

KERALA STATE ELECTRICITY BOARD LIMITED

Office of the Chief Engineer (Supply Chain Management)

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Vidyuthi Bhavanam,
Pattom,
Thiruvananthapuram-695004

PURCHASE ORDER

From
CHIEF ENGINEER (SCM)

To
M/s.Cable Corporation of India Limited,
Southern Regional Office.
Temple Tower, 7th Floor, 672,
Anna Salai,
Chennai - 600035.

P.O. No.	SCM.28/2014-15/1615
Date	05/07/2014
P.O. type	Supply
P.O. type	New Order
Reference file	Ideas No.2597/XH-AE1/ 2013/CE (SCM)
Tender No.	SCM.37/2013-14 dated 04/11/2013.
Purchase Value	Rs.62,07,498/-
Price	Fixed

Dear Sirs,

Sub:- Supply of 1.8 Km of 110 kV, 1x400mm² Dry Cured Aluminium Conductor XLPE UG Cable- reg.

- Ref:-
- 1) This office Bid No: SCM.37/2013-14 dated 04/11/2013 and its Corrigendum dated 20/11/2013.
 - 2) Your offer No.HO/PI/EJR/KSEB/110-400-Supp/1613195 dated 26/12/2013.
 - 3) Your letter No.SRS/1613195/110kV/VP dated 29/03/2014.
 - 4) This office letter No. 2597/XH-AE1/2013/CE(SCM)/SCM.37/UG Cable/378 dated 26/04/2014.
 - 5) Your letter No.HO/PI/EJR/KSEB/110-400-Supp/1613195 dated 30/04/2014.
 - 6) This office letter No.2597/XH-AE1/2013/CE(SCM)/SCM.37/UG Cable/1148 dated 12/06/2014.
 - 7) Your letter No.SRS/1613195/110kV/VP dated 18/06/2014.
 - 8) Proceedings of the Purchase Committee held on 01/07/2014 vide Agenda Item No.28/14-15.
 - 9) This office letter of Acceptance No.2597/XH-AE1/2013/CE(SCM)/dated 04/07/2014.

Your offer to supply the materials as per the schedule attached is accepted. Please effect the supply according to the instructions given in this order. None of the conditions stated in your offer or other letters will be applicable unless it is specifically mentioned in this order.

Please return the duplicate copy of this purchase order duly signed and seal affixed in all pages as token of acceptance for incorporation in the contract agreement.

This Purchase Order contains 16 pages serially numbered from 1 of 16 to 16 of 16 and signed by the Chief Engineer on all pages.

Yours faithfully,


J.BABURAJ
CHIEF ENGINEER

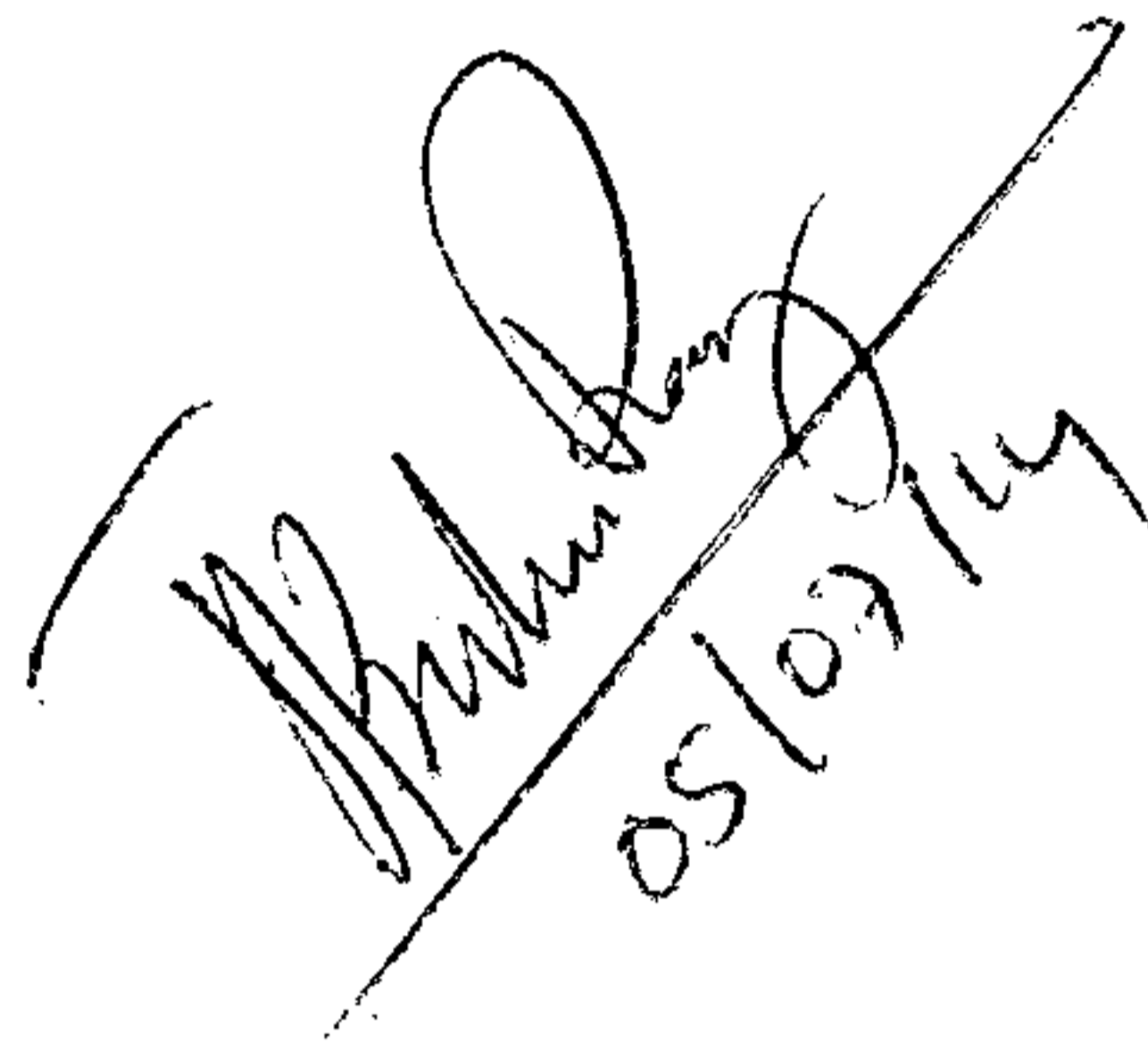
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Acc:-

- Schedule of price and list of materials accepted to be supplied – Annexure -I.
- Technical Specification – Annexure-II.
- Guaranteed Technical Particulars (GTP) – Annexure-III.

Copy to:-

- 1) The Chief Engineer (Transmission) South, Vydyuthi Bhavanam, Pattom, Thiruvananthapuram.
- 2) The Financial Adviser, K.S.E.Board, Thiruvananthapuram.
- 3) The Deputy Chief Engineer, Transmission Circle, Poovanthuruthu.
- 4) The Executive Engineer, Transmission Division, Poovanthuruthu.
- 5) The Accountant General, Kerala, Thiruvananthapuram.
- 6) The TA to Chairman & Managing Director/Director (Transmission & System Operation)
- 7) The Secretary, Board of Revenue (ST), Thiruvananthapuram.
- 8) Stock file.


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ANNEXURE - I

SCHEDULE OF PRICES AND LIST OF MATERIALS ACCEPTED TO BE SUPPLIED

Sl. No	Specification	Qty (M)	All inclusive rate Variable (Rs. / km)	Total (Rs.)
1	110kV grade cross-linked polyethylene insulated UG Cable with stranded Aluminium conductor. The conductor screening shall consist of an extruded layer of semi conducting XLPE compound. The insulation screening shall consist of a non-metallic part shall be directly over the insulation of core and shall consist of a layer of extruded semi conducting XLPE compound. The metallic part shall be a layer of copper tape over the core. The cable should have inner sheath of extruded PVC(type ST2), Aluminium Wire armour and overall extruded PVC (type ST2) outer sheath covering coated with conducting material conforming to IS:7098 Part III/1985 and IS 5831, with amendment and REC Specifications suitable for 110kV earthed neutral system and manufactured through dry cure technology.	1800	3448.61	62,07,498.00
	Total	1800	3448.61	62,07,498.00
(Rupees Sixty Two Lakh Seven Thousand Four Hundred and Ninety Eight only)				


J. BABURAJ
CHIEF ENGINEER

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SPECIAL INSTRUCTIONS

1. Scope:-

This order covers the design, manufacture, inspection, testing at supplier's works and delivery including unloading at site at K.S.E. Board's Stores of items mentioned in the schedule and its guarantee for satisfactory performance for a period of 18 months from the date of acceptance by consignee or 12 months from the date of commissioning whichever is earlier.

This contract will be governed by the Board's above bid specification, terms and conditions in our bid documents, General Conditions of Contract and this Purchase order. In case there is any disparity between the terms and conditions of this order and aforesaid specifications and offer, the Terms and Conditions stated herein and the specification shall prevail. None of the conditions stated in your offer or in subsequent letters shall be deemed to be accepted unless specifically stated herein.

2. Price Details:-

The price noted above in Annexure-I is all inclusive of Taxes, Excise Duty/ Other Levies, Packing and Forwarding, Freight, Insurance, Loading, Unloading at site and all other charges for delivery at Board's stores. Unloading of materials at store is supplier's responsibility. Any variation in statutory levies due to change in policy of Government during scheduled delivery period will be to Board's account, provided the supply is made within the delivery period. Service Tax on Freight charges shall be to supplier's account.

The split up details of the all-inclusive price are as follows:

Split up of Prices (Rs.)		
1.	Unit Basic rate (per km) (Including packing & forwarding charges)	2,900.00
2.	Excise Duty @ 12%	348.00
3.	Cess on Excise Duty @ 3%	10.44
4.	CST @ 2% against 'C' form	65.17
5.	Freight Charges	100.00
6.	Insurance charges for Transit cum one month storage	25.00
7.	All inclusive rate Rs/km	3448.61
8.	Contract Value (Rs.)	62,07,498.00
(Rupees Sixty Two Lakh Seven Thousand Four Hundred and Ninety Eight only)		

3. Firmness of rate:-

The price noted above is fixed.

Taxes and duties quoted by the firm will be reimbursed after submitting undertaking from the supplier in Kerala Stamp Paper worth Rs.100/- in the following format.

"Purchase Order No.SCM.28/2014-15/1615 dated 05.07.2014. M/s.Cable Corporation of India Limited, Southern Regional Office, Temple Tower, 7th Floor, 672, Anna Salai, Chennai - 600035 hereby agreed that if any dispute on payment of taxes and duties from concerned tax authorities occurs in future, the firm shall indemnify the Board from such liabilities and supplier will be liable for the additions, loss or cost on account of such discrepancies/dispute."

The undertaking shall be submitted to the Chief Engineer (SCM).

4. Payment terms:-

Statutory variation in taxes and duties due to change in Government policy will be reimbursed by KSEB Ltd., provided the material is delivered within the scheduled delivery period.

90% of payment with 100% Taxes and Duties, Freight and Insurance shall be paid by the Consignee after receipt of materials at stores and then verification and passing of bills by Consignee. Balance 10% will be paid only after satisfactory completion of the guarantee period or on production of a Bank Guarantee from a Nationalized / Scheduled Bank, except Indus Ind Bank Limited, for an amount equivalent to 10% of the Contract Value valid upto the expiry of the guarantee period. Clause No.15 of the General Condition of Contract stands amended to this extent. Bank charges if any incurred in connection with effecting payment to the suppliers will be to the Supplier's account and payments will be made under REC inventory loan / scheme or from Board's funds.

5. **Agreement:-**

A contract agreement should be executed by you within 15 days on receipt of this order in the prescribed form in Kerala Government Stamp Paper worth Rs.100/- along with Security Deposit as referred below. The Power of Attorney (duly certified by a Notary and with attestation of signature) authorizing the person signing the contract agreement on behalf of company may also please be forwarded with the contract agreement. Payment on account of supplies against this order will be withheld until the agreement is executed.

6. **Security Deposit (Performance Security):-**

An amount of **Rs.3,11,000/-** (Rupees three Lakh and Eleven Thousand only) has to be deposited as Security Deposit by way of Demand Draft drawn in favour of Chief Engineer (SCM). Cheques are not acceptable. Security Deposit can also be furnished in the form of Bank Guarantee from a Nationalised/Scheduled Bank except Indus Ind. Bank Limited, in favour of Chief Engineer (SCM).

7. **Delivery Period and Schedule:-**

Delivery shall commence within 90 days from the date of Purchase Order with full quantity of 1.8 km to the Assistant Executive Engineer 220kV Substation Sub Division, Poovanthuruthu. Delivery period noted above cannot be altered except under recognized force majeure conditions or under revised instructions from this office. Unloading of materials at the destination store is suppliers responsibility. Early delivery also is acceptable.

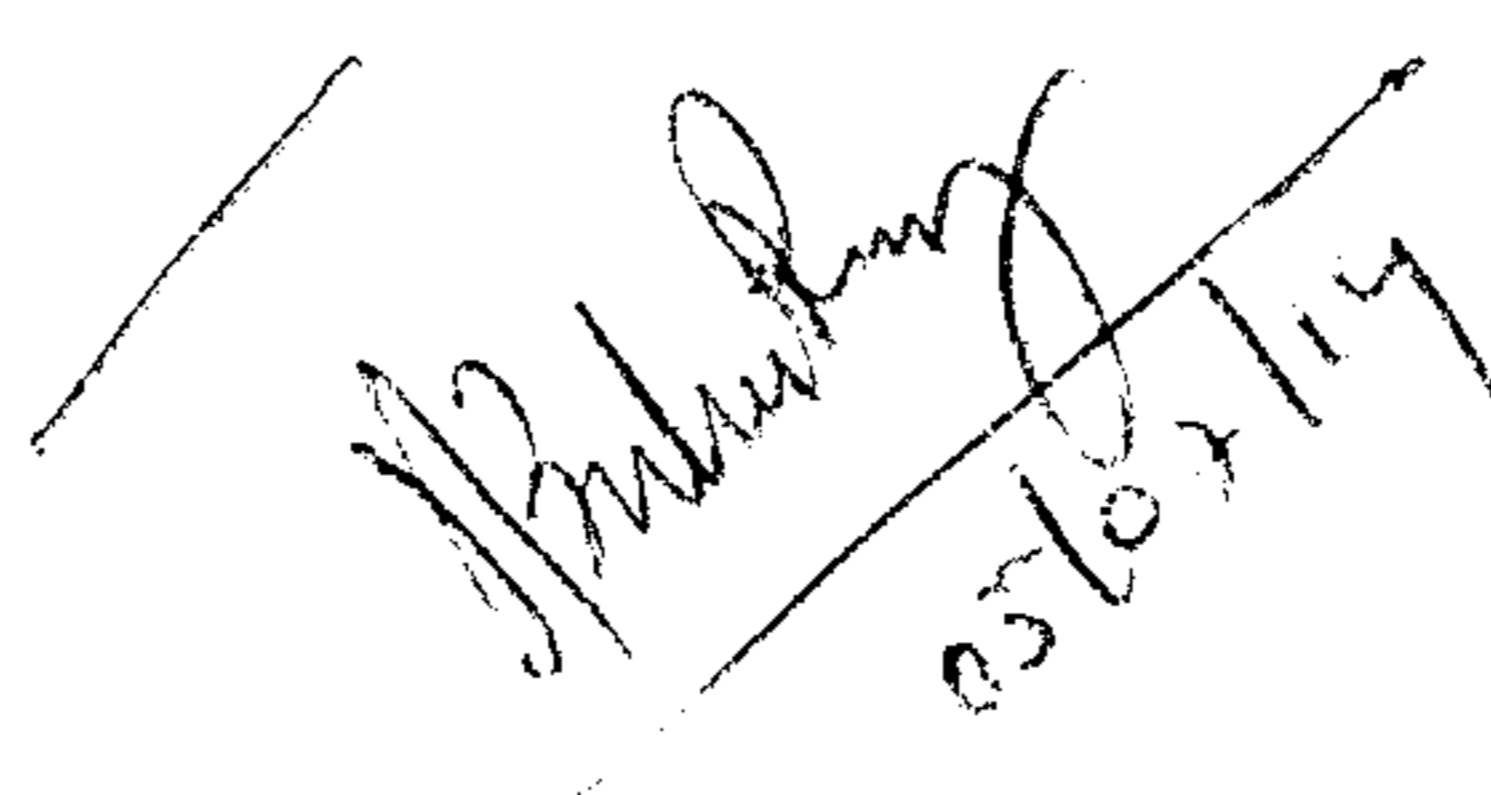
8. **Packing and Marking:-**

- (a) The cables shall be wound in wooden drum and packed as per IS 10418-1982 or its latest amendments. The ends of the cable shall be sealed by means of non-hygroscopic sealing materials.
- (b) Marking:- Cable shall carry information as per IS:7098 (Part III).

The material shall be packed properly as per standard to eliminate the chances of damages during transit and while handling at site. The package should be marked Chief Engineer (SCM)/KSEB/SCM.28/2014-15/110kV UG Cable/CCI/1615 dated 05/07/2014.

9. **Quantity variation:-**

Purchase Order for an additional quantity up to 25% over and above the original ordered or bidded quantity will be placed if the supplier is willing to supply the additional quantity at the same rates, terms and conditions of the original order and accepts the Board's refixation clause such as **"the price for this additional quantity shall be refixed if a fall in price occurs in the next tender opened (price bid) during the delivery schedule fixed for the additional order"**. The materials if any, supplied after the delivery schedule mentioned in the 25% additional quantity will be accepted only on condition that price of such materials shall also be refixed. Variation of \pm (1%) one percentage of the ordered quantity in the supply is allowable and will be treated as completion of supply and payment will be released for the entire quantity at 101%.



10. Branding:-

The manufacturers name or trademark, the Voltage grade, Year of manufacture etc may be printed or embossed on the cable as stipulated in IS:7098 (Part III).

The marking "KSEB 110kV UG Cable" shall also be printed or embossed at every one metre through out the length of cable.

11. Drawing approval :-

Revised cross sectional drawing indicating all dimensions as per the Purchase Order specification should be submitted and got approved before commencing the manufacturing of cable.

12. Pre-Despatch Inspection and Testing:-

1) The Board reserves its right to inspect and approve the materials before despatch. All facilities should be rendered for the Board's representative for inspecting the materials. All tests as prescribed in the relevant BIS have to be conducted in his presence. Advance information regarding readiness of goods for inspection and the date of inspection and testing shall be given to the Chief Engineer (SCM) immediately when the consignment is ready for despatch.

- i) The Board's representative shall be entitled at all reasonable times during manufacture, to inspect, examine and conduct tests on the materials and workmanship of the item to be supplied under this contract. If any part of the item offered is being manufactured out side the supplier's premises, the supplier shall obtain permission for the Board's representative to inspect, examine and test the items under manufacture as if they were being manufactured in supplier's premises. Such inspection, examination and testing shall not release the supplier from the obligations under this contract.
- ii) The supplier shall give the Board's representative Twenty (20) days notice in writing of the date and place where the items will be ready for testing.
- iii) Where the contract provides for testing in the premises of the supplier or any of his subcontractors, the supplier shall provide all assistance as may be required or as may be reasonably demanded by the Board's representative to carry out such tests efficiently.
- iv) The materials will be inspected and relevant test if deemed necessary will be conducted on receipt of the materials by the consignee and the lot not satisfying the tests will be rejected.

13. Test Certificate:-

Test certificate covering all acceptance tests and routine tests as per relevant IS for each consignment shall be submitted to this office for approval before despatch. It should be duly attested by your testing Engineer with name and seal affixed. Copies of tests certificate thus approved shall be sent along with the delivery documents to the respective consignees.

The goods shall be despatched only after the test certificates are approved from this office and MDCC is issued by the Chief Engineer (SCM).

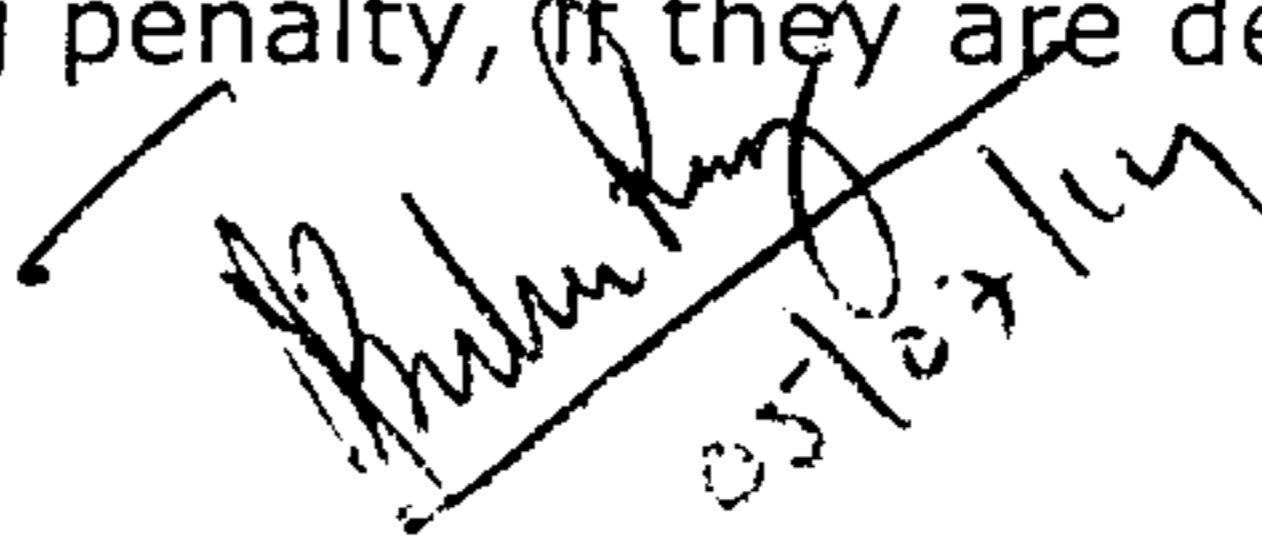
14. Guarantee:-

The material shall be guaranteed for satisfactory performance for the period of 18 months from the date of acceptance by the consignee or 12 months from the date of commissioning whichever is earlier. Defects, if any, noticed during this period which are due to faulty design / workmanship, inferior raw materials, shall be made good by way of replacement free of all costs to the Board.

15. Penalty for delayed supply:-

If the delivery schedule as per this order is not maintained, penalty at the rate of one percent for every month on the all inclusive order rate minus Taxes and Duties (i.e. Ex-works rate + Freight & Insurance) of delay subject to a maximum of ten percent will be levied on the value of materials supplied belatedly.

If the materials are offered and inspected within the contractual delivery schedule, the materials will be accepted without imposing penalty, if they are delivered within 15 days from

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the date of issue of material despatch clearance certificate. This is not applicable for refixation of prices.

Penalty is applicable for belated replacement of materials rejected also as stated above.

If the rejected materials are not lifted from the site/store within 15 days on receipt of the intimation of rejection by the consignee, the supplier shall be liable to pay ground rent @ 0.1% of the value of rejected materials for every day of delay. Maximum ground rent shall be 10%.

For calculation of penalty, periods less than fifteen days will not be counted and delay of fifteen days and above will be counted as one month. In the event of non supply of the total quantity before due date, Board reserves the right to terminate the contract to the extent of the quantity remaining undelivered at the risk and cost of the supplier. In case Board accepts belated supply after completion period of contract this will be regulated as per clause-27 (Price refixation) below.

16. Replacement of Rejected Materials:-

Rejected materials will have to be replaced by you free of cost within 30 days from the date of intimation by the consignee. If the replacement is not effected within the above period, the rejected materials should be taken back within a maximum period of 3 months from the date of intimation of rejection by the consignee officer, failing which the Board will be at liberty to dispose off the rejected materials without any notice. No claim by the supplier will be entertained on account of the disposal. K.S.E. Board also reserves the right to recover from the concerned supplier any loss sustained by Board due to the delay in clearing the rejected materials by the suppliers and the inconvenience caused to the Board in this respect.

17. Acceptance of materials and Tests:-

A minimum period of 15 days will be required for verification and acceptance of the items by the consignee. Damages and defects if any noticed will be intimated to you within the period.

Final acceptance of materials will be made after conducting tests, if deemed necessary, by the purchaser in an independent laboratory and the lot not satisfying the tests will be rejected. The fact that the consignee has received the materials will not automatically imply total acceptance.

18. Raw Materials:-

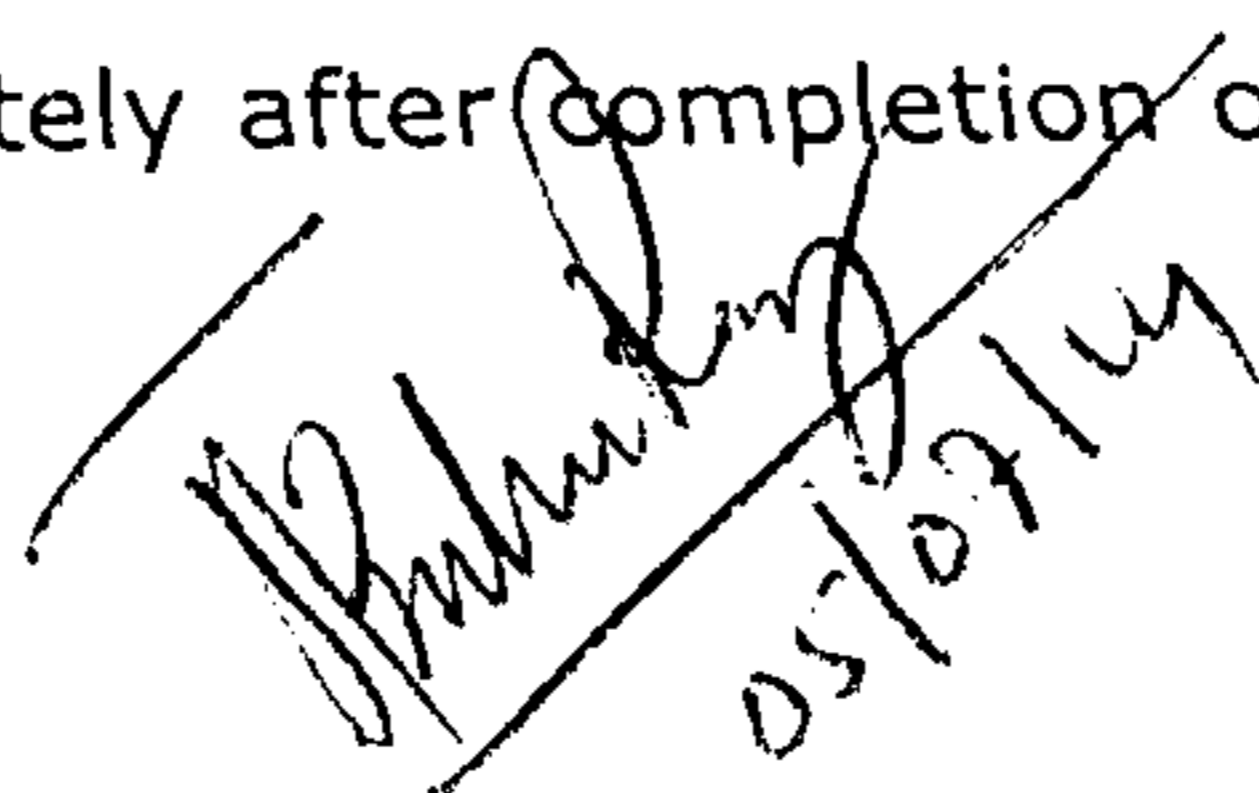
Raw materials required for the manufacture of the ordered item shall be procured by the supplier himself. No assistance in any form will be provided by the Board for procuring raw materials.

19. Force Majeure conditions:-

You will not be liable for any liquidated damages for such delay due to force majeure conditions such as acts of God, acts of Public enemy, acts of Government, fire, floods, epidemics, quarantine restrictions, riots, civil commotion and freight embargo, provided that you notify (within 10 days from the beginning of such delay due to force majeure conditions) with valid proof for force majeure conditions. The Board will verify the facts on merits and grant suitable extension of delivery period if facts justify.

20. Sales Tax/ Excise duty:-

The Board is a registered dealer under the central sales tax Act and the Registration No.32051622508. Hence interstate Sales Tax, if payable, will be only at the concessional rates allowed to Registered dealer. "C" forms will be issued by the concerned consignee officer on request, with full details of R/R and invoice. Request for "C" forms should be made to consignee Executive Engineers immediately after completion of supply. The Deputy Chief

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Engineer, Transmission Circle, Poovanthuruthu will issue 'C' forms within 15 days of receipt of request.

21. **Recovery:-**

Any sum of money due and payable to the Board arising out of this contract or under any other contract made by the supplier with the purchaser may be appropriated by the purchaser and set off against the pending payments of the present contract.

22. **Termination:-**

The purchaser without prejudice to the condition laid in the General Conditions of Contract may terminate this contract, if the supplier fails to commence the supply within the stipulated time or fails to perform any other obligations under this contract or does not cure its failure within a period allowed by the purchaser after the receipt of the default notice from the purchaser.

23. **Corrections and Omissions:-**

Specification, quantities, prices etc. noted in the schedule is subjected to corrections. Errors or omissions, if any will be intimated to or by the contractor within ten days from the date of this order.

24. **Insurance:-**

The materials should be insured at your cost to the destination and for one month of storage. However, proof of insurance will not be insisted.

25. **Bankers:-**Our Bankers are State Bank of Travancore.

26. **Invoice:-**

Invoice in triplicate should be drawn and forwarded to the consignee concerned. A copy of the invoice should be sent to the Chief Engineer (SCM) simultaneously. In all correspondence and invoices relating to this order, the number and date of the order given in page-1 should be clearly quoted.

27. **Price Refixation:-**

The materials, if any supplied after the Scheduled delivery period as per clause '7' of this order will be accepted only on condition that price of such materials will be refixed taking into consideration the value of such materials on the date of actual supply as per the new tender/Purchase Order or as per this order whichever is lower. The Chief Engineer's decision in refixing the price will be final. For applying price refixation the date of opening of price bid of the new tender shall be treated as the effective date. The price shall be refixed only for the quantity of materials delivered after this effective date. The refixation shall be done on the basic price only when there is a fall in price noticed in the basic price of the materials with same specifications supplied and accepted by Board on subsequent Purchase Orders.

28. **Jurisdiction:-**

The courts situated at the place where the Headquarters of the KSEB Ltd. is situated viz. Thiruvananthapuram alone will have jurisdiction to entertain civil suits pertaining to this contract.

29. **Consignee:-** The consignee for this order shall be the Assistant Executive Engineer, 220 kV Substation Subdivision, Poovanthuruthu.

30. **Governing conditions:-** This order shall only be governed by the conditions stated herein and in the tender notification issued by the Board. None of the conditions stated in your offer or in the subsequent letter shall be deemed to be accepted unless specifically stated herein. Acknowledgement and all other communications regarding the order may be sent to the Chief Engineer (SCM), K.S.E.Board Ltd., Thiruvananthapuram-695004.


J.BABURAJ
CHIEF ENGINEER

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ANNEXURE -II

SPECIFICATIONS OF 110 kV 400MM² SINGLE CORE ALUMINIUM CONDUCTOR XLPE UG CABLE

1. **Scope:-** Design, Manufacture, testing at supplier works and supply of 110 kV single core , 400Sq.mm, Al conductor, cross linked poly ethylene insulated, PVC outer sheathed, armoured, underground cable conforming to relevant National and International standards and manufactured through dry cure technology.

2. **System details:-**

- 1) Rated Voltage : 110kV (rms)
- 2) Highest system voltage : 123kV
- 3) Rated frequency : 50 Hz.
- 4) Neutral earthing : Solidly Earthed.
- 5) Short Circuit level : 40 kA
- 6) Duration of short circuit : 1 Sec.
- 7) Basic impulse level : 550kV (peak)
- 8) Power frequency withstand voltage : 275kV (rms)
- 9) Power to be transmitted : 65MVA
- 10) Maximum permissible operating Temp. of conductor under :
 - a) Normal operation : 90°C
 - b) Emergency operation : 120°C
 - c) Short circuit : 250°C
- 11) Creep age distance per kV of Phase voltage : 25mm/kV

3. **Applicable Standards:-** The 110kV XLPE UG cables offered shall be manufactured and tested as per the following standards as amended from time to time.

IEC:540 : Test methods for insulation and sheaths of electric cables and chords.

IEC:229 : Tests on cable oversheaths which have a special protective function and are applied by extrusion.

IS:8130-1984 : Conductors of insulated Electric Cables.

IEC:228 : Conductors of insulated Cables.

IEC:287 : Calculation of continuous current rating of cables (100% load factor)

IS:7098 (Part-III) : Cross linked Polyethylene insulated thermoplastic sheathed cable for voltages from 66kV up to and including 220kV.

IS:5831-1984 : PVC insulation and sheath for electrical cables.

IS:3975 : Mild steel wires, strips and tapes for armouring of cables.

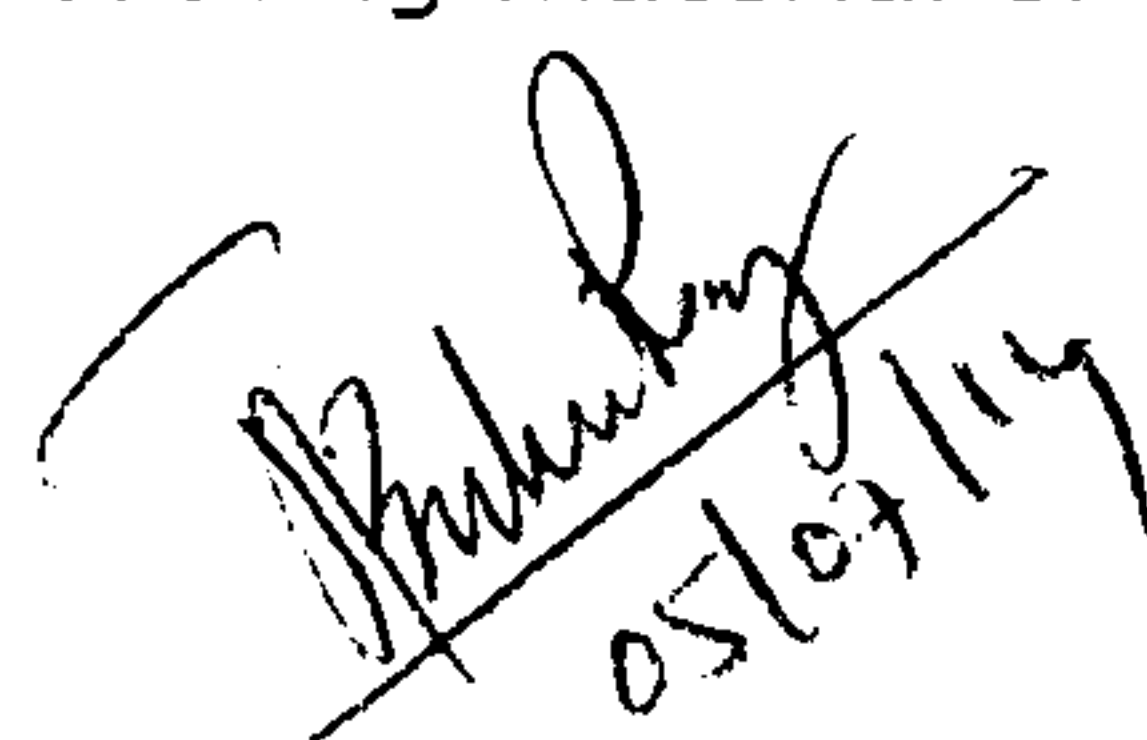
IEC:840(1)-1987 : Tests on Power cables with extruded insulation for rated voltage above 30kV up to 150kV.

IEC:885(2)-1987 : Electrical test methods for electric cable Part-2 Partial discharge test.

IS:10810 : Methods of test for cables.

IEC:811 : Common test methods for insulating and sheathing material of electric cables.

IEC:230 : Impulse tests on cable & other accessories.



4) Quantity per Drum:- The cable shall be supplied in the following lengths

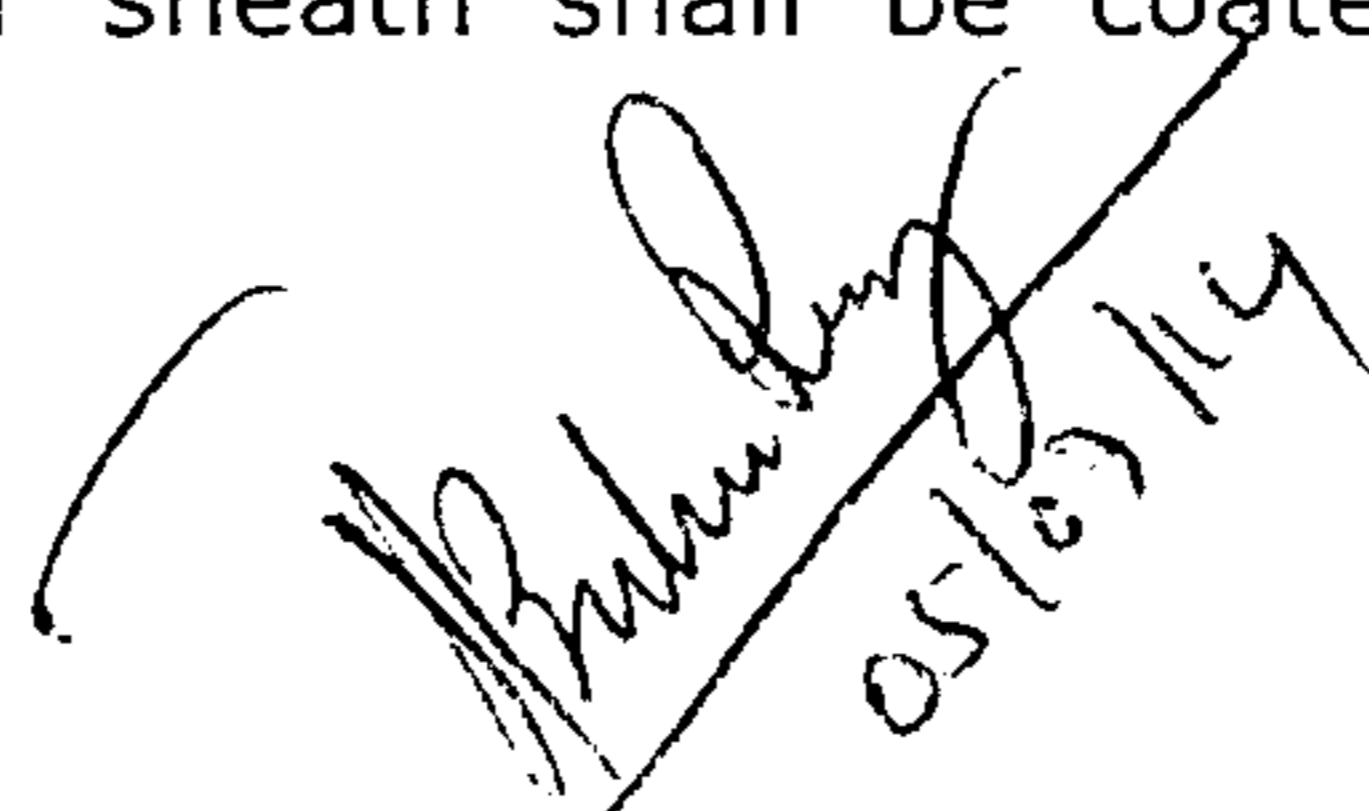
- 1) 350m - 3 Nos.
- 2) 250m - 3 Nos.

Total length – 1.8 km, the cables shall be supplied in the specified lengths with maximum permitted variation of – 3 percentage.

5) Cable Materials:-

1. **Conductor:-** The conductor shall be composed of plain Al wires complying with IEC publication 228/ IS:8130-1984.
2. **Form of conductor:-** The conductor shall be compacted stranded circular. It shall be clean, reasonably uniform in size and shape, smooth and free from harmful defects.
3. **Semi- Conducting barrier tape/tapes:-** The semi conducting barrier tape/tapes shall be provided over the conductor.
4. **Conductor screen:-** The conductor screen shall comprise of a layer of semi conducting compound extruded over the semi conducting barrier tape/tapes.
5. **Insulation:-** The insulation shall be of super clean cross linked polyethylene (XLPE) conforming to IS:7098 (Part-3).
6. **Insulation screen/outer semi conducting layer:-** The insulation screen shall comprise of semi conducting layer extruded directly over the XLPE insulation.
7. **Water barrier tape/semi conducting swellable tape:-** This shall be applied over the insulation screen/outer semi conducting layer.
8. **Metallic screen:-** The metallic screen shall consists of copper wires/copper tape (s) helically applied over the water barrier tape/blocking tape.

A binder tape of copper shall be applied over the copper wire metallic screen, where used as above.
9. **Water barrier tape/semi conducting swellable tape:-** Water barrier tape shall consist of a layer of semi conducting swellable tape applied directly over metallic screen.
10. **Moisture barrier:-** The moisture barrier shall be provided as per IS:7098 part-III. Metallic sheath shall be of lead alloy E conforming to IS:7098 part-III.
11. **Inner sheath:-** The inner sheath shall be of PVC compound. The PVC compound shall conform to ST2 of IS:5831 or ST4 of IEC:840.
12. **Bedding tape:-** Rubberised cotton bedding tape or equivalent may be provided if required over the inner sheath to avoid damage to laying of armour directly over the inner sheath as also during handling of the cable during laying.
13. **Armour:-** The armour shall be non magnetic metallic wires. The armour wires shall be applied as closely as possible. The armour shall be capable of carrying 40 KA for duration of one second and also satisfy the dimensional requirement.
14. **Outer sheath:-** The outer sheath shall be PVC/Polyethylene and shall be provided over the armour as specified in clause 13. It shall be applied by extrusion and shall be black in colour. The outer sheath shall be coated with a suitable conducting material.



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6) Cable Construction:-

1. **Conductor shape:-** The conductor shall be of circular compacted/segmental construction complying with the requirement of class 2 of IS:8130- 1984/ IEC:228. Variations are also acceptable if in line with latest trends subject to furnishing the copies of type tests, acceptance test and performance certificate from the utilities using the same.
2. **Conductor screen:-** The cable shall be provided with conductor screening consisting of a layer of semi conducting compound extruded over the semi conducting barrier tape/tapes. The minimum thickness of the extruded conductor screen shall preferably be 0.8 mm.
3. **Insulation:-** The insulation shall be supercleaned extruded cross linked polyethylene (XLPE) conforming to IS 7098(Part-3). The nominal thickness of insulation shall preferably be 16 mm with permissible variation as per IS 7098 part III. The smallest of the measured values of thickness of insulation shall not fall below the nominal value of insulation thickness by more than 10%.
4. **Insulation screen/Outer semi conducting layer:-** The insulation screen shall consist of a layer of semi conducting compound extruded directly over the insulation. The minimum thickness of extruded insulation screen shall be 0.8 mm.
5. **Water barrier tape/semi conducting swellable tape:-** Water barrier tape shall consist of a layer of semi conducting swellable tape applied directly over the extruded insulation screen and metallic screen.
6. **Metallic screen:-** The metallic screen shall consist of copper wire/copper tape (s) helically wound over the semi conducting swellable tape applied over the insulation screen. The diameter of copper wire shall not be less than 0.8 mm. The perpendicular gap between two adjacent wires shall not be more than 4 mm. The nominal thickness of copper tape shall not be less than 0.1 mm. The minimum thickness of tape shall not fall below the nominal value by more than 10%.

A binder tape of copper of nominal thickness not less than 0.1 mm shall be applied over the wire screen. The minimum thickness shall not fall below the nominal value by more than 10%.

7. **Moisture barrier:-** The moisture barrier shall be provided as per IS:7098 part-III. Metallic sheath shall be of lead alloy E conforming to IS:7098 part-III.
8. **Inner sheath:-** The extruded PVC inner sheath shall be applied over the semi conducting swellable tape/water barrier tape. The nominal thickness of inner sheath and tolerance shall be as per IS:7098 part-III.
9. **Bedding tape:-** Rubberised cotton bedding tape or equivalent may be provided if required over the inner sheath.
10. **Armour:-** Armouring as per IS:7098 part-III shall be applied over bedding tape/inner sheath. The armour wires shall be applied as closely as practicable. The nominal diameter of the armour wire shall be as per IS 7098 (part-3).

Joints in the armour wires shall be made by welding and surface irregularities shall be removed. A joint in any wire shall be atleast 300 mm from the nearest joint in any other armour wire in the completed cable.

11. **Outer sheath:-** The thickness of outer sheath shall be calculated as per IS:7098 Part-III. The letters 'K.S.E.B. 110kV U.G.Cable' shall be embossed on the outer sheath at intervals of 1 m throughout the length of the cable.

12. Earthing of metallic sheath:-

1. The sheath voltage under normal operating condition shall not exceed 50volts to ground in any section. Sheath voltage arising from maximum momentary fault current shall not damage the cable sheath and sheath insulation used for insulating the cable. Sheath voltage limiters if deemed necessary shall be provided between sheath and ground. The characteristics of sheath voltage limiters may be indicated.
2. Sheath of the three cables of a circuit shall be connected together and earthed through disconnecting link boxes. It shall be possible to test the insulation of sheath by opening the links. The supplier in consultation with the purchaser shall insulate the sheath from ground wherever necessary.

13. **Charging current:-** The charging current of the cable shall be as low as possible and shall be stated in the tender.

14. **Mechanical Characteristics:-** The cable system shall be capable to withstand the mechanical stresses set up due to short circuit current. The cable design shall be such that it should take care of the stresses in the insulation of the cable due to earth fault current.

The minimum bending installation radius and the pulling tension of the cable during laying shall be specified by the tenderer.

7) **Quality & Test:-**

I. Quality tests and test certificates:- The cables shall conform to type tests, special tests, routine tests and also electrical tests after installation at site and shall be subjected to all tests as stipulated in IEC:840 or any authoritative standard to which the cable conforms, in addition to test to prove the capability of cable to avoid longitudinal and radial penetration of water. The accessories shall be tested in accordance with IEC:502 or any international standards giving equal or better performance so as to meet the requirement of system parameters and stipulations made in the specification.

The following additional tests shall be carried out in accordance with standards/ equivalent international standards/ specification requirement mentioned against each.

II. Type tests:-

- i. Tensile test for Aluminium.
- ii. Wrapping test for Aluminium
- iii. Resistance test for Al conductor as per IS:8130 and IS:10810 (part-5)
- iv. Dimension, Tensile strength and elongation at break, wrapping test and resistance test of armouring material as per IS 10810 (part 36),(part 37) , part 3 and part 42 respectively.
- v. Void and contamination test of insulation
- vi. Resistivity test for semi conducting screen.
- vii. Test for concentric metallic screen.
- viii. Test for thickness of insulation and sheath.
- ix. Dielectric power factor measurement at elevated temperature.

- x. Dielectric power factor and capacitance measurement at ambient temperature.
- xi. Water tightness test.
- xii. Partial discharge test.
- xiii. Heating cycle test.
- xiv. Bending test.
- xv. Impulse withstand test.
- xvi. Flammability test.
- xvii. Short circuit test

II. Acceptance tests:-

- i. Tensile test (for Al)
- ii. Wrapping test (for Al)
- iii. Conductor resistance as per IS:8130 & IS:10810
- iv. Test for dimensions of insulation and sheath.
- v. Tensile strength and elongation at break of insulation and sheath
- vi. Insulation resistance test.
- vii. High voltage test.
- viii. Void and contamination test for insulation.
- ix. Measurement of capacitance.
- x. Hot set test for insulation.
- xi. Partial discharge test.

IV. Routine tests:-

- i. Conductor Resistance Test.
- ii. Partial Discharge Test.
- iii. High Voltage Test.

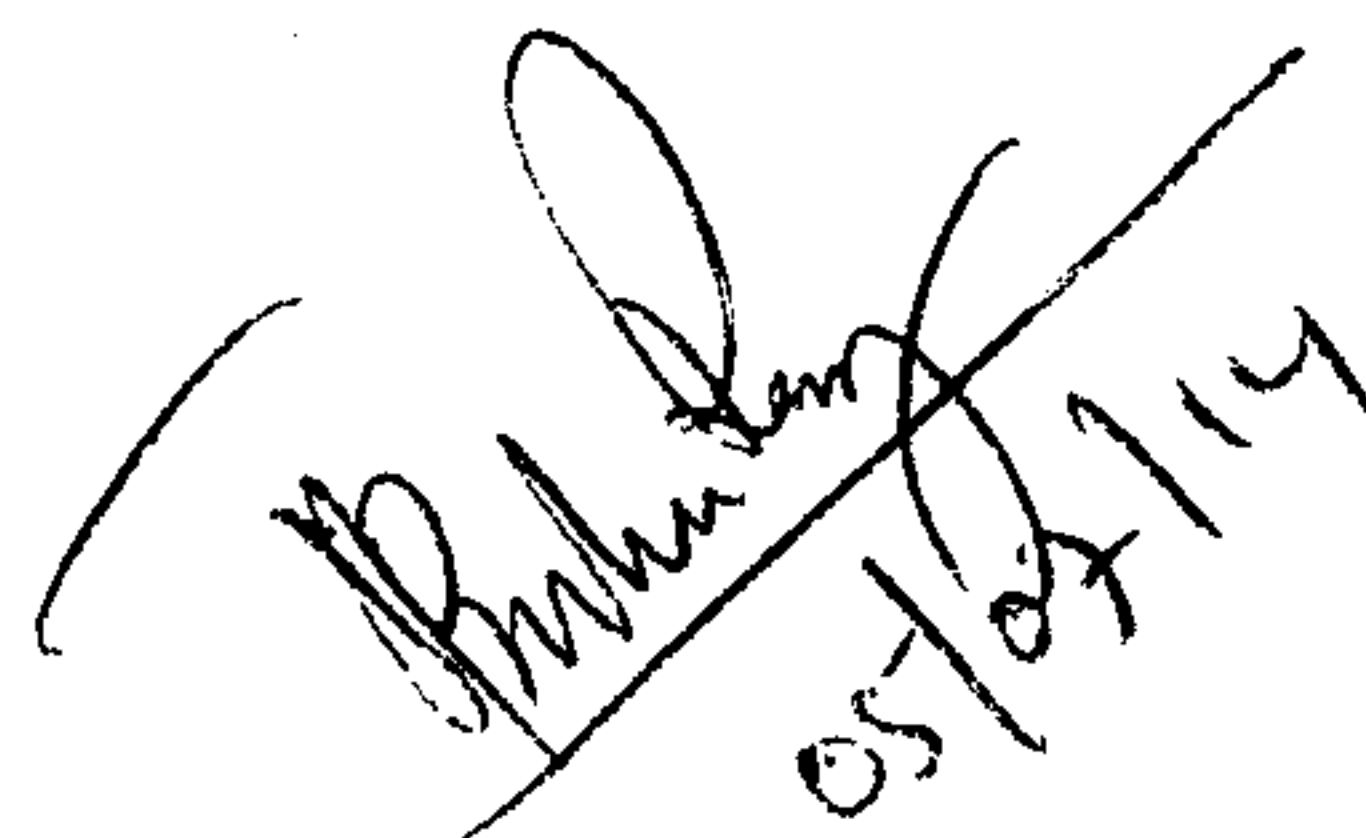
V. Short Circuit Test:- The short Circuit Test shall be treated as one of Type test.

8) General requirements on manufacturing and delivery:-

- 1) Standard Length: The cable will be supplied as per clause "quantity of drum" as specified earlier.
2. On the outer sheath red stripes may be provided to identify the power cable from communication cables.
3. Branding: The manufacture's name or Trade Mark, the voltage grade year of manufacture etc may be printed or embossed on the cable as stipulated in IS 7098 (Part III). The marking "KSEB 110kV UG CABLE" shall also be printed or embossed at every one-meter length throughout the length of the cable.

9) Packing and Marking:- The cable shall carry the following information stenciled on the drum.

- a. Reference Standard.
- b. Manufacturers' name or trade mark.

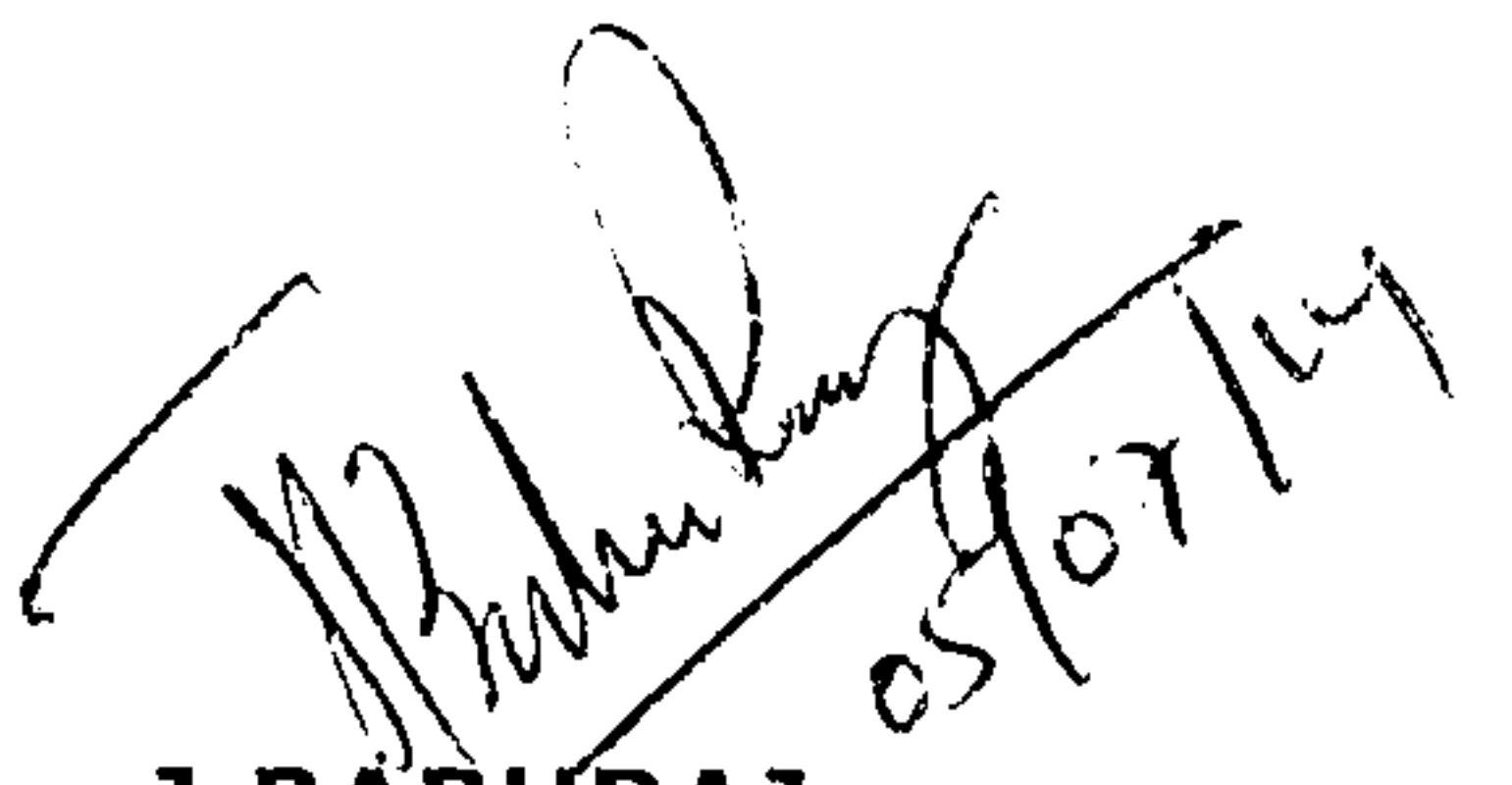


- c. Country of manufacture.
- d. Year of manufacture.
- e. Purchase order No.
- f. Name of consignee.
- g. Type of cable and voltage grade.
- h. Cable code.
- i. Number of cores.
- j. Nominal cross sectional area of conductor.
- k. Length of cable of the drum.
- l. Direction of rotation of drum.
- m. Gross mass/weight of empty drum.

The drawing of the drum shall be got approved before despatch of materials.

10) Manuals:- 4 copies of the following manuals shall be supplied, one month prior to transportation of consignment:-

- a. Jointing procedures.
- b. Terminating procedures (indoor and outdoor)
- c. Fault location procedures (sheath and insulation.)
- d. Maintenance procedures.
- e. Procedures for measuring the soil thermal resistivity.


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ANNUEXURE – III

GUARANTEED TECHNICAL PARTICULARS

Sl. No	Particulars	Description
I	Code Word	
1)	Manufacturer's Name, Address and Country	M/s. Cable Corporation of India Limited, Chennai.
2)	Conductor cross sectional area mm ²	400 Sq.mm
3)	Number of strands / core (Min.)	Number of strands and actual Aluminium area will be such that it will met with standard D.C. resistance
4)	Actual aluminium area mm ²	400 Sq.mm
5)	Tensile strength of aluminium N/mm ²	100 to 150 N/mm ²
6)	Conductor resistance per km at 20°C	0.078 ohm/km
7)	Volume resistivity ohm mm ² /km (At 20°C)	1x10 ¹⁴ ohm-cm. Min.
8)	Purity of aluminium used	99.60%
II	General	
1)	No. of Cores & Areas of Conductor	1x400 Sq.mm
2)	Voltage Grade	64KV/110KV
3)	Standards applicable	Generally as per IS7098-3 and KSEB specifications
4)	Extrusion method	Triple Extrusion Dry Cured in CCV Line 110KV
III	Conductor	
1)	Material	E.C.Grade Aluminium
2)	Cross Sectional Area	400 Sq.mm
IV	Conductor Screen	
1)	Material	Extruded semi-conducting XLPE Compound
2)	Thickness (Min.)	Minimum: 0.8mm
V	Insulation	
1)	Material	Cross linked Poly-ethylene (XLPE)
2)	Thickness (Min.)	Minimum: 16mm
3)	Tensile strength	12.5 N/mm ² (Min.)
4)	Elongation at Break	200% (Min.)
4)	Volume Resistivity ohm cm (At 27°C)	1x10 ¹⁴ ohm-cm. Min.
5)	Conductor Temperature	
a)	Rated	90°C
b)	During short circuit	250°C
VI	Insulation Screen	
1)	Material	Extruded semi-conducting XLPE Compound
2)	Thickness (Min.)	0.8 mm
VII	Metallic Shield	
1)	Material & Thickness	Lead Alloy E sheath and Nominal thickness of 2.3 mm
2)	Short Circuit Current rating	34.5K Amps/ sec
VIII	Inner Sheath	
1)	Material	PVC ST2
2)	Thickness (Min.)	1.3 mm
3)	Colour	Black

IX	Armour	
1)	Material	Hard drawn Aluminium Wire
2)	Size of armour	3.15 mm (Nom.)
3)	Elongation at break %	N/A
4)	Tensile strength	100 to 150N/ mm ²
5)	Weight of zinc coating	N/A
6)	Resistivity	0.028264 ohm. mm ² /meters
X	Outer sheath	
1)	Material	Extruded PVC ST-2
2)	Thickness (Min.)	2.84 mm
3)	Tensile strength	12.5 N/mm ²
4)	Elongation at Break	150%
5)	Volume resistivity	-
6)	Colour	Black
XI	Electrical Data	
1)	Max. D.C. resistance at 20 °C	0.78 ohms/km
2)	A.C. resistance at 90 °C	0.101 ohms/km
3)	Current rating	Continuous current rating for the following conditions. Depth of lying 1.2 mtrs. Soil resistivity 1.2 and lying as flat with spacing formation with Single Point Bonding/Cross Bonding with one circuit in operation
4)	In ground (at 30°C)	481 Amps
5)	In air (at 40°C)	695 Amps
6)	Short Circuit Current rating of conductor for 1 sec.	36.03 to 40 KA/sec
XII	Cable Data	
1)	Approximate overall dia of Cable	84.7 mm
2)	Tolerance on overall dia	+/-3%
3)	Standard Length of Each Drum	As per clause 4 of Annexure-II
4)	Tolerance if any on Standard Length	
5)	Dimensions of the drum (FxTxB)	2800mm x 1800 mm x 1400mm
6)	Approx. Weight of Cable in One Drum	4842 Kg.
7)	Approx. Gross Weight of Cable in One Drum incldg. Cable Weight	5942 Kg.
8)	Standard according to which cable will be manufactured & Tested	Construction as per IS7098-3 and KSEB specifications Testing as per IEC
XIII	Embossing Details	
1)	Manufacture's Name Or Trade Mark	
2)	Voltage Grade	64kV/110kV
3)	Year of Manufacture	2014
4)	No. of Cores & Size	1x400mm ²
XIV	Min. Bending radius	20 times the overall dia of cable
XV	Sequential length marking	Per each meter


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