

138-1:2020

CEB  
SPECIFICATION

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**MEDIUM VOLTAGE  
AERIAL BUNDLED CONDUCTORS  
(95 mm<sup>2</sup> and 150 mm<sup>2</sup>)**



**CEYLON ELECTRICITY BOARD  
SRI LANKA**



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## SPECIFICATION FOR MEDIUM VOLTAGE AERIAL BUNDLED CONDUCTORS (95 mm<sup>2</sup> and 150 mm<sup>2</sup>)

### 1. SCOPE

This specification covers the general requirements of the design, manufacturing and testing of under mentioned medium voltage Aerial Bundled Conductors.

1. 11kV XLPE Insulated Three Core Aerial Bundled Conductors – 95 mm<sup>2</sup>
2. 11kV XLPE Insulated Three Core Aerial Bundled Conductors – 150 mm<sup>2</sup>
3. 33kV XLPE Insulated Three Core Aerial Bundled Conductors – 95 mm<sup>2</sup>
4. 33kV XLPE Insulated Three Core Aerial Bundled Conductors – 150 mm<sup>2</sup>

The procurement entity shall prescribe one of the above categories in price schedule indicating the cable size and any other extra options.

### 2. SYSTEM PARAMETERS

(a)	Nominal voltage (U)	11 kV	33 kV
(b)	System highest voltage (U <sub>m</sub> )	12 kV	36 kV
(c)	System frequency	50 Hz	50 Hz
(d)	Method of earthing	Resistively/ Effectively earthed	Resistively /Effectively earthed
(e)	Maximum system fault current/duration	12.5 kA/ 1 second	17.6 kA/ 1 second

**Note:** This specification only provides for MV networks downstream of grid substations having maximum of three transformers parallel.

### 3. SERVICE CONDITIONS

(a)	Annual average ambient temperature	30 °C
(b)	Maximum ambient temperature	40 °C
(c)	Maximum relative humidity	90%
(d)	Environmental conditions	Humid tropical climate with heavily polluted atmosphere
(e)	Operational altitude	From M.S.L. to 1900 m above M.S.L.
(f)	Isokeraunic (Thunder days) level	100 days
(g)	Solar Radiation	4.5 kWh/m <sup>2</sup> /day



#### 4: APPLICABLE STANDARDS

The equipment and components supplied shall be in accordance with the latest editions of the standards specified below and amendments thereof.

(a)	BS 6622:2007	Electric cables. Armoured cables with thermosetting insulation for rated voltages from 3.8/6.6 kV to 19/33 kV. Requirements and test methods
(b)	IEC 60502-2:2014	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) – Part 2: Cables for rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)
(c)	BS EN60228:2005 IEC 60228:2004	Conductors of insulated cables
(d)	BS EN/IEC 60811 - 201,202,203,501:2012	Electric and optical fiber cables - Test methods for non-metallic materials - Part 201: General tests - Measurement of insulation thickness, Part 202: General tests - Measurement of thickness of non-metallic sheath, Part 203: General tests - Measurement of overall dimensions, Part 501: Mechanical tests - Tests for determining the mechanical properties of insulating and sheathing compounds
(e)	BS EN/IEC 60229: 2007	Electric cables - Tests on extruded over sheaths with a special protective function
(f)	IEC 60949:1988	Calculation of thermally permissible short-circuit currents, taking into account non-adiabatic heating effects
(g)	BS 183:1972	Specification for general purpose galvanized steel wire strand
(h)	BS EN 10244-2:2009	Steel wire and wire products. Non-ferrous metallic coatings on steel wire. Zinc or zinc alloy coatings
(i)	BS 2627:1970	Wrought Aluminium for Electrical Purpose

Material conforming to other International Standards which are equal to or higher but not less stringent than the Standards stipulated above may be offered. When such alternative Standards are used, reference to such Standards shall be quoted and English language copies of such Standards shall be provided with the offer.

**However, in the event of discrepancy, details given in this CEB specification supersede above standards.**



## 5: BASIC FEATURES

Aerial Bundled Conductor shall comprise of three numbers of phase cores and a steel messenger core. Three cores and the messenger shall be twisted together with right-handed lay (Z-lay) direction.

Maximum design electrical stress shall be such that purity of raw materials, manufacturing conditions and ageing of cables has been taken into account. Maximum design stress shall not be more than 5kV/mm. Minimum designed withstand fault current and duration for conductors shall be as follows:

Conductor Size	Minimum fault current/duration
95mm <sup>2</sup>	9 kA/ 1 second
150mm <sup>2</sup>	14.2 kA / 1 second

The technical requirements of the medium voltage Aerial Bundled Conductors (ABC) shall be in accordance with the following table.

Technical Feature	11kV ABC	33 kV ABC
<b>1. Design</b>	The cable shall be designed to a maximum operating temperature of 90 °C and a maximum short circuit temperature of 250 ° C.	
<b>2. Phase Conductor</b>		
(a) Material	Phase conductor shall be of Plain Aluminium manufactured in accordance with BS 2627.	
(b) Type	Circular Compacted Aluminium with cross sectional areas of 95 mm <sup>2</sup> and 150 mm <sup>2</sup> . The number of strands shall be in accordance with BS EN/IEC 60228.	
(c) Resistance of each conductor at 20°C	As per BS EN / IEC 60228.	
<b>a. Conductor Screen</b>		
(a) Type	Extruded Semi-conducting Compound type. The extruded layer shall be continuous and shall cover the surface of the conductor completely. The Conductor Screen shall be applied in the same operation as the insulation and shall be fully bonded to the insulation.	
(b) Volume resistivity	Shall not exceed 500 Ω.m at 90 °C when measured in accordance with Annex J of BS 6622:2007 or Annex D of IEC 60502-2:2014 as applicable.	



Technical Feature	11kV ABC	33 kV ABC
(c) Thickness	Shall be in accordance with BS 6622:2007 or IEC 60502-2:2014 standards.	
<b>b. Insulation</b>		
(a) Type	XLPE and shall be applied by extrusion and cross-linked to form a compact and homogeneous layer in accordance with the standards specified.	
(b) Nominal thickness as per BS 6622	3.4 mm	8.0mm
<b>c. Insulation Screen</b>		
(a) Type	Non-metallic semi-conducting layer having a resistivity not exceeding 500-ohm meter at 90 ° C, in combination with metallic layer. The extruded layer shall be continuous and shall cover the surface of the insulation completely. The insulation screen shall be cold strippable.	
(b) Thickness	Shall be in accordance with BS 6622:2007 or IEC 60502-2:2014 standards.	
<b>d. Metallic Screen</b>		
(a) Type	Each Core shall be covered with Copper Tape or wire Screen as per BS 6622:2007.	
(b) Fault current withstand capability	The cross-sectional area of the metallic screen of each core shall be able to withstand minimum of 3 kA fault current over 1 second.  Manufacturer shall prove the fault current withstand capability using adiabatic equation specified in IEC 60949.	
<b>e. Longitudinal Water Barrier</b>		
Construction	Non-Conducting water barrier swelling tape over metallic screen shall be provided to protect against longitudinal water penetration. Materials of the water barrier shall be suitable for the operating temperature of the cable and compatible with the insulating materials. When choosing the material for the metallic layer, special consideration should be given to the possibility of corrosion, with regard to mechanical safety as well as electrical safety.  Conditions of cable hang above the ground in tropical humid conditions should be considered.	



Technical Feature	11kV ABC	33 kV ABC
<b>f. Oversheath</b>		
(a) Construction	Oversheath shall be comprised of two sections as Inner Sheath and Outer Sheath. The combined inner and outer sheath shall withstand the DC voltage test in accordance with the relevant BS 6622 standard. This test shall be carried out on each delivery length.	
(b) Inner Sheath	The inner sheath shall be of PVC-ST2 as per IEC 60502-2 or PVC Type 9 as per BS 6622 and shall be suitable for the maximum operating temperature in accordance with the design requirements stipulated in item 1. The colour of the inner sheath shall be black. The mean value of the thickness shall not be less than 1.0 mm.	
(c) Outer Sheath	The outer sheath shall be of High-Density Polyethylene (HDPE – ST 7) and Black in colour (Ultraviolet - UV resistant). The mean value of the thickness shall not be less than 1.0 mm. The outer sheath shall be embossed with figures 1, 2, 3 or Ribs. When Ribs are provided to identify cores, they shall be so made to enable workmen to identify the cores easily.	
<b>g. Coatings</b>	A coating of Graphite shall be applied over the oversheath to carry out D.C. Voltage Test.	
<b>3. Messenger Wire</b>		
(a) Construction	Messenger shall bear the weight of the conductor with the support of hardware accessories and shall prevent the stretching of the conductor.	
(b) Material	Material of the messenger shall be circular compacted galvanized steel.	
(c) Cross Section	50 mm <sup>2</sup>	
(d) Minimum Breaking Load	49 kN for 95 mm <sup>2</sup> conductor 62 kN for 150 mm <sup>2</sup> conductor	
(e) Insulation	The insulation shall be of High-Density Polyethylene (HDPE-ST7) and UV resistant. The colour of the insulation shall be black. The mean value of the thickness shall not be less than 1.0 mm and compliance shall be checked by carrying out tests given in the relevant BS standards.	

Note: The conductor screen, the insulation and the non-metallic insulation screen shall be extruded simultaneously in a triple extrusion process to prevent forming any air voids and prevent allowing dust. The insulation screen shall be cold strippable.



## 6: REQUIREMENTS FOR SELECTION

### 6.1. Quality Assurance

The manufacturer shall possess ISO 9001:2015 or latest Quality Assurance Certification valid throughout the delivery period of this bid, for the manufacture of XLPE Insulated medium voltage Aerial Bundled Conductors for the plant where manufacturing is being done. The Bidder shall furnish a copy of the ISO certificate certified as true copy of the original by the manufacturer, along with the offer.

### 6.2. Manufacturing Experience

The manufacturer shall have minimum of eight (8) years experience in manufacturing XLPE Insulated medium voltage Aerial Bundled Conductors. In addition, minimum of five (5) years experience shall be in manufacturing for orders from outside the country of the manufacturer. The product offered has to be in same voltage range of offered item and shall have been used in service utilities over past 5 years.

If the manufacturer has supplied similar items to CEB for the last five (5) years with proven sales records; without any adverse performance records, such manufacturers will be exempted from above requirements.

### 6.3. Type Tests

The following Type Test Certificates conforming to the BS 6622:2007 or any other international standard which is not less stringent, issued by:

Either

- (a) an accredited independent testing laboratory acceptable to the CEB or
- (b) an accredited or independent testing laboratory acceptable to the CEB where the type tests have been witnessed by CEB or a reputed independent body acceptable to CEB

shall be furnished with the offer. Type Test Certificates shall clearly indicate the relevant standard, items concerned, showing the manufacturers identity, type No. /catalogue No. and basic technical parameters. In case if the submitted type tests are according to any other international standard which is not less stringent than the specified, then the copy of the used standard in English shall be submitted with offer.

Proof of accreditation and accredited scope by a national/ international authority shall be





forwarded with the offer. Test certificates shall be complete including all the pages as issued by the testing authority. Type test certificates shall be in English language. Parts of test certificates shall not be acceptable.

If cables type tested for IEC standards are offered, such cables will be accepted with a condition that the tests which are not covered or less stringent than BS 6622:2007 shall be performed at pre-shipment inspection as an acceptance criteria. In case any standard other than BS 6622:2007 is followed for testing full test procedure of that standard shall be furnished with the offer.

Electrical Type tests done on Cables subject to the following conditions will be acceptable. Type tests performed on any other cable will not be accepted.

- (a) The type tested cable should have same insulation material, same form of semi-conductor screen, same manufacturing process. The conductor material will not be a limitation.
- (b) Type tested cable should be of equal or higher voltage designation over the offered cable.
- (c) With regard to the Cross-sectional area of the cables offered, Clause G.3 of Annex G of BS 6622:2007 shall apply.
- (d) Type test done for three core cables will be accepted as type test for single core cables but type test for single core cable is acceptable only for the single core cable.

### 6.3.1. Type Tests for Phase Conductors

#### Electrical Tests

- (a) Partial Discharge Test
- (b) Bending Test
- (c) Tan  $\delta$  in Relation to Voltage
- (d) Tan  $\delta$  in Relation to Temperature
- (e) Heating Cycle Test
- (f) Impulse Voltage Test
- (g) Four-hour Voltage Test
- (h) Adherence of screens at short circuit temperature



- (i) Resistance of the cable at 20°C

#### **Material Tests**

- (a) Conductor Screen Resistivity
- (b) Insulation Material
- (c) Insulation Screen Resistivity
- (d) Insulation Screen Cold Strippability
- (e) Semi-conducting Lapped Inner covering Resistance
- (f) Separation Sheath Material
- (g) Tests on Armour
- (h) Tests on Over Sheath Material
- (i) Compatibility Test
- (j) Test under Fire Conditions

#### **6.3.2. Type Tests for Messenger Wires conforming to BS 183, BS EN 10244-2**

- (a) Mass of zinc coating
- (b) Adhesion of zinc coating
- (c) Wrapping Test
- (d) Ultimate tensile strength of the messenger

### **7. INFORMATION TO BE FURNISHED WITH THE OFFER**

The following shall be furnished with the offer.

- (a) Following technical details in English clearly identifying the offered items, but not limited to:

- (i) Comprehensive catalogues.
- (ii) Dimensional drawings.
- (iii) Schematic diagrams.
- (iv) Calculations, graphs and tables.
- (v) Operational literature.
- (vi) Calculations to prove metallic screen can withstand specified earth fault current.

- (b) Documentary evidence on following:



- (i) Maximum design electrical stress (taking purity of raw materials, manufacturing conditions and ageing of cables into account).
  - (ii) Purity of raw materials.
  - (iii) Control of extrusion process to achieve smooth extruded surfaces, homogenous extrudates and prevention of void formations.
- (c) ISO 9001:2015 or latest Quality Assurance Certificate in accordance with clause 6.1.
- (d) Manufacturer shall furnish a list of supplies with supplied item, purchaser (specifying address contact persons and contact details, country), year & quantity to prove his manufacturing experience and outside the country sales in accordance with Clause 6.2.
- (e) Type Test Certificates in accordance with the clause 6.3.
- (f) Duly filled and signed 'Annex - B: Schedule of Technical Requirements and Guaranteed Technical Particulars'.

Not furnishing above documents and details may result in offer being rejected.

## 8. PERFORMANCE GUARANTEES AND WARRANTY

Manufacturer should provide CEB a warranty ensuring that cables supplied meet the specification and any defected cable shall be replaced without extra cost during the first year after the final delivery to CEB stores.

## 9. SAMPLES

Two specimen samples of length 0.5 meter from offered category shall be supplied with the offer.

If the size of the conductor specified in the bid is not available with the manufacturer at the time of submitting the samples the manufacturer may submit a sample closest to the size of the conductor specified.

## 10. SPARES

Not Applicable.

## 11. PACKING AND LABELING/MARKING

### 11.1. Packing

The cables shall be supplied in non-returnable drums. Drums shall be made of steel and



suitably protected against corrosion. A polythene lining shall be provided to prevent any damage to cable from the chemicals used for preservation of drum.

The drum shall be lagged with closely fitted battens to protect cable from damage. The ends of cables shall be sealed with heat shrinkable caps to prevent the ingress of moisture during transportation and storage. The preferred length of cable per drum shall be 300 meters subject to a maximum gross drum weight of 5 MT. The cable length per drum shall not vary more than  $\pm 2\%$ .

The final packing requirements for the overall consignment are given in bid document.

## 11.2. Identification and Labeling/Marking

The word "CEB", voltage rating as  $U_0/U (U_m)$ , size of the cable, standard adopted, conductor size, year of manufacture, manufacturer's name or trade mark and travel length shall be embossed at intervals as stipulated in BS 6622-2007 or IEC 60502-2-2014 as applicable, on the outside of the oversheath. The embossing shall be weatherproof and abrasion proof.

Each drum shall be labeled (with clear stencil) with the following;

- (a) "PROPERTY OF CEYLON ELECTRICITY BOARD"
- (b) Bid No. .... Serial No.....
- (c) Manufacturer's identification.
- (d) Cable Type, Voltage Rating, Conductor Size and Number of Cores.
- (e) Number and year of standard adopted.
- (f) Net Weight & Gross Weight in kg.
- (g) Length of cable in meter.
- (h) Direction of rolling
- (i) Year of Manufacture.

## 12. INSPECTION AND TESTING

### 12.1. Routine Tests

Depending on the choice of the applicable standards, the following Routine Test Certificates conforming to the BS 6622:2007 standard shall be furnished for the observation of the Engineer appointed by the purchaser at the time of inspection. In addition, the routine test certificates shall be sent with the shipment of cables.



- (a) Spark Test on Oversheath
- (b) Conductor Resistance
- (c) Copper Wire Screen Resistance
- (d) Partial Discharge Test
- (e) Voltage Test on Complete Cable
- (f) Cable Marking
- (g) D.C. Voltage Test on Oversheath
- (h) Galvanize thickness of messenger wires
- (i) Dimensional test on messenger wires

## 12.2. Inspection

The Successful bidder shall make necessary arrangements for inspection by an Engineer appointed by the CEB and also to carry out in his presence necessary Acceptance tests on procured item and material without any additional cost. Acceptance test reports shall be a part of the shipping document. CEB may waive off the inspection either with the condition of witnessing the acceptance tests by an independent body acceptable to CEB or completely. In such a situation a notice of waive off will be issued in advance to the supplier.

## 12.3. Acceptance Tests

Depending on the choice of the applicable standards, the following Sample/Acceptance Tests conforming to the BS 6622:2007 standard shall be witnessed by the Engineer.

- (a) Conductor Material and Construction
- (b) Conductor Screen Application
- (c) Insulation, Hot set Test
- (d) Insulation, Thickness
- (e) Insulation, Concentricity
- (f) Circularity of Cores
- (g) Insulation Tests on Screen
- (h) Metallic Screen, Application
- (i) Measurement of Amour Wires
- (j) Oversheath Thickness



- (k) Four-hour Voltage test
- (l) Measurement of messenger wire

Additionally, verification of dimension and resistivity of metallic screen as against calculations provided in clause 7.0 (a)(vi) should be done.

### 13. ANNEXES

- Annex – A : Price Variation
- Annex – B1 : Schedule of Technical Requirements and Guaranteed Technical Particulars  
(For 11kV ABC)
- Annex – B2 : Schedule of Technical Requirements and Guaranteed Technical Particulars  
(For 33kV ABC)
- Annex – C : Non-Compliance Schedule



## ANNEX- A: PRICE VARIATION

The Bidders shall forward their offers on the basis of the Price Variation stipulated below.

### 1. BASIS OF THE OFFER

- (a) Bidders are required to make their offers on the basis of a Base Price plus a Fixed Price Margin.
- (b) The Base Price shall be the Cash Seller's Midday Official Average Price of Aluminium High Grade 99.7% , Steel and Copper (Grade A) at London Metal Exchange (LME) in US Dollars on the 14<sup>th</sup> day before the closing of Bids (exclusive of the bid closing date) or the previous working day if that day is a non-working day at the LME.
- (c) The Fixed Price Margin shall be quoted in the currency of choice of the Bidder.

Accordingly, FOB Price of foreign Bidders offering cables from outside the country and the ex-factory price of Local Bidders shall be computed **for the evaluation as;**

$$\{[(BA \times MTA) + (BC \times MTC) + (BS \times MTS)] \times US_0\} + (FP \times CC_0) \times TL$$

Where;

- BA** - Base Price which is the Cash seller's midday official average price of Aluminium High Grade 99.7% in USD per Metric Ton at the LME on the fixed date [Clause (1 b)]
- BC** - Base Price which is the Cash seller's midday official average price of Copper Grade-A in USD per Metric Ton at the LME on the fixed date [Clause (1 b)]
- BS** - Base Price which is the 1 month closing price of Steel Rebar in USD per Metric Ton at the LME on the fixed date [Clause (1 b)]
- FP** - Fixed Price Margin per kilometer of cable in the currency allowed under Clause 1(c) above.
- MTA** - Quantity of Aluminium High Grade 99.7% in Metric Ton required to manufacture one kilometer of cables considered for bid price.
- MTC** - Quantity of Copper Grade-A in Metric Ton required to manufacture one kilometer of cables considered for bid price.



- **MTS** - Quantity of Steel in Metric Ton required to manufacture one kilometer of cables considered for bid price.
- TL** - Total Length in kilometers of cables offered.
- CC<sub>0</sub>** - Currency Conversion rate from the currency of choice of the Bidder to LKR prevailing on the 14<sup>th</sup> day before Bid opening.
- US<sub>0</sub>** - Currency Conversion rate from the US Dollars to LKR prevailing on the 14<sup>th</sup> day before Bid opening.

## 2. AWARD PRICE

- (a) The FOB Award Price of foreign Bidders offering ABC shall be computed as;

$[(B_1A \times MTA) + (B_1C \times MTC) + (B_1S \times MTS)] \times TL$  in US Dollars +  $[FP \times TL]$  in the currency of choice quoted.

- (b) The Ex-factory Award Price of Local Bidders offering underground cables shall be computed as;

$\{[(B_1A \times MTA) + (B_1C \times MTC) + (B_1S \times MTS)] \times US_1\} + (FP \times CC_1) \times TL$  in LKR

Where;

- B<sub>1A</sub>** - Base Price which is the Cash seller's midday official average price of Aluminium High Grade 99.7% in USD per Metric Ton at the LME on the 3<sup>rd</sup> working day immediately after the day of award.
- B<sub>1C</sub>** - Base Price which is the Cash seller's midday official average price of Copper Grade-A in USD per Metric Ton at the LME on the 3<sup>rd</sup> working day immediately after the day of award.
- B<sub>1S</sub>** - Base Price which is the 1 month closing price of Steel Rebar, in US Dollars per Metric ton at the 3<sup>rd</sup> working day immediately after the day of award.
- CC<sub>1</sub>** - Conversion rate from the currency of choice to Sri Lankan Rupees prevailing on the 3<sup>rd</sup> working day immediately after the day of award.
- US<sub>1</sub>** - Currency Conversion rate from the US Dollars to LKR prevailing on the 3<sup>rd</sup> working day immediately after the day of award.

Intimation of the award will be faxed/ e-mailed to the successful Bidder and or to his agent in Sri Lanka on the same day of the award.





**3. CONVERSION OF CURRENCY**

- (a) For the purpose of the evaluation the Prices **BA** , **BC** and **BS** in US Dollars and the Fixed Price Margin (FP) in the currency of choice of the Bidder will be converted to LKR at the official Selling Exchange Rate of the Central Bank of Sri Lanka prevailing on the 14<sup>th</sup> day before closing of Bids.
- (b) The payment for the foreign Bidders for supply of ABC will be made at the contract price in the currency quoted for the Fixed Price Margin (FP) .The metal base prices in US Dollars will be converted to the currency of the FP at the official Selling Exchange rate at the Central Bank of Sri Lanka prevailing at the 3<sup>rd</sup> working day immediately after the day of award,
- (c) The payment for local suppliers for the supply of ABC will be made in LKR. The Prices of Aluminium High Grade 99.7%, Copper Grade A, and Steel Rebar, in US Dollars will be converted to LKR at the official Selling Exchange rate at the Central Bank of Sri Lanka prevailing on the 3<sup>rd</sup> working day immediately after the day of award.

**4. VARIATION FIGURES**

The Bidders shall furnish;

- (i) Fixed Price Margin (FP) for manufacture of one kilometer of offered cable in the currency allowed in Clause 1(c).
- (iii) Weight in metric tons of Aluminium High Grade 99.7% (MTA) required for the manufacture of one kilometer of cables offered.
- (ii) Weight in metric tons of Copper Grade A (MTC) required for the manufacture of one kilometer of cables offered.
- (v) Weight in metric tons of Steel (MTS) required for the manufacture of one kilometer of cables offered.

in the price schedule.

.....  
Signature and seal of the Manufacturer

.....  
Date

**I/We certify that the above data are true and correct**

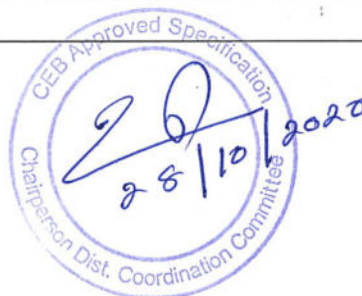
.....  
Signature and seal of the Bidder

.....  
Date



ANNEX B1: SCHEDULE OF TECHNICAL REQUIREMENTS AND GUARANTEED  
TECHNICAL PARTICULARS (For 11kV ABC)

		CEB Requirement	Offered
1.	Name of the Manufacturer		
2.	Country of Origin		
3.	Nominal cross-sectional area mm <sup>2</sup>	As per the price schedule	
4.	Rated Voltage category	11 kV	
5.	System Highest Voltage	12 kV	
6.	Designed Fault Current and duration for conductor	As per clause 5.0	
7.	Basic Insulation Level	95 kV	
8.	Maximum Nominal Operating Temperature	90 °C	
9.	Maximum Design Stress	5 kV/mm	
10.	Applicable Standards	BS 6622-2007/IEC 60502-2-2014 as applicable	
11.	Conductor Particulars		
	(a) Diameter mm		
	(b) Number of strands. Nos.		
	(c) Diameter of strands. mm		
	(d) Material	Aluminium	
	(e) Shape	Round	
	(f) Type		
	I. Solid / Stranded	Stranded	
	II. Compact / Non compact	Compacted	
	(g) Overall diameter of the conductor mm		
	(h) Maximum DC Resistance of the conductor at 20° C Ω	As per applicable standard	
	(i) Maximum AC Resistance of the conductor at 20° C Ω	As per applicable standard	
	(j) Maximum Current Carrying Capacity at 27° C (In Air) A	As per applicable standard	
	(k) Capacitance μF/ km		
12.	Conductor Screen Particulars		



	(a) Material		Extruded Semi-Conducting compound	
	(b) Thickness	mm	As per applicable standard	
	(c) Method of Application		Extruded	
	(d) Whether applied in the same operation as insulation		Yes	
13.	Insulation Particulars			
	(a) Material		XLPE	
	(b) Extrusion process		Triple	
	I. Minimum average	mm	As per applicable standard	
	II. Minimum at a point	mm	As per applicable standard	
14.	Insulation Screen Particulars			
	(a) Type		non-metallic semi-conducting	
	I. Semi-conducting layer		Extruded	
	II. Metallic		No	
	III. Strippability		Cold	
	(b) Material		Extruded Semi-conducting Compound	
	(c) Maximum Electrical Stress		5 kV.mm	
15.	Metallic Screen Particulars			
	(a) Fault current withstand capability		As Per Clause 5	
	(i) Fault Current(minimum)	kA	3 kA	
	(ii) Duration	Sec	1	
16.	Longitudinal water blocking			
	(a) form of water blocking material		As per clause 5	
17.	Oversheath Particulars for Phase Conductors			
	(a) Inner Sheath			
	(i) Type/Material		As per clause 5	
	(ii) Nominal Thickness		As per clause 5	
	(b) Outer Sheath			
	(i) Type/Material		As per clause 5	
	(ii) Nominal Thickness		As per clause 5	
	(c) Whether Graphite layer provided	Yes/No	Yes	



	(d) Whether DC test on oversheath carried out	Yes/No	Yes	
18.	Messenger			
	(a) Diameter	mm		
	(b) Number of strands.	Nos.		
	(c) Diameter of strands.	mm		
	(d) Material		Galvanized Steel	
	(e) Shape		Round	
	(f) Type			
	I. Solid / Stranded		Stranded	
	II. Compact / Non compact		Compact	
	(g) Oversheath			
	(i) Material		High Density Polyethylene	
	(ii) Nominal thickness	mm	As per clause 5	
	(h) Overall diameter of the messenger	mm		
	(i) Ultimate Tensile Strength of the Messenger	kN	As per clause 5	
19.	Overall diameter of complete cable		mm	
20.	Approximate weight of cable	kg/ km		
21.	Minimum bending radius	mm	As per applicable standard	
22.	Whether the cable ends are sealed before shipping		As per clause 11	
23.	Indicate the details of marking provided on the over sheath.			
	(a) Cable Designation		As per applicable standard	
	(b) Identification of manufacturer			
24.	Whether the maximum symmetrical short circuit current rating curves for 0.2 to 3 Sec. duration Furnished		Yes	
25.	Maximum allowable conductor temperature and duration			
	(a) Full Load conditions/ Duration (°C/ Duration)			
	(b) Short Circuit conditions/ Duration (°C/ Duration)			
	(c) Overload conditions/ Duration (°C/ Duration)			
	(d) Allowable maximum overloading in determining the above	%/A		
26.	Drum Particulars			
	(a) Material of the drum		Steel	
	(b) Dimensions.	mm x mm		
	(c) Weight of the empty drum	kg		



	(d) Cable length per drum		As per clause 11.1	
	(e) Weight of standard length with drum	kg		
27.	Whether a certified copy of ISO 9001:2015 or latest furnished with the offer?		As per clause 6.1	
28.	Whether the entire Type Test Certificates in accordance with clause 6.3 furnished with the offer?		As per clause 6.3	
29.	In case of cables which are type tested for IEC standards, whether supplier/manufacturer is agreeing to perform tests which are less stringent than BS 6622:2007 and not covered, during pre-shipment?	Agreed /Not	To be agreed	

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Signature of the Manufacturer and seal

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Date

I/We certify that the above data are true and correct

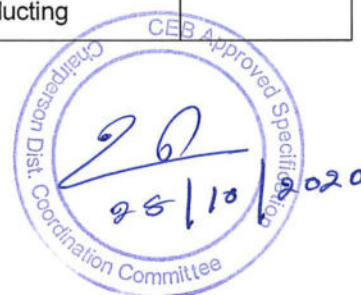
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Signature of the Bidder and seal

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Date

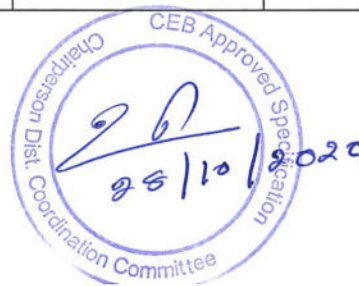


**\* ANNEX B2: SCHEDULE OF TECHNICAL REQUIREMENTS AND GURANTEED  
TECHNICAL PARTICULARS (For 33kV ABC)**

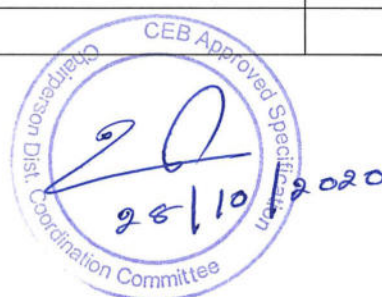
		CEB Requirement	Offered
1.	Name of the Manufacturer		
2.	Country of Origin		
3.	Nominal cross-sectional area <span style="float: right;">mm<sup>2</sup></span>	As per the price schedule	
4.	Rated Voltage category	33 kV	
5.	System Highest Voltage	36 kV	
6.	Designed Fault Current and duration for conductor	As per clause 5.0	
7.	Basic Insulation Level	194 kV	
8.	Maximum Nominal Operating Temperature	90 °C	
9.	Maximum Design Stress	5 kV/mm	
10.	Applicable Standards	BS 6622-2007/IEC 60502-2-2014 as applicable	
11.	Conductor Particulars		
	(a) Diameter <span style="float: right;">mm</span>		
	(b) Number of strands. <span style="float: right;">Nos.</span>		
	(c) Diameter of strands. <span style="float: right;">mm</span>		
	(d) Material	Aluminium	
	(e) Shape	Round	
	(f) Type		
	III. Solid / Stranded	Stranded	
	IV. Compact / Non compact	Compacted	
	(g) Overall diameter of the conductor <span style="float: right;">mm</span>		
	(h) Maximum DC Resistance of the conductor at 20° C <span style="float: right;">Ω</span>	As per applicable standard	
	(i) Maximum AC Resistance of the conductor at 20° C <span style="float: right;">Ω</span>	As per applicable standard	
	(j) Maximum Current Carrying Capacity at 27° C (In Air) <span style="float: right;">A</span>	As per applicable standard	
	(k) Capacitance <span style="float: right;">μF/ km</span>		
12.	Conductor Screen Particulars		
	(a) Material	Extruded Semi-Conducting	



			compound	
	(b) Thickness	mm	As per applicable standard	
	(c) Method of Application		Extruded	
	(d) Whether applied in the same operation as insulation		Yes	
13.	Insulation Particulars			
	(a) Material		XLPE	
	(b) Extrusion process		Triple	
	III. Minimum average	mm	As per applicable standard	
	IV. Minimum at a point	mm	As per applicable standard	
14.	Insulation Screen Particulars			
	(a) Type		non-metallic semi-conducting	
	IV. Semi-conducting layer		Extruded	
	V. Metallic		No	
	VI. Strippability		Cold	
	(b) Material		Extruded Semi-conducting Compound	
	(c) Maximum Electrical Stress		5 kV.mm	
15.	Metallic Screen Particulars			
	(a) Fault current withstand capability		As Per Clause 5	
	(i) Fault Current (minimum)	kA	3 kA	
	(ii) Duration	Sec	1	
16.	Semi-Conductive Water Blocking Tape			
			As per clause 5	
17.	Longitudinal water blocking			
	(a) form of water blocking material		As per clause 5	
18.	Oversheath Particulars for Phase Conductors			
	(a) Inner Sheath			
	(i) Type/Material		As per clause 5	
	(ii) Nominal Thickness		As per clause 5	
	(b) Outer Sheath			
	(i) Type/Material		As per clause 5	
	(ii) Nominal Thickness		As per clause 5	
	(c) Whether Graphite layer provided	Yes/No	Yes	



	(d) Whether DC test on oversheath carried out	Yes/No	Yes	
19.	Messenger			
	(a) Diameter	mm		
	(b) Number of strands.	Nos.		
	(c) Diameter of strands.	mm		
	(d) Material		Galvanized Steel	
	(e) Shape		Round	
	(f) Type			
	III.Solid / Stranded		Stranded	
	IV. Compact / Non compact		Compact	
	(g) Oversheath			
	(i) Material		High Density Poly Ethylene	
	(ii) Nominal thickness	mm	As per clause 5	
	(h) Overall diameter of the messenger	mm		
	(i) Ultimate Tensile Strength of the Messenger	kN	As per clause 5	
20.	Overall diameter of complete cable		mm	
21.	Approximate weight of cable	kg/ km		
22.	Minimum bending radius	mm	As per applicable standard	
23.	Whether the cable ends are sealed before shipping		As per clause 11	
24.	Indicate the details of marking provided on the over sheath.			
	(a) Cable Designation		As per applicable standard	
	(b) Identification of manufacturer			
25.	Whether the maximum symmetrical short circuit current rating curves for 0.2 to 3 Sec. duration Furnished		Yes	
26.	Maximum allowable conductor temperature and duration			
	(a) Full Load conditions/ Duration (°C/ Duration )			
	(b) Short Circuit conditions/ Duration (°C/ Duration)			
	(c) Over load conditions/ Duration (°C/ Duration)			
	(d) Allowable maximum overloading in determining the above	%/A		
27.	Drum Particulars			
	(a) Material of the drum		Steel	
	(b) Dimensions.	mm x mm		
	(c) Weight	kg		





	• (d) Cable length per drum	As per clause 11.1	
	(e) Weight of standard length with drum kg		
28.	Whether a certified copy of ISO 9001:2015 or latest furnished with the offer?	As per clause 6.0	
29.	Whether the entire Type Test Certificates in accordance with clause 6.3 furnished with the offer?	As per clause 6.3	
30.	In case of cables which are type tested for IEC standards, whether supplier/manufacturer is agreeing to perform tests which are less stringent than BS 6622:2007 and not covered, during pre-shipment?	Agreed /Not	To be agreed

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Signature of the Manufacturer and seal

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Date

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Date



**ANNEX C: NON-COMPLIANCE SCHEDULE**

On this schedule the bidder shall provide a list of non-compliances with this specification, documenting the effects that such non-compliance is likely to have on the equipment life and operating characteristics. Each non-compliance shall be referred to the relevant specification clause.

Clause No.	Non-Compliance

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Signature of the Manufacturer

.....  
Date

I/We certify that the above data are true and correct

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Signature of the Bidder and seal

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Date

