



**ODISHA POWER TRANSMISSION CORPORATION LIMITED  
OFFICE OF THE SENIOR GENERAL MANAGER  
CENTRAL PROCUREMENT CELL  
JANAPATH, BHUBANESWAR-751022**

**TEL NO. 0674-2541801 FAX NO. 0674-2542964  
TENDER SPECIFICATION NO: SR.G.M-CPC-e TENDER- XLPE Cable -50/2022-23**

**PROCUREMENT OF XLPE UNDERGROUND CABLE**

**PART-I COMMERCIALBID**

<b>SECTION-I</b>	<b>INSTRUCTION TO TENDERERS</b>
<b>SECTION-II</b>	<b>GENERAL CONDITIONS OF CONTRACT</b>
<b>SECTION-III</b>	<b>LIST OF ANNEXURES</b>
<b>SECTION-IV</b>	<b>TECHNICAL SPECIFICATION</b>

**PART-II PRICEBID**

<b>Request for online tender documents</b>	<b>From</b>	<b>Date</b>	<b>15.03.2023</b>	<b>To</b>	<b>Date</b>	<b>05.04.2023</b>
		<b>Time</b>	<b>11.00Hrs</b>		<b>Time</b>	<b>12:30Hrs</b>
<b>Last date of submission of online tender</b>					<b>Date</b>	<b>05.04.2023</b>
					<b>Time</b>	<b>13:00Hrs</b>
<b>Date of opening of Tender</b>					<b>Date</b>	<b>06.04.2023</b>
					<b>Time</b>	<b>11.00Hrs</b>



**ODISHA POWER TRANSMISSION CORPORATION LTD.  
REGD. OFFICE: JANPATH, BHUBANESWAR – 751 022,**

**e-TENDER NOTICE NO CPC- 50/2022-23**

For and on behalf of ODISHA POWER TRANSMISSION CORPORATION LTD, Sr.G.M. [C.P.C.] invites Tenders from reputed manufacturers in two part bidding system for procurement of XLPE Underground Cable. The interested bidders would be required to enroll themselves on the tender portal [www.tenderwizard.com/OPTCL](http://www.tenderwizard.com/OPTCL) Complete set of bidding documents are available at [www.tenderwizard.com/OPTCL](http://www.tenderwizard.com/OPTCL) from **15.03.2023 (11.00 hrs.) to 05.04.2023 (13:00 hrs.)** Interested manufacturers may visit OPTCL's official web site <http://www.optcl.co.in> and [www.tenderwizard.com/OPTCL](http://www.tenderwizard.com/OPTCL) for detail specification.

N.B:- All subsequent addendums/corrigendum to the tender shall be hosted in the OPTCL's official web site <http://www.optcl.co.in> and [www.tenderwizard.com/OPTCL](http://www.tenderwizard.com/OPTCL) **only.**

SENIOR GENERAL MANAGER [C.P.C.]



**NOTICE INVITING TENDER**

**ODISHA POWER TRANSMISSION CORPORATION LTD**

**REGD. OFFICE: JANPATH, BHUBANESWAR – 751 022**

**e-TENDER NOTICE NO- 50/2022-23**

For and on behalf of the ODISHA POWER TRANSMISSION CORPORATION LTD., the undersigned invites bids under two-part bidding system in e- tendering mode only as per the following details.

Sl. No	Tender Specificati No	Description of materials.	Qty	INDIAN RUPEES			Last date of submission & Date of opening of Tender
				Earnest Money Deposit	Cost of Tender Spec. Document	Tender Processing Fee	
1.	Sr.G.M-CPC- e Tender-XLPE UG Cable - 50/2022-23	XLPE UG Cable (Details as per TABLE-A)	(Details as per TABLE-A	Rs.7,29,877 (Rupees Seven Lakhs Twenty Nine Thousand Eight Hundred Seventy Seven )Only	Rs.12,000/+GST @18% GST) =Rs.14,160/- (Rupees Fourteen thousand one hundred sixty only)	Rs 5,000/ + GST@ 18% Rs 5,900/- (Rupees Five thousand nine hundred)	Up to 05.04.2023 (13.00Hrs.) & On 06.04.2023 ( 11.00Hrs.)

**TABLE A**

Sl	Item Name/Category	Item Description	UOM	Quantity
1	CABLE	1.1)132kV, 1 core, 1000 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminium sheath type).	Km	0.5
		1.2)132kV, 1 core, 630 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminium sheath type).	Km	1.5
		1.3) Supply of single core 300 Sq.mm XLPE bonding cable.	Km	1

	1.4)Earth bonding cable 240 sq.mm XLPE	Km	1
	1.5)33kV, 1 core, 630 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminum sheath type).	Km	5.58
	1.6)33kV, 1 core, 300 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminum sheath type).	Km	1

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

**TENDER COST:**

The bidders shall submit Tender Paper Cost (Cost of Tender Spec.) as per tender notice online through e-payment gateway link provided in e-tender portal (by using Net Banking, Debit Card or Credit Card) prior to last date & time of submission of online tender.

They have to also submit notarized hard copy of GST registration certificate on or before the date & time of submission of techno-commercial bid.

**TENDER PROCESSING FEE:**

The bidders shall have to submit non-refundable amount of Rs.5,900/- (Rupees Five thousand & nine hundred) only including GST @ 18%) towards the tender processing fee to K.S.E.D.C.Ltd, in e-payment mode. The e-payment of above amount is to be made to enable the bidder to down load the bid proposal sheets & bid document in electronic mode.

**SUBMISSION OF TENDER COST, TENDER PROCESSING FEE & EMD:**

The bidder shall deposit the tender cost, tender processing fee & EMD BG prior to last date & time for submission of bid as notified in tender notice. Local micro & small enterprisers (MSEs) **(In the state of Odisha)** based in Odisha and registered with respective DICs, Khadi, Village, Cottage & Handicrafts Industries, OSIC and NSIC can participate without payment of the cost of tender specification. They have to submit notarized hard copy of valid registration as local MSE **(In the state of Odisha)** as above on or before the date & time of submission of techno-commercial bid.

**The proof of payment for tender cost, processing fees are to be submitted along with the EMD at the office of the undersigned on or before the last date & time of submission of tender.**

The bidders shall scan the Demand Draft/Pay order/ Bank guarantee, towards EMD/ notarised hard copy of valid registration as local MSE **(In the state of Odisha)** (if any) and upload the same in the prescribed form in .gif or .jpg format in addition to sending the original as stated above.

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

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

***Minimum qualification criteria of bidders: AS STIPULATED IN SECTION-II, (G.T.C.C) OF THE TENDER SPECIFICATION.***

**SENIOR GENERAL MANAGER,(CPC)**

**SR.G.M-CPC-e TENDER- XLPE UG CABLE - 50/2022-23**

<b>CONTENT</b>	
SECTION – I	INSTRUCTION TO TENDERERS
SECTION – II	GENERAL TERMS AND CONDITIONS OF CONTRACT ( G.T.C.C.) (COMMERCIAL
SECTION – III	LIST OF ANNEXURES (COMMERCIAL)
SECTION – IV	TECHNICAL SPECIFICATION
SECTION – V	PRICE BID.



**PART – I**

**SECTION – I**

**INSTRUCTIONS TO TENDERERS**

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**COMMERCIAL SPECIFICATION**  
**PART-I**  
**SECTION-I**  
**INSTRUCTIONS TO BIDDER**

**1. Submission of Bids: -**

The bidder shall submit the bid in Electronic Mode only i.e. [www.tenderwizard.com/OPTCL](http://www.tenderwizard.com/OPTCL). The bidder must ensure that the bids are received in the specified website of the OPTCL by the date and time indicated in the Tender notice. Bids submitted by telex/telegram will not be accepted. No request from any bidder to the **OPTCL** to collect the Bids in physical form will be entertained by the **OPTCL**.

The OPTCL reserves the right to reject any bid, which is not deposited according to the instruction, stipulated above. The participants to the tender should be registered under **GST Laws**.

1. For all the users it is mandatory to procure the Digital Signatures.
2. Contractors / Vendors / Bidders / Suppliers are requested to follow the below steps for Registration:
  - a. Click “Register”, fill the online registration form.
  - b. Pay the amount of Rs. **2360/-** through e- payment mode only in Favour of **KSEDCL** Payable at **Bangalore**.
  - c. Send the acknowledgment copy for verification.
  - d. As soon as the verification is being done the e-tender user id will be enabled.
3. After viewing Tender Notification, 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 Certificates).
4. If any Bidder wants to participate in the tender he will have to follow the instructions given below:
  - a. 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).
  - b. Click / Double Click to open the Microsoft Internet Explorer (This icon will be located on the Desktop of the computer).
  - c. Go to Start > Programs > Internet Explorer.
  - d. Type **www.tenderwizard.com/OPTCL** in the address bar, to access the Login Screen.
  - e. Enter e-tender User Id and Password, click on “Go”.
  - f. Click on “Click here to login” for selecting the Digital Signature Certificate.
  - g. Select the Certificate and enter DSC Password.
  - h. Re-enter the e-Procurement User Id Password
5. To make a request for Tender Document Bidders will have to follow below mentioned steps.
  - Click “Un Applied” to view / apply for new tenders.
  - Click on Request icon for online request.
6. After making the request Bidders will receive the Tender Documents which can be checked and downloaded by following the below steps:
  - Click to view the tender documents which are received by the user.



- Tender document screen appears.
  - Click “Click here to download” to download the documents.
7. After completing all the formalities Bidders will have to submit the tender and they must take care of following 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
  8. Tender Opening event can be viewed online.
  9. Competitors bid sheets are available in the website for all.
  10. **For any e-tendering assistant contact help desk number mentioned below.**
    - Bangalore – 080- 40482000.

The participants to the tender should be registered under **GST Laws**.

**2. Division of Specification.**

The specification is mainly divided into two parts viz. Part-I & Part-II.

**Part-I Consists of**

- |                   |   |
|-------------------|---|
| [i] Section-I     | Instruction to Tenderers.               |
| [ii] Section-II   | General Terms & conditions of contract. |
| [iii] Section-III | Schedules and forms etc.                |
| [iv] Section-IV   | Technical Specification.                |

**Part-II Consists of**

- [i] Schedule of prices as per Annexure-V

**3. Tenders shall be in Two Parts.**

The Tenderers are required to submit the tenders in two parts Part-I “Technical and commercial” and Part-II “Price Bid”.

**4. Opening of Bids.**

**[a]** The part-I shall be opened on the date and time fixed by the **OPTCL** for opening of bids in Electronic mode in presence of such of the Tenderers or their authorized representatives **[limited to one person only]** on the due date of opening of tender who opt remain present. After scrutiny of the technical particulars and other commercial terms, clarifications, if required, shall be sought for from the bidders. The Tenderers shall be allowed **15 days**’ time for such activity.

**[b]** On receipt of technical clarification, the bids shall be reviewed, evaluated and those not in conformity with the technical Specification / qualifying experience, shall be rejected. If any of the technical proposals requires modification to make them comparable, discussion will be held with the participating bidders.

All the responsive bidders shall be given opportunity to submit the revised technical and revised price proposals as a follow up to the clarification (modification if any) on the technical proposals. The qualified bidders shall be given opportunity to submit revised price proposals within **15 days** from the date of such discussion or within time frame mutually agreed, whichever is earlier.

**[c]** When the revised price proposals are received, the original price proposals will be returned to the bidders unopened along with their original technical proposals. Only the revised technical and price proposals will be considered for bid evaluation. The

price bids [Part-II] of such of the Tenderers, whose tenders have been found to be technically and commercially acceptable, including those supplementary revised price bids, submitted subsequently, shall be opened in the presence of the bidder's representative on a date and time which will be intimated to all technically and commercially acceptable Tenderers.

- [d] The bidders are required to furnish sufficient information to the Purchaser to establish their qualification, capacity to manufacture and/or supply the materials/perform the work. Such information shall include details of bidder's experience, its financial, managerial and technical capabilities.
- [e] The bidders are also required to furnish details of availability of appropriate technical staff and capability to perform after sales services. The above information shall be considered during scrutiny and evaluation of bids and any bid which does not satisfactorily meet these requirements, shall not be considered for price bid evaluation.
- [f] The price bids of the technically and otherwise acceptable bids shall only be evaluated as per the norms applicable in terms of this Specification.

#### **4.1. Registration certificate of DPIIT:**

4.1.4.1 As per Office Memorandum No.F.No.6/18/2019-PPD, Ministry of Finance, Dept. of Expenditure Public Procurement Division, New Delhi and Office Memorandum No. FIN-CON-MISC-0007/2019/27945/F Dated.16.10.2020 of Finance Department, Govt. of Odisha "*Any bidder from a country which **shares a land border with India** will be eligible to bid in any procurement whether goods, services (Including consultancy services and non-consultancy services) or works (including turnkey projects) **only if the bidder is registered with the Competent Authority, DPIIT** (i.e. Department for Promotion of Industry and Internal Trade)*". Pursuant to decision of Govt. of India prescribing imposition of restriction on public procurement from bidders of certain countries on ground of defence of India or matters directly or indirectly related thereto, the Office Memorandum No. 4939/F, dated: 13.02.2012 of Finance Department, Govt of Odisha has been amended vide Office Memorandum No 27945 Dtd 16.10.2020 by inserting sub-para-3 (vii) to para-3 thereof. Prescribing the restriction on procurement made by the State Govt., State Public Sector Undertaking including local bodies etc. and directing no procurement shall be made in violation of such restrictions, it is hereby clarified that the provisions of the same shall be applicable for the tenders for works/procurement/Service in OPTCL in both ongoing (Techno-Commercial bid not opened) and future tenders. The tender documents of OPTCL shall contain following additional clauses and certificate formats

<b>A. To be incorporated as qualifying requirement of bidder /certificates in case of tenders for procurement of goods/services(including consultancy and non-consultancy)</b>
--

- |  |
|--|
| <ul style="list-style-type: none"><li>I. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority as per requirement of Govt. of India</li><li>II. "Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any</li></ul> |
|--|

member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated herein before, including any agency branch or office controlled by such person, participating in a procurement process.

III. "Bidder from a country which shares a land border with India" for the purpose of this Order means :-

- a. An entity incorporated, established or registered in such a country ; or
- b. A subsidiary of an entity incorporated, established or registered in such a country ' or
- c. An entity substantially controlled through entities incorporated , established or registered in such a country ; or
- d. An entity whose beneficial owner is situated in such a country ; or
- e. An Indian (or other) agent of such an entity ; or
- f. A natural person who is a citizen of such a country ; or
- g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above.

IV. The beneficial owner for the purpose of (iii)(d) above will be as under :

1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting along or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.

**Explanation-**

- a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent of shares or capital or profits or the company.
- b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreement;
2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting along or together, or through one or more juridical person, has ownership or entitlement to more than fifteen per cent of capital or profits of the partnership ;
3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting along or together, or through one or more juridical person, his ownership of or entitlement to more than fifteen per cent of the property or capital or profits of such association or body of individuals ;
4. Where no natural person is identified under (1) or (2) or (3) above, the

beneficial owner is the relevant natural person who hold the position of senior managing official ;

5. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen per cent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

V. An Agent is a person employed to do any act for another, or to represent another in dealings with third person.

**Certificate ( to be furnished in bidder's letter head)**

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where applicable, evident of valid registration by the Competent Authority shall be attached.]

**5. Purchaser's Right Regarding Alteration of Quantities Tendered.**

The Purchaser may alter the quantities of materials/equipment at the time of placing orders. Initially the purchaser may place orders for lesser quantity with full freedom to place extension orders for further quantity under similar terms and conditions of the original orders. Orders may also be split among more than one tenderer for any particular item, if considered necessary in the interest of the Purchaser to get the goods/equipment earlier.

**6. Procedure and opening time of tenders.**

Tenders will be opened in the office of the **Senior General Manager [C.P.C.]** on the specified date and time in presence of the Tenderers or their authorized representatives [**limited to one person only**] in case of each bidder who may desire to be present, at the time of opening the bids.

**7. Bidder's Liberty to deviate from Specification.**

The Tenderer may deviate from the specification while quoting, if in his opinion, such deviation is in line with the manufacturer's standard practice and conducive to a better and more economical offer. All such deviations should however be clearly indicated giving full justifications for such deviation. [Read with Clause-9, Section-II of the Specification].

**8. Eligibility for submission of bids.**

Only those manufacturers who have deposited the cost of tender specification are eligible to participate in the tender. They should submit the money receipt as a proof of such payment. The Local (**In the state of ODISHA**) Micro and small Enterprises (MSEs) registered with respective DICs, Khadi, Village, Cottage & Handicrafts

Industries, OSIC and NSIC (**Registered in Odisha**) can participate without payment of the cost of tender specification

**9. Purchaser's right to accept/reject bids:**

The purchaser reserves the right to reject any or all the tenders without assigning any reasons what so ever if it is in the interest of **OPTCL**, under the existing circumstances. [Read with clause-10, Section-II of the specification].

**10. Mode of submission of Tenders.**

[A] Tenders shall be submitted in electronic mode only.

([www.tenderwizard.com/OPTCL](http://www.tenderwizard.com/OPTCL))

[B] **Telegraphic or FAX tenders** shall not be accepted under any circumstances.

**11. Earnest money deposit:**

The tender shall be accompanied by **Earnest Money deposit** of value specified in the notice inviting tenders against each lot / bid. Tenders without the required **EMD** as indicated at **Annexure-VIII** will be rejected out rightly.

The **Local (In the state of ODISHA) Micro and small Enterprises** (MSEs) registered with respective DICs, Khadi, Village, Cottage & Handicrafts Industries, OSIC and NSIC (**Registered in Odisha**) can participate by submitting Earnest Money Deposit @ **50(fifty)** percent of the amount indicated in the Notice Inviting Tender.

The earnest money deposit shall be furnished in one of the following forms subject to the conditions mentioned below:

- (a) ~~**Cash:** Payable to **drawing & disbursing Officer**, OPTCL (HQRS Office), Bhubaneswar-751022.~~
- (b) **Bank Draft:** -To be drawn in favour of **Drawing & Disbursing Officer**, OPTCL [HQRS Office], Bhubaneswar-751 022.
- (c) Bank Guarantee from any **Nationalized/Scheduled Bank** strictly as per enclosed proforma vide **Annexure-VI** to be executed on non-judicial stamp paper worth **Rs.29.00** or as applicable, as per prevailing laws in force and also to be accompanied by the confirmation letter of the issuing Bank Branch.
- (d) National saving certificates duly pledged in favour of Senior General Manager [Central Procurement Cell] OPTCL {HQRS Office}, Bhubaneswar-751 022.
- (e) The non-judicial stamp paper should be purchased in favour of **issuing Bank's Branch name** , otherwise the EMD B.G cannot be accepted

**NOTE:**

- (i). The validity of the **EMD** in the form of Bank Guarantee shall be at least for **240 days** from the date of opening of tender failing which the tender will be liable for rejection.
- (ii) No interest shall be paid on the Earnest Money Deposit.
- (iii) E.M.D. in shape of cash may be submitted up to **Rs. 25,000/- (Rupees Twenty-five Thousand)** only. Above Rs. 25,000/- (Rupees Twenty-five thousand) the Earnest Money Deposit shall be furnished in any one of the forms indicated above (i.e. Through Bank Draft, Bank Guarantee/ National Savings Certificate).
- (iv) No adjustment towards EMD shall be permitted against any outstanding amount with the **ODISHA POWER TRANSMISSION CORPORATION LTD.**
- (v) The chart showing particulars of EMD to be furnished by Tenderers of different categories is placed at **Annexure-VIII.**

- (vi) In the case of un- successful tenderer, the EMD will be refunded after the tender is decided. In the case of successful Tenderer, this will be refunded only after furnishing of security money referred to a clause-19 of Section-II.
- (vii) Suits, if any, arising out of this clause shall be filed in a Court of law to which the jurisdiction of High Court of **ODISHA** extends.
- (vii) EMD will be forfeited if the tenderer fails to accept the letter of intent and/or purchase order issued in his favour or to execute the order, placed on them.
- (viii) Tenders not accompanied by Earnest Money shall be disqualified.

12. **Validity of the Bids: -**

The tenders should be kept valid for a period of **180 days** from the date of opening of the tender, failing which the tenders will be rejected.

13. **PRICE: -**

The quoted price shall be variable as per IEEMA PVC.

**IEEMA CLAUSE: -**

For the procurement Contracts, the price variation shall be allowed for below items

- ~~1. Power Transformers & Reactors,~~
- ~~2. Substation & Transmission Line Tower Structure materials including Nuts & Bolts,~~
- ~~3. Conductors,~~
4. Power, control and EHV cables

The quoted price shall be variable as per IEEMA PVC

The IEEMA formula as on date of opening of tender shall be applicable. Whenever IEEMA formula is amended subsequently, the same shall be applicable from the effective date mentioned therein with two stage computation for the period prior to amendment and subsequent to amendment.

**Computational procedure**

- IEEMA PV formula shall be made applicable on 95% of taxable value (Discovered in OPTCL tenders/negotiated including freight and insurance) considering 5% towards freight and loading & unloading cost
- There would be ceiling of 20% on positive side and no ceiling on negative side for price variation. However increase beyond 15% can be given in exceptional cases only.
- ~~The GIS S/s will also be added in the list of items, whenever the same is covered by IEEMA, OPTCL may also include PV formula for GIS S/s.~~
- ~~For Conductor, only Monthly average Aluminium LME seller settlement price will be considered as per IEEMA for calculating PV.~~
- When the actual delivery date is within the contract delivery date, the PV will be calculated considering the actual delivery date (the date on which the item is notified as being ready for inspection/dispatch or in the absence of such notification, the date of manufacturers dispatch note is to be considered as the date of delivery.

When the actual delivery date is after the contract delivery date, the PV will be calculated considering the scheduled delivery date or the date of offer for inspection or the actual delivery date, whichever is advantageous to the purchaser.



- Price variation bills/ debit or credit notes are to be submitted by the firm for the item that are subject to variable price for a quarter
- In case of upward revision of price due to price variation, the BG for 10% of differential amount shall be submitted within 15 days of approval of Price Variation
- ~~For Conductor, only Monthly average Aluminium LME seller settlement price will be considered as per IEEEMA for calculating PV.~~

14. **Revision of tender price by Bidders:** -

- [a] After opening of tenders and within the validity of period, no reduction or enhancement in price will be entertained. If there is any change in price, the tender shall stand rejected and the EMD deposited shall be forfeited.
- [b] After opening of price bid if the validity period is not sufficient to place purchase order, the tenderer may be asked by the purchaser to extend the validity period of the bid under the same terms and condition as per the original tender. However, the tender are free to change any or all conditions including price except delivery period of their bids at their own risk, if they are asked by the purchaser to extend the validity period of the bid prior to opening of price bid.

15. **Tenderers to be fully conversant with the clauses of the Specification:** -

Tenderers are expected to be fully conversant with the meaning of all the clauses of the specification before submitting their tenders. In case of doubt regarding the meaning of any clause, the tenderer may seek clarification in writing from the **Senior General Manager (Central Procurement Cell) OPTCL**. This, however, does not entitle the Tenderer to ask for time beyond due date, fixed for receipt of tender.

**16.0 Documents to Accompany Bids.**

Tenderers are required to submit tenders in the following manner:

**The Tender shall contain the following documents.**

[i]	Declaration Form. [As per Annexure-I]
[ii]	Earnest Money. [As per <b>Annexure-VIII</b> ], Tender Cost .
[iii]	Technical specification and Guaranteed Technical Particulars conforming to the Purchaser's Specification along with drawings, literatures and all other required Annexures, duly filled in.
[iv]	Photostat copies of type test certificates of materials/equipment offered as stipulated in the Technical Specification.
[v]	Abstract of Terms & conditions in prescribed proforma as per <b>Annexure-II</b> .
[vi]	General Terms & Conditions of supply offer as per Section-II of the Specification.
[vii]	List of orders executed for similar materials/equipment during preceding 2 (two) years indicating the customer's name, Purchase Order No. & Date, date of supply and date of commissioning etc.
[viii]	Data on past experience <b>as per Clause-7 of Section-II</b> of the Specification.
[ix]	GST Compliance Rating. The GST Identification Number (GSTIN) under GST Laws and permanent account number [PAN] of the firm, IT return for

	last 3 years under Income tax Act are required.
[x]	Audited Balance sheet & profit loss accounts of the bidder, for past (3) three years.
[xi]	Schedule of quantity and delivery in the prescribed Proforma vide <u>Annexure, as appended.</u>
[xii]	List of Orders in hand to be executed.
[xiii]	Deviation schedule.
[xiv]	The bidder should not have any pending litigation or arbitration with OPTCL with regard to any project or related activity. The bidder should certify/declare the same in unequivocal terms by way of an affidavit duly sworn before a magistrate/notary.
[xv]	Notarized hard copy and soft copy of valid registration as local ( <b>In the state of Odisha</b> ) MSE (if any).
[xvi]	Reverse Auction Process Compliance Form (Annexure-IB)
[xvii]	Certificate of DPIIT

**17. Documents/Papers to accompany Part-II Bid.**

Part – II of the tender shall consist of the following

- (i) Schedule of prices in the prescribed pro-forma as per Annexure-V

**18. Conditional Offer:**

Conditional offer shall not be accepted.

**19. General: -**

- (i) In the event of discrepancy or arithmetical error in the schedule of price, the decision of the purchaser shall be final and binding on the Tenderer.
- (ii) For evaluation, the price mentioned in words shall be taken if there is any difference in figures and words in the price bid.
- (iii) Notice inviting tender shall form part of this specification.
- (iv) The price bids of the technically and otherwise acceptable bids shall only be evaluated. The **EMD** of others, if any, shall be returned to the bidders.
- (v) Tenderer can offer any lot or all the lots of the tender, if there is more than one lot. But the tender (bid) must be furnished separately for each lot. For each lot, the tenderer has to submit PART-I & PART-II of the bids separately.
- (vi) It should be distinctly understood that the part-II of the bid shall contain only details/documents relating to price, as outlined in clause-17 mentioned herein above. Inclusion of any of the documents/information etc. shall render the bid liable for rejection.
- (vii) The tenderer must submit the EMD amount, cost of tender document (Form Fee) and Tender processing fee in a sealed cover envelope super-scribing the tender specification number, Tender Notice No & Date of tender clearly on the cover envelope. The said envelope is to be submitted in the office of the purchaser on or before the last date and time of submission of Bids.



**20.0 Expenses in respect of OPTCL's representative for witnessing the inspection & testing of the offered equipment/materials at the inspection and testing site.**

The testing and inspection of the equipment/ materials at manufacturer works are in the scope of work of the Contractor/Supplier.

OPTCL inspecting officer, on receipt of offer for inspection from the contractor/supplier, proceeds to the manufacturer works to witness the Type/Acceptance/Routine test.

Important:

It is hereby informed to all the bidders that the relevant clauses of the contract specification, pertaining to inspection and testing of equipment/materials, are hereby supplemented with following additional terms and conditions.

The expenses under the following heads, in respect of OPTCL's representative for witnessing the inspection & testing of the offered equipment/materials at the inspection and testing site, shall be borne by the contractor / supplier.

**a) Hotel Accommodation:**

- I. Single room accommodation in 4 star hotel for the OPTCL inspecting officer of the rank of Assistant General Manager (Grade E-6) and above.
- II. Single room accommodation in 3 star hotel for the OPTCL inspecting officer of the rank below Assistant General Manager (Grade E-6).

N.B.: It is the responsibility of the contractor to arrange the hotel accommodation matching with their inspection and testing schedule, so that the inspecting officer can check-in the hotel one day prior to the date of inspection and check out after the completion of the inspection, subject to availability of the return travel ticket. In case of extended duration of inspection or non-availability of the return travel ticket, Contractor/supplier/manufacturer shall arrange for the extended stay of the inspecting officer in the Hotel accordingly. In case there is no hotel with prescribed standard in and around the place of inspection, the contractor/supplier/manufacturer shall suggest alternative suitable arrangement at the time of offer for inspection, which is subjected to acceptability of OPTCL inspecting officer.

**b) Journey of the inspecting officer:**

- (i) To and fro travel expenditure from the Head Quarters of the inspecting officer to the place of inspection/testing shall be borne by the contractor/supplier/manufacturer. Journey from the Head Quarters of the inspecting officer to the nearest Air Port by train (Ist/IIInd A.C) & A/C Taxi then by Air to the place of inspection/testing or to the nearest place of inspection/testing and then by train (Ist/IIInd A.C) & A/C taxi to the place of inspection/testing shall be arranged by the contractor/supplier/manufacturer.
- (ii) For train journey, inspecting officer of the rank Assistant General Manager and above shall be provided with 1st class AC ticket and inspecting officer below the rank of Assistant General Manager shall be provided with 2nd class AC ticket.

- (iii) The Air-ticket / train-ticket booking/cancellation is the responsibility of the contractor / supplier.
- (iv) Moreover, if during the journey there is an unavoidable necessity for intermediate travel by road/ waterway/sea-route, the contractor/supplier shall provide suitable conveyance to the inspecting officer for travel this stretch of journey or bear the cost towards this. Any such possibilities shall be duly intimated to OPTCL at the time of their offer for inspection.

**c) Local Conveyance:**

At the place of the inspection/testing, for local journey of the inspecting officer between Hotel and inspection/testing site and or any other places, Air-conditioned four wheeler vehicle in good condition shall be provided by the contractor/supplier/manufacturer.

**d) Following points are also to be considered:**

- (i) All the above expenses shall be deemed to be included in the bidder's quoted price for that supply item. Bidder shall not be eligible to raise any extra claim in this regard.
- (ii) Contractor/supplier/manufacturer may assume that only in 40% of the inspection and testing offer cases, OPTCL inspecting officer, not below the rank of Assistant General Manager will witness the inspection and testing.
- (iii) In case of inspection and testing of some critical equipment/materials like Power transformers, OPTCL may depute more than one inspecting officer.
- (iv) Contractor/supplier/manufacturer shall judiciously plan the inspection/testing schedule and place of inspection/testing, so that optimum number of inspection/testing and minimum time shall be required to cover all the equipment/materials of the relevant contract package.
- (v) It shall be the responsibility of the Contractor/Supplier to organize the above tour related matters of OPTCL inspecting officer including the matters related to overseas inspection/testing, if any.

**21.0 (a).**Detailed information on any litigation or arbitration arising out of contract completed or under execution by it over the last five years. A consistent history of litigation by or against the bidder may result in rejection of bid.

**21.0 (b)** The bidder should not have any pending litigation or arbitration with OPTCL with regard to any project or related activity. The bidder should certify / declare the same in the unequivocal terms by way of an affidavit duly sworn before a magistrate/notary. Bid furnished by the bidder shall not be eligible for consideration if it is not accompanied by the affidavit. Further the bid / LOA/ LOI shall be liable for outright rejection/ cancellation at any stage if any information contrary to the affidavit / declaration is detected.

## **SECTION – II.**

### **GENERAL TERMS AND CONDITIONS OF CONTRACT [G.T.C.C.]**

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## SECTION-II

### GENERAL TERMS AND CONDITIONS OF CONTRACT [G T C C]

#### **1.0 Scope of the contract:**

The scope of the contract shall be to design, manufacture, supply of equipments/materials as per the specification at the consignee's site, and rendering services in accordance with the enclosed technical specification and bill of quantity.

#### **2.0 Definition of terms:**

For the purpose of this specification and General Terms and Conditions of contract [GTCC], the following words shall have the meanings hereby indicated, except where otherwise described or defined.

- **“The Purchaser”** shall mean the Senior General Manager [Central Procurement Cell] for and on behalf of ODISHA POWER TRANSMISSION CORPORATION LTD., Bhubaneswar.
- **“The Engineer”** shall mean the Engineer appointed by the Purchaser for the purpose of this contract.
- **“Purchaser's Representative”** shall mean any person or persons or consulting firm appointed and remunerated by the Purchaser to supervise, inspect, test and examine workmanship and materials of the equipment to be supplied.
- **“The supplier”** shall mean the bidder whose bid has been accepted by the purchaser and shall include the bidder's executives, administrators, successors and permitted assignees.
- **“Equipment”** shall mean and include all machinery, apparatus, materials, and articles to be provided under the contract by the suppliers.
- **“Contract Price”** shall mean the sum named in or calculated the bid.
- **“General Condition”** shall mean these General Terms and Conditions of Contract.
- **“The Specification”** shall mean both the technical as well as commercial parts of the specification annexed to or issued with GTCC and shall include the schedules and drawings, attached thereto as well as all samples and pattern, if any.
- **“Month”** shall mean “Calendar month”.
- **“Writing”** shall include any manuscript, type written, printed or other statement reproduction in any visible form and whether under seal or under hand.
- **“Basic Price (Taxable value for Goods) at the point of destination”** shall mean the price quoted by the bidder for equipment and material at the consignee's store/site. The cost is inclusive of packing, forwarding, freight, insurance and all expenses and taxes & duties at the end of the supplier excluding Goods & Service Tax. The Goods & Service Tax shall be shown in a separate column item wise alongside the Basic Price quoted at the applicable rate in the Tax Invoice. The applicable rate of GST shall refer to the HSN code of the material supplied. The Basic Price and GST thereon shall be the “FOR Destination Price” as quoted by the bidder.
- The term **“Contract document”** shall mean and include GTCC, specifications, schedules, drawings, form of tender, Notice Inviting Tender, covering letter, schedule of prices or the final General Conditions, any special conditions, applicable to the particular contract.
- **Terms and conditions** not herein defined shall have the same meaning as are assigned to them in the Indian Contract Act, failing that in the Odisha General Clauses Act.

#### **3.0 Manner of execution:**

All equipments/materials supplied under the contract shall be manufactured in the manner, set out in the specification or where not set out, to the reasonable satisfaction of the Purchaser's representative.

#### **4.0 Inspection and Testing:**

- [i] The purchaser's representative shall be entitled at all reasonable times during manufacture to inspect, examine and test at the supplier's premises, the materials and workmanship of all equipments/ materials to be supplied under this contract and if part of the said equipment is being manufactured in other premises, the supplier shall obtain for the purchaser's representative permission to inspect, examine and test as if the equipment were being manufactured in the contractor's premises. Such inspection, examination and testing shall not release the supplier from his obligations under the contract.
- [ii] The Supplier shall give to the purchaser adequate time/notice (at least clear **15 days** for inside the state suppliers and **20 days** for outside the state suppliers) in writing for inspection of materials indicating the place at which the equipment/material is ready for testing and inspection and shall also furnish the shop Routine Test Certificate, Calibration certificates of Testing instruments, calibrated in Govt. approved laboratory with authenticity letter of that laboratory along with the offer for inspection. A packing list along with the offer, indicating the quantity which can be delivered in full truck load/Mini truck load to facilitate issue of dispatch instruction shall also be furnished.
- [iii] Where the contract provides for test at the Premises of the supplier or any of his sub-vendors, the supplier shall provide such assistance, labour, materials, electricity, fuel and instruments, as may be required or as may be reasonably demanded by the Purchaser's representative to carry out such tests efficiently. The supplier is required to produce shop routine test Certificate, calibration certificates of Testing Instruments before offering their materials/equipment for inspection & testing. The test house/ laboratory where tests are to be carried out must be approved by the Govt. A letter pertaining to Govt. approved laboratory must be furnished to the purchaser along with the offer for inspection.
- [iv] After completion of the tests, the Purchaser's representative shall forward the test results to the Purchaser. If the test results conform to the specific standard and specification, the Purchaser shall approve the test results and communicate the same to the supplier in writing. The supplier shall provide at least five copies of the test certificates to the Purchaser.
- [v] The Purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is dispute regarding the quality of supply.
- [vi] If the firm fails to present the offered items for inspection/testing as per their inspection call due to any reason(s) during the visit of inspecting officer at the testing site , the firm shall have to bear all expenses towards repetition of inspection and testing of the total offered quantity or part thereof.

#### **5.0 Training facilities.**

The supplier shall provide all possible facilities for training of Purchaser's Technical personnel, when deputed by the Purchaser for acquiring first-hand knowledge in assembly of the equipment, its erection, commissioning and for its proper operation and maintenance in service, wherein it is thought necessary by the purchaser.

## **6.0 Rejection of Materials.**

In the event any of the equipments/materials, supplied by the manufacturer is found defective due to faulty design, bad workmanship, bad materials used or otherwise not in conformity with the requirements of the Specification, the Purchaser shall either reject the equipment or ask the supplier in writing to rectify or replace the defective equipment free of cost to the purchaser. The contractor on receipt of such notification shall either rectify or replace the defective equipment free of cost to the purchase within **15 days** from the date of issue of such notification by the purchaser. If the supplier fails to do so, the Purchaser may:-

[a]At its option replace or rectify such defective equipments/materials and recover the extra costs so involved from the supplier plus fifteen percent and/or.

[b]Terminate the contract for balance work/supplies, with enforcement of Price Reduction Clause as per contract for the undelivered goods and with forfeiture of Performance Guarantee/Composite Bank guarantee.

[c]Acquire the defective equipment/materials at reduced price, considered equitable under the circumstances.

## **7.0 Experience of Bidders:**

The Bidders should furnish information regarding experience particularly on the following points:

[i]Name of the manufacturer:

[ii]Standing of the firm and experience in manufacture of equipment/material quoted:

[iii]Description of equipment/material similar to that quoted, supplied and installed within last 7(seven) years with the name(s) of the Organization's to whom supplies were made wherein; at least one (1) certificate shall be from a **State/Central P.S.U.**

[iv]Details as to where supplied etc.

[v] Testing facilities at manufacturer's works.

[vi]If the manufacturer is having collaboration with another firm [s], details regarding the same.

[vii]A list of purchase orders of identical material/equipments/materials offered as per technical specification executed within last seven(7) years along with user's certificate. User's certificate shall be legible and must indicate user's name, address, designation, place of use, and satisfactory performance of the equipment/materials for at least one year from the date of commissioning as on the date of opening of the tender. Wherein at least one (1) Certificate shall be from a State/Central or P.S.U. Bids will not be considered if the past manufacturing experience is found to be unsatisfactory or is of less than 1(one) year on the date of opening of the tender and bids not accompanying user's certificate will be rejected.

## **8.0 Language and measures:**

All documents pertaining to the contract including specifications, schedule, notices, correspondence, operating and maintenance instructions, drawings or any other writing shall be written in English language. The metric system of measurement shall be used exclusively in this contract.

## **9.0 Deviation from specification:**



It is in the interest of the Bidders to study the specification, specified in the tender schedule thoroughly before tendering so that, if any deviations are made by the Bidders,(both commercial and Technical), the same are prominently brought out on a separate sheet under heading “Deviations Commercial” and “Deviations Technical”.

A list of deviations shall be enclosed with the tender. Unless deviations in scope, technical and commercial stipulations are specifically mentioned in the list of deviations, it shall be presumed that the Bidder has accepted all the conditions, stipulated in the tender specification, notwithstanding any exemptions mentioned therein.

**10.0 Right to reject/accept any tender:**

The purchaser reserves the right either to reject or to accept any or all tenders if the situation so warrants in the interest of the purchaser. Orders may also be split up between different Bidders on individual merits of the Bidder. The purchaser has exclusive right to alter the quantities of materials/ equipment at the time of placing final purchase order. After placing of the order, the purchaser may defer the delivery of the materials. It may be clearly understood by the Bidder that the purchaser need not assign any reason for any of the above action [s]

**11.0 Supplier to inform himself fully:**

The supplier shall examine the instructions to Bidders, general conditions of contract, specification and the schedules of quantity and delivery to himself as to all terms and conditions and circumstances affecting the contract price. He shall quote price [s] according to his own views on these matters and understand that no additional allowances except as otherwise provided there in will be admissible. The purchaser shall not be responsible for any misunderstanding or incorrect information, obtained by the supplier other than the information given to the supplier in writing by the purchaser.

**12.0 Patent rights Etc.**

The supplier shall indemnify the Purchaser against all claims, actions, suits and proceedings for the infringement of any patent design or copy right protected either in the country of origin or in India by the use of any equipment supplied by the manufacturer. Such indemnity shall also cover any use of the equipment, other than for the purpose indicated by or reasonably to be inferred from the specification.

**13.0 Delivery:-**

[a] Time being the essence of the contract; the equipment shall be supplied within the delivery period, specified in the contract. The Purchaser, however, reserves the right to reschedule the delivery and change the destination if required. The delivery period shall be reckoned from the date of placing the Letter of Intent/Purchase order, as may be specified in LOI/Purchase order.

[b] The desired delivery period shall be as indicated at **Annexure-III (Quantity & Delivery Schedule) and Appendix-I of Section-IV (Technical Specification).**

**14.0 Dispatch instructions.**

I] Equipment/material should be securely packed and dispatched directly to the specified site at the supplier’s risk by Road Transport only.

II] **Loading & unloading of Ordered Materials.**

It will be the sole responsibility of the supplier for loading and unloading of materials both at the factory site and at the destination site/store.

The Purchaser shall have no responsibility on this account.

**15.0 Supplier's Default Liability.**

- [i] The Purchaser may, upon written notice of default to the supplier, terminate the contract in circumstances detailed hereunder.
  - [a] If in the judgement of the Purchaser, the supplier fails to make delivery of equipment/material within the time specified in the contract or within the period for which if extension has been granted by the Purchaser in writing in response to written request of the supplier.
  - [b] If in the judgement of the Purchaser, the supplier fails to comply with any of the provisions of this contract.
- [ii] In the event, Purchaser terminates the contract in whole or in part as provided in **Clause-15 (i)** of this section, the Purchaser reserves the right to purchase upon such terms and in such a manner as he may deem appropriate in relation to the equipment/material similar to that terminated and the supplier will be liable to the Purchaser for any additional costs for such similar equipment/material and/or for Price Reduction for delay as defined in **clause-22** of this section until such reasonable time as may be required for the final supply of equipment.
- [iii] In the event the Purchaser does not terminate the contract as provided in **clause 15(I)** of this Section, supplier shall be liable to the Purchaser for Price Reduction for delay as set out in **Clause-22** of this section until the equipment is accepted. This shall be based only on written request of the supplier and written willingness of the Purchaser.

**16.0 Force Majeure:**

The supplier shall not be liable for any Price Reduction schedule 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, floods, epidemics, Quarantine restrictions, strikes, Freight Embargo and provided that the supplier shall within **Ten (10)days** from the beginning of delay on such account notify the purchaser in writing of the cause of delay. The purchaser shall verify the facts and grant such extension, if facts justify.

**17.0 Extension of time:-**

If the delivery of equipment/material is delayed due to reasons beyond the control of the supplier, the supplier shall without delay give notice to the purchaser in writing of his claim for an extension of time. The purchaser on receipt of such notice may or may not agree to extend the contract delivery date as may be reasonable but without prejudice to other terms and conditions of the contract.

**18.0 Guarantee period: -**

(As per clause 35 of the technical specification).

- [i] The stores covered by this specification should be guaranteed for satisfactory operation and against defects in design, materials and workmanship for a period of at least 36 [thirty six] months from the last date of delivery. [The above guarantee certificate shall be furnished in triplicate to the purchaser for his approval]. Any defect noticed during this period should be rectified/replaced by the supplier free of cost to the purchaser provided such defects are due to faulty design, bad



workmanship or bad materials used, within one month upon written notice from the purchaser failing which provision of **clause 22 (ii)** shall apply.

[ii] The supplier's liability shall be to the extent of repair/replacement of such defective equipment/material either arising from faulty design or defective equipment/materials and /or bad workmanship. Such defective equipment /materials shall be handed over to the supplier for repair or replacement by a new one, unless otherwise repairable at site. The supplier shall complete the repair /replacement work within the reasonable time frame (as mentioned in clause 22(ii)) intimated by OPTCL.

If it becomes necessary for the supplier to replace or repair any defective portions of the equipment/ materials the provision of this clause shall apply to portion of the equipment/materials so replaced or repaired until the expiry of guarantee period.

**19.0 B.G. towards security deposit, 100% payment and performance guarantee:**

[i] For manufacturers situated inside & out side the state of Odisha.

A Composite Bank Guarantee as per the Proforma enclosed at Annexure-VII of the specification for 10% (ten percent)of the Total Landing cost (Taxable Value plus GST thereon) of the purchase order (In case of successful bidder who is a local Micro and small Enterprise(MSEs) (In the state of Odisha) registered with respective DICs, Khadi, Village, Cottage & Handicrafts Industries, OSIC and NSIC 5%(Five percent) shall be furnished from any nationalized/scheduled bank having a place of business at Bhubaneswar, to the office of Senior General Manager [Central Procurement Cell] OPTCL within 15 days from the date of issue of the purchase order,.

The BG shall be executed on non-judicial stamp paper worth of Rs.29.00 [Rupees twenty nine] only or as per the prevalent rules, valid for a period of 2 months more than the Guarantee period, for scrutiny and acceptance, failing which the supply order will be liable for cancellation without any further written notices. The BG should be accompanied by a confirmation letter from the concerned bank and should have provision for encashment at Bhubaneswar, before the Bank Guarantee is accepted and all concerned intimated. The B.G should be revalidated as and when intimated to you to cover the entire guarantee period.

[ii] No interest is payable on any kind of Bank Guarantee.

[iii] In case of non-fulfillment of contractual obligation, as required in the detailed purchase order/Specification, the composite Bank guarantee shall be forfeited.

**20.0 Import License**

In case imported materials are offered, no assistance will be given for release of Foreign Exchange. The firm should arrange to import materials from their own quota. Equipment of indigenous origin will be preferred.

**21.0**

**(A) Terms of Payment.**

i) 100% taxable value of each consignment with 100% Goods and Services Tax in full as applicable will be paid on receipt of materials in good condition at stores/desired site and verification thereof, subject to furnishing and approval of

a. Contract cum Performance Bank Guarantee at the rate of 10% (ten percent) of Taxable Value plus GST thereon. [In case successful bidder is a local Micro and small Enterprise (MSEs), based in Odisha & registered with respective DICs, Khadi, Village, Cottage & Handicrafts Industries, OSIC and NSIC, 5%(Five percent) **in place of 10%** (ten percent) will be applicable].

b. Guarantee certificate,

c. Test certificate by the Purchaser.

ii) TDS under GST Laws and Income Tax Act shall be deducted, if applicable.

iii) Any imposition of new tax or revision of tax shall be paid/reimbursed at the time of dispatch, scheduled or actual whichever is lower (i.e. If delivery is within schedule period, tax variation as applicable shall be paid, and if delivery is made beyond schedule date, any additional financial implication due to statutory variation in tax shall be to bidder's account)

**[B]** The supplier shall furnish contract cum performance Bank Guarantee of appropriate amount to OPTCL as indicated in (i) above, within 30 days from the date of issue of the purchase order.

## **22.0 Price Reduction Schedule for Delay in Completion of Contract**

(i) If the Supplier fails to deliver the materials/equipment within the delivery schedule, specified in the Purchase Order/Contract including delivery time extension, if any, granted with waiver of Price Reduction Schedule, the Purchaser shall recover from the Supplier, Price Reduction Schedule for a sum of half per cent (0.5 per cent) of the Taxable Value of the un-delivered equipment /materials for each calendar week of delay or part thereof. For this purpose, the date of receipted challan shall be reckoned as the date of delivery. The total amount of Price Reduction Schedule shall not exceed five per cent (5%) of the Taxable Value of the un-delivered equipment/materials. Equipment will be deemed to have been delivered only when all its components, accessories and spares as per technical Specification are also delivered. If certain components, accessories and spares are not delivered in time, the equipment/ materials will be considered delayed until such time as the missing components, accessories and spares are delivered.

(ii) During the guarantee period, if the Supplier fails to rectify/replace the equipment/material within 30 days from the date of intimation of defect by the purchaser, then the Price Reduction Schedule at the rate of half percent (0.5%) of the Total Taxable Value for each calendar week of delay or part thereof shall be recovered by the purchaser. For this purpose, Price Reduction Schedule shall be reckoned from the 30th day from the date of issue of letter on defectiveness of equipment/material. The total amount of Price Reduction Schedule in this case shall not exceed 10% (TEN PERCENT) of the Purchase Order/Contract amount except GST (i.e. Total Taxable Value). If the defects, so intimated are not rectified or equipment/materials not replaced by the supplier within the guarantee period, then whole of the C.P.B.G. will be forfeited by the purchaser, without any intimation to the supplier.

### **23.0 Insurance**

The Supplier shall undertake insurance of stores covered by this Specification unless otherwise stated. The responsibility of delivery of the stores at destination in good condition rests with the Supplier. Any claim with the Insurance Company or transport agency arising due to loss or damage in transit has to be settled by the supplier. The Supplier shall undertake free replacement of materials damaged or lost, which will be reported by the consignee within **30 days** of receipt of the materials at destination without waiting for the settlement of their claims with the carriers and underwriters.

### **24.0 Payment Due from the Supplier.**

All costs and damages, for which the supplier is liable to the purchaser, will be deducted by the purchaser from any money, due to the supplier, under any of the contract (s), executed with OPTCL.

### **25.0 Rating under Goods and Services Tax and Balance sheet and profit & Loss Account:**

The following documents are to be submitted at the time of Tender Submission:

- i. Compliance rating under Goods and Services Tax for immediate preceding financial year.
- ii. Audited Balance Sheet and Profit & Loss Account of the bidder for the previous three years to assess the financial soundness of the bidder(s).
- iii. GST registration certificate and PAN Card Copy.
- iv. Tax holiday/exemption certificate under GST or any other Act.
- v. TDS exemption certificate under the Income Tax Act or any other act.

### **26.0 Certificate of Exemption from Goods and Services Tax.**

Offers with exemption from Goods and Services Tax shall be accompanied with authenticated attested Photostat copy of exemption certificate. Any claim towards Goods and Services Tax shall be paid on actual basis subject to payment of GST by the supplier. In case Outward supply details of the supplier of Goods in GSTR-1 do not match with GSTR -2 of OPTCL on GSTN portal, the same will be adjusted through debit/credit advice issued by **OPTCL** under intimation to the supplier after allowing cooling period of **3 months** after the date of supply.

### **27.0 Contractors/Supplier's Responsibility.**

Notwithstanding anything mentioned in the Specification or subsequent approval or acceptance by the Purchaser, the ultimate responsibility for design, manufacture, materials used and satisfactory performance shall rest with the Bidders. The Supplier(s) shall be responsible for any discrepancy noticed in the documents, submitted by them along with the bid(s)

### **28.0 Validity**

Prices and conditions contained in the offer should be kept valid for a minimum period of **180(one hundred eighty)** days from the date of opening of the tender, failing which the tender shall be rejected.

### **29.0 Evaluation.**

(i) Evaluation of price bids will be on the basis of the FOR DESTINATION PRICE including Goods and Services Tax & other levies as may be applicable. The FORD PRICE shall consist of the following components:

- a) Taxable value of equipment/materials
- b) Good and Services Tax
- c) Other levies, if any.
- d) Mandatory spares, if any for maintenance of equipment. (At discretion of the purchaser)
- e)Test charges, if any.
- f)Supervision of erection, testing and commissioning charges, if any.
- g)Any other items, as deemed proper for evaluation by the purchaser.
- h) Loading will be made for items not quoted by the bidder at the highest rate quoted by other bidders unless particular item is included in other items.
- i) Any imposition of new tax or revision of tax shall be considered between due date of submission of bids and the date of price bid opening.

\* The Final ranking of the eligible Bidders for supply of XLPE Underground cable shall be on the basis of Total cost at **(I) as indicated above.**

**(II) Weightage shall be given to the Following factors in the Evaluation & Comparison of Bids.**

In comparing bids and in making awards, the Purchaser will consider other factors such as compliance with Specification, **minimum qualification criteria as per clause-30, outright rejection of tenders clause-34 of this tender**, relative quality, adaptability of Supplies or services, experience, financial soundness, record of integrity in dealings, performance of materials/equipments/materials earlier supplied, ability to furnish repairs and maintenance services, the time of delivery, capability to perform including available facilities such as adequate shops, plants, equipment and technical organisation.

(III) The local MSE (In the state of Odisha) bidders shall be required to furnish their willingness to match their bid price with that of the lowest evaluated bidder without any price preference and in case they agree, they shall be eligible to get up to 30% of the tendered quantity to be distributed suitably among the willing MSE bidders failing which the said 30% of the tendered quantity be awarded to the lowest evaluated bidder.

**E-Reverse Auction is hereby incorporated in the referred tender as follows.**

<b>STRATEGY FOR E-REVERSE AUCTION</b>	
1	Bidders are required to go through the guide lines given below and submit their acceptance to the same.

2	e-Reverse Auction (RA) will be conducted in e-tender portal of OPTCL on specified date and time, while bidders shall quote from their own offices/places of their choice. Internet connectivity shall be ensured by the respective agencies/bidders themselves.
3	Demonstration/ training (if not trained earlier) of bidder's nominated person(s), shall be done to explain all the rules related to e-Reverse Auction/ Business Rule document to be adopted.
4	The strategy to be used for reverse auction shall be "DYNAMIC TEMPLATE BIDDING"
<b>Procedure for electronic Reverse Auctioning (e-RA):</b>	
5	<p>a. The e-RA shall be conducted on <a href="http://www.tenderwizard/OPTCL.com">www.tenderwizard/OPTCL.com</a> only.</p> <p>b. Bidder has to submit letter towards agreement to the Process related Terms &amp; Conditions for e-Reverse Auction, as per (Reverse Auction Process Compliance Form at Annexure-IB). In non-receipt of the same, vendors will not be allowed to participate in e-RA.</p> <p>c. e-RA shall be carried out after opening of Price bids and completion of Price bid evaluation, which will be intimated only to the techno-commercially qualified bidders by OPTCL as per procedure given below.</p> <p>d. OPTCL reserves the right to conduct e-RA and it is obligatory on part of bidder(s) invited to participate in e-RA process once they have responded to the techno-commercial bid.</p>
6	<p>Prior intimation/ Notice for RA invitation will be given to techno-commercially qualified bidders regarding the date &amp; time of opening of the e-RA.</p> <p>The start bid price (SBP) for e-Reverse Auction of each bidder under a particular package shall be the L1 evaluated price for the subject package including Taxes &amp; Duties for the total scope for subject Package. Taking the above discovered L1 price as the upper limit e-RA will be conducted to determine the lowest possible price.</p> <p>Reverse Auction will be conducted amongst first 50% of the technically qualified bidders arranged in order of prices from lowest to highest, as L1, L2,L3-----Ln, and L1 price will be discovered. Minimum of 3 bidders shall be eligible for e RA. (eg. If 4 bidders are financially evaluated then the L1, L2 and L3 bidders shall be eligible for e-RA). Number of bidders eligible for participating in RA would be rounded off to next higher integer value if number of technically qualified bidders is odd (e.g. if 7 bids are technically qualified, then RA will be conducted amongst L1 to L4).</p> <p>However, in case only two bidders are found to be responsive, e-RA would be carried out with both the parties without any elimination. However,</p>

	<p>OPTCL reserves the right to invite the evaluated L1 bidder for negotiation without conducting the e-RA.</p> <p>In case of price submitted by any bidder is found to be abnormal, OPTCL reserves the right to reject the bid of the bidder(s) .</p> <p>Rank of bidders would be displayed as per the total cost to OPTCL, i.e including Taxes and Duties payable by OPTCL as per the provisions of the bidding document &amp; after e-RA process is over.</p>
7	<p>Names of bidders/ vendors shall not be disclosed during the e-RA process. Names of bidders/ vendors shall be anonymously masked in the e-RA process.</p> <p>(i) In case of RA, start/ reference price and step value of decrement shall be indicated to the bidders at the start of the auction. Any participating bidder can bid one or multiple step decrement lower than the prevailing lowest bid at that time. The Bidder shall be able to view Bid Start Price, Bid Decrement Value, Prevailing Lowest Bid value, last Bid Placed by him and time left for bidding.</p> <p>(ii) The step value of decrement in a package to be offered by bidder (the minimum amount of reduction in the total bid price including all taxes &amp; duties during auction) , shall be kept at 0.15% of L1 bidder's final evaluated price (or) at approved amount as decided by OPTCL.</p> <p>(iii) Bidders can only quote any value lower than their previous quoted price. However, at no stage, increase in Price will be permissible.</p> <p>(iv) At any point during Reverse Auction, bidding Price field shall remain enabled for the bidders. <b>The reverse auction period shall be unlimited</b> and the initial auction period (1<sup>st</sup> slot) will be of thirty (30) minutes with provision of auto extension by (10) ten minutes from the schedule/ extended closing time. If any fresh lower bid is received in last ten minutes of initial auction period or extended auction period, the auction shall get extended automatically for another 10 minutes. In case, there is no bid received during schedule/extended slot, the auction shall get closed automatically without further extension.</p> <p>(v) However, bidders are advised not to wait till the last minute or last few seconds to enter their bid during the period of e-reverse auction to avoid complication related with internet connectivity, network problem, system crash down, power failure etc.</p>
8	<p>After conclusion of e-Reverse Auction i.e (Closing Price in Reverse Auction will be taken as offered price by the L1 bidder), decrease in price of individual head of the template shall be considered proportionately on all individual line items of the respective head of the price schedule of the successful L1 bidder .</p> <p>Any bid received at the tender wizard server end subsequent to closure of the e-RA shall be summarily rejected and shall not be considered as a valid bid under whatsoever circumstances. For this purpose, tender wizard server log shall prevail.</p> <p>The bidder shall not involve himself or any of his representatives in price manipulation of any kind directly or indirectly by communicating with</p>



	<p>other bidders.</p> <p>During Reverse Auction, If no bid is received within the specified time, OPTCL, at its discretion, may decide to close the reverse auction process/ proceed with conventional mode of tendering [ Evaluation of Part-II (price bid) submitted by bidders earlier].</p>
9	<p>Consequent upon completion of e-Reverse Auction, OPTCL's decision on award of contract shall be final and binding on the bidders.</p> <p>OPTCL shall be at liberty to call the L1 bidder for further process/ negotiation and also at liberty to cancel the e-reverse auction process/ re-tender at any time, without assigning any reason thereof. OPTCL can decide to reschedule or cancel any reverse auction: the bidders shall be informed accordingly.</p> <p>OPTCL/ Service Provider shall not have any liability to bidders for any interruption or delay in access to the e-Tender site/ Reverse Auction link irrespective of the cause.</p>

### **30.0 Qualification Criteria of Bidders.**

**(The following supersedes any other criteria indicated elsewhere in the document)**

#### **QUALIFYING REQUIREMENTS**

All the prospective bidders are requested to note that their bids for tendered material (equipment) can only be considered for evaluation if:

This section covers the requirements with respect to experience, capability and other particulars of the bidder to be considered eligible for participation in the bid for the proposed work. The BIDDER shall become eligible to bid on satisfying the following "BID QUALIFICATION REQUIREMENTS" and on production of the required documentary evidences along with the Tender.

1. The cable manufacturer should have established production line in India and having experience in manufacturing and supply experience of **at least 50% of the tendered quantity of 110/132kV rating or higher voltage class XLPE insulated cables within last 7(seven) years** as on the date of opening of the tender.
2. The manufacturer must have supplied above rated or higher voltage class XLPE insulated cables within last **7(seven) years** from the date of the opening of the tender, which must be in satisfactory operation for at least **1(one) year** from the date of commissioning, as on the date of opening of the tender. At least one of the performance certificates shall be submitted from Govt. of India/State Govt.(s) or their undertakings for **25% of the tendered quantity**.
3. The Bidder must possess bureau of Indian Standard Certification (ISI mark).
4. The bidder must possess valid ISO 9001:2008 certification for Manufacturer/Supplier.

5. The manufacturer must have their own equipped workshop and testing facilities in India for testing 110/132kV or higher voltage class single core XLPE insulated cable.
6. The manufacturing process of the cable shall possess modern techniques of a Vertical Continuous Vulcanizing (VCV) Extrusion System OR Continuous Catenary Vulcanizing (CCV) Extrusion System for manufacturing of 132 KV or higher voltage class single core XLPE insulated cables. The manufacturer shall submit documentary evidence & a certificate on the cable manufacturing process.
7. The Bidder should have adequate infrastructural facility for “After sales service”.
8. Copies of documents, defining the constitution or legal status, place of registration and principal place of business of the company or firm or partnership or collaborator or parent Company etc. shall be furnished along with the bid.
9. The Bidder should have conducted type tests(as per latest IEC & IS standard) on the tendered cables in Government approved laboratory/NABL accredited lab/ laboratory of foreign country accredited by National Accreditation Body of that Country within **10(ten) years** from the date of opening of the tender as per CEA guideline 2020.
10. Even though the Bidders meet the above qualifying criteria, they are subject to be disqualified if they have
  - a) Made misleading or false representations in the forms, statements and attachments, submitted in proof of qualification requirements and/ or
  - b) Record of poor performance such as not properly completing the contract, inordinate delays in completion of supply, litigation history or financial failure etc.
9. Notwithstanding anything stated above, the purchaser reserves the right to assess the Bidder’s capability & capacity to perform the contract should circumstances warrant such an assessment in the overall interest of the purchaser.  
NOTE: The offers of bidders not satisfying any of the above “bid qualification requirements” are likely to be rejected.

**31.0 Jurisdiction of the High Court of Odisha.**

Suits, if any, arising out of this contract shall be filed by either Party in a court of Law to which the jurisdiction of High court of Orissa extends.

**32.0 Correspondences.**

- i) Any notice to the supplier under the terms of the contract shall be served by Registered Post or by hand at the Supplier’s Principal Place of Business.
- ii) Any notice to the Purchaser shall be served at the Purchaser’s Principal Office in the same manner.

**33.0 Official Address of the Parties to the Contract**

The address of the parties to the contract shall be specified:-

- [i] **Purchaser:** Senior General Manager (Procurement)(CPC) OPTCL  
Bhubaneswar-751022 (Orissa) Telephone No. 0674 – 2541801 FAX  
No.0674 – 2542964
- [ii] **Supplier:** Address  
Telephone No Fax No.

**34.0 Outright Rejection of Tenders**

Tenders shall be outright rejected if the followings are not complied with.



- [i] The tenderer shall submit the bid in electronic mode only and shall submit the tender cost on or before the date and time of submission of technical bid.
- [ii] The tenderer shall submit the bid in electronic mode only. In case of local Micro and small Enterprises(MSEs) registered with respective DICs, Khadi, Village, Cottage & Handicrafts Industries, OSIC and NSIC (**Registered in Odisha**)participating in the tender they have to submit notarised hard copy of valid registration as local MSE as above on or before the date and time of submission of technical bid.
- [iii] The Tender shall not be submitted telegraphically or by FAX.
- [iv] The prescribed EMD shall be submitted on or before the date and time of submission of technical bid.
- [v] The Tender shall be kept valid for a minimum period of 180 days from the date of opening of tender.
- [vi] The Tender shall be submitted in two parts as specified.
- [vii] The Tenders shall be accompanied by a list of major supplies affected prior to the date of opening of tender. Data of at least 2 (two) years shall be furnished.
- [viii] The tenderer shall upload the scanned copy of latest type test certificates (for the tests, carried out on the tendered equipments, being offered). Such type tests should have been conducted within last ten years from the date of opening of this tender in a Government approved laboratory/CPRI in presence of any Government Organization's representative(s).
- [ix] The schedule of prices should be filled up fully to indicate the break-up of the prices including taxes and duties. Incomplete submission of this schedule will make the tender liable for rejection. Vide Clause-4(ii) of Part-II.
- [x] The quoted price shall be variable as per IEEEMA PVC and the price should be kept valid for a minimum period of **180 days** from the date of opening of the tender.
- (xi) The tenderer shall upload the scanned copy legibly written user's certificate to prove the satisfactory operation of the offered equipments/materials for a minimum period of 1 (**one**) **year** from the date of commissioning/use as per the tender specification as on the date of opening of the tender. User's certificate shall include the detailed address of the user with Equipment/Material, Name and type as per this specification, number of years of satisfactory use/operation & date of issue of this user's certificate with official seal written in English only & clearly visible must be furnished. At least one of the user's certificates shall be from state or Central Govt. or their Undertakings.
- (xii) Guaranteed Technical particulars & Abstract of terms and Conditions should be filled in completely.  
***At least one of the user's certificates shall be from state or Central Govt. or their Undertakings.***
- (xiii) (a) Detailed information on any litigation or arbitration arising out of contract completed or under execution by it over the last five years. A consistent history of litigation by or against the bidder may result in rejection of bid.  
(b) The bidder should not have any pending litigation or arbitration with OPTCL with regard to any project or related activity. The bidder should certify/declare the same in unequivocal terms by way of an affidavit duly sworn before a magistrate/notary. Bid furnished by the bidder shall not be eligible for consideration if it is not accompanied by the affidavit. Further, the bid/LOA/LOI shall liable for

outright rejection/cancellation at any stage if any information contrary to the affidavit/declaration is detected.

**35.0 Documents to be treated as confidential.**

The supplier shall treat the details of the specification and other tender documents as private and confidential and these shall not be reproduced without written authorization from the Purchaser.

**36.0 Scheme/Projects**

The materials/equipment covered in this specification shall come under “O&M WORKS and/or CONSTRUCTION WORKS”.

**37.0 Empanelment of Bidders:-**

OPTCL may consider for empanelment of such Bidders and for such Equipments for which the Bidders will be found to be techno-commercially responsive against this Tender Specification. Such empanelment should be valid for a period of **02 (two) years** from the date of opening of techno-commercial bids against this Tender. During the above period, **OPTCL** may ask for price bids as and when required by **OPTCL**. The Bidders are required to give their consent in their offers against the above tender for such empanelment. However, the Bidders are to note that such empanelment is not binding on the purchaser and the purchaser is free to take any other decision under the prevailing circumstances in the interest of OPTCL.

**38.0 Contacting the purchaser: -**

(a) Subject to Clause No.4 (opening of bids) of part-I, Section-I (Instruction to Bidder), no Bidder shall contact the purchaser on any manner, relating to its bid, from the time of bid opening to the time of the contract is awarded.

(b) No effort shall be made by a Bidder to influence the purchaser in the purchaser's bid evaluation.

**[PAGE 22 to 34 ]**

### SECTION – III

#### [LIST OF ANNEXURES]

The following schedules and proforma are annexed to this specification and contained in Section-III as referred to in the relevant clauses.

1	Declaration form	ANNEXURE-I
2	Abstract of terms and conditions to accompany Section-II of Part-I	ANNEXURE-II
3	Schedule of Quantity and Delivery	ANNEXURE-III
4	Abstract of price component [to accompany Part-II of this specification]	ANNEXURE-IV
5	Schedule of prices to accompany Part-II	ANNEXURE-V
6	Bank Guarantee form for earnest money deposit	ANNEXURE-VI
7	Composite Bank Guarantee form for security deposit, payment and performance	ANNEXURE-VII
8.	Chart showing particulars of E.M.D.	ANNEXURE – VIII
9.	Data on Experience.	ANNEXURE – IX
10.	Schedule of spare parts.	ANNEXURE-X
11.	Schedule of Installations.	ANNEXURE-XI
12.	Schedule of deviations(Technical)	ANNEXURE-XII(A)
13.	Schedule of deviations(Commercial)	ANNEXURE-XII(B)
14.	Litigation/Arbitration	ANNEXURE-XIII
15.	Affidavit Of Bidder	ANNEXURE-XIV
16	Reverse Auction Process Compliance Form	Annexure-IB
17	Certificate of DPIIT	ANNEXURE-XV

#### **LIST of Documents**

The following documents are to be attached in the below name

- 1.PAN
- 2.GSTIN
- 3.Income tax return
- 4.Audited B/s & Profit loss account
5. Certificate of incorporation
6. E payment proof of tender cost

**ANNEXURE - I**  
**DECLARATION FORM**

**To**

The Sr. General Manager (CPC)  
OPTCL Head Qrs.BBSR,751022

Sub:- Tender Specification No-\_\_\_\_\_

Sir,

1. Having examined the above specification together with terms & conditions referred to therein \* I/We the undersigned hereby offer to supply the materials/equipment covered therein complete in all respects as per the specification and General conditions, at the rates, entered in the attached contract schedule of prices in the Tender.
2. \* I/We hereby undertake to have the materials/equipment delivered within the time specified in the Tender.
3. \* I/We hereby guarantee the technical particulars given in the Tender supported with necessary reports from concerned authorities.
4. \* I/We certify to have submitted the bid electronically by remitting \*cash/money order/D.D./ remitting the cost of tender, herewith and this has been acknowledged by your letter/ money receipt No.                      Dated,
5. In the event of Tender, being decided in \*my/our favour, \* I/We agree to furnish the Composite B.G. in the manner, acceptable to ORISSA POWER TRANSMISSION CORPORATION LTD., and for the sum as applicable to \*me/us as per clause-19 of section-II of this specification within 15 days of issue of letter of intent/purchase order failing which \*I/We clearly understand that the said letter of Intent/Purchase order will be liable to be withdrawn by the purchaser.

Signed this                                      day of                                      2022

Yours faithfully

Signature of the Bidder with seal of the company

[This form should be dully filled up by the Bidder and uploaded at the time of submission of tender.]

\* (Strikeout whichever is not applicable)

**Annexure-IB**

**(Reverse Auction Process Compliance Form)**

(To be submitted on letter head of the bidding company with sign and stamp and along with Technical bid)

To,

Sr.GM (CPC), OPTCL

Bhubaneswar-751010, Odisha

Sub: Agreement to the Process related Terms & Conditions for e-Reverse Auction.

Dear Sir,

This letter is to confirm that:

- The undersigned is authorized representative of the company.
- We have studied the Commercial Terms and the Business rules governing the Reverse Auction as mentioned in your tender and confirm our agreement to that.
- We also confirm that we have gone through the auction manual and have understood the functionality of the same thoroughly.
- We, hereby, confirm that we will honour the Bids placed by us during the tendering/ e-Reverse auction process as called as e-RA.
- We also confirm that we will accept our Rank / Position that will be displayed when the Bidding Time for the Online Reverse Auction is over.

With regards,

Signature with Designation with company seal Name & Address

Person having power of attorney for the subject package.

**ANNEXURE-II****ABSTRACT OF GENERAL TERMS AND CONDITIONS OF CONTRACT [COMMERCIAL]**

(To be filled up by the tenderer as indicated in the excel sheet)

1	Whether the material/equipment offered conforms to the OPTCL'S specification (If not, specify the deviations in Annexure).	Yes/No
2.a.i	Cost of Tender Document:	Submitted/Not submitted
2.a.ii	OPTCL Money Receipt No. & Date / D.D No & Date.	
2.b.i	Earnest money furnished.	Submitted/Not submitted
2.b.ii	Bank Guarantee No. & Date / D.D No. & Date.	
2.c.i	Tender Processing Fee:	Submitted/Not submitted
2.c.ii	D.D No. & Date.	
3	Manufacturer's supply experience including user's certificate uploaded or not. [As per clause No.7 of Section-II.]	Yes/No
4.a.i	Commercial Deviations to the specification if any	Yes/No
4.a.ii	If Yes, [list uploaded or not, As per clause-9 of the Section-II	Yes/No
4.b.i	Technical Deviations to the specification if any	Yes/No
4.b.ii	If Yes, list uploaded or not, As per clause-9 of the Section-II	Yes/No
5	Delivery <u>(Period in months from the date of issue of PO)</u>	
6	Guarantee: - Whether agreeable to OPTCL's terms[As per clause-18 of Section-II].	Yes/No
7	Whether agreeable to furnish Composite B.G. in case his tender be successful [As per clause-19 of Section-II]	Yes/No
8	Terms of payment:- Whether agreeable to OPTCL's terms or not [As per clause-21 of Section-II]	Yes/No
9	Nature of price:- variable as per IEEMA PVC	Yes/No
10	Price Reduction: - Whether agreeable to OPTCL's terms or not (As per clause- 22 of Section-II)	Yes/No
11	Whether STCC/ P&L A/C, Balance Sheet for the required period are uploaded as per clause-25 of Section-II	Yes/No
12	Validity: - Whether agreeable to OPTCL's terms or not[As per clause-28 of Section-II]	Yes/No
13	Whether recent type test certificates from any Government approved laboratory is uploaded or not. [As per clause-30[viii] of section-II]	Yes/No
14	Whether guaranteed technical particulars are uploaded or not	Yes/No
15	Whether dimensional design/drawings uploaded or not	Yes/No
16	Whether materials are ISI/ISO marked.	Yes/No
17	Manufacturer's name and its trademark	
18	Whether registered under GST Laws.	Yes/No
19	Whether declaration form, duly filled in, uploaded or not	Yes/No

Place:

Signature of the Bidder

Date:

with seal of the company.

**ANNEXURE-III**

**SCHEDULE OF QUANTITY AND DELIVERY**

(To be filled up by the Bidder)

(To be filled up by the tenderer as indicated in the excel sheet)

Sl	Description of materials	Quantity in Km	Desired Delivery	Destinati on	REmarks
1	2	3	4	5	6
1	1.1)132kV, 1 core, 1000 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminium sheath type).	0.5	Within 6 months from the date of LOA.		
	1.2)132kV, 1 core, 630 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminium sheath type).	1.5			
	1.3) Supply of single core 300 Sq.mm XLPE bonding cable.	1			
	1.4)Earth bonding cable 240 sq.mm XLPE	1			
	1.5)33kV, 1 core, 630 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminum sheath type).	5.58			
	1.6)33kV, 1 core, 300 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminum sheath type).	1			

**ANNEXURE-IV**

**ABSTRACT OF PRICE COMPONENT [TO ACCOMPANY PRICEBID]**

(To be filled up by the tenderer as indicated in the excel sheet)

NB:- Abstract of price component shall be done for equipment/material offered, for testing & commissioning charges, if any. All the above prices will be taken during bid price evaluation.

<b>Sl.No.</b>	<b>Description</b>	<b>To be filled by the bidder.</b>
1	Price basis	F.O.R. Purchaser's destination Stores/site.( Taxable value including packing forwarding, Freight, Insurance, unloading)
2	HSN Code of the Item	
3	GST Identification Number (GSTIN) of the firm	
4	Whether Intra-state supply(i.e. from inside Odisha) or Inter-state supply( i.e from outside Odisha). select from dropdown list	
5	Rate of CGST	
6	Rate of OGST.	
7	Rate of IGST.	
8	Rate of Goods and Services Tax on supervision of erection testing and commissioning	
9	Nature of price.	
10	We hereby undertake and declare that implication of lower Tax and Input Tax Credit benefit as per anti-profiteering (under Section 171 of CGST Act) and other provisions under GST Laws have been fully passed on to the purchaser while quoting the price.	Agreed
11	Any imposition of new tax or revision of tax shall be paid/reimbursed at the time of dispatch, scheduled or actual whichever is lower (i.e. If delivery is within schedule period, tax variation as applicable shall be paid, and if delivery is made beyond schedule date, any additional financial implication due to statutory variation in tax shall be to bidder's account). (Indicated- Yes/No)	

Place:

Signature of the Bidder

Date:

with seal of the company.



**ANNEXURE-V.**

**SCHEDULE OF PRICES**

**TENDER SPECIFICATION No.**

Item No.	Description.	Qty (unit)	Unit Price (Taxable Value at Destination), in Rs.	Unit GST	Unit landing Cost including All taxes & Duties.	Total landing cost Including all taxes & duties.
1.	2.	3.	4.	5.	6= (4+5)	7= (6*3)

NB: -

- The tenderer should fill up the schedule properly and in full in Excel file of e-tender mode.** The tenderer should fill up the schedule properly and in full. The tender will be rejected, if the schedule of price is submitted in incomplete form. No post tender correspondence will be entertained on break-up of prices. Also, the supplier should agree for delivery at sub-station site.
- The Tenderer shall give an undertaking in part-I of the bid that, any implication of lower Tax and Input Tax Credit benefit have been fully passed on to the purchaser as per anti-profiteering and other provisions under GST Laws while quoting the tender price.
- Conditional offers will not be acceptable.
- The bidder is to clearly indicate the period up to which the tax holidays are available to them.
- Price bid in any other format will not be acceptable and the offer will be rejected.
- All the above charges will be taken into account, during bid price evaluation.

**ANNEXURE-VI**

**PROFORMA FOR BANK GUARANTEE FORM FOR EARNEST MONEY DEPOSIT**

**(To be Stamped in accordance with Stamp Act and the Non-Judicial Stamp Paper of appropriate value should be in the name of Issuing Bank)**

**Ref No:** .....

**Bank Guarantee No.** .....

**Date:**.....

**BG Amount:**.....

**Validity Period:**.....

This Guarantee Bond is executed this..... day of ..... by us the..... Bank at ..... , P.O..... , Dist....., State..... and Code No.....

Whereas the ODISHA POWER TRANSMISSION CORPORATION Limited, Janpath, Bhubaneswar, a company constituted under the Companies Act-1956 (hereinafter called OPTCL) has invited Tender vide e-NIT No..... Dated..... for the purpose of ..... work under Package(s) No...../ purchase of ----- .

1. Now, therefore, in accordance with Notice Inviting Tender (e-NIT) No..... Dated ..... of OPTCL, Ms/Shri.....Address..... Wish / wishes to participate in the said tender and as a Bank Guarantee for the sum of Rs..... [ Rupees in **words**----- ] valid for a period of .....days is required to be submitted by the bidder, as per Tender Specification, we the \_\_\_\_\_ ) [indicate the name, Address & Code of the bank] [hereinafter referred to as "Bank"] at the request of Ms/Shri..... [hereinafter referred to as "Bidder"] do hereby unequivocally and unconditionally guarantee and undertake to pay during the above said period on written request by the <Tender Issuing Authority, Central Procurement Cell (CPC) ODISHA POWER TRANSMISSION CORPORATION Ltd. , Bhubaneswar an amount not exceeding Rs..... to OPTCL., without any reservation. The guarantee would remain valid up to ..... [Date] and if any further extension to this is required, the same will be extended on receiving instruction from ----- on whose behalf this Bank Guarantee has been issued.

2. We, the \_\_\_\_\_ [indicate the name of the Bank, Address, Code] do hereby further undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from OPTCL. 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 in words.....)

3. We undertake to pay to OPTCL any money so demanded notwithstanding any dispute or disputes so raised by the bidder in any suit or proceeding instituted/pending before any court or tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the bidder shall have no claim against us for making such payment.
4. We, the \_\_\_\_\_ [indicate the name of the Bank] Bank further agree that the guarantee herein contained shall remain in full force and effect during the aforesaid period of 240 days [two hundred forty days] (as per Tender Specification) and it shall continue to be so enforceable till all the dues of OPTCL under or by virtue of the said Bid have been fully paid and its claims satisfied or discharged or Managing Director, ODISHA POWER TRANSMISSION CORPORATION LTD certifies that the terms and conditions of the said Bid have been fully and properly carried out by the said bidder and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us or our Branch Office at Bhubaneswar <Mention Name, Address & Code of the Branch Office at Bhubaneswar of Issuing Bank> in writing on or before \_\_\_\_\_ we shall be discharged from all liability under this guarantee thereafter.
5. We the \_\_\_\_\_ [indicate the name of the Bank] further agree with OPTCL that OPTCL 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 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 OPTCL 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 OPTCL or any indulgence by OPTCL 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 the 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 and/or of the Bidder.
- 7 We \_\_\_\_\_ [indicate the name of Bank, Address & Code] lastly undertake not to revoke this guarantee during its currency except with the previous consent of OPTCL in writing .
8. We, the \_\_\_\_\_ Bank (Name, Address & Code) further agree that this guarantee shall also be invokable at our place of business at ----- Branch of **Bhubaneswar** (indicate Name, Address & Code of the Branch at Bhubaneswar) in the State of Odisha.”

**“ Notwithstanding anything contained herein”**

a) Our liability under the bank guarantee shall not exceed Rs.------(Rupees in words-----) only.

b) This Bank guarantee shall be valid up to -----.

c) We or our Branch at Bhubaneswar <Mention Name, Address & Code.....> are liable to pay guaranteed amount or any part thereof under this guarantee only if you serve upon us at----- Branch of Bhubaneswar(Indicate the name of the Branch) a written claim or demand on or before dt .....,

The Bank Guarantee is issued in paper form and Advice transmitted through SFMS with required details to the beneficiary's advising bank (ICICI Bank Bhubaneswar, IFSC Code ICIC0000061).

Dated, the \_\_\_\_\_ Day of \_\_\_\_\_

For \_\_\_\_\_ [Indicate name of Bank]

Signature .....

Full name .....

Designation .....

Power of Attorney No. ....

Date.....

Seal of the Bank.....

**WITNESS: (SIGNATURE WITH NAME AND ADDRESS)**

(1)

Signature .....

Full name .....

(2)

Signature .....

Full name .....

N.B.:

1. Name of the Bidder.: .....
2. BG No & Date :.....
3. Amount (In Rs.):.....
4. Validity up to :.....
5. E-NIT No.....
6. Package/Works No.....
7. Name, Address & Code of Issuing Bank:.....
8. Name, Address & Code Bhubaneswar Branch of the Issuing Bank:.....
9. The Bank Guarantee shall be accepted after getting SFMS advice as per details below.

**N.B. : To be Stamped in accordance with Stamp Act and the Non-Judicial Stamp Paper of appropriate value should be in the name of Issuing Bank**

### **Format for SFMS details**

**(The Unique Identifier for field 7037 is “OPTCL541405793”)**

<b>Sl. No</b>	<b>PARTICULARS</b>	<b>TYPE</b>	<b>DETAILS</b>
1	Type of Bank Guarantee	Mandatory	EMD
2	Currency & Amount	Mandatory	
3	Validity Period(from—to --)	Mandatory	
4	Effective Date	Mandatory	
5	End date of lodgment of Claim	Mandatory	
6	Place of lodgment of claim	Mandatory	Bhubaneswar, Branch Name----- of Bhubaneswar Branch code----- of Bhubaneswar Branch Address ----- at Bhubaneswar
7	Issuing Branch IFSC Code	Mandatory	
8	Issuing Branch name &	Mandatory	

	address		
9	Name of applicant and its details	Mandatory	
10	Name of Beneficiary and its details	Mandatory	
11	Beneficiary's Bank/Branch and IFSC Code	Mandatory	ICICI Bank Ltd IFSC Code-ICIC0000061
12	Beneficiary's Bank/Branch name and address	Mandatory	ICICI Bank Ltd Bhubaneswar Main Branch, Bhubaneswar
13	Sender to receiver information	Mandatory	
14	Purpose of Guarantee	Mandatory	EMD
15	Reference/Description of the underlined tender/contract	Mandatory	NIT No

**ANNEXURE-VII**

**[PROFORMA FOR COMPOSITE BANK GUARANTEE FOR SECURITY DEPOSIT PAYMENT  
AND PERFORMANCE]**

**(To be stamped in accordance with Stamp Act and the Non-Judicial stamp paper of appropriate value should be in the name of the Issuing Bank.)**

**Ref No:-** .....

**Bank Guarantee No.** .....

**Date:** .....

**BG Amount:**.....

**Validity Period:**.....

This Guarantee Bond is executed this..... day of ..... by us the..... Bank at ..... , P.O..... , Dist....., State..... and Code No.....

Whereas the ODISHA POWER TRANSMISSION CORPORATION Limited, Janpath, Bhubaneswar, a company constituted under the Companies Act-1956 (hereinafter called OPTCL) has issued Letter of Award (LOA) No..... Dated..... for the purpose of ..... work under Package No..... (herein after called "the Agreement") to M/s/Shri ..... , Address..... (herein after called the "Contractor") for supply, erection, installation & commissioning and

associated civil works under the above LoA and whereas OPTCL has agreed (1) to exempt demand of security deposit under the terms and conditions of the LOA (2) to release payment of the cost of the Contract Price to the Contractor on furnishing by the Contractor to OPTCL a Contract Performance Bank Guarantee (CPBG) of the value of 10% of the Contract Price of the said Agreement.

1. Now therefore, in accordance with the terms and conditions of LOA No. \_\_\_\_\_ dated \_\_\_\_\_ for the due fulfillment by the said Contractor of the terms and conditions contained in the said agreement, on production of a Bank Guarantee for Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) only, we the bank \_\_\_\_\_ [Indicate bank Name , Address & Code ] (hereinafter referred to as “the Bank”) at the request of M/s/Shri \_\_\_\_\_ contractor do hereby undertake to pay to OPTCL, an amount not exceeding Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) only .

2. We, the \_\_\_\_\_ Bank [indicate the name of the Bank, Address & Code] do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from OPTCL. 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----- In Words).

3. We, the ..... Bank also undertake to pay to OPTCL any money so demanded notwithstanding any dispute or disputes raised by the Contractor in any suit or proceeding instituted / pending before any court or tribunal relating thereto, our liability under this present being absolute and irrevocable. The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the Contractor shall have no claim against us for making such payment.

4. We, the \_\_\_\_\_ Bank further agree that the guarantee herein contained 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 OPTCL under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till OPTCL certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said contractor and accordingly discharges this guarantee.

Unless a demand or claim under this guarantee is made on us or our Branch Office at Bhubaneswar <Mention Name, Address & Code of the Branch Office at Bhubaneswar of issuing Bank> in writing on or before ..... (Date), we shall be discharged from all liability under this guarantee thereafter.

5. We, the \_\_\_\_\_ Bank [indicate the name of the Bank, Address & Code] further agree with the Board that OPTCL 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 Bid or to extend time or performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by OPTCL against the said contractor(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 contractor(s) or for any forbearance, act or omission on the part of OPTCL or any



indulgence by OPTCL to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have the effect of so relieving us.

6. This guarantee will not be discharged due to the change in the name, style or constitution of the Bank and/or of the contractor(s).

7. We, the \_\_\_\_\_ Bank [indicate the name of the bank, Address & Code ] lastly undertake not to revoke this guarantee during its currency except with the previous consent of OPTCL in writing.

8. We, the \_\_\_\_\_ Bank (Name, Address & Code) further agree that this guarantee shall also be invokable at our place of business at **Bhubaneswar** (indicate Name, Address & Code of the Branch at Bhubaneswar) in the State of Odisha.

**“ Notwithstanding anything contained herein”**

a) Our liability under the bank guarantee shall not exceed Rs.------(Rupees in words-----) only.

b) This Bank guarantee shall be valid up to -----.

c) We or our Branch at **Bhubaneswar** <Mention Name, Address & Code.....> shall be liable to pay guaranteed amount or any part thereof under this guarantee only if you serve upon us at----- Branch of Bhubaneswar a written claim or demand on or before .....,

The Bank Guarantee is issued in paper form and Advice transmitted through SFMS with required details to the beneficiary’s advising bank (**ICICI Bank Bhubaneswar**, IFSC Code ICIC0000061).

Dated, the \_\_\_\_\_ Day of \_\_\_\_\_

For \_\_\_\_\_ [Indicate name of Bank]

Signature.....

Full Name.....

Designation.....

Power Of Attorney.....

Dated.....

Seal of the Bank.....

**WITNESS: (SIGNATURE WITH NAME AND ADDRESS)**

1. Signature.....

Full Name.....

2. Signature.....

Full Name.....

N.B.:

1. Name of the Contractor.: .....
2. BG No & Date :.....
3. Amount (In Rs.):.....
4. Validity up to :.....
5. LOA No.....
6. Package No.....
7. Name, Address & Code of Issuing Bank:.....
8. Name, Address & Code of Bhubaneswar Branch of the Issuing Bank:.....
10. The Bank Guarantee shall be accepted after getting SFMS advice as per details below.

**Format for SFMS details**

**(The Unique Identifier for field 7037 is “OPTCL541405793”)**

Sl. No	PARTICULARS	TYPE	DETAILS
1	Type of Bank Guarantee	Mandatory	Contract Performance
2	Currency & Amount	Mandatory	
3	Validity Period(from—to --)	Mandatory	
4	Effective Date	Mandatory	
5	End date of lodgment of Claim	Mandatory	
6	Place of lodgment of claim	Mandatory	Bhubaneswar, Branch Name----- of Bhubaneswar Branch code----- of Bhubaneswar Branch Address ----- at Bhubaneswar

7	Issuing Branch IFSC Code	Mandatory	
8	Issuing Branch name & address	Mandatory	
9	Name of applicant and its details	Mandatory	
10	Name of Beneficiary and its details	Mandatory	
11	Beneficiary's Bank/Branch and IFSC Code	Mandatory	ICICI Bank Ltd IFSC Code- ICIC0000061
12	Beneficiary's Bank/Branch name and address	Mandatory	ICICI Bank Ltd Bhubaneswar Main Branch, Bhubaneswar
13	Sender to receiver information	Mandatory	
14	Purpose of Guarantee	Mandatory	Contract Performance
15	Reference/Description of the underlined tender/contract	Mandatory	LOA No----

**N.B. : To be Stamped in accordance with Stamp Act and the Non-Judicial Stamp Paper of appropriate value should be in the name of Issuing Bank**

#### **ANNEXURE-VIII**

CHART SHOWING PARTICULARS OF EARNEST MONEY DEPOSIT FURNISHABLE BY TENDERERS

1.	Central and State Government Undertakings	<u>Exempted</u>
2.	All other inside & outside state units.	The amount of EMD as specified in the specification /Tender Notice in shape of bank guarantee /DD.

**NB: - REFUND OF E.M.D.**

- [a] In case of unsuccessful tenderers, the EMD will be refunded immediately after the tender is decided. In case of successful tenderer, this will be refunded only after furnishing of Composite Bank Guarantee referred to in clause No.19 of Section-II of this specification.

Suits, if any, arising out of EMD shall be filed in a court of law to which the jurisdiction of High Court of ODISHA extends.

- [b] Earnest Money will be forfeited if the tenderer fails to accept the letter of intent/purchase order, issued in his favour or revises the bid price[ s] within the validity period of Bid.

**ANNEXURE-IX**

DATA ON EXPERIENCE

- [a] Name of the manufacturer.
- [b] Standing of the firm as manufacturer of equipment quoted.
- [c] Description of equipment similar to that quoted [supplied and installed during the last two years with the name of the organizations to whom supply was made].
- [d] Details as to where installed etc.
- [e] Testing facilities at manufacturer's works.
- [f] If the manufacturer is having collaboration with another firm, details regarding the same and present status.
- [g] A list of purchase orders, executed during last three years.
- [h] A list of similar equipments of specified MVA rating, voltage class, Impulse level, short circuit rating, Designed, manufactured, tested and commissioned which are in successful operation for at least two years from the date of commissioning with legible user's certificate. User's full complete postal address/fax/phone must be indicated. (Refer clause No.7 of the Part-I, Section-II of the specification).

Place:

Date:

Signature of Bidder

Name, Designation, Seal

**ANNEXURE-X**

SCHEDULE OF SPARE PARTS FOR FIVE YEARS OF NORMAL OPERATION & MAINTENANCE

SL. No	Particulars	Quantity	Unit delivery rate	Total price

Place:

Date:

Signature of Bidder

Name, Designation, Seal

**ANNEXURE-XI**  
**SCHEDULE OF INSTALLATIONS**

Rated MVA	Rated Voltage	Place of installation and complete postal address	Year of commissioning

Place: -

Date

Signature of Bidder:

Name, Designation, Seal

**ANNEXURE-XII**

**DEVIATION SCHEDULE**

**Bidder shall enter below particulars of his alternative proposal for deviation from the specification, if any.**

A) Technical

***(To be filled up by the tenderer as indicated in the excel sheet)***

B) Commercial deviations.

***(To be filled up by the tenderer as indicated in the excel sheet)***

**ANNEXURE – XIII**  
**LITIGATION HISTORY**

Name of the Bidder:

Bidder should provide information on any history of litigation or arbitration resulting from contracts executed in the last five years or currently under execution.

Year.	Award for or against bidder	Name of client, cause of litigation and matter in dispute	Disputed amount (current value in Rs.)

Place: -

Date

Signature of Bidder:

**ANNEXURE-XIV**  
**AFFIDAVIT OF BIDDER**

**(To be submitted in a non-judicial stamp paper of appropriate value)**

BEFORE Sri/ ....., Notary, At-.....  
.....

**Affidavit**

WHEREAS the Odisha Power Transmission Corporation Ltd., Bhubaneswar(OPTCL) has floated its Tender No.....inviting bids from eligible bidder to execute the work of.....

AND WHEREAS M/s..... (Briefly "Bidder") has offered its bid on .....in response to the said Tender No.....of the OPTCL expressing its interest to execute the work as specified therein.

AND WHEREAS the said Tender No..... of OPTCL requires the Bidder to solemnly affirm the correctness of the document and information furnished in its bid, so offered to OPTCL.

NOW THEREFORE, in response to the requirement, the Tender No..... of OPTCL, and having been duly authorized by the Bidder, I Sri/ Mrs. .... aged about ..... years, Son/Daughter/Wife of Sri/Mrs. ...., At present working as..... of M/s..... (The Bidder) do hereby solemnly affirm and state as follows:

1. That I am competent and have been duly authorized by the Bidder M/s..... to swear this affidavit on its behalf.
2. That the documents and information furnished by the Bidder in its bid offered in respect to the said Tender No.....of OPTCL are true and correct.



3. That in the event any document and information as furnished by the Bidder in response to the said Tender No of OPTCL is found/ considered by the OPTCL at any time as to be not correct/ wrong, the OPTCL shall be competent and at liberty without any show cause to the Bidder to terminate its contract/ agreement With the Bidder, if any.
4. The OPTCL shall also be competent, without any reference to the Bidder, to black list the Bidder and debar the Bidder from participating in any other Tender of OPTCL pursuant to its consideration/ finding that the Bidder has furnished any incorrect/ wrong document and information tendered/made pursuant to Tender No of OPTCL.
5. That the affirmation made herein above is/are correct and true and nothing Stated herein is false.

Identified by  
**DEPONENT**

**ADVOCATE**

**Annexure-XV**  
**Certificate ( to be furnished in bidder company's letter head)**

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where applicable evidence of valid registration by the Competent Authority shall be attached.]

Authorized signatory

Company seal

\*\*\*\*\*

## **PART – II**

### **PRICE BID**

#### **1. PRICE:**

(i) Bidders are required to quote their price(s) for goods offered indicating they are 'FIRM'

(ii) The prices quoted shall be FOR Destination only at the consignee's site/store inclusive of packing, forwarding, Freight & Insurance. In addition, the break-up of FOR Destination price shall be given as per schedule of Prices in Annexure-V of Section – III. The Bidders has to certify in the price bid that any implication of lower Tax and Input Tax Credit benefit as per anti-profiteering and other provisions under GST Laws, have been fully passed on to the Purchaser, while quoting the tender prices.

#### **2. INSURANCE:**

Insurance of materials/equipment, covered by the Specification should normally be done by the Suppliers with their own Insurance Company unless otherwise stated. The responsibility of delivery of the materials/equipment at destination stores/site in good condition rests with the Supplier. Any claim with the Insurance Company or Transport agency arising due to loss or damage in transit has to be settled by the Supplier. The Supplier shall undertake free replacement of equipment/materials damaged or lost which will be reported by the Consignee within 30 days of receipt of the equipment/materials at Destination without awaiting for the settlement of their claims with the carriers and underwriters.

#### **3. CERTIFICATE FOR EXEMPTION FROM GOODS AND SERVICES TAX:**

Offers with exemption from Goods and Services Tax shall be accompanied with authenticated proof of such exemption. Authenticated proof for this clause shall mean Photostat copy of exemption certificates, attested by Gazetted Officers of State or Central Government.

#### **4. PROPER FILLING UP OF THE PRICE SCHEDULE:**

The Bidders should fill up the price schedule (Annexure-V of Section-III) properly and in full. The tender may be rejected if the schedule of price is submitted in incomplete form as per clause-34 (ix) of Section-II of the Specification.

#### **5. NATURE OF PRICE INDICATED IN SPECIFICATION SHALL BE FINAL.**

The nature of price indicated in the Clause-13, Section – I of PART –I of the Specification shall be final and binding.

## SECTION-IV

### TECHNICAL SPECIFICATION

Sl.No.	Item	Page
1.	Scope	
2.	Description of materials	
3.	Standards.	
4.	Climatic conditions.	
5.	Tests.	
6.	Guaranteed Technical Particulars.	
7.	Requirement of Transformer oil and desired period of delivery.	
8.	Specific experience of supplier.	
9.	Guarantee Technical particulars.	
10.	Additional Technical Particulars.	
11.	Schedule of requirement & Desired Delivery.	

**TECHNICAL SPECIFICATION FOR 33/132/220 KV H.T. XLPE POWER CABLE**  
**(A) TECHNICAL SPECIFICATION FOR 33 kV CROSS LINKED ETHYLENE INSULATED**  
**PVC SHEATHED SINGLE CORE, (DIFFERENT CROSS SECTION AREA) COPPER**  
**POWER CABLE.**

**1. SCOPE**

This specification covers the design, manufacture, testing, inspection at manufacturer's work, supply & delivery F.O.R. destination of **(DIFFERENT CROSS SECTION AREA)** Single Core XLPE insulated PVC sheathed Cable and single core XLPE cable suitable for solidly grounded system size as per clause(5) mentioned below.

**2. PARTICULARS OF THE SYSTEM**

The cable should be suitable for use on 50 Cycles, 3 Phases solidly earth neutral system & working voltage of 33kV.

**3. STANDARDS**

The cable covered under this Specification shall conform in all respects with the latest editions of IS-7098 (Part-2) 2011 & IS-8130-2013 & IEC: 60502 of the latest version thereof.

**4. TECHNICAL PARTICULARS**

33kV, Single Core underground XLPE insulated PVC sheathed cable suitable for working potential of 33kV on earthed system manufactured in accordance with IS-7098 (Part-2) 2011 with latest amendments or latest editions thereof. The electrolytic grade copper conductor with formation of stranded compacted type as per IEC-60228, tapped with semi conducting water blocking conductor shall comply with requirements specified in IS:8130-2013. The insulation shall be chemically cross-linked polyethylene confirming to the physical, electrical and ageing property as required in latest edition of IS-7098 (Part-2) 2011. Cable shall be provided with both conductor screening and insulation screening. The conductor screening shall be non-metallic and shall be consisting of either a layer of semi-conducting compound or combination of two. The insulation screening shall consist of non-metallic extruded semi conducting compound layer followed by a semiconducting water blocking tape in combination with non- magnetic armour (Armour shall be suitable to carry 31.5 kA for 1 second). Armouring shall be arranged over the insulation screen and it shall be of non-magnetic material. The material for the Armouring shall be as per relevant ISS & a non-conducting water blocking tape shall be provided over armour. Over the Armouring the cable shall be provided with extruded PE outer sheath. The composition of PE compound shall be type ST-7 of IEC 60502-2 & the colour of outer sheath shall be black. A conductive layer of extruded semiconducting shall be provided on outer sheath to facilitate sheath integrity test.

**5. TESTS**

**5.1 Type Tests**

The equipment offered should be type tested. Type test report should not be more than seven years old, reckoned from the date of bid opening, in respect of the following tests, carried out in accordance with ISS-7098/IEC-871/IEC- 60502, from Govt. /Govt.

Approved test house, shall be submitted along with bid:

- i) Physical tests for insulation and outer sheath.
- ii) Bending test.
- iii) Di-electrical power factor test.
- iv) Heating cycle test followed by di-electrical power factor as a function of voltage and partial discharge test.
- v) Impulse withstand test.

The remaining type test report as per clause 3 of ISS-7098/IEC-871/IEC-60502 shall be

submitted by the successful bidder within three months from the date of placement of order. These type test reports shall be from Govt./Govt. approved test house and shall not be more than seven years old, reckoned from the date of placement of order. The failure to do so will be considered as a breach of contract.

## **5.2 ROUTINE TESTS AND ACCEPTANCE TESTS**

All routine and acceptance tests shall be carried as per relevant ISS in the presence of Nigam's representative.

Following additional tests shall be carried out

1. Convolution and protrusion (as per Annexure A)
2. Sheath integrity test

## **6. INSPECTION**

The material shall be inspected and tested before dispatch by an authorized representative of OPTCL in respect of quality.

## **7. TEST CERTIFICATES**

The supplier shall supply test certificates from a Govt. agency in respect of quality as per IS:7098(part-II) 2011 with latest amendments thereof for approval of the purchaser.

## **8. PACKING**

The cable shall be supplied in Returnable Steel drum so constructed, as to enable the cable to be transported on each drum. The cable wound on such drum shall be one continuous length. The ends of cables shall be sealed by means of non-hygroscopic sealing material.

## **9. MARKING**

The marking on the drum shall have the following information: -

- a) Reference to Indian Standard & cable code.
- b) Name of the manufacturer & trade name.
- c) Nominal cross section area of conductor for the cables.
- d) Number of core.
- e) Type of the cable & voltage for which it is suitable.
- f) Length of cable on the drum.
- g) Approximate gross weight.
- h) Net weight of the cable.
- i) Drum identification number.
- j) P.O. No. and date.
- k) Consignee's name with designation.
- l) Year of manufacture.

Note: Cable should be marked with ISI Certification mark.

## **10. DRAWINGS & INSTRUCTION MANUAL**

The tenderer shall supply the following drawings with the tender: -

- i) Detailed drawing of the cable showing conductor, screening insulation, Armouring, outer sheath etc.
- ii) Detailed drawing showing jointing of cable and sealing of end boxes.

Copies of instruction manuals for testing, installation jointing operation and maintenance of cables, shall also be submitted with the offer for reference of the purchaser.

## **11. CONTINUOUS A.C. CURRENT & OTHER DATAS (ALUMINIUM CONDUCTOR):**

Conductor sizes in sq.mm.	When laid direct in the ground	When laid in air	Short circuit current in kA 1sec ( $I=0.094 \times A/\text{sq.rt (t)}$ )	A.C resistance at 90 deg in Ohm/Km	D.C resistance at 20 deg in Ohm/Km	Capacitance at 50Hz in $\mu\text{F}/\text{Km}$
70	170	220	6.58	0.567	0.443	0.14
95	200	265	8.93	0.410	0.320	0.15
120	225	300	11.28	0.325	0.253	0.16
150	250	340	14.10	0.265	0.206	0.18
185	280	385	17.39	0.211	0.164	0.19
240	315	450	22.56	0.162	0.125	0.21
300	345	500	28.20	0.130	0.100	0.23
400	385	570	37.60	0.1023	0.0778	0.25
500	415	640	47.00	0.0808	0.0605	0.27
630	450	720	59.22	0.0648	0.0469	0.29
800	485	790	75.20	0.0530	0.0367	0.34
1000	510	850	94.00	0.0444	0.0291	0.37

## 12. CONTINUOUS A.C. CURRENT & OTHER DATAS (COPPER CONDUCTOR):

Conductor sizes in sq.mm.	When laid direct in the ground	When laid in air	Short circuit current in kA 1sec ( $I=0.143 \times A/\text{sq.rt (t)}$ )	A.C resistance at 90 deg in Ohm/Km	D.C resistance at 20 deg in Ohm/Km	Capacitance at 50Hz in $\mu\text{F}/\text{Km}$
70	215	280	10.01	0.343	0.268	0.14
95	255	335	13.59	0.248	0.193	0.15
120	285	380	17.16	0.197	0.153	0.16
150	310	430	21.45	0.159	0.124	0.18
185	345	485	26.46	0.127	0.0991	0.19
240	390	560	34.32	0.0976	0.0754	0.21
300	420	620	42.90	0.0778	0.0601	0.23
400	455	690	57.20	0.0678	0.0470	0.25
500	480	750	71.50	0.0489	0.0366	0.27
630	510	820	90.10	0.0391	0.0283	0.29
800	540	840	114.40	0.0319	0.0221	0.34
1000	550	940	143.00	0.0268	0.0176	0.37

## 13. TESTS AND TESTING FACILITIES:

### 13.1 TYPE TESTS:

All the type tests in accordance with IS: 7098 (Part 2), IEC 60228, (amended upto date), shall be performed on cable. The same is to be furnished for verification if the type test (in an external NABL accredited lab) has been conducted in last five years from the date of submission of GTP & drawing for approval. If the same is not available than the firm to conduct the type test again and submission for verification.

### 13.2 ROUTINE TESTS:

All the Routine tests as per IS: 7098 (Part 2) ,IEC 60228,( amended upto date) shall be carried out on each and every delivery length of cable. The result should be given in test report. Partial discharge test must be carried out in a fully screened test cell. It is, therefore, absolutely essential that the manufacturer should have the appropriate type of facility to conduct this test which is routine test.

The details of facility available in the manufacturer's works in this connection should be given in the bid.

**13.3 ACCEPTANCE TESTS:**

All Acceptance tests as per IS: 7098 (Part 2) /IEC 60228, (amended upto date) including the optional test as per clause no 18.4 and Flammability Test shall be carried out on sample taken from the delivery lot. In addition, test for convolution and protrusion shall be carried out as per Annexure- "A"

**13.4 SHORT CIRCUIT TEST:**

The contractor shall also undertake to arrange for the short circuit test as a type test on any one size of each voltage grade i.e on one size of 33 kV earthed grade shielded XLPE cables. If facilities for carrying out short circuit tests are available at the works of the supplier, and provided the certification procedure is approved by the Purchaser, testing at the supplier's works will be acceptable.

Short Circuit test shall be witnessed by the purchaser's representative.

13.4.1 The short circuit test shall be preceded and followed by the following tests so as to ensure that the characteristics of the cable remain within the permissible limits even after it is subjected to the required short circuit rating.

- a) Partial Discharge Test.
- b) Conductor Resistance Test.
- c) High Voltage Test.

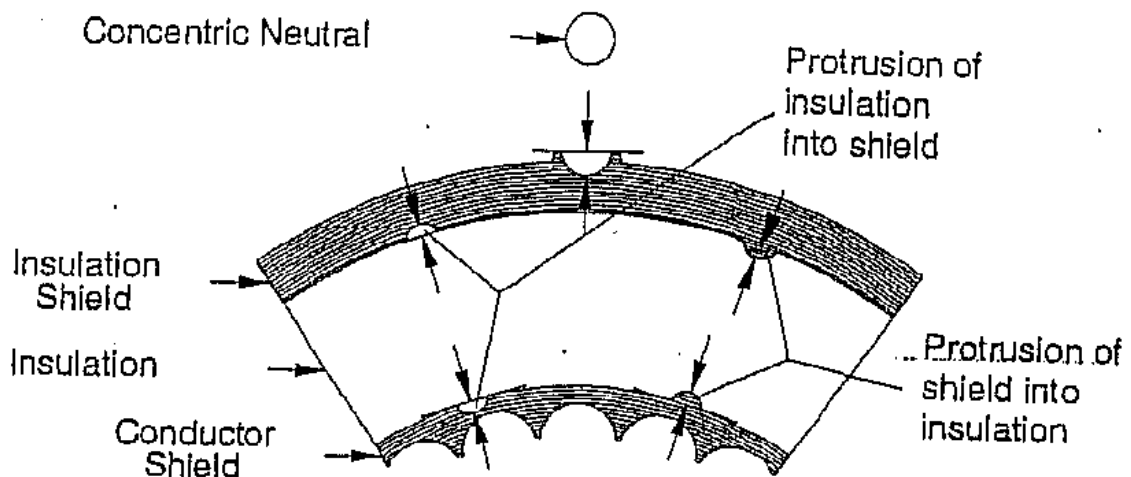
13.4.2 The manufactured cable will be acceptable only after such acceptance test is successfully carried out at CPRI /ERDA or at suppliers works and approved by the Purchaser.

**13.5 TESTING FACILITIES**

The supplier / tenderer shall clearly state as to what testing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out type, routine and acceptance tests mentioned in specified IS. The facilities shall be provided by the bidder to purchaser's representative for witnessing the tests in the manufacturer's works. If any test cannot be carried out at manufacturer's works reason should be clearly stated in the tender.

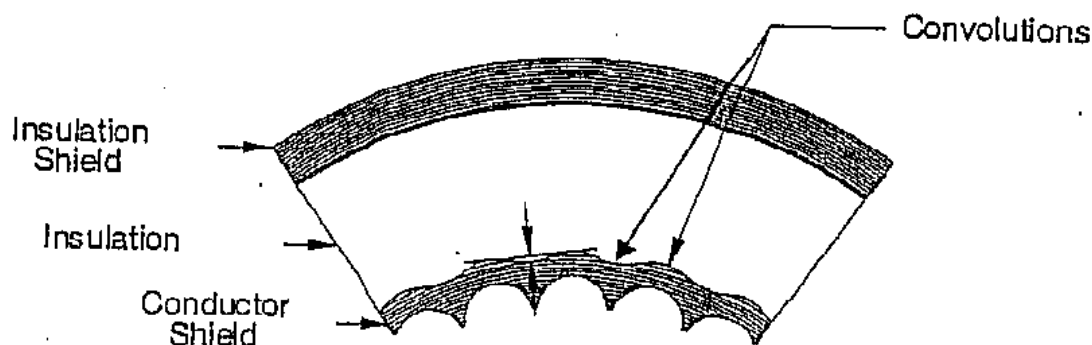
ANNEXURE A

Item (For XLPE/TR XLPE insulation)	Clause of AEIC CS8	Unit	Requirement
<b>Procedure to Measure Protrusions and Indentations</b>			





## Procedure to Measure Convolutions



### 14 QUALITY ASSURANCE PLAN:

A detailed list of bought out items which got into the manufacture of cables should be furnished indicating the name of the firms from whom these items are procured. The bidder shall enclose the quality assurance plan invariably along with offer followed by him in respect of the bought out items, items manufactured by him & raw materials in process as well as final inspection, packing & marking. The Company may at its option order the verification of these plans at manufacturer's works as a pre-qualification for technically accepting the bid. During verification if it is found that the firm is not meeting with the quality assurance plan submitted by the firm, the offer shall be liable for rejection.

### 15 LIST OF STANDARDS

(All amended up to date)

SR.NO.	STANDARD NO.	TITLE
1.	IS: 8130 ,IEC 60228:	Conductors for insulated electric cables and flexible cords.
2.	IS :7098 (Part 2) ,IEC 60502:	XLPE PVC sheathed cable for working voltages from 3.3 kV upto and including 33 kV.
3.	IS:7098(pt-2),IEC 60502:	Insulation XLPE.
4.	IS: 7098(pt-2),IEC:60502:	Insulation Metallic & Non Metallic Screen.
5.	IS: 7098(pt-2),IEC:60502:	Fillers: Non Hygroscopic PVC/Polypropylene Fiber to maintain roundness of cable.
6.	IS:7098 (pt-2),IS:3975,IEC:60502 (pt-2):	Armour.
7.	IS:7098(pt-2), IEC:60502 (pt-2):	Outer Sheath: PE ST 7.
8.	IS :10462 ( Part I) -1983 :	Fictitious calculation method for determination of dimensions of protective coverings of cable.

### 16.0 TECHNICAL DATA FOR 33kV SINGLE CORE 300 SQMM, 400 SQMM & 630 SQMM, XLPE INSULATED, COPPER CONDUCTOR ARMoured CABLE

Sl.	Name of the	1CX300 SQMM	1CX400 SQMM	1CX630 SQMM
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No.	Particulars			
1	Type of cable	Copper Conductor, XLPE Insulated (2XWcWa2Y)	Copper Conductor, XLPE Insulated (2XWcWa2Y)	Copper Conductor, XLPE Insulated (2XWcWa2Y)
2	Standard according to which cable has been manufactured and tested	IS:7098-Part 2 & generally IEC 60502-2	IS:7098-Part 2 & generally IEC 60502-2	IS:7098-Part 2 & generally IEC 60502-2
3	Rated Voltage (U <sub>0</sub> /U)	19/33(36) kV	19/33(36) kV	19/33(36) kV
4	Highest System Voltage which the cable can withstand	36 kV (U <sub>m</sub> )	36 kV (U <sub>m</sub> )	36 kV (U <sub>m</sub> )
5	Maximum Conductor temperature for continuous operation	90°C	90°C	90°C
6	(a) Maximum short time conductor temperature with duration	250°C for 1 sec.	250°C for 1 sec.	250°C for 1 sec.
	(b) Maximum allowable conductor temp. during overload	130°C for 2 hours at a time & 1500 hours cumulative during life time of the cable	130°C for 2 hours at a time & 1500 hours cumulative during life time of the cable	130°C for 2 hours at a time & 1500 hours cumulative during life time of the cable
7	Conductor Details			
	Normal Cross-Sectional Area	300 mm <sup>2</sup>	400 mm <sup>2</sup>	630 mm <sup>2</sup>
	Material and Grade	Annealed Plain Copper to IS 8130/2013	Annealed Plain Copper to IS 8130/2013	Annealed Plain Copper to IS 8130/2013
	Shape of Conductor	Compacted stranded circular	Compacted stranded circular	Compacted stranded circular
	Diameter of Conductor	20 mm (Approx.)	23 mm (Approx.)	30 mm (Approx.)
	No. of Strands and Diameter of each Strand	34 Min. as per IS 8130) / Vendor to provide	53 Min. as per IS 8130) / Vendor to provide	53 Min. as per IS 8130) / Vendor to provide
	Water swellable powder/yarn/non conducting water blocking tape provided	Yes	Yes	Yes
	Conducting water swellable tape with 50% overlap over compacted conductor provided	Yes	Yes	Yes

8	Extruded Conductor Screen			
	Material	Extruded Semi-Conducting compound	Extruded Semi-Conducting compound	Extruded Semi-Conducting compound
	Nominal Thickness	0.50 mm (Approx.)	0.5 mm (Approx.)	0.5 mm (Approx.)
	Diameter over Conductor screen	22.0 mm (Approx.)	25.0 mm (Approx.)	32.0 mm (Approx.)
	Designed maximum stress at conductor screen	2.95 kV/mm	2.85 kV/mm	2.72 kV/mm
9	Insulation			
	Material	XLPE	XLPE	XLPE
	Nominal Thickness	8.80 mm	8.80 mm	8.80 mm
	Minimum thickness at any point	Subject to tolerance as per IS	Subject to tolerance as per IS	Subject to tolerance as per IS
	Diameter over insulation	40.0 mm(Approx)	43.0 mm(Approx)	50.0 mm(Approx)
	Designed maximum stress	1.63 kV/mm	1.67 kV/mm	1.74 kV/mm
	Detail of vulcanization process	CCV/VCV	CCV/VCV	CCV/VCV
	Extrusion method	Triple Extrusion Process	Triple Extrusion Process	Triple Extrusion Process
	Curing method	Dry Cured	Dry Cured	Dry Cured
	Cooling method	Water cooling	Water cooling	Water cooling
	CCV/VCV line	CCV/VCV	CCV/VCV	CCV/VCV
10	Extruded Insulation Screen			
	Material	Extruded Semi-Conducting XLPE	Extruded Semi-Conducting XLPE	Extruded Semi-Conducting XLPE
	Thickness	1.0 mm (Approx.)	1.0 mm (Approx.)	1.0 mm (Approx.)
	Diameter over insulation screen	42.0 mm (Approx.)	45.0 mm (Approx.)	52.0 mm (Approx.)
	Strippable/ Bonded	Bonded	Bonded	Bonded
11	Conducting Longitudinal Water Sealing			
	Material	Water Swellable Tape applied with minimum 10% overlap	Water Swellable Tape applied with minimum 10% overlap	Water Swellable Tape applied with minimum 10% overlap
	Thickness	0.3 mm (Approx.)	0.3 mm (Approx.)	0.3 mm (Approx.)
12	Metallic Sheath/ Screen (Armour)			
	Material	Aluminium Wire (Round wire Armour) as per IS:8130		

	No. of strands	Vendor to provide (Suitable to carry 31.5 kA for 1 second)		
	Diameter of each Strand (Nom/Min)			
	Diameter of Cable after stranding			
	Coverage	As per IS minimum 90%		
13	Non-conducting Longitudinal Water Sealing			
	Material	Water Swellable Tape applied with minimum 10% overlap.	Water Swellable Tape applied with minimum 10% overlap.	Water Swellable Tape applied with minimum 10% overlap.
	Thickness	0.3 mm (Approx.)	0.3 mm (Approx.)	0.3 mm (Approx.)
14	HDPE Outer Sheath			
	Type	Extruded HDPE Type ST-7	Extruded HDPE Type ST-7	Extruded HDPE Type ST-7
	Colour	Black	Black	Black
	Thickness (Min)	2.04 mm (Min. Spot)	2.04 mm (Min. Spot)	2.36 mm (Min. Spot)
	Conductive Coating Provided	Extruded semiconducting layer compatible to material of outer sheath	Extruded semiconducting layer compatible to material of outer sheath	Extruded semiconducting layer compatible to material of outer sheath
15	Nominal overall Diameter of cable	57 mm (Approx.)	60 mm (Approx.)	66 mm (Approx.)
16	Nominal Overall Weight of Cable per Meter	5.0 kg/m (Approx)	5.9 kg/m (Approx)	8.4 kg/m (Approx)
17	Standard Drum Length with Tolerance	500 m ± 5%	500 m ± 5%	500 m ± 5%
18	Minimum Bending Radius allowable during installation	1140 mm (during installation) 1026 mm (after laying)	1080 mm (during installation) 1200 mm (after laying)	1320 mm (during installation) 1188 mm (after laying)
19	Short Circuit Current Rating of Conductor with maximum conductor temperature (90°C) at the commencement of fault 1Sec. Duration	42.90 kA	57.20 kA	90.09 kA

20	Maximum Continuous Current Rating of a Circuit Comprising of 3 nos. Single Core Cable laid in trefoil formation at a depth of 1.05 M.			
	Soil Temperature	30°C	30°C	30°C
	Ambient Temperature	40°C	40°C	40°C
	Soil Thermal Resistivity	150°C Cm/W	150°C Cm/W	150°C Cm/W
	System of Bonding	Solidly earthed at both ends	Solidly earthed at both ends	Solidly earthed at both ends
	Laid in ground (at a depth of 1.05 m)	442 A	490 A	586 A
	Laid in dusts	382 A	422 A	501 A
	Installed in Air	644 A	734 A	920 A
21	Short Time Overload capacity with Duration of cable installed as per conditions mentioned in Item no.22 (2 hours)			
	Laid in ground ( at a depth of 1.05 m)	535 A	593 A	709 A
	Laid in dusts	462 A	510 A	606 A
	Installed in Air	811 A	925 A	1159 A
22	Maximum AC Resistance at 90°C	0.0782 ohm/km	0.0620 ohm/km	0.0398 ohm/km
23	Equivalent Star Reactance of a Circuit comprising of 3 Nos. of Single Core cable laid in Trefoil Formation	0.129	0.122	0.113
24	Maximum Charging Current per Conductor at Nominal Voltage	1.40 A/Km (at 19kV)	1.56 A/Km (at 19kV)	1.87 A/Km (at 19kV)
25	Loss in Metallic Screen of a Circuit comprising of 3 nos. of Single Core Cable installed in Trefoil Formation as per item no. 20 (Ground)	Vendor to provide	Vendor to provide	Vendor to provide

26	Maximum Current in Metallic Screen when the cable is installed as per item no. 20 (Circulating Current)	Vendor to provide	Vendor to provide	Vendor to provide
27	Derating factor of Cable installed as per Item No.22 under following conditions Ambient Temperature			
	35°C	Chart for Derating factors to be provided by the vendor	Chart for Derating factors to be provided by the vendor	Chart for Derating factors to be provided by the vendor
	45°C			
28	Group derating factor of Cable Circuits installed as per Item no. 22 under following conditions			
	Laid 100 mm. apart	Chart for Derating factors to be provided by the vendor	Chart for Derating factors to be provided by the vendor	Chart for Derating factors to be provided by the vendor
	Laid 250 mm. apart			
29	Induced voltage in metallic screen when Conductor is carrying 100 Amps(V/Km)	N/A for both end bonding	N/A for both end bonding	N/A for both end bonding
30	Circulating current in metallic screen when conductor is carrying 100 Amps	Vendor to provide	Vendor to provide	Vendor to provide
31	Test Voltages			
	Impulse Withstand Voltage at 90°C	170 kVp	170 kVp	170 kVp
	Rated Power Frequency Withstand Voltage (kV)	63 kV for 5 minutes	63 kV for 5 minutes	63 kV for 5 minutes
	Water penetration test as per IEC 60502-2 on core	Yes, Water penetration test on conductor as per IEC 60502-2	Yes, Water penetration test on conductor as per IEC 60502-2	Yes, Water penetration test on conductor as per IEC 60502-2
	Abrasion Test on HOPE Outer sheath as per IEC 60229	Yes (Physical Abrasion test as per IEC 60229 clause 4.1.2.1)	Yes (Physical Abrasion test as per IEC 60229 clause 4.1.2.1)	Yes (Physical Abrasion test as per IEC 60229 clause 4.1.2.1)
	Recommended Test Voltage after installation	Comply with Clause 20 as per IEC 60502-2	Comply with Clause 20 as per IEC 60502-2	Comply with Clause 20 as per IEC 60502-2

	Details of Drum			
	Material and Weight of Drum	Returnable Steel Reel / Vendor to provide	Returnable Steel Reel / Vendor to provide	Returnable Steel Reel / Vendor to provide
32	Weight of Drum with Cable	Vendor to provide	Vendor to provide	Vendor to provide
	Flange Diameter of Drum	Vendor to provide	Vendor to provide	Vendor to provide
	Barrel Width of Drum	Vendor to provide	Vendor to provide	Vendor to provide
	Spindle hole Diameter	Vendor to provide	Vendor to provide	Vendor to provide
33	Safe Pulling force	5kg/mm2 of CU area.	5kg/mm2 of CU area.	5kg/mm2 of CU area.
36	The following details shall be embossed/ Printed on outer sheath at regular interval not exceeding one metre. (a) Manufacturer's Name or Trade name (b) Year of Manufacture (c) Voltage grade of Cable i.e. 19/33kV (d) Cable Code i.e. 2XWcWa2Y (e) Number of cores & cable size e.g. 300 Sq mm (Cu) 1 core or 400 Sqmm (Cu) 1 core or 630 Sqmm (Cu) 1	"LOGO" "MANUFACTURER'S NAME" "19/33 kV" "300 Sqmm (Cu) 1 Core" "2XWa2Y" "Year" "OPTCL" "PO No"	"LOGO" "MANUFACTURER'S NAME" "19/33 kV" "400 Sqmm (Cu) 1 Core" "2XWa2Y" "Year" "OPTCL" "PO No"	"LOGO" "MANUFACTURER'S NAME" "19/33 kV" "630 Sqmm (Cu) 1 Core" "2XWa2Y" "Year" "OPTCL" "PO No"
	Sequential length marking shall also be provided on outer sheath by inkjet or hotfoil printing.	Yes	Yes	Yes
	Cable shall be supplied in returnable steel drums	Yes	Yes	Yes
	<b>NOTE:</b> Bidder to consider the above GTP for quoting.			

17.0 GUARANTEED TECHNICAL PARTICULARS FOR 33 KV CABLE: (To be filled up by the bidder & submission of the same during approval)

Sl. No.	Name of the Particulars		
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1	Type of cable		
2	Standard according to which cable has been manufactured and tested		
3	Rated Voltage (U <sub>0</sub> /U)		
4	Highest System Voltage which the cable can withstand		
5	Maximum Conductor temperature for continuous operation		
6	(a) Maximum short time conductor temperature with duration		
	(b) Maximum allowable conductor temp. during overload		
7	Conductor Details		
	Normal Cross-Sectional Area		
	Material and Grade		
	Shape of Conductor		
	Diameter of Conductor		
	No. of Strands and Diameter of each Strand		
	Water yarn/non conducting water blocking tape provided in intermediate layers of conductor?		
	Conducting water swellable tape with 50% overlap over compacted conductor provided		
8	Extruded Conductor Screen		
	Material		
	Nominal Thickness		
	Diameter over Conductor screen		
	Designed maximum stress at conductor screen (supporting calculation to be submitted)		
9	Insulation		
	Material		
	Nominal Thickness		
	Minimum thickness at any point		
	Diameter over insulation		
	Designed maximum stress		
	Detail of vulcanization process		
	Extrusion method		
	Curing method		
	Cooling method		
CCV/ VCV Line			
10	Extruded Insulation Screen		
	Material		
	Thickness		
	Diameter over insulation screen		
	Strippable/ Bonded		
11	Conducting Longitudinal Water Sealing		
	Material		
	Thickness		
12	Metallic Sheath/ Screen		

	Material		
	No. of strands		
	Diameter of each Strand (Nom/Min)		
	Diameter of Cable after stranding		
	Armour coverage		
13	Non-conducting Longitudinal Water Sealing		
	Material		
	Thickness		
14	HDPE Outer Sheath		
	Type		
	Colour		
	Thickness (Nom/Min)		
	Conductive Coating Provided		
15	Nominal overall Diameter of cable		
16	Nominal Overall Weight of Cable per Meter		
17	Standard Drum Length with Tolerance		
18	Minimum Bending Radius allowable during installation		
19	Short Circuit Current Rating of Conductor with maximum conductor temperature (90°C) at the commencement of fault 1Sec. Duration		
20	Maximum Continuous Current Rating of a Circuit Comprising of 3 nos. Single Core Cable laid in trefoil formation at a depth of 1.05 M.		
	Soil Temperature		
	Ambient Temperature		
	Soil Thermal Resistivity		
	System of Bonding		
	Laid in ground ( at a depth of 1.05 m)		
	Laid in dusts		
	Installed in Air		
21	Short Time Overload capacity with Duration of cable installed as per conditions mentioned in Item no.22 ( 2 hours)		
	Laid in ground ( at a depth of 1.05 m)		
	Laid in dusts		
	Installed in Air		
22	Maximum AC Resistance at 90°C		
23	Equivalent Star Reactance of a Circuit comprising of 3 Nos. of Single Core cable laid in Trefoil Formation		
24	Maximum Charging Current per Conductor at Nominal Voltage 1.64 AI km		
25	Loss in Metallic Screen of a Circuit comprising of 3 nos. of Single Core Cable installed in Trefoil Formation as per item no. 22		
26	Maximum Current in Metallic Screen when		

	the cable is installed as per item no. 22 (Circulating Current)		
27	Derating factor of Cable installed as per Item No.22 under following conditions Ambient Temperature		
	35°C		
	45°C		
28	Group derating factor of Cable Circuits installed as per Item no. 22 under following conditions		
	Laid 100 mm. apart		
	Laid 250 mm. apart		
29	Induced voltage in metallic screen when Conductor is carrying 100 Amps(V/Km)		
30	Circulating current in metallic screen when conductor is carrying 100 Amps		
31	Test Voltages		
	Impulse Withstand Voltage at 90°C		
	Rated Power Frequency Withstand Voltage (kV)		
	Water penetration test as per IEC 60502-2		
	Abrasion Test on HDPE Outer sheath as per IEC 60229		
	Recommended Test Voltage after installation		
32	Details of Drum		
	Material and Weight of Drum		
	Weight of Drum with Cable		
	Flange Diameter of Drum		
	Barrel Width of Drum		
	Spindle hole Diameter		
33	Safe Pulling force		
34	Armour		
	Material		
	Type of Armouring		
	Nominal Diameter in (mm)		
	Short circuit capacity of Armour (Supporting calculation to be submitted)		
	Armour coverage (supporting calculation to be submitted)		
36	The following details shall be embossed/ Printed on outer sheath at regular interval not exceeding one metre. (a) Manufacturer's Name or Trade name (b) Year of Manufacture (c) Voltage grade of Cable i.e. 19/33kV (d) Cable Code i.e. 2XWa2Y (e) Number of cores & cable size e.g. 300 Sq mm (Cu) 1 core 400 Sq mm (Cu) 1 core 630 Sqmm (Cu) 1 core		
	Sequential length marking shall also be provided on outer sheath by hot foil or indelible printing.		

	Cable shall be supplied in returnable steel drums		
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**18.0 33 kV CABLE JOINTING KITS: SPECIFICATION OF CABLE KITS:**

The distribution system in which the cables along with the Straight through and end termination kits joints are expected to perform reliably over a period of 30-35 years, is a five phase, 3-wire System operating at 33 KV with solidly earthed neutral at the source neutral terminal with maximum possible continuous voltages being 36KV, and cable conductor temperatures up to 90°C on a continuous basis and This specification defines the requirements for 33KV Straight through and end termination kits jointing Cable Joints kits for underground 33 kV XLPE insulated power cables. The requirements cover the material properties of the components used in the Cable Joints as well as the performance of these products after installation on cables. Heat shrinkable components are based on polymeric materials and are to be supplied in an expanded state. Heating of these components to a temperature generally above 120°C would activate their elastic memory and cause these components to recover or shrink down on a substrate within a specific application range.

**Service Conditions:**

Under short circuit conditions up to 250°C.

The Service conditions include ambient temperatures range from -5°C to 50°C, height of installation up to 700 m above sea level, dusty, industrially polluted as environments, humidity levels up to 95% and heavy average rainfall of 600 mm (annually).

**18.1 GENERAL REQUIREMENTS**

All materials used and products provided under this specification must be in accordance with the standards listed below of this specification

**18.2 REFERENCES:**

1. Standard Number ESI-09-13- Performance Specification for high voltage, heat shrinkable components for use with high voltage solid cables up to an including 33,000 volts.
2. IS 13573 Type Test and Performance Requirements for cable Terminations and Joints on XLPE Cables from 6.6 KV to 33 KV ratings.
3. IEC 61238-1 : Compression and Mechanical Connectors for Power Cables with copper or aluminum conductors - Tests Materials and Requirements.

All materials components and products offered shall be of the latest designs, incorporating any improvements in materials and installation procedures knowledge of which has been gained through the manufacturers’ research or experience.

The jointing materials and components shall be offered in the form of kits. The kits shall be supplied complete with all necessary tubings components (mechanical connectors/ earthing/ cable preparation etc) to form a ready to energize joint / termination.

**18.3 QUALITY, ENVIRONMENTAL MANAGEMENT SYSTEM AND LABORATORY ACCREDITATION:**

The kits shall be offered from the factory having a valid ISO 9001:2000 Quality Management System(QMS) certificate for the goods offered. The goods shall include the shrinkable and moulded components, as well as connectors.

**Units of measurement**

In all correspondence, in all technical schedules and drawings metric units of measurement shall be used.

**18.4 PACKING AND MARKING**

The joint/termination kit shall be properly packed with all the shrinkable tubings, moulding components and connectors, lugs, other accessories as required to form a self contained kit. The packing shall be of such design as to prevent moisture and dust ingress

and shall also protect the contents against mechanical damage.

External packing shall carry a label with the following information clearly marked:

- Name of Manufacturer
- Manufacturers reference
- Year of Manufacture/ Purchase order No.
- Expiry date whenever applicable

The kits shall also include the following:

- a) Installation Instruction sheet manuals containing complete step by step instructions in the English language.
- b) A check list stating the quantities and description of components contained in the kit shall be supplied in each kit.

Each component of the kit shall be separately packed in polyethylene and component name/part number shall be marked on the polyethylene packing.

All materials and components comprising the kit shall be clearly and permanently marked in a prominent position with the supplier's/manufacturer's name, product identification, batch number and year of manufacture. The batch number shall allow for full traceability of manufacture including the new materials which make up the polymeric compounds used in extrusion and moulding processes. Extruded components (tubing and wrap-arounds) shall additionally be marked with their expanded and fully recovered internal diameter. They may alternatively be marked with the upper and lower diameters of their range of application.

Markings on extruded components shall be repeated along the length with gaps not exceeding 200mm. Components which cannot be marked shall have the above information provided on immediate packaging.

Packed kits shall be packed in carton boxes which shall be placed in wooden pallets in order to facilitate fork-lift handling.

### **18.5 STORAGE**

Components and kits shall be capable of being stored without deterioration in an ambient air temperature 5°C to 50°C when protected from direct sunlight.

### **Inspection and testing**

All materials covered by this Specification shall be subject to inspection and test by the Authority during manufacture and before final despatch from manufacturer's works. The approval of the Authority of any such inspection or test will not, however, prejudice the right of the Authority to reject the materials or any part thereof, if it does not comply with the specification when erected or does not give complete satisfaction in service. The contractor shall make available to the Authority for the inspection and testing all required personnel and offer facilities (equipment, testing instruments etc.) at no cost to the Authority. The Authority may, however, use his own instruments and apparatus as a check.

Before any part of the jointing materials is packed or despatched from the manufacturers works, all tests called for are to have been successfully and satisfactorily carried out in the presence of the Inspector and a certificate issued to that effect by the Inspector in writing.

Adequate notice is to be given when any part of the jointing materials is ready for inspection or test and every facility is to be provided by the Contractor and his sub-contractors to enable the Inspector to carry out the necessary inspection and witness the tests. Duplicate copies of all principal Test Records and Test Certificates are to be supplied to the Inspector for all tests carried out in accordance with the provisions of this specification.

The jointing materials and all component parts thereof are to be fully tested in accordance with the provisions of the latest relevant standards as stated in paragraph 2.0 of this Specification or as may be agreed in writing with the Inspector. Test Certificates are to be forwarded to the Purchaser together with the invoices.

### **Guarantee.**

**The Straight through and end termination kits jointing kits shall be guaranteed for five years form the date of supply.**

#### **18.6 SAMPLES**

Bidders are required to submit with their BIDs two No's samples of the kits offered as to be delivered in case of order. The kits shall include the installation instructions.

BIDs without samples shall not be considered. The samples shall be returned to the Bidders, after the award, at their own expenses.

#### **18.7 TRAINING**

Bidders are required to provide training for OPTCL staff and also to the available outsourced cable jointers for at least 10 man days in phase wise over the period of the contract, at dates that will be decided at a later stage. All expenses i.e trainers wages, living expenses. Training materials i.e cables and jointing materials shall be provided by shall be covered by the Bidder.

#### **18.8 TECHNICAL REQUIREMENTS**

The technical requirements described below refer to heat shrinkable, elastic and moulded products (separable connectors).

#### **18.9 DESIGN AND TECHNOLOGY**

Product design shall be based on the use of heat-shrinkable or elastic tubings and moulded parts to provide for the functions of high voltage insulation, electrical stress control, electrical screening, sealing and environmental protection as necessary. The use of tapes to provide primary insulation, screening or primary stress control is not acceptable.

BIDers shall submit evidence with their BIDs that designs are based on sound engineering principles, accumulated know-how and satisfactory service experience.

Design shall aim at minimizing the number of component parts and the time and skill required for satisfactory installation.

For joints single anti tracking tube design is required, which shall provide both anti tracking and stress control grading.

Anti-track and weather-resistant tubing shall be used in outdoor Straight through and end termination kits kits in all positions where the material surface is subject to electrical stress. Mastics or adhesives used as sealants for these tubings must be similarly anti-track and weather-resistant.

All necessary sealants shall be provided pre-coated on the internal surfaces of tubings and moulded parts. Sealant surfaces shall be protected by release paper as necessary.

Screening of conductor connectors shall be achieved with *single* co-extruded dual wall tubing/Trippl wall tubing comprising an inner insulating layer and an outer conducting layer. Separate or additional insulating and conducting tubings are not acceptable. The insulating layer shall provide an insulation thickness at least 30% more than the cable insulation.

#### **18.10 LUGS AND CONNECTORS**

##### **Mechanical shear bolt type**

Mechanical shear bolt type connectors shall be used as follows:

They shall have the following characteristics/features:

- (i) They shall be in accordance with EN 61238-1.
- (v) Connectors shall be of the water block type, and the shear bolt heads to be hexagonal.
- (vi) Lugs on aluminium cores shall be provided with oxidation inhibiting compound, or any other approved means for inhibiting oxidation.
- (vii) Bolts of the shear bolt type shall be suitable for M12 bolt

##### **Installation Instructions**

Detailed installation instructions with drawings for all joints and terminations offered, including all parts, shall be provided with the BID documents in English language.

The successful BIDer shall provide installation instructions in English language.



### **Component types**

For heat shrinkable materials:

(i) The tubing components (such as internal insulating tubing, stress control tubing, anti-track tubing, external protective tubing) shall conform to the requirements given of EA TS 09

The moulded components shall conform to the requirements given in List 2 of EA TS 09-13.

(ii) The sealants shall conform to the requirements given in List 3 of EA TS 09-13 and EA TS 09-11.

### **Specific requirements for components**

Electric stress control for the cable insulation screen ends and over the connectors shall be achieved by tubings.

The stress control material shall have defined impedance characteristic, volume resistivity, and permittivity (dielectric constant). The AC impedance shall remain constant despite of thermal ageing, which will take place due to heating effect within the conductor and the temperature of the environment.

### **Non tracking erosion and weather resistant, insulating tubing and moulded parts**

Bidders must provide proof of weather and track resistance of the polymeric material offered, through actual field studies or through accelerated laboratory studies, to confirm a minimum of 30 years expectancy.

This should include:

- (i) Thermal Endurance - An Arrhenius plot to confirm the life expectancy on continuous exposure at 90° C.
- (ii) Tracking and Erosion Resistance Test to prove the withstand ability against effects of surface electrical leakage currents.
- (iii) Weathering Data properties.

### **Track Resistant Sealant is (Insulating and Weather Resistant)**

Sealing of the interfaces between components subject to electrical stress shall be achieved by using a track resistant sealant or a hot melt adhesive. This sealant/adhesive shall be pre-coated inside the shrinkable components. **Bidders must provide the following information:**

- (a) The adhesive peel strength the sealant provides between Non tracking tubing and non tracking moulded part.
- (b) The dielectric strength, tracking and erosion resistance of the sealant as per ASTM D2303.

### **Triple wall co, extruded Tubing**

(a) The Triple wall tubings are manufactured by means of co extrusion.

Further the Bidder shall have

- Proof of accelerated laboratory and long term field usage to confirm the retention of key properties within permissible limits due to thermal ageing. Minimum key properties before and after ageing to be stated.
- Confirmation of the minimum thickness of insulation provided over the connector for the maximum size of conductor for which the tubing is supplied.

The insulation layer shall provide an insulation thickness at least 30% more than the cable insulation.

### **Void Filling, Stress Relieving Mastic**

Bidders must submit:

(a) Data of the stress relieving mastic, which should include information on the volume resistivity, and permittivity.

The mastic shall provide a void free interface between the stress control layer and the cable insulation as well as the connector and Proof of long term usage in the field to confirm satisfactory performance.

### **Specific Requirements for Joints.**

### **General requirements for joints.**

External leakage insulation between the live conductor and earth potential using anti-track and weather resistant material.

Electrical stress control using electrical stress control material over the cores.

Hermetic sealing of the interfaces between the cable accessory and cable surfaces, bushings or cable lugs by use of track resistant adhesive/sealant.

Detail technical characteristics wrap around sleeve if offered must be provided.

Outdoor termination kits shall provide means for protecting the exposed insulation of the conductors from UV radiation.

### **18.11 TESTS**

#### **Type Tests on Components**

1. The Bidder shall submit with the BID documents test certificates tested not more than 5 years to prove that shrinkable or elastic or moulded components connectors used for cable joints and termination kits comply with the performance specification as indicated IS 13573 1992 with latest amendments and EATS 09-13. Test certificates shall be submitted with the BID documents.

#### **Routine Tests on Components**

Bidders must submit with their BIDs routine tests certificates as per the requirements of EA TS 09-11 and EA TS 09-13.

In addition, during the acceptance testing of the first and any other subsequent consignment, components will be randomly selected by the Inspector from jointing kits and will be subjected to the following routine and type tests, at CPRI.

The cost of testing shall be inclusive of all tests specified at CPRI in the bid cost. Visual examination

- a) Dimension
- b) Flame Retardance
- c) Packing and markings.

#### **Type Tests on 33 kV Straight through and end termination kits kit**

The Bidders are required to submit with their BIDs the type test certificates mentioned in the following paragraphs, for Straight through and end termination kits kit

#### **Bidders must submit**

2. Test certificates certified by CPRI or any international recognized testing laboratory as per IS 13573 1992 with latest amendments not more than 5 years..
3. Test certificates certified by CPRI or any international recognized testing laboratory as per EATS 09-13 not more than 5 years.
4. Test certificate as per IEC 61238-1 from CPRI or any international recognized Mechanical Connectors testing laboratory not more than 5 years.
5. Documentary evidence including graphs showing the effects of temperature and thermal ageing on the impedance of the stress control material offered.
- 4 A technical explanation as to how the correct electrical properties of the material Vs volume resistivity, permittivity and AC impedance, have been derived
- 5 The recommended lengths of the stress control material.
- 6 Proof of accelerated laboratory and long term field usage to confirm the retention of the properties within permissible limits under variations of temperature and thermal ageing
- 7 Full set of dimensioned drawings including installation instructions
- 8 Transport, storage and installation requirements
- 9 Acceptance letter of two samples to be submitted

### **18.12 GUARANTEED TECHNICAL PARTICULARS FOR ACCESSORIES:**

#### **Outdoor type Cable end Termination (Sealing End) With unicon tube**



<b>Class of Power Cables</b>		
1	Manufacturer's Name	
2	Country of Manufacture	
3	Class and Type	
4	No. of years the design is in commercial use	
5	Rated Voltage kV	
6	Total Creepage distance (mm)	
7	Maximum conductor size, Al (sq.mm)	
8	Details of terminal connectors	
9	Power frequency voltage 1 min. (kV rms) dry withstand test	
10	Power frequency voltage wet with stand voltage KV & duration	
11	Power frequency voltage 6 H Dry withstand voltage Kv. Rms.	
12	Radio interference voltage (R.I.V) Test (Micro Volts)	
13	Practical discharge (corona) extinction test :	
	a) Extinction voltage Kv rms	
	b) Minimum detector sensitivity PC	
14	Impulse voltage Lightning voltage Dry with stand kV (Crest)	
15	Direct voltage 15 Min. Dry with stand KV	
16	Description of materials used in the terminations with electrical & mechanical particulars	
17	Mounting Structure Details for termination	
18	Electrical & Mechanical Particulars of	
	a) Heat Shrinkable Tubing	
	b) Heat Shrinkable Moulded parts	
	c) Heat Shrinkable adhesives / sealents	
19	Type tested to (standard(s))	
20	Other details	
20.1	Please enclose complete Technical literature	
20.2	Comply with IS	
20.3	Comply with EATS/ESI	
20.4	Comply with IEC	
20.5	Type test report	
20.6	All Drawings	

### **19.0 INSTALLATIOIN OF 33 kV U.G. CABLES:**

### 19.1 SYSTEM PARTICULARS:

Nominal system voltage	33 kV
Highest system voltage	36.3 kV
Maximum permissible one phase System voltage (both cores insulated)	42 kV
Maximum permissible one phase System voltage (one core earthed)	21 kV
Number of phases	3
Frequency	50 Hz
Method of grounding	Solidly Earthed
Total relay and breaker operation time	15 to 20 cycles
Basic impulse level	170 KVp

### 19.2 METHOD OF LAYING:

19.2.1 This involves digging a trench in the ground in all types of soils including laterite and rock and laying cable(s) on a bedding of minimum 75-mm sand at the bottom of the trench, and covering with additional sand of minimum 75-mm and protecting it by means of tiles, bricks or slabs. The desired minimum depth of laying from ground surface to the top of the cable shall not be less than 1.2-m. At railway crossings the same shall be measured from bottom of sleepers to the top of pipe.

19.2.2 The desired minimum clearances are as follows:

Power cable to power cable: Clearance not necessary; however, larger the clearance, better would be current carrying capacity.

Power cable to control cables: 0.2-m

Power cable to communication cable: 0.3-m

Power cable to gas/water main: 0.3-m

19.2.3 RCC Hume pipes or earthenware/stoneware pipes depending on the crossing and load should be used where cables cross roads and railway tracks depending on the requirement, and at each particular location either RCC Hume pipes or stoneware pipes shall be used as directed by the Owner's representative. Spare ducts/pipes for future extension should be provided as per the directions of OPTCL. Such spare ducts/pipes shall be sealed off. The inner diameter of the ducts/pipes shall not be less than 225 mm. The ducts/pipes shall be mechanically strong to withstand forces due to heavy traffic when they are laid across the roads/railway tracks.

19.2.4 The power cable should not be laid above the telecommunication cable, to avoid danger to the life of the person, digging to attend to the fault in telecommunication cable. For identification of power cables, the cable protective cover, such as bricks or RCC slabs shall be marked as "OPTCL". The likely interference to the existing telecommunication cables should be avoided by referring to and coordinating with the appropriate telecommunication authorities.

### 19.3 ROUTE PLANS:

Tentative cable route plans will be furnished to the contractors, indicating the roads, position of substations and road crossings. The exact route survey and alignment will be decided on evaluating the findings by excavating trial holes by the contractor / subcontractor. The work should be taken upon only after OPTCL's Engineers approve the final route. The OPTCL reserves the right to change, alter deviate the route on technical

reasons. It is the responsibility of the contractor to conduct necessary detailed route survey and submit of proposals to the owner for approval.

#### **19.4 TRIAL HOLES:**

The Bidder shall excavate trial holes, for alignment purpose at appropriate distance apart as warranted by the local conditions, keep a record of the findings and close the trial holes properly to avoid hindrance / accidents to pedestrian traffic. The final route / alignment of the cable shall be decided based on the finding of the trial holes.

It is the responsibility of the bidder to maintain as far as possible the required statutory clearances from other utility services.

Any damage caused, inadvertently to any utility services shall be set right & it is the sole responsibility of the contractor to do the same to the satisfaction of the concerned utility.

#### **19.5 LAYING OF CABLES:**

The contractor shall excavate the cable trench using manual and mechanical modes. An air compressor driven pneumatic drill or equivalent mechanical excavating tool will be essential if the crossing is to be made with minimum delay. Where paved footpaths are to be dug to excavate the cable trench, care must be taken to carefully remove the pavement slabs and store them properly and relay them properly after the work is completed.

The contractor shall take all precautions while excavating the trench to protect the public / private property and to avoid any accidental damage. Any accidental damage should immediately be reported to the concerned utility.

The contractor is liable to pay for all damages caused by his workmen. The sides of the excavated trench shall, wherever necessary be well shored up with timber and sheeting and use of danger boards wherever required. The depth of the cable trench shall be 1.2 m.

The width shall be sufficient for easy handling of the cables during the laying operations depending upon the method of laying employed. For road crossings and railway crossings the same shall be 1.0 m. At other places the width varies from 0.45m to 1.0 m depending on number of cables to be laid in the trench.

The excavated material shall be properly stored to avoid obstruction. The bottom of the excavated trench should be carefully leveled and freed from pebbles / stones. Any gradient encountered shall be gradual.

There is a likelihood of a situation demanding that more than one cable is required to be run in the same trench. The contractors shall agree to increase the width of the trench to accommodate more than one cable.

The arrangement of cable trench duly indicating the position of cable, sand cushion, back fill and concrete finishing shall be as per sketch enclosed. It should be noted that the excavation required for laying the cable shall be finished accordingly by providing the sand cushion, back fill etc.

#### **19.6 PAVING OUT OF THE CABLE:**

The pulling shall be done by hand and in such a manner as to provide good bedding for the protective cable covers like tiles or bricks. The maximum permissible pulling force on XLPE armored cables shall not exceed  $P = 9 D^2$  Newton where P is the pulling force in Newton and D is the outer diameter of the cables in mm. However the normal values of pulling force shall be around 15 to 20 percent of this force when laid in trenches, 20 to 40 percent with one or two 90 degree bends in trenches, 50 to 60 percent when the bends are 3 or more. The cables shall have a minimum of 0.3-m clearance from the communication cables or water supply mains whenever they are encountered.

The excavated cable trench shall be drained of all water and bed surface shall be smooth, uniform and fairly hard before laying out the cable. The cable shall be pulled in the trench only on cable rollers spaced out at uniform intervals to prevent damage to cable.

The laying out process shall be smooth and steady, without subjecting the cable to abnormal tension. The cable laid out shall be smoothly and evenly transferred to the ground after providing sand cushion and shall never be dropped. All snake bends in the cable shall be straightened out.

#### **19.7 FLAKING:**

Wherever it is not possible to lay off the entire cable drum length, the cable should be cut and properly sealed and if it is necessary to remove the cable from the drum, it should be properly flaked, in the form of figure 8. Such cable lengths should be properly stored at site.

#### **19.8 SAND CUSHION:**

When the cable has been properly straightened the trench shall be covered with 75mm thick layer of good quality clean sand cushion. Then the cable shall be lifted and placed over the sand cushion. Again, another layer of sand 75mm thick should be laid and gently pulled on to the top of the cable to form a depth of 75mm from the top of the cable. The minimum envelope cushion around the cable shall not be less than 150 mm.

#### **19.9 CABLE COVERING TILES:**

The earthen ware cable covers / tiles shall be of burnt clay and so made and fired that they shall be true in shape, well burnt in kilns throughout and free from detrimental cracks. Except for the interlocking features straight covers shall be rectangular in plan with the underside flat.

The size of RCC covers should be 250mm long x 350mm wide. The thickness at the outer edge should be 50mm. The average breaking load shall be not less than 135Kg. The tiles should be laid side-by-side without any gap in between.

#### **19.10 PREVENTION OF DAMAGE DUE TO SHARP EDGES:**

After the cable has been laid in the trench and until the cable is covered with its protective covering, no sharp metal tool shall be used in the trench or placed in such a position that may fall into the trench.

Rollers used during laying of the cables shall have no sharp projecting parts liable to damage the cables.

While pulling cable through Hume pipes/stoneware pipes/G.I. pipes/M.S. pipes, the cable shall be protected to avoid damage due to sharp edges.

**Warning tape:**

A pre warning, Red color plastic / PVC tape, 250 mm wide 150 microns thick, two runs shall be laid at approximate 500mm above the cable specified depth, throughout the Trenched cable route. The tape shall carry the legend printed in black continuously as under

**CAUTION / OPTCL / 33 KV CABLES ARE BELOW.** With a 'SKULL AND BONE' Signs

The cables shall never be bent, beyond the specified bending radius

**19.11 CABLES OVER BRIDGES:**

Wherever the cable route crosses bridges the cable shall be laid in the ducts, if provided, by removing and replacing the R.C.C. covers and filled with sand cushion.

In the absence of the cable ducts over bridges, the cable shall be laid in suitable size RCC/steel/G.I. pipes or as directed by the engineer In-charge and the pipe covered by cement concrete if necessary to protect from direct sunrays and Masonry/RCC supports at suitable intervals, wherever required as decided by the Engineer in charge and/or stipulations of concerned Highway/Railway/local authorities.

**19.12 CABLE CROSSING OPEN DRAINS WITH LONG SPAN:**

Wherever the cable has to cross open drains, with a long span, the cable shall be laid in suitable size RCC closed duct/GI pipe/ hume pipe properly jointed with suitable collars. The GI pipe/hume pipe shall be firmly supported on pillars, columns, or suitable support of R.C.C. foundation & walls in CC 1:1½ : 3 to the required depth & width as required at site and directions & drawings as per technical specifications & procedures of PWD.

Wherever the U.G. cable has to cross the sewerage or water supply line the U.G. cable has to be taken below them maintaining adequate clearance. Further wherever the U.G. cable runs parallel to the telephone cable a separation distance of at east 300-mm shall be maintained. The cable should be taken inside Hume Pipes wherever required.

The cables shall be laid in Hume pipes/stoneware pipe wherever the cable and trench crosses private roads, gates, etc. In order to avoid inconvenience the stoneware pipe should be laid first after excavation and excavated trench shall be back filled, compacted and surface properly redone to restore that original condition.

**19.13 ROAD CROSSINGS:**

The road cutting whether cement concrete, asphalt or macadam road shall be taken after obtaining approval from civic authorities, Police, Telecom authorities and work should be planned to be completed in the shortest possible time. Where necessary the work shall be planned for night time or light traffic time. . In the excavated trench across the road the GI pipe or hume pipe (NP3 class) of appropriate size shall be laid, excavation back filled compacted and surface shall be redone in shortest time to allow the traffic on the road.

**19.14 FOOTPATH CUTTING:**

The pavement slabs shall be removed, neatly stacked on side before starting excavation.

### **19.15 REINSTATMENT:**

After the cables and /or pipes have been laid and before the trench is filled in all joints and cable positions should be carefully plotted and preserved till such time the cable is energized and taken over by the engineer in charge. The requisite protective covering will then be provided, the excavated soil replaced after removing large stones and well rammed in successive layers of not more than 20cm in depth, where necessary the trench being watered to improve consolidation. It is advisable to leave a crown of earth not less than 50 mm and not more than 100 mm in the center and tapering towards the sides of the trench.

The temporary reinstatement of roadways should be inspected at regular intervals, more frequently during the wet weather and immediately after overnight rain. If trench is to be closed overnight and settlement should be made good by further filling to the extent required, such temporary reinstatement should then be left for a time so that soil thoroughly settles down.

After the subsistence has ceased the trench may be permanently reinstated and the surface restored to the best possible condition.

### **19.16 CIVIL AND STRUCTURAL WORKS:**

#### **The scope of civil works include:**

- (a) Earth excavation and cable laying, removal of excavated earth, design, supply and provide plain and / or reinforced cement concrete for the cable trenches, back filling, de-watering of trenches. The surplus earth should be disposed off suitably at all leads/lifts. Excavation should be done in all types of soils laterite or rock either manually or using machines as per site requirements & instructions.
- (b) The design of cable duct/pipe ducts for crossing drains, roads, Railways, Highways, canals etc., shall be suitably done and rates quoted shall include complete supplies and erection as per relevant schedules. The Masonry work / concrete work should be done as per standard PWD practices and specifications & instructions of engineer-in-charge.
- (c) Design, fabrication, supply & erection of galvanized steel structures for cable end terminations.
- (d) Supply of all consumables and sundry materials not included in the specifications in detail but are necessary to meet the intent of the project.

Codes and standards: Unless otherwise stated, latest editions of the following standards are applicable.

- 1) IS: 1255: Installation and maintenance of power Cable.
- 2) IS : 5820: Specification for pre-cast concrete cable cover.
- 3) IS : 209 : Quality of zinc for galvanizing.
- 4) IS : 2062 : Structural steel.
- 5) IS : 456 : Plain and reinforced cement concrete.
- 6) IS : 800 : Use of structural steel in general building construction.
- 7) IS : 2016 : Plain washers
- 8) IS : 2633: Zinc coating on galvanized steel.
- 9) IS : 3063 : Spring washers.
- 10) IS : 5358: Hot Dip Galvanized coating on fasteners.
- 11) IS : 6639 : Hexagonal bolts for steel structures.



12) Any other equivalent International/ National standard

19.17 Excavation and measurement in hard rock: Blasting in hard rock shall be done as per IS: 4081 (latest edition). The hard rock excavated shall be stacked, measured and reduced by 40% for voids. Pre-measurement of rock is to be recorded when measured on section. The quantity whichever is less shall be paid.

19.18 Back, filling materials: The back filling of excavated trenches around foundation, shall consist of one of the following materials as the Engineer-in-charge may direct in each location.

- i. Selected sieved earth from excavated soil.
- ii. Selected sieved earth brought from borrow area
- iii. Sand filling (sieved).

**NOTE:** Sieved sand shall be strictly used for all the works.

Filling shall be done after the work of laying cables and providing sand cushion is completed. The contractor shall commence concrete finish only after the proper reinstatement and approved by the Engineer-in-charge.

19.19 Back filling for cable trench: Back filling shall be done in horizontal layers of thickness not exceeding 300-mm thickness, free from pockets with careful watering where necessary for compaction. The backfill earth shall be riddled free from materials likely to cause damage to the cables. The thermal backfill surrounding the cable shall be as per the design approved by the owner. Surplus available/ New earth after refilling should be disposed off to a place away from site at all leads & lifts.

#### **19.20 Cable route markers/joint markers:**

Permanent and durable type, cable route markers/joint indicating blocks should be provided as per the design supplied by the purchaser. The cement concrete shall consist of one part cement, two parts sand, four parts aggregate of size 20 mm and down. The finishing should be given a smooth cover surface of cement mortar and shall have the appropriate legends, 5 mm deep engraved on them as "OPTCL 33 KV CABLE", or "OPTCL 33 KV CABLE JOINT" as the case may be. Markers shall be of size 700x240x75mm thick RCC and fixed in cement concrete at top of cable trench at 250mts distances.

19.21 Pipes: Hume pipes and accessories conforming to the relevant Indian standard specifications shall be used wherever required. All sundry materials like coupling, collars, caps to cover the pipe ends before cable is pulled in shall be provided. Stoneware pipes, shall be of good quality, salt glazed and approved by the Owner's representative. Hume pipes, stoneware pipes, can also be used where the cable passes through the passage or driveways of public and private buildings as per the directions of the Owner's representative for each particular location. The size of the pipe shall be at least 225 MM. The pipe joint shall be done by using proper sleeves so as to get tight fitting. Suitable steel rope will be drawn in pipe to pull the cable. Before drawing the cable, wire brush to be drawn through pipe to clean the burrs and steel ball (sphere) shall be pushed through pipe to know whether pipe is smooth for drawing the cable. G.I pipes of suitable size shall be used wherever required as per site requirement G.I pipes shall be of "B" grade.

**19.22 SAND:** The sand used for filling should be sieved, free from pebbles and approved quality. Only river sand should be used. The depth & width of sand filling should correspond to the details shown in the drawing.

**19.23 RCC Work:** RCC work required for supports to hume pipe /G.I. Pipes & others shall be of required size and depth constructed as per PWD specifications. The foundations should be of RCC as per design and drawing ( to be furnished by the bidder) and got approved. Care to be taken to divert/bailout water wherever necessary during constructions. All RCC work should be of 1:1½ :3 proportion. The surface of supporting wall should be neatly plastered and finished suitable clamps should be provided for holding the pipes in position.

19.24 **CONCRETE:** All plain concrete/RCC provided should correspond to relevant IS codes. Concrete mixing should be done with machines. Curing should be as per codal requirements. All plain concrete should of 1:2:4 proportions. Before laying concrete at top of cable trenches, the back fill earth should be thoroughly compacted with water. The Concrete should be compacted and nearly finished to correspond to the road level.

19.25 Precast RCC slabs/ or interlocking stones for cable protection at top shall be provided as per drawing and design with wedge shaped notches on one side and protruding wedges on the other to facility interlocking and placing RCC shall be of M20 grade and shall be provided in stretches of concrete roads and such others reaches specified and decided during execution. Interlocking stones of approved quality should be provided wherever instructed.

#### **19.26 CABLE AND JOINT MARKERS:**

Permanent means of indicating the positions of joints on site should be provided. During the course of permanent reinstatement cable and joint markers, should be laid directly above the route of the cable and the position of the joint respectively.

Wherever it is not possible to place the marker directly over the cable route or the joint, the marker should be suitably placed near the cable route or joint on which the distance of the cable route or joint at right angles to and parallel to the marker should be clearly indicated.

The position of fixing the markers will be at the discretion of the Engineer In-charge.

#### **19.27 JOINTING OF CABLES:**

**GENERAL:** It shall be noted that the U.G. cables are of XLPE insulation and needs special care in jointing. The cable jointer and his assistant shall have experience in making joints/terminations. Jointing work should commence as soon as two or three lengths of cables have been laid. All care should be taken to protect the factory-plumbed cap/seal by laying the end solid in bitumen until such time as the jointing is commenced.

Jointing of cables in carriage ways, drives, under costly paving, under concrete or asphalt surfaces and in proximity to telephone cables and water mains, should be avoided whenever possible.

**JOINT PITS:** The joint pits should be of sufficient dimensions as to allow jointers to work with as much freedom of movement and comfort as possible. The depth of the pit should be at least 0.3-m below the cables proposed to be jointed. The sides of the pit should be draped with tarpaulin sheet to prevent loose earth from falling on the joint during the course of making. The pit should be well shored with timber, if necessary. An overlap of about 1.0-m of the cables to be jointed may be kept, for allowance to adjust the position of the joint. When two or more cables are laid together the joints shall be arranged to be



staggered by 2 to 2.5 m.

**SUMP PITS:** When jointing cables in water logged ground or under monsoon conditions, a sump pit should be excavated at one end of the joint pit in such a position so that the accumulating water can be pumped or baled out by buckets without causing interference to the jointing operation.

**TENTS:** A tent should be used in all circumstances wherever jointing work is carried out in the open irrespective of the weather conditions. The tent should be so covered as to have only one entrance and the back facing the direction of the wind. The tent cover should be properly weighted or tied down on the sides.

**19.28 PRECAUTIONS BEFORE MAKING A JOINT OR CUTTING A CABLE:** The cable end seals should not be opened until all necessary precautions have been taken to prevent circumstances arising out of rainy/inclement weather conditions, which might become uncontrollable. The cable seals should be examined to ascertain if they are intact and also that the cable ends are not damaged. If the seals are found **broken or the lead** sheath punctured, the cable ends should not be jointed until after due examination and testing by the engineer in charge of the work.

**MEASUREMENT OF INSULATION RESISTANCE:** Before jointing is commenced the insulation resistance of both sections of the cable to be jointed should be checked by insulation resistance testing instrument. An insulation resistance-testing instrument of 2.5/5 kV shall be used. The insulation resistance values, between phases and phase to earth shall be recorded. The actual jointing operation shall start only after the approval of the engineer in charge of works.

**PRECAUTIONS TO BE TAKEN ON LIVE CABLES IN SERVICE:** Sometimes it becomes necessary that a H.V. cable, which is in service, be cut for making a straight joint with a new cable. In such cases work on joint should start only after the in service cable is properly identified, isolated, discharged, tested and effectively earthed. Search coils, interrupters or cable-identifying instruments should be used for this purpose.

**IDENTIFICATION NUMBERS / COLORS AND PHASING:** The cables should be laid and jointed number to number or color to color shown on the core identifying marks and prevent cross jointing. In all cases, the cables should be tested and phased out, and more particularly so when the cable terminates at Ring Main Unit/Sub-Station.

**MAKING A JOINT:** The Heat shrinkable joints used shall conform to the specification vide Annex 2. The contractor should furnish all the technical particulars of these joints and obtain approval only in case they are found superior to the heat shrinkable joints. Epoxy based joints are not permitted. Comprehensive jointing instructions obtained from the manufacturer of joint kits shall be meticulously followed. The connection of the earth wires should be done using flexible bonds connected to cable sheath using clips or soldering. Aluminum conductor strands shall be joined by mechanical compression method, using suitable die and sleeve with a good quality tool. The joints shall conform to specification as per IS 13573.

**TRANSITION JOINTS:** Wherever straight through joints will have to be made with existing cables under the following conditions the contractor shall arrange such type of joints and execute them with skilled jointers:

- (1) Between cables having two different types of insulation viz., paper and XLPE.
- (2) Between cables having two different types of conductor material, viz., copper and aluminum.

(3) Or a combination of the above.

The transition joints shall conform to IS: 13705 - Transition joints for cables for working voltages from 11 kV up to and including 33 KV \_ performance requirements and type tests.

**19.29 CABLE TERMINATIONS:** Cable terminations required are both indoor and outdoor type and invariably be of heat shrinkable type conforming to the specifications vide Annex 2. All the technical particulars to establish the superiority in the performance of these joints shall be furnished while seeking approval. The terminations shall conform to specifications as per IS: 13573. The instructions furnished by the manufacturer of termination boxes/kits should strictly be followed.3

Wherever a cable rises from the trench to end in a termination, to be finally connected to an overhead line or a transformer, the following instructions should be complied with:

- i) One coil to be made and left in the ground for future needs.
- ii) The rise of cable, immediately from the ground level should be enclosed in suitable diameter GI pipe to a height of 2 m.
- iii) The balance portion of the cable should be neatly curved, in 'S' shape.
- iv) The cable and pipe should be properly fastened by using appropriate clamps/support. The hardware of clamps shall be painted with red oxide and enamel paint or galvanized.
- v) The lugs on the termination shall be compressed with a suitable compression tool.

#### **EARTHING AND BONDING:**

The metal sheath and Armor should be efficiently bonded and earthed at all terminals to earth electrodes provided. The cross sectional area of the bond shall be such that the resistance of each bond connection shall not exceed the combined resistance of an equal length of the metal sheath and Armor of the cable.

#### **19.29 TESTING BEFORE AND AFTER LAYING AND JOINTING:**

All new cables should be tested for insulation resistance before jointing with a 2.5 kV megger. After satisfactory results are obtained cable jointing and termination work should commence. Records of this shall be maintained.

All cables after laying and jointing works are completed should be tested systematically and insulation and pressure tests should be made on all underground cables.

All test results should be recorded in tabular form in logbooks kept for the purpose.

The cable cores should be tested for: -

- i) Continuity;
- ii) Absence of cross phasing;
- iii) Insulation resistance to earth; Insulation resistance between conductors.
- iv) Conductor Resistance (dc) measured with a suitable bridge.
- v) Capacitance. Using Capacitance Bridge.
- vi) Sheath integrity test

#### **19.30 H.V. TESTS:**

After the laying and jointing work is completed, a high voltage test should be applied to the cable to ensure that the cable has not been damaged during or after the laying operations and there is no defect in the jointing.

The high voltage tests should be as per IS 1255 or as per international standards. The H.V. testing instruments shall be brought by the bidder. The dc test voltage to be applied after installation and before commissioning between any conductor and metallic sheath/screen/armor shall be 60 kV.

#### **19.31 TESTING AND RECORD OF CABLE CONSTANTS:**

When the cable is ready, just before commissioning, the cable constants, viz., the resistance, capacitance and inductance of each conductor should be determined and recorded, along with frequency at which the values of capacitance and inductance are determined.

#### **19.32 GUARANTEE:**

All cable joints/termination done by the contractor shall be guaranteed for 24 months from the date of energization of the complete cable. In the event of failure during the guarantee period, the restoration work shall be done free of cost by the contractor within 24 hours of giving notice or else the expenditure incurred by OPTCL to re-do the joint/termination will be recovered from the performance guarantee amount with the OPTCL. (See Performance guarantee clause in special Conditions of contract.)

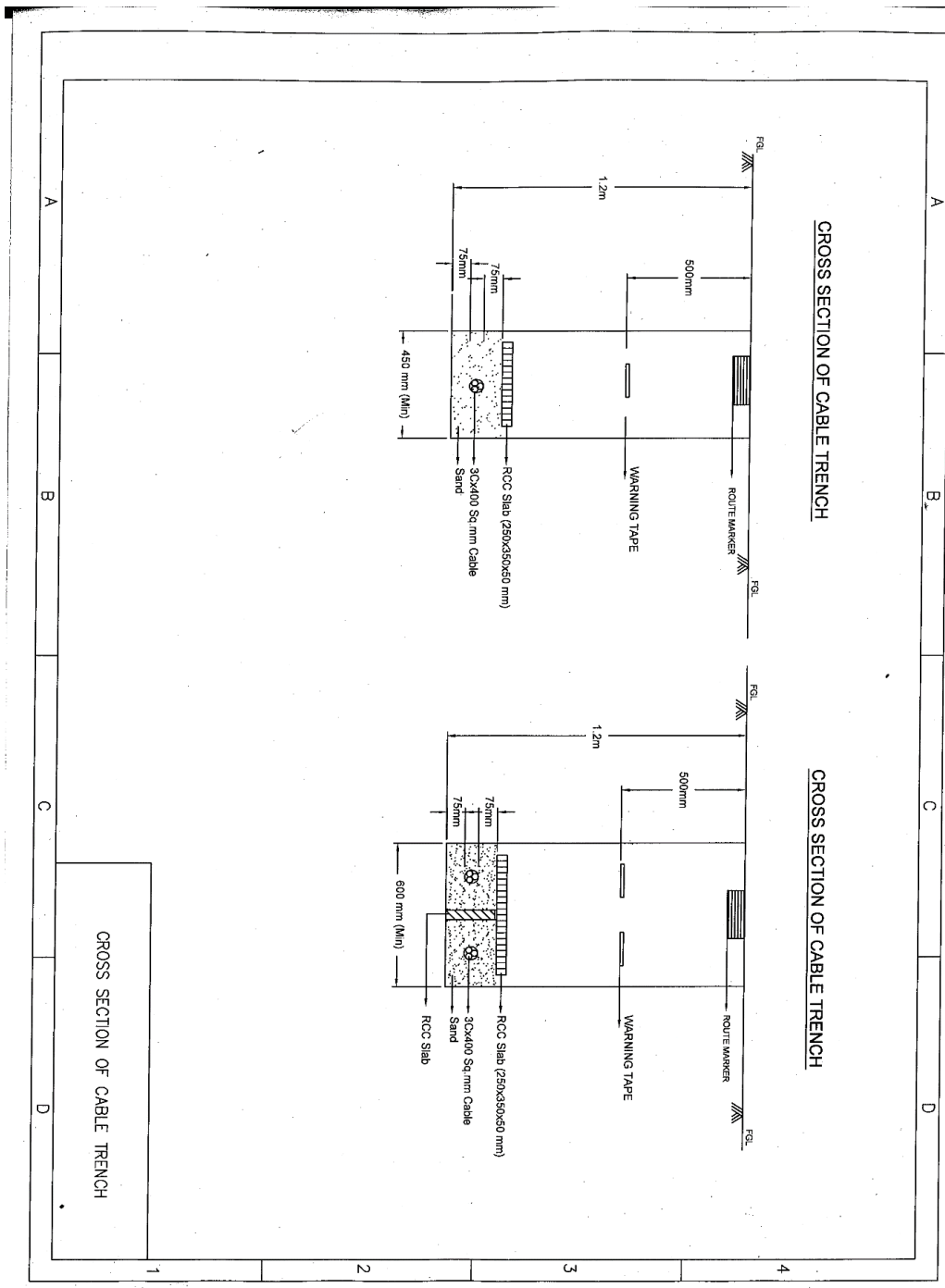
#### **19.33 CABLE RECORDS:**

Accurate neat plans/sketches, drawn to suitable scale (1 cm = 10M) should be prepared and furnished by the contractor after the completion of each work.

All relevant information should be collected at site, during the progress of work and preserved for preparation of drawings.

The following essential data should be incorporated on all drawings.

- a) Size, type of cable or cables.
- b) Location of the cable in relation to prominent land mark property. Kerb-line, etc., with depths.
- c) The cross section showing where cables are laid in pipes or ducts, giving their sizes, type and depths.
- d) Position and type of all joints.
- e) Location of other cables which run alongside or across the cable route.
- f) Position and depths of all pipes, ducts, etc., which are met as obstruction to the cable route.
- g) Accurate lengths from joint to joint and
- h) Manufacturers name and drum number of the cable, between sections/joint to joint.
- i) Year and month of laying



**B) TECHNICAL SPECIFICATION FOR 132 kV XLPE (CROSS LINKED POLYETHYLENE) INSULATED POWER CABLE:**

**1.1 SCOPE**

1.1.1 The scope under this section covers design, manufacturer, testing, packing, supply, delivery and laying of 132kV XLPE, insulated power cable including integrated testing and commissioning, technical support, supervision of maintenance, training of Employer’s staff and documentation for a complete System necessary to deliver the requirements of this Specification.

**1.2 STANDARDS:**

Unless otherwise specified, the cables shall conform, in all respects, to IEC-60840 and

IS:7098 (Part-III)/1993 with latest amendment or latest edition for cross linked polyethylene insulated PVC sheathed cable for working voltage of 132 kV. The following standard specifications of latest version updated to as on date of opening of this bid document will govern supply, laying testing and commissioning of cables and their accessories that are being used in this Contract. In case of conflict between such codes and/ or standards and the specification, the specifications shall govern.

<b>Sr. No</b>	<b>Title of Specification</b>	<b>Specification No.</b>
1	Cross linked polyethylene insulated Thermoplastic sheathed cables	IEC: 60502-2 IEC: 60840, IEC: 62067
2	Conductors for insulated cables.	IEC : 60228
3	Test on cable over Sheath which have a special protective function and are applied by extrusion	IEC 60229
4	HDPE pipes	BIS 4984
5	Power cables with extruded insulation and their accessories for rated voltage above 30 kV and up to 150 kV- Test Methods & requirements	IEC 60840
6	Power Cables with extruded insulation and their accessories for rated voltages above 150kV.	IEC: 62067
7	Impulse test on cables & their accessories.	IEC 60230
8	Cyclic and emergency rating of cable	IEC 60852-2
9	Common test methods for insulating and sheathing material of electrical cables.	IEC 60811
10	Electric test methods for Electric cables – Test methods for Partial Discharge measurements on lengths of extruded power cables.	IEC 60885

### **1.3 PRINCIPAL PARAMETERS:**

1.3.1 132 KV (E) grade XLPE single core power cable conductor electrolytic grade copper of single length, with formation of stranded compacted circular water blocked conductor for size up to 630/800/1000 Sqmm and segmental type for size above 1000mm<sup>2</sup> as per IEC-60228, tapped with high penetration resistant semi conducting water blocking tape, shielded with extruded semi-conducting layer, insulated with dry gas cured cross linked polyethylene (XLPE) insulation, insulation screened with extruded semi- conducting layer, lapped with foam type semi- conducting water swellable, Corrugated Aluminium sheathed followed by anti-corrosive bitumen compound and non-conducting tape and black HDPE ST7 with extruded conductive layer overall cable, confirming to IEC-standards for construction and also confirming to IS:7098 (Part-III)/1993 or any latest amendments thereof.

1.3.2 Outer sheathing should be designed to afford high degree of mechanical protection and should also be heat, oil chemicals and weather resistant.

1.3.3 The cable should be suitable for laying in covered trenches and/or underground for outdoor

1.3.4 The sheath/screen bonding system shall provide a continuous current path through the cable sheath and jointing kits and shall be bonded. The bonding ends shall be suitably earthed with/without SVL as per approved configuration/design. The sheath voltage under full load condition shall not exceed the voltage specified/allowed in relevant standard for safety of personal as well as satisfactory working of cable i.e 65 v. Sheath shall be solidly grounded at suitable location with or without SVL. Bidder must indicate details of

configuration proposed along with sufficiency calculation with the bid so as to limit induced voltage of sheath within 65V. Detailed calculation supporting selection of SVL and bonding cable size and rating with margin of protection to be submitted with bid.

#### 1.3.5 CABLE PARAMETERS

Sr. No.	System Particulars	132kV
i)	Voltage Grade (U <sub>o</sub> /U)	76/132
ii)	No. of Cores	Single
iii)	Size (mm <sup>2</sup> )	630mm <sup>2</sup> , 800mm <sup>2</sup> ,1000mm <sup>2</sup> , 1200 mm <sup>2</sup>
iv)	Nominal system voltage KV	132
v)	Highest system voltage KV	145
vi)	System Frequency Hz	50
vii)	Variation in Frequency	+ 3%
viii)	Fault level individually for i) Conductor ii) Metallic Sheath	40 KA for 1sec
ix)	Maximum allowable temperature	
	a) Design continuous operation at rated full load current, the max, temp. of conductor shall not	90
	b) The conductor temperature after a short circuit for 1.0 sec shall not exceed. 0C	250
x)	Basic insulation level (1.2/50 Micro Second Wave)	625 KVP
xi)	30-min. power frequency withstand voltage (rms)	190 KV
xii)	System earthing	Effectively earthed

#### 1.4 OPERATION CHARACTERISTICS:

- One/Two Three-phase feeders, each consisting of 1 runs of 4 Single core cables, feed power at 132 kV
- In normal situation, each cable will have to be designed to carry a continuous current, to deliver a rated power of Transformers and its designed overload.
- The cable should be designed for a suitable current carrying capacity under normal situation, and which will cater for the above overload capabilities also, will be required.

#### 1.5 GENERAL TECHNICAL REQUIREMENTS:

##### 1.5.1 CONDUCTOR:

The cable conductor shall be made from electrolytic grade copper with formation as stranded compacted circular conductor for size upto 1000 sqmm and segmental type as per IEC-60228 for the size above 1000mm<sup>2</sup>.The conductor shall confirm to IS:8130/2013. Conductor should be water blocked. Water blocking to be achieved by combination of water blocking yarn and non-conducting water blocking tapes in intermediate layers of conductor / segments.

##### 1.5.2 CONDUCTOR SCREEN:

A Conductor screen made of semiconducting compound shall be provided over the conductor, by extrusion. The extruded coat shall be continuous, with a constant mean depth, without bump, perfectly adhering to the insulation envelope. A high penetration resistant semiconducting water blocking tape(s) shall be provided below the extruded semi-conducting conductor screen to prevent penetration of the compound into the underlying



conductor with min 50 % overlap. The conductor having a semi-conducting screen shall ensure perfectly smooth profile and avoid stress concentration. The conductor screen shall be extruded in the same operation as the insulation; the semi-conducting polymer shall be cross-linked. Minimum thickness of the conductor screen shall be 0.8 mm. The electric resistivity of the conductor screen shall not be more than 5000  $\Omega$  cm at 20°C and not more than 25000  $\Omega$  cm at the working rated temperature.

**1.5.3 INSULATION:**

The Insulation envelope shall be of cross-linked polyethylene (XLPE) insulation applied by extrusion should be suitable for 132kV system voltage. The nominal thickness of insulation shall not be less than 18 mm (minimum subject to only positive tolerances (no negative tolerance is accepted). However min value at any point shall be as per IEC 60840 latest versions. The manufacturing process shall ensure that the Insulation shall be applied by extrusion and vulcanized using dry curing process to form a compact homogenous body free from micro voids and contaminants. The insulation compound shall be of high quality, heat, moisture, ozone and corona resistant. The insulation shall withstand mechanical and thermal stressed under steady state and transient operating conditions. The extrusion method should give very smooth interface between semi-conducting screen and insulation.

**1.5.3.1 Ideal voltage gradient in the rated working conditions shall be**

- a) equal to or less than 6kV/mm at the level of internal semiconductor.
- b) Equal to or less than 3kV/mm at the level of external semiconductor

Note: However supplier has to submit the stress calculation based on 18.0 mm insulation thickness

**1.5.3.2 The mechanical characteristics shall be as follow:**

- a) In delivery condition:
  - 1) minimal traction resistance : 12.5 Mpa
  - 2) minimal elongation before breaking : 200%
- b) After ageing of 240 h at 135°C:
  - 1. maximal variation of traction resistance :  $\square$  25%
  - 2. maximal variation of elongation before breaking :  $\square$  25%

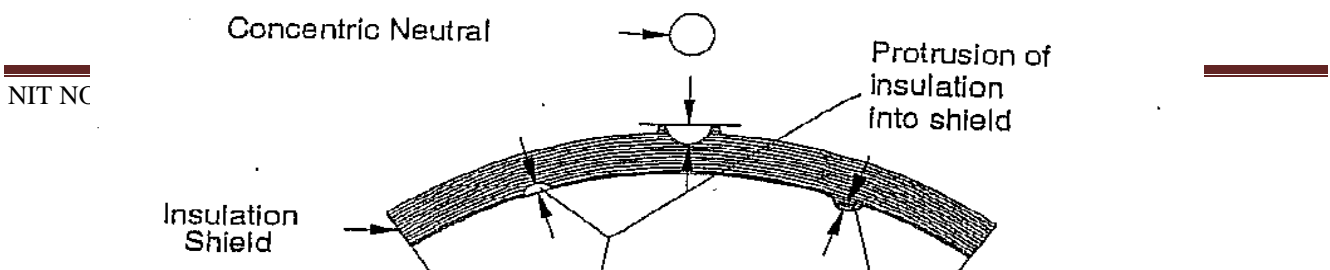
**1.5.3.3 The isolating envelope shall comply with the hot condition elongation test:**

- a) temperature : (200)°C
- b) on load duration : 15 minutes
- c) mechanical constraint : 0.2 Mpa
- d) maximal elongation on load : 100%
- e) maximal elongation after cooling : 15%

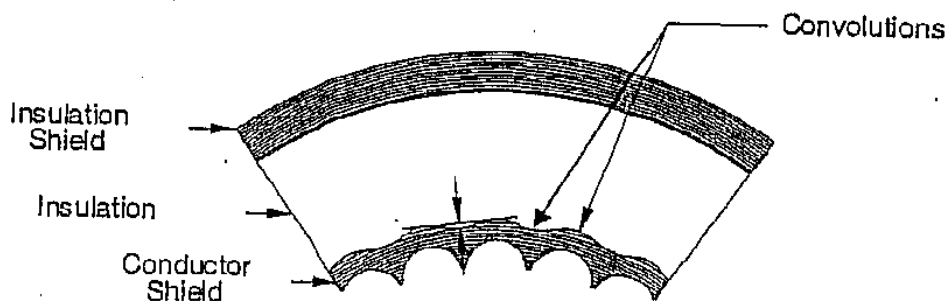
1.5.3.4 Test for surface irregularities shall be carried out as below

Item (For XLPE/TR XLPE insulation)	Clause of AEIC CS8	Unit	Requirement
Protrusions into insulation from conductor screen	3.2	mm	$\leq 0.076$
Protrusions into conductor screen	3.2	mm	$\leq 0.18$
Strand Convolutions	3.3	mm	$\leq 0.18$
Protrusions into insulation from insulation screen	5.2	mm	$\leq 0.13$
Protrusions into insulation screen	5.2	mm	$\leq 0.18$

**Procedure to Measure Protrusions and Indentations**



### Procedure to Measure Convolutions



#### 1.5.4 INSULATION SCREEN:

To confine electrical field to the insulation, non-magnetic semi- conducting shield shall be put over the insulation. The insulation shield shall be extruded in the same operation as the conductor shield and the insulation by suitable extrusion process (triple extrusion). The XLPE insulation shield should be bonded type. It shall be lapped by Foam type semiconducting tape with min thickness of 1 mm. Metallic screening shall be provided. The metallic screen shall be of *Seamless/Seam welded Corrugated Aluminum* having fault current capacity 40 KA for 1-sec with initial temperature of screen as 80 degC and final temperature as 250 degC calculated by adiabatic method. Supporting calculations shall be submitted with bid. (Minimum thickness of the insulation screen shall be 0.8 mm)

##### 1.5.6.1 ANTI CORROSIVE LAYER

An anticorrosive layer of Bitumen compound followed by a suitable tape shall form the anti-corrosive layer

#### 1.5.7 OUTER SHEATH:

The outer extruded semiconducting layer sheath shall be embossed/printed red/yellow/blue colour or similar (as per phase). Suitable semi conducting layer coated on black HDPE ST7 with extruded conductive layer confirming to IEC: 60840, shall be applied over corrugation with suitable additives to prevent attach by rodents and termites. Only, outer extruded semiconducting layer to be provided, which shall be compatible to material of outer sheath.

The outer sheath should have embossing/ indelible Printing at every one meter for Supplier Name, buyer's name, PO No, Voltage grade, size, type etc.

1.5.7.1 The Mechanical Characteristics shall be as follow :

c) - In delivery condition



- 1) - minimal traction resistance : 12.5 Mpa
- 2) - minimal elongation before breaking : 200%
- d) - After ageing of 240 h at 135°C:
  - 1) - traction resistance:
  - 2) - minimum value : 12.5MPa
  - 3) - maximum variation : □ 25%
  - 4) - elongation before breaking:
  - 5) - minimum value : 200%
  - 6) - maximum variation : 25%

1.5.7.2 The variation is the difference between the medium value obtained after ageing and the medium value without ageing, expressed in percentage of the last.

1.5.7.3 **Fiber specification for integration in Power cable (Optional)**

Fiber used in the power cable or supplied separately in the OFC shall be as per below specification.

Attenuation	$\leq 0.35$ dB/km at 1310 nm (Typical $\leq 0.34$ dB/km) $\leq 0.35$ dB/km at 1383nm (Typical $\leq 0.34$ dB/km) # $\leq 0.21$ dB/km at 1550 nm (Typical $\leq 0.20$ dB/km) $\leq 0.23$ dB/km at 1625 nm (Typical $\leq 0.22$ dB/km)
Mode field diameter	$8.6 \pm 0.4$ $\mu$ m at 1310 nm
Cable cutoff wavelength	$\leq 1260$ nm
Zero dispersion wavelength	1300 nm to 1324nm
Zero dispersion slope	$\leq 0.092$ ps/nm <sup>2</sup> .km
Dispersion at 1550 nm	$\leq 18.0$ ps/nm.km
PMD Individual Fiber*	$\leq 0.1$ ps/ $\sqrt$ km
PMD LDV	$\leq 0.06$ ps/ $\sqrt$ km
Cladding diameter	$125 \pm 0.7$ $\mu$ m
Core-clad concentricity error	$\leq 0.5$ $\mu$ m
Cladding non-circularity	$\leq 0.8$ %
Coating diameter	$242 \pm 5$ $\mu$ m
Coating-cladding concentricity error	$\leq 10$ $\mu$ m

\* Individual PMD values may change when cabled

# After hydrogen aging according to IEC-60793-2-50 regarding the B1.3 fiber category

**Mechanical Characteristics**

Proof Test Levels	$\geq 100$ kpsi (0.7GN/m <sup>2</sup> ). This is equivalent to 1% strain
Coating strip force(Force to mechanically strip the dual coating)	$\geq 1.3$ N (0.3 lbf) and $\leq 5.0$ N (1.1lbf)
Fiber curl	$\geq 4$ m

Macro bend loss: The maximum attenuation with bending does not exceed the specified values with the following deployment conditions

Deployment condition	Wavelength	Induced attenuation
10 turn, 15 mm radius	1550 nm	$\leq 0.03$ dB
10 turn, 15 mm radius	1625 nm	$\leq 0.10$ dB
1 turn, 10 mm radius	1550 nm	$\leq 0.10$ dB
1 turn, 10 mm radius	1625 nm	$\leq 0.20$ dB
1 turn, 7.5 mm radius	1550 nm	$\leq 0.20$ dB
1 turn 7.5 mm radius	1625 nm	$\leq 0.50$ dB

## Environmental Characteristics

Temperature dependence Induced attenuation, -60°C to +85°C at 1310, 1550, 1625 nm	≤ 0.05 dB/km
Temperature humidity cycling Induced attenuation, -10°C to +85°C and 95% relative humidity at 1310, 1550, 1625 nm	≤ 0.05 dB/km
High temperature and humidity aging 85°C at 85% RH, 30 days Induced attenuation at 1310, 1550, 1625 nm due to aging	≤ 0.05 dB/km
Water immersion, 30 days Induced attenuation due to water immersion at 23±2°C at 1310, 1550, 1625 nm	≤ 0.05 dB/km
Accelerated aging (Temperature), 30days Induced attenuation due to temperature aging at 85±2°C at 1310,1550,1625 nm	≤ 0.05 dB/km

## Other Performance Characteristics\*

Effective group index of refraction	1.4678 at 1310 nm 1.4685 at 1550 nm 1.4689 at 1625 nm
Attenuation in the wavelength region from 1285 - 1330 nm in reference to the attenuation at 1310 nm	≤ 0.03 dB/km
Attenuation in the wavelength region from 1525 - 1575 nm in reference to the attenuation at 1550 nm	≤ 0.02 dB/km
Point discontinuities at 1310 nm & 1550 nm	≤ 0.05 dB
Dynamic fatigue parameter (N <sub>a</sub> )	≥ 20

### 1.5.8 CONSTRUCTION:

1.5.8.1 All materials used in the manufacture of cable shall be new unused and of finest quality. All materials should comply with the applicable provision of the tests of the specification. IS, IEC, Indian Electricity Rules, Indian Electricity Act and any other applicable statutory provisions rules and regulations.

### 1.5.9 CURRENT RATING:

The cable will have current ratings and de-rating factors as per relevant standard IEC.

1.5.9.1 The one-second short circuit rating values each for conductor, & screen shall be furnished and shall be subject to the purchaser's approval.

1.5.9.2 The current ratings shall be based on maximum conductor temperature of 90 deg. C with ambient site condition specified for continuous operation at the rated current.

### 1.5.9.3 SIZE:

The different sizes of cable shall be 132 kV Single Core

- a) 630mm<sup>2</sup>
- b) 800mm<sup>2</sup>
- c) 1000mm<sup>2</sup>
- d) 1200mm<sup>2</sup>

### 1.5.10 OPERATION:

1.5.10.1 Cables shall be capable of satisfactory operation under a power supply system frequency variation of plus minus 3% voltage variation of plus, minus 10% and combined frequency voltage variation of 10% (absolute sum).

1.5.10.2 Cable shall be suitable for laying in ducts or buried under ground.

1.5.10.3 Cable shall have heat and moisture resistance properties. These shall be of type and design with proven record on transmission network service.

1.5.11 LENGTHS: The cable shall be supplied in standard drum lengths as below: **Size of cable Standard Drum Length**

a) Single Core, 630mm<sup>2</sup>, 800mm<sup>2</sup>, 1000mm<sup>2</sup>, 1200 mm<sup>2</sup> 500 meters  $\pm$  5% tolerance and  $\pm$  2% overall tolerance in total quantity of cable.

#### 1.5.11 IDENTIFICATION MARKING:

Identification of cables shall be provided externally at one meters' intervals to identify as under:-

- i) 'Name of Manufacture'
- ii) 'Year of manufacture'
- iii) 'Voltage grade' to be printed/embossed at the interval of one meter-length. The identification, by printing or embossing shall be done only on the outer sheath. Name of purchaser shall also be embossed.
- iv) PO No
- v) Scheme

### 1.6.0 TESTS

#### 1.6.1 Type Tests

The equipment offered should be type tested as a cable system with terminations and both type of joints. Type test report should not be more than five years old, reckoned from the date of bid opening, in respect of the following tests, carried out in accordance with ISS-7098/IEC-871, from Govt./Govt. approved test house, shall be submitted along with bid:

- i) Physical tests for insulation and outer sheath.
- ii) Bending test.
- iii) Di-electrical power factor test.
- iv) Heating cycle test followed by di-electrical power factor as a function of voltage and partial discharge test.
- v) Impulse withstand test.

The remaining type test report as per clause 3 of ISS-7098/ IEC-871/ IEC-60840 shall be submitted by the successful bidder within three months from the date of placement of order. These type test reports shall be from Govt./Govt. approved test house and shall not be more than five years old, reckoned from the date of placement of order. The failure to do so will be considered as a breach of contract.

#### 1.6.2 ROUTINE TESTS AND ACCEPTANCE TESTS

All routine and acceptance tests shall be carried as per relevant ISS in the presence of Employer's representative.

Following additional tests shall be carried out in routine tests

- a) Fiber continuity (For FIPC)
- b) Optical loss measurement ( for FIPC: 1 sample)

### 1.7 INSPECTION

The material shall be inspected and tested before dispatch by an authorised representative of the Owner in respect of quality. The inspecting officer shall also satisfy himself about the correctness of length of cables. In case the supplier is not in a position to get these tests carried out at his works, such tests may be got carried out by him at any

Govt. recognized test agency at his own expense.

In addition to acceptance tests stipulated by relevant IS/IEC, following additional tests need to be carried out

Measurement of gap below Corrugation

- a) Measurement of thickness of Foam type semiconducting water swellable tape
- b) Measurement of protrusions and convolutions
- c) Sheath integrity test
- d) Water boil test
- e) 4 hours voltage test on 3.5 m sample (once in PO)
- f) Volume resistivity (once in PO)
- g) Fiber continuity

**1.8 TEST CERTIFICATES**

The supplier shall supply test certificates from a Govt. agency in respect of quality as per IS: 7098(part-II) 1985 with latest amendments thereof for approval of the purchaser.

**1.9 PACKING**

The cable shall be supplied in Returnable Steel so constructed, as to enable the cable to be transported on each drum. The cable wound on such drum shall be one continuous length. The ends of cables shall be sealed by means of non-hygroscopic sealing material.

**1.10 MARKING**

The marking on the drum shall have the following information: -

- a) Reference to Indian Standard & cable code.
- b) Name of the manufacturer & trade name.
- c) Nominal cross section area of conductor for the cables.
- d) Number of core.
- e) Sequential No. at each meter.
- f) Type of the cable & voltage for which it is suitable.
- g) Length of cable on the drum.
- h) Approximate gross weight.
- i) Net weight of the cable.
- j) Drum identification number.
- k) P.O. No. and date.
- l) Consignee's name with designation.
- m) Year of manufacture.

**1.11 DRAWINGS & INSTRUCTION MANUAL**

The tenderer shall supply the following drawings with the tender: -

- i) Detailed drawing of the cable showing conductor, screening insulation, Armouring, outer sheath etc.
- ii) Detailed drawing showing jointing of cable and sealing of end boxes.

Copies of instruction manuals for testing, installation jointing operation and maintenance of cables shall also be submitted with the offer for reference of the purchaser.

**1.12 TECHNICAL & GUARANTEED PARTICULARS:**

The tenderer shall furnish guaranteed technical particulars as per the tender specification. Particulars, which are subject to guarantee, shall be clearly marked. Offer not containing this information will not be considered.

**1.13 TERMINATION KITS AND STRAIGHT THROUGH JOINTS**

The entire necessary Straight through joints and Sealing Ends for 132 kV shall be

supplied and erected. The Straight through joints and Sealing Ends wherever required shall be moulded Type or equivalent, of reputed make with shear head type mechanical connectors of proven technology & make.

#### **1.14 ISO Accreditation**

The cable shall be manufactured by a company having ISO accreditation for quality. The manufacturing process of XLPE cable shall consist of conductor screen, insulation & insulation screen shall be extruded in a single process.(triple extrusion) and cross linked by VCV Process (Vertical Continuous Vulcanization process) / CCV (Continuous Catenary Vulcanization process) dry curing technology to ensure homogeneity and absence of micro voids. The cables shall be manufactured by “Dry Curing” Process. It is mandatory that bidder should submit Plant Installation Certificate for VCV/CCV Line and for Metallic sheath machineries indicating the year of installation and other details along with bid

The Employer may decide to visit the works of cable manufacturer to confirm the manufacturing process mentioned.

### **PART II:**

## **TECHNICAL SPECIFICATION FOR LAYING, TESTING AND COMMISSIONING OF 132kV XLPE UNDERGROUND POWER CABLE**

### **SECTION-1: SPECIFICATION FOR LAYING OF CABLE**

#### **1.1 GENERAL**

1.1.2 The Cable Laying works shall be executed according to the rules of the Art pertaining to professional grade and generally in compliance with International Standards and Indian Standards.

1.1.3 The EHV Cables between the Power Supply Authorities Substation and the DMRC RSS shall be laid in ground depending upon the site conditions of the selected route, any of the following paying conditions, may be adopted.

#### 1.1.4 Cable Laying Cases

- |        |   |  |
|--------|---|--|
| Case 1 | - | Direct buried, with all cables laid in flat formation.   |
| Case 2 | - | Direct buried, with the cables (3) of each circuit laid in trefoil formation and side by side in one trench. |
| Case 3 | - | Laid in underground duct.  |
| Case 4 | - | Laid in Trench less piping.  |
| Case 5 | - | Laid in abutment crossing  |
| Case 6 | - | Laid in Rail Track crossing  |
| Case 7 | - | Laid in Air, supported on piers/walls, for nallah-crossing   |

#### 1.1.5 Details of Case 2 :

The trench for carrying the cables shall be at least 1.8m deep and 1.1m wide, which may vary as per site conditions with the approval of employer. Each of the 2 feeders shall consist of 3 single-core cables, and laid in trefoil formation. Cables shall be laid at a depth of 1.7m below the ground level and over a 100 mm bed of coarse sand. Trench is to be filled with sand upto a depth of 1100mm below the ground level. Warning concrete slabs of at least 50mm thickness shall then be laid above the sand. Trench shall then be filled with earth upto a depth of 300 mm below the ground level. A warning net shall then be laid above the earth filling (at 300 mm depth below the ground level). A warning tape shall also be laid appropriately with Purchaser's Name marked on it. The top space of 300 mm shall be suitably filled with compacted Boulder and Bitumen/Jelly and given a final finish matching the surroundings. The cables shall be tied through locking belts after 2 meters each for keeping the cables intact in case of trefoil formation. At locations, where there is

change of level of laying, the cables shall be tied through locking belts after 1 meter each.

#### 1.1.6 Details of Case 3

In specific locations, the Employer may require the cables to be laid in underground ducts. The underground ducts shall be laid where road construction or formation is under construction or where water logging stretch is expected or as per the specific site condition.

#### 1.1.7 Details of Case 4 & 6

On all road/rail crossings and at other specific locations, cable laying shall be through trenchless drilling and the cables shall be passed through High Density Polyethylene (HDPE) Pipes or G.I. Pipes of appropriate diameter and thickness (Case-4). One spare HDPE pipe shall be laid for each feeder of 3 cables at the road/rail crossings.

#### 1.1.8 Details of Case 5 & 7

On all abutment crossing or in air, supported on piers/walls, for Nallah crossing and at other specific locations, cable laying shall be on the galvanized steel structures which can withstand wind velocity of 160kmph, supported on piers and have sufficient structural strength. The minimum average weight of zinc coating should be 1000g/m<sup>2</sup> (RDSO). The cables should be well protected by providing MS sheet of thickness 8mm at least fastened with nuts and bolts & tag welded on all sides to be protected from any pilferages. The arrangement shall render cable absolutely safe from any natural calamity. The cable shall not be exposed or get affected due to stray fire caused in the vicinity. Indicative arrangement is shown in the drawing.

#### 1.1.9 Spare Cables and Pipes

When cables are laid in pipes, in addition to the pipes carrying the cables, at least one spare pipe (minimum 200 mm dia), without cable shall also be provided. In the case cables laid in underground ducts (Case 3) and cables laid in Trenchless piping (Case 4), spare HDPE pipes, one for each circuit, shall be provided. In addition to pipes for power cables, 2 additional pipes, each of not less than 100 mm dia, shall be provided to carry control and monitoring cables, one operational and one spare (As indicated in the Interfacing Requirements, other cables such as pilot wire for pilot wire protection, if required, copper-core or optic fibre cables for control and monitoring, tele-communication etc, supplied by other Suppliers.

#### 1.1.10 Cable protection at changeover location

The cable path, when changing from buried in ground to underground duct or trenchless piping shall be adequately protected by proper sealing in concrete or other suitable means of sufficient mechanical strength to avoid cable from suffering damage due to heat/fire/water ingress etc.

#### 1.1.11 Pulling Chambers

Pulling chambers shall be provided, as necessary, along the route. Such pulling chambers shall be 4m long, 3m wide and at least 2.5m deep. The masonry structure should be of adequate strength with water proofing to avoid any accumulation of seepage of water inside. The edges of RCC covers and masonry shall be lined in GI angles to achieve a long service life.

#### 1.1.12 Route Markers

The route shall be appropriately marked by suitable retro-reflective cable markers, at suitable intervals and positions of straight through joints shall be indicated by suitable boards.

### 2.0.0 CABLE ACCESSORIES AND BONDING

#### 2.1.0 Straight Through Joints

2.1.1 The straight through Joints should be HEAT SHRINKABLE type or cold shrink type of proven technology and make, suitable for underground buried cables. The joint should comprise of stress control sleeves, insulating sleeves and co-extruded dual wall Tubing comprising of an insulating and semi-conducting layer. A mechanical connector with shear head bolts shall make the conductor connection.



2.1.2 The product should be type tested as per IEC /KEMA specifications

### 2.1.3 GENERAL SPECIFICATIONS

a. The product offered should be proven and should be in use in India for a minimum period of 5 years for the same voltage class. List of past supplies in India to be furnished. Performance certificates to be submitted along with the offer.

b. The product offered should have unlimited shelf life.

c. Offers should be supported with type test certificates from test laboratories of repute, as per IEC/ KEMA specifications, failing which the offers shall be ignored.

### 2.1.4 General Specifications for Joints and Terminations for 132 kV XLPE Cables

The Terminations (Outdoor Sealing ends) and Straight Through Joints for 132 kV cables shall be of 'Heat-shrinkable, " type or cold shrink type of proven technology and make, suitable for 132 kV (E) grade or higher, Single core 400 sq mm or higher, XLPE Insulated, Aluminium sheathed cables. The Indoor termination for use in the GIS Substation.

### 2.2.0 Bonding

2.2.1 Suitable bonding methods viz., Single End, Both End and Cross Bonding shall be used.

2.2.2 Link boxes with & without SVL shall be used as required.

## 3.0.0 TESTING AND INSPECTION

### 7.1.0.1.1 TYPE-TESTS

#### 7.1.0.2 General

All the equipment which are used for this work shall be of proven design and standards to achieve a very high level of reliability in service. An equipment is considered to be proven if it is in successful operation at least for a period of two years. Irrespective of the fact that the summary of type test reports was submitted for 132kV (E) or higher grade Single core, XLPE insulated, Copper conductor Aluminium Sheathed cable along with the bid, the Supplier shall furnish a summary of type test reports for all the equipment listed below except those equipment which are yet to be type tested being under development within three (3) months period from the date of signing the contract.

7.1.0.3 Heat Shrinkable type or cold shrink type of proven technology and make straight through joint suitable for 132 kV (E) grade Single Core 400 sq. mm or above size XLPE insulated cable with Aluminum sheath.

7.1.0.4 Heat Shrinkable type or cold shrink type of proven technology and make cable terminations (indoor & outdoor) suitable for 132 kV (E) grade

7.1.0.5 The cable and cable accessories intended to be used for this work shall be (i) Type-tested within the last ten (10) years period prior to the date of bid opening. (ii) Proven in service for at least two (2) years as on the date of bid opening.

7.1.0.6 Submission of Performance Certificates

As a proof of satisfactory performance of following equipments during last two years from the bidder /JV partner /sub Supplier from whom Bidder intends to supply them.

7.1.0.7 Heat shrinkable " type or cold shrink type of proven technology and make straight through joint suitable for 132 kV (E) grade or above grade, Single Core 400 sq. mm or above size XLPE insulated cable with Aluminum sheath.

7.1.0.8 Heat shrinkable " type or cold shrink type of proven technology and make cable terminations (indoor & outdoor) suitable for 132 kV (E) grade

#### 7.1.1 Type Test Results

Summary of type test results of the above mentioned equipment will be in the following format:

SI. No.	Equipment	Manufactured By	Rating	Governing specification for type test	Name of type test	Month/Year conducted	Testing Lab/ Testing House/In House	Result/ Remark

7.1.1.1 If the type tests of any equipment being supplied for this work are not yet conducted by the Supplier then all the type tests as per the relevant IEC shall be conducted at his expense in the presence of employer's representative either at manufacturer's works having requisite facilities and approved by independent laboratory like CPRI, KEEMA, Netherland or CESI Italy, or at KEEMA, Netherlands or CESI, Milano, Italy.

7.1.1.2 Details of 'Make of Cables/Accessories

The bidder shall submit to the employer the proposed "make" of all the above equipment in the bid form along with other details such as rating, quantity in use, place of installation number of years in satisfactory operation, summary of type test reports of required rating of 132kV or higher grade, Aluminum/copper conductor, XLPE insulated, Aluminum or Copper sheath cable along with the bid so as to decide the 'make' of the items. Based on the information thus furnished the employer shall decide the 'make' of the items to be used for the work. The plant & equipment being supplied against this bid shall conform to relevant IEC standards.

#### 7.1.1.3 Rejection of Type Test Report

When the Employer rejects any specific type test report for a particular equipment stating the grounds for such rejection, the Supplier shall re-conduct the relevant type tests as per the specification in the presence of Employer's representatives before the item is supplied by him. Such type test shall be conducted by the Supplier at his own expense at the manufacturer's works approved by CPRI, KEMA Netherland or CESI Italy in the presence of Employer's representative.

#### 7.1.1.4 Type Test Reports

The type test reports of the equipment shall be of the tests carried out either at the manufacturer's works having requisite facilities or at CPRI, KEEMA, Netherlands, CESI, Milano, Italy during the last ten (10) years period as on the date of bid opening. If any type test report is older than 10 years, the type tests will have to be repeated at Supplier's cost. Employer shall waive some of these tests in case of equipment / sub assemblies where the manufacturer can establish to the satisfaction of employer that such tests have already been carried out earlier or where the equipment have been proved in service. In such a case, manufacturer shall submit complete test reports along with necessary certification.

### 7.2.0 ROUTINE TESTS

Routine tests shall comprise of visual inspection of the items and all the routine tests as per specification. All these tests shall be conducted in the presence of Employer's nominated representative at the manufacturer's works. Routine test shall be carried out as per specification IEC 60840 latest version.

#### 7.2.1.1 General

The following tests shall be carried out on each manufactured length of cable:

- a) Partial discharge test (see 5.2.2);
- b) Voltage test (see 5.2.3);
- c) Electrical test on over sheath of the cable, if required (see 5.2.4).

7.2.1.2 The order in which these tests are carried out is at the discretion of the manufacturer. The main insulation of each prefabricated necessary shall undergo



partial discharge (see 5.2.2) and voltage (see 5.2.3) tests according to either 1), 2) or 3) below:

- 1) On accessories installed on cable;
- 2) By using a host accessory into which a component of an accessory is substituted for test;
- 3) By using a simulated accessory rig in which the electrical stress environment of a main insulation component is reproduced.

7.2.1.3 In cases 2) and 3), the test voltage shall be selected to obtain electrical stresses at least the same as those on the component in a complete accessory when subjected to the test voltages specified in 5.2.2 and 5.2.3

7.2.1.4 NOTE: The main insulation of prefabricated accessories consists of the components that come in direct contact with the cable insulation and are necessary to control the electric stress distribution in the accessory. Examples are pre-moulded or pre-cast elastomer or filled epoxy resin insulating components that may be used singly or jointly to provide the necessary insulation or screening of accessories.

#### **7.2.1.5 Partial discharge test**

The partial discharge test shall be carried out in accordance with IEC 60885-3 for cables, except that the sensitivity as defined in IEC 60885-3 shall be 10pC or better. Testing of accessories follows the same principles, but the sensitivity shall be 5pC or better. The test voltage shall be raised gradually to and held at  $1.75 U_0$  for 10 s and then slowly reduced to  $1.5 U_0$ . There shall be no detectable discharge exceeding the declared sensitivity from the test object at  $1.5 U_0$ .

#### **7.2.1.6 Voltage test**

The voltage test shall be made at ambient temperature using an alternating test voltage at power frequency. The test voltage shall be raised gradually to  $2.5 U_0$  and then be held for 30 min between the conductor and metallic screen/sheath. No breakdown of the insulation shall occur 60840 @ IEC: 2004 Electrical test on over sheath of the cable When the test is required by the particular contract, the cable over sheath shall be subjected to the electrical test specified in Clause 3 of IEC 60229.

### **7.3.0 Acceptance tests**

#### **7.3.1 General**

Acceptance tests for the power cable & its accessories shall be carried out wherever the same is mentioned in the relevant specification governing the cable and its accessories. All the acceptance tests as mentioned in the governing specification to which the product is manufactured shall be conducted in the presence of Employer's nominated representative by the Supplier at their manufacturing works. The following tests shall be carried out on samples which, for the tests in terms b) and g), may be drum lengths of cable, taken to represent batches:

- a) Conductor examination (see 5.3.4);
- b) Measurement of electrical resistance of conductor and of metallic screen (see 5.3.5);
- c) Measurement of thickness of insulation and over sheath
- d) Measurement of thickness of metallic sheath
- e) Measurement of diameters, if required
- f) Hot set test for XLPE, EPR and HEPR insulations Measurement of capacitance
- g) Water penetration test, if applicable
- h) Tests on components of cables with a longitudinally applied metal foil
- i) test for convolution & protrusion

#### **7.3.2 Frequency of tests**

The sample tests in items a) to h) of 5.3.1 shall be carried out on one length from each batch (manufacturing series) of the same type and cross-section of cable, but

shall be limited to not more than 10% of the number of lengths in any contract, rounded to the nearest whole number. The frequency of the tests in items l) and j) of 5.3.1 shall be in accordance with agreed quality control procedures. In the absence of such an agreement, one test shall be made for contracts with a cable length above 20 km.

### **7.3.3 Repetition of tests**

If the sample from any length selected for the tests falls in any of the tests in 5.3.1, further samples shall be taken from two further lengths of the same batch and subjected to the same tests as those in which the original sample failed. If both additional samples pass the tests, the other cables in the batch from which they were taken shall be regarded as having complied with the requirements of this standard. If either fail, this batch of cables shall be regarded as having failed to comply.

### **7.3.4 Conductor examination**

Compliance with the requirements of IEC 60228 for conductor construction, or the declared construction, shall be checked by inspection and measurement when practicable. Measurement of electrical resistance of conductor and metallic screen The cable length, or a sample thereof, shall be placed in the test room, which shall be maintained at a reasonably constant temperature for at least 12 h before the test. If there is a doubt that the conductor or metallic screen temperature is not the same as the room temperature, the resistance shall be measured after the cable has been in the test room for 24 h. Alternatively, the resistance can be measured on a sample of conductor or metallic screen, conditioned for at least 1 h in a temperature controlled liquid bath.

### **7.3.5 Additional Acceptance Tests**

The following additional acceptance tests shall be carried out.

1. Additional acceptance tests (1 sample/offered lot) shall be carried out for Ovality & Eccentricity.
2. Tensile strength and Elongation on insulation and over sheath before and after ageing and Thermal Stability on outer sheath of power cable.
3. Finish and length measurement shall be carried on one length of each size of offered lot of power cables.

### **7.3.6 Short Circuit Test :**

Short Circuit test for Power Cables will be conducted by the Supplier on the cable at Manufacturer's works having requisite facilities approved by CPRI, INDIA or KEMA Netherlands or CESI Italy or at KEEMA, Netherlands or CESI Milano, Italy & shall be witnessed by the Employer's authorized representative.

### **7.3.7 TEST CERTIFICATES**

Three copies of the test certificates of successful type tests if any carried out on cables and cable accessories shall be furnished to the Employer within fifteen days after completion of such type tests. Three copies of successful acceptance & routine tests carried out on cables and cable accessories and the certificate of inspection issued by the Employer's representative shall be furnished within 15 days, after the completion of tests by the Employer's representative.

### **7.3.8 RESPONSIBILITY OF SUPPLIER FOR DELIVERY/SUPPLY**

(a) All defects detected as a result of testing / inspection shall be rectified by the manufacturer at his own expense and shall be documented and corrected prior to shipment. If in opinion of Employer, a repeat of the test is required after such rectification, this shall also be carried out at the expense of the Supplier.

(b) No cable / accessory shall be supplied until Employer has inspected the same to his satisfaction and accepted. However, such inspection and/or acceptance certificate shall not relieve the Supplier of his responsibility for furnishing the cables

and cable accessories conforming to the requirements of the contract nor prejudice any claim, right or privilege which the Employer may have because of the use of defective or unsatisfactory items. Should the Employer waive the right to inspect any item, such waiver shall be obtained by the Supplier from the Employer in writing and such a waiver shall not relieve the Supplier in any way from his obligation under the contract.

(c) Only after obtaining clearance from the Employer, the Supplier shall despatch the items to site.

**7.3.9 INSPECTION OF ERECTION WORK**

All erection work will be subject to inspection by the Employer or his representative to ensure that the work is done in accordance with the specification and approved drawing.

**7.3.10 INSPECTION AND TESTS OF COMPLETELY LAID CABLE**

**7.3.10.1 General**

As soon as the work is completed and ready for inspection and testing, the Supplier shall advise the Employer in writing. Tests will be carried out by the Employer jointly with the Supplier. Testing equipment and staff required for the tests shall be provided by the Supplier free of charge. The Supplier shall take full responsibility for these tests inter alia his other responsibilities. The Supplier shall notify the manufacturer of cable and cable accessories regarding likely date of pre-commissioning tests, one month in advance so that their representative may be available at site at the time of conducting the tests. It shall be Supplier’s responsibility to ensure that the cable and it’s accessories are commissioned as per laid down procedures.

**7.3.11** Pre commissioning Tests for the facility as a whole The following site tests shall be conducted on a completed power cable installation as per specification IEC 60840 latest version.

(i) Visual Inspection and Continuity Check Visual inspection shall include check for satisfactory workmanship Continuity check shall be carried out on the cable to ensure that the cable is continuous.

(ii) DC voltage test of the over sheath The test shall be conducted as per Clause 15.1 of IEC 60840.

(iii) AC voltage test for the installation. The test shall be conducted as per Clause 15.2 of IEC 60840.

(iv) the insulation resistance of the cable shall be checked before & after the HV test on cable. The core resistance shall be measured and the value corrected in accordance with clause 5 of IEC 60228.

(v) The cable must be discharged on completion of DC High Voltage Test and the cable shall be kept earthed until it is put into service. The values obtained during these tests shall be in conformity with the values obtained during inspection of the materials at the manufacturer’s works.

**7.3.12 PROFORMA FOR TESTS**

The Supplier shall submit the results of tests in quadruplicate in an approved proforma within 7 days from the date of completion of the tests but before actual commissioning of the cable. The proforma shall be developed by the Supplier and got approved from Employer within three (3) months from the effective date of the contract.

**7.3.13 TECHNICAL DATA FOR 132kV SINGLE CORE 1000 & 630 SQMM XLPE INSULATED, ALUMINIUM CORUGATED CABLE:**

Sl. No	Name of the Particulars	Desired Value	
		1000 sqmm	630 sqmm

1	No. of cores	1(Single)	1(Single)
2	Size (in mm <sup>2</sup> )	1000	630
3	Voltage Grade( in kV)	76/132(145) kV	76/132(145) kV
4	Type of cable	2XA2Y	2XA2Y
5	Standard according to which cable has been manufactured and tested	IS: 7098- Part 3, IEC-62067, Testing as per IEC- 60840.	IS: 7098- Part 3, IEC-62067, Testing as per IEC- 60840.
6	Permissible Voltage & Frequency variation for satisfactory operation.		
	Voltage	± 10%	± 10%
	Frequency	± 5%	± 5%
7	Maximum rated conductor temperature	90°C	90°C
8	Max. allowable conductor temperature during short circuit	250°C	250°C
9	Conductor Details		
	(a) Normal Cross-Sectional Area	1000 mm <sup>2</sup>	630 mm <sup>2</sup>
	(b) Material and Grade	Annealed Plain Copper to IS 8130/84	Annealed Plain Copper to IS 8130/84
	(c) Shape of Conductor	Compacted stranded circular	Compacted stranded circular
10	<b>Conductor Screen</b>		
	(a)Material	Extruded Semi-Conducting XLPE as per IS-7098 Pt 3/93	Extruded Semi-Conducting XLPE as per IS-7098 Pt 3/93
	(b)Nominal Thickness	0.8 Min.	0.8 Min.
11	<b>Insulation</b>		
	(a) Material	Cross linked Polyethylene to IS-7098 Pt 3/93	Cross linked Polyethylene to IS-7098 Pt 3/93
	(b) Nominal Thickness	18.0 mm	18.0 mm
12	<b>Insulation Screen</b>		
	(a) Material	Extruded Semi-Conducting XLPE (SC) layer followed by water swellable SC tape	Extruded Semi-Conducting XLPE (SC) layer followed by water swellable SC tape

	(b) Min. Thickness	0.8 mm followed by water swellable SC tape	0.8 mm followed by water swellable SC tape
	(c) Longitudinal Water Sealing	Semiconducting water blocking tape(s) with 50% over lap	Semiconducting water blocking tape(s) with 50% over lap
13	<b>Metallic Sheath</b>		
	(a) Material	Seamless/ <i>Seam welded Corrugated Aluminum</i> sheath with anti-corrosion protection	Seamless/ <i>Seam welded Corrugated Aluminum</i> sheath with anti-corrosion protection
	(b) Thickness	Suitable thickness to carry Min 40 kA fault current	Suitable thickness to carry Min 40 kA fault current
	(c) Short Circuit current of metallic screen for 1 sec (kA)	>40	>40
14	<b>Outer Sheath</b>		
	(a) Material	Extruded HDPE Type ST-7 to IS-7098 (PIII)/93	Extruded HDPE Type ST-7 to IS-7098 (PIII)/93
	(b) Colour	Black	Black
	(c) Thickness (Nom/Min)	4.0 mm / 3.3 mm	3.8 mm / 3.13 mm
	(d) Conducting layer over outer sheath	extruded Semiconductor type compatible to the material for outer sheath	extruded Semiconductor type compatible to the material for outer sheath
15	Nominal overall Diameter of cable	108mm(Approx.)	99mm(Approx.)
16	Nominal Overall Weight of Cable per Meter	15.7 kg/m (Approx)	11.4 kg/m (Approx)
17	Standard Drum Length with Tolerance	500m±5%	500m±5%
18	Minimum Bending Radius allowable during installation	20 x OD	20 x OD
19	Safe Pulling force	5kg/mm <sup>2</sup> of CU area.	5kg/mm <sup>2</sup> of CU area.

20	(a) Impulse Withstand	650kVp	650kVp
21	(b) One minute Power Frequency Withstand Voltage (kV)	190kV for 30 sec	190kV for 30 sec
22	Short circuit current for one second (kA)	143	90.1
	Max conductor DC resistance at 20°C	0.0176 ohm/km	0.0283 ohm/km
	Approx. AC resistance at 90°C	0.0268 ohm/km	0.0390 ohm/km
	Max. capacitance	0.240 microF/km	0.200 microF/km
23	Continuous Current Rating for cable laid in close trefoil formation	BEB/ SPB	BEB/ SPB
	(i) In ground at 30°C ground temp, Depth of laying 1.0 m, Thermal Resistivity of soil 150°C Cm/W	655/795	590/670
	(ii) In free air at 40°C Ambient Air Temperature	1095/1250	910/1000
BEB: Sheath both end bonded SPB: Sheath single point/ Cross bonded			
1. The following details shall be embossed/ Printed on outer sheath at regular interval not exceeding one metre. (a) Manufacturer's Name or Trade name (b) Year of Manufacture (c) Voltage grade of Cable i.e. 76/132kV (d) Cable Code i.e. 2XA2Y (e) Number of cores & cable size e.g. 1000 Sqmm (Cu) 1 core/630 Sqmm (Cu) 1 core			
2. Sequential length marking shall also be provided on outer sheath by hot foil or inkjet printing.			
3. Cable shall be supplied in returnable steel drums.			

### 7.3.14 GUARANTEED TECHNICAL PARTICULARS FOR 132 KV CABLE:

Sl. No.	Name of the Particulars	1CX630 SQMM/1x800 sq.mm	1CX1000 SQMM/1x1200 sq.mm
1	Type of cable		
2	Standard according to which cable has been manufactured and tested		
3	Rated Voltage (U <sub>0</sub> /U)		
4	Highest System Voltage which the cable can withstand		
5	Maximum Conductor temperature for continuous operation		
6	(a) Maximum short time conductor temperature with duration		
	(b) Maximum allowable conductor temp. during overload		

7	Conductor Details		
	Normal Cross-Sectional Area		
	Material and Grade		
	Shape of Conductor		
	Diameter of Conductor		
	No. of Strands and Diameter of each Strand		
	Water swellable powder/yarn provided		
	Conducting water swellable tape with 50% overlap over compacted conductor provided		
8	Extruded Conductor Screen		
	Material		
	Nominal Thickness		
	Diameter over Conductor screen		
	Designed maximum stress at conductor screen		
9	Insulation		
	Material		
	Nominal Thickness		
	Minimum thickness at any point		
	Diameter over insulation		
	Designed maximum stress		
	Detail of vulcanization process		
	Extrusion method		
	Curing method		
	Cooling method		
	CO/ or VOI Line		
10	Extruded Insulation Screen		
	Material		
	Thickness		
	Diameter over insulation screen		
	Strippable/ Bonded		
11	Conducting Longitudinal Water Sealing		
	Material		
	Thickness		
12	Metallic Sheath/ Screen		
	Material		
	No. of strands		
	Diameter of each Strand (Nom/Min)		
	Diameter of Cable after stranding		
	Armour coverage		
13	Non-conducting Longitudinal Water Sealing		
	Material		
	Thickness		
14	HDPE Outer Sheath		
	Type		
	Colour		



	Thickness (Nom/Min)		
	Conductive Coating Provided		
15	Nominal overall Diameter of cable		
16	Nominal Overall Weight of Cable per Meter		
17	Standard Drum Length with Tolerance		
18	Minimum Bending Radius allowable during installation		
19	Short Circuit Current Rating of Conductor with maximum conductor temperature (90°C) at the commencement of fault 1Sec. Duration		
20	Maximum Continuous Current Rating of a Circuit Comprising of 3 nos. Single Core Cable laid in trefoil formation at a depth of 1.05 M.		
	Soil Temperature		
	Ambient Temperature		
	Soil Thermal Resistivity		
	System of Bonding		
	Laid in ground ( at a depth of 1.05 m)		
	Laid in dusts		
	Installed in Air		
21	Short Time Overload capacity with Duration of cable installed as per conditions mentioned in Item no.22 ( 2 hours)		
	Laid in ground ( at a depth of 1.05 m)		
	Laid in dusts		
	Installed in Air		
22	Maximum AC Resistance at 90°C		
23	Equivalent Star Reactance of a Circuit comprising of 3 Nos. of Single Core cable laid in Trefoil Formation		
24	Maximum Charging Current per Conductor at Nominal Voltage 1.64 AI km		
25	Loss in Metallic Screen of a Circuit comprising of 3 nos. of Single Core Cable installed in Trefoil Formation as per item no. 22		
26	Maximum Current in Metallic Screen when the cable is installed as per item no. 22 (Circulating Current)		
27	Derating factor of Cable installed as per Item No.22 under following conditions Ambient Temperature		
	35°C		
	45°C		
28	Group derating factor of Cable Circuits installed as per Item no. 22 under following conditions		
	Laid 100 mm. apart		
	Laid 250 mm. apart		
29	Induced voltage in metallic screen when Conductor is carrying 100 Amps(V/Km)		

30	Circulating current in metallic screen when conductor is carrying 100 Amps		
31	Test Voltages		
	Impulse Withstand Voltage at 90°C		
	Rated Power Frequency Withstand Voltage (kV)		
	Water penetration test as per IEC 60840		
	Abrasion Test on HDPE Outer sheath as per IEC 60229		
	Recommended Test Voltage after installation		
32	Details of Drum		
	Material and Weight of Drum		
	Weight of Drum with Cable		
	Flange Diameter of Drum		
	Barrel Width of Drum		
	Spindle hole Diameter		
33	Safe Pulling force		
34	Moisture barrier		
	Material		
	Min. Thickness (in mm)		
35	Metallic sheath		
	Material		
	Type of corrugation		
	Gap (in mm)		
	Min & nom thickness		
	Diameter above metallic sheath		
	Anti Corrosive layer		
	Material		
	Tape		
36	The following details shall be embossed/ Printed on outer sheath at regular interval not exceeding one metre. (a) Manufacturer's Name or Trade name (b) Year of Manufacture (c) Voltage grade of Cable i.e. 132 kV (d) Cable Code (e) Number of cores & cable size e.g. 630 Sq mm (Cu) 1 core 1000 Sqmm (Cu) 1 core		
	Sequential length marking shall also be provided on outer sheath by hot foil or inkjet printing.		
	Cable shall be supplied in returnable steel drums		

**C) TECHNICAL SPECIFICATION FOR 220 kV XLPE (CROSS LINKED POLYETHYLENE) INSULATED POWER CABLE:**

**1.1 SCOPE**

1.1.1 The scope under this section covers design, manufacturer, testing, packing, supply, delivery and laying of 220 kV XLPE, insulated power cable including integrated testing and commissioning, technical support, supervision of maintenance, training of Employer's staff and documentation for a complete System necessary to deliver the requirements of this

Specification.

## 1.2 STANDARDS:

Unless otherwise specified, the cables shall conform, in all respects, to IEC 62067 and IS:7098 (Part-III)/1993 with latest amendment or latest edition for cross linked polyethylene insulated , metallic sheathed & PVC or Polyethylene sheathed cable for working voltage of 220 kV.

The following standard specifications of latest version updated to as on date of opening of this bid document will govern supply, laying testing and commissioning of cables and their accessories that are being used in this Contract. In case of conflict between such codes and/ or standards and the specification, the specifications shall govern.

<b>Sr. No</b>	<b>Title of Specification</b>	<b>Specification No.</b>
1	Cross linked polyethylene insulated Thermoplastic sheathed cables	IEC: 60502-2 IEC: 60840, IEC: 62067
2	Conductors for insulated cables.	IEC : 60228
3	Test on cable over Sheath which have a special protective function and are applied by extrusion	IEC 60229
4	HDPE pipes	BIS 4984
5	Power cables with extruded insulation and their accessories for rated voltage above 150 kV- Test Methods & requirements	IEC 60840
6	Power Cables with extruded insulation and their accessories for rated voltages above 150kV.	IEC: 62067
7	Impulse test on cables & their accessories.	IEC 60230
8	Cyclic and emergency rating of cable	IEC 60852-2
9	Common test methods for insulating and sheathing material of electrical cables.	IEC 60811
10	Electric test methods for Electric cables – Test methods for Partial Discharge measurements on lengths of extruded power cables.	IEC 60885

## 1.3 PRINCIPAL PARAMETERS:

1.3.1 220 KV (E) grade XLPE single core power cable conductor electrolytic grade copper of single length, with formation of stranded compacted circular water blocked conductor for size up to 1000 Sqmm and segmental type for size above 800mm<sup>2</sup> as per, as per IEC-60228, tapped with high penetration resistant semi conducting water blocking tape, shielded with extruded semi-conducting layer, insulated with dry cured cross linked polyethylene (XLPE) insulation, insulation screened with extruded semi- conducting layer, insulated core lapped with a combination of semi- conducting water swell able and Corrugated Aluminium sheath (acting as a screen and also as a mechanical protector), anti-corrosive bitumen compound layered followed by tape and black HDPE ST7 (as per IEC 62067 – 2011) with extruded conductive layer overall cable conforming to IS:7098 (Part-III)/1993 or any latest amendments thereof.

1.3.2 Outer sheathing should be designed to afford high degree of mechanical protection and should also be heat, oil chemicals and weather resistant.

1.3.3 The cable should be suitable for laying in covered trenches and/or underground for outdoor. The sheath/screen bonding system shall provide a continuous current path through the cable sheath and jointing kits and shall be bonded. The bonding ends shall be suitably earthed with/without SVL as per approved configuration/design. The sheath voltage under full load condition shall not exceed the voltage specified/allowed in relevant

standard for safety of personal as well as satisfactory working of cable i.e 65 v. Sheath shall be solidly grounded at suitable location with or without SVL. Bidder must indicate details of configuration proposed along with sufficiency calculation with the bid so as to limit induced voltage of sheath within 65V. Detailed calculation supporting selection of SVL and bonding cable size and rating with margin of protection to be submitted with bid. NOTE: Method of LILO of integrated fiber at each joint for sensing purpose, jointing methodology, Power cable termination to FMS connection method to be submitted for a FIPC cable.

**1.3.5 CABLE PARAMETERS**

Sr. No.	System Particulars	220kV
i)	Voltage Grade (Uo/U)	127/220 kV
ii)	No. of Cores	Single
iii)	Size (mm <sup>2</sup> )	630mm <sup>2</sup> , 800mm <sup>2</sup> ,1000m <sup>2</sup> , 1200 mm <sup>2</sup>
iv)	Nominal system voltage KV	220
v)	Highest system voltage KV	245
vi)	System Frequency Hz	50
vii)	Variation in Frequency	+ 3%
viii)	Fault level individually for i) Conductor ii) Corrugated Aluminium sheath	40 kA for1sec 50 kA for1sec
ix)	Maximum allowable temperature	
	a) Design continuous operation at rated full load current, the max, and temp. of conductor	90
	b) The conductor temperature after a short circuit for 1.0 sec shall not exceed. °C	250
x)	Basic insulation level (1.2/50 Micro Second Wave)	1050 KVP
xi)	System earthing	Effectively

**1.4 OPERATION CHARACTERISTICS:**

- a) One/more Three-phase feeders, each consisting of 1 runs of 3/4 Single core cables, feed power at 220 kV.
- b) In normal situation, each cable will have to be designed to carry a continuous current, to deliver a rated power of Transformers and its designed overload.
- c) The cable should be designed for a suitable current carrying capacity under normal situation, and which will cater for the above overload capabilities also, will be required.

**1.5 GENERAL TECHNICAL REQUIREMENTS:**

**1.5.1 CONDUCTOR:**

The cable conductor shall be made from electrolytic grade copper with formation as stranded compacted circular conductor for size upto 1000 sqmm and segmental type as per IEC-60228 for the size above 1000mm<sup>2</sup>.The conductor shall confirm to IS:8130/2013. Conductor should be water blocked. Water blocking to be achieved by combination of water blocking yarn and non-conducting water blocking tapes in intermediate layers of conductor.

**1.5.2 CONDUCTOR SCREEN:**

A Conductor screen made of semiconducting compound shall be provided over the conductor, by extrusion. The extruded coat shall be continuous, with a constant mean depth, without bump, perfectly adhering to the insulation envelope. A high penetration resistant semiconducting water blocking tape(s) shall be provided below the extruded semi-

conducting conductor screen to prevent penetration of the compound into the underlying conductor with min 50 % overlap. The conductor having a semi-conducting screen shall ensure perfectly smooth profile and avoid stress concentration. The conductor screen shall be extruded in the same operation as the insulation; the semi-conducting polymer shall be cross-linked. Minimum thickness of the conductor screen shall be nominal **1.20 mm** (minimum). The electric resistivity of the conductor screen shall as per IS 7098 (part 3).

**1.5.3 INSULATION:**

The Insulation envelope shall be of cross-linked polyethylene (XLPE) insulation applied by extrusion should be suitable for 220 kV system voltages. The nominal thickness of insulation shall not be less than **27 mm** (minimum subject to only positive tolerances (no negative tolerance is accepted) in min value at any point shall be as per IEC 60840. The manufacturing process shall ensure that the Insulation shall be applied by extrusion and vulcanized using dry curing process to form a compact homogenous body free from micro voids and contaminants. The insulation compound shall be of high quality, heat, moisture, ozone and corona resistant. The insulation shall withstand mechanical and thermal stressed under steady state and transient operating conditions. The extrusion method should give very smooth interface between semi-conducting screen and insulation.

1.5.3.1 The nominal thickness of insulation shall not be less than **27 mm (minimum)** (IS 7098-part 3).

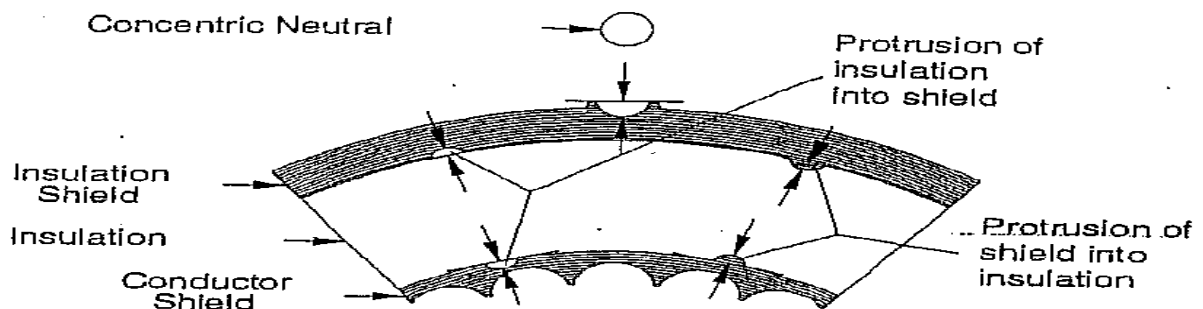
1.5.3.2 The mechanical characteristics shall be as per IS 7098 (Part 3):

1.5.3.3 The isolating envelope shall be as per IS 7098 (Part 3):

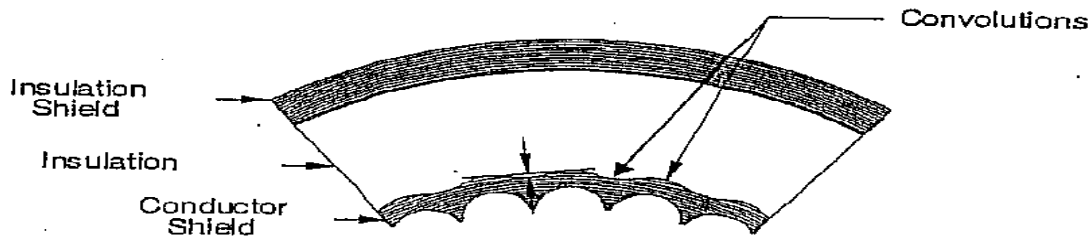
1.5.3.4 Test for surface irregularities shall be carried out as below

Item (For XLPE/TR XLPE insulation)	Clause of AEIC CS8	Unit	Requirement
Protrusions into insulation from conductor screen	3.2	mm	≤ 0.076
Protrusions into conductor screen	3.2	mm	≤ 0.18
Strand Convolutions	3.3	mm	≤ 0.18
Protrusions into insulation from insulation screen	5.2	mm	≤ 0.13
Protrusions into insulation screen	5.2	mm	≤ 0.18

**Figure 1 Procedure to Measure Protrusions and Indentations**



## Procedure to Measure Convolutions



### 1.5.4 INSULATION SCREEN:

To confine electrical field to the insulation, non-magnetic semi-conducting shield shall be put over the insulation. The insulation shield shall be extruded in the same operation as the conductor shield and the insulation by suitable extrusion process (triple extrusion). The insulation shield shall be extruded in the same operation as the conductor shield and the insulation by suitable extrusion process (triple extrusion). The XLPE insulation shield should be bonded type. It shall be lapped by Foam type semiconducting tape with min thickness of 1 mm. Metallic screening shall be provided by Aluminium Sheath. (Minimum thickness of the insulation screen shall be 1.0 mm)

### 1.5.6 Metallic sheath:

The metallic screen shall be of Seamless/Seam welded Corrugated Aluminum having fault current capacity 50KA for 1-sec with initial temperature of screen as 80 and final temperature as 250 degC calculated by adiabatic method. Supporting calculations shall be submitted with bid

#### 1.5.6.1 ANTICORROSIVE LAYER.

An anticorrosive layer of Bitumen compound followed by tape shall form the anti-corrosive layer

### 1.5.7 OUTER SHEATH:

The outer extruded semiconducting layer sheath shall be embossed/printed red/yellow/blue colour or similar (as per phase). Suitable semi conducting layer coated on black HDPE ST7 with extruded conductive layer confirming to IEC: 60840, shall be applied over corrugation with suitable additives to prevent attach by rodents and termites. The outer sheath should have embossing/ indelible Printing at every one meter for Supplier Name, buyer's name, PO No, Voltage grade, size, type etc.

#### 1.5.7.1 The Mechanical Characteristics shall be as follow :

- a) - In delivery condition
  - 1) - minimal traction resistance : 12.5 Mpa
  - 2) - minimal elongation before breaking : 200%
- b) - After ageing of 240 h at 135°C:
  - 1) - traction resistance:
  - 2) - minimum value : 12.5MPa
  - 3) - maximum variation :  $\pm$  25%
  - 4) - elongation before breaking:
  - 5) - minimum value : 200%
  - 6) - maximum variation : 25%

1.5.7.2 The variation is the difference between the medium value obtained after ageing and the medium value without ageing, expressed in percentage of the last.

#### 1.5.7.3 Fiber specification for integration in Power cable

Fiber used in the power cable or supplied separately in the OFC shall be as per below specification.



Attenuation	$\leq 0.35$ dB/km at 1310 nm (Typical $\leq 0.34$ dB/km) $\leq 0.35$ dB/km at 1383nm (Typical $\leq 0.34$ dB/km) # $\leq 0.21$ dB/km at 1550 nm (Typical $\leq 0.20$ dB/km) $\leq 0.23$ dB/km at 1625 nm (Typical $\leq 0.22$ dB/km)
Mode field diameter	$8.6 \pm 0.4$ $\mu$ m at 1310 nm
Cable cutoff wavelength	$\leq 1260$ nm
Zero dispersion wavelength	1300 nm to 1324nm
Zero dispersion slope	$\leq 0.092$ ps/nm <sup>2</sup> .km
Dispersion at 1550 nm	$\leq 18.0$ ps/nm.km
PMD Individual Fiber*	$\leq 0.1$ ps/ $\sqrt$ km
PMD LDV	$\leq 0.06$ ps/ $\sqrt$ km
Cladding diameter	$125 \pm 0.7$ $\mu$ m
Core-clad concentricity error	$\leq 0.5$ $\mu$ m
Cladding non-circularity	$\leq 0.8$ %
Coating diameter	$242 \pm 5$ $\mu$ m
Coating-cladding concentricity error	$\leq 10$ $\mu$ m

\* Individual PMD values may change when cabled

# After hydrogen aging according to IEC-60793-2-50 regarding the B1.3 fiber category

## Mechanical Characteristics

Proof Test Levels	$\geq 100$ kpsi (0.7GN/m <sup>2</sup> ). This is equivalent to 1% strain
Coating strip force(Force to mechanically strip the dual coating)	$\geq 1.3$ N (0.3 lbf) and $\leq 5.0$ N (1.1lbf)
Fiber curl	$\geq 4$ m

Macro bend loss: The maximum attenuation with bending does not exceed the specified values with the following deployment conditions

Deployment condition	Wavelength	Induced attenuation
10 turn, 15 mm radius	1550 nm	$\leq 0.03$ dB
10 turn, 15 mm radius	1625 nm	$\leq 0.10$ dB
1 turn, 10 mm radius	1550 nm	$\leq 0.10$ dB
1 turn, 10 mm radius	1625 nm	$\leq 0.20$ dB
1 turn, 7.5 mm radius	1550 nm	$\leq 0.20$ dB
1 turn 7.5 mm radius	1625 nm	$< 0.50$ dB



## Environmental Characteristics

Temperature dependence Induced attenuation, -60°C to +85°C at 1310, 1550, 1625 nm	≤ 0.05 dB/km
Temperature humidity cycling Induced attenuation, -10°C to +85°C and 95% relative humidity at 1310, 1550, 1625 nm	≤ 0.05 dB/km
High temperature and humidity aging 85°C at 85% RH, 30 days Induced attenuation at 1310, 1550, 1625 nm due to aging	≤ 0.05 dB/km
Water immersion, 30 days Induced attenuation due to water immersion at 23±2°C at 1310, 1550, 1625 nm	≤ 0.05 dB/km
Accelerated aging (Temperature), 30days Induced attenuation due to temperature aging at 85±2°C at 1310,1550,1625 nm	≤ 0.05 dB/km

## Other Performance Characteristics\*

Effective group index of refraction	1.4678 at 1310 nm 1.4685 at 1550 nm 1.4689 at 1625 nm
Attenuation in the wavelength region from 1285 - 1330 nm in reference to the attenuation at 1310 nm	≤ 0.03 dB/km
Attenuation in the wavelength region from 1525 - 1575 nm in reference to the attenuation at 1550 nm	≤ 0.02 dB/km
Point discontinuities at 1310 nm & 1550 nm	≤ 0.05 dB
Dynamic fatigue parameter (N <sub>a</sub> )	≥ 20

### 1.5.8 CONSTRUCTION:

1.5.8.1 All materials used in the manufacture of cable shall be new unused and of finest quality. All materials should comply with the applicable provision of the tests of the specification and any other applicable statutory provisions rules and regulations (IS, IEC, Indian Electricity Rules, Indian Electricity Act).

### 1.5.9 CURRENT RATING:

The cable will have current ratings and de-rating factors as per relevant standard IEC.

1.5.9.1 The one-second short circuit rating values each for conductor, Metal sheath shall be furnished and shall be subject to the purchaser's approval.

1.5.9.2 The current ratings shall be based on maximum conductor temperature of 90 deg. C with ambient site condition specified for continuous operation at the rated current.

### 1.5.9.3 SIZE:

The different sizes of cable shall be 220 kV Single Core

- a) **630mm<sup>2</sup>**
- b) **800mm<sup>2</sup>**
- c) **1000mm<sup>2</sup>**
- d) **1200mm<sup>2</sup>**

### 1.5.10 OPERATION:

1.5.10.1 Cables shall be capable of satisfactory operation under a power supply system frequency variation of plus minus 3% voltage variation of plus, minus 10% and combined frequency voltage variation of 10% (absolute sum).

1.5.10.2 Cable shall be suitable for laying in ducts or buried under ground.

1.5.10.3 Cable shall have heat and moisture resistance properties. These shall be of type and design with proven record on transmission network service.

1.5.11 LENGTHS: The cable shall be supplied in standard drum lengths as below: **Size of cable**                      **Standard Drum Length**

- a) **Single Core, 1000 sq.mm**                      500 meters ± 2% tolerance

### 1.5.11 IDENTIFICATION MARKING:

Identification of cables shall be provided externally at three meters' intervals to identify as

under: -

- i) 'Name of Manufacture'
- ii) 'Year of manufacture'
- iii) 'Voltage grade' to be printed/embossed at the interval of one meter-length.

The identification, by printing or embossing shall be done only on the outer sheath.

- iv) Name of purchaser shall also be embossed.

## **1.6.0 TESTS**

### **1.6.1 Type Tests**

The equipment offered should be type tested as a cable system with terminations and both type of joints. Type test report should not be more than seven years old, reckoned from the date of bid opening, in respect of the following tests, carried out in accordance with **IEC 62067**, from Govt./Govt. approved test house, shall be submitted along with bid:

- i) Physical tests for insulation and outer sheath.
- ii) Bending test.
- iii) Di-electrical power factor test.
- iv) Heating cycle test followed by di-electrical power factor as a function of voltage and partial discharge test.
- v) Impulse withstand test.

The remaining type test report as per **IEC 62067** shall be submitted by the successful bidder. These type test reports shall be from Govt. /Govt. approved test house and shall not be more than five years old, reckoned from the date of issue of tender notification. The failure to do so will be considered as a non-responsive.

### **1.6.2 ROUTINE TESTS AND ACCEPTANCE TESTS**

All routine and acceptance tests shall be carried as per relevant ISS in the presence of Employer's representative.

Following additional tests shall be carried out in routine tests (Optional)

- a) Fiber continuity (For FIPC)
- b) Optical loss measurement (for FIPC: 1 sample)

## **1.7 INSPECTION**

The material shall be inspected and tested before dispatch by an authorised representative of the Owner in respect of quality. The inspecting officer shall also satisfy himself about the correctness of length of cables. In case the supplier is not in a position to get these tests carried out at his works, such tests may be got carried out by him at any Govt. recognized test agency at his own expense.

In addition to acceptance tests stipulated by relevant IS/IEC, following additional tests need to be carried out

### Measurement of gap below Corrugation

- a) Measurement of thickness of Foam type semiconducting water swellable tape
- b) Measurement of protrusions and convolutions
- c) Sheath integrity test
- d) Wafer boil test
- e) 4 hours voltage test on 3.5 m sample (once in PO)
- f) Volume resistivity (once in PO)
- g) Fiber continuity

## **1.8 TEST CERTIFICATES**

To be submitted.

## **1.9 PACKING**

The cable shall be supplied in returnable Steel drum as per so constructed, as to enable the cable to be transported on each drum. The cable wound on such drum shall be one

continuous length. The ends of cables shall be sealed by means of non-hygroscopic sealing material. The Top end shall be provided with Suitable Pulling eye.

#### **1.10 MARKING**

The marking on the drum shall have the following information: -

- a) Reference to Indian Standard & cable code.
- b) Name of the manufacturer & trade name.
- c) Nominal cross section area of conductor for the cables.
- d) Number of core.
- e) Sequential No. at each meter.
- f) Type of the cable & voltage for which it is suitable.
- g) Length of cable on the drum. h) Approximate gross weight.
- i) Net weight of the cable.
- j) Drum identification number.
- k) P.O. No. and date.
- l) Consignee's name with designation.
- m) Year of manufacture.

#### **1.11 DRAWINGS & INSTRUCTION MANUAL**

The tenderer shall supply the following drawings with the tender: -

- i) Detailed drawing of the cable showing conductor, screening insulation, Armouring, outer sheath etc. ii) Detailed drawing showing jointing of cable and sealing of end boxes. Copies of instruction manuals for testing, installation jointing operation and maintenance of cables shall also be submitted with the offer for reference of the purchaser.

#### **1.12 TECHNICAL & GUARANTEED PARTICULARS:**

The tenderer shall furnish guaranteed technical particulars as per the tender specification. Particulars, which are subject to guarantee, shall be clearly marked. Offer not containing this information will not be considered.

#### **1.13 TERMINATION KITS AND STRAIGHT THROUGH JOINTS**

The entire necessary Straight through joints and Sealing Ends for **220 kV** shall be supplied and erected. The Straight through joints and Sealing Ends wherever required shall be Heat Shrink Type or equivalent, of reputed make with shear head type mechanical connectors or cold shrink type of proven technology & make.

#### **1.14 ISO Accreditation**

The cable shall be manufactured by a company having ISO accreditation for quality. The manufacturing process of XLPE cable shall consist of conductor screen, insulation & insulation screen shall be extruded in a single process (Triple extrusion) and cross linked by a suitable proven & latest Process having dry curing technology to ensure homogeneity and absence of micro voids. The cables shall be manufactured by "Dry Curing" Process. It is mandatory that bidder should submit Plant Installation Certificate for process Line and for Metallic sheath machineries indicating the year of installation and other details along with bid. The Employer may decide to visit the works of cable manufacturer to confirm the manufacturing process mentioned & decision of accepting the process is the sole discretion of OPTCL.

## **PART II**

### **TECHNICAL SPECIFICATION FOR LAYING, TESTING AND COMMISSIONING OF 220 kV XLPE UNDERGROUND POWER CABLE**

#### **SECTION-1 SPECIFICATION FOR LAYING OF CABLE:**

##### **1.1 GENERAL**

1.1.2 The Cable Laying works shall be executed according to the rules of the Art pertaining to

professional grade and generally in compliance with International Standards and Indian Standards.

#### 1.1.3 The EHV Cables between the Power Supply Authorities Substation and the DMRC RSS

shall be laid in ground depending upon the site conditions of the selected route, any of the following paying conditions, may be adopted.

##### 1.1.4 Cable Laying Cases

Case 1 - Direct buried, with all cables laid in flat formation.

Case 2 - Direct buried, with the cables (3) of each circuit laid in trefoil formation and side by side in one trench.

Case 3 - Laid in underground duct.

Case 4 - Laid in Trench less piping.

Case 5 - Laid in abutment crossing

Case 6 - Laid in Rail Track crossing

Case 7 - Laid in Air, supported on piers/walls, for nallah-crossing

##### 1.1.5 Details of Case 2 :

The trench for carrying the cables shall be at least 1.8m deep and 1.1m wide, which may vary as per site conditions with the approval of employer. Each of the 2 feeders shall consist of 3 single-core cables, and laid in trefoil formation. Cables shall be laid at a depth of 1.7m below the ground level and over a 100 mm bed of coarse sand. Trench is to be filled with sand upto a depth of 1100mm below the ground level. Warning concrete slabs of at least 50mm thickness shall then be laid above the sand. Trench shall then be filled with earth upto a depth of 300 mm below the ground level. A warning net shall then be laid above the earth filling (at 300 mm depth below the ground level). A warning tape shall also be laid appropriately with Purchaser's Name marked on it. The top space of 300 mm shall be suitably filled with compacted Boulder and Bitumen/Jelly and given a final finish matching the surroundings. The cables shall be tied through locking belts after 2 meters each for keeping the cables intact in case of trefoil formation. At locations, where there is change of level of laying, the cables shall be tied through locking belts after 1 meter each.

##### 1.1.6 Details of Case 3

In specific locations, the Employer may require the cables to be laid in underground ducts. The underground ducts shall be laid where road construction or formation is under construction or where water logging stretch is expected or as per the specific site condition.

##### 1.1.7 Details of Case 4 & 6

On all road/rail crossings and at other specific locations, cable laying shall be through trenchless drilling and the cables shall be passed through High Density Polyethylene (HDPE) Pipes or G.I. Pipes of appropriate diameter and thickness (Case-4). One spare HDPE pipe shall be laid for each feeder of 3 cables at the road/rail crossings.

##### 1.1.8 Details of Case 5 & 7

On all abutment crossing or in air, supported on piers/walls, for Nallah crossing and at other specific locations, cable laying shall be on the galvanized steel structures which can withstand wind velocity of 160kmph, supported on piers and have sufficient structural strength. The minimum average weight of zinc coating should be 1000g/m<sup>2</sup> (RDSO). The cables should be well protected by providing MS sheet of thickness 8mm at least fastened with nuts and bolts & tag welded on all sides to be protected from any pilferages. The arrangement shall render cable absolutely safe from any natural calamity. The cable shall not be exposed or get affected due to stray fire caused in the vicinity. Indicative arrangement is shown in the drawing.

##### 1.1.9 Spare Cables and Pipes

When cables are laid in pipes, in addition to the pipes carrying the cables, at least one spare pipe (minimum 200 mm dia), without cable shall also be provided. In the case cables laid in underground ducts (Case 3) and cables laid in Trenchless piping (Case 4), spare

HDPE pipes, one for each circuit, shall be provided. In addition to pipes for power cables, 2 additional pipes, each of not less than 100 mm dia, shall be provided to carry control and monitoring cables, one operational and one spare (As indicated in the Interfacing Requirements, other cables such as pilot wire for pilot wire protection, if required, copper-core or optic fibre cables for control and monitoring, tele-communication etc, supplied by other Suppliers.

**1.1.10 Cable protection at changeover location**

The cable path, when changing from buried in ground to underground duct or trenchless piping shall be adequately protected by proper sealing in concrete or other suitable means of sufficient mechanical strength to avoid cable from suffering damage due to heat/fire/water ingress etc.

**1.1.11 Pulling Chambers**

Pulling chambers shall be provided, as necessary, along the route. Such pulling chambers shall be 4m long, 3m wide and at least 2.5m deep. The masonry structure should be of adequate strength with water proofing to avoid any accumulation of seepage of water inside. The edges of RCC covers and masonry shall be lined in GI angles to achieve a long service life.

**1.1.12 Route Markers**

The route shall be appropriately marked by suitable retro-reflective cable markers, at suitable intervals and positions of straight through joints shall be indicated by suitable boards.

**2.0.0 CABLE ACCESSORIES AND BONDING**

**2.1.0 Straight Through Joints**

2.1.1 The straight through Joints should be HEAT SHRINKABLE type or cold shrink type of proven technology and make, suitable for underground buried cables. The joint should comprise of stress control sleeves, insulating sleeves and co-extruded dual wall Tubing comprising of an insulating and semi-conducting layer. A mechanical connector with shear head bolts shall make the conductor connection.

2.1.2 The product should be type tested as per IEC /IS specifications

**2.1.3 GENERAL SPECIFICATIONS**

a. The product offered should be proven and should be in use in India for a minimum period of 5 years for the same voltage class. List of past supplies in India to be furnished. Performance certificates to be submitted along with the offer.

b. The product offered should have unlimited shelf life.

c. Offers should be supported with type test certificates from test laboratories of repute,

as per IEC /IS specifications, failing which the offers shall be ignored.

**2.1.4 General Specifications for Joints and Terminations for 220 KV XLPE Cables**

Suitable Terminations (Outdoor & Indoor Sealing ends) and Straight through Joints having proven technology of reputed international make & of 220 kV grade or higher for single core 220 kV cables, XLPE Insulated, Aluminium sheathed cables to be used. The Indoor termination for use in the GIS Substation.

**2.2.0 Bonding**

2.2.1 Suitable bonding methods viz., Single End, Both End and Cross Bonding shall be used.

2.2.2 Link boxes with & without SVL shall be used as required.

**3.0.0 TESTING AND INSPECTION:**

**AS per IS/IEC to be carried out before election.**

**3.1 TECHNICAL DATA FOR 220kV SINGLE CORE 1000 SQMM XLPE INSULATED, PE SHEATHED CABLE:**

Sl.	Name of the Particulars	Desired Value
-----	-------------------------	---------------

No		
1	No. of cores	1(Single)
2	Size (in mm <sup>2</sup> )	1000
3	Voltage Grade( in kV)	127/220(245) kV
4	Type of cable	2XA2Y
5	Standard according to which cable has been manufactured and tested	IS: 7098- Part 3, IEC-60840, IEC-60502-2, Testing as per IEC- 62067.
6	Permissible Voltage & Frequency variation for satisfactory operation.	
	Voltage	± 10%
	Frequency	± 5%
7	Maximum rated conductor temperature	90°C
8	Max. allowable conductor temperature during short circuit	250°C
9	Conductor Details	
	Normal Cross-Sectional Area	1000 mm <sup>2</sup>
	Material and Grade	Annealed Plain Copper to IEC 60228
	Shape of Conductor	Compacted stranded circular
	(d) Separator over conductor	Semi-conducting tapes
10	<b>Conductor Screen</b>	
	Material	Extruded Semi-Conducting XLPE compound
	Nominal Thickness	1.2 mm minimum
11	<b>Insulation</b>	
	Material	Cross linked Polyethylene to IEC 62067
	Nominal Thickness	27.0 mm
12	<b>Insulation Screen</b>	
	Material	Extruded Semi-Conducting XLPE (SC) layer followed by water swellable SC tapes
	Min. Thickness	1.0 mm
	Longitudinal Water Sealing	Foam type Semiconducting water blocking tape(s) with min 10% over lap
13	<b>Metallic Sheath</b>	
	(a) Material	Seam Welded/ Extruded, Corrugated Aluminium sheath with anti-corrosion protection
	(b) Thickness	2.3mm
	(c) Short Circuit current of metallic screen for 1 sec (kA)	min50 KA for 1 sec
14	<b>Outer Sheath</b>	
	(a) Material	Extruded HDPE Type ST-7 to IEC 62067
	(b) Colour	Black
	(c) Thickness (Nom/Min)	4.0 mm
	(d) Conducting layer over outer sheath	baked on graphite/Extruded Semiconducting compound



		compatible with outer sheath	
15	Nominal overall Diameter of cable	125 mm (Approx.)	
16	Nominal Overall Weight of Cable per Meter	18.6 kg/m (Approx)	
17	Standard Drum Length with Tolerance	500m±5%	
18	Minimum Bending Radius allowable during installation	20 x OD	
19	Safe Pulling force	5kg/mm <sup>2</sup> of CU area.	
20	Impulse Withstand Voltage	1050kVp	
21	One minute Power Frequency Withstand Voltage (kV)	318kV for 30 min	
22	Short circuit current for one second(kA)	143	
	Max conductor DC resistance at 20°C	0.0176 ohm/km	
	Approx. AC resistance at 90°C	0.0234 ohm/km	
	Max. capacitance	0.17 microF/km	
23	Continuous Current Rating for cable laid in close trefoil formation	<b>BEB</b>	<b>SPB</b>
	(i) In ground at 30°C ground temp, Depth of laying 1.0 m, Thermal Resistivity of soil 150°C Cm/W	650	820
	(ii) In free air at 40° C Ambient Air Temperature	1100	1345
	<b>BEB:</b> Sheath both end bonded <b>SPB:</b> Sheath single point/ Cross bonded		

### 3.2 GTP FORMAT:

Sl. No	Name of the Particulars	Value
	<b>Name of the manufacturer</b>	
1	No. of cores	
2	Size (in mm <sup>2</sup> )	
3	Voltage Grade( in kV)	
4	Type of cable	
5	Standard according to which cable has been manufactured and tested	
6	Permissible Voltage & Frequency variation for satisfactory operation.	
	Voltage	
	Frequency	
7	Maximum rated conductor temperature	
8	Max. allowable conductor temperature during short circuit	
9	Conductor Details	
	Normal Cross-Sectional Area	
	Material and Grade	
	Shape of Conductor	
	(d) Separator over conductor	
10	<b>Conductor Screen</b>	
	Material	
	Nominal Thickness	
11	<b>Insulation</b>	



	Material		
	Nominal Thickness		
12	<b>Insulation Screen</b>		
	Material		
	Min. Thickness		
	Longitudinal Water Sealing		
13	<b>Metallic Sheath</b>		
	(d) Material		
	(e) Thickness		
	(f) Short Circuit current of metallic screen for 1 sec (kA)		
14	<b>Outer Sheath</b>		
	(e) Material		
	(f) Colour		
	(g) Thickness (Nom/Min)		
	(h) Conducting layer over outer sheath		
15	Nominal overall Diameter of cable		
16	Nominal Overall Weight of Cable per Meter		
17	Standard Drum Length with Tolerance		
18	Minimum Bending Radius allowable during installation		
19	Safe Pulling force		
20	Impulse Withstand Voltage		
21	One minute Power Frequency Withstand Voltage (kV)		
22	Short circuit current for one second(kA)		
	Max conductor DC resistance at 20°C		
	Approx. AC resistance at 90°C		
	Max. capacitance		
23	Continuous Current Rating for cable laid in close trefoil formation	<b>BEB</b>	<b>SPB</b>
	i) In ground at 30°C ground temp, Depth of laying 1.0 m, Thermal Resistivity of soil 150°C Cm/W		
	v) In free air at 40° C Ambient Air Temperature		
	<b>BEB:</b> Sheath both end bonded <b>SPB:</b> Sheath single point/ Cross bonded		

## **(D) TECHNICAL SPECIFICATION CABLE SEALING END KIT for 220 KV, 132 KV & 33 KV**

- (a) Specifications of 245 KV, 145 kV & 33 KV Dry type.  
(b) Termination, Dry type O/D Termination & St through Joints  
(c) Applicable IECs: IEC 60840 for technical data, IEC 62271-209 for dimensioning, EN 50089 for routine tests on Epoxy insulators

### **1.0 TYPE & MAKE OF CABLE KITS**

#### **1.1 SF6 SWITCHGEAR TYPE SEALING END:**

1.1.1 For the feeder bays having power cable connections, the suitable cable sealing end enclosures will be supplied by the GIS bidder but 245 KV, 145 kV & 33 KV XLPE cables and cable sealing end terminators with cable cone will not be included in the GIS bidder's supply. Interface between GIS and power cable will be in accordance with IEC 62271-209

(2007-08).

1.1.2 The GIS Plug-in (Dry) type cable sealing end, conforming to IEC: 60840 for termination of the Cables for maximum continuous voltage of 245 KV, 145 kV & 33 KV at SF6 switchgear end will be supplied by the cable manufacturer. The contractor shall be responsible for the preparation of the cable insulation and conductors and correct termination of each cable to these sealing ends.

1.1.3 Bidders are requested to quote cable sealing end with design that helps reducing, if possible, the works on the gas compartments. The cable sealing end shall be of plug-in type that allows easy plugging and unplugging of high voltage power cable without the need of opening the GIS and related time consuming gas works. The supplier of GIS Plug-in (Dry) type Termination will coordinate closely with GIS manufacturer for mounting the epoxy insulator in the GIS cable chamber. The cable contractor will supply only the Plug-in part and associated components.

1.1.4 Cable manufacturer shall furnish large scale general assembly drawings of the SF6 sealing ends, mounting flange details, size of terminal opening in the junction box, weight of terminal including accessories, physical shape and dimensions of all live part, recommended clearances from live parts to the inside surface to permit the SF 6 switch gear manufacturer to design and supply junction boxes of adequate dimensions and construction to permit the installation and maintenance of the terminals without difficulty.

1.1.5 The stress cone made of EPDM rubber shall inhibit possible mechanical stress and deformation of the cable insulation surface during operation and also shall be capable of accommodating minor radial and longitudinal movement without detriment to the dielectric stress in the insulation shield.

1.1.6 Manufacturer shall state the connector clearances required when the assembled cable DC proof test is undertaken for co-ordination with the SF6 switch gear design.

1.1.7 All supporting structures for the SF6 bus-duct connections between the XLPE cable sealing ends and the GIS shall be supplied by the outdoor GIS supplier. The supplier may specify connecting & supporting arrangements for approval of the purchaser.

## 1.2 **OUTDOOR TYPE SEALING END.**

1.2.1 The Dry type cable sealing end (where no oil filling is required in the Termination), conforming to IEC-60840 will be preferred, for maximum continuous voltage of 245 KV, 145 kV & 33 KV cables at the outdoor yard shall be supplied by the cable manufacturer. The contractor shall be responsible for correct termination of each cable to sealing ends, installation of the cable sealing end and providing of terminal connectors for connecting to terminal conductor. The requisite interconnection between line end & sealing end is required to be designed (as per safety and statutory provision aspects) and executed (after approval of Owner) by successful bidder.

1.2.2 The silicone rubber /composite bushing termination of rated capacity, suitable for outdoor installation in heavily polluted atmosphere shall be used. The minimum creepage offered should not be less than 31mm/kV. It should be resistant to UV exposure. The termination stress control shall be by means of stress cone.

1.2.3 The stress cone made of EPDM rubber shall inhibit possible mechanical stress and deformation of the cable insulation surface during operation and also shall be capable of accommodating minor radial and longitudinal movement without detriment to the dielectric stress in the insulation shield.

### 1.3 STRAIGHT THROUGH JOINTS

1.3.1 The Pre-Moulded type straight through joints for XLPE cable, conforming to IEC 60840 shall be suitable for underground buried installation with incorporated back fill and chances of flooding by water. The straight through joints should be absolutely impervious to the entry of water. The manufacturer shall use the proven technology and design to prevent entry of water or any other liquid inside the straight through joints and cables.

1.3.2 The stress cone made of EPDM rubber shall inhibit possible mechanical stress and deformation of the cable insulation surface during operation and also shall be capable of accommodating minor radial and longitudinal movement without detriment to the dielectric stress in the insulation shield.

1.4 Type tests conducted for offered make cable and accessories separately will be considered for evaluation.

Type test for cable conducted shall be as per IEC 60840 or equivalent/higher standard for 245 KV, 145 kV 1000sqmm, & 33 KV 630 & 300 Sqmm copper cable or above sizes offered make cable & pre moulded joints and end terminations.

**i) The above tests should have been conducted from any one of the reputed International Test Laboratories mentioned below.**

- a) CPRI, Bangalore .
- b) STRI Sweden.
- c) Hydro-Quebec, Canada
- d) EDF, France.
- e) KEMA, Holland.
- f) CESI, Italy.
- g) IPH, Germany.
- h) NEETRAC (USA).

However, the type tests conducted at any other international accreditation test laboratory is also considered, subject to verification of accreditation certification issued by international accreditation board only and for the purpose of conducting type test.

## **(E) TECHNICAL SPECIFICATION OF LINK BOXES FOR**

<b>Sl. No</b>	<b>PARTICULARS</b>
<b>1.0</b>	<b>Link boxes and sheath voltage limiters</b>
<b>1.1</b>	<b>General</b>
<b>1.2</b>	<b>Cross Bonding</b>
<b>1.3</b>	<b>Mechanical Design</b>
<b>1.4</b>	<b>Electrical Design</b>
<b>1.5</b>	<b>Applications</b>
<b>1.6</b>	<b>Type Tests</b>
<b>1.7</b>	<b>Dimensions</b>
<b>1.8</b>	<b>Factory Type Tests</b>
<b>1.9</b>	<b>Routine Tests</b>

### **CROSS BONDING OF EHV CABLES:**

#### **1.0 Link boxes and sheath voltage limiters:**

##### **1.1 General**

Link boxes are used with cable joints and terminations to provide easy access to shield breaks for test purposes and to limit voltage build-up on the sheath. Lightning, fault currents and switching operations can cause over voltages on the cable sheath. The link box optimizes loss management in the cable shield on cables grounded both sides.

##### **1.2 Cross Bonding:**

For cross bonding, the cable length is divided into 3 equal sections. Each of the alternating magnetic fields induces a voltage with a phase shift of 120° in the cable shields. The cross bonding takes place in the link boxes. Ideally, the vectorial addition of the induced voltages becomes zero. In practice, the cable length and the laying conditions will vary, resulting in a small residual voltage and a negligible current. Since there is no current flow, there are practically no losses in the screen. The total of the three voltages is zero, thus the ends of the three sections can be grounded. However sections for cross bonding may vary depending on the length of cables.

##### **1.3 Mechanical Design:**

1.3.0 Made of stainless steel

1.3.1 Compact design

1.3.3 Single phase and 3-phase link boxes

1.3.4 Hermetically sealed

1.3.4.1 Resists water pressure up to 1 bar (20 psi)

1.3.4.2 Lugs and bonding cables are heat shrink sealed inside and outside

##### **1.3.5 Suitable for different applications**

1.3.5.0 Single point bonding

1.3.5.1 Cross bonding

1.3.5.2 Direct grounding

1.3.5.3 Grounding through SVL

1.3.5.4 Combined direct and SVL grounding

1.3.5.5 Cross bonding and transposition

#### **1.4 Electrical Design:**

- 1.4.1 Grounding box
- 1.4.2 Link box
- 1.4.3 ZnO sheath voltage limiter
- 1.4.4 3 kV and 6kV protection levels
- 1.4.5 Same outer dimensions for both levels

#### **1.5 Applications:**

- 1.5.1 Can be installed in underground pits at a depth of 2mtr and more.
- 1.5.2 Use with single core or concentric bonding lead

#### **1.6 Type Tests:**

- 1.6.1 Tested to ANSI/IEEE Std 575-1988 IEEE-Guide for the application of sheath-bonding methods for single conductor cables and the calculation of induced voltages and currents in cable sheaths.
- 1.6.2 Any NABL accredited laboratories..

#### **1.7 Dimensions:**

- 1.7.1 Single Phase Link Box: L 300 x W 190 x H 165 (mm)
- 1.7.2 Three Phase Link Box with or Without SVL: L 310 x W 310 x H 255 (mm)

**Note:** This is Dimensions are indicative only which will be finalized during detailed engineering.

#### **1.8 Factory Type Tests:**

- 1.8.1 Water Immersion Test (IP 68- IEC 60529)
- 1.8.2 Impulse Voltage Withstand Test
- 1.8.3 Dust Test
- 1.8.4 Water Jet Test

#### **1.9 Routine Tests:**

##### **1.9.1 DC Withstand Test:**

25 kV DC voltage is applied for 5 minutes to each cable lug meanwhile all other lugs to be earthed. If exist(s), SVL(s) dismantled during test. In the DC withstand test is no breakdown and flash over.

##### **1.9.2 Insulation Resistance Measurement Test:**

5 kV DC voltage is applied for 1 minute to each cable lug meanwhile box itself to be earthed. If exist(s), SVL(s) dismantled during test. At the end of test duration insulation resistance of each link box is greater than 100 MΩ.

##### **1.9.3 Contact Resistance Measurement Test:**

50 A DC current will be applied to each contact points which had been squeezed with 40 kN torque. If exist(s), SVL(s) dismantled during test. Contact resistance each contact point is less than 10μΩ.

##### **1.9.4 Water Sealing Test:**

All underground type link boxes after manufacturing with cover bolted closed, and phase glands capped, filled with water trough earthing gland will be subject to equivalent 3.0 meter water pressure (0.3 bars) for 15 minutes. VISUALY inspection of external surf. There is no leaks and water spots.

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**APPENDIX-II**  
**SCHEDULE OF QUANTITY AND DELIVERY**

<b>Sl. No</b>	<b>Item Name/ Category</b>	<b>Item Description</b>	<b>UOM</b>	<b>Quantity</b>	<b>Desired Delivery</b>	<b>Destination</b>
1	CABLE	1.1)132kV, 1 core, 1000 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminium sheath type).	Km	0.5	Within 6(Six) months from the date of issue of the purchase order	Any Site/store of OPTCL within the state of Odisha (which will be indicated in PO/Dispatch Instruction)
		1.2)132kV, 1 core, 630 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminium sheath type).	Km	1.5		
		1.3) Supply of single core 300 Sq.mm XLPE bonding cable.	Km	1		
		1.4)Earth bonding cable 240 sq.mm XLPE	Km	1		
		1.5)33kV, 1 core, 630 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminum sheath type).	Km	5.58		
		1.6)33kV, 1 core, 300 Sq. mm Copper XLPE UG cable (Extruded semi conducting Screen and extruded or seam welded corrugated Aluminum sheath type).	Km	1		

**END OF TENDER SPECIFICATION**