

**THE BRIHAN-MUMBAI ELECTRIC SUPPLY**

**&**

**TRANSPORT UNDERTAKING**

**(OF THE BRIHAN MUMBAI MAHANAGARPALIKA)**



**SPECIFICATION NO.: 012(A)0114**

**FOR**

**11kV COPPER / ALUMINIUM CONDUCTOR  
XLPE INSULTATED, PVC SHEATHED  
ARMOURED CABLES**

**Notice for revision of specification (summary sheet)**

Attention of tenderers for – the tender is invited with following additions/ amendments made in specification

Sr.No	Existing specification no.	Revised specification no.	Date of revision
1	012(A)0107	012(A)01113	14.11.2013
2	012(A)01113	012(A)01114	17.01.2014

Sr.No.	Existing section/ clause No.	Description of existing clause	Revised Section/ Clause No.	Description of additions/amendments
1	Instruction to the tenderer	Description was for old two bid tendering system.	Instruction to the tenderer	New e-tendering system description included.
2	Instruction to the tenderer clause 16.2	Details of cable supplied by tenderers to other reputed customers during previous three years	16.2	Description changed to include the details of 3C/240 sq.mm. cable
3	----	----	17	Factory inspection clause included
4	----	----	18	Inspection and Testing: The proto and / or Lot inspection by the undertaking's officers will be carried out as per Sr.No.5 of condition of supply.
5	Section-1 clause no. 1.1.2	This specification covers supply of 11kV, 3C x 50 sq.mm., Copper Conductor, XLPE cables.	Section-1 clause no. 1.1.2	Description changed to include the details of 3C/240 sq.mm. cable
6	section 1 clause no. 1.6	Guarantee against manufacturing and material defects	1.6.1	The equipment shall be guaranteed against manufacturing and material defects for a period of 66 months from the date of supply or 60 months from the date of its installation whichever occurs earlier.
			1.6.2	In case of the equipment which fail in the guarantee period, the successful tenderer shall have to replace the same free of cost.
7	Section-3 clause no. 3.1	Climatological data	Section-3 clause no. 3.1	Latest available data included.
8	Section-4	clause no. 4.1.2 , 4.2, 4.3 , 4.4 moved to section 5	section 5	clause nos. 5.1.4 , 5.1.5, 5.1.6, 5.1.3 added respectively
9	Section no- 4 clause no. 4.1	Type and quantity of cable required	Section no- 4 clause no. 4.1	Description changed including the details of 3C/240 sq.mm. cable.
10	Section no- 4 clause no. 4.2	Short circuit level for cable	Section no- 4 clause no. 4.2	System fault level mentioned.
11	Section no- 4 clause no. 4.5.2	Quantity variation and tolerance limits.	Section no- 4 clause no. 4.5.2	Description changed including the details of 3C/240 sq.mm. cable.

Sr.No.	Existing section/ clause No.	Description of existing clause	Revised Section/ Clause No.	Description of additions/amendments
12	Section no- 5 clause no. 5.1.2	Type test requirement	Section no- 5 clause no. 5.1.2	Description changed in tabular format including the details of 3C/240 sq.mm. cable. Also <b>minimum type test requirement is mentioned as per latest amendments available for IS:7098/part II</b>
13	Section no- 5 clause no. 5.2	Conductor requirements	Section no- 5 clause no. 5.2	Description changed in tabular format including the details of 3C/240 sq.mm. cable along with water blocking arrangement.
14	Section no- 5 clause no. 5.3	Insulation requirements	clause no. 5.3.1	insulation requirements for 11 kV cable
			Clause no. 5.3.2	insulation thickness and tolerance
			Clause no. 5.3.3	Curing process description
15	Section no- 5 clause no. 5.4	cable screening requirements	Clause no. 5.4.1	screening concept
			Clause no. 5.4.2	Conductor screening requirement
			Clause no. 5.4.3	Description of insulation screening with <u>inclusion of insulation screening consisting non metallic semiconducting water swellable tapes laid over extruded semiconducting insulation screen followed by copper tape insulation screen on each core for 3C/240 sq.m.cable and specification for water swellable tape.</u>
			Clause no. 5.4.3.1 and 5.4.3.2	Description of semiconducting and metallic screening
16	---	----	Clause no. 5.7	New clause added for Filler requirements.
17	Section no- 5 clause no. 5.8	Armouring	Clause no. 5.9.1	The armour shall consist of a single layer of galvanized steel wire conforming to IS:3975/1999 (amended to date).
			Clause no. 5.9.2	The <u>rubberized cotton tape</u> shall be applied to bind armour wires such that it shall not affect the electrical properties of the armour wires.
			Clause no. 5.9.3	The joint in armour wires shall be made by brazing or welding and surface irregularities shall be removed. A joint in any wire shall be at least 300 mm from nearest joint in any other armour in the completed cable.
18	Section-5	----	Clause no.5.13.2	Additional Polyester strip having manufacturer brand name and year of manufacture printed for identification.

Sr.No.	Existing section/ clause No.	Description of existing clause	Revised Section/ Clause No.	Description of additions/amendments
19	Section no- 5 clause no. 5.16	description mentions GPP required to be filled by tenderer as section 12 instead of section 11	Section no- 5 clause no. 5.19	Required correction made.
20	Section no- 5 clause no. 5.16.1 and 5.16.2	shape of conductor and number of strands	----	both clauses removed as given description is already covered in clause no. 5.2 of section 5
21	Section no- 5 clause no. 5.16.3	drawing to be submitted by the tenderer	clause no. 5.16.1	change in clause number
22			Section 5 5.18.1	Pulling Eye: A pulling eye per drum shall be provided on the running end of the cable or as per IS1255/1983 amended to date.
23			Section 5 5.18.2	Other end of the cable shall be properly sealed with one PVC cap with Polyurethane compound shall be provided as primary sealing and heat-shrink end-cap shall form a secondary sealing over the PVC cap.
24	Section no- 6 Clause no. 6.1	Tests	Clause no. 6.1	Description of the clause is changed to describe all the required tests to be carried out on 11 kV cables
25	Section no- 7 Clause no. 7.10	information to be painted on cable drums	Section no- 7 Clause no. 7.10	xi) Water swellable tape Provided
26	Section no- 8 Clause no. 8.1 , 8.2 , 8.3	Drawings	Section No- 8	Details regarding drawings to be submitted along with the bid and drawing and documents to be submitted and get approved after placement of P.O. are added
27	Section- 9 Clause no. 9.2.3	Delivery instruction	Section- 9 Clause no. 9.2.3	Details included regarding documents to be submitted along with inspection call
28			Annexure I	Typical diagram of 11kV Multi Core XLPE Power Cable.
29			Annexure II	Details of sub vendors for critical items.
30	Amendment No.1 in Clause 5.9.1		5.9.1	Armour strips shall be applied as closely as possible with armour coverage not less than 90% as per IS:7089/Part-II/2011.

**(OF THE MUNICIPAL CORPORATION OF MUMBAI)**

**SPECIFICATION FOR 11kV COPPER / ALUMINIUM CONDUCTOR XLPE  
INSULATED, PVC SHEATHED ARMoured CABLES**

**SPECIFICATION NO.: 012(A)0114**

**C O N T E N T S**

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## **I - INSTRUCTIONS TO TENDERERS**

1. The e-tender called for herein is for the supply of 11kV, 3C x 50 sq.mm., Copper Conductor / 3C x 240 sq.mm. Alu. Conductor XLPE insulated PVC sheathed armoured Cable to the entire satisfaction of the General Manager, the B.E.S.&T. Undertaking, Mumbai, in accordance with the Specification No.012(A)0114 and requirements accompanying these instructions.

2. This Two part Bid e-Tender shall be submitted as under:

### **2.1 Pre-qualification Criteria:**

The tenderers shall fill in the price bid as well as the questionnaire displayed on the site under the heading Pre-qualification CRITERIA. Some fields in this questionnaire are mandatory. The offers of the tenderers not filling these questionnaires shall not be considered. Further, wherever possible and requested the tenderers shall upload the necessary documents in PDF, JPG format only.

ALL THIS EXERCISE OF FILLING IN THE OFFER AND QUESTIONNAIRE OF PRE-QULIFICATION CRITERIA SHALL HAVE TO BE CARRIED OUT BY THE TENDERERS WELL BEFORE THE BID ENDING DATE.

### **2.2 Evaluation of the offers:**

The pre-qualification Criteria of all tenderers will be opened on the next day of bid ending date. The techno-commercial suitability of the offers received shall be decided on the basis data furnished in the pre-qualification questionnaire. The price bids of only those suitable firms shall be opened on the basis of the techno-commercial suitability report. The date and time of price bid opening shall be displayed on the site. After opening of price-bid on the stipulated date, the tenderers whose offers are techno-commercial suitable shall be able to view their rates as well as those of other suitable competitor tenderers but, he unsuitable tenderers shall be able to read only the reasons for unsuitability of their respective offers.

3. The Bid opening date and bid ending date shall be as displayed on the e-tender site of this tender. The tenderers shall submit their offers in 'e' mode (i.e. soft mode), before the said bid ending date.

4. No tenders can be uploaded after the Bid-ending date and tenders received in physical form will not be considered unless the due date for submission of the tender is extended in which case due intimation would be given to individual participants through e-mail.

5. Tenderers shall submit particulars of similar equipments supplied by them to some of the important customers in India or abroad especially in the tropical regions. Preference will be given to the manufacturer having his own organization or accredited representatives of long standing possessing suitable technical and installation experience.

6. Tender should be submitted complete in all respects and must be accompanied by descriptive and technical particulars, drawings and other data required for proper consideration of the tender. This information should be submitted along with the quotation before the due date. THE SUBMISSION OF MERE TELEGRAPHIC PRICES DELIVERY PARTICULARS OR SKELETON TENDERS BEFORE THE DUE DATE WHICH ARE TO BE CONFIRMED AND/OR SUPPLIMENTED SUBSEQUENTLY SHALL NOT RECEIVE CONSIDERATION.
7. For any technical information required regarding the tender may be obtained from the office of the Divisional Engineer, Planning (Materials), B.E.S & T. Undertaking, 3<sup>rd</sup> floor, Veej Bhavan, Gen. J. Bhosale Marg, Backbay Reclamation, Mumbai – 400 021, on any working day during office hours, but after the Bid ending date of the tender, No representative of the tendering firm will be granted an interview for discussing matters connected with the tender.
8. ATTENTION OF THE TENDERERS IS PARTICULARLY DRAWN TO THE FACT THAT THEY SHOULD ACQUAINT THEMSELVES THOROUGHLY WITH THE INSTRUCTIONS ON THE e-TENDER SITE, THE PARTICULARS GIVEN, THE PROVISIONS OF THE 'CONDITIONS OF THE CONTRACT', THE SPECIFICATION, REQUIREMENTS, SCHEDULE OF GUARANTEED PERFORMANCE, ETC.
9. All the tenderers (except those registered with NSIC) will have to deposit, as described in the Conditions of Tender, Tender Cost & Earnest Money IN THE e-PAYMENT MODE ONLY.
10. The Earnest Money Deposit paid by Unsuccessful tenderers will be returned after finalization of the tender by e-payment mode only to the same account, from which it is paid.
11. All correspondence connected with the tender e.g. schedule of departure from specification, guaranteed technical particulars etc., shall be uploaded only and will not be accepted in hard copy format.
12. The final acceptance of the tender rests with the General Manager, The B.E.S.& T. Undertaking (subject to the approval of appropriate authority) who reserves to himself the right to reject any tender without assigning any reason and does not bind himself to accept the lowest, the whole of a tender or any tender.
13. The tenderers must upload information about manufacturing unit as per the PROFORMA given in the credential form displayed on site.
14. The acceptance of the tender shall be governed by the General Conditions of Contract and in particular by those relating to delivery, guarantee, execution of contract and security deposit. The successful tenderer shall sign a contract agreement for the due execution of the work as accepted by the General Manager.

15. The tenderer shall specify against each item the delivery period as specified in the General Conditions of contract of the Specifications. In case of contract for erection & commissioning of the plant and equipment, the tenderers shall specify the working period for carrying out the work. These periods of time shall be specified in number of weeks, where week shall mean 7 days of the Calendar inclusive of Sundays & Holidays, if any.

16. **Eligibility Criteria:**

16.1 Only those tenderers whose Minimum Annual Turnover is **Rs.25 Crores** per year, for any one of the previous two financial years, should quote against the tender. The tenderers for documentary proof should submit certified copies of assessment of Annual Turnover from Chartered Accountant. The offers of the tenderers not fulfilling above requirements, will not be considered.

16.2 The sum total of quantity supplied and orders secured by tenderer during three financial years shall be as given in the table below:

Sr. No.	Offered size of cable by the tenderer	Minimum size of the 11kV XLPE insulated PVC Sheathed armoured cable supplied	The sum total of minimum size of cable as mentioned in column (3) of this table or above supplied and order secured by the tenderer during previous three financial years.
(1)	(2)	(3)	(4)
1.	3C x 50 sq.mm. Cu.Cond.	3C/50 sq.mm. Cu. / Alu. Cond.	Should be more than the tender quantity of the respective item offered in case of annual tender and should be more than half the tender quantity, in case of biennial tender.
2.	3C x 240 sq.mm. Alu. Cond.	3C/240 sq.mm. Cu. / Alu. Cond.	-- do --

16.3 The tenderer has to quote for minimum 50% of the tender quantity and confirm the same otherwise their offer will not be considered.

17. All the successful tenderers, who are new supplied to the procured item (i.e. first time suppliers to BEST Undertaking) for part / full quantity against the tender shall note that they will be placed conditional order subject to inspection of their works/factory. Further, these tenderer/s will have to bear the full charges towards factory inspection which will include to and fro travelling expenses and other sundry/incidental charges during to and fro travelling and day of inspection for two officers. The convenient date and time for inspection of your factory will be decided mutually. Only after satisfactory inspection by the inspecting officers, the detailed order with terms and conditions will be placed.

18. **Inspection and Testing:**

The proto and / or Lot inspection by the undertaking's officers will be carried out as per Sr.No.5 of condition of supply.



**THE BRIHANMUMBAI ELECTRIC SUPPLY & TRANSPORT UNDERTAKING**  
**(of the BRIHAN MUMBAI MAHANAGARPALIKA)**

**SPECIFICATION NO.: 012(A)0114**

**SECTION 1: GENERAL**

**1.1 Tender document**

- 1.1.1 This tender document shall be read and understood as a whole inclusive of all annexures, and every section or sub-section of this document shall be interpreted in proper context with other sections contained herein.
- 1.1.2 This specification covers supply of 11kV, 3C x 50 sq.mm., Copper Conductor / 3C x 240 sq.mm. Alu. Conductor, XLPE insulated PVC sheathed armoured cables.
- 1.1.3 All supply covered by this Specification shall be carried out in accordance with the "General Conditions of Contract".
- 1.1.4 Wherever the directions to the tenderers embodied herein conflict with those specified in the General Conditions of Contract, the former shall be binding in preference to the latter.

**1.2 Standards**

- 1.2.1 The cables shall be designed, manufactured and tested in accordance with the following National Standards.

IS:7098 Part-2:2011	Cross linked polyethylene (XLPE) insulated PVC sheathed cables for working voltages from 3.3kV upto and including 33kV.
IS:5831 : 1984	PVC insulation & sheath of electric cables.
IS:10810:1984	Methods of test for cables.
IS:8130:1984	Conductors for insulated electric cables and flexible cords.
IS:3975:1999	Mild steel wires, formed wires and tapes for armouring of cables.
IS:10462 (Part 1)/ 1983	Fictitious calculation method for determination of dimensions of protective covering of cables.
IS:9938 : 1981	Recommended colours for PVC insulation for LF wires and cables.
IS:10418:1982	Specification for drums for electric cables.

- 1.2.2 Except as specified herein, all parts of the equipments shall comply with the latest published editions of International Standards Specifications (as amended to date), or equivalent national standards.
- 1.2.3 Where Indian Standards Specification does not exist, the Relevant British Standard Specification shall be taken as standard.
- 1.2.4 If the equipments offered is manufactured according to some other standard, it shall be clearly stated and a copy of the latest publication of the standard in English shall be forwarded with the offer.

### **1.3 Legislation**

- 1.3.1 The whole of the equipments shall comply in every respect with the provisions of relevant Government Legislations and/or Rules and Regulations governing manufacture, installation, operation and maintenance of the equipments.
- 1.3.2 Tenderers shall ensure that all safety measures are extensively provided in the equipment against hazards to life and property and that the proper installation and use of the equipments under no circumstances shall contravene any enactments rules, laws and by-laws of the Government and the Local Authority.

### **1.4 Departure from Specification**

- 1.4.1 If due to any reason, tenderers find it necessary to depart from the provisions of section of the specification, such departures shall be clearly stated and underlined giving full reasons.
- 1.4.2 If departures from the provisions of any section of this specification are not notified in writing, it will be presumed that tenderers will abide by this specification.
- 1.4.3 Any suggestion, comment, or advice to include in this document, additional provisions in respect of any special device or attachment necessary but not already specified herein, may be put forward by the tenderers giving full details of the special/additional features of the equipments together with the justification for its inclusion.

### **1.5 Materials and Workmanship**

- 1.5.1 The equipment shall conform to the best engineering practice in design, usage of materials and fabrication so as to ensure reliability, economy, safe and convenient operation in the environment in which they are installed.
- 1.5.2 Manufacturers shall give details of the experience in the supply of similar equipment. A list of important customers who have been supplied with similar equipment with particulars of quantity, location and dates when supplied shall be furnished.

### **1.6 GUARANTEE**

- 1.6.1 The cable shall be guaranteed against manufacturing and material defects for a period of 66 months from the date of supply or 60 months from the date of its installation whichever occurs earlier.
- 1.6.2 In case if the cable fails in the guarantee period, the successful tenderer shall have to replace the same free of cost.

## **SECTION 2: DESCRIPTION OF THE POWER SYSTEM**

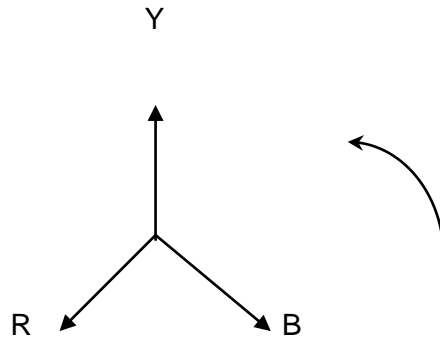
### **2.1 Grid**

- 2.1.1 The Tata Power Company Ltd. (TPCL) and the Maharashtra State Electricity Generation Co. Ltd. (MSEGCL) have their generating stations located in different parts of Maharashtra State and form an interconnected transmission system in the Mumbai-Pune Region.
- 2.1.2 Power from this system is transmitted at 220 / 110kV through overhead conductors and underground cables amongst others to TPCL's five main receiving stations at Backbay, Carnac, Parel, Dharavi and Mahalaxmi situated in the island of Mumbai, where they have installed either delta/star or star/zigzag step down transformers with star point effectively earthed for making power available to their consumers at 110 / 33 / 22kV.

### **2.2 Existing B.E.S.T. System**

- 2.2.1 The B.E.S. & T. Undertaking, on behalf of the Brihan Mumbai Mahanagarpalika (who are the licensees for the distribution of electric power within the City limits of Mumbai) receives power in bulk from the Tata Power Company Ltd. at 110 / 33 / 22kV, 3 Phase, 50 Hz.
- 2.2.2 Bulk power at 110 / 33 / 22kV is transmitted from TPCL's five main receiving stations through effectively earthed underground cables to BEST's receiving sub-stations situated at different localities in Mumbai where the BEST Undertaking has installed 110 / 33kV, 110 / 11kV, 22 / 11kV or 33 / 11kV, star – z, star/star, delta/star power transformers of vector group YNzn11, YNyn0, 31Dy1 with neutral earthed with / without a resistance. Where the transformation is 110/11kV or 110/33, 22/11kV or 33/11kV the starpoint of the transformers has been effectively earthed. The power transformers are provided with OLTC gear to regulate and maintain the 11kV voltage fairly constant.
- 2.2.3 Underground 11kV (effectively earthed) feeder cables radiate from the B.E.S.& T. Receiving Sub-stations to supply power to a large number of distribution substations and to certain consumer's substations. These feeders form a radial network under which each feeder supplies on an average 4 to 5 substations in series.
- 2.2.4 Power at 11kV is stepped down to 415/240V at the distribution substations where the various sizes of 11kV/415-240V delta/star transformers of vector group Dyn11 are installed. The star point of the transformer is solidly earthed and is also brought out to an insulated terminal for the 3 phase, 4 wire distribution system.
- 2.2.5 The 415/240V secondary distribution system comprises of a vast network of underground four core cables, suitably sectionalised by means of distribution pillars, to which service lines are teed off to supply power to medium and low voltage consumers.

2.2.6 The phase sequence of the 3 phases at the existing receiving sub-stations is in accordance with the International Standards as indicated below :



## **SECTION 3: PREVAILING SERVICE CONDITIONS**

### **3.1 Climatological Data**

3.1.1 The information given hereunder is based on data supplied by the Regional Meteorological Centre, Colaba, Mumbai – 400 001.

3.1.2 The information is based on the data collected over the years 1881 to 2007.

3.1.3 The table below gives the climatological data for the city of Mumbai.

a) Air Temperature in Shade

Highest temperature recorded	:	40.6 <sup>0</sup> C
Lowest temperature recorded	:	11.7 <sup>0</sup> C
24 hours daily average	:	26.0 <sup>0</sup> C

b)

Mean highest temperature in sun	:	62.2 <sup>0</sup>
Highest temperature in sun	:	64.0 <sup>0</sup> C

c) Relative Humidity

Lowest mean RH	:	62%
Highest mean RH	:	85%

d) Rainfall

Mean no. of rainy days in a year	:	75.9 days.
Mean rainfall in a year	:	2146.5 mm
Maximum rainfall recorded in a year	:	3481.6 mm
Heaviest rainfall in a day recorded	:	575.6 mm

e) Wind

Mean daily wind speed – min. in a year	:	9.8 km/hr
Mean daily wind speed – max. in a year	:	18.7 km/hr
Highest wind speed in gust	:	103 km/hr on 17/06/2004

## 3.2 Geographical Data

3.2.1 MUMBAI City is situated on the western coast of India and is the second biggest city in the country. It has an excellent sea port and is on the world's main routes by sea and air. It is well connected with the hinterland by road and railways.

Area	:	61 sq. km.
Population	:	38,00,000
Longitude	:	72 40' E
Latitude	:	18 54' N
Height above MSL	:	11 Meters

## 3.3 Local Conditions

3.3.1 MUMBAI is a densely populated city with large commercial centers, engineering workshops and several varieties of large and small industries occupied in the manufacture of consumer goods and other commodities.

3.3.2 Although certain areas are still undeveloped, the city is divided into several zones such as residential, commercial, industrial etc. with a view to minimize nuisance and localize the civil activities as far as practicable. Still there are several mixed localities where such zoning has not been done and two or more types of activities are allowed to continue. By and large, the heavy industries are gradually shifting from the city, to suburbs.

3.3.3 The city originally comprised of five islands separated by small creeks which were, in later years filled in and reclaimed. The city now stands as one large island separated from the mainland by creek, the shores of which more or less demarcate the boundaries of the city and suburban limits.

3.3.4 Because of large areas of reclaimed land, the soil conditions and the sub-soil water levels in the different parts of the city vary widely.

3.3.5 The sub-soil water level varies with the time and height of the tides and lies between 0.5 meter to 4 meters below ground level in the densely populated areas. The water has considerable salt content.

3.3.6 During rains, flooding of the roads takes place and water level in certain low lying areas may go up to about 1 meter above ground level.

3.3.7 The chemical composition of soil obtained from typical samples is given below:

Appearance	<b><u>Sample No.1</u></b> A mixture of clay, Stones, some clinker & coal bits & other organic matter.	<b><u>Sample No.2</u></b> Mainly clay with a few small stones & a few bits of organic matter.
Moisture	2.00%	7.20%
<b><u>Analysis on dry soil</u></b>		
Organic matter	14.20%	3.00%
Combined Water	4.00%	3.60%
Carbon dioxide	NiL	3.70%
Total Water Solubles (100 gms. in 500 cc Water).	0.1075%	0.1855%
Reaction of water	pH Value	pH Value
Extract	7.5%	7.6%
<b><u>Analysis of water Solubles</u></b>		
Silicon SiO <sub>2</sub>	0.0100	0.0065
Lime CaO <sup>2</sup>	0.0060	0.0104
Magnesia MgO	0.0101	0.0109
Sulphur Trioxide SO <sub>3</sub>	0.0065	0.0143
Sodium Oxide Na <sub>2</sub> O	0.0149	0.0138
Chlorine Cl <sub>2</sub>	0.0340	0.0221
Di-Nitrogen Na <sub>2</sub> O <sub>5</sub>	0.0040	0.0078
Pentoxide		

The above radicals are probably combined as follows:

Calcium Sulphate	CaSO <sub>4</sub>	0.0146	0.0253
Magnesium Chloride	MgCl <sub>2</sub>	0.0428	0.0257
Sodium Chloride	NaCl	0.0035	0.0049
Sodium Silicate	Na <sub>2</sub> SiO <sub>3</sub>	0.0203	0.0132
Sodium Nitrate	NaNO <sub>3</sub>	0.0063	0.1040
Total Inorganic Salts		0.0875	0.0815
Water Soluble Organic matter		0.0200	0.1040
Total Water soluble Matter		0.1075	0.1855

The mean ground temperature may be taken as 30<sup>0</sup> C and the thermal resistivity of soil  $\rho = 120^0$  C watt per cm<sup>3</sup>.

### 3.4 Existing Practice

- 3.4.1 All the cables are laid direct in the ground except for small length laid in ducts, earthenware or R.C.C. pipes/DWC pipes inside the receiving stations, sub-stations and across carriage ways.
- 3.4.2 The cables are normally laid along footpaths according to standard alignments decided upon by the local authority to bring about uniformity and proper co-ordination between the underground services of different utilities such as gas mains, water mains, electric mains, telephone, etc. The minimum clearance between electric cables and the mains of other utilities when they run parallel to each other is generally 45 cms. but in certain cases electric cables have been laid almost touching the water mains or sewer due to congestion.
- 3.4.3 The city has suburban and main line electric rail traction system operating at 25kV AC/ 1500 volts D.C. which are subject to problem involving electrolytic corrosion and vibration.
- 3.4.4 The underground utility services are laid in close proximity of chemical corrosion and microbiological action at these places.
- 3.4.5 The standard depths below the surface of ground at which the cables are generally laid are as follows:

Type of Cables	Depth below Ground Level
33,000 / 22,000 Volt Cable	1,070 mm
11,000 Volt Cable	910 mm
1,100 Volt Cable	760 mm
Communication Cable	910 mm



- 3.4.6 Where the cables cross railway tracks, they are generally laid in R.C.C. pipes, the depth being such that clear minimum distance of 1,220 mm is left from the bottom of the sleepers to the top of pipes.
- 3.4.7 The number of cables in any one section of the trench of sub-stations or distribution pillars, any number up to 20 may be side by side or in special configuration. The spacing between cables may be 23 cms., 17 cms., or 11 cms., depending upon the number of cables and availability of spaces.

## **SECTION 4: REQUIREMENTS**

### **4.1 Type & Quantity**

***11kV cables of following type / size are required:***

<b><i>Item No.</i></b>	<b><i>Description</i></b>	<b><i>Qty. in Mtrs.</i></b>
<b>1</b>	Three core, <u>Copper Conductor</u> , XLPE insulated, with Conductor and <i>water swellable</i> insulation screen, PVC sheathed, galvanised steel wire armoured and overall PVC sheathed. Size: 3C x 50 sq.mm.	
<b>2</b>	Three core, <u>Aluminium Conductor</u> XLPE insulated, with Conductor and water swellable insulation screen, PVC sheathed, galvanized steel wire armoured and overall PVC sheathed. Size: 3C x 240 sq.mm	

### **4.2 Quantity Variation**

- 4.2.1 The General Manager at his discretion may alter the above quantity by –25% or +25% after the contract is awarded and before delivery of material is completed.
- 4.2.2 The length of cable in each drum shall be 500 mtrs. for 3C/50 sq.mm. cable and 250 mtrs. for 3C/240 sq.mm. cable.

A tolerance not exceeding +/- 5% shall be permitted on standard drum length.

## **SECTION 5: TECHNICAL SPECIFICATION**

### **5.1 General**

5.1.1 This specification covers requirement of 11kV, 3C x 50 sq.mm. copper conductor / 3C x 240 sq.mm. Alu. Cond., cross linked polyethylene insulated and PVC sheathed armoured cable generally conforming to IS:7098(Part-II)/2011 (amended to date).

5.1.2 The tenderer who had supplied specified material in past to the Undertaking **and** carried out any changes in design.

### **AND**

The tenderer who have not supplied the specified material to the Undertaking in the past i.e. New supplier shall submit Type test certificates with the offer, for the records of the purchaser.

The type test should have been conducted during the period not exceeding 5 years from the date of opening the bid. The minimum test certificate requirements are given below:

<b>Sr.No.</b>	<b>Offered Cable</b>	<b>Minimum type test required</b>
1	11 kV, 3C/50 sq.mm. Cu. Cond. XLPE cable.	11kV, 3C/50 sq.mm. or above size, Cu. / Alu. Cond., XLPE insulated, PVC sheathed armoured cable
2	11 kV, 3C/240 sq.mm. Alu. Cond. XLPE cable.	11kV, 3C/240 sq.mm. or above size, Cu. / Alu. Cond., XLPE insulated, PVC sheathed armoured cable

5.1.3 The cable shall be suitably tropicalised and rated for the service conditions on site. The cable shall be liberally designed and manufactured from the best materials for satisfactory operation under onerous service conditions without causing any permanent injury or shortening of the life.

### **5.1.4 Short Circuit Level**

The maximum symmetrical short circuit level will be 350 MVA at receiving stations and 250 MVA at substation. The cable insulation shall withstand the stresses and the resultant increase in temperature caused by the flow of short circuit currents. The cable should carry the short circuit currents without any damage to any components.

### **5.1.5 Installation in Vertical Situation**

The cable shall also be suitable for installation in vertical situation.

## 5.2 Conductor

Sr.No.	Cable	Conductor requirement
1	11 KV, 3C/50 sq.mm. Cu. Cond. XLPE cable.	<ul style="list-style-type: none"> <li>- Conductor shall be stranded and composed of high conductivity annealed copper wires conforming to IS:8130/1984 (amended to date).</li> <li>- Conductor shall be compacted circular shape.</li> <li>- Minimum no. of strands shall be 6 nos.</li> <li>- Longitudinal water-blocking arrangement (or water-tight construction or water barrier protection) shall be provided within the conductor.</li> <li>- As per manufacturer's procedures, 100% water-tight conductor shall be achieved.</li> <li>- Make and type of material to be used (i.e. water-swellaable tapes/ yarn/ powder, etc.) shall also be stated in the annexure II</li> <li>- All detailed constructional features shall be shown in the cross-sectional drawing.</li> </ul>
2	11 KV, 3C/240 sq.mm. Alu. Cond. XLPE cable.	<ul style="list-style-type: none"> <li>- Conductor shall be stranded and composed of high conductivity H2 grade Aluminium wires conforming to IS:8130/1984 (amended to date)</li> <li>- Conductor shall be compacted circular shape.</li> <li>- Minimum no. of strands shall be 37 nos.</li> <li>- Longitudinal water-blocking arrangement (or water-tight construction or water barrier protection) shall be provided within the conductor.</li> <li>- As per manufacturer's procedures, 100% water-tight conductor shall be achieved.</li> <li>- Make and type of material to be used (i.e. water-swellaable tapes/ yarn/ powder, etc.) shall also be stated in the annexure II</li> <li>- All detailed constructional features shall be shown in the cross-sectional drawing.</li> </ul>

### 5.3 **Insulation**

5.3.1 The insulation shall be cross linked polyethylene as per clause no.5 of IS:7098(Part-II)/2011, with latest amendments.

5.3.2 The thickness of the insulation and tolerance on this thickness shall be confirming to appropriate clause of IS:7098 (part II)2011 as amended to date

5.3.3 Cable shall be manufactured by using DRY CURING process. The cable shall be extruded and cross linking shall take place in the atmosphere of inert gas at suitable temperature and pressure.

### 5.4 **Screening**

5.4.1 The cable shall consist of conductor screening and insulation screening.

5.4.2 Conductor screening:

Conductor screening shall be non-metallic and shall consist of a layer of extruded semi-conducting compound.

5.4.3 Insulation screening:

The insulation screening shall consist of non-metallic semiconducting water swellable tapes laid over extruded semiconducting insulation screen followed by copper tape insulation screen on each core.

The specification of non-metallic semiconducting water swellable tape is as follows:

It shall be provided under copper tape on each core.

The thickness shall be approx. 0.3 mm and weight shall be approx.118 gms /sqm.

Swell height shall be  $\geq 12$  mm in 1 min.

It shall be compatible to the non strippable semicon over which it is applied.

5.4.3.1 The non-metallic part shall be directly applied upon the insulation of each core and shall consist of extruded semi-conducting compound which will be followed by non-metallic semiconducting water swellable tapes.

5.4.3.2 The metallic part shall be applied over water swellable tapes of the individual core and shall consist of one or more copper tapes.

### 5.5 **Core Identification**

The core identification shall be as per Clause 14 of IS:7098(Part-II)/2011 (amended to date).

### 5.6 **Laying up of cores**

These shall be in accordance with the Clause 15 of IS:7098(Part-II)/2011 (amended to date).

## 5.7 **Fillers**

The filler material shall be non-hygroscopic and non-fibrous polypropylene (PP) conforming to all its requirements as per clause 7 of IS: 7098 (part II) 2011 as amended to date. Fillers shall not have any effect on other compounds used and shall be stable at cable temperatures, All interstices including center interstices shall be filled by PP (Polypropylene) filler.

## 5.8 **Sheathing**

Inner sheath shall be of extruded PVC type ST2 as per IS:5831/1984 (amended to date). It shall be generally conforming to clause no.7 IS:7098(Part-II)/2011 (amended to date).

## 5.9 **Armouring**

5.9.1 The armour shall consist of a single layer of galvanised steel wire conforming to IS:3975/1999 (amended to date) and armour strips shall be applied as closely as possible with armour coverage not less than 90% as per IS:7089/Part-II/2011. The armouring shall be suitable for carrying system fault current.

5.9.2 The rubberized cotton tape shall be applied to bind armour wires such that it shall not affect the electrical properties of the armour wires.

5.9.3 The joint in armour wires shall be made by brazing or welding and surface irregularities shall be removed. A joint in any wire shall be at- least 300 mm from nearest joint in any other armour in the completed cable.

## 5.10 **Outer Sheath**

The outer sheath shall be of extruded PVC type ST2 with termite repellent as per IS:5831/1984 (amended to date) and meeting requirement of IS:7098(Part-II)/2011. The colour of the outer sheath shall be blue as per IS:9938/1981 (amended to date).

## 5.11 **Manufacturer's Identification**

The manufacturer shall be identified as per clause no.21.1 of IS:7098(Part-II)/2011 (amended to date).

## 5.12 **"CABLE" Identification**

5.13.1 The cable shall be identified by embossing the following information on the outer sheath of the cable with the given sequence as below:

"Manufacturer's Brand name, 11kV, Number of Core / size in sq.mm, XLPE, *BEST*, year of manufacturer should be embossed on outer sheath and letter size shall not be less than 5mm x 5mm".

The above shall be embossed throughout the length at an interval of one meter.

5.13.2 Additional Polyester strip having manufacturer name and year of manufacture printed through out the length at an interval of one meter, shall be provided under armouring of cable.

5.14 Entire length of cable should be marked progressively either by embossing or by punching at every meter so that final position should indicate total drum length of cable.

**5.15 End Marking**

The marking of the running end shall be written on the drum. The 'A' or 'Z' end shall be written on the drum.

The end 'A' means B, Y, R or 1, 2 and 3 anticlock wise direction when looking at cross section of the cable.

The end 'Z' means B, Y, R or 1, 2 and 3 clock-wise direction when looking at cross section of the cable.

5.16 The tenderer shall indicate the source of supply of raw materials / components and forward the test certificates of raw materials / components incorporated in the cables.

5.17 The tenderer shall furnish detailed drawings and basic data assumed in the design.

**5.18 Cable Drum**

The outer width of cable drums shall not exceed 1.25 m.

**5.18.1 Pulling Eye**

A pulling eye per drum shall be provided on the running end of the cable or as per IS1255/1983 amended to date.

5.18.2 Other end of the cable shall be properly sealed with one PVC cap with Polyurethane compound shall be provided as primary sealing and heat-shrink end-cap shall form a secondary sealing over the PVC cap.

5.19 In Annexure 'A' of the specification, the tenderer is required to submit the guaranteed technical particulars. The cable shall be as per our specification regarding essential parameters listed in guaranteed technical particulars. If there is any deviation from our specification or if the tenderer does not furnish all parameters in guarantee technical particulars, no correspondence will be made after opening of the tender and the offer is liable to be overlooked.

5.19.1 Sectional Drawings of the cable must be submitted in duplicate as given in Section 8 of the specification alongwith the offer.

**5.20 Cost Data Sheet:**

As and when required by Undertaking, the bidder shall submit the cost data sheets indicating the break up prices and quantity of each raw material and components along with the unit rates required for manufacturing 1 km length of the offered cable. The cost data sheet format is enclosed herewith.

<b>FORMAT FOR COST DATA</b>					
<b>ITEM: .....Core / .....sq.mm. 11 KV, XLPE cable.</b>					
<b>Sr.No.</b>	<b>Particulars</b>	<b>Unit</b>	<b>Unit Rates (Rs.)</b>	<b>Qty. / Km</b>	<b>Amt.(Rs.)</b>

## **SECTION 6: TESTS**

- 6.1** All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components should also be type tested as per the relevant standards. Following tests shall be necessarily conducted on the 11kV cables in additions to others specified in IS/IEC Standards.

### **TYPE TESTS**

1. Tests on conductor
  - a) Tensile stress
  - b) Wrapping test
  - c) Resistance
2. Tests for armouring wires as per IS:3975:1979.
3. Tests for thickness of insulation and sheath.
4. Physical test for insulation
  - a) Tensile strength and elongation at break
  - b) Ageing in air oven
  - c) Hot test
  - d) Shrinkage test
  - e) Water absorption (gravimetric)
5. Physical test for outer sheath
  - a) Tensile strength and elongation at break
  - b) Ageing in air oven
  - c) Shrinkage test
  - d) Hot deformation
6. Bleeding and blooming test (for outer sheath)
7. Partial discharge test
8. Bending test
9. Dielectric power factor test
  - i) As a function of voltage
  - ii) As a function of temperature
10. Insulation resistance (volume resistivity) test
11. Heating cycle test
12. Impulse withstand test
13. High voltage test
- 14.** Flammability test

### **ACCEPTANCE TESTS**

1. Annealing test (for copper)
2. Tensile test (for aluminium)
3. Wrapping test (for aluminium)
4. Conductor resistance test
5. Test for thickness of Insulation and sheath
6. Hot set test for insulation
7. Tensile strength and elongation at break test for insulation and sheath.
8. Partial discharge test
9. High voltage test and
- 10.** Insulation resistance (volume resistivity) test



- 6.1.1 All the type tests shall be carried out as per clause 19.1 of IS:7098(Part-II)/2011 on atleast 1 drum of each lot. Test certificates shall be submitted along with the lot.
- 6.1.2 All the acceptance tests shall be carried out as per clause 19.2 of IS:7098(Part-II)/2011 on no. of drums as specified in clause A2 of Appendix `A' of IS:7098(Part-II)/2011.
- 6.1.3 All the routine tests shall be carried out on all the drums as per clause 19.3 of IS:7098(Part-II)/2011. Test certificates shall be submitted along with the lot

**6.2 Additional Tests**

In addition to the tests specified above, the purchaser reserves the right of carrying out any inspection or tests at manufacturer's works during al stages of manufacture of the cable, in addition to such inspection and tests as may be considered necessary after laying at site.

Signature of the  
Tenderer \_\_\_\_\_

Date \_\_\_\_\_

## **SECTION 7: DESPATCH INSTRUCTIONS**

- 7.1 The cable shall be securely packed and protected by the contractor. The contractor will be held responsible for the efficiency for the packing and protection to ensure safe transport from the manufacturer's works to the BEST's Kussara / Dharavi Stores, Mumbai.
- 7.2 The cable shall be wound very securely and in an approved manner on non-returnable strong wooden drum which has been treated previously with P.C.P. or with other fungicides to ensure long life of the drums in tropical climates and which shall be specifically suited for transport.
- Alternatively tenderer may offer cable wound on M.S. steel drum which can be returnable after use. Steel drum should be of collapsible design for easy transportation but otherwise with the same dimensions as of wooden drums. Detail drawings of the steel drum increase/decrease in cost per km. of cable on account of steel drum should be separately given alongwith credit on returning of the drum.
- 7.3 The drum shall be fitted with spindle plates. It should be ensured that screw holding the spindle plate to planks shall not be fixed on the joints of two planks. Drums may be made with nails provided that any nail which come through into the cable space shall be properly and efficiently clinched.
- 7.4 The drums shall be effectively lagged with stout close fitting battens so as to effectively prevent damage to the cable during transit or storage.
- 7.5 Both ends of the cable on each drum shall be easily accessible for testing and if brought through the drum face, shall be protected by a steel cover plate (or plates) rigidly fixed to the drum face with screw or nails.
- 7.6 The two cable ends shall be so fastened and secured to the drums that during process of transit, rolling etc. the cable does not get loosened or displaced.
- 7.7 If the ends are left inside the drums, the batten or battens which are necessary to be removed to obtain access to the ends, must be marked clearly with red paint.
- 7.8 An arrow shall be painted in indelible paint on both sides of the drum to indicate the direction in which the drum should be rolled.
- 7.9 All drums shall be stencilled in indelible paint as follows:

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7.10 The following information shall be painted on both the sides of each drum and also be embossed on at least two metal labels on each side of the drum:

- i) Type of the cable and voltage for which it is suitable.
- ii) Size
- iii) Number of cores
- iv) Length - Metres
- v) Drum Number
- vi) Gross Weight
- vii) Net Weight
- viii) Year of manufacture
- ix) Name of manufacturer
- x) Trade mark, if any
- xi) Water swellable tape Provided.

The drum shall also be marked with I.S.I. certificate mark.

7.11 Each drum shall have clearly stencilled on it in good paint "NOT TO BE SLUNG EXCEPT BY BAR THROUGH THE CENTRE" and in addition it should be marked "STORE AWAY FROM BOILERS".

7.12 The length of cable in each drum shall be 500 mtrs for 3C/50 sq.mm. cable and 250 mtrs for 3C/240 sq.mm. cable.

7.13 A tolerance not exceeding +/- 5% shall be permitted on standard drum length.

## **SECTION 8: DRAWINGS & DOCUMENTS**

Following documents shall be prepared based on the BEST specifications and statutory requirements and shall be submitted with the bid:

- a) Completely filled-in Guaranteed Technical Particulars in format specified by BEST in Annexure 'A' of specification.
- b) General description of the equipment and all components including brochures.
- c) Type test Certificates.
- d) Experience List.
- e) Cross sectional Diagram of the cable

### **Drawings/Documents to be submitted after the award of the contract:**

<b>Sr. No.</b>	<b>Description</b>	<b>For approval</b>	<b>For review information</b>	<b>Final Submission</b>
<b>1</b>	Guaranteed Technical Particulars	√		√
<b>2</b>	Manual/Catalogues		√	
<b>3</b>	Cross sectional drawing		√	√
<b>4</b>	Dimensional drawing for pulling eye		√	√
<b>5</b>	Fault level calculation for armour and copper tape screen		√	√
<b>6</b>	Technical details and test certificate of XLPE compound		√	√
<b>7</b>	Armour coverage calculation		√	√
<b>8</b>	Installation instructions		√	√
<b>9</b>	Type test certificate	√	√	√
<b>10</b>	List and address of raw material suppliers and purchase details as per annexure II		√	√

All the documents shall be in English language.

The drawings shall be to scale and fully detailed. All important dimensions shall be given and the material of each component shall be indicated.

All the above mentioned drawings/documents are required to be submitted and get approved from the Divisional Engineer, Planning materials, within 15 days from the placement of purchase order.

## **SECTION 9: PRICES, DELIVERY & VALIDITY**

### **9.1 Prices**

- 9.1.1 The tenderer should quote the prices with IEEMA price variation without ceiling applicable for copper / aluminium (as applicable) conductor XLPE insulated 3.3kV to 33kV power cables (Please refer clause no.2.7 of Conditions of Tender) and shall be for free delivery by road transport to our Kussara Stores, Mazagaon, Mumbai / Dharavi / Wadala-Anik Depot, including arrangement for unloading of the same and stacking them at the proper place. The prices shall include transit insurance, but shall be exclusive of Excise Duty, S.T./ C.S.T. and Octroi wherever applicable, the percentage of which should be clearly stated. The Ex-works prices shall be mentioned for the purpose of charging Excise Duty.
- 9.1.2 These goods are meant for use in generation/ distribution of electrical energy. Form `E/C' is applicable and the tenderers should indicate the exact sales tax that will be charged against issue of Form `E/C' by us.
- 9.1.3 It will be the responsibility of the manufacturer for safe transport of all Meters including arrangement for unloading and keeping the same at proper place. The freight charges, insurance and unloading charges shall be clearly quoted in the Schedule of prices and delivery. The offers of tenderers, who quote only Ex-Works prices will be overlooked.

### **9.2 Delivery**

- 9.2.1 The delivery of the cable shall be made in two phases with gap of approx. 6 to 9 months between both the phases. The delivery of 1<sup>st</sup> phase shall commence within 8 weeks from the date of receipt of our Purchase Order and be completed @ \_\_\_\_\_ meters per month.
- 9.2.2 The delivery schedule given above is tentative and may be revised by us at our option. However, notice of 30 to 40 days would be given for the change in delivery schedule. Therefore, the tenderers shall specifically confirm that they would agree to our deferred delivery schedule.
- 9.2.3 Before delivering each lot as specified above, tenderers shall offer these lots for inspection and testing at your works. In this connection, they shall give an advance intimation of 15 days to our Divisional Engineers (Planning – Materials) at Veej Bhavan, Backbay Reclamation, Gen. Jagannath Bhosale Marg, Mumbai – 400 021, ***along with the following documents***, who will arrange to depute Engineers to their works for inspection and testing.
- 1) Inspection call mentioning the quantity, lot no. & month corresponding to delivery schedule given by the Undertaking.
  - 2) Routine test & acceptance test reports.
  - 3) Packaging details.

### **9.3 Validity**

The offer should be valid upto \_\_\_\_\_. The offers with lesser validity period may be overlooked.

## **SECTION 10: TERMS OF PAYMENT**

- a) All bills (in duplicate) shall be addressed to the Assistant General Manager (Materials), for the exact quantities of the materials accepted by the Undertaking and for such bills submitted 95% payment within 30 days from the date of acceptance of materials or on the 8<sup>th</sup> day from the date of submission of tax invoice, whichever is later.

**AND**

- b) 5% balance payment after expiry of guarantee period i.e. 12 months from the date of installation but not later than 15 months from the date of acceptance of material.

KINDLY NOTE THAT OFFERS WITH ADVANCE PAYMENT CONDITIONS SUCH AS PAYMENT AGAINST DELIVERY, PAYMENT AGAINST DOCUMENTS THROUGH BANK AND ALSO ACCEPTING RISK PURCHASE AND LIQUIDATED DAMAGES CLAUSE AND WITH LESSER VALIDITY PERIOD ARE LIABLE TO BE OVERLOOKED.

**Annexure 'A'**

**SCHEDULE OF GUARANTEED PERFORMANCE  
AND OTHER PARTICULARS**

(Must be filled in by the tenderer in given format only.)

**1) 11KV, 3C x 50 sq.mm., COPPER CONDUCTOR XLPE CABLE.**

The particulars given in this schedule will be binding upon the tenderer and must not be departed from without the written permission of the General Manager.

Sr. No.	Particulars	As specified by BES&T	As furnished by Bidders
1	Voltage grade	11 kV	
2	Type of cable	2XWY	
3	Make of cable	To be furnished by bidder	
4	I.S. or other standard specification to which the cable is manufactured.	To be furnished by bidder	
5	Conductor		
	a) Material	high conductivity annealed copper wires conforming to IS:8130/1984	
	b) No. of cores and size in sq.mm.	3C X 50	
	c) No. of wires and dia. of each wire	6 min / dia. to be furnished by bidder	___Nos./ ___mm
	d) Shape of conductor	Stranded compacted circular	
	e) calculated dia. of stranded conductor	To be furnished by bidder	
6	Conductor screening	Extruded semiconducting compound (min. thickness 0.5 mm)	
7	Core identification	As per IS:7098(part II)/2011	
8	Insulation		
	a) Material	XLPE insulation as per IS7098 (part II)/2011	
	b) Nominal thickness	3.6 mm	
	c) Calculated dia. over insulation in mm	To be furnished by bidder	
9	Type of curing process	Dry curing	
10	Average specific inductive capacity of complete dielectric.	To be furnished by bidder	
11	Minimum volume resistivity of insulation	$1 \times 10^{14} \Omega\text{-cm}$ at $27^{\circ} \text{C}$	
12	Max. thermal resistivity of dielectric in electrical measure (difference in C between opposite faces of a cm. cube of the dielectric to cause transference of 1 watt of heat)	$650^{\circ}\text{C Cm/W}$	
13	Max. dielectric power factor at rated voltage	0.004	
14	<b>Details screening over insulation</b>		
	a) <u>Non Metallic extruded semiconducting Material</u>		
	Thickness in mm	To be furnished by bidder	
		0.5 mm	
	b) <u>Water swellable</u>		
	Thickness in mm	Approx. 0.3 mm	
	Approx. Weight in gms/sqm.	Approx. 118 gms/sqm.	
	Swell height	$\geq 12\text{mm}$ in 1 min.	
	Make & grade	To be furnished by bidder	

Sr. No.	Particulars	As specified by BES&T	As furnished by Bidders
	c) <u>Metallic tape</u> Material Thickness (mm) Width of tape (mm) Overlap	Copper 0.1 +/- 5% 50 mm 20%	
15	Thickness of inner sheath	0.5 mm (min)	
16	Material used for inner sheath	PVC type ST2 as per IS:5831/1984 applied with extrusion process.	
17	Calculated diameter of cable over inner sheath	To be furnished by bidder	
18	Additional polyester strip for identification provided	Yes / No	
	<b>Armouring</b>		
19	a) Type and Size (i.e. Nominal dia of armour wire)	To be furnished by bidder	
	b) No. of armour wires	To be furnished by bidder	
	c) Armour lay angle	To be furnished by bidder	
	d) % armour covering	As per IS:7098(Part-II)/2011	
20	Calculate diameter of cable over armouring	To be furnished by bidder	
21	Thickness of outer sheath	To be furnished by bidder	
22	Material and Colour of outer sheath	PVC type ST2 as per IS:5831/1984 and <b>Blue</b> in Colour	
23	Calculate overall diameter of cable	To be furnished by bidder	
24	Max. thermal resistivity of inner sheath in electrical measure (difference in c between opposite faces of a cm cube of the dielectric to cause transference of 1 watt of heat).	650°C Cm/W	
25	Max. thermal resistivity of outer sheath in electrical measure (difference in c between opposite faces of a cm cube of the dielectric to cause transference of 1 watt of heat).	650°C Cm/W	
26	Weight of copper in each length of 1000 mtrs. of cable in Kgs.	To be furnished by bidder	
27	Total weight of each drum length of cable in Kgs.	To be furnished by bidder	
28	Total length of cable for each drum in mtrs.	500 ± 5%	
29	Total weight of each drum length of cable with drum in Kgs.	To be furnished by bidder	
30	Size of each drum (Flange x Barrel x Traverse) in mm.	To be furnished by bidder	
31	Nos. of years the design of the cable offered is in service.	To be furnished by bidder	
32	Continuous safe current carrying capacity for following conditions for a single cable. a) Ground temp. 30° C. b) Thermal resistivity of soil 120° C cm/w. c) Depth of laying 1070 m.	To be furnished by bidder	
33	Continuous current rating in air.	To be furnished by bidder	
34	Permissible temp. rise of the conductor for continuous capacity.	To be furnished by bidder	



<b>Sr. No.</b>	<b>Particulars</b>	<b>As specified by BES&amp;T</b>	<b>As furnished by Bidders</b>
35	Current density under conditions stipulated in 31 above.	To be furnished by bidder	
36	Insulation resistance Meg-Ohms per 1000 mtrs. of finished cable at 20° C.	To be furnished by bidder	
37	Conductor resistance Ohms per 1000 mtrs. of finished cable at 20° C.	0.387 (Max)	
38	Specific inductive capacity microfarads per 1000 mtrs. of finished cable at 20° C.	To be furnished by bidder	
39	Impulse level.	To be furnished by bidder	
40	Positive sequence impedance of cable per 1000 mtrs. in ohms.	To be furnished by bidder	
41	Negative sequence impedance of cable per 1000 mtrs. in ohms.	To be furnished by bidder	
42	Zero sequence impedance of cable per 1000 mtrs. in ohms.	To be furnished by bidder	
43	Max. allowable asymmetrical fault current to each for 1 second.	To be furnished by bidder	
44	Max. allowable symmetrical short circuit current for 1 sec.	To be furnished by bidder	
45	Weight of XLPE insulating in each length of 1000 mtrs. of cable in Kg.	To be furnished by bidder	
46	Weight of insulation (inner sheath) in each length of 1000 mtrs. of cable in Kg.	To be furnished by bidder	
47	Weight of insulation (outer sheath) in each length of 1000 mtrs. of cable in Kg.	To be furnished by bidder	
48	Weight of armour in each length of 1000mtrs. of cable in Kg.	To be furnished by bidder	
49	Weight of other insulating / filling material (excluding insulating material mentioned in Sr.Nos.46, 47 & 48) used in each length of 1000 mtrs. of cable in Kg.	To be furnished by bidder	
50	Outer width of each cable drum.	1.25 mtrs (Max)	
51	Diameter of each cable drum.	To be furnished by bidder	
52	Details of Type test certificates of NABL accredited laboratory submitted.	To be furnished by bidder	

Signature of the Tenderer \_\_\_\_\_

Date \_\_\_\_\_

**2) 11KV, 3C x 240 sq.mm. ALUMINIUM CONDUCTOR XLPE CABLE.**

The particulars given in this schedule will be binding upon the tenderer and must not be departed from without the written permission of the General Manager.

Sr. No.	Particulars	As specified by BES&T	As furnished by Bidders
1	Voltage grade	11 kV	
2	Type of cable	A2XWY	
3	Make of cable	To be furnished by bidder	
4	I.S. or other standard specification to which the cable is manufactured.	To be furnished by bidder	
5	<b>Conductor</b>		
	a) Material	high conductivity H2 grade Aluminium conforming to IS:8130/1984	
	b) No. of cores and size in sq.mm.	3C X 240	
	c) No. of wires and dia. of each wire	37 min / to be furnished by bidder	____ Nos./ ____ mm
	d) Shape of conductor	Stranded compacted circular	
	e) Calculated dia. of Stranded Conductor	To be furnished by bidder	
6	<b>Conductor screening</b>	Extruded semiconducting compound (min. thickness 0.5 mm)	
7	Core identification	As per IS:7098(part II)/2011	
8	<b>Insulation</b>		
	a) Material	XLPE insulation as per IS7098 (part II)/2011	
	b) Nominal thickness	3.6 mm	
	c) Calculated dia. over insulation	To be furnished by bidder	
9	Type of curing process	Dry curing	
10	Average specific inductive capacity of complete dielectric.	To be furnished by bidder	
11	Minimum volume resistivity of insulation	$1 \times 10^{14} \Omega\text{-cm}$ at 27° C	
12	Max. thermal resistivity of dielectric in electrical measure (difference in C between opposite faces of a cm. cube of the dielectric to cause transference of 1 watt of heat)	650°C Cm/W	
13	Max. dielectric power factor at rated voltage	0.004	
14	<b>Details screening over insulation</b>		
	a) <u>Non Metallic extruded semiconducting</u> Material	To be furnished by bidder	
	Thickness in mm.	0.5mm	
	b) <u>Water swellable</u> Thickness in mm Approx. Weight in gms/sqm. Swell height Make & grade	Approx. 0.3 mm Approx. 118 gms/sqm. ≥ 12mm in 1 min. To be furnished by bidder	

Sr. No.	Particulars	As specified by BES&T	As furnished by Bidders
	c) <u>Metallic tape</u> Material Thickness (mm) Width of tape (mm) Overlap	Copper 0.1 +/- 5% 50 mm 20%	
15	Thickness of inner sheath	0.7 mm (min)	
16	Material used for inner sheath	PVC type ST2 as per IS:5831/1984 applied with extrusion process.	
17	Calculated diameter of cable over inner sheath	To be furnished by bidder	
18	Additional polyester strip for identification provided	Yes / No	
	<b>Armouring</b>		
19	a) Type and Size (i.e. Nominal dia of armour wire)	To be furnished by bidder	
	b) Approx. No. of armour wires	To be furnished by bidder	
	c) Armour lay angle	To be furnished by bidder	
	d) % armour covering	As per IS:7098(Part-II)/2011	
20	Calculate diameter of cable over armouring	To be furnished by bidder	
21	Thickness of outer sheath	To be furnished by bidder	
22	Material and Colour of outer sheath	PVC type ST2 as per IS:5831/1984 and <b>Blue</b> in Colour	
23	Calculate overall diameter of cable	To be furnished by bidder	
24	Max. thermal resistivity of inner sheath in electrical measure (difference in c between opposite faces of a cm cube of the dielectric to cause transference of 1 watt of heat).	650°C Cm/W	
25	Max. thermal resistivity of outer sheath in electrical measure (difference in c between opposite faces of a cm cube of the dielectric to cause transference of 1 watt of heat).	650°C Cm/W	
26	Weight of aluminium in each length of 1000 mtrs. of cable in Kgs.	To be furnished by bidder	
27	Total weight of each drum length of cable in Kgs.	To be furnished by bidder	
28	Total length of cable for each drum in mtrs.	250 ± 5%	
29	Total weight of each drum length of cable with drum in Kgs.	To be furnished by bidder	
30	Size of each drum (Flange x Barrel x Traverse) in mm.	To be furnished by bidder	
31	Nos. of years the design of the cable offered is in service.	To be furnished by bidder	
32	Continuous safe current carrying capacity for following conditions for a single cable. a) Ground temp. 30° C. b) Thermal resistivity of soil 120° C cm/w. c) Depth of laying 1070 m.	To be furnished by bidder	

<b>Sr. No.</b>	<b>Particulars</b>	<b>As specified by BES&amp;T</b>	<b>As furnished by Bidders</b>
33	Continuous current rating in air.	To be furnished by bidder	
34	Permissible temp. rise of the conductor for continuous capacity.	To be furnished by bidder	
35	Current density under conditions stipulated in 31 above.	To be furnished by bidder	
36	Insulation resistance Meg-Ohms per 1000 mtrs. of finished cable at 20° C.	To be furnished by bidder	
37	Conductor resistance Ohms per 1000 mtrs. of finished cable at 20° C.	0.125 (Max)	
38	Specific inductive capacity microfarads per 1000 mtrs. of finished cable at 20° C.	To be furnished by bidder	
39	Impulse level.	To be furnished by bidder	
40	Positive sequence impedance of cable per 1000 mtrs. in ohms.	To be furnished by bidder	
41	Negative sequence impedance of cable per 1000 mtrs. in ohms.	To be furnished by bidder	
42	Zero sequence impedance of cable per 1000 mtrs. in ohms.	To be furnished by bidder	
43	Max. allowable asymmetrical fault current to each for 1 second.	To be furnished by bidder	
44	Max. allowable symmetrical short circuit current for 1 sec.	To be furnished by bidder	
45	Weight of XLPE insulating in each length of 1000 mtrs. of cable in Kg.	To be furnished by bidder	
46	Weight of insulation (inner sheath) in each length of 1000 mtrs. of cable in Kg.	To be furnished by bidder	
47	Weight of insulation (outer sheath) in each length of 1000 mtrs. of cable in Kg.	To be furnished by bidder	
48	Weight of armour in each length of 1000mtrs. of cable in Kg.	To be furnished by bidder	
49	Weight of other insulating / filling material (excluding insulating material mentioned in Sr.Nos.46, 47 & 48) used in each length of 1000 mtrs. of cable in Kg.	To be furnished by bidder	
50	Outer width of each cable drum.	1.25 mtrs (Max)	
51	Diameter of each cable drum.	To be furnished by bidder	
52	Details of Type test certificates of NABL accredited laboratory submitted.	To be furnished by bidder	

Signature of the Tenderer \_\_\_\_\_

Date \_\_\_\_\_

**Annexure 'E'**

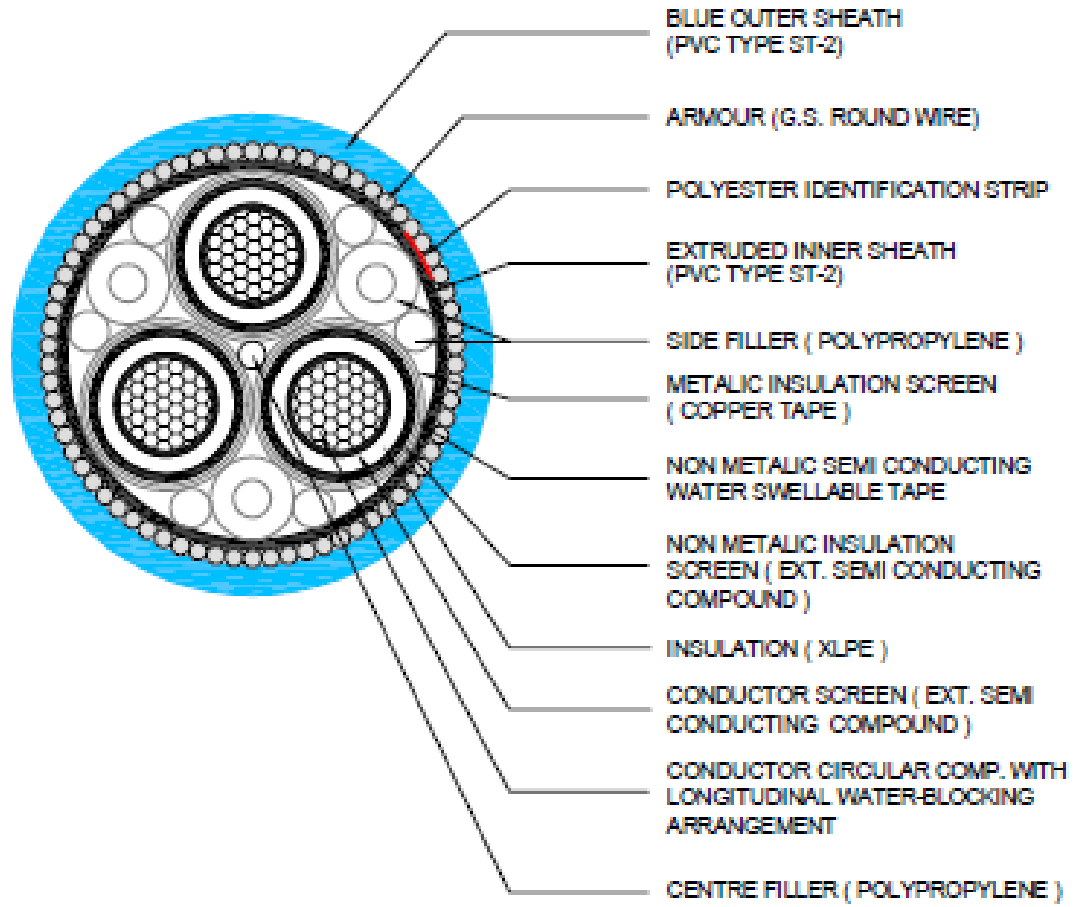
**SCHEDULE OF DEPARTURES FROM SPECIFICATION**

Tenderer shall mention in this schedule all departures from the various sections of the specification. In the absence of any mention in this schedule, the sections of this specification shall be binding on the tenderers.

Sr.No.	Reference to section No. of specification	Departures

Signature of the  
Tenderer \_\_\_\_\_

Date \_\_\_\_\_



**नियोजन (नेटवर्क) विभाग**

**बृहन्मुंबई विद्युत पुरवठा व परिवहन उपक्रम**

बीको वीक पल

(पुणेक कलंक 11KV, 33KV वीको)

कलक वकलकलक वीको वीक, मुंबई-400002.

**TYPICAL DIAGRAM OF 11KV  
3 CORE XLPE POWER CABLE**

वरीकल B.G.M-FATHE	क-वरीकल	नकलशल कुरलंक : SK/PL - (2013) 299					
वरीकल वरीकल	कलकलक वरीकल/ वरीकल	कलकलक	कलकलक	वरीकल कलकलक	कुरलक कलकलक	क- कलकलक	कलकलक/ कलकलक
कुरलक वरीकल	नलकलकलक वरीकल नलकलक		A				
कलकलक- N.T.S.	नलकलक : 22.11.13		B				
			C				

UPDATION STATEMENT\_3/OUTPUT STATEMENT/ASHAWHI M/CAD/TYPICAL DIAGRAM\_1

## Annexure – H

### Details of sub-vendors for critical items

Tenderer shall submit details of sub-vendors for the critical items listed below, which can be verified at any stage after award of the contract.

Sr.No.	Description of material	Details of sub-vendor
1	XLPE compound	
2	Semi-conducting compound	
3	Conductor water-blocking tapes/ yarn/ powder	
4	Water swellable tapes	
5	E.C. Grade Aluminium rod	
6	E.C. Grade Copper rod	
7	Aluminium Alloy	
8	G.S. Wires/ strips	
9	PVC compound	
10	PVC Resin	
11	Copper tape (for screening)	
12	P.P. Fillers	