials of different parts of the H.G Fuse shall clearly be indicated in the tender and illustrative pamplet/ literature for the same shall be submitted along with the tender.

9.7 TESTS & TEST CERTIFICATE:-

9.7.1 Type Test:- Certificates for the following type tests conducted within five years proceeding to the date of opening of tender on a prototype set of H.G. Fuse in a Govt. Approved Testing Laboratory preferably at CPRI Bangalore shall be submitted along with the tender.

- i) Impulse voltage dry test
- ii) Power frequency voltage dry test
- iii) Power frequency voltage wet test
- iv) Temperate of resistance.
- v) Test to prove the capability of carrying the rated peak short circuit current and the rated short time current.
- vi) Mainly active load braking capacity test.
- vii) Transformer off-load breaking test.
- viii) Line charging breaking capacity test.
- ix) Operation tests.
- x) Mechanical endurance test.
- xi) Mechanical strength test for the post insulator as per IS:2544/1973, 5350 (Pt-II)/1970 & relevant IEC.
- xii) Test for galvanization of metal (ferrous) parts as per IS- 2633/1973.

Besides above, mechanical endurance test will have to be conducted on one set in the presence of our authorized person who shall be deputed to carryout acceptance test before delivery of the materials.

9.7.2 Routine Tests:-

The following routine tests shall have to be conducted on each sets and results are to be furnished for consideration for acceptance of deputing inspecting Officer for inspection & conducting testing of the materials.

- i) Power frequency voltage dry test.
- ii) Tests to prove satisfactory operation.
- iii) Dimension check.
- iv) Galvanisation test.

9.8 GUARANTEED TECHNICAL PARTICULARS:-

The bidders are required to furnish the guaranteed technical particulars at Schedules attached to this specification duly filled in along with the tender.

9.9 COMPLETENESS OF EQUIPMENT:-

Any fittings accessories or apparatus which may not have been specifically mentioned in this specification but which are usually necessary in equipment of similar plant shall be deemed to be included in the specification and shall be supplied by the bidder without extra charge. All plant and equipment shall be complete in all details whether such details are mentioned in the specification or not.

9.10 INSPECTION AND TESTING:-

The Purchaser shall have free entry at all times, while work on the contract is being performed, to all parts of the manufacturer's works which concern the processing of the equipment ordered. The manufacturer shall afford the Purchaser without charge, all reasonable facilities to assure that the equipment being furnished is in accordance with this specification.

The equipment shall successfully pass all the type tests and routine tests referred to and those listed in the most recent edition of the standards given in this specification.

The Purchaser reserves the right to reject an item of equipment if the test results do not comply with the values specified or with the data given in the technical data schedule.

Type tests shall have been / shall be carried out at CPRI / National Govt. approved Laboratory and be witnessed by a representative of such laboratory or some other representative acceptable to the Purchaser. Routine tests shall be carried out by the Supplier at no extra charge at their works.

Adequate facility with calibrated testing equipment must be provided by the manufacturer free of cost to carry out the tests. Type test certificates must be furnished along with the tender for reference of the Purchaser.

All costs in connection with the testing, including any necessary re-testing, shall be borne by the Supplier who shall provide the Purchaser with all the test facilities which the latter may require, free of charge. The Purchaser shall have the right to select the samples for test and shall also have the right to assure that the testing apparatus is duly calibrated and correct. Measuring apparatus for routine tests shall be calibrated at the expense of the Supplier at an approved laboratory and shall be approved by the Purchaser.

The Supplier shall be responsible for the proper testing of the plant or materials supplied by sub-suppliers to the same extent as if the work, plant or materials were completed or supplied by the Supplier.

Any cost, incurred by the Purchaser in connection with inspection and re-testing as a result of failure of the equipment under test or damage during transport or offloading shall be to the account of the Supplier.

The supplier shall submit to the Purchaser five signed copies of the test certificates, giving the results of the tests as required. No materials shall be despatched until the test certificates have been received by the Purchaser and the Supplier has been informed that they are acceptable.

The test certificates must show the actual values obtained from the tests, in the units used in this specification, and not merely confirm that the requirements have been met.

In the case of components for which specific type tests or routine tests are not given in this specification, The Supplier shall include a list of the tests normally required for these

components. All materials used in the Contract shall withstand and shall be certified to have satisfactorily passed such tests.

The Purchaser at his discretion may re-confirm the Test Results in his own laboratory or laboratory of his choice.

No inspection or lack of inspection or passing by the Purchaser's Representative of equipment or materials whether supplied by the Supplier or sub-supplier, shall relieve the Supplier from his liability to complete the contract works in accordance with the contract or exonerate him from any of his guarantees.

R. G.I. Flat (25x 6 mm)

GURANTEED TECHNICAL PARTICULARS

(To be submitted along with Offer)

Sl. No	Particulars	Bidders' Offer
1	Location of Factory or Place of Manufacture	
2	Maker's Name, Address & Country	
3	Size of G.I. Flat	
4	Standard Length	
5	Galvanization Process	
6	Galvanization thickness	
7	Galavanization tests to be conducted	

9.12 Earth Electrode (50/40 NB 3.0 Mtr Length)

I. The prospective bidder may source Earth Electrode from sub vendors / manufacturers who must qualify all the following requirements :

a) The sub vendor /manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.

b) The manufacturer should have supplied at least 200 no.s to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer / sub vendor as proof of successful operation in field.

II. Scope:-

This specification provides for design, manufacturing, testing before dispatch, supply & delivery of Earthing Device (Heavy Duty) (for use in line (40x3000) mm & SS (50x3000 mm), as per enclosed Drawing.

III. APPLICABLE STANDARDS:-

The Earthing Device must be made out of 50 mm for S/S, 40 mm for line (Heavy Gauge- No minus Tolerance allowed) Wall thickness Hot Dip G.I. Pipe (as per IS :- 1239, Part-1, 1990 of reputed Make (TATA/Jindal) & 3.0 mtrs length tapered finished smooth at one end for a length of 75 mm & Clamp at the other end.

Staggered drills hole of 12 mm Dia of interval of 150mm shall be made before galvanization.

The GI Earthing Clamp/ Strip (C- Clamp Type) is to be of 50mm width, 6mm thickness & flange length of 65 mm in each side. This should be suitable for termination of 4 nos of GI Flat earth electrodes. The Clamp/ Strip & Earthing pipe after fabrication will be hot dip galvanized confirming to IS: 2629/85 with latest amendments. The clamp shall have two holes in both sides suitable for 16 mm GI Bolts & Nuts.

S. Earth Electrode (40 NB 3.0 Mtr Length)

Guaranteed Technical Particulars

(To be submitted along with Offer)

Sl. No.	Particulars	Bidder's Offer
1	Location of Factory or Place of Manufacture	
2	Maker's Name, Address & Country	
3	Size of	
	a) Pipe	
	b) Earthing Strips	
4	Length	
5	Thickness of Pipe	
6	Galvanization Process	
7	Galvanization thickness	
	a) For Earthing device	
	b) For Connecting Flat	
8	Galvanization tests to be conducted as per ISS	
9	Any other Particulars (like details of Clamp/ G.I. Bolts)	
10	Details of Drawings submitted	

Metal parts of all equipment other than those forming part of an electrical circuit shall be connected directly to the main earth system via two separate conductors of adequate capacity at two different points.

All main members of structural steelworks shall be earthed by galvanised iron flat connections bonded by welding or bolting to the steelworks.

Connections to apparatus and structures shall be made clear of ground level, preferably to a vertical face and protected as appropriate against electrolytic corrosion. They shall be made between clean surfaces and of sufficient size and pressure to carry the rated short circuit current without damage.

Earth bars installed directly into the ground should normally be laid bare and the trench back-filled with a fine top soil. Where the soil is of a hostile nature, special precautions must be taken to protect the earth bar. Wherever required to achieve the required resistance bentonite powder to be mixed in lom/ blackcotton crushed soil in 1: 10 proportion is permissible, the method used being subject to the agreement of the Engr. Incharge (Divisional Engr.). In the event of bentonite powder being adopted, water supply through conduit to the area must be supplemented and regulated to keep the surface / mat moisture absorbent.

Joints in earth bars+ shall be welded and then coated with a suitable anti-corrosion protection treatment.

Facilities shall be provided on the earth bar run between equipment and the base of structures, comprising a looped strip, so as to permit the attachment of portable earth connections for maintenance purposes.

The cross sectional area of the earth bar and connections shall be such that the current density is not greater than 100 A/mm^2 for a 3 second fault duration.

SECTION - V

E-Tender Notification No.:
SOUTHCO UTILITY/BGJY-33 KV Line /2
Dt. 12.07.2016

ANNEXURE

BID PROPOSAL LETTER

Electrical Installation of Works under SOUTHCO

Bidder's Name and Address:

(in case of JV/Consortium, Name of JV/Consortium)

Bid Proposal Reference:

Person to be contacted:

Designation:

Telephone No. :

E-mail:

Fax No. :

To,

**RURAL ELECTRIFICATION CELL
Corporate Office, SOUTHCO UTILITY:
Courtpetta, Berhampur – 760004**

Dear Sir,

We the undersigned bidder have read and examined the detailed specification and bidding documents for execution of various electrical installations works and do herewith submit our bid for the following packages:

Sl. No.	Name of the Owner	Name of the Package	Estimated Cost (Rs. in Cr.)

We declare the following:

1.0 PRICES AND VALIDITY:

1.01 All the prices and price components stated in our bid proposal are firm and not subject to any price adjustment, in line with the bidding documents. All the prices and other terms and conditions of this proposal are valid for a period of 180 days

from the date of opening of the bids. We further declare that prices stated in our proposal are in accordance with “Instructions to Bidders” of bidding documents.

- 1.02 We do hereby confirm that our bid prices as quoted in attached Schedules include all import duties and levies including license fees lawfully payable by us on imported items and other taxes, duties and levies applicable on bought – out components, materials, equipment and other items and confirm that any such taxes, duties and levies additionally payable shall be to our account.
- 1.03 We confirm that the Sales tax on Works Contract, Turnover Tax or any other similar taxes under the Sales Tax Act, as applicable, are included in our quoted bid price and there shall not be any liability on this account to the Purchasers. We understand that Owner shall, deduct such taxes at source as per the rules and issue TDS Certificate to us.
- 1.04 We confirm that, in our Bid Price, we have considered service tax in line with lawful prevalent practice.
- 1.05 Price components of various items are indicated in the B.O.Q. for the respective works.
- 1.06 We further declare that while quoting the price, the due credit under MODVAT scheme, re-christened as CENVAT scheme, as per relevant Government policies wherever applicable, have been taken into account.
- 1.07 We, having studied the bidding document in three volumes relating to taxes & duties and hereby, declare that if any income tax, charge on income tax or any other corporate tax is attracted under the law, we agree to pay the same.
- 1.08 We are aware that the Price schedules do not generally give a full description of the supplies to be made and work to be performed under each item and we shall be deemed to have read the Technical Specifications and other bidding documents and drawings to ascertain the full scope of work included in each item while

filling in the related and prices. We agree that the entered rates and prices shall be deemed to include the full scope as aforesaid, including overheads and profits.

1.09 We understand that in the price schedule, if there is discrepancy between the unit price and total price, the same shall be corrected as per relevant provisions.

1.10 We declare that prices for items left blank in the schedules will be deemed to have been included in other items. The TOTAL for each schedule and the TOTAL of Grand summary shall be deemed to be the total price for executing the facilities and sections thereof in complete accordance with the contract, whether or not each item has been priced.

2.0 CONSTRUCTION OF THE CONTRACT

2.01 We declare that we are making the offer on the basis of indivisible supply-cum-Erection contract on a single source responsibility basis.

3.0 BID SECURITY (EMD)

We are enclosing Bank Draft / Bank Guarantee No. _____ dtd. _____ amounting _____ to _____ Rs.----- (Rupees only) issued by _____ Bank -----branch, payable on Berhampur towards Bid Security against our above Bid. The Bid Security amount has been computed by adding the Estimated Cost of the package no.s ----- for which we are submitting our bid.

4.0 EQUIPMENT PERFORMANCE GURANTEE

We declare that the ratings and performance figures of the equipment to be furnished and erected by us are guaranteed. The Guaranteed particulars of different equipments are enclosed along with our bid.

5.0 BID PRICING

We further declare that the prices stated in our proposal are in accordance with your 'Instruction of Bidders of Conditions of Contract, Volume-1 of the bid documents.

6.0 PRICE ADJUSTMENT

We declare that all the prices and price components stated in our offer are on FIRM price basis.

7.0 QUALIFICATION

We confirm having submitted the Qualification Data in original plus one copy, as required by you under clause 2.0 'Invitation for Bids'. Further we have filled in the information for qualification requirements. In case you require any further information in this regard, we agree to furnished the same in time .

8.0 DEVIATIONS

8.01 We declare that the contract shall be executed strictly in accordance with the specifications and documents except for the variations and deviations all of which have been detailed out exhaustively in the following schedules, irrespective of whatever has been stated to the contrary anywhere else in our proposal.

- a) Commercial Deviations Schedule
- b) Cost of withdrawal of Deviations on Critical
- c) Technical Deviation Schedule

8.02 We confirm that specified stipulation of following critical clauses is acceptable to us and no deviations/exceptions are taken on any account whatsoever in the following clauses:

- (a) Payment Terms :
- (b) Bid Guarantee :
- (c) Contract Performance Guarantee :
- (d) Liquidated Damages for delay :
- (e) Prices and Price Adjustment :
- (f) Guarantee / Warrantees :

8.03 Further, we agree that the additional conditions, deviations, if any, found in our bid proposal documents other than those stated in attached Deviation Schedules, save that pertaining to any rebates offered, shall not be given effect to.

9.0 ADDITIONAL INFORMATION

We have included with this proposal additional information listed. We further confirm that such additional information does not imply any additional deviation beyond those covered in appropriate schedules and in case of any contradiction between these additional information and other provisions of Bid, the latter prevail.

10.0 GURANTEE DECLARATION

We guarantee that the equipment offered shall meet the rating and performance requirements stipulated in this specification. The Guarantee Declaration which shall attract levy of liquidated damages for non-performance is indicated in the relevant schedule.

11.0 BOUGHT-OUT AND SUB-CONTRACTED ITEM

We are furnishing herewith at appropriate Schedule, the detail of all major item of supply amounting to more than 10% of our Bid Price, which were propose subletting giving detail of the name of sub-contractor/sub-vendor and quantity for each item.

12.0 WORK SCHEDULE

If this proposal is accepted by you, we agree to submit engineering data, provide services and complete the entire work from time to time, in accordance with schedule indicated in the proposal. We fully understand that the time schedule stipulated in this proposal is the essence of the contract, if awarded. The completion schedule of the various major key phases of the work is indicated in the designated schedule.

13.0 CONTRACT PERFORMANCE GUARANTEE

We further agree that if our Bid is accepted we shall provide an irrevocable Bank guarantee towards Contract Performance Guarantee, of value equivalent to ten percent (10%) of the Contract Price initially valid up to the end of ninety (90) days after the end of the contract warranty period in the form of Bank Guarantee in your favour within 15 (fifteen) days from the date of ‘Notice of Award of Contract’ and enter into a formal agreement with you immediately thereafter.

14.0 CHECK LIST

We have included a check list duly filled in Schedule. We understand that only this check list, commercial and technical deviation will be read out during the part-I bid opening before the bidders present.

(For Joint Venture/consortium only) We, the Partners of joint venture/ consortium submitting their Bid, do agree and confirm that in case of Award of the Contract on the joint venture, we shall be jointly and severally responsible for the execution of the contract in accordance with contract terms and conditions.

We, hereby declare that only the persons or firms interested in this proposal as principals are named herein and that no other persons or firms other than those mentioned herein have any interest in this proposal or in the contract to be entered into if we are awarded the contract, and that this proposal is made without any connection with any other person, firm or party likewise submitting a proposal and that this proposal is in all respect for and in good faith, without collusion or fraud.

Dated thisday of20.....

Thanking you,
Yours faithfully,

(Signature of the Authorized Signatory)

Name

Designation

Seal of the company.....

(To be signed by lead partner in case of Joint Venture) Signature of other partner (s) in case of Joint Venture)

Name

Designation

Date :

Place :

(Written power of Attorney of all signatories of the bid to commit the Bidder must be enclosed with the Bid. In case of joint venture, the written Power of Attorney of all signatories from respective partners must be enclosed with the Bid. .

*** Applicable case of a Bid from Joint Venture of Firms. Further, the Bid must be signed by each partner of the Joint venture.

DECLARATION FORM

To,

**RURAL ELECTRIFICATION CELL
CORPORATE OFFICE, SOUTHCO UTILITY:
COURTPETA,
BERHAMPUR – 760004**

Sir,

Having examined the above specifications together with the Tender terms and conditions referred to therein

1 – I / We the undersigned do hereby offer to execute the contract covered there on in complete shape in all respects as per the rules entered in the attached contract schedule of prices in the tender.

2 – I / We do hereby under take to have executed the contract within the time specified in the tender.

3 – I / We do hereby guarantee the technical particulars given in the tender supported with necessary reports from concerned authorities.

4 – I / We do hereby certify to have purchased a copy of the tender specifications by remitting Cash / Demand draft & this has been duly acknowledged by you in your letter No.....Dt.....

5 – I / We do hereby agree to furnish the composite Bank Guarantee in the manner specified / acceptable by SOUTHCO UTILITY (as the case may be) & for the sum as applicable to me / us as per clause No.13 of Annexure -V of this specification within fifteen days of issue of Letter of intent / Work Order , in the event of Work order being decided in my / us favour , failing which I / We clearly understand that the said LOI / W.O. shall be liable to be withdrawn by the Owner.

Signed this.....Day of.....20...

Yours faithfully

(Signature of Bidder with Seal of Company)

ANNEXURE – III

PROFORMA FOR CONTRACT PERFORMANCE BANK GUARANTEE

**(To be executed on Rs. 100/- Non-judicial Stamp Paper purchased in the name of
the BG Issuing Bank)**

This Guarantee Bond is executed this ____ day of _____ by
us,
_____ Bank at
_____ P.O. _____ P.S. _____ Dist _____
State _____

Whereas SOUTHCO UTILITY, Coporate Office, Courtpeta, Berhampur-760004 registered under the Company Act 1956 (here in after called “Owner”) has placed Work Order No. _____ Dt. _____ (hereinafter called “Agreement”) with M/s _____ (hereinafter called “the Contractor”) for supply and installation of _____ (description of the works) and whereas Owner has agreed (1) to exempt the Contractor from making payment of security deposit, (2) to release 100% payment of the cost of materials as per the said agreement and (3) to exempt from performance guarantee on furnishing by the Contractor to Owner a composite Bank Guarantee of the value of 10% (ten percent) of the Contract price of the said Agreement.

1. Now, therefore, in consideration of Owner having agreed (1) to exempt the Contractor for making payment of security deposit, (2) to release 100% payment to the Contractor and (3) to exempt from furnishing performance guarantee in terms of the said Agreement as aforesaid, we the _____ Bank, Address _____ (code No. _____) (hereinafter referred to as “the Bank”) do hereby undertake to pay to the Owner an amount not exceeding Rs. _____ (Rupees _____) only against any loss or damage caused to or suffered by the Owner by reason of any breach by the said Contractor(s) of any of the terms or conditions contained in the said Agreement.

2. We, the _____ Bank do hereby undertake to pay the amounts due and payable under the guarantee without any demur, merely on a demand from Owner stating that the amount claimed is due by way of loss or damage caused to or suffered by Owner by reason of any breach by the said Contractor(s) of any of the terms or conditions contained in the said Agreement or by the reason of any breach by the said Contractor's failure to perform the said Agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ (Rupees _____) only.

3. We, the _____ Bank also undertake to pay to Owner any money so demanded notwithstanding any dispute or dispute raised by the Contractor(s) in any suit or proceeding instituted/ pending before any court or Tribunal relating thereto our liability under this Agreement being absolute and irrevocable. The payment so made by us under this bond shall be valid discharge of our liability for payment there under and the Contractor(s) shall have no claim against us for making such payment.

4. We, the _____ Bank further agree that the guarantee herein contain shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and it shall continue to remain in force endorsable till all the dues of Owner under by virtue of the said Agreement have been fully paid and its claim satisfied or discharged or till Purchaser certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharge this guarantee and will not be revoked by us during the validity of the guarantee period.

Unless a demand or claim under this guarantee is made on us or with our Berhampur branch at _____ (Name, address of the Berhampur branch and code No.) in writing on or before _____ (date) we shall be discharged from all liability under this guarantee thereafter.

5. We, the _____ Bank further agree that Owner shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said Contractor(s) and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said Contractor(s) or for any forbearance act or omission on part of Owner or any indulgence by Owner to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provisions have effect of so relieving us.

6. The Guarantee will not be discharged due to change in the name, style and constitution of the Bank and or Contractor(s).

7. We, the _____ Bank lastly undertake not to revoke this Guarantee during its currency except with the previous consent of the Owner in writing.

Dated _____ the _____ day of Two thousand _____ .

Notwithstanding anything contained herein above.

Our liability under this Bank Guarantee shall not exceed Rs. _____ (Rupees _____)
_____)
only.

The Bank Guarantee shall be valid up to _____ only.

Our branch at Berhampur (Name & Address of the Berhampur branch) is liable to pay the guaranteed amount depending on the filing of claim and any part thereof under this Bank Guarantee only and only if you serve upon us at our Berhampur branch a written claim or demand and received by us at our Berhampur branch on or before Dt. _____ otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

For _____

(Indicate the name of the Bank)

N.B.:

- (1) Name of the Contractor:
- (2) No. & date of the Work order/ agreement:
- (3) Amount of W.O:
- (4) Name of Work:
- (5) Name of the Bank:
- (6) Amount of the Bank Guarantee:
- (7) Name, Address and Code No. of the Berhampur Branch of the Issuing Bank:
- (8) Validity period or date up to which the agreement is valid:
- (9) Signature of the Constituent Authority of the Bank with seal:
- (10) Name & addresses of the Witnesses with signature:
- (11) **The Bank Guarantee shall be accepted only after getting confirmation from the issuing Branch & from main branch/specified branch at Berhampur of issuing Bank.**

**FORM OF POWER OF ATTORNEY FOR JOINT VENTURE
(On Non –Judicial Stamp Paper of Appropriate value
to be Purchased in the Name of Joint Venture)**

KNOW ALL MEN BY THESE PRESENTS THAT WE, the Members whose details are given hereunder..... have formed a joint Venture/Consortium and having our Registered Office (s)/Head Office (s) at(hereinafter called the ‘Joint Venture/Consortium’ which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) do hereby constitute, nominate and appoint M/s..... a company/Electrical Contractor incorporated under the laws ofand having its Registered/Head Office atas our duly constituted lawful Attorney (hereinafter called “Attorney” (hereinafter called Lead Member) to exercise all or any of the powers for and on behalf of the joint venture/Consortium in regard to Tender Notice No..... for construction of (name of the package) of SOUTHCO (hereinafter called the “Owner”) for which bids have been invited by the Owner, to undertake the following acts :

- (i) To submit proposal, participate and negotiate in respect of the aforesaid Bid – Specification of the Owner on behalf of the “Joint Venture / Consortium”.
- (ii) To negotiate with Owner the terms and conditions for award of the contract pursuant to the aforesaid Bid and to sign the contract with the Owner for and on behalf of the “Joint Venture / Consortium”.
- (iii) To do any other act or submit any document related to the above.
- (iv) To receive, accept and execute the contract for and on behalf of the “Joint Venture / Consortium”.
- (v) To submit the Contract performance security in the form of an unconditional irrecoverable Bank Guarantee in the prescribed format and as per terms of the contract.

It is clearly understood that the Lead Member shall ensure performance of the contracts(s) and if one or more Member fail to perform their respective portion of the contracts(s), the same shall be deemed to be a default by all the Members.

It is expressly understood that this power of Attorney shall remain valid, binding and irrevocable till completion of the Defect of liability period in terms of the contract.

The Joint Venture / Consortium hereby agrees and undertakes to ratify and confirm all the whatsoever the said Lead Member quotes in the bid, negotiates and signs the Contract with the Owner and / or proposes to act on behalf of the Joint Venture / Consortium by virtue of this Power of Attorney and the same shall bind the Joint Venture / Consortium as if done by itself.

IN WITNESS THEREOF the Members Constituting the Joint Venture / Consortium as aforesaid have executed these presents on this day of under the Common Seal (s) of their Companies

for and on behalf of
the members of Joint Ventures/Consortium
.....
.....
.....

The Seal of the above Partners of the Joint Venture / Consortium:

The Seal has been affixed there unto in the presence of:

WITNESS

- 1. Signature
- Name
- Designation
- Occupation
- 2. Signature
- Name
- Designation
- Occupation

FORM OF JOINT VENTURE/ CONSORTIUM AGREEMENT

(To be executed on non-judicial stamp paper of appropriate value to be purchased in the name of executants or as required by the Jurisdiction in which executed)

THIS Joint Venture/Consortium Agreement executed on this day of Two thousand by:

M/s.a company/Partnership Firm/Sole Proprietorship Organization incorporated under the Act/Laws and having its Registered Office/Head Office at (hereinafter called the "Lead Member/First Member" which expression shall include its successors),and

M/s.a company/Partnership Firm/Sole Proprietorship Organization incorporated under the Act/Laws and having its Registered Office/Head Office at (hereinafter called the " Second Member" which expression shall include its successors),and

M/s.a company/Partnership Firm/Sole Proprietorship Organization incorporated under the Act/Laws and having its Registered Office/Head Office at (hereinafter called the "Third Member" which expression shall include its successors),and

M/s.a company/Partnership Firm/Sole Proprietorship Organization incorporated under the Act/Laws and having its Registered Office/Head Office at (hereinafter called the "Fourth Member" which expression shall include its successors).

The Lead Member/First Member, Second Member, the Third Member and the Fourth Member shall collectively hereinafter be called as the “Joint venture/Consortium Members” for the purpose of submitting a bid proposal to SOUTHCO UTILITY being a company

incorporated under the Companies Act. 1956 having its. Corporate Office at Courtpeta, Berhampur-760004 (hereinafter called the “Owner”) in response to the invitation of bids (hereinafter called as “Tender Notice No.....” Document) dated..... for supply, erection, Testing & Commissioning as per the scope of work(hereinafter called as “the Transaction”)

WHEREAS Clause-2 of the Invitation for Bids (IFB), stipulates that two or more bidder(s) may form a joint venture/Consortium among them and apply against this tender specification, provided they fulfill the following eligible criteria;

1. They should have legally valid Consortium agreement as per the prescribed format for the purpose of participation in the bidding process. The total no of a Consortium shall be limited to four members.
2. One of the Joint Venture/Consortium members should be a Electrical Contractor having valid HT License.
3. Consortium as a whole shall meet the qualifying norms specified in the tender, they participate.
4. The lead member of the Consortium should meet at least 50% of the qualifying norms in respect to the work experience & Turn Over requirement.
5. Besides the lead member, other member(s) of the Consortium together shall meet the balance 50% of the qualifying norms in respect to the work experience & Turn Over requirement.
6. All the Consortium member(s) shall authorize the lead partner by submitting a power of Attorney as per the prescribed format duly signed by the authorized signatories. The lead partner shall be authorized to receive instructions for and on behalf of all partners of the Consortium and entire execution of the contract.
7. The Consortium and its members shall be jointly and severally responsible and be held liable for the purpose of guaranteed obligation and any other matter as required under the contract.
8. Any member of the Consortium member(s) shall not be eligible either in an individual capacity or part of any other Consortium to participate in the tender, where the said Consortium participates.
9. Work Order(s) will be placed to lead members of the Consortium.

10. In addition to the above the Lead Member of the bidder(s) should submit the following documents in part-I bid as qualifying terms.
 - i. Valid electrical (HT) license for Electrical Works.
 - ii. PAN & TIN No.
 - iii. EPF registration.
11. The Lead Member of the Bidder(s) shall have to furnish service tax registration, ESI and Labour license within 45 days of receipt of the order.
12. The prescribed format for Power of Attorney (Annexure-V) is provided in the tender specification as enclosures.

AND WHEREAS the members of the Joint Venture/Consortium together shall strictly comply the eligible criteria of the Clause-2 of the Invitation for Bids (IFB).

AND WHEREAS bid has been proposed to be submitted to the Owner by Lead Member based on this Joint Venture/Consortium agreement all the members, signed by all the members.

NOW THIS INDENTURE WITNESSETH AS UNDER:

In consideration of the above premises, in the event of the selection of Joint Venture/Consortium as successful bidder, all the parties to this Joint Venture/Consortium Agreement do hereby agree abide themselves as follows:

1. M/s Shall act as Lead Member for and on behalf of Joint Venture/Consortium Members. The said Joint Venture/Consortium members further declare and confirm that they shall jointly and severally be bound and shall be fully responsible to the Owner for supply, erection, Testing & commissioning as per the scope of work and successful performance of the works, obligations under the same by the Lead Member are as follows:
 - i) Despite any breach by the Lead Member or other Member(s) of the Joint Venture/Consortium agreement, the Member(s) do hereby agree and undertake to ensure full and effectual and successful performance of the contract with the Owner and to carry out all the obligations and responsibilities under the said Contract in accordance with the requirements of the Contract.

- ii) If the Owner suffers any loss or damage on account of any breach in the Contract or any shortfall in the performance of the equipment in meeting the performance guaranteed as per the specification in terms of the Contract, the Members (s) of these presents undertake to promptly make good such loss or damages caused to the Owner, on its demand without any demur. It shall not be necessary or obligatory for the Owner to proceed against Lead Member to these presents before proceeding against or dealing with the other Members(s). The obligation of each of the member is absolute and not independent of the Joint Venture/Consortium or any member.
- iii) The financial liability of the Members of this Joint Venture/Consortium agreement to the Owner, with respect to any of the claims arising out of the performance of non-performance of the obligations set forth in the said Joint Venture/Consortium agreement, read in conjunction with the relevant conditions of the Contract shall, however, not be limited in any way so as to restrict or limit the liabilities of any of the Partners of the Joint Venture/Consortium agreement. The liability of each Member is absolute and not severable.
- iv) It is expressly understood and agreed between the Members to this Joint Venture/Consortium agreement that the responsibilities inter se amongst the Members shall not in any way be a limitation of joint and several responsibilities and liabilities of the Members to the Owner. It is clearly understood that the Lead member shall ensure performance under the agreements and if one or more Joint venture/Consortium Member(s) fail to perform its/their respective obligations under the agreement(s), the same shall be deemed to be a default by all the Joint venture/Consortium Members. It will be open for the Owner to take any steps, punitive and corrective action including the termination of contract in case of such default also.
- v) This Joint Venture agreement shall be construed and interpreted in accordance with the laws of India and the courts of Odisha shall have the exclusive jurisdiction within Bhubaneswar in all matters arising there under.
- vi) In case of an award of a Contract, all the Members to the Joint Venture/Consortium agreement do hereby agree that Lead Partner shall furnish Performance Bank Guarantee for value of 10% of the Contract Price and additional 1% by the other Joint

Venture/Consortium Member in the form of an unconditional irrecoverable Bank Guarantee in the prescribed format and as per terms of the contract.

- vii) It is further agreed that the Joint Venture/Consortium agreement shall be irrevocable and shall form an integral part of the Contract, and shall continue to be enforceable till the Owner discharges the same. It shall be effective from the date first mentioned above for all purposes and intents.
- viii) Capitalized terms used but not defined herein shall have same meaning as assigned to them in the Tender Documents and/or the agreements.
- ix) In case of any dispute amongst the members of the Joint Venture/Consortium, Owner shall not be in any way liable and also the Consortium members shall not be absolved from the contractual obligation in any manner.

IN WITNESS WHEREOF the Members to the Joint Venture/Consortium agreement have through their authorized representatives executed these presents and affixed Common Seals of their companies, on the day, month and year first mentioned above.

1. Common Sealof For Lead Member/First Member

has been affixed in my/our presence pursuant to the Board of Director's resolution dt.----- (Signature of authorized representative)

Name... ..

Signature.. ..

Designation

.....

Name Common Seal of the company

Designation.....

.....

2. Common Seal of For Second Member

has been affixed in my/our presence

pursuant to the Board of Director's resolution dated (Signature of authorized representative)

Name.....

Signature..... Designation

Name Common Seal of the company

Designation.....

2. Common Seal of For Third Member

has been affixed in my/our presence

pursuant to the Board of Director's resolution dated (Signature of authorized representative)

Name.....

Signature..... Designation

Name Common Seal of the company

Designation.....

3. Common Seal of For Fourth Member

has been affixed in my/our presence

pursuant to the Board of Director's resolution dated (Signature of authorized representative)

Name.....

Signature..... Designation

Name Common Seal of the company

Designation.....

WITNESSES:

1.....

2.....

(Signature)

(Signature)

Name

Name

(Official address)

(Official

ADDITIONAL INFORMATION

Bidder's Name & Address

To

**RURAL ELECTRIFICATION CELL
CORPORATE OFFICE, SOUTHCO UTILITY:
COURTPETA,
BERHAMPUR – 760004**

Dear Sirs,

We have enclosed with our proposal the following additional information for the subject, package.

Sl. No	Brief description of Information	Ref.& Page No.

Date: (Signature)

Place: (Printed Name)

(Designation)

(Common Seal)

Note: Continuation sheets, of like size and format, may be used as per Bidder's requirements and annexed to this Schedule.

BOUGHT OUT & SUB CONTRACTED ITEMS

Bidder's Name & Address

To

**RURAL ELECTRIFICATION CELL
CORPORATE OFFICE, SOUTHCO UTILITY:
COURTPETA,
BERHAMPUR – 760004**

Dear Sirs,

We hereby furnish the details of the items/sub-assemblies amounting to more than 10% of our bid price, we propose to buy for the purpose of subject package

Sl. No	Item description	Qty. Proposed	Source of Supply
		Be bought/ Sub-contracted	
1.
2.
3.
4.
5.
6.
7.

Date:

(Signature)

Place:

(Printed Name)

(Designation)

(Common Seal)

WORK COMPLETION SCHEDULE

Bidder's Name & Address

To

**RURAL ELECTRIFICATION CELL
CORPORATE OFFICE, SOUTHCO UTILITY:
COURTPETA,
BERHAMPUR – 760004**

Dear Sirs,

We hereby declare that the following Work Completion Schedule shall be followed by us for the purpose of subject package

Sl. No	Description of Work	Period in Months(from the date of LOA)
1	Completion of detailed engineering	
2	Procurement of raw materials	
3	Establishment of site office	
4	Erection	
	(a) Commencement	
	(b) Completion	
5	Testing & Pre-commissioning	
	(a) Commencement	
	(b) Completion	
6	Commissioning	

Date:

(Signature)

Place:

(Printed Name)

(Designation)

(Common Seal)

PROFORMA OF INDEMNITY BOND TO BE EXECUTED BY THE CONTRACTOR FOR THE EQUIPMENT/MATERIAL HANDED OVER BY SOUTHCO FOR PERFORMANCE OF ITS CONTRACT

**(Entire Equipment consignment in one lot)
(On non-Judicial stamp paper of appropriate Value)**

INDEMNITY BOND

THIS INDEMNITY BOND is made this day of20..... by..... a Company registered under the Companies Act, 1956/ Partnership Firm / Proprietary Concern having its Corporate Office at(hereinafter called as 'Contractor' or "Obligor" which expression shall include its successors and permitted assigns) in favour of SOUTHCO UTILITY ,Corporate Office, Courtpeta, Berhampur – 760004 registered under the Company Act 1956 (here in after called "Owner")"Which expression shall include its successors and assigns) :

WHEREAS Owner has awarded to the Contractor a Contract for vide its Letter of Award / Contract No..... dated..... and its Amendment No. and Amendment No..... (applicable when amendments have been issued) hereinafter called the "Contract") in terms of which Owner is required to handover various equipment to the Contractor for execution of the Contract.

And WHERAS by virtue of Clause No..... of the said Contract, the Contractor is required to executive an Indemnity Bond in favour of Owner for the Equipment/Material handed over to it by Owner for the purpose of performance of the Contract / Erection portion of the Contract (hereinafter called the "Equipment")

NOW THEREFORE, This Indemnity Bond witnessh as follows:

1. That in consideration of various equipment as mentioned in the Contract, valued at Rs... (Rupees) handed over to the Contractor for the purpose of performance of the Contract, the Contractor hereby undertakes to indemnify and shall keep Owner indemnified, for the full value of the Equipment. The Contractor hereby acknowledges receipt of the Equipment as per dispatch title documents handed over to the Contractor duly endorsed in their favour and detailed in the Schedule appended hereto. It is expressly understood by the Contractor that handing over of the dispatch title documents in respect of the said Equipment duly endorsed by Owner in favour of the

Contractor shall be construed as handing over of the Equipment purported to be covered by such title documents and the Contractor shall hold such Equipment in trust as a Trustee for and on behalf of Owner.

2. That the Contractor is obliged and shall remain absolutely responsible for the safe transit / protection and custody of the Equipment at Owner project Site against all risks, whatsoever, till the Equipment are duly used / erected in accordance with the terms of the Contract and the Plant / Package duly erected and commissioned in accordance with the terms of the Contract, is taken over by Owner. The Contractor undertakes to keep Owner harmless against any loss or damage that may be caused to the Equipment.
3. The Contractor undertakes that the Equipment shall be used exclusively for the performance / execution of the Contract strictly in accordance with its terms and conditions and no part of the equipment shall be utilized for any other work or purpose whatsoever. It is clearly understood by the Contractor that non-observance of the obligations under this Indemnity Bond by the Contractor shall inter-alia constitute a criminal breach of trust on the part of the Contractor for all intents and purpose including legal / penal consequences .
4. That SOUTHCO UTILITY (as the case may be) is and shall remain the exclusive Owner of the Equipment free from all encumbrances, charges or liens of any kind, whatsoever. The Equipment shall at all times be open to inspection and checking by Engineer in Charge / Engineer or other employees/agents authorized by him in this regard. Further, Owner shall always be free at all times to take possession of the Equipment in whatever form the Equipment may be, if in its opinion the Equipment are likely to be endangered, misutilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor binds himself and undertakes to comply with the direction of demand of Owner to return the Equipment without any demur or reservation.
5. That this indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipment or the same or any part thereof is misutilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Engineer-in-Charge/Engineer of Owner as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipment at its own cost and/or shall pay the amount of loss of Owner without demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to Owner against the Contractor under the Contract and under this Indemnity Bond.

6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with terms and conditions of this Bond to the satisfaction of Owner, THEN, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorized representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE

Particulars of the Equipment handed over	Quantity	Particulars of Dispatch Title Documents		Value of the Equipment	Signature of Attorney (authorised representative as a token of receipt)
		RR / GR / No. / Date of Bill of Lading	Carrier		

For an on behalf of M/s.....

WITNESS

1. 1. Signature Signature
2. Name Name
3. Address..... Designation
- Authorised representative *

2. 1. Signature
2. Name(Common Seal in case of Company)
3. Address

* Indemnity Bonds are to be executed by the authorised person and (i) in case of Contracting Company under common seal of the Company or (ii) having the Power of Attorney issued under common seal of the company with authority to execute Indemnity Bonds, (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a Photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.

ANNEXURE-X

SELF DECLARATION FORM

Name of the Purchaser: -----

Tender Notice No: -----

Sir,

1. I / we, the undersigned do hereby declare that, I / we have never ever been blacklisted and / or there were no debarring actions against us for any default in supply of material / equipments or in the performance of the contract entrusted to us in any of the Electricity Utilities of India.

2. In the event of any such information pertaining to the aforesaid matter found at any given point of time either during the course of the contract or at the bidding stage, my bid/contract shall be liable for truncation / cancellation / termination without any notice at the sole discretion of the purchaser.

Yours faithfully,

Place-
Date-

Signature of the bidder
With seal

(This form shall be duly filled-up and signed by the bidder & submitted along with the original copy of the Bid.)

ANNEXURE – XI (A)
PROFORMA FOR BANK GUARANTEE FOR EARNEST MONEY DEPOSIT

(ON NON-JUDICIAL STAMP PAPER OF Rs.100/-)

Ref Date Bank Guarantee No:

In accordance with invitation to Tender Notice No.----- Dated -----
of Southco Utility. for the execution of
(name of package)

M/s _____ Address _____
_____ wish/wished to participate
in the said tender and as the Bank Guarantee for the sum of Rs. _____
[Rupees _____ Valid for a period of days
(in words) is required to be submitted by the Bidder.

1. We the _____ [Indicate the Name of the
Bank] [Hereinafter referred to as 'the Bank'] at the request of M/S
_____ [Herein after referred
to as supplier (s)] do hereby unequivocally and unconditionally guarantee and undertake to pay
during the above said period, on written request by SOUTHCO UTILITY an amount not
exceeding Rs. _____ to the SOUTHCO UTILITY, without any reservation. The
guarantee would remain valid up to 4.00 PM of _____ [date] and if any further
extension to this is required, the same will be extended on receiving instructions from M/s
_____ on whose behalf this guarantee has been issued.

2. We the _____ [Indicate the name of the bank] do
hereby further undertake to pay the amounts due and payable under this guarantee without any
demur, merely on a demand from the SOUTHCO UTILITY stating that the amount claimed is
due by way of loss or damage caused to or would be caused to or suffered by the SOUTHCO
UTILITY by reason of any breach by the said supplier [s] of any of the terms or conditions or
failure to perform the said Bid. Any such demand made on the Bank shall be conclusive as
regards the amount due and payable by the Bank under this guarantee. However, our liability
under this guarantee shall be restricted to an amount not exceeding
Rs. _____ (in wards)

3. We, the _____ Bank undertake to pay the SOUTHCO UTILITY any money so
demanded notwithstanding any dispute or disputes so raised by the supplier [s] in any suit or
proceeding instituted/pending before any Court or Tribunal relating thereto, our liability under this
agreement being absolute and unequivocal. The payment so made by us under this bond shall be a
valid discharge of our liability for payment there under and the supplier(s) shall have no claim
against us for making such payment.

4. We, the _____ Bank [Indicate the name of the bank] or our local branch at Berhampur further agree that the guarantee herein contain shall remain in full force and effect during the aforesaid period of ----- days and it shall continue to be so enforceable till all the dues of the SOUTHCO UTILITY under by virtue of the said Bid have been fully paid and its claims satisfied or discharged or till SOUTHCO UTILITY certifies that the terms and conditions of the said Bid have been fully and properly carried out by the said Supplier [s] and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____ (date) we shall be discharged from all liability under this guarantee thereafter.

5. We, the _____ Bank [Indicate the name of the bank] or our local branch at Berhampur further agree that the SOUTHCO UTILITY shall have the fullest liberty without our consent and without affecting in any manner our obligations here under to vary any of the terms and conditions of the said Bid or to extend time of performance by the said Supplier [s] from time to time or to postpone for any time or from time to time any of the powers exercisable by the SOUTHCO UTILITY against the said supplier [s] and to forbear or enforce any of the terms and conditions relating to the said bid and we shall not be relieved from our liability by reason of any such variation, postponement or extension being granted to the said Supplier [s] or for any forbearance act or omission on the part of the SOUTHCO UTILITY or any indulgence by the SOUTHCO UTILITY to the said Supplier[s] or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision, have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the name, style and constitution of the Bank or the supplier [s].

7. We, the _____ Bank or our local branch at Berhampur lastly undertake not revoke this Guarantee during its currency except with the previous consent of the SOUTHCO UTILITY in writing.

8. We, the _____ Bank further agree that this guarantee shall also be invokable at our place of business at Berhampur [**Indicate address & Branch code of local branch at Berhampur**] in the State of Orissa.

Dated _____ Day of 2012.

Witness ((Signature, names & address)

- 1.
- 2

For _____ [Indicate the name of Bank]

Power of Attorney No. _____

Date: _____

SEAL OF BANK

Note: The non-judicial stamp paper of worth Rs.100/- shall be purchased in the name of the bank, which has issued the bank guarantee.

ANNEXURE- XI (B)

FORM OF EXTENSION OF BANK GUARANTEE (ON NON-JUDICIAL STAMP PAPER OF Rs.100/-)

Ref. No. _____

Dated: _____

SOUTHCO UTILITY.,

Corporate Office: Courtpeta

Berhampur - 760004

Dear Sirs,

Sub: Extension of Bank Guarantee No. _____ for Rs. _____ favouring yourselves
expiring _____ on account of M/s. _____ in respect of contract
No. _____ dated _____ (hereinafter called original bank guarantee).

At the request of M/s. _____ we _____ bank Branch office at _____
having its head office at _____ do hereby extend our liability under the above
mentioned guarantee No. _____ Dated _____ for a further period of _____
Years/months from _____ to expire on _____ except as provided above, all other terms
and conditions of the original bank guarantee No. _____ dated _____ shall remain
unaltered and binding.

Please treat this as an integral part of the original guarantee to which it would be attached.

Yours faithfully,

For _____

Manager/Agent/Accountant

Power of Attorney No. _____

Date: _____

SEAL OF BANK

Note: The non-judicial stamp paper of worth Rs.100/- shall be purchased in the name of the bank, which has issued the bank guarantee.