

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

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

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1.	<p>1. Sealed bids are invited for the items mentioned in the enquiry conforming to specifications. Bids should be typed and free from over writing and erasures, corrections or additions must be clearly written both in words and figures and attested and otherwise offer may be liable for rejection.</p> <p>2. Bidder to ensure that quotation is received / dropped in the tender box on or before 14.00 Hrs. as per Indian standard time (IST) of the due date of opening in Material Management Division, Transmission Business Group, Tower-A, 5th Floor, Advant Navis IT Business Park Plot-7, Sector-142, Expressway Noida, Noida-201305, UP, India</p> <p>3. The tenders will be opened on due date at 14.30 Hrs. as per IST in the presence of participating vendors, who may like to be present. Tenders received late are liable for rejection. Vendors should ensure that an offer is delivered in time.</p> <p>4. Bids are to be submitted in Two parts:</p> <p>Part-I: Qualification Criteria/Technical / Commercial Bid (in two copies)</p> <p>Part-II: Price Bid</p> <p>Part-I Envelopes super scribed with Technical / Commercial Bid to contain information regarding, among others:</p> <ol style="list-style-type: none">1. Specification2. Deviations (if any) in deviation sheet of BHEL's Format.3. All commercial terms, Un-priced copy of Price Bid with units for measurement.4. Delivery terms & period required for supply from order, Filled in activity Schedule format5. Evidence for Qualification criteria. <p>Part-II Envelopes super scribed with Price Bid should contain priced copy of Price Bid. The price should be mentioned both in figures and words. Price bid containing any additional information is liable for rejection. In case of any difference between figures and words, the quoted rate in words will prevail over figure. If there is a calculation mistake in multiplication of unit rate with quantity, then the unit rate quoted will be considered for calculation.</p> <p>Both Part I and Part II bids are to be kept in separate envelopes and both envelopes to be kept in another common envelope. Each envelope should be sealed and super scribed with enquiry no., item / package name, project name and due date of opening.</p> <p>Note: 1 Representative deputed to witness tender opening must produce an authority letter from the signatory of offer at the time of tender opening.</p> <p>Note: 2 Authorized signatory should authenticate tender documents.</p> <p>Note: 3 The bid of bidder will be accepted subject to vendor approval by Customer.</p>

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	<p>5. For any Technical clarification, please contact:</p> <p>Sh. Dileep Kumar Shukla, Dy. MANAGER / TBEM BHARAT HEAVY ELECTRICALS LIMITED TRANSMISSION BUSINESS GROUP TOWER A, 5TH FLOOR, ADVANT NAVIS IT BUSINESS PARK, PLOT NO-7, SECTOR-142, EXPRESSWAY NOIDA, NOIDA-201305, DISTT- GAUTAM BUDH NAGAR, UP, INDIA Phone : 0120-06748533 E-mail : dkshukla@bhel.in</p> <p>For any commercial clarification please contact person issuing enquiry. Mr. S. C. Shivhare, Sr. Manager-TBMM or, Smt. Archana Kumari, Sr. Engr.-TBMM BHEL, Transmission Business Group, Tower-A, 5th Floor, Advant Navis IT Business Park Plot-7, Sector-142, Expressway Noida, Noida-201305, UP, India Phone : +91 (0) 0120- 6748471/8467, Fax: +91 (0) 0120 . 6748581. e-mail :scshivhare@bhel.in / archanak@bhel.in</p> <p>6. Unsolicited Supplementary / Revised price bid submitted during validity period of offer, unless asked by BHEL, shall not be considered. Withdrawal of quotation by the vendor, at any stage after submission, may entail action.</p> <p>7. If scope also includes site activities (i.e. Supervision, Erection, Installation, Testing and Commissioning of the equipment / material), separate contracts may be awarded for Supply portion and Site execution portion. For Supply portion General Terms and Conditions mentioned here shall be applicable. For Site execution portion, Terms and conditions for Installation services shall be applicable. However, any breach in either of the contract shall be deemed as the breach of other contract also.</p>
2.	<p>PRICES:</p> <p><u>The Prices shall remain FIRM during contract period.</u></p> <p><u>Project Status:</u> Domestic. Excise Duty, CST, CD are payable by vendor.</p> <p><u>For Foreign Bidder:</u></p> <p>The break-up of the prices shall be as mentioned in the schedule of price format.</p> <ol style="list-style-type: none"> i. FOB / CIF (Port of loading) including sea worthy packing & forwarding charges. ii. Marine Freight. From port of loading to discharge port iii. Insurance.do..... iv. Vendor to mention Port of Loading (ō ō ō ō ō ō .) v. Destination Port (Mumbai) <p>Foreign vendors to quote Freight & Insurance charges from port of loading to port of discharge (Mumbai). However, in case of insurance by foreign vendor, the beneficiary shall be BHEL only.</p> <p><i>Loading shall be done on foreign vendors for Custom Clearance charges as well as Custom Duty at Port and for transportation from Port of Discharge to site including insurance and all other associated Charges, Taxes & duties involved till delivery of goods at site. However, foreign vendor can also quote for inland transport (From Mumbai Port to Site).</i></p>

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	<p><u>Type Test charges:</u> As mentioned in technical specification – The supplier shall conduct the type tests as per relevant IEC standards and no extra cost shall be paid by BHEL.</p> <p><u>Laying, Erection, Testing and Commissioning charges:</u> As mentioned in the technical specification, is to be quoted separately along with applicable taxes and duties on them.</p> <p><u>Training at Supplier's Works / Site: -</u> As mentioned in the technical specification, is to be quoted separately along with applicable taxes and duties on them.</p> <p>Service Tax: Applicable towards Erection, Testing & Commissioning & Training (if any) and type test charges as per the current prevailing rate in India.</p> <p>NOTE: Please note that in case training / Type Test is conducted outside India, taxes / duties outside India shall be in scope of bidder and included in their quoted prices.</p> <p><u>For evaluation purpose:</u></p> <p>Price quoted in any currency will be converted to Indian rupee at the TT Selling Rate of SBI in India on the date of Techno – Commercial Bid opening.</p> <p><u>For Indigenous bidder:</u></p> <p>The prices are to be quoted on FOR (Destination) basis. The break-up of price shall be as under:-</p> <p>a) Ex-works Price: Ex- works price including packing & forwarding charges.</p> <p>b) Excise duty: ED as applicable is to be quoted as percentage in both un-price and price bid.</p> <p>c) Sales Tax: ST / VAT / CST (against C-form) to be quoted as percentage in un-price and price bid.</p> <p>d) Entry tax / Octroi Charges: Any Entry tax / Octroi applicable at destination / destination state shall be paid extra on proof of such payment.</p> <p>e) Freight & Insurance: Freight and Transit Insurance for door delivery up to destination/store is to be quoted.</p> <p>f) Service Tax: Applicable towards Erection, Testing & Commissioning & Training (if any) and type test charges as per the current prevailing rate in India.</p> <p>g) Type Test charges: As mentioned in technical specification – The supplier shall conduct the type tests as per relevant IEC standards and no extra cost shall be paid by BHEL.</p> <p>h) <u>Laying, Erection, Testing and Commissioning charges:</u> As mentioned in the technical specification, is to be quoted separately along with applicable taxes and duties on them.</p> <p>i) <u>Training at Supplier's Works / Site: -</u> As mentioned in the technical specification, is to be quoted separately along with applicable taxes and duties on them.</p>

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	<p><u>NOTE:</u></p> <p>The purchase order shall be placed on Ex- Works basis for Indian Vendor.</p> <p>For overseas Vendor, the order is proposed to be placed on CIF basis. However, BHEL reserves the right to convert the order on FOB also. The evaluation of bids shall be done on delivered cost to BHEL, in such case the F & I charges from discharge port to site shall be loaded on CIF value quoted by the overseas vendors.</p> <p>“BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. All bidders to give their acceptance for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.</p> <p>In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit ‘online sealed bid’ in the Reverse Auction. Non-submission of ‘online sealed bid’ by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.”</p> <p>(Further to above clause, please refer attached Annexure I for Terms & Conditions Of Reverse Auction Page 1 & 2)</p> <p><u>RA guidelines is also on BHEL website (www.bhel.com)</u></p>
3.	<p><u>TERMS OF PAYMENT:-</u> For Overseas Vendors:</p> <p><u>FOR SUPPLY PORTION:-</u></p> <p>i) By irrevocable LC (With Usance Period of 60 days, to be counted from the date of presentation of documents in LC opening bank) which will be opened after placement of order and receipt of performance bank guarantee for 10% of order value. All bank charges to supplier’s account.</p> <p>90% against original invoice, original bill of lading, packing list, MICC (dispatch clearance given by BHEL), guarantee certificate, transit insurance certificate, certificate of origin.</p> <p>ii) “10% direct payment within 60 days from the date of confirmation of material receipt by BHEL Site and against submission of invoice to BHEL TBG.”</p> <p>NOTE: In regards LC Payment, please note that all bank charges are in beneficiary account. Period of presentation should be 7-10 working days from the date of shipment / invoice whichever is later. However, documents must reach LC opening bank within 21 days of date of B / L.</p> <p><u>FOR INSTALLATION SERVICES:-</u> Direct payment on prorata basis within 60 days as follows:</p> <ol style="list-style-type: none"> 1. 90% payment after measurement acceptance of respective services by BHEL Site and submission of bill by the vendor for the same. 2. 10% payment after successful testing & commissioning of entire cable system as per the scope of contract. <p><u>Terms of payment for Training charges:</u></p> <p>100% direct payment with full taxes and duties on completion of training within 60 days from the date of receipt of invoice. Documents (original + 2 copies) required</p>

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	<p>for payment.</p> <ul style="list-style-type: none"> - Invoice - Training completion certificate from BHEL. <p><u>TERMS OF PAYMENT:- For Indian Vendors:</u></p> <p>100 % Payment with Taxes, Duties, Freight & Insurance within 60 days (45 Days for MSE vendor) from the date of receipt of complete invoice with following documents in 3 sets (Original + 2 copies):</p> <ul style="list-style-type: none"> - LR duly endorsed in the name of customer by BHEL site - Receipt of material on the attached format by BHEL site - Excise invoice (If Applicable) - Delivery Challan or Packing list (case wise) - Transit insurance certificate from under writers or Copy of Intimation of Transit Insurance duly endorsed by under writers - MICC - Guarantee Certificate - Copy of Performance Bank Guarantee. <p>[A.] Documents to be furnished by vendor immediately after dispatch:</p> <ul style="list-style-type: none"> - Copy of Invoice - Copy of LR - Copy of Delivery Challan / Packing List - Copy of Insurance Certificate - Copy of Guarantee Certificate <p>[B.] Following Documents to be sent by vendor to TBG, BHEL :</p> <ul style="list-style-type: none"> - LR duly endorsed in the name of customer by BHEL site - Receipt of material on the attached format by BHEL site - Excise invoice (If Applicable) - Delivery Challan / Packing list (case wise) - Transit insurance certificate from under writers or Copy of Intimation of Transit Insurance duly endorsed by under writers - Dispatch Clearance / MICC - Guarantee certificate - All Test & Inspection Reports <p><u>FOR INSTALLATION SERVICES:-</u> Direct payment on prorata basis within 60 days as follows:</p> <ol style="list-style-type: none"> 1. 90% payment after measurement acceptance of respective services by BHEL Site and submission of bill by the vendor for the same. 2. 10% payment after successful testing & commissioning of entire cable system as per the scope of contract. <p><u>Terms of payment for Training charges:</u></p> <p>100% direct payment with full taxes and duties on completion of training within 60 days from the date of receipt of invoice. Documents (original + 2 copies) required for payment.</p> <ul style="list-style-type: none"> - Invoice - Training completion certificate from BHEL. <p>INTEREST LIABILITY</p> <p>In case of any delay in payment due to any reason, BHEL shall not pay any interest on delayed payment.</p>
4	GUARANTEE: The equipment / material shall be guaranteed for 18 months

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	from the date of delivery or 12 months from the date of commissioning, whichever is earlier. The defective material / component shall be replaced free of cost at site.
5.	<p><u>SECURITY CUM PERFORMANCE BANK GUARANTEE:</u></p> <p><u>OPTION -A</u></p> <p>For Overseas Vendors: In the event of an order, tenderer shall furnish BG towards Security Cum Performance for 10% of total value of P.O.(for supply portion), within two weeks of placement of P.O. valid till 60 days beyond the guarantee period, from any schedule bank subject to acceptance by TBG/BHEL Finance</p> <p>For Indian Vendors: Bidder shall furnish along with first invoice Performance BG / deposit as per following options.</p> <p>BG for 10% of the total Ex-works PO value, initially valid for 18 months + 3 months claim period (i. e. total 21 months) from the date of last delivery</p> <p>In case BG period is expiring before expiry of Guarantee Period, vendor (applicable for both Indian as well overseas vendors) will have to keep the BG extended suitably till the end of Guarantee Period. In case of foreign vendors, BG will be required to be submitted before opening of L/C.</p> <p>All the Bank Guarantee shall be from a scheduled bank in India acceptable to BHEL. The original BG should be sent by issuing bank directly to AGM (Finance), TBG, BHEL, Noida. BANK Guarantee should be valid for lodging claim within two months after expiry of guarantee period.</p> <p><u>OPTION-B(Applicable for Indian as well as Overseas Vendors)</u> Retention of 10% of the total Ex-works PO value by BHEL from the first bill in lieu of Performance Bank Guarantee, to be released after expiry of Guarantee Period.</p> <p>If no option is specified, by default option – A shall be considered for confirmation</p>
6.	<p><u>INSPECTION:</u> BHEL and/or customer will inspect the Equipment/Material before dispatch. In the event BHEL / Customer waives off inspection, TEST REPORTS and RESULTS shall be submitted by vendor for approval by BHEL / Customer. Based on that MICC (Material Inspection Clearance Certificate) / MDCC shall be issued by BHEL. Material to be dispatched only after getting Dispatch Clearance from BHEL.</p> <p>BHEL / Customer may also carry out stage inspection during manufacturing of the ordered item.</p> <p>Supplier shall send inspection call on prescribed format only with an advance notice of 15 days.</p> <p>“BHEL representative from unit or CQ is authorised to carry out audits along with TPIA at vendor’s works before clearing the items for despatch”.</p>
7.	<p><u>DISPATCH DOCUMENTS:</u> Dispatch documents (Negotiable documents) shall normally comprise Original Invoice, Bill of Lading/LR, Shipping / Packing lists (case wise), Certificate of country of origin, Material Inspection Clearance certificate (MICC), Test Certificates & approval of acceptance & routine test certificates,</p>

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	Insurance certificate and manufacturer's guarantee certificate.
8.	<p>DELIVERY PERIOD: AT THE EARLIEST: Vendor to quote their best possible delivery plan in activity schedule to meet the tender's delivery requirement. In case, BHEL's delivery requirement is not met by vendor(s), then a chance may be given to all such vendors to review their quoted delivery schedule in line with BHEL's delivery requirement. However, if vendor fails to meet the requisite delivery plan, then BHEL reserves the right not to consider the offer of such vendor(s).</p> <p>Time for conducting the type test, if required, is to be separately indicated.</p> <p><u>Note:</u> BOL/LR date or Invoice date whichever is later shall be considered as delivery date for supply portion and date of completion of installation work shall be considered as delivery date for installation work.</p>
9.	<p>DELAYED DELIVERY: In case of delay in execution of order beyond the lot wise contractual delivery, an amount of ½ % of total Ex-Works / FOB Value per week or part there-of subject to maximum of 10 % of total Ex-Works / FOB value of P.O. will be levied.</p>
10.	<p>VALIDITY: The offer shall be valid for 120 days from the due date of opening.</p>
11.	<p>ACCEPTANCE / REJECTION OF TENDER: BHEL reserves the right to reject in full or part, any or all tender without assigning any reason thereof. BHEL also reserves right to vary the quantities mentioned in the tender.</p>
12.	<p>EVALUATION: Comparative statement shall be prepared based on overall quantity unless otherwise indicated in the enquiry. Evaluation of offers shall be done on the basis of delivered cost to BHEL including all taxes and duties, but after taking VAT credit i. e. deducting from cost, if applicable.</p>
13.	<p>DEVIATION: The bids having deviation(s) w.r.to tender are liable for rejection. However, BHEL, at its discretion, may load the prices for evaluation of offer as mentioned at Sl. No. - 22.</p>
14.	<p>ARBITRATION:</p> <p>All cases of disputes emanating from and relating to this contract shall be referred to the sole arbitrator appointed by Unit Head / GM, BHEL. The arbitrator may be an employee of BHEL whether serving or retired or any other person nominated by Unit Head/GM BHEL. The arbitration shall be in accordance with The Arbitration and Conciliation Act 1996 and the rules there under as amended from time to time. The arbitrator shall give a reasoned award. The decision of the arbitrator shall be final & binding upon both the parties.</p> <p>The venue of arbitration shall be Delhi.</p>
15.	<p>LEGAL SETTLEMENT: All disputes shall be subject to jurisdiction of court situated</p>

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	in Noida / New Delhi only. Notwithstanding contained herein anything in this NIT, the original exclusive jurisdiction shall remain of the court at Delhi / New Delhi.
16.	<u>SUBCONTRACTING :</u> In case further subcontracting of BHEL order or part thereof is envisaged by vendor, the same can be done only after written permission is obtained from BHEL. However it shall not absolve the vendor of the responsibility of fulfilling BHEL purchase order requirements.
17.	<u>RISK PURCHASE:</u> In case the successful bidder fails to supply or fails to comply with the terms & conditions of the purchase order, BHEL reserves the right to source such material/ component / equipment/ system from any other agency at the risk and cost to BHEL of the successful bidder.
18.	<u>ADJUSTMENT OF RECOVERY:</u> Any amount payable by the supplier under any of the condition of this contract shall be liable to be adjusted against any amount payable to the supplier under any other works/contract awarded to him by any BHEL unit. This is without prejudice to any other action as may be deemed fit by BHEL.
19.	<u>FORCE MAJEURE CONDITION:</u> Force Majeure will mean: Circumstances beyond the control of contracting parties such as but not limited to act of God, natural catastrophes, fire, war, embargo, industrial dispute, riot, civil commotion, restrictions etc. Vendors willing to plead force majeure shall inform its effect on fulfillment of contract and shall not be held responsible for non-performance in such circumstances.
20	<u>DEMURRAGE / WHARFAGE:</u> For the reasons of delay in receipt of documents from suppliers or due to the same being found to be incomplete, and/or faulty, the suppliers shall be responsible to reimburse in all demurrages / wharfages, if any, paid by BHEL (for stated reasons).
21	<u>Instructions for OEM:</u> Procurement directly from the manufacturers / suppliers shall be preferred. However, if the OEM / Principal insist on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacture / supplier. Moreover, either the agent could bid on behalf of the manufacture / supplier or the manufacture / supplier could bid directly but not both. In case, bids are received from both the manufacture / supplier and the agent, bid received from the agent shall be ignored. Guarantee Certificate should be from OEM only. However, in case of part supply or services to be done by the agent of manufacture / supplier, two separate orders can be placed by BHEL one on OEM & other on the agent of OEM. However, System guarantee shall be provided by OEM only.
22	LOADING CRITERIA FOR DEVIATIONS TAKEN BY BIDDER ON: <u>22.1 : TERMS OF PAYMENT:</u>

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	<p>If a bidder asks for payment within specified no. of days from the date of receipt of invoice with complete documents as per %terms of Payment+at sr. No. 3 above, loading to be done as follows:</p> <ul style="list-style-type: none"> a) Base rate of SBI (as applicable on the date of techno commercial bid opening) + 6 % shall be considered for loading for the period of relaxation sought by the bidder. b) 60 days - No loading <p>22.2 : <u>DELAYED DELIVERY / PENALTY DUE TO DELAYED DELIVERY:</u></p> <p>Loading for not accepting this clause / accepting only on un delivered portion shall be the maximum amount specified in this clause.</p>
23	<p>Indemnity (Against Patents / Trademarks etc) :</p> <p>The vendor shall at all times indemnify the purchaser against all claims which may be made in respect of the said supply from any rights protected by patent registration of design or trade mark; provided always that in the event of any claim in respect of an alleged breach of patents registered design or trademark being made against. The purchaser shall notify the seller of same and the seller shall be at liberty, but entirely at their own expenses, to conduct negotiation for settlement or deal with any litigation that may arise there from.</p>
24	<p>CONVERSION TO SINGLE CURRENCY:</p> <p>Prices expressed in currency other than Indian Rupee will be converted to Indian Rupee at the exchange rate (TT selling rate of State Bank of India) on the due date of submission of offer for the purpose of evaluation.</p>
25	<p>FINAL ENGINEERING DOCUMENTATION:</p> <p>Final documentation as called in the specification is to be submitted within 3 to 5 months from the date of dispatch of material at site against this contract.</p>
26	<p>"MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) or valid NSIC certificate or EM II certificate along with attested copy of a CA certificate (Format enclosed at Annexure -1 where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid). Non submission of such documents will lead to consideration of their bid at par with other bidders. No benefit shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or attested by a Gazetted officer. "</p>
27	<p>"The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as</p>

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	soon as it comes to their notice."
28	<p data-bbox="370 233 829 264"><u>Technical Pre-Qualification Criteria</u></p> <p data-bbox="370 300 1383 436">The bidder must have type tested (as per relevant IEC and equivalent standards applicable), manufactured, supplied at least 3kms 66kV or higher rating XLPE cable in a single contract, which must be in operation for atleast two years as on original scheduled date of bid opening.</p> <p data-bbox="370 472 1383 709"><u>The Bidder must ensure that they confirm the Qualifying Requirement and the necessary documentation in this regard would be provided by Bidder to BHEL along with their offer for ascertaining that they confirm the Qualifying Requirement. BHEL Reserves the Right to reject any offer from Bidder in case of Non . Compliance to the Qualifying Requirement or inability of Bidder to produce the necessary documentation for ascertaining that they confirm the Qualifying Requirement.</u></p>

Signature of Bidder

Seal

Terms & Conditions of Reverse Auction

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

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit 'online sealed bid' in the Reverse Auction. Non-submission of 'online sealed bid' by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.

10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the 'Business Rules of Reverse Auction', which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

BHEL UN-PRICE BID FORMAT FOR SUPPLY PORTION.

Enquiry No: 225E326 DATED 18/02/2016
 Project: ONGC HAZIRA
 Item: 66 kV Cable & Accessories

S.N	PH-ITEM	Unit	Qty	Currency	Unit Ex-works/ FOB	Total Ex-works/ FOB	Unit marine freight & Insurance	Total Marine Freight & Insurance	Unit Inland F & I Charges	Total Inland F & I Charges	Excise Duty (ED)	Central Sales Tax (CST)	Total Cost to BHEL for indian supplier for each line item	CIF Value + Inland F & I (if opted by foreign bidder)	
Instruction to bidder----->						1. Applicable only for foreign bidder. 2. Quoted prices of marine freight & insurance is inclusive of all taxes & duties		Quoted prices of inland freight & insurance is inclusive of all taxes & duties		Rate of Excise Duty (in Percentage)	Amount of Excise Duty	Rate of CST (in Percentage)	Amount of CST	Bidder to indicate prices in price bid of BHEL's Format & mention QUOTED / NOT QUOTED OR NOT APPLICABLE of each & every cell	
Applicable formula to bidder----->			(8)		(1)	(2) = (1) X (8)	(3)	(4) = (3) X (8)	(5)	(6) = (5) X (8)	(7) = (.....%)	(8) = (7) x 2	(9) = (.....%)	(10) = ((9) + (2)) x (9) [EX-WORKS+ INLAND F & I + ED + CST]	(11) = [(2)+(6) + (8) + (10)] FOB+ SEA F & I + INLAND F & I
9	A9-Main Supply item - Supply item - Non magnetic, Single type cleats/ clamps for fixing 66kV cable to structure (1lot is for 3 phase).	lot	9												
10	A10-Main Supply item - Supply item - Consumables having limited shelf life required during erection, testing and commissioning. (1 lot is for complete package).	lot	1												
11	A11-Supply item - Structure for cable support structure for GIS end and transformer end (bidder to provide quantity in MT).	lot	1												
A	Total Ex-works / FOB =														
B	Total Sea freight & Insurance =														
C	Total Inland freight & insurance charges =														
D	Total Excise Duty														
E	Total central sales taxes =														
Total cost to BHEL for Indian supplier in Indian Currency (A + C + D + E)															
CIF Value + Inland F & I (if opted by foreign bidder) (A + B + C) =															

- Note:**
- Each cell to be filled by bidder in the price bid. In case that cell is not applicable as per NIT condition, NA must be mentioned in UN-PRICED BID.
 - In UN-PRICED, Bidder to indicated QUOTED in placed of price. NA in placed of not applicable. For example Marine freight & insurance charges-Not applicable in case of indian supplier.
 - Bidder stickly to quote in BHEL format only. Other format of price bid will be liable for rejection.

BHEL UN-PRICE BID FORMAT FOR SERVICE PART

Enquiry No: 225E326 DATED 19/02/2016

Project: ONGC HAZIRA

Item: 66 kV Cable & Accessories

S.N.	PI-ITEM	Unit	Qty	Currency	Unit Charges	Total Charges	Service taxes, if applicable in INDIA	Total Cost to BHEL for Indian supplier for each line item	Total cost to BHEL for foreign supplier for each line item
Instruction to bidder----->							Bidder to indicate percentage for each line item	Value	In case training / Type Test is conducted outside India, taxes outside India shall be in scope of bidder and deemed to be included in their quoted prices.
As per BOQ for Services (Detail description as per Tech Spec.)			(0)		(1)	(2) = (1) X (0)	(3) =% of (2)	(4)	[(6) = (2) + (4)]
								[TOTAL CHARGES + SERVICE TAX]	[TOTAL CHARGES + SERVICE TAX]
1	B12-Services - Installation of 66kV XLPE, 1 core, 500 sqmm cable in trefoil form by fixing trefoil clamps and/or single form on support structure using cleats/ clamps. It includes fixing of support structure for cable terminations and fixing of clamps on cable rack assembly/ support structure by making holes etc, if required.	Mtrs.	4950						
2	B13-Services - Indoor cable termination complete in all respect suitable for 66kV, 1core, 500sqmm aluminium cable for G (Heat Shrinkable/ Cold shrinkable). It includes fixing of clamps & connectors, if required.	Nos.	27						
3	B14-Services - Outdoor cable termination complete in all respect suitable for 66kV, 1core, 500sqmm aluminium cable for Transformer Box end (Heat Shrinkable/ Cold shrinkable) including fixing of lugs/ clamps & connectors, as applicable.	Nos.	15						
4	B15-Services -Outdoor cable termination complete in all respects suitable for 66kV, 1core, 500 sqmm aluminium cable for switchyard end (Heat Shrinkable/ Cold shrinkable) including fixing of connector.	Nos.	12						
5	B16-Services -Installation of earthing system for 66kV XLPE cable including installation of 3-phase earthing link box with (sheath voltage limiter) and earthing/ bonding cable alongwith cable accessories required.	Set	9						
6	B17-Services - Installation of earthing system for 66kV XLPE cable including installation of 3-phase earthing link box without SVL (sheath voltage limiter) and earthing/ bonding cable alongwith cable accessories required.	Set	9						
7	B18-Services -Training during erection/ installation at site (1 lot=4 ONGC/BHEL Engineers at site for 1 day).	Lot	1						
8	B19-Services -Training during testing & commissioning at site (1 lot=4 ONGC/BHEL Engineers at site for 1 day).	Lot	1						
9	B20-Services - Field testing & commissioning of 66kV XLPE Cables (1 Lot for 1 circuit).	Lot	9						
10	B21-Services -Site Survey for laying of 66kV XLPE cable at ONGC Hazira site.	Lot	1						

BHEL UN-PRICE BID FORMAT FOR SERVICE PART

Enquiry No: 225E326 DATED 19/02/2016

Project: ONGC HAZIRA

Item: 66 kV Cable & Accessories

S.N.	PI-ITEM	Unit	Qty	Currency	Unit Charges	Total Charges	Service taxes, if applicable in INDIA	Total Cost to BHEL for Indian supplier for each line item	Total cost to BHEL for foreign supplier for each line item	
Instrctiion to bidder----->							Bidder to indicate percentage for each line item	Value	In case training / Type Test is conducted outside India, taxes outside India shall be in scope of bidder and deemed to be included in their quoted prices.	
	As per BOQ for Services (Detail description as per Tech Spec.)		(0)		(1)	(2) = (1) X (0)	(3) =% of (2)	(4)	[(6) = (2)+ (4)] [TOTAL CHARGES + SERVICE TAX]	[(6)=(2)+ (4)] [TOTAL CHARGES + SERVICE TAX]
A	Total Charges =									
B	Total Service Taxes =									
	Total cost to BHEL for service portion in case of Indian supplier in Indian Currency (A + B)=									
	Total cost to BHEL for service portion in case of foreign supplier in foreign currency (A + B) =									

Note:

1. Each cell to be filled by bidder in the price bid. In case that cell is not applicable as per NIT condition, NA must be mentioned in UN-PRICED BID.
2. In UN-PRICED, Bidder to indicated QUOTED in placed of price. NA in placed of not applicable.
3. Bidder stickly to quote in BHEL format only. Other format of price bid will be liable for rejection.

TRANSMISSION BUSSINESS GROUP
MATERIAL MANAGEMENT
BHEL, NOIDA

ACTIVITY SCHEDULE

Please submit this format duly filled in along with offer. Time indicated will be used for calculating contractual delivery period.

ENQUIRY NO. 225E326

DATE: 18/02/2016

PROJECT: ONGC HAZIRA

ITEM: 66 kV CABLE & ACCESSORIES [SUPPLY + SERVICES]

VENDOR :

OFFER REF.

SL. NO.	ACTIVITY	ACTIVITY TIME IN WEEKS	REMARKS IF ANY
1.	Receipt of P.O		
2.	P.O Acceptance	ONE WEEK	Vendor must Submit Po acceptance with in one week
3.	Submission of documents necessary for getting manufacturing clearance like Drawings, data sheet, QAP etc.		Documents complete in all respect are to be Submitted. Delay in approval on account of incomplete / inadequate information shall be the responsibility of supplier
4.	Review and Approval of documents and issue of manufacturing clearance	BHEL ACTIVITY	Vendor must ensure to reply all queries expeditiously.
5.	Manufacturing Time		Manufacturing time be indicated considering all constrains & must include time required for internal inspections etc.
6	Raise inspection call	-VE 2 WEEKS TO SL NO 5	Call for inspection must be raised at least two weeks in advance in the prescribed format. Non availability of offered material for inspection to the inspector will be viewed very seriously & may result in financial implications. The date of inspection must be with in the period indicated in 5 above.
7	Inspection	BHEL	
8	Issue of MICC, MDCC & other documents like EDEC , Road permits etc	BHEL	Vendor must indicate requirement well in advance.
9	Dispatch	ONE WEEK	Vendor must ensure to dispatch with in one Week of receiving all documents required
10	Installation Services(Laying/Erection/Testing / Commissioning		(Please refer clause no. . 3 of terms and conditions for services portion and kindly quote accordingly for completion of service work)

Total time in vendor's scope:

Please mention constraints if any. For multiple lot delivery activity landmark for each lot should be mentioned. Multiple inspection calls for one lot are to be avoided & delay on this account shall be vendor's responsibility.

SIGNATURE AND SEAL

CHECKLIST**SCHEDULE OF INFORMATION TO BE FURNISHED WITH THE OFFER**

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

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

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

The above checklist is verified for:-

Offer Ref. :

Equipment :

Submitted by : M/s

Project Reference. :

Signed with Seal ò ò ò ò ò ..

Date ò ò ò ò ò ò ..

SCHEDULE OF COMMERCIAL DEVIATION

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

SL. NO.	CLAUSE NO. OF GENERAL TERMS & CONDITIONS	STATEMENT OF DEVIATION

Incase, this schedule is not submitted, it will be presumed that the equipment / material to be supplied under this contract is deemed to be in compliance with the General terms and Conditions.

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

NOTE: Continuation sheets of like size and format may be used as per the Bidder's requirement and shall be annexed to this schedule.

Place _____

Date _____

Signature of the authorized representative of

Bidder's Name _____

Designation _____

Company seal _____

SCHEDULE OF TECHNICAL DEVIATION

The following are the deviations / variations exception from the Technical Specifications:-

SL. NO.	CLAUSE NO. OF TECHNICAL SPECIFICATIONS	STATEMENT OF DEVIATION

Incase, this schedule is not submitted, it will be presumed that the equipment / material to be supplied under this contract is deemed to be in compliance with the Technical Specifications.

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

NOTE: Continuation sheets of like size and format may be used as per the Bidder's requirement and shall be annexed to this schedule.

Place _____

Signature of the authorized representative of

Date _____

Bidder's Name _____

Designation _____

Company seal _____

**BHARAT HEAVY ELECTRICALS LTD.
(TRANSMISSION BUSINESS GROUP)**

TERMS & CONDITIONS FOR SUPERVISION / INSTALLATION SERVICES

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

Sl. No.	Terms & Conditions
1.0	<u>SCOPE OF WORK:</u> As per our attached Technical Specification No. TB-383-316-002 REV 00
2.0	<u>COMMENCEMENT OF WORK:</u> Project start / zero date / Readiness at site for this work shall be intimated by BHEL.
3.0	<u>COMPLETION SCHEDULE:</u> Bidder to specify delivery period in weeks from the date of Project start / zero date / Readiness at site in the activity schedule format enclosed with enquiry.
4.0	<u>OVER RUN CHARGES:</u> No over run charges are payable.
5.0	<u>IDLE LABOUR CHARGES:</u> No idle labour charges will be admissible in the event of any stoppage of work resulting in the contractor's workmen being rendered idle due to any reason at any time.
6.0	<u>SECURITY-CUM-PERFORMANCE GUARANTEE:</u> The contractor shall furnish security-cum-performance BG for 10% of contract value (for Service portion) within two weeks of placement of work order valid till guarantee period from any schedule bank subject to acceptance by TBG/BHEL Finance. The original BG shall be sent by issuing bank directly to AGM - FINANCE, TBG, BHARAT HEAVY ELECTRICALS LIMITED, NOIDA. In case BG period is expiring before expiry of Guarantee Period, vendor will have to keep the BG extended suitably till the end of Guarantee Period.
7.0	<u>INSURANCE:</u> The Contractor shall take insurance cover(s) to cover his Tools and Plant assets, workman compensation and third party liability. The contractor shall make available the original insurance cover(s) to the Engineer for necessary verification before commencement of work.
8.0	<u>GUARANTEE:</u> Though the work will be carried out under the supervision of BHEL Engineers, the contractor shall be responsible for the quality of the workmanship and shall guarantee the work done for a period of 15 months from the date of putting the complete system into commercial operation or 18 months from the date the system is declared completely erected, duly tested and accepted by customer, whichever is later and shall rectify free of cost all defects due to faulty erection detected during the guarantee period starting from the date of the completion of rectification. In the event of the contractor failing to repair the defective works within the time specified by the engineer, BHEL may proceed to undertake the repairs of such defective works at the contractor's risk and cost without prejudice to any other rights under the contract and recover the same from security deposit/ other dues of this project or any other project executed by the contractor.
9.0	<u>TERMS OF PAYMENT:</u> The terms of payment shall be as specified under Clause 3 of General Terms and Conditions of this Enquiry.

10.0	ESCALATION / PRICE VARIATION: Prices shall be firm for total contract period and extended period, if any, and no price escalation / price variation will be applicable.
11.0	COMPENSATION FOR DELAY IN EXECUTION: In case the contractor fails to complete the work within the time specified or any extension thereof subject to force major condition, the contractor shall be liable to pay by way of compensation, a sum equal to half percent (½%) of the contract price, per calendar week or part thereof by which the commissioning is delayed, subject to a ceiling of 10% of the contract price.
12.0	ADDITIONAL EXPENDITURE: In case any additional expenditure is incurred in the works arising out of the faulty execution of the works by the contractor, such additional expenditure shall be borne by the contractor.
13.0	REGULATION OF LOCAL AUTHORITIES AND STATUS : The contractor shall adhere to the regulation of local authorities and status.
14.0	DISCIPLINE OF WORKMEN: The contractor shall adhere to the disciplinary procedure set by the owner in respect of his employees and workman at site.
15.0	FORCE MAJEURE: The force majeure shall be as specified under Clause 19 of General Terms and Conditions of this Enquiry.
16.0	ARBITRATION: The arbitration shall be as specified under Clause 14 of General Terms and Conditions of this Enquiry.
17.0	PROTECTION OF WORK: The Contractor shall have total responsibility for protecting his works till it is finally taken over by the BHEL/Customer. No claim will be entertained by the BHEL for damage or loss to the Contractor's works & the contractor shall be responsible for the complete restoration of the damaged work to its original condition to comply with the specification & drawings.
18.0	ELECTRICITY & WATER:
18.1	Electricity for construction work shall be provided at one point (in the battery limit of the Plant Area) on chargeable basis. The contractor shall have to make their own arrangements for distribution to various locations for their works including proper switch/fuse units, distribution boards, cables poles etc. to ensure safety of men and equipment along with installation of approved energy meter. In addition to this, the contractor shall employ diesel operative equipment in addition to electric operated ones to ensure timely completion of work.
18.2	Unless stated otherwise, the contractor shall make his own adequate arrangement for procuring clear water to be used in various works.
19.0	TESTING AND COMMISSIONING : All the electrical / mechanical test of the materials and equipment shall be arranged by the contractor as per standard specification / Field Quality Plan / Erection Manual / Directive of the Site Engineer/ and Owner. The contractor shall fill the check list for storage, erection, testing and commissioning of all their equipment as per BHEL systems to ensure proper quality of work. All the testing equipment required to carry out the site test for all their equipment or the erected equipment shall be arranged by the contractor at his own cost. However, necessary instructions and guidelines will be given by BHEL/Owner. The contractor shall be completely responsible for the satisfactory erection and providing test equipment and skilled manpower for testing, commissioning of all equipment. Before charging, the system shall have to be approved by Statutory Govt. Authorities like Electrical Inspector, other concerned agency and the contractor has to arrange approval for the same.

We understand that the bids having deviation (s) w.r.t tender are to be out rightly rejected. BHEL, however at their discretion, if consider the bid, have undisputable right to load the prices for price comparison as they deem fit.

Signature of Supplier with seal



**BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP
MATERIAL RECEIPT CERTIFICATE**

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

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

Other Remarks:

Signature with date: _____

Name & Designation: _____

(With Seal)

Certificate by Chartered Accountant on letter head

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

Further verified from the Books of Accounts that the investment of the company as per the latest audited financial year as per MSMED Act 2006 is as follows:

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

(Strike off whichever is not applicable)

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

Or

The company has been graduated from its original category (Micro/ Small) (Strike off which is not applicable) and the date of graduation of such enterprise from its original category is (dd/mm/yyyy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S.O. No. 3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:



(Signature)

Name -

Membership number -

Seal of Chartered Accountant

(ON RS.100/- NON - JUDICIAL STAMP PAPER)

PROFORMA FOR SECURITY-CUM-PERFORMANCE GUARANTEE

1. This deed of Guarantee made this _____ day of _____ 200 ____ by _____ Bank Ltd., _____ in favour of **Bharat Heavy Electricals Limited, Transmission Business Group, Tower-A, 5th Floor, Advant Navis IT Business Park, Plot-7, Sector-142, Expressway Noida, Noida-201305** having their registered office at **BHEL House, Siri Fort, New Delhi - 110 049**.
2. Whereas **M/s** _____ (here in after called the **Contractor / Seller**) have entered into a Contract bearing No. _____ dated _____ (herein after called the **Contract**) for supply / erection of **M/s Bharat Heavy Electricals Limited** (hereinafter called the **Company**).
3. And whereas the said Contract Inter-alia provides that the Contractor / Seller shall pay to the company a sum of Rs. _____ only, towards **Security deposit-Cum-Performance Guarantee** in the for and manner therein specified.
4. And whereas the Seller/Contractor have approached _____ Bank Limited (hereinafter referred to as the **Guarantor**) and at their request and in consideration of the arrangement arrived at between the **Contractor** and the **Guarantor**, the Guarantor has agreed to give the Guarantee as herein after mentioned in favour of the Company.

NOW THIS DEED WITNESSES AS FOLLOWS :

5. The Guarantor by the hand of Mr. _____ and its lawfully and fully constituted attorney and do hereby guarantee the due and faithful performance of the said contract and do hereby irrevocably undertake and promise to pay the Company without any demur merely on demand made by them a sum not exceeding Rs. _____ only in case the Company sustains any loss or damage by reason of any breach, default, by the Contractor / Seller of any of the terms conditions, stipulations or undertakings or any one of them contained in the said contract and the tender documents attached hereto and for payment of any moneys payable by the Contractor/ Seller to the Company under the terms and conditions of the said contract. The decision of the company regarding the breach, default, loss, damage or payment shall be conclusive and binding in the guarantor irrespective of the fact whether the contractor/seller admits or denies such claims or questions its correctness in any court, tribunal or arbitration proceedings or before any other authority.

(Contd....2.)

6. The company shall have the fullest liberty without effecting in any way the liability of the Guarantor under this Guarantee, from time to time to vary any of the terms and conditions of the contract or extend time by the Seller/Contractor or to postpone for any time and from time to time any of the powers exercisable by its against the Seller/Contractor and either to enforce or forbear from enforcing any of terms and conditions governing the contract or securities available to the Company and the guarantor shall not be released from it's liability under these presents by any exercise by the company of the liberty with reference to the matters aforesaid or by reason of time being given to the seller or any other forbearance, act or omission on the part of the company or any induigence by the company to the Seller/Contractor or of any other matter or thing whatsoever which under the law relating to sureties, would but for this provision have the effect of so releasing the Guarantor/contractor from its liability under this Guarantee.
7. This Guarantee shall remain in full force and effect and the Guarantor shall be liable under the same irrespective of any concession or time being granted by the company to the contractor in or for fulfilling the said contract and this Guarantee shall remain in full force irrespective of any change in terms, conditions, stipulations or any variations in the terms of contract irrespective of whether notice of such change and / or variation is given to the Guarantor or not and the claim to receive such notice of any change and or variation of the terms/or conditions of the contract is hereby specifically waived by the Guarantor.
8. The Guarantor here in contained shall not be determined prejudiced or effected by the liquidation or winding up or insolvency of or change in the constitution of the contractor but shall in all respects and for all purposes be binding and operative until all payments or all moneys due or that may hereafter become payable to the company are paid in respect of any liability or obligation of the contractor under the contract.
9. The Guarantor further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the commencement of the contract till end of the contract and its claim satisfied or discharged and till the company certified that the terms and conditions of the contract have been fully and properly carried out by the seller and accordingly discharges this Guarantee, subject, however, that the company shall have no claim under this guarantee after _____ months from the date of completion of the guarantee has been served on the guarantor before the expiry of the said period in which case the same shall be enforceable against the Guarantor not with standing the fact that the same is enforced after expiry of said period.

The Guarantor undertake not to revoke this Guarantee during the period it is in force except with the previous consent of the company in writing and agree that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the Seller or the guarantor shall not discharge the Guarantor's liability here under.

(3)

It shall not be necessary for the company to proceed against the seller before proceeding against the Guarantor and the Guarantee herein contained shall be enforceable against them not with standing any security which the company may have obtained or obtained from the seller shall at the time when proceedings are taken against the Guarantor here under be outstanding or unrealised.

The Guarantor hereby declares that it has power to execute this Guarantee and the executant has full powers to do so on its behalf under the power of attorney dated _____granted to him by the proper authorities of the Guarantor.

- 10. Not withstanding anything here in before contained, our liability under this Guarantee is restricted to Rs. _____(Rs. _____only) and will expire on _____ and unless a claim in writing is presented to us or an action or suit to enforce the claim is filed against us, within **three months** from the date, all our rights shall be forfeited and we shall be relieved and discharged from all our liabilities there under.

IN WITNESS whereof the _____(Bank) have hereunto set and subscribed their hands the day, month and year first above written.

**SIGNED FOR AND ON
BEHALF OF THE BANK**

WITNESSESS

Name and Address

Signature

1.

2.

↓
Shri. D. Shukla
27/11/15



BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

DOCUMENT No.	TB-383-316-002	Rev 00	Prepared	Checked	Appd	
TYPE OF DOC.	TECHNICAL SPECIFICATION	NAME	MM	SK	AS	
66kV Cable & accessories		SIGN	<i>M. Murtuza</i>	<i>SK</i>	<i>AS</i>	
		DATE	12-10-15		27/11/15	
		GROUP	TBEM			
		W.O. No				

CUSTOMER/CONSULTANT ONGC/
FITCHNER Consulting Engineers (India) Pvt Ltd.

PROJECT Combined cycle captive power plant at ONGC Hazira (1x51 MW)

Contents:

Section No.	Description	No of Pages
SECTION-1	<ul style="list-style-type: none"> ▪ SCOPE, SPECIFIC TECHNICAL REQUIREMENTS and QUANTITIES ▪ BOQ (Annexure-I) ▪ Drawings (3 nos.) ▪ Document list • ANNEXURE - 2 	8 2 5 1 1
SECTION-2	EQUIPMENT SPECIFICATION	6+3
SECTION-3	PROJECT DETAILS AND GENERAL SPECIFICATION ANNEXURE - A ANNEXURE - B ANNEXURE - C	11 4 4 1
SECTION-4	GUARANTEED TECHNICAL PARTICULAR	3
SECTION-5	CHECKLIST (to be submitted with the bid)	5

Offers without checklist will not be accepted.

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This must not be used directly or indirectly in anyway detrimental to the interest of the company.

Rev	Date	Altered	Checked	Approved					
Distribution				To					
				Copies					

SECTION 1
SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES

1 SCOPE

The scope covers the supply and services required for the comprehensive functional system covering 66kV XLPE Cables, cable terminations end, cable accessories etc. for interconnecting line/GT/ST bays between GIS and outdoor substation/ transformer yard (Transformer Box).

This technical specification covers the complete requirements (Point to Point) of turnkey execution including supply & services of complete 66kV XLPE Cable system (HT & Earthing /Bonding Cables, Clamps, Cable terminations, earthing, link boxes etc.) complete in all respect along with accessories.

Supply - Design, manufacturing, quality assurance, quality control, shop assembly, testing at works, packing and dispatch, transporting, supervision of unloading

Services - Installation (including laying of cable at site in BHEL provided trench), clamping, commissioning, performance and acceptance testing.

This section covers the specific technical requirements.

In case of any discrepancies between the requirements mentioned under Section-1/Section-2 and those specified in the Section-3. The following shall be order of prevailing

- a. Statutory Regulations
- b. Section-1
- c. Section – 2 (ONGC Specification)
- d. International standards

The equipment is required for the following project:

Project name :	Combined cycle captive power plant at ONGC Hazira (1x51 MW)
Customer name :	ONGC
Consultant :	FITCHNER Consulting Engineers (India) Pvt Ltd.
Main Contractor :	BHEL

Refer Section - 3 for Project Details and General Specifications.

2 Project Information

GIS will be installed at first floor of building. Circuit wise breakup of quantities of cables as below:

Total no of 3-phase circuits=9

Breakup as below:

Sl No	Circuit	End A	End B	No of circuits	LENGTH (APPROX IN MTR)
1.	Line-1,2	Outdoor CSE	GIS	2	150
2.	Existing grid transformer (GTG-1,2)	Outdoor CSE	GIS	2	170
3.	GTG-3	Transformer cable box	GIS	1	170
4.	GTG-4	Transformer cable box	GIS	1	200
5.	STG-1	Transformer cable box	GIS	1	185
6.	SAT-1,2	Transformer cable box	GIS	2	170

2.2 General

It may be noted that:

- **Schedule** –

- Supplier will submit detailed bar chart indicating all the milestones from Engineering till manufacturing/ testing, dispatch to site and commissioning.
- Bidder to submit list of consumables with shelf life of less than two years. It shall be supplied before erection after clearance from BHEL.

Store will be provided by BHEL. Bidder to provide their requirement of space in open and closed store during tender stage. Supervision of loading, unloading & storage alongwith verification shall be in bidder's scope.

Office facilities & accommodation for supplier staff, Travel expenses for supplier staff, Transportation of all tools and equipment, Transportation of material tools and equipment between storage /warehouse and complete ETC shall be in supplier scope.

- Calculation - Bidder will submit short circuit current calculation, continuous current rating calculation and sheath standing voltage calculation for justifying the size of the 66kV cable in line with proposed laying condition. Any other calculations which may be required during detailed engineering stage may also be submitted.

- **Earthing**

- Earthing of 66kV cable rack/tray with suitable size of flat shall be in BHEL scope.
- Earthing of cable system shall be in bidder's scope. Earthmat grid is available at all ends and shall be interconnected.

- **Construction Supply** - The necessary power supply at site shall be provided by BHEL at one point only.

- **Terminal Connector** - Cable termination are required at switchyard end (Outdoor type), Transformer Box end and GIS end (Indoor type). Terminal connector for connection between cable termination and overhead conductor for outdoor termination only shall be

provided by BHEL (at switchyard end).

• **Installation –**

- The cable will be laid in cable trenches. The cable trench and support structures/angles in the trenches will be supplied and fixed by BHEL as per detailed design and drawing provided by bidder. The typical sketch for reference shall also be given with bid based on which the design calculations will be done.
 - Provision of manpower in the grade of foreman and skilled technician, provision of laying supervisor, provision for laying tools and equipment, cable pulling, cut cable, place cable, supply of cable cleat, installation of cable cleat etc. to complete is deemed to be included in scope.
 - The necessary holes required for fixing trefoil clamp ^{laid on the cable} on the cable rack assembly shall be done by vendor.
 - Transportation of all tools, material and equipment between store/warehouse to site and complete erection is in scope.
 - **Termination:** Provision of Jointer and termination material, tools and Terminating Scaffolding, cranes for lifting for the joints and termination materials, assembly of joint and sealing ends will be in vendor's scope.
 - Any cable or accessories damage during laying will be repaired/replaced by bidder to the satisfaction of owner/BHEL.
 - Bidder to note that GT, ST, Line bays shall be commissioned separately. Cables for these bays shall be commissioned accordingly.
- **Site Test:** Provision of test engineer, supply of all test equipment (including DC test for outer sheath) and arrangement like cranes etc. AC voltage test of insulation with voltage of U_0 (complying with IEC 60840) etc. for completion of total site work. AC supply shall be arranged by BHEL/ONGC from nearby grid.
- Any other tools and tackles and accessories required to complete the cable laying, termination and ETC shall be included in the offer. Please note BHEL shall not provide any equipments, tool and tackles for installation or carrying out any test.

2.3 **SPECIFIC TECHNICAL REQUIREMENTS**

The site is located in coastal area.

Sl.No.	Particulars	Value
	Codes & Standards	IS 7098 Part 3, IEC 60228, IEC 60840, IEC 60287, IEC 60332, IEC 60859
	Cable construction	
1	Type of Cables	Cross-linked polyethylene insulated
2	No. of Cores	Single.

Sl.No.	Particulars	Value
3.1	Conductor size	500 sq. mm
3.2	Conductor material	Aluminium, stranded
3.3	Shape	Compacted Circular
	Refer Annexure-2 for construction	
	System Parameters	
1	Normal system voltage	66KV
2	Maximum system voltage	72.5kV
3	Rated Short Circuit Withstand Current at a rated voltage for 1 second	<u>40kA r.m.s</u>
4	Dynamic Short Circuit Withstand Current	<u>100 kA(peak)</u>
5	System frequency	50hz
6	Frequency variation	<u>-3% to +5%</u>
7	Rated continuous Current	<u>Minimum 481A for one run of cable (after derating)</u>
9	Maximum allowable temperature for cable and accessories.	As per IEC
10	Operating Temperature of conductor:	
a)	Maximum permissible temperature during normal operation under combined effect of ambient and maximum load	90 deg C
b)	Maximum permissible temperature during short circuit under combined effect of ambient and maximum load (with conductor temperature at inception of short circuit as 90 deg. C).	250 deg C
11	Dry & wet one minute Power frequency withstand voltage	140 kV
12	Dry & wet lightning impulse withstand voltage (1.2/50 micro second wave)	325 kV (peak)
13	Creepage	<u>31mm/kV</u>
14	System Earthing	Effectively earthed (Solidly Grounded)
15	Daily Load	24 Hours
16	Sheath Voltage	Sheath voltage to ground under normal operating conditions shall not exceed 65 V
17	Type of Cable Sealing Termination	Hot shrink / Cold shrink
	Laying conditions	
(a)	Cable Laying	Laid on cable racks in cable trench. In trefoil formation
(b)	Earthing of screen	Single Point Bonding ?
	-GIS end	Solidly earthed link box without SVL (sheath voltage limiter).
	-switchyard end	Solidly earthed link box with SVL (sheath voltage limiter)
(c)	Ambient air temp.	50 deg. C
(d)	Type of atmosphere	Heavily polluted

2.4

QUANTITIES:

Material and Services required for the execution of the job are listed below. All item listed in the following BOQs shall be offered. Any item not appearing herein but required for completeness of the job is deemed to be included in the scope.

As per Annexure-I

Notes:

- 1) The un-price BOQ shall be strictly as per ANNEXURE-I.
- 2) **Cable Length** - The exact length shall also be decided by supplier after visiting site & making precise measurements at contract stage. Manufacturing lengths and drum length shall be determined as per the joint site survey with ONGC/BHEL.
 - a. The Payment of cables length (for supply) will be as per approved quantities after joint survey.
 - b. The Payment of cables length (for installation) will be as per actual measurement at site which shall also include cable terminations.
 - c. The exact length may vary by -20% to +20% at Contract Stage based on actual measurement at site and calculations submitted by the bidder. Individual quantity of other items may vary to any extent and may get deleted during contract/execution stage.
- 3) The cable cleats including hardware for fixing the cable on BHEL provided support structure shall be in supplier scope.
- 4) Earthing of HT cables shall be in supplier scope. Earth mat grid exists at both ends (switchyard/transformer yard and GIS) and will be interconnected. The accessories shall necessarily include the following but not limited to: Earthing cable, earth continuity cables, bonding cables etc. as per the requirements. Any special earthing required shall be supplied and installed by the bidder in the cable trench. The complete earthing BOQ items shall be clearly mentioned in the offer.
- 5) Earthing and Link Box: Design of support structure for link box, earthing cable, installation of link box, installation of earthing cable, connection of bonding cable, etc. to complete is deemed to be included in bidder's scope.

OTHER SERVICES FOR CABLES:

The specification envisages turnkey execution of a COMPLETE, POINT TO POINT, 66 kV CABLE SYSTEM and the scope includes services (including laying, supervision, termination, clamping, testing and commissioning of the cable system) necessary to execute the job to satisfaction of ONGC and BHEL.

Any other item /service required for the execution for the complete job shall be included in the offer, whether specifically mentioned in the specification or not.

Bids in which only Supplies or only Installation Services are offered shall be rejected.

66KV XLPE CABLE DOCUMENT TO BE SUBMITTED:

Document schedule as per Annexure-III

2.5

Drg. Enclosed

Sl. No.	ONGC/BHEL Drg. No.	Drawing Title
1.	TB-0-383-510-001	66 kV system Single Line diagram
2.	0-381-01-01570	Plot Plan
3.	TB-3-383-316-007	CONCEPTUAL LAYOUT FOR GIS BUILDING
4.	TB-0-383-316-008	LAYOUT PLAN & SECTION FOR 66KV S/S ONGC HAZIRA

2.6

Type Testing

The 66kV Cabling system (66 kV XLPE Cables, cable sealing end, cable joints etc., complete in all respect along with accessories) should have been type tested (as per relevant IEC 60840) from reputed testing laboratory such as CPRI or equivalent independent test laboratory.

All the equipment shall have valid type test certificates as per relevant standards. The type test reports submitted shall be of tests conducted within last 5 years prior to the date of bid opening (date of bid opening is 17.12.2012).

In case any of any of the reports are not acceptable to customer or found invalid, the requisite tests shall be conducted by bidder on the offered equipment without any extra cost and delivery implication to BHEL.

The cables and cable terminations shall be subjected to tests as per applicable standards in the presence of Customer /BHEL and/ or their authorized representatives. After installation, the cables shall also be subjected to tests at sites. Following test but not limited to this as mentioned below shall be conducted on cables and accessories as per latest IEC.

(A) Following type tests reports shall be submitted on cable system as per cl. no. 12 of IEC60840.

- i) Bending test
- ii) Tan δ measurement
- iii) Heating cycle voltage test
- iv) Partial discharge test
 - a) At ambient temperature
 - b) At high temperature
- v) Lightning impulse voltage test followed by a power frequency withstand voltage test
- vi) Test of outer protection
- vii) Examination of cable system with cable & accessories
- viii) The resistivity of the cable semi-conducting screen
- ix) Non electrical type test as per cl. no. 12.5 of IECC-60840

(B) Following type tests shall be carried out on cable accessories-

As per cl. no. 15 of IEC 60840

2.7 INSPECTION & TESTING

Prior to dispatch, the routine & acceptance tests shall be carried out on cables and accessories in accordance with the applicable IEC /IS and the material shall be offered for final inspection by BHEL and ONGC in accordance with approved quality assurance plan. Contractor shall submit detailed Quality Plan for BHEL / ONGC approval.

The contractor shall carry out the works in accordance with sound quality management principles which shall include such as controls which are necessary to ensure full compliance to all requirements of the specification & applicable international standards. These quality management requirement shall apply to all activities during design, procurement, manufacturing, inspection, testing, packaging, shipping, inland transportation, storage, site erection & commissioning.

2.7.1 Acceptance Tests (Sample Tests) -

(A) Acceptance Tests (Sample Tests) on Cables (Cl. 10 of IEC 60840)

Following tests shall be carried out on minimum 10% of the drums subject to minimum one sample in each lot:

- i) Conductor Examination
- ii) Measurements of Electrical resistance of conductor and of metal screen
- iii) Measurement of thickness of insulation and oversheath
- iv) Measurement of thickness of metal sheath
- v) Measurements of diameters , if required
- vi) Hot set test for XLPE insulation
- vii) Measurement of capacitance
- viii) Lightning impulse voltage test
- ix) Water penetration test
- x) Test on components of cables with a longitudinal applied metal tape or foil, bonded to the oversheath

(B) Sample tests on accessories -As per cl. no. 11 of IEC 60840

2.7.2 ROUTINE TESTS


Following routine test shall be carried out as per Clause 9 of IEC 60840 on samples drawn from each drum and each accessory.

- a) Partial discharge test
- b) Voltage test
- c) Electrical test on oversheath of the cable

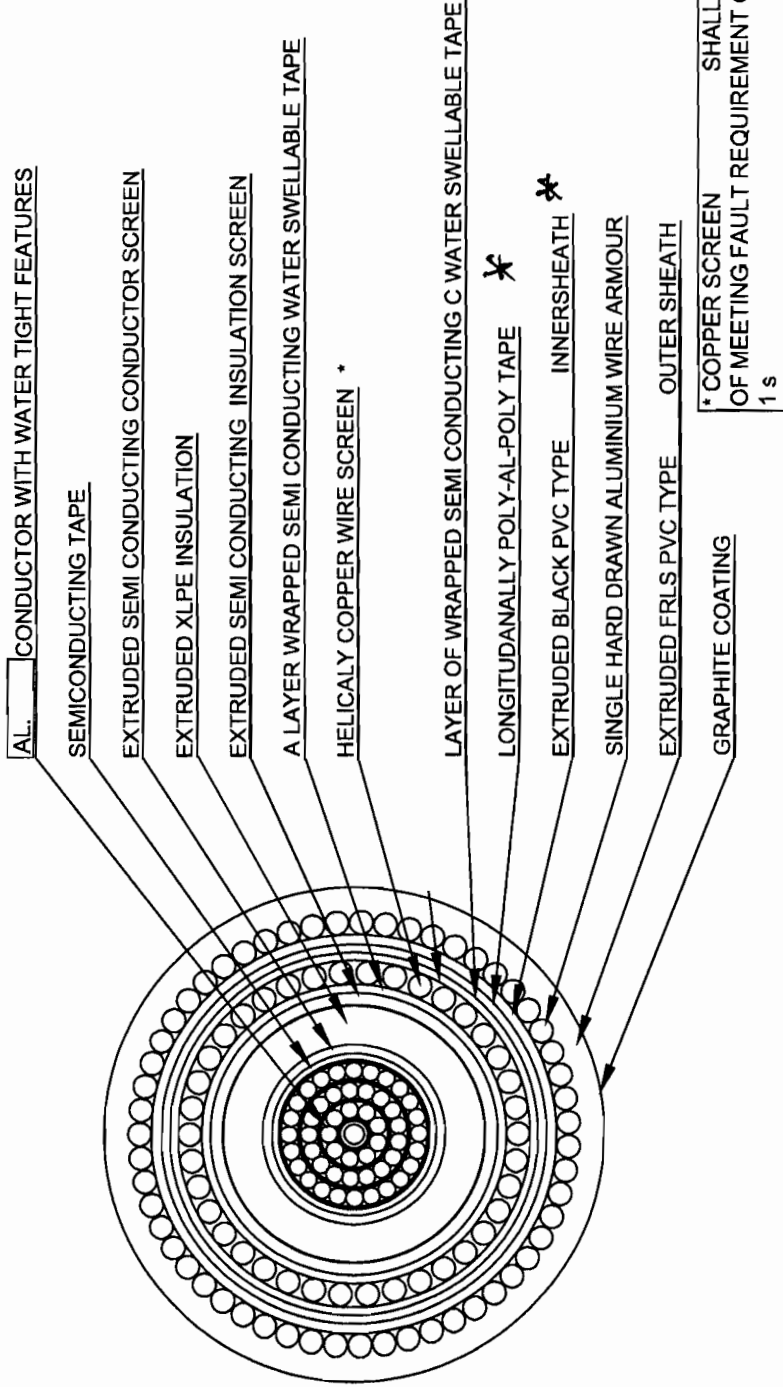
2.8 FIELD TESTS

The suppliers shall furnish field quality assurance plans giving different checks and tests, including high voltage tests, to be carried out at site to ensure a maintenance-free installation. Atleast following site test shall be carried out by cables supplier as detailed in Clause 16 of IEC 60840.

- a) DC voltage test of the oversheath

- 
- b) AC voltage test of the insulation

**CROSS SECTIONAL SKETCH FOR
1 CORE x 500 SQ.MM AL 66KV(E) CABLE**



* COPPER SCREEN SHALL BE CAPABLE OF MEETING FAULT REQUIREMENT OF 40KA FOR 1 s

Water Tight feature for conductor is met by providing non-conducting water swellable tape at each layer of stranding.

- 1. Extrusion shall be of triple extrusion type.
- 2. FRLS properties shall meet the requirements of specifications
- 3. Kindly indicate the make with type test certificates (as per approved make list)

M. S. M. S.

PROJECT: Switchyard package for Combined cycle captive power plant at ONGC Hazira (1x51 MW)

DOCUMENTS TO BE SUBMITTED FOR 66KV CABLE SYSTEM

ANNEXURE-III

Document Title	Purpose (Approval/ Information)
66 KV Cable drawing and Technical Data Sheet	A
GIS termination drawing & Technical Data Sheet	I
Outdoor Termination drawing & Technical Data Sheet	I
Bonding cable drawing	I
Earthing Link Box drawing	I
Cable Fixing clamp drawing	I
Cable Drums details	I
Circuit earthing drawing	I
General Cable Support drawing with horizontal supports including hardware & inserts etc	I
GIS Termination Support Structure drawing at GIS hall indoor Termination including hardware, inserts & foundation at GIS	I
66KV Cables Layout and section drg in GIS Hall	I
66KV Cables layout and section drg in outdoor	I
Cable and Accessories load on civil work in GIS Hall, Cable trench & switchyard	I
Calculation of cable continuous rated current	A
Calculation of cable short circuit current	A
Manufacturing Quality plan for 66KV Cables, Accessories & Support structures	I
Type Test Reports for 66KV Cables & Accessories	I
Field Quality Plan	I
Commissioning Test Procedure	I

Bill of Quantity

Annexure-I
Rev-00

Sl. No.	Description	Unit	Qty.
A	Main items		
1	Supply item - 66kV XLPE, Al conductor, 1core, 500sqmm cable	Mtrs.	4950
2	Supply item - 66 kV Indoor cable termination kit complete in all respects suitable for 1core, 500sqmm aluminium cable for GIS end (Heat Shrinkable/ Cold shrinkable). It includes clamps and connectors, If required.	Nos.	27
3	Supply item - 66 kV cable termination kit complete in all respects suitable for 1core, 500sqmm aluminium cable for Transformer Box end (Heat Shrinkable/ Cold shrinkable) including lugs/ clamps & connectors, as applicable.	Nos.	15
4	Supply item - 66 kV Outdoor cable termination kit complete in all respects suitable for 1core, 500sqmm aluminium cable for switchyard end (Heat Shrinkable/ Cold shrinkable) including clamps for fixing cables on structure. It excludes connectors and structure materials.	Nos.	12
5	Supply item - 3x1-phase Earthing link box with SVL (sheath voltage limiter) including all cable/cable accessories required for the connection (1 set for 3x1-ph cable).	Set	9
6	Supply item - 3x1-phase Earthing link box without SVL (sheath voltage limiter) including all cable/cable accessories required for the connection (1set for 3x1-ph cable).	Set	9
7	Supply item - Earthing materials for 66kV XLPE cable as per requirement, including earthing / bonding cable along with accessories (1lot is for 3phase).	lot	9
8	Supply item - Non magnetic, trefoil clamps for fixing 66kV cable in trefoil formation on cable racks (Cable trays are not envisaged) (1lot is for 3phase).	lot	9
9	Supply item - Non magnetic, Single type cleats/ clamps for fixing 66kV cable to structure (1lot is for 3 phase).	lot	9
10	Supply item - Consumables having limited shelf life required during erection, testing and commissioning. (1 lot is for complete package).	lot	1
11	Supply item - Structure for cable support structure for GIS end and transformer end (bidder to provide quantity in MT).	lot	1
B	Services		
12	Services - Installation of 66kV XLPE, 1 core, 500 sqmm cable in trefoil form by fixing trefoil clamps and/or single form on support structure using cleats/ clamps. It includes fixing of support structure for cable terminations and fixing of clamps on cable rack assembly/ support structure by making holes etc, if required.	Mtrs.	4950
13	Services - Indoor cable termination complete in all respect suitable for 66kV, 1core, 500sqmm aluminium cable for GIS end (Heat Shrinkable/ Cold shrinkable). It includes <u>fixing of clamps & connectors, if required.</u>	Nos.	27
14	Services - Outdoor cable termination complete in all respect suitable for 66kV, 1core, 500sqmm aluminium cable for Transformer Box end (Heat Shrinkable/ Cold shrinkable) <u>including fixing of lugs/ clamps & connectors, as applicable.</u>	Nos.	15
15	Services - Outdoor cable termination complete in all respects suitable for 66kV, 1core, 500 sqmm aluminium cable for switchyard end (Heat Shrinkable/ Cold shrinkable) <u>including fixing of connector.</u>	Nos.	12
16	Services - Installation of earthing system for 66kV XLPE cable including installation of 3-phase earthing link box with SVL (sheath voltage limiter) and earthing/ bonding cable alongwith cable accessories required.	Set	9
17	Services - Installation of earthing system for 66kV XLPE cable including installation of 3-phase earthing link box without SVL (sheath voltage limiter) and earthing/ bonding cable alongwith cable accessories required.	Set	9
18	Services - Training during erection/ installation at site (1 lot=4 ONGC/BHEL Engineers at site for 1 day).	Lot	1
19	Services - Training during testing & commissioning at site (1 lot=4 ONGC/BHEL Engineers at site for 1 day).	Lot	1
20	Services - Field testing & commissioning of 66kV XLPE Cables (1 Lot for 1 circuit).	Lot	9
21	Services - Site Survey for laying of 66kV XLPE cable at ONGC Hazira site.	Lot	1

CT PARAMETERS OF CTG#3, CTG#4 TR. BAY

Core No.	Current Ratio	Accuracy Class	Min. Burden	Min. LPV	Max. RCT at 75 Deg	Max. In at LPV/2	Purpose
1	500/1	PS	-	700 V	5 Ohms	30 mA	870 & 870/2
2	500/1	PS	-	700 V	5 Ohms	30 mA	871 / 871/2
3	500/1	0.2S ISE-S	30 VA	-	-	-	BCT/Tariff Metering
4	500/1	PS	-	700 V	5 Ohms	30 mA	SPARE
5	500/1	PS	-	700 V	5 Ohms	30 mA	87B

CT PARAMETERS OF ST#1, ST#2 BAY

Core No.	Current Ratio	Accuracy Class	Min. Burden	Min. LPV	Max. RCT at 75 Deg	Max. In at LPV/2	Purpose
1	500/1	PS	-	700 V	5 Ohms	30 mA	871, 871/2
2	500/1	PS	-	700 V	5 Ohms	30 mA	50/51
3	500/1	0.2S ISE-S	30 VA	-	-	-	BCT/Tariff Metering
4	500/1	PS	-	700 V	5 Ohms	30 mA	SPARE
5	500/1	PS	-	700 V	5 Ohms	30 mA	87B, 87B/2

CT PARAMETERS OF CT#1 (EXISTING), CT#2 (EXISTING)

Core No.	Current Ratio	Accuracy Class	Min. Burden	Min. LPV	Max. RCT at 75 Deg	Max. In at LPV/2	Purpose
1	300/1	PS	30 VA	-	-	-	Metering (Existing)
2	300/1	PS	30 VA	-	-	-	51, 51N, 67, 67N (Existing)
3	300/1	PS	30 VA	-	-	-	87CT (Existing)
4	300/1	PS	30 VA	-	-	-	SPARE
5	300/1	PS	30 VA	-	-	-	87B

Core No.	Current Ratio	Accuracy Class	Min. Burden	Min. LPV	Max. RCT at 75 Deg	Max. In at LPV/2	Purpose
1	300/1	PS	-	700 V	5 Ohms	30 mA	Differential Protection

CT PARAMETERS OF INCOMER#1, INCOMER#2 OUTDOOR CT. - (GETCO SPECIFICATION)

Core No.	Current Ratio	Accuracy Class	Min. Burden	Min. LPV	Max. RCT at 75 Deg	Max. In at LPV/2	Purpose
1	500/1	0.2S	5 VA	-	-	-	Metering

INDOOR GIS CT. -

Core No.	Current Ratio	Accuracy Class	Min. Burden	Min. LPV	Max. RCT at 75 Deg	Max. In at LPV/2	Purpose
1	500/1	0.2S	30 VA	-	-	-	Metering (Tariff)
2	500/1	PS	-	700 V	5 Ohms	30 mA	Line Main Protection - Distance
3	500/1	SP20	15 VA	-	-	-	Line Backup Protection
4	500/1	0.2	30 VA	-	-	-	SAS Metering / Digital MFM
5	500/1	PS	-	700 V	5 Ohms	30 mA	87B

CT PARAMETERS OF ST#1, SPARE TRAKO.

Core No.	Current Ratio	Accuracy Class	Min. Burden	Min. LPV	Max. RCT at 75 Deg	Max. In at LPV/2	Purpose
1	500/1	PS	-	700 V	5 Ohms	30 mA	870
2	500/1	PS	-	700 V	5 Ohms	30 mA	871, REF
3	500/1	0.2S	30 VA	-	-	-	Metering (Tariff)
4	500/1	PS	-	700 V	5 Ohms	30 mA	SPARE
5	500/1	PS	-	700 V	5 Ohms	30 mA	87B

CT PARAMETERS OF BUS COUPLER

Core No.	Current Ratio	Accuracy Class	Min. Burden	Min. LPV	Max. RCT at 75 Deg	Max. In at LPV/2	Purpose
1	2000/1	PS	-	2000V	20 Ohms	30 mA	87B/2
2	2000/1	PS	-	2000V	20 Ohms	30 mA	87B/1
3	2000/1	SP20	15 VA	-	-	-	51, 51N, 50Z
4	2000/1	PS	-	2000V	20 Ohms	30 mA	SPARE

SL. NO.	FEEDER DESCRIPTION	FEEDER NO.	RATING	QTY.
1.	GTG-3	01	630A	01
2.	GTG-4	02	630A	01
3.	GEI I/C-1	03	630A	01
4.	SAT-1	04	630A	01
5.	BUS COUPLER	05	2000A	01
6.	SAT-2	06	630A	01
7.	STG-1	07	630A	01
8.	GT-2	08	630A	01
9.	GEI I/C-2	09	630A	01
10.	GT-1	10	630A	01
11.	SPARE TRFR FEEDER	11	630A	01
12.	BUS VI	-	-	02

PARAMETERS OF GIS PT

CORE NO	RATIO	ACCURACY	BURDEN (VA)
CORE-1	66kV/110V	3P	100
CORE-2	66kV/110V	0.2	100

CORE NO	RATIO	ACCURACY	BURDEN (VA)
CORE-1	66kV/110V	0.2	10
CORE-2	66kV/110V	0.2	10

METERING PT PARAMETERS OF INCOMER#1, INCOMER#2 (PT1B) OUTDOOR PT (GETCO SPECIFICATION)

LEGEND

S.N.	EQUIPMENT DESCRIPTION	WV	SYMBOL	LEGEND
1.	CIRCUIT BREAKER (3-PH), WITH SYNCHRONISING FACILITY	72.5		52
2.	CIRCUIT BREAKER (3-PH), WITH SYNCHRONISING FACILITY	72.5		52#
3.	ISOLATOR	72.5		89A, 89B, 89C
4.	HIGH SPEED EARTH SWITCH	72.5		89LE
5.	MAINTENANCE EARTH SWITCH	72.5		89AE, 89CE
6.	BUS EARTH SWITCH	72.5		ES
7.	CURRENT TRANSFORMER	72.5		CT
8.	POTENTIAL TRANSFORMER	72.5		PT
9.	SURGE ARRESTOR, 10kA	60		SA
10.	66 kV XLPE CABLE TERMINATION	72.5		
11.	66 kV XLPE CABLE	72.5		
12.	66 kV SF6 TO AIR BUSHING	72.5		

NOTES:-

- THE DETAILS OF GIS MAY CHANGE AS PER VENDOR'S STANDARD PRACTICE (LOCATION OF BUS EARTHING SWITCH, PT)
- 3-CT1B, 8-CT1B, 3-PT1B, 8-PT1B, RATIOS MAY CHANGE AS PER GETCO GUIDELINES.
- METERING CT & PT SHALL BE OUTDOOR TYPE.
- RATING OF EQUIPMENTS IN SLD SHALL BE REVERSE AFTER FINALIZATION /APPROVAL OF INDIVIDUAL EQUIPMENT RATING/SIZING CALCULATION.

- INDICATES CB WITH SYNCHRONISING FACILITY

REFERENCE DRAWING:-

- KEY SINGLE LINE DIAGRAM BHEL PD DWG. NO. - 0-381-21-02239
- 66KV SYSTEM SINGLE LINE DIAGRAM (TENDER DRG) DWG. NO. - 00-5111188-E-203

CLIENT:
OIL AND NATURAL GAS CORPORATION LTD.
 AT HAZIRA PLANT, GUJARAT.

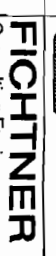
EPC CONTRACTOR:
BHARAT HEAVY ELECTRICALS LTD
 TRANSMISSION BUSINESS GROUP

PROJECT:
1x51 MW COMBINED CYCLE
COGENERATION CATIVE POWER PLANT

REV/DATE	AA/MM	VK	AS	REV/DATE	MM/AA	VK	AS	SHEET: 02 OF 02	SCALE:	REV/02
02	19.09.15	DRN.	CHKD	APPD	10.08.19	DRN.	CHKD	APPD		

DRG REVISED AS PER ONGC/FE COMMENTS DATED 19.08.2015
 CT VT RATING REVISED.

DRG REVISED AS PER ONGC/FE COMMENTS DATED 02.06.2015
 ALL LINE/TRFR CHANGED TO 66KV CABLE. 66KV SA PROVIDED IN GIS.



FICHTNER
 Consulting Engineers
 (India) Private Limited
 Chennai, Bangalore.

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The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
it must not be used directly or indirectly in anyway detrimental to the interest of the company.

COMPUTER DRG. PATH NAME :

INVENTORY NO. SIGN & DATE

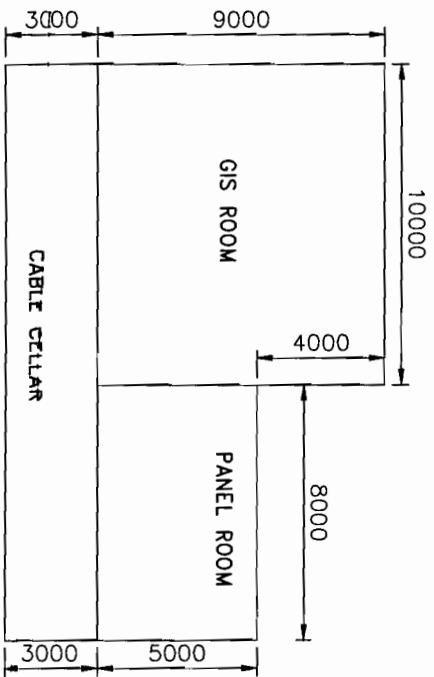
REV.	DATE	ALTD.	CHD.	APPD.	REV.	DATE	ALTD.	CHD.	APPD.
SIGN.					SIGN.				

NAME	SIGN.	DATE
DRAWN		
CHECKED		
APPROVED		

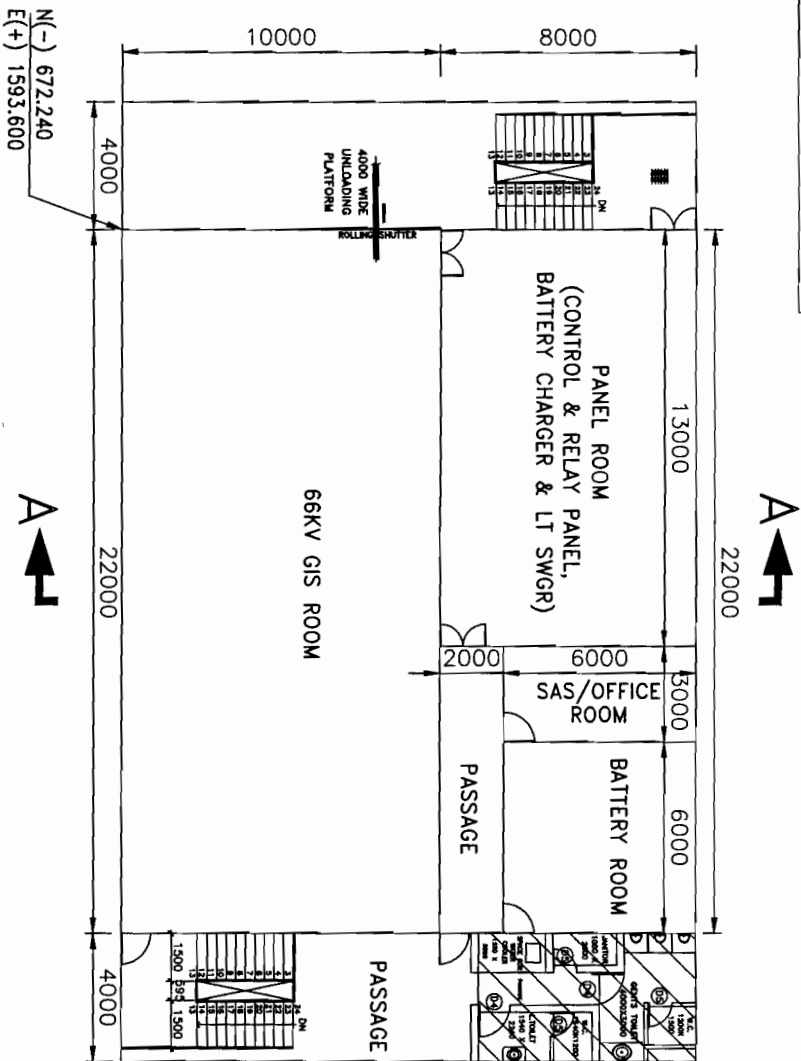
DEPT.	CODE
TBEM	422

TITLE	CARD CODE
BHARAT HEAVY ELECTRICALS LIMITED	
TRANSMISSION BUSINESS GROUP	
CONCEPTUAL LAYOUT FOR GIS BUILDING	
SCALE	W.O. No 80003
	DRG. No. TB-3-383-316-007
NEXT SHEET	REV
SHEET No.	01
	00

SECTION A-A



CONTROL ROOM BUILDING PLAN



FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

NOTE:-

1. ALL DIMENSIONS ARE IN MM AND MINIMUM CLEAR DIMENSIONS.
2. LOCATION OF DOORS AND SIZE OF STAIR CASE AND PLATFORM ARE TENTATIVE AND SHALL BE FINALIZED IN CIVIL DWG.
3. GIS WITH INTEGRATED LCC SHALL BE PROVIDED.
4. DIMENSIONS OF GIS ROOM ARE TENTATIVE. WILL BE FINALISED AFTER THE PLACEMENT OF ORDER FOR GIS.
5. GIS ROOM SHALL BE PROVIDED WITH WALL MOUNTED SUPPLY AIR FANS FOR DRY PRESSURISED VENTILATION.
6. SPLIT AC SHALL BE PROVIDED FOR RELAY PANEL ROOM AND OFFICE ROOM.

REFERENCE:-

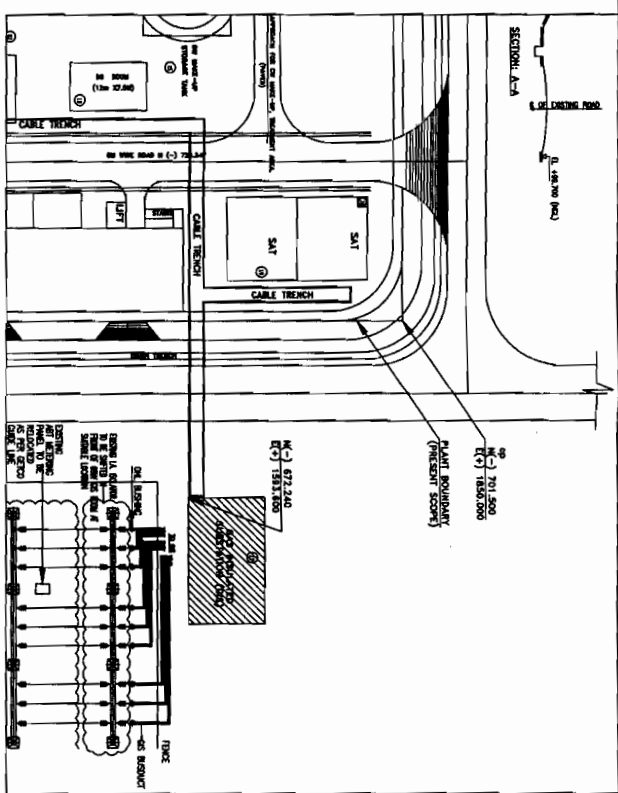
1. PLOT PLAN : 0-381-01-01570

NAME OF PROJECT/CUSTOMER : OIL AND NATURAL GAS CORPORATION LTD.
COMBINED CYCLE CAPTIVE POWER PLANT AT HAZIRA UNIT, GUJARAT

NAME OF CONSULTANT : FITCHNER CONSULTING ENGINEERS INDIA PVT LTD

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP

CONCEPTUAL LAYOUT FOR GIS BUILDING



SECTION 2 EQUIPMENT SPECIFICATION

Customer specification is enclosed as Annexure-7. In addition to that general requirements are as follows.

1.0 GENERAL

The section covers the broad technical specifications of 66kV cable system complete with accessories and spares etc.

2.0 GENERAL REQUIREMENTS

The design and workmanship of the cable and accessories covered under this specification shall be in accordance with the best engineering practices to ensure satisfactory performance and service life of 50 years. The cable accessories shall also be designed for maximum reliability and acceptability.

Unless brought out clearly, the offer shall be deemed to confirm to this specification. Any deviation between this specifications and bid offered, if not clearly brought out and accepted by BHEL/Customer will not be considered as a valid deviation.

The vendor shall bring out clearly any additional feature which they deem to include to give a complete and comprehensive offer. The vendor shall, however sustain his reasons for offering such additional feature/item in his proposal.

3.0 STANDARDS:

The XLPE Cables and the associated accessories shall conform to the following International standards, as amended/ revised till date, as appropriate:

IEC 60840	Power cables with extruded insulation and their accessories for rated voltage above 33 kV up to 150kV – Test methods and requirements.
IEC 60060 Part-1	High voltage test techniques
IEC 60187	General definitions & test requirements
IEC 60068	Seismic test methods for the equipment
IEC 60183	Guide to the selection of High Voltage Cables
IEC 60228	Conductors for insulated cables
IEC 60229	Tests on cable over sheaths
IEC 60230	Impulse test on cables and their accessories
IEC 60270	Partial Discharge Measurements
IEC 60287	Calculation of continuous current carrying capacity & losses

IEC 60332 Part-1	Test on Electric Cables under fire conditions
IEC 60502	Power Cables with extruded insulation and their accessories
IEC 60506	Switching Impulse test on EHV Insulators
IEC 60540	Test methods for insulations and sheaths of electric cables and cords
IEC 60811 Part-1 to Part-4	Common test methods for insulating and sheathing materials of electric cables
IEC 60859	Cable connections for gas insulated metal enclosed switchgear
IEC -60885 Part-3	Electrical test methods for electric cables
CIGRE WG21.03 (Electra 151) (Dec 1993)	Recommendation for electrical tests on extruded cables and accessories
IEEE 48	Test procedures and requirements for high voltage cable terminations
IEEE 404	Joints for use with solid dielectric cables
IEEE 635	Guide for selection and design of aluminium sheath

4.0 GENERAL TECHNICAL REQUIREMENTS OF CABLE:

- 5.1 The cable and all its accessories shall conform in all respects, to the requirement of the latest standards of IEC except in so far as they are modified in these specifications. Whenever a standard is specifically mentioned in the specification, it is understood that the corresponding standard or standard from amongst the source mentioned above shall also apply. It is, however, understood that the cable and accessories etc., supplied shall conform to one consistent set of standards except in so far as they are modified by the requirement of these specifications.
- 5.2 Cables/Cable accessories satisfying the quality requirements of other International standards, which ensure equal or better quality than the standards mentioned above shall also be acceptable. Where the equipment offered by the supplier conforms to other standards, salient points of difference between the standards preferred and the specified standards shall be informed. Copies of the reference standards in English language shall be furnished for reference.
- 5.3 The general principle on which these specifications are drawn up, is to permit the adaptation of modern manufacturing standards. The Contractor shall supply his own standard equipment as far as possible, provided they comply with the requirements of these specifications. However, should the Contractor wish to depart from the provisions of these specifications either on account of manufacturing practice or for any other reasons, he shall draw the attention of the

Corporation to the proposed items of departure and shall submit such full information, drawings and specifications, full justification as will enable the relative merits.

- 5.4 In the event of these specifications or part thereof and of the Contractor's drawings, specifications, forms, tables etc., being found to disagree during the execution of the contract, these specifications shall be held as binding unless, the departures have been duly approved in writing by the Corporation.
- 5.5 All similar component parts of similar equipment supplied shall be interchangeable with one another.
- 5.6 The size of the conductors of the cable shall be sufficient to carry continuously Current at a maximum temperature of 90° C under site conditions.
- 5.7 Insulation Curing: Dry curing process should be adopted in cross-linking the insulation.
- 5.8 Triple Extrusion:
- The conductor screen, insulation and insulation screen shall be extruded in single process (triple extrusion) and cross linked by continuous vulcanization process or MDCV process (Mitsubishi Dainichi Continuous Vulcanization process) or any other equivalent process using dry curing technology to ensure homogeneity and absence of micro voids.
- 5.9 The cable shall be designed to have a minimum useful life of not less than fifty years.
- 5.10 Each cable length shall be provided with a pulling socket, pulling eye, which shall be fitted to pulling end to withstand the maximum pulling force.
- 5.11 The contractor shall furnish the details of any specific construction features which will be provided to ensure specific water tightness of cable both transversely and longitudinally.

5.0 MECHANICAL CHARACTERISTICS OF CABLE:

The cable shall withstand the electro-mechanical forces due to short circuit current of 40 kA and shall withstand the stresses in the insulation due to faults. The cable shall withstand the mechanical stress during installation.

6.0 TEMPERATURE RISE:

The maximum conductor temperature shall not exceed 90°C during continuous operation of current. The temperature after a short circuit for one second shall not exceed 250° C, with initial conductor temperature of 90° C.

7.0 IDENTIFICATION:

The following information shall be embossed on the outer sheath of the cable continuously repeated through out the length of the cable.

- i) Brand Name of Manufacturer
- ii) Year of Manufacture
- iii) Voltage rating/conductor cross Section
- iv) Customer:
- v) XLPE
- vi) Running length of cables

The embossed letters and figures shall be raised and consist of upright block characters along one or more lines.

The maximum size of the characters shall be 20 mm and the minimum size not less than 15 percent of the nominal or specified external dia of cable or 3 mm whichever is greater

The gap between the end of one set of embossed characters and the beginning of the next shall not exceed 1 m. Any additional information embossed on the sheath shall not affect the spacing between repetitions of the legend.

Further as a safety if any additional ground wire is required for grounding all clamping equipment at ground potential shall also be supplied.

8.0 CABLE END TERMINATIONS:

- a) The cable end termination shall be indoor/outdoor type suitable for cable size as specified in section-1 and shall conform to the relevant IEC.
- b) The outdoor termination should have a device for electrical stress control at the end of screen/shield. It should avoid partial discharges and surface Corona under the service conditions. It should seal any ingress of atmospheric elements. The total creepage distance shall not be less than **31 mm/kV**.
- c) The terminations shall be suitable for insulation voltage, conductor size and current rating of the cable.
- d) Cable terminations (**heat shrink/cold shrink type**) – The sealing ends shall conform to the latest International Standards and shall be of thoroughly proven design. The cable terminations shall be outdoor type. The outdoor type sealing end shall be suitable for installation in polluted atmosphere and shall be completely weather proof. Each outdoor type sealing end shall be supplied complete with mounting plate insulators to insulate the sealing end from the supporting structures and to control the sheath current. Each sealing end shall be provided with consumable materials such as viper and cleanant for cleaning. The power cable leading to sealing end shall be provided with proper sunshield cover.
- e) The material for the housing of the termination should be resistant to tracking, ultra violet radiation (U-V exposure) weathering and should have stable hydrophobic properties.
- f) The contractor shall provide necessary arrangement to limit flow of current in the structure supporting the sealing end.
- g) The sealing ends shall withstand the power frequency, impulse and cable testing voltage after installation as specified.
- h) The cable and accessories shall withstand all thermal and mechanical stresses under steady state and transient operating conditions.

9.0 SPARE CABLE: Not applicable

10.0 SUPPORTS, HARDWARES AND ACCESSORIES:

- (a) The supporting structure (in BHEL scope) for the outdoor cable termination in switchyard shall be fabricated from lattice steel structure. The detailed drawings of foundation and structure shall be furnished by the successful bidder. The Contractor shall furnish necessary information such as foundation load and mounting details to the Corporation.

Structure for transformer cable box and GIS termination shall be in supplier's scope.

- (b) Cable cleats, clamps, fire barriers, fixing bandage, miscellaneous accessories and hardware required for the assembly of the cable support system shall be supplied. The complete detailed fixing arrangement/ installation drawings of the cables shall be furnished.

11.0 PROTECTION AGAINST EARTH QUAKE:

Cable system shall be so designed as to be secured to the foundation clamps to withstand earthquake forces of the above.

12.0 CABLE DRUMS

Immediately after the inspection, both ends of each cable length shall be sealed by means of end caps in the presence of the inspector. Cable drums shall be of rugged construction, with a drum diameter of ample dimensions to accommodate the single-conductor cables. The drum cable length shall be chosen considering the lengths to be laid at site. No negative tolerance on the required lengths may be adopted.

Each drum shall be marked, by stenciling thereon, with an arrow the direction in which the drum should be rolled. The cable shall be wound on non-returnable strong steel drums. The dimensional drawings of steel drums shall be furnished. The drum shall be provided with circumferential lagging of strong wooden planks. The ends of the cable shall be sealed with good quality heat shrink sealing caps.

The cable drums shall be supplied with definite cable length (to be informed before start of manufacturing) within +/- 2 m tolerance. Contractor shall not be reimbursed for excess lengths supplied. Cable drums with shorter lengths shall not be accepted.

13.0 INSTALLATION & COMMISSIONING

Cable drum shall be **unloaded**, handled and stored on hard and well drained surface so that they may not sink. In no case, the drum shall be stored flat i.e. with horizontal. Rolling of drums shall be avoided as far as possible. For un-reeling the cable, drum shall be mounted on suitable jacks or on cable wheels and shall be rolled slowly so that the cable comes out over the drum and not from below. All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends. Cable ends shall always be kept sealed by heat shrinkable PVC caps to prevent damage and ingress of moisture.

While laying the cable, **power rollers** shall be used at required interval to avoid cable touching ground. The cables shall be pushed over the rollers by a gang of people positioned in between the rollers. Cables shall not be pulled from the end without having intermediate pushing arrangement. Pulling tension shall not exceed recommended values. Selection of cable drum for each run shall be planned so as to avoid using straight through joint. Cable splices will not be allowed unless approved by customer.

The cables shall be laid and terminations installed by skilled and experienced workers, fully qualified to carry out the work. The supplier shall also be responsible for providing clamps, required to support cables on racks for cable laying in trenches.

In surface trench, cable will be laid in trefoil arrangement on support angle and will be fixed with angle by clamps made of non-magnetic material. These surface trenches will be covered by suitable trench covers. The cable shall also be laid in RCC trench on sand bed in flat formation as per requirements specified in section-1.

The sheath voltage under full load conditions shall be within safe limits. The value of sheath voltage shall be furnished for approval. Sheath shall be solidly grounded at both end. The connection to earth shall be as short as possible to prevent HV impulses and spikes. A sheath voltage limiter shall be provided as per section-1 to control the sheath voltage. These voltage

limiters shall be without boxes.

14.0 TESTS

The cables and cable terminations shall be subjected to tests as per applicable standards in the presence of Customer /BHEL and/ or their authorized representatives. After installation, the cables shall also be subjected to tests at sites.

15.0 DESIGN REQUIREMENTS

Supplier of the cable system shall furnish the details calculations along with technical data sheet for verification/approval of design parameters elected. Detail design calculations/documents will be submitted for approval to Customer/BHEL:

- a) Calculation of continuous current capacity for specified cable laying conditions
- b) Adequacy of XLPE insulation thickness.
- c) Calculation for short circuit currents for metal sheath or screen.
- d) Calculation for adequacy of metallic sheath/ screen for short circuit current carrying capability.
- e) Calculation of sheath induced voltage for single point bonding.
- f) Manufacturing Quality plan
- g) Field quality plan for site installation, commissioning and testing
- h) Instruction manual for jointing and cable laying.

16.0 PACKING AND MARKING

The packing should be able to withstand the rigors of transport.

The following information in bold letters in English shall be painted on the flanges.

- (i) Name and address of the Manufacturer, Trade name/Trade Mark/Brand.
- (ii) Size of cable (cross section) rated voltage, standard, insulation, cable code, drum number, year of manufacture.
- (iii) Length of cable (metres)
- (iv) Direction of Rolling
- (v) Net weight (in Kg)
- (vi) Gross weight (in Kg)
- (vii) Purchase order reference.

Section-4

Guaranteed Technical Particulars for the 66kV XLPE Insulated Cable


Sl. No.	Item Description	Unit	Data
1	Manufacturer's Name & Address		
2	Cable Type		
3	Rating		
a)	Rated voltage	kV	
b)	Maximum rated voltage	kV	
4	Applicable Standard		
5	Number of cores		
6	CONDUCTOR		
a)	Cross sectional area	mm ²	
b)	Material		
c)	Design		
d)	Overall diameter	mm	
e)	Soldering Temperature	deg C	
6.1	CONDUCTOR SCREEN		
a)	Material		
b)	Nominal thickness	mm	
c)	Diameter over conductor screen	mm	
7	INSUALTION		
a)	Material		
b)	Type of curing		
c)	Nominal thickness	mm	
7.1	INSULATION SCREEN		
a)	Material		
b)	Nominal thickness	mm	
c)	Diameter over insulation screen	mm	
8	METAL Screen and SHEATH		
a)	Material		
b)	Nominal thickness	mm	
c)	Cross sectional area	sq mm	
8.1	WATER SEALING LAYER		
a)	Material		
b)	Thermal resistivity of material	km/W	
9	OUTER SHEATH		
a)	Material		
b)	Minimum average thickness	mm	
c)	Diameter over outer sheath	mm	
10	COMPLETED CABLE		
a)	Overall diameter	mm	
b)	Weight per meter	kg/m	
c)	Maximum drum length	m	
11	MAXIMUM DIELECTRIC STRESS		
a)	At the conductor (assumed smooth)	MV/m	

b)	At the conductor screen	MV/m	
12	MAXIMUM CONDUCTOR TEMPERATURE		
a)	Laid direct in ground	deg C	
b)	Drawn in ducts	deg C	
c)	Erected in air	deg C	
13	MINIMUM RADIUS OF BEND AROUND WHICH CABLES WILL BE LAID		
a)	Laid direct	m	
b)	In ducts	m	
c)	In air	m	
d)	Nominal internal diameter of pipes or ducts through which cable may be pulled		
14	MAXIMUM DC RESISTANCE PER METER OF CABLE AT 20 DEC C		
a)	Conductor	Micro-ohm	
b)	Metallic layer	Micro-ohm	
c)	Metallic sheath	Micro-ohm	
15	AC RESISTANCE PER METER OF CABLES AT MAXIMUM CONDUCTOR TEMPERATURE		
a)	Conductor	Micro-ohm	
b)	Metallic layer	Micro-ohm	
c)	Metallic sheath	Micro-ohm	
16	Insulation resistance		
a)	At 20 deg C	Mega-Ohm	
b)	At maximum rated temperature	Mega-Ohm	
17	Current carrying capacity of cable in RCC trench with removable cover		
a)	In air (Ambient temperature 50 deg C)		
	One circuit	A min	
	Two circuit	A min	
	Three circuit	A min	
18	Maximum dielectric loss angle of charging VA of cable at nominal voltage and frequency and conductor temperature of		
a)	50% rated voltage		
b)	200% rated voltage		
19	Creepage distance of sealing end porcelain	mm	
20	Metallic layer earth fault current carrying capacity for one second,	kA	

	cable fully loaded prior to earth fault and final screen temperature of 250 deg C		
21	Dielectric loss of completed cable when laid direct in ground per 1000 meters and at maximum continuous operating temp	W	
22	Impulse withstand voltage		
a)	Positive 1.2/50 micro-second wave	kVp	
b)	Negative 1.2/50 micro-second wave	kVp	
23	Short circuit capacities with a conductor temperature of 90°C at the commencement		
a)	0.5 s duration		
b)	1.0 s duration		
c)	2.0 s duration		
d)	3.0 s duration		
24	Impedance per km of three-phase circuit, at 50 Hz and max. Conductor temperature		
a)	Positive and negative sequence	Ω	
b)	Zero sequence	Ω	
25	Maximum capacitance	MicroF/kM	
26	Max. Drum length of cable	m	
27	Screen earthing method	-	

CABLE TERMINATION KIT FOR 66kV XLPE INSULATED CABLE

S. No.	Item Description	Unit	Data
			Termination Kit
1.	Manufacturer's Name & Address		
2.	Country of Manufacture		
3.	Type of Cable Termination		
4.	Applicable Standards for manufacturing		
5.	Applicable Standards for testing		
6.	Rated Voltage	kV	
7.	Maximum service voltage	kV	
8.	Type & Material of bushing		
9.	Creepage Distance	mm	
10.	Whether full details of termination and BOQ furnished with offer		
11.	Whether cable sealing end is complete with all accessories		
12.	Whether descriptive pamphlet enclosed		
13.	Whether full details of tests to be carried out furnished with offer		
14.	Copies of type test reports enclosed		

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Annexure – 7

Specification for 66 kV Cables

General

This specification covers the design, manufacture, supply, erection, testing and commissioning of 66kV Power Cables

It is not the intent to specify completely herein all details of the equipment; nevertheless, the equipment shall be complete and operative in all respects and shall conform to the highest standard of engineering, design and workmanship.

Scope of Work

The scope of work shall include but not limited to the following

66 kV, XLPE power cables

Codes & Standards

Cables shall also conform to relevant IS /IEC standards amended up to date including the following.

IS: 7098 Part 3

IEC 60228

IEC 60840

IEC 60287

IEC 60332


IEC 60859

Technical Requirement

Design Criteria

Power cables shall be sized to satisfy the following Criteria:

- System short circuit current.

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- Derating factors due to higher ambient temperature and grouping of cables.
- Continuous current rating.
- Voltage drop during starting and continuous operation.
- Standardization of the cable size to minimize too many sizes of cables

Power cables shall withstand the fault current of the circuit for the duration not less than the maximum time taken by the primary protective system to isolate the fault. Cables shall be sized for the following short circuit rating.

Three phase symmetrical short circuit ratings of 66kV System: **40 kA for 1 s**

To maintain voltage at terminals /equipment end within desirable limit, it is proposed to limit the voltage drop in the cables within the following limits:

Steady state Voltage drop (Continuous running condition) : 3%

Transient state voltage drop (During Starting) : 10 %

Following design ambient shall be considered while sizing the cables.

Design Ambient Air Temperature : 50 degree C

Ground Temperature : 40 degree C


Cables installed in hot areas shall be specially designed for that ambient temperature.

Cables shall be adequately sized to take care of any derating due to fire stop cable sealing/fire resistant coating.

Constructional requirement

Power Cables up to 300sqmm size shall be of Multicore cables. For above 300sqmm size single core cables shall be considered. All 66 kV power cables shall be XLPE insulated. XLPE insulation shall be suitable for continuous conductor temperature of 90 °C and short circuit conductor temperature of 250°C.

66 kV cables will be of stranded Aluminium conductor, Triple extruded insulation with field limiting layers of cross linked polyethylene, bedding tapes, Armoured, copper screen,

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longitudinally water tight ^{tape} ~~embedding crepe paper~~, copolymer coated aluminum tape. All the conductors shall be multi-stranded.

Cables shall be suitable for laying on racks, in ducts, trenches with chances of flooding by water and shall also be suitable for directly buried installation. All the cables shall be flame retardant low smoke (FRLS) type designed to withstand mechanical, electrical and thermal stresses developed under steady state and transient operating conditions. The maximum Voltage rating shall be as per standards & the cables shall be suitable for Termination at 66kV GIS

Outer sheath shall be of FRPLS PVC, black in colour having following properties.

Oxygen index of not less than 29.

Acid gas emission of max. 20%.

Smoke density of not more than 60%.

The cables shall meet flammability test as per IEEE – 383.

All the cables shall be protected against rodent and termite attack. Necessary chemicals shall be added in to the PVC compound of the outer sheath.

Cables shall be supplied in wooden or steel drums of heavy construction. Wooden drums shall comply with IS 10418

Considering the aforesaid factors bidder shall submit the cable sizing calculations for owners approval during detailed engineering.

TESTS

Cables offered shall be of type tested and proven type. Type test certificates for test conducted earlier on similar rating shall be furnished. Routine tests, Acceptance tests and all special tests for FRLS properties shall be carried out for all the cables as per applicable standards. The sample shall be drawn at the rate of one per type and size for every lot offered for inspection.

Bidder is requested to visit the ONGC Site in order to assess the tentative length of the cables required.

SECTION – 3
PROJECT DETAILS AND GENERAL SPECIFICATIONS

SL.NO.	DESCRIPTION	
1.	PROJECT INFORMATION	
	a) Customer	ONGC Ltd.
	b) Consultant	FICHTNER Consulting Engineers (India) Pvt. Ltd.
	b) Project	66 KV GIS system for 1 X 51 MW CCCPP for ONGC , Hazira
1.0	Location	ONGC Limited, Hazira
2.0	Elevation above mean sea level	RL 6.0 above, MSL
3.0	Nearest Railway Station	Surat, 20 KM
4.0	Nearest Airport	Surat, 10 KM
5.0	Nearest Harbour	Magdalla, 20 KM
6.0	Access Road	NH-8 (30 KM)
7.0	Atmospheric pressure at MSL	1.013 bar
8.0	Ambient Temperature	
	a) Max. average dry bulb temperature	45.6 oC
	b) Min. average dry bulb temperature	4.4 oC
	c) Design temperature for electrical equipment / device	50 oC
9.0	Relative Humidity	
	a) Max.	70%
	b) Min.	18%
	c) Average	64%
10.0	Seismic Zone	III (IS 1893)
11.0	Rainfall	
	a) Max. Intensity of rainfall in 24 hrs.	459.2 mm
	b) Period – Monsoon showers	June to September
	c) Average rainfall per annum	1203.5 mm
12.0	Wind data	
	Max. wind speed (as per IS:875) 20-61 kmph for 20 days in a year < 20 kmph for remaining period	62 kmph
	Most predominant wind direction	South -West
13.0	Land	
14.0	Tropicalisation	
	All equipment supplied against specification shall be given tropical and fungicidal treatment in view of the climatic conditions prevailing at site.	
	Tropical protection shall conform to BS: CP-1014-1965 "Protection of Electrical Power Equipment" against climatic conditions.	

Auxiliary Supply

Normal Voltage	Variation in Voltage	Frequency in Hz	Phase/Wire	Neutral Connection
415 Volts	± 10%	50 +3% to -5%	3 phase/ 4 wires	Solidly earthed
240 Volts	± 10%	50 +3% to -5%	1 phase/ 2 wires	One point earthed
110 Volts DC	± 10%	DC	1 phase/ 2 wires	Isolated 2 wire system

2. General electrical requirement as per Annexure A (Vol III, Section 3.1 of ONGC specification.(4 pages))

The discharge of pollution in water and air as well as noise levels shall meet with the stipulations of State Pollution Control Board as well as other Acts of the Government under the Ministry of Environment and Forestry. It is a pre-condition that irrespective of what is stated in statutory regulations or any other act or norms, the Specification stipulated environmental qualities standards are the minimum requirements and shall be fulfilled in all aspects.

For control room and offices, noise level shall not exceed 60 dB (A) near to the duct and at other places in the control room/offices noise levels shall not exceed 50 dB (A).

Equipment supplied and all work done including system design and detailed engineering shall also comply with the statutory requirements of the State/Central government and with the Indian Electricity Rules.

Unless otherwise specified, at least 10 % margin shall be considered in equipment sizing over and above the calculated load current/fault current/power requirements. If not specified otherwise the electrical operational equipment must be designed to meet protection classes stated below.

- HT Switchgear (Indoor) - IP 4X
- LT Switchgear (Indoor) - IP 52
- Control panels (Indoor) - IP 42
- Relay panel - IP 42
- Motors (indoor) - IP 54
- Motors and other equipment located outdoor - IP 55
- Emergency DG (Indoor) - IP 23

Each individual enclosure accommodating electrical equipment which is liable to suffer from internal condensation due to atmospheric or load variations shall be fitted with heating

3. Standards and Codes of Practice

All equipment, systems and works covered under these specifications shall be in accordance with all the applicable statutes, regulations, codes and standard specified as well as all such standards, statutes, regulations and safety codes applicable in the locality where the equipment will be installed. Contractor may familiarize themselves with all such requirements.

Complete design including pressure parts, piping, valves and fittings shall meet or exceed all the latest requirements of the Indian Boiler Regulations (IBR), latest Indian Standards /ASME codes,

latest codes and standards as applicable. Any Indian/International standards shall be followed for any imported equipment. For plant layout aspects and area classification requirements OISD standards shall be followed.

The design, construction and testing of all equipment, facilities, components and systems shall be in accordance with relevant standards and codes issued by Bureau of Indian Standards (BIS) and/or reputed international standards and codes as on the date of Award of Contract. A non-exhaustive list of reputed international standards is given below:

- a) American National Standards Institute (ANSI)
- b) American Petroleum Institute (API)
- c) American Society of Mechanical Engineers (ASME)
- d) American Society of Testing and Materials (ASTM)
- e) American Water Works Association (AWWA)
- f) American Welding Society (AWS)
- g) British Standards (BS)
- h) Cooling Technology Institute (CTI)
- i) Deutsches Institut für Normung (DIN), Germany
- j) Gosstandart of Russia (GOST) standards
- k) Heat Exchange Institute (HEI), USA
- l) Hydraulic Institute Standards (HIS), USA
- m) International Electro-technical Commission (IEC)
- n) Institute of Electrical and Electronics Engineers (IEEE)
- o) International Organisation for Standardisation (ISO)
- p) Japanese Industrial Standards (JIS)
- q) National Electric Code (NEC), USA
- r) National Electrical Manufacturers Association (NEMA), USA
- s) Central Electricity Authority (Construction of Electrical Plants and Electric Lines) Regulations, Notification, 20th August 2010 and to those referred therein
- t) National Fire Protection Association (NFPA), USA
- u) Occupational Safety and Health Administration (OSHA)
- v) Tubular Exchanger Manufacturers Association (TEMA), USA
- w) VDE association for Electrical, Electronic and Information Technologies (VDE), Germany
- x) OISD

Other international Standards, equivalent or superior to the above Standards can also be adopted. However, In the event of any conflict between the requirements of the international standards or codes and the requirements of the BIS standards or codes, the latter shall govern unless specified

elsewhere in the specifications. Any Indian/International standards shall be followed for imported equipment.

The Plants and Electric Lines (within the plant) shall also be designed to comply with the requirements stipulated in.

- a) Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006.
- b) Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007.
- c) Central Electricity Authority (Measures relating to Safety and Electricity Supply), Regulations as and when these are notified by the Authority.
- d) Central Electricity Authority (Safety Requirements for Construction, Operation and Maintenance of Electrical Plants and Electric Lines) Regulations as and when these are notified by the Authority.
- e) Central Electricity Authority (Grid Standards) Regulations as and when these are notified by the Authority.
- f) Central Electricity Authority (Construction of Electrical Plants and Electric Lines) Regulations, Notification, 20th August 2010 and to those referred therein
- g) Indian Electricity Grid Code issued by Central Electricity Regulatory Commission (CERC) and
- h) Applicable State Grid Code issued by appropriate Regulatory Commission.

All material and equipment supplied and all work carried out as well as calculation sheets, drawings, quality and class of equipment, methods of inspection, constructional peculiarities of equipment and parts and acceptances of partial plants, as far as these are beyond the special requirements of the specifications, shall comply in every respect with the technical codes of the above listed codes and Standards.

It shall be the responsibility of the Contractor to take all approvals required and get the HRSG registered under the IBR. In all other cases where IBR does not govern, IS/ASME, Japanese, American, British, German or other international standards established to be equivalent or superior to IS/ASME shall be acceptable with the approval of the Owner/Owner's representative at the time of detailed engineering.

Where there are no standards or regulations, or the standard is not sufficient to meet the need of design and supply, for such items relating to the power plant, the Contractor shall carry out the design, manufacture, supply and installation on the basis of good engineering practice.

During the period of Contract execution, if any standards change, the Contractor shall be responsible to notify the Owner/Owner's representative and provide the basis for the prospect that it would not cause the lowering of quality, performance and service life of the power plant due to alteration of the standard and the latest standards shall be followed by the Contractor.

Further requirements about applicable standards and codes are specified in the detailed technical specifications.

4. SPECIAL TOOLS, TACKLES AND EQUIPMENT

One set of special tools and tackles required unit for the operation, maintenance, inspection and repair of the individual main equipment and auxiliary equipment shall be supplied by the Contractors in sufficient quantity to equip the shift personnel, maintenance personnel and workshop craftsman for commissioning, testing, calibration, modification and maintenance of the unit, List of such special tools, tackles and equipment shall be submitted in the EPC bid.

Special tools and tackles excludes conventional ones and those locally available normally (not those requiring a drawing and considered as those made to order).

The special tools and equipment for maintenance and repair shall be delivered by the Contractor in lockable steel boxes and they shall be marked in an approved manner for identification purposes and a corresponding tool chart shall be supplied with the steel boxes.

The following tools and appliances shall be supplied under this Contract for use by the Owner/Owner's representative:

- two sets of special tools and gauges required for the maintenance of the Plant
- one set of special lifting and handling tackles / appliances required for the maintenance of the Plant.

The tools, tackles and appliances supplied in general, shall not be used for erection purposes by the Contractor and shall be handed over in brand new condition. Damaged tools, tackles, and appliances shall be replaced before handing over.

The exception to this is the special lifting gear which may be used provided that when it is handed over to the Owner/Owner's representative it has not been subjected to more than normal wear and is still fully suitable for its intended use.

Each set of tools, gauges and appliances under category (a) above shall be suitably arranged in fitted boxes of mild steel construction, the number of boxes being determined in relation to the layout of the plant and equipment in question.

If the weight of any box and its contents should be such that it cannot conveniently be carried, it shall be supported on steerable rubber-tyred wheels.

Each cabinet and box shall be painted, fitted with a lock and clearly marked in white letters with the name of the item of equipment for which the tools and appliances contained are intended.

Suitable storage racks shall be provided for all portable lifting tackle supplied under this contract. Suitable lifting lugs, ears or ring bolts, or tapped holes for lifting rings shall be provided on all equipment items where the weight exceeds 15 kg.

All lifting tackle shall be stamped with a unique identification number and safe working load. A test certificate from an approved Authority shall be supplied for each item of lifting tackle. The Contractor shall provide a schedule of all lifting tackle and tools and appliances being supplied, for the approval of the Owner/Owner's representative.

The Contractor shall provide all runway beams, trolleys, lifting blocks, special slings necessary for the safe and efficient handling and maintenance of the works. Particular attention shall be paid to handling of equipment located at higher elevations safety valves

The tools and appliances with the appropriate storage racks, cabinets and boxes shall be handed over to the Owner/Owner's representative at the time of Taking Over of the complete Plant.

Since the Contract includes site erection, any special tools or appliances required solely for erection shall be provided by the Contractor for his own use and shall remain the property of the Contractor. Control and Instrumentation: Software with associated hardware required to access instruments or control systems to be provided.

5. CLEANING, PROTECTIVE COATING AND PAINTING

Refer Annexure-D (Vol III /Section 2/ Sub Section 2.15 Surface Preparation and Painting.)

6. INSPECTION, TESTING AND INSPECTION CERTIFICATE

Inspection testing shall be done as per customer specification as per Annexure – B.

7. DOCUMENTATION

Format of Documentation

All engineering documents and drawings shall be of international "A" series sizes, that is, A0, A1, A2, A3 and A4.

One set of CD containing all the drawings in Auto CAD (for final as built drawings) shall also be supplied in addition to hard copies.

Soft copy of all other documents shall be supplied in a CD in PDF or editable format. For review purpose pdf or editable version shall be considered.

Grouped documents shall be provided by size A4, with the inclusion of bigger size drawings which, however, have to be folded as Size A4.

Numbering and Identification of Documents

All the drawings shall be identified through a common way of numbering in accordance with the requirement of contracting. The numbering system of drawings and documents proposed by the Contractor shall be in compliance with the plant identification system and to be agreed with the Owner/Owner's representative. Apart from this, some drawings may also be numbered in the way which the contractor or subcontractors are used to do. But, there shall be a common title Block on all published drawings which include the following contents:

- Owner
- Owner's Engineer
- Project
- Contractor
- System
- Drawing No.
- Sheet No
- Revision No.

The measuring units and dimensions marked on the project engineering drawings shall be of SI system conforming to ISO 1000.

English words shall be used as descriptions on drawings.

In case dimensions are not marked in conformity with the scale of drawings and any dimension on the drawing does not conform to those dimensions and sizes measured through certain scale, the actual marked dimensions shall be applicable.

For revision of drawings, the revised part shall be clearly and definitely shown on the drawing.

For revision of documents which have been grouped together, a brief description shall be a perpendicular line with the margin of the revised copy closely following it.

Provision for Documents

Generally, copies of drawings or documents containing trade secret and drawings with patented nature need not be provided.

However, to know whether the Contractor has performed its obligations, the Owner/Owner's representative has the right to examine those drawings within the Contractor's working scope. The Contractor shall meet the Owner/Owner's representative's reasonable demands to files and do the following to satisfy the Owner/Owner's representative:

- Contractor will work according to the requirements specified in the contract.
- Contractor's working has been arranged properly and developed according to the plan.
- The quality control system is reliable.
- After receiving all documents necessary for power plant operation and maintenance, Contractor shall supply equipment and systems.
- Having received all necessary documents for Contractor to perform its legal obligations or other relevant responsibilities.

Distribution of documents

The source, distribution, no. of copies shall be as per the following document distribution schedule. Annexure –C.

Title block for the Project:

a) Customer	ONGC
b) Consultant:	FICHTNER Consulting Engineers (India) Pvt. Ltd.
c) Project:	66 KV GIS system for 1 X 51 MW CCCPP for ONGC , Hazira
d) Main Contractor	BHEL

DOCUMENTS TO BE SUBMITTED ALONGWITH OFFER

- 1) Drawings in 2D and 3D format.
- 2) Guaranteed Technical Particulars
- 3) Type Test Reports
- 4) Manufacturing Quality Plan

DOCUMENTATION SCHEDULE AT CONTRACT STAGE

No. of Copies	A: For Approval
5	Copies of GA drawings (2d and 3D) with projects details, dimension, equipment weight, fixing details, tolerances and terminal details etc.
5	Copies of type test reports
5	Copies of shipping list detailing the description & quantities of all items being dispatched separately, with shipping weights, number of cases and dimensions.
5	Copies of manufacturing and field quality plan.

5	Copies of installation, operation & Maintenance manual. B : After Approval and For Information/Distribution.
12	Copies of All drawings
12	Bound sets containing all drawings/manuals, type and routine test reports etc. along with sub-vendor's test reports for all bought out assemblies/components/parts including Internal wiring diagrams and exploded diagrams of assemblies/ parts, shall be furnished.
12	Copies of Installation, Operation & Maintenance manual. C: On Completion of Entire works
12	Bound sets of Installation, Operation & Maintenance manual and all as built drawings
12	Set of Computer CD-ROMs (with unbreakable CD Covers) containing all as-built drawings in Auto-Cad version 2008 or later with 2D and 3D drawings, Instruction Manual and GTP.

8. Package, storage

All materials and equipment should be packaged according to the typical environmental conditions during storage. In case of severe conditions, these materials and equipment should be packaged carefully by taking a full and appropriate preventive measure to protect from any damage or wear.

The Contractor and his appointed Subcontractor for installation should guarantee jointly that a good supplementary storage will be carried out within the equipment site controlled by them. Three classes for storehouse are described as follows:

Storehouse class A items: Special measures are taken to protect the stored goods and the temperature, humidity are controlled within a specified range.

Storehouse class B items: Goods are stored with temperature uncontrolled.

Storehouse class C items: It is an outdoor storage with a drainage system on the ground.

For storehouses of class A and B they should be fireproof, heat resisting, waterproof and well ventilated. They should not be wet and should be provided with good drainage system and preferably with a brick laying or concrete ground. For storehouses of class C, they should not be wet and should be well drained, preferably with a brick laying or crushed stone ground, should be protected from rainfall, salt corrosion, ash and other adverse conditions with a temporary cover or tent if possible

Component surfaces should not be contacted directly with the ground or ground laying material. There should be a layer of oilcloth or wax or other similar materials between the machine surface and ground surface.

All components shall be inspected for their painting, storing, sealing and any damage or wear should be repaired during acceptance and storage periodically. The inspection interval is determined by the component function, applied protection measure and storehouse class.

Many components are provided with a drying agent or sealed in a coverage (polyethylene or insulating cover) containing drying agent. The drying condition shall be inspected during storage in an interval of every 4 weeks.

9. SPECIAL TOOLS, TACKLES AND EQUIPMENT

One set of special tools and tackles required unit for the operation, maintenance, inspection and repair of the individual main equipment and auxiliary equipment shall be supplied by the Contractors in sufficient quantity to equip the shift personnel, maintenance personnel and workshop craftsman for commissioning, testing, calibration, modification and maintenance of the unit, List of such special tools, tackles and equipment shall be submitted in the EPC bid.

Special tools and tackles excludes conventional ones and those locally available normally (not those requiring a drawing and considered as those made to order).

The special tools and equipment for maintenance and repair shall be delivered by the Contractor in lockable steel boxes and they shall be marked in an approved manner for identification purposes and a corresponding tool chart shall be supplied with the steel boxes.

The following tools and appliances shall be supplied under this Contract for use by the Owner/Owner's representative:

- Two sets of special tools and gauges required for the maintenance of the Plant
- One set of special lifting and handling tackles / appliances required for the maintenance of the Plant.

The tools, tackles and appliances supplied in general, shall not be used for erection purposes by the Contractor and shall be handed over in brand new condition. Damaged tools, tackles, and appliances shall be replaced before handing over.

The exception to this is the special lifting gear which may be used provided that when it is handed over to the Owner/Owner's representative it has not been subjected to more than normal wear and is still fully suitable for its intended use.

Each set of tools, gauges and appliances under category (a) above shall be suitably arranged in fitted boxes of mild steel construction, the number of boxes being determined in relation to the layout of the plant and equipment in question.

If the weight of any box and its contents should be such that it cannot conveniently be carried, it shall be supported on steerable rubber-tyred wheels.

Each cabinet and box shall be painted, fitted with a lock and clearly marked in white letters with the name of the item of equipment for which the tools and appliances contained are intended.

Suitable storage racks shall be provided for all portable lifting tackle supplied under this contract. Suitable lifting lugs, ears or ring bolts, or tapped holes for lifting rings shall be provided on all equipment items where the weight exceeds 15 kg.

All lifting tackle shall be stamped with a unique identification number and safe working load. A test certificate from an approved Authority shall be supplied for each item of lifting tackle.

The Contractor shall provide a schedule of all lifting tackle and tools and appliances being supplied, for the approval of the Owner/Owner's representative.

The Contractor shall provide all runway beams, trolleys, lifting blocks, special slings necessary for the safe and efficient handling and maintenance of the works. Particular attention shall be paid to handling of equipment located at higher elevations safety valves.

The tools and appliances with the appropriate storage racks, cabinets and boxes shall be handed over to the Owner/Owner's representative at the time of Taking Over of the complete Plant.

Since the Contract includes site erection, any special tools or appliances required solely for erection shall be provided by the Contractor for his own use and shall remain the property of the Contractor.

Control and Instrumentation: Software with associated hardware required to access instruments or control systems to be provided.

10. Painting, Insulation, Anti-dewing

Anti-corrosive coatings and painting shall be carried out as a pre-treatment to all equipment and parts. The paint system used should coordinate with the painted objects and surrounding conditions of project.

In multi-layer painting system, different painting layers should be selected to make the painting coordinate. If multi-layer painting system is used, various painting layers should have distinct colours so that the later layer can be distinguished from the former one.

After the equipment or apparatus finished preliminary or full painting, it can be supplied to field. After the installation is finished, ground coat must be painted.

Entire painting procedure should be supplied in order to repair the injures of painting coat after the equipment is delivered to field.

Colour strip indication system should be used for pipes. These strips should be painted on the joint of pipes, entrance, valves of pipe. This pipe without outside protection layer should be marked by some colour in whole length.

The principal colour of field equipment should be determined by Owner/Owner's representative and Contractor during execution stage. For Electrical equipment, paint shade shall be as mentioned in the equipment Specification.

Further requirements with regard to painting, insulation, and anti-dewing are specified in the relevant sections in the detailed technical specifications. The specified requirements shall be applied to the whole equipment and facilities of the Contract.

Insulation specification for MPP supplied equipment shall be as mentioned in detailed technical specification.

Language to be used

English shall be used as the general Contract language English translations shall be provided for any code and standards not in English language.

Name plates of equipment and instrument scale shall be marked in English.

Documents for training shall be provided in English.

Danger signs / Exit signs shall be in English, Hindi and Gujarati.

11. CONSUMABLES

12.1.0 Lubricants and greases

All lubricants proposed for the Plant operation shall be suitable for all operating and environmental conditions that will be met on site.

All oils and greases shall where possible be readily available in India.

The number of oils and greases shall be kept to a minimum to the extent feasible. For each type and grade of lubricant recommended the contractor shall list at least three equivalent lubricants manufactured by alternative companies. This will be in line with that suggested by OEM and outcome will be informed to the Owner/Owner's representative.

In case of imported oils, lubricants and other consumables, the contractor shall indicate the indigenous equivalents to enable the Owner/Owner's representative to arrange subsequent fills. Preference should be given to indigenous oils and lubricants during first filling itself. Short shelf life items if any may be supplied in a phased manner keeping in view of their actual use.

The Contractor shall supply the first fill lubricants and greases, and also shall provide at the Completion Certificate sufficient lubricants and greases necessary for the efficient operation and maintenance of the Plant at full load 24 hours per day for a period as mentioned in the relevant portion of Commercial Specification.

12.2.0 Chemicals and other consumables

Contract includes the supply (by the Contractor) of all chemicals, reagents, resins, and other consumables required for testing, commissioning and setting to work of each section of the Works. The Contractor shall provide all chemicals and other consumables required for the efficient operation and maintenance of the plant at full load 24 hours per day for a period as mentioned in the relevant portion of Commercial Specification.

The Contractor shall prepare a list of these consumables giving quantities necessary for each section of the works and the recommended suppliers.

The Contractor shall deliver to site sufficient quantities of consumables in his supply to allow for 6 months running of the Works prior to the issue of the Completion Certificate. The delivery of the remainder of the consumables shall be programmed to suit the operational requirements and space availability within the various stores.

12. Plant and Equipment Identification

The contractor shall follow identification system for the whole plant equipment, instruments, facilities and systems as per the Annexure-4 **Guide for Coding Equipment, Documents & Drawings MPP generated drawings, identification system shall be based on MPP standard.**

Labelling

Name plates which are to be firmly fixed on all the equipment, instruments, buildings and structures shall be provided. For equipment of small size, these are to be fixed on the piping or structure adjacent to the equipment. The contents of nameplate are to include the designation and principal parameters of the equipment.

The nameplate within the field shall be made of a high temperature - resistant metallic sheets, with designation permanently engraved on them. Indoor installed equipment (e.g., panels, cabinets, switchgear) shall also be labelled by appropriate name plate.

The form, size, base colour and colour of contents of the name plates and prompting plates will be agreed between the Contractor and the Owner/Owner's representative. It shall be possible for these to be readily seen by the operator. The designation of warning tags shall be different from that of other tags. All buried pipes and cables routes shall be identified with permanent marker.

The embossed letters and figures shall be raised and consist of upright block characters along one or more lines.

The maximum size of the characteristics shall be 20 mm and the minimum size not less than 15 percent of the nominal or specified external dia of cable or 3 mm whichever is greater

The gap between the end of one set of embossed characters and the beginning of the next shall not exceed 1 m. Any additional information embossed on the sheath shall not affect the spacing between repetitions of the legend.

Further as a safety if any additional ground wire is required for grounding all clamping equipment at ground potential shall also be supplied.

8.0 CABLE END TERMINATIONS:

- a) The cable end termination shall be indoor/outdoor type suitable for cable size as specified in section-1 and shall conform to the relevant IEC.
- b) The outdoor termination should have a device for electrical stress control at the end of screen/shield. It should avoid partial discharges and surface Corona under the service conditions. It should seal any ingress of atmospheric elements. The total creepage distance shall not be less than **31 mm/kV**.
- c) The terminations shall be suitable for insulation voltage, conductor size and current rating of the cable.
- d) Cable terminations (**heat shrink/cold shrink type**) – The sealing ends shall conform to the latest International Standards and shall be of thoroughly proven design. The cable terminations shall be outdoor type. The outdoor type sealing end shall be suitable for installation in polluted atmosphere and shall be completely weather proof. Each outdoor type sealing end shall be supplied complete with mounting plate insulators to insulate the sealing end from the supporting structures and to control the sheath current. Each sealing end shall be provided with consumable materials such as viper and cleanant for cleaning. The power cable leading to sealing end shall be provided with proper sunshield cover.
- e) The material for the housing of the termination should be resistant to tracking, ultra violet radiation (U-V exposure) weathering and should have stable hydrophobic properties.
- f) The contractor shall provide necessary arrangement to limit flow of current in the structure supporting the sealing end.
- g) The sealing ends shall withstand the power frequency, impulse and cable testing voltage after installation as specified.
- h) The cable and accessories shall withstand all thermal and mechanical stresses under steady state and transient operating conditions.

9.0 SPARE CABLE: Not applicable

10.0 SUPPORTS, HARDWARES AND ACCESSORIES:

- (a) The supporting structure (in BHEL scope) for the outdoor cable termination in switchyard shall be fabricated from lattice steel structure. The detailed drawings of foundation and structure shall be furnished by the successful bidder. The Contractor shall furnish necessary information such as foundation load and mounting details to the Corporation.

Structure for transformer cable box and GIS termination shall be in supplier's scope.

- (b) Cable cleats, clamps, fire barriers, fixing bandage, miscellaneous accessories and hardware required for the assembly of the cable support system shall be supplied. The complete detailed fixing arrangement/ installation drawings of the cables shall be furnished.

11.0 PROTECTION AGAINST EARTH QUAKE:

Cable system shall be so designed as to be secured to the foundation clamps to withstand earthquake forces of the above.

12.0 CABLE DRUMS

Immediately after the inspection, both ends of each cable length shall be sealed by means of end caps in the presence of the inspector. Cable drums shall be of rugged construction, with a drum diameter of ample dimensions to accommodate the single-conductor cables. The drum cable length shall be chosen considering the lengths to be laid at site. No negative tolerance on the required lengths may be adopted.

Each drum shall be marked, by stenciling thereon, with an arrow the direction in which the drum should be rolled. The cable shall be wound on non-returnable strong steel drums. The dimensional drawings of steel drums shall be furnished. The drum shall be provided with circumferential lagging of strong wooden planks. The ends of the cable shall be sealed with good quality heat shrink sealing caps.

The cable drums shall be supplied with definite cable length (to be informed before start of manufacturing) within +/- 2 m tolerance. Contractor shall not be reimbursed for excess lengths supplied. Cable drums with shorter lengths shall not be accepted.

13.0 INSTALLATION & COMMISSIONING

Cable drum shall be **unloaded**, handled and stored on hard and well drained surface so that they may not sink. In no case, the drum shall be stored flat i.e. with horizontal. Rolling of drums shall be avoided as far as possible. For un-reeling the cable, drum shall be mounted on suitable jacks or on cable wheels and shall be rolled slowly so that the cable comes out over the drum and not from below. All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends. Cable ends shall always be kept sealed by heat shrinkable PVC caps to prevent damage and ingress of moisture.

While laying the cable, **power rollers** shall be used at required interval to avoid cable touching ground. The cables shall be pushed over the rollers by a gang of people positioned in between the rollers. Cables shall not be pulled from the end without having intermediate pushing arrangement. Pulling tension shall not exceed recommended values. Selection of cable drum for each run shall be planned so as to avoid using straight through joint. Cable splices will not be allowed unless approved by customer.

The cables shall be laid and terminations installed by skilled and experienced workers, fully qualified to carry out the work. The supplier shall also be responsible for providing clamps, required to support cables on racks for cable laying in trenches.

In surface trench, cable will be laid in trefoil arrangement on support angle and will be fixed with angle by clamps made of non-magnetic material. These surface trenches will be covered by suitable trench covers. The cable shall also be laid in RCC trench on sand bed in flat formation as per requirements specified in section-1.

The sheath voltage under full load conditions shall be within safe limits. The value of sheath voltage shall be furnished for approval. Sheath shall be solidly grounded at both end. The connection to earth shall be as short as possible to prevent HV impulses and spikes. A sheath voltage limiter shall be provided as per section-1 to control the sheath voltage. These voltage

limiters shall be without boxes.

14.0 TESTS

The cables and cable terminations shall be subjected to tests as per applicable standards in the presence of Customer /BHEL and/ or their authorized representatives. After installation, the cables shall also be subjected to tests at sites. Following test but not limited to this as mentioned below shall be conducted on cables and accessories as per latest IEC.

15.0 DESIGN REQUIREMENTS

Supplier of the cable system shall furnish the details calculations along with technical data sheet for verification/approval of design parameters elected. Detail design calculations/documents will be submitted for approval to Customer/BHEL:

- a) Calculation of continuous current capacity for specified cable laying conditions
- b) Adequacy of XLPE insulation thickness.
- c) Calculation for short circuit currents for metal sheath or screen.
- d) Calculation for adequacy of metallic sheath/ screen for short circuit current carrying capability.
- e) Calculation of sheath induced voltage for single point bonding.
- f) Manufacturing Quality plan
- g) Field quality plan for site installation, commissioning and testing
- h) Instruction manual for jointing and cable laying.

16.0 PACKING AND MARKING

The packing should be able to withstand the rigors of transport.

The following information in bold letters in English shall be painted on the flanges.

- (i) Name and address of the Manufacturer, Trade name/Trade Mark/Brand.
- (ii) Size of cable (cross section) rated voltage, standard, insulation, cable code, drum number, year of manufacture.
- (iii) Length of cable (metres)
- (iv) Direction of Rolling
- (v) Net weight (in Kg)
- (vi) Gross weight (in Kg)
- (vii) Purchase order reference.

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VOLUME - III

SUB-SECTION - 3.1

GENERAL ELECTRICAL REQUIREMENT

1.0.0 INTENT OF SPECIFICATION

- 1.1.0 This specification covers the design, manufacture, assembly, testing at manufacturer's works, packing, transportation to site including transit insurance, unloading, erection, testing & commissioning of Electrical Equipment complete with all accessories for efficient and trouble-free operation of combined cycle captive power project.
- 1.2.0 It is not the intent to specify completely herein all details of the equipment; nevertheless, the equipment shall be complete and operative in all respects and shall conform to the highest standard of engineering, design and workmanship.

2.0.0 ELECTRICAL SYSTEM DESCRIPTION

- 2.1.0 The proposed Power plant consisting of one Gas Turbine Generator (GTG) & one Steam Turbine Generator (STG). GTG shall be connected to the new 66kV indoor type Gas Insulated Switchgear (GIS) through a Step-up Generator Transformer using phase segregated bus duct. STG shall be connected to the 66kV Outdoor type Gas insulated switchgear (GIS) through a Step-up Generator Transformer using phase segregated bus duct. Power shall be evacuated from 66kV GIS to the grid through the 66kV outgoing line feeders. For commissioning of plant the start-up power shall be drawn from grid to the 66kV GIS.
- 2.2.0 Auxiliary Power supply is envisaged at 11kV & 415V level. Two numbers of Station Transformers are provided for supplying unit loads.
- 2.3.0 Required numbers of unit and station ~~service transformer~~ (11/0.415 kV) are provided for supplying 415V loads. Electrical Auxiliary power ~~distribution arrangement~~ & Power Evacuation Arrangement is shown in the enclosed "Key Single Line diagram" (Dwg. No. 00-5111168-E-201, 2 sheets).
- 2.4.0 One number Black start cum Emergency DG set shall be considered for starting of Gas turbine and safe shutdown of units. During ~~blackout condition~~ Diesel Generator (DG) set shall feed essential loads, same Diesel generator set shall feed ~~unit~~ emergency loads for safe shut down of Units.
- 2.5.0 To provide uninterrupted power supply to DCS and other Control Panels, a dedicated 110 V AC UPS system shall be provided. To feed ~~essential loads~~, such as the emergency oil pumps, Control Supply to Switchgears / Panels, Emergency DC lighting etc, 110 V DC supply backed by DC Batteries shall be provided. DC system shall include 66kV GIS control supply requirements also.
- 2.6.0 If 125V DC system is required by the Gas Turbine supplier as per manufacturer's standard the same shall also be provided.
- 2.7.0 Plant communication system shall be provided with Public address system & telephone system.
- 2.8.0 For all electrical MV/LV/Control panels, Local control panels and Junction boxes, Transformers, etc shall be painted with RAL 7032

ANNEXURE-A

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3.0.0 ELECTRICAL SYSTEM DESIGN

- 3.1.0 The plant shall be designed to operate in islanding mode of operation on tripping of all the grid incoming lines and Steam Turbine generator, so that the Gas Turbine generator unit can be made running with the available plant load under such condition.
- 3.2.0 The design, manufacture, assembly, shop testing, erection, testing & commissioning as well as performance of the equipment shall conform to the latest edition of relevant IS / IEC specifications.
- 3.3.0 Before starting manufacture of any equipment the Contractor shall have to take approval of relevant drawings and data from the Owner/Owner's representative.
- 3.4.0 All equipment supplied and all work carried out including design and detailed engineering shall comply with the statutory requirements local Government as well as Central Government and with the Indian Electricity Rules. The accuracy class of meters, CTs, PTs (inside GIS) for energy accountability shall be as per latest GETCO regulations.
- 3.5.0 Unless otherwise specified in the respective section, Electrical design ambient for all equipment sizing shall be considered as 50 Deg C dry bulb temperature and 95% RH. All the equipment are required to operate in a highly corrosive environment and highly humid (at costal area) atmosphere.
- 3.6.0 Unless otherwise specified, at least 20 % margin shall be considered in equipment sizing over and above the calculated load current/fault current/power requirements.
- 3.7.0 Makes of all Electrical equipment are subject to prior approval by the purchaser. Similar equipment and components shall be of same make. Equipment of same type and rating shall be interchangeable.
- 3.8.0 The 415V PCC & MCC panels shall be of minimum FORM 3B type of construction.
- 3.9.0 In respect to the above LV circuit breaker selection, following should be considered as per IEC:-

Utilisation Category	Application
Category A	Circuit-breakers with no assigned short-time rating (e.g Current limiting ACBs and MCCBs) cannot be used if coordination is required with downstream switchboard feeders. Applicable for the outgoing feeders
Category B	Circuit-breakers with assigned short-time rating (e.g ACBs and some Supplier's larger rated MCCBs) that shall be used if coordination is required with downstream switchboard / MCCs. Applicable for the incomer and outgoing feeders.

Outgoing feeders not requiring any coordination for example motor feeders Category "A" MCCB can be considered.

- 3.10.0 In switchgear for Motor feeders rated 15kW & above an ammeter & transducer shall be provided. All transducers will be of dual output type.
- 3.11.0 All LT motors rated 90 kW & above shall be controlled through Air Circuit Breakers. LT motors rated below 90 kW shall be controlled by fused contactor. In addition to the above ELCB shall be provided for all 415V motor feeder. Each feeder shall also provided with O/L relay and SPPR relay.
- 3.12.0 For the motor feeders, the essential auxiliaries shall have contactors with delayed drop out feature adjustable up to 3 sec and necessary auto reset facility and the relay should be of digital type. The

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list of motors shall not be limited to BFP, AOP, JOP, lube oil pump, compressors, bearing pumps and any other drive recommended by GTG,STG & HRSG vendor.

3.13.0 The power cables upto and including 10 sq.mm should be copper conductor and above 10 sq.mm Aluminium conductor may be used. For CT circuits minimum cable size shall be 4sq.mm. Minimum size of control cables shall be 2.5sqmm. 20% spare cores shall be provided in all control cables. The maximum no. of cores shall be limited to 27.

3.14.0 The equipment supplied shall meet the requirement of state electricity and Indian grid code.

3.15.0 The Substation Automation System (SAS) shall have provision for interfacing with remote PLDC (Regional Load Dispatch Centre) through suitable gateways with adequate number of ports along with modems at substation level.

3.16.0 Voltage Levels shall be as follows:

- Power Evacuation : 66 kV ($\pm 10\%$), 3 phase, 3 wire 50 Hz, effectively earthed.
- Generation Voltage : Manufacturer's standard Voltage, 3 phase, 50 Hz
- Plant HT Auxiliary Supply : 11000V ($\pm 10\%$), 3-phase, 3W, 50 Hz, earthed through resistance.
- Plant LT Auxiliary Supply : 415V ($\pm 10\%$), 3 phase, 4 wire, solidly earthed.
- Plant LT Emergency Supply : 415V ($\pm 10\%$), 3 phase, 4 wire ungrounded.
- Plant DC Supply : 110V ($+10\%$ to -15%), DC 2 wire unearthed.
- Plant UPS Supply : 110V ($\pm 10\%$), 1 phase, 2 wires 50 Hz, A.C.
- Transducers : 110V DC (For LT boards 230V AC)
- Metering : 110V AC PT Voltage
- Control & protection : 110V, DC 2 wire unearthed
- Panel lighting and space heaters : 240V, 1-phase, 2wires 50 Hz, A.C. with one point earthed.
- Control Supply for Breaker feeders : 110V, DC 2 wire unearthed
- Control Supply for LV DOL modules : 110V, 1 phase, 2 wires
- Permissible Frequency variation for generator : $+3\%$ to -5%
- Permissible Frequency variation for auxiliaries : $+5\%$ to -5%
- Voltage level for AC Motors below 0.2 kW : 240 V, Single phase, 50 Hz, with DOL start.
- Voltage level for AC Motors from 0.2kW up to and including 160 kW : 415 V, 3 phase, 50 Hz, with DOL start.
- Voltage level for A.C Motors above 160 kW : 11000V, 3 phase, 50 Hz, with DOL start.

3.17.0 Design short circuit levels shall be at least the following and has to be supported by calculation:

- Three phase symmetrical short circuit ratings of 66kV System : 40 kA for 3 sec
- Three phase symmetrical short circuit ratings of 11kV System : 44 kA for 3 sec
- Earth fault current for 11kV System : 100A.
- Three phase symmetrical short circuit ratings of 415V System : 50 kA for 1sec
- Short circuit ratings of 110V DC System : 20 kA for 1 sec (min)

3.18.0 Insulation level at various voltages shall be as follows:

66kV System

- One minute Power Frequency withstand voltage : 140 kV (rms)
- Switching Impulse withstand Voltage : 325 kV (peak)

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11kV System

One minute Power Frequency withstand voltage : 28 kV (rms)
1.2/50 Micro sec, impulse withstand voltage : 75 kV (peak)

415 V System

One minute Power Frequency withstand voltage : 3 kV (rms)

3.19.0 Sizing criteria for auxiliary transformers

Design Criteria for Auxiliary Transformer and Generator Transformer

i. The Contractor shall size the auxiliary transformer as per sizing criteria furnished below:

$$\text{Min. Rating of each Auxiliary transformer (in kVA at p.f.0.8)} = 1.2 \times (\text{Sum of total connected load} + \text{Max of (sum of 20\% of total standby loads or the largest standby load) + max of (sum of 50\% total intermittent loads or the largest intermittent load)})$$

✓ The auxiliary transformers shall be sized for 2x100%

4.0.0 QUALITY ASSURANCE, TESTING & INSPECTION.

4.1.0 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, tested, and commissioned at all the stages, as per approved Quality Plan.


4.2.0 All tests shall be conducted as per relevant IS/IEC/IEEE standards and shall be performed in the presence of purchaser's representative, if so desired by the purchaser. The Bidder shall give at least 15 days advance notice of the date when the tests are to be carried out.

4.3.0 Equipment offered shall be of type tested and proven type. Type test certificates for test conducted earlier on similar rating shall be furnished. Type testing shall be conducted without any cost implication to the purchaser if type testing is not already carried out for any equipment supplied. For the various bought out items test certificates from equipment manufacturer shall be furnished. Routine tests shall be carried out for all the equipment as per applicable standards whether specifically mentioned or not. Specific type tests are to be carried out as specified in individual equipment specifications.

4.4.0 Copies of certified reports of all tests carried out at the works shall be furnished. The equipment shall be dispatched from works, only after receipt of Purchaser's written approval of the test reports.

The charges for carrying out all routine tests shall be deemed to be included in the Bid price. The charge of carrying out each type test/ special test if any shall be given separately in "Unit Price Schedule".

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7.17.0 List of Approved Sub-vendors

Refer Volume IV/Annexure-1/ Section 8.

With full information substantiating the technical acceptability of the proposed change. The Owner/Owner's representative's decision shall be final. Concessions granted shall not absolve the Contractor from any of his responsibilities under the Contract.

8.0.0 QUALITY ASSURANCE, SHOP INSPECTION AND TESTING**8.1.0 General**

This section contains general requirements for inspection of material, parts, equipment and workmanship of the plant during manufacture, assembling to demonstrate compliance with specification, codes and standards to ensure overall reliability of plant operation and performance.

The Owner/Owner's representative and/or authorised Representatives shall, at any time, be allowed free and ready access to the Contractor's premises and those of his suppliers as well as to the site installation and the Contractor has to make the plant items available for the purpose of inspecting the specified equipment components and obtaining information as to the progress of the work. Failure on the part of the Owner/Owner's representative, at this or any other time, to discover or reject materials or work which do not meet specified requirements shall not be deemed an acceptance thereof nor a waiver of defects therein.


The approval of the Owner/Owner's representative shall not prejudice the right to reject equipment if it does not give complete satisfaction in service.

8.2.0 Scope

All materials, components and equipments covered under this specification shall be tested at all stages of procurement, manufacturing, erection, commissioning as per a comprehensive quality assurance programme. The requirements of minimum quality plans to be followed by the Bidder in respect of various equipment are specified in detailed technical specification. The Bidder shall draw his own quality plans in line with these requirements and his standard practices and implement such programme after approval by the Owner/Owner's representative. The Owner/Owner's representative shall appoint a Third party inspection (TPI) agency for bought out items/outside inspection. The Owner/Owner's representative will carry out on-site supervision and inspection.

Manufacturing quality plan shall detail out, for all the components and equipments, various tests/inspection to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by contractor's quality control organization, the relevant reference document and standards, acceptance norms and inspection documents raised. during all stages of material procurement, manufacture, assembly and final testing/performance testing.

The Contractor has primary responsibility for ensuring the quality of items of equipment supplied under the contract and remains accountable when manufacture or erection is subcontracted. It is therefore a requirement of the specification that work is only subcontracted to companies with effective quality control organization and that the Contractor monitors the performance of these by the attendance at tests of experienced inspectors employed by the Contractor. The Contractor shall, at the appropriate time, prove that his

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material and / or equipment comply with all the requirements of this Section, such proof being the successful completion of tests and inspections. Routine test and type test certificates shall be submitted for each item of equipment, wherever applicable.

All materials, components and equipment supplied under the contract shall be subject to inspection by the Owner/Owner's representative, his representative, Inspectors of Boilers (India) or his authorized Agency or any other Inspector of the Government, should they so require during manufacture, erection and after completion. The necessary inspection charges of the authorized agency of Inspection of Boilers (India) shall be borne by the contractor. The inspection and tests shall include but shall not be limited to the requirements of this section of the specification. Further requirements to be applied are specified in the detailed specification.

The Bidder along with quality plan, shall also furnish copies of the reference documents/plant standards/acceptance norms/test and inspection procedure referred by him in quality plans. These quality plans and reference documents/standards will be subject to Owner/ Owner's representative's approval and will form a part of the contract. In these approved quality plans, Owner/Owner's representative shall identify customer hold points (CHP), indicating tests/checks which shall be carried out in presence of the Owner/Owner's representative's or authorized representative and beyond which work will not proceed without consent of Owner/Owner's representative's in writing.

No materials/equipment shall be dispatched from the manufacturer's works before the same is either accepted subsequent to pre-dispatch final inspection including verification of records of all previous tests/inspections by Owner/Owner's representative or such pre-dispatch final inspection is waived by the Owner/Owner's representative and dispatch is authorized after review of test reports.

All materials used or supplied shall be accompanied by valid and approved material certificates and test and inspection reports duly approved by the Owner/Owner's representative. These certificates and reports shall indicate the acceptable identification number of the material they proposed to certify. The material certified shall also have the identification details stamped on it.


All material used for equipment construction including castings and forgings shall be of tested quality as per relevant codes/standards. Details of results of the test conducted to determine the mechanical properties, chemical analysis and details of heat treatment procedures recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or as specified in detailed specification.

All welding shall be carried out as per welding procedure drawn and qualified in accordance with requirements of ASME Section IX. Welding procedures shall be submitted to the Owner/Owner's representative for approval prior to carrying out qualification test in the presence of Owner/Owner's representative

All welders/welding operators employed on any part of the contract either in the Supplier's works or at site or elsewhere shall be qualified as per ASME Section-IX.

Test results of qualification tests and specimen testing shall be furnished to the Owner /Owner's representative for approval. However, wherever required by the Owner/ Owner's representative, tests shall be conducted in presence of Owner/Owner's representative

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

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All the sub-vendors proposed by the Bidder for procurement of major bought out items including castings, forgings, pumps, heat exchangers, semi finished and finished components/equipment-(list of which shall be drawn up by the Bidder along with his offer and finalized with the Owner/Owner's representative) shall be subject to Owner/ Owner's representative's approval.

The type and extent of inspection of items shall be in accordance with the relevant International/Indian Standards/Indian Boiler Regulations and other standards approved by the Owner/Owner's representative, supplemented or amended by the requirements of this section of the specification or as specified elsewhere in the Specification.

8.3.0 Inspection Program and Test Notifications

Before manufacturing commences and not later than 45 days after award of contract, the Contractor shall submit an outline of his proposed inspection program, which shall include all major stages during manufacturing. The inspection and test program shall include for the various items the designation No., name of equipment, part of equipment, the kind of test, test standard, company which carries out the test, place, date and witnesses by the Contractor, third party or Owner/Owner's representative's .

The Owner/Owner's representative will return a copy of the Contractor's proposed inspection program indicating those inspection stages for which notification is required. Notification shall be by Fax or email in a format to be agreed and shall be sent at least 20 days prior to the intended test in accordance with 'Conditions of Contract'. If the Owner/Owner's representative intends to be represented at the test he will provide at least 24 hours' notice and if his representative does not attend on the notified date, the test may proceed unless an alternative date has been requested by the Owner/Owner's representative.

8.4.0 Test Certificate Documentation

The results of all tests shall be certified by the manufacturer, Contractor or independent agency as appropriate.


Document files containing material certificates, welding procedures, test report shall be compiled for each item of plant and shall be suitably identified (including equipment classification reference) and bound.

Three copies of each document file containing inspection reports and certificates of site erection testing activities of a particular item of plant or system shall be supplied to the Owner/Owner's representative prior to commissioning.

Copies of the performance and acceptance test reports shall be prepared and distributed as specified in Clause 'Performance and acceptance test data and reports' of this Section. All documentation as required by IBR shall also be prepared and submitted.

8.5.0 Certification of Equipment by Owner/Owner's representative's

The Personal and travelling costs in connection with the Owner/Owner's representative's inspection and witnessing of tests of equipment, components and material manufactured in India and abroad will be borne by the Owner/Owner's representative.

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8.6.0 Codes and Standards

8.6.1 General

The type and extent of inspection shall generally be in accordance with that specified in the standard used for design and construction of the item of equipment supplemented or amended by the requirements of this section of the specification. The Contractor should provide the relevant codes and standard to the Owner/Owner's representative.

8.6.2 Reference to Codes and Standards

Reference to special codes and standards, where designated either directly or as "relevant", is intended to provide a measure of performance, safety, in-shop and on-site testing, and methods of construction and/or installation which must be equalled or exceeded in order to be considered acceptable for use under this specification. If more than a single degree of quality or accuracy is permitted within the scope of particular code or standard, the highest quality shall be applicable and the degree of accuracy commensurate with the intended function shall be selected, but with the understanding that the final decision will be made by the Owner/Owner's representative.

In all instances, the finally accepted applicable code or standard shall be the version last published.

8.6.3 Alternative Standards

Where no appropriate standard is available, tests shall be conducted in accordance with the manufacturer's standard practice, subject to the approval of the Owner/Owner's representative.

In such cases the Contractor shall submit to the Owner/Owner's representative, complete data and a suggested procedure for the testing to be performed. Commencement of manufacture before receipt of the Owner/Owner's representative's approval shall be at the Contractor's risk.

If the proposed procedures are accepted, the Contractor shall provide the Owner/Owner's representative with four additional copies in English before any test is performed.

8.6.4 Derating Standards

The Contractor's attention is drawn to the climatic conditions in the site area. Derating factors shall apply in accordance with the relevant and approved standards if not specified in the contract documents.

8.7.0 Services prior to and During Inspection and Testing

In accordance with and in addition to specified standards the Contractor shall submit procedures for material testing, manufacture, quality control and performance testing as they apply from the procurement phase of raw materials to the finished product. Manufacture commenced before receipt of the Owner/Owner's representative's approval of material specifications and testing procedures shall be at the Contractor's risk.

No inspection shall be valid unless the Contractor and manufacturer are in possession of relevant approved drawings and procedures for the item to be tested. The Contractor on

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16.4.1 Document Distribution Schedule - After Placement of Order

Sl. No.	Document	Total	Distribution		Owner's representative
			Owner	Owner's representative	
			HQ	SITE	
1.	PERT Network, work schedules, Bar charts, Layout drawings	10	-	5	5
2.	Data, drawings, documents, write-ups, calculation - Preliminary - Revised	10 10	-	5 5	5 5
3.	Approved drawings and documents.	10	-	5	5
4.	Instruction manuals for erection and O&M	10	-	8	2
5.	As built drawings including O & M manual - Hard Copy - Soft Copy	10	-	8	2

Section-4

Guaranteed Technical Particulars for the 66kV XLPE Insulated Cable

Sl. No.	Item Description	Unit	Data
1	Manufacturer's Name & Address		
2	Cable Type		
3	Rating		
a)	Rated voltage	kV	
b)	Maximum rated voltage	kV	
4	Applicable Standard		
5	Number of cores		
6	CONDUCTOR		
a)	Cross sectional area	mm ²	
b)	Material		
c)	Design		
d)	Overall diameter	mm	
e)	Soldering Temperature	deg C	
6.1	CONDUCTOR SCREEN		
a)	Material		
b)	Nominal thickness	mm	
c)	Diameter over conductor screen	mm	
7	INSUALTION		
a)	Material		
b)	Type of curing		
c)	Nominal thickness	mm	
7.1	INSULATION SCREEN		
a)	Material		
b)	Nominal thickness	mm	
c)	Diameter over insulation screen	mm	
8	METAL Screen and SHEATH		
a)	Material		
b)	Nominal thickness	mm	
c)	Cross sectional area	sq mm	
8.1	WATER SEALING LAYER		
a)	Material		
b)	Thermal resistivity of material	km/W	
9	OUTER SHEATH		
a)	Material		
b)	Minimum average thickness	mm	
c)	Diameter over outer sheath	mm	
10	COMPLETED CABLE		
a)	Overall diameter	mm	
b)	Weight per meter	kg/m	
c)	Maximum drum length	m	
11	MAXIMUM DIELECTRIC STRESS		
a)	At the conductor (assumed smooth)	MV/m	

b)	At the conductor screen	MV/m	
12	MAXIMUM CONDUCTOR TEMPERATURE		
a)	Laid direct in ground	deg C	
b)	Drawn in ducts	deg C	
c)	Erected in air	deg C	
13	MINIMUM RADIUS OF BEND AROUND WHICH CABLES WILL BE LAID		
a)	Laid direct	m	
b)	In ducts	m	
c)	In air	m	
d)	Nominal internal diameter of pipes or ducts through which cable may be pulled		
14	MAXIMUM DC RESISTANCE PER METER OF CABLE AT 20 DEC C		
a)	Conductor	Micro-ohm	
b)	Metallic layer	Micro-ohm	
c)	Metallic sheath	Micro-ohm	
15	AC RESISTANCE PER METER OF CABLES AT MAXIMUM CONDUCTOR TEMPERATURE		
a)	Conductor	Micro-ohm	
b)	Metallic layer	Micro-ohm	
c)	Metallic sheath	Micro-ohm	
16	Insulation resistance		
a)	At 20 deg C	Mega-Ohm	
b)	At maximum rated temperature	Mega-Ohm	
17	Current carrying capacity of cable in RCC trench with removable cover		
a)	In air (Ambient temperature 50 deg C)		
	One circuit	A min	
	Two circuit	A min	
	Three circuit	A min	
18	Maximum dielectric loss angle of charging VA of cable at nominal voltage and frequency and conductor temperature of		
a)	50% rated voltage		
b)	200% rated voltage		
19	Creepage distance of sealing end porcelain	mm	
20	Metallic layer earth fault current carrying capacity for one second,	kA	

	cable fully loaded prior to earth fault and final screen temperature of 250 deg C		
21	Dielectric loss of completed cable when laid direct in ground per 1000 meters and at maximum continuous operating temp	W	
22	Impulse withstand voltage		
a)	Positive 1.2/50 micro-second wave	kVp	
b)	Negative 1.2/50 micro-second wave	kVp	
23	Short circuit capacities with a conductor temperature of 90°C at the commencement		
a)	0.5 s duration		
b)	1.0 s duration		
c)	2.0 s duration		
d)	3.0 s duration		
24	Impedance per km of three-phase circuit, at 50 Hz and max. Conductor temperature		
a)	Positive and negative sequence	Ω	
b)	Zero sequence	Ω	
25	Maximum capacitance	MicroF/kM	
26	Max. Drum length of cable	m	
27	Screen earthing method	-	

CABLE TERMINATION KIT FOR 66kV XLPE INSULATED CABLE

S. No.	Item Description	Unit	Data
			Termination Kit
1.	Manufacturer's Name & Address		
2.	Country of Manufacture		
3.	Type of Cable Termination		
4.	Applicable Standards for manufacturing		
5.	Applicable Standards for testing		
6.	Rated Voltage	kV	
7.	Maximum service voltage	kV	
8.	Type & Material of bushing		
9.	Creepage Distance	mm	
10.	Whether full details of termination and BOQ furnished with offer		
11.	Whether cable sealing end is complete with all accessories		
12.	Whether descriptive pamphlet enclosed		
13.	Whether full details of tests to be carried out furnished with offer		
14.	Copies of type test reports enclosed		

SECTION – 5
CHECK LIST

1. TECHNICAL REQUIREMENTS FOR 66KV XLPE CABLES, CABLE SEALING END, ETC., COMPLETE IN ALL RESPECT ALONG WITH ACCESSORIES

Sl.	Particulars	Reply by bidder.	
1	TECHNICAL QUALIFYING REQUIREMENT		
1.1	Papers for qualifying requirement enclosed.	Confirmed	Yes/No
1.2	The bid shall be submitted by the Manufacturer of the 66 kV Cable. ✓ The bidder's scope includes supply and services like installation, testing and commissioning. Bids submitted by agents will not be considered.	Confirmed	Yes/No
1.3	All the documents shall be submitted in English. Translated pages should be attested by the bidder.	Confirmed	Yes/No
2	Un-priced Offer –.		
2.1	✓ Confirm that all items have been quoted. (If any item has not been quoted, the same shall be specifically brought out in Schedule of Technical Deviation)	Confirmed	Yes/No
2.2	The Specification envisages turnkey execution of a COMPLETE, POINT TO POINT, 66kV CABLE SYSTEM and the scope includes all materials and installation services (including laying, supervision, termination, clamping, testing and commissioning of the cable system, point to point) necessary to execute the job to satisfaction of ONGC and BHEL. This includes all accessories required to complete the job in all respect.	Confirmed	Yes/No
2.3	Any other item /service required for the execution for the complete job is deemed to be included in the offer, whether specifically mentioned in the specification or not. The Bill of quantities included in the offer shall clearly reflect such additional items along with their respective quantities and prices. List of items required for completeness (Attach list, if required)	Additional items required	Yes/No
2.4	Support structure and foundation for outdoor cable termination (switchyard end) shall be provided by BHEL based on the input (configuration, loads etc) provided by bidder. The erection of structure shall be done by BHEL. Supply of material and arrangement for supporting the cable at GIS end (located at first floor above cable vault) & transformer cable box is in bidder's scope. The supply of cable cleats for fixing of the cable on BHEL provided structure is in bidder's scope.	Noted	Yes/No
2.5	The cable trench and support structures/angles in the trenches will be provided by BHEL as per detailed design and drawing provided by	Confirmed. Drgs of	Yes/No

Sl.	Particulars	Reply by bidder.	
	bidder. The design of the cable support structures/angles in the cable trench will be given by bidder. The supply and initial erection of cable supports shall be in BHEL scope. Changes to be made during cable laying and during cable jointing shall be in bidder's scope.	cable support given alongwith bid	
2.6	Terminal connector for overhead connection with outdoor cable sealing end shall be provided by BHEL.	Confirmed	Yes/No
2.7	Confirm that the consumables (list to be enclosed by bidder during contract stage) with shelf life of fewer than two years shall be supplied before erection after clearance from BHEL.	Confirmed	Yes/No
3	Cable Lengths		
3.1	Manufacturing lengths and drum length shall be determined as per the joint site survey with ONGC/BHEL.	Confirmed	Yes/No
3.2	The Payment of cables length (for supply) will be as per approved quantities after joint survey.	Confirmed	Yes/No
3.3	The Payment of cables length (for installation) will be as per actual measurement at site which shall include margin for cable sealing end and two joints in future.	Confirmed	Yes/No
4	Technical		
4.1	<i>The site is situated in coastal area with high level of pollution. Design parameters considered accordingly.</i>		
4.2	Manufacturing process used for vulcanizing		
4.3	Calculations		
4.3.1	Calculations – All calculations have been submitted alongwith configuration of cable laying in cable trench arrangement	Enclosed with bid	Yes/No
4.3.2	Continuous current rating of cable with under voltage condition along with overload As per IEC:60287, thermal stresses in respect of short circuit current, external serving of cable, surrounding medium , etc., shall also be considered for current rating	Enclosed with bid	Yes/No
4.3.3	Bonding details and Sheath voltage calculations	Enclosed with bid	Yes/No
4.3.4	Calculation for sizing of metallic screen	Enclosed with bid	Yes/No
4.4	Technical Deviations		
4.4.1	Confirm that the Complete systems have been offered as per the requirements of Technical Specification and Technical Deviation sheet has been submitted. Deviations mentioned elsewhere in the bid will not be considered.	Confirmed	Yes/No
4.4.2	Technical Deviation sheet has been submitted.	Confirmed	Yes/No
5	Barchart		
5.1	Bidder will submit detailed bar chart indicating all the milestones from Engineering till manufacturing/ testing, dispatch to site and	Confirmed	Yes/No

Sl.	Particulars	Reply by bidder.	
	commissioning.		
6	Conditions		
6.1	The necessary power supply at site shall be provided by BHEL at one point only.	Noted	Yes/No
6.2	<u>Cable Laying:</u> Provision of manpower in the grade of foreman and skilled technician, provision of laying supervisor, provision for laying tools and equipment, cable pulling, cut cable, place cable, supply of cable cleat, installation of cable cleat , etc. to complete.	Confirmed	Yes/No
6.3	<u>Termination:</u> Provision of Jointer and Terminating material, tools and Scaffolding, cranes for lifting for the sealing end materials, assembly of sealing ends. Design of support structure for sealing end etc. to complete.	Confirmed	Yes/No
6.4	Store will be provided by BHEL. Bidder to provide their requirement of space in open and closed store during tender stage. Supervision of loading, unloading & storage alongwith verification shall be in bidder's scope. Office facilities & accommodation for supplier staff, Travel expenses for supplier staff, Transportation of all tools and equipment, Transportation of material tools and equipment between storage /warehouse and complete erection shall be in supplier scope.	Confirmed	Yes/No
6.5	Any tools and tackles and accessories required to complete the cable laying, termination and ETC shall be included in the offer. Please note BHEL shall not provide any equipment, tool and tackles for carrying out any test /or laying of cables.	Noted	Yes/No
6.6	Earthing of HT cables shall be in bidder scope. The items and accessories required for completeness of earthing at ends and joints but not limited to: Earthing cable, Bonding cable, Earth continuity cables, Link boxes etc as per the requirements. Earth mat grid is existing and interconnected at both end (switchyard/transformer yard end and GIS). Any special earthing required for cable jointing area inside and other associated earthing material shall be supplied and installed by the bidder in the cable trench. The complete earthing BOQ items and shall be clearly mentioned in the offer.	Details given with the bid.	Yes/No
6.7	Tools and tackles for installation and testing, Facilities (Office facilities & accommodation for your staff, Travel expenses for your staff), Transportation of all tools, material and equipment between store/warehouse to site and complete erection is in scope.	Confirmed	Yes/No
6.8	The entire installation, supply and erection of structure for cable sealing end (for termination at GIS and transformer cable box) is in bidder's scope - BHEL will only provide constructed cable trench with	Confirmed	Yes/No

Sl.	Particulars	Reply by bidder.	
	installed cable support –Any accessories viz. and cable sealing, clamps for fixing cable with structure, clamps in cable trench, additional support at joints, etc. to complete the entire job shall be supplied by bidder at no extra cost.		
6.9	Any damage in civil works during installation will be repaired by the bidder.	Confirmed	Yes/No
7	Site Test		
7.1	Provision of test engineer, supply of all test equipment and arrangement like cranes (for lifting of cable drums, test equipment etc), all Test Equipment (DC/AC voltage test equipment etc) for completion of total site work shall be in bidder's scope.	Confirmed	Yes/No
7.2	All field tests including tests during installation, pre-commissioning, commissioning, field acceptance tests shall be conducted by the Contractor, in presence of representative of the Employer.	Confirmed	Yes/No
7.3	No separate site test will be conducted by BHEL/Customer	Confirmed	Yes/No
8	TYPE TESTS REQUIREMENTS		
8.1	The 66kV Cabling system (66 kV XLPE Cables, cable sealing end, etc., complete in all respect along with accessories) should have been type tested (as per relevant IEC 60840 / IEEE 48 standard). The cable sealing end shall be of same make and type as that used in type test.	Confirmed	Yes/No
8.3	Type test report for 66 kV cable system (1CX 500 sq.mm cable alongwith accessories like cable end terminations and cable joints etc) shall be submitted with the bid. Differences, if any, in the items offered and those which have been Type tested shall be clearly brought out alongwith explanation for suitability. Type test reports will be vetted by BHEL/ ONGC/ Fichtner at contract stage and if the same is not acceptable to BHEL/ONGC/Fichtner, bidder has to repeat type tests without any cost and delivery extension.	Confirmed and enclosed with bid	Yes/No
8.5	The Type Tests on 66kV System (XLPE Cables, cable joints, cable sealing end etc.) shall meet the requirements as per <u>IEC</u>	Confirmed	Yes/No
8.6	The test - reports submitted shall be of the tests conducted within last 5 (ten) years prior to the date of bid opening. Date of Bid opening is 17.02.2012	Confirmed	Yes/No
8.7	In case the test reports are not found technically valid during contract stage by BHEL/ ONGC or if the tests were conducted earlier than 5 (five) years prior to the date of bid opening, the bidder shall repeat these test(s) <u>at no extra cost to the purchaser and no delivery implication.</u> Technical valid - Any error or (any/all additional type tests not carried out) or discrepancy in the test reports vis-à-vis offered equipment due to any design / manufacturing changes (including substitution of components) or non-compliance with the requirement stipulated in the Technical Specification.	Confirmed	Yes/No

Sl.	Particulars	Reply by bidder.	
8.8	The type tests conducted earlier should have either been conducted in an accredited laboratory (accredited base on ISO / IEC Guide 25 / 17025 or EN 45001 by the national accreditation body of the country where laboratory is located). If the laboratory is not a national laboratory and member of STL, relevant papers of accreditation shall be submitted in English. If the laboratory is in-house, the tests should have been witnessed by an independent agency.	Confirmed	Yes/No
8.9	The short circuit test should have been conducted in a laboratory which should be a member of STL (Short-Circuit Testing Liaison - www.stl-liaison.org).	Confirmed	Yes/No
8.10	The type test report shall be complete including list the test objects, photographs, oscillographs, test arrangement, drawing of tested objects (cables, accessories, etc), test connections. The type test report shall be in English. If it is in any other language, it should include an English version (Translation shall be attested by the Bidder). The English version should be complete with measured values and conclusion.	Confirmed	Yes/No
9	INSPECTION & TESTING		
9.1	Inspection and Testing shall be as approved Quality Plan.	Confirmed	Yes/No