WEST BENGAL STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED
(A Govt. of West Bengal Enterprise)

Office of the Chief Engineer,
Procurement & Contracts Department
Vidyut Bhavan, 4th. floor,
Bidhannagar, Kolkata – 700091.

TECHNICAL SPECIFICATION

FOR

1 CORE X 400SQ MM XLPE ARMOURED ALUMINIUM CABLE

SUITABLE FOR

NON-EFFECTIVELY EARTHED 33 KV SYSTEM

AUGUST'2024

TECHNICAL SPECIFICATION
FOR
1CORE 400SQ MM XLPE CABLE SUITABLE FOR USE IN NON-EFFECTIVELY EARTHED 33 KV SYSTEMS

1. SCOPE :

1.1 The specification covers the design, manufacture, testing, supply and delivery in proper packed condition of 33 KV grade of 1Core 400 Sqmm Aluminium conductor XLPE insulated PVC sheathed, armoured, screened Power Cables.

2. DEVIATION :

Normally the offer should be as per Technical Specification without any deviation. But any deviation felt necessary to improve performance, efficiency and utility of equipment must be mentioned in the 'Deviation Schedule' with reasons duly supported by documentary evidences and advantages of such deviation. Such deviation suggested may or may not be accepted. But deviations not mentioned in 'Deviation Schedule' will not be considered afterwards.

3. LOCATION :

3.1 The Cables may be laid buried directly in ground at a depth of one meter in average, anywhere in West Bengal and terminated for outdoor connection to a power transformer or to overhead lines and indoor panels.

3.2 The Cables may also be laid within covered cable trenches, in cable racks or open air ladder trays etc. for certain portions of lengths.

4.0 SYSTEM DEAILS :

4.1	*Voltage grade (KV) of cable required*	::	***19/33***
4.2	*Service Voltage*	::	*33 KV*
4.3	*Highest Voltage*	::	*36 KV*
4.4	*Earthing System*	::	*Delta connected system earthed through Earthing transformer*
4.5	*B.I.L. For Cable*	::	*170 KV for 33 KV Grade*
4.6	*Fault Level (Maxm.)*	::	*See Clause 7.06*
4.7	*Frequency*	::	*50 C./S*

5.0 WEATHER CONDITION :

5.1 Monsoon prevails generally from the month of June to October with showers sometimes heavy, acidic, smoky, industrial and foggy.

5.2	*Maximum ambient temperature*	::	*50 degree C.*	
5.3	*Minimum ambient temperature*	::	*4 degree C*	
5.4	*Thermal resistance of soil*	::	*150 degree C-Cm/Watt*	
5.5	*Maximum Daily average ambient temp*	::	*40 degree C*	
5.6	*Maximum relatively humidity*	::	*100.00%*	
5.7	*Average rainfall per annum*	::	*200 cm*	
5.8	*Maximum height above the Sea level*	::	*1000*	*Meters*

6.0 STANDARDS:

6.1 The Cable shall conform to the following standards to the extent of WBSEDCL's requirement is fulfilled.

1)	*IS: 7098 (Part-II) (**2011**)and its latest amendment*	:	*Specification for cross-linked polyethylene Insulated PVC Sheathed Cables for working Voltages from 3.3 KV up to and including 33 KV*
2)	*IS:8130-1984*	:	*Specification for Conductors for insulated electric cables and flexible cords*
3)	*IS:5831-1984*	:	*PVC insulation & sheath of electric cables*
4)	Armouring	:	*As per IS 7098 (Part II)*
5)	*IS:10810-1984*	:	*Methods of test for Cables.*
6)	*IS:10418-1982*	:	*Cable Drums for Electric Cables.*
7)	*IEC 60502*	:	*For water penetration test*

6.2 The cable, joints, outdoor termination and their accessories and fittings may conform to other Indian and/or equivalent Standards or important publications to improve upon their performance, but shall not fall short of the requirement of this specification. The tenderer shall clearly indicate such standards in their offers.

7.0 ELECTRICAL CHARACTERISTICS & PERFORMANCE:

7.01 Description of Cables: Voltage Grade : 19/33kV grade

i) Stranded compacted circular Aluminum (H4 Grade as per IS 8130/1984) with Water Tight Conductor Core i.e. **non-conducting water swellable Tape with 50% overlap inside each layer and semi-Conducting water swellable tape with 50% overlap between compacted conductor & conductor screen to stop longitudinal propagation of water**. Conductor screening shall be provided over the compacted water tight conductor core (shielded with the semi-conducting water swellable tape) by extrusion of semiconducting compound.

ii) Insulation material is XLPE conforming to IS 7098 (Part 2) laid by triple extrusion method and **cured by dry Nitrogen and cooled in CCV line**.

iii)INSULATION SCREENING: -Non-metallic part shall be applied directly over the insulation of core and shall consist of extruded semi-conducting compound. Armouring will constitute the metallic part of the screening. **Non-Magnetic Armour to be used as metallic part of the Screen. Semi-Conducting Water swellable tape Shall be applied helically over extruded semiconducting layer with 50 % overlap**.

iv) Single layer of round hard drawn aluminum wires with more than 90% coverage (Armour wires shall be applied as closely as practicable so that gap between the armour wires should be less than the diameter of the single wire). Non-conducting water swellable tape shall be applied over armour with 50% overlap.

v) Outer sheath shall be applied by extrusion by Green extruded PVC (Type ST-2)

7.02 Service Voltage : 33 KV
7.03Maxm.Conductortemp. : 90 degree C at maxm. continuous current.

7.04 ***33 kV System***

Permissible Maxm. Short Ckt. Current for conductors	37.6 KA for 1Sec for 33 KV 400 sq.mm
Short Ckt. Current – Single Phase to Earth for Armour	*22 KA (minimum) for1 Sec for Armour cum screen.*

7.05	Maximum Permissible emergency overload temp. at 25% overload to 100 hrs. per year or 500 hrs. in life of Cable	:	130 $^{\circ}$ C for one one hour
7.06	Maxm. Permissible short circuit Temperature	:	250 $^{\circ}$C for one second
7.07	Conductor Material	:	Stranded compacted circular Aluminum (H4 grade) conductor of class 2 (As per IS 8130/1984) with **non-conducting water swellable Tape with 50% overlap inside each layer** to stop longitudinal propagation of water. And semi-Conducting water swellable tape with 50% overlap betweencompacted watertight conductor core& conductor screen.
7.08	Conductor screening	:	Black Extruded, cross linked, semi-conducting compound of 1.0 mm.(minimum) thickness.
7.09	Insulation	:	XLPE of thickness, 8.8 mm. (Nominal) laid by triple extrusion method and cured by dry Nitrogen and cooled in CCV line.
7.10	Insulation Screening :	::	Non-metallic part shall be applied directly over the insulation of core and shall consist of black extruded bonded typesemi-conducting compound **(0.5 mm minimum thickness)** and are easily removable during jointing & termination operations. Armouring will constitute the metallic part of the screening. Non-Magnetic Armour to be used as metallic part of the Screen. Black Semi-Conducting Water swellable tape (0.3 mm minimum thickness before application) Shall be applied helically over extruded semiconducting layer with 50 % overlap.
7.11	Armouring	:	Single layer of round hard drawn aluminum wires with more than 90% coverage (Armour wires shall be applied as closely as practicable so that gap between the armour wires should be less than the diameter of the single wire). Non-conducting water swellable tape shall be applied over armour with 50% overlap. Thickness of water blocking tape 0.3 mm (Minimum) before application
7.12	Overall Sheathing	:	Coloured PVC Type ST-2 compound to IS:5831, extruded for both 33 KV (**green**) Thickness shall be as per ISS.
7.13	Approx length of Cable in a Drum & tolerance in quantity.	:	500 Meters ±5% per drumfor 1 Core. However the tolerance shall be restricted upto ±2% on the quantity mentioned per lot in the delivery schedule of purchase order except the last lot. But **overall tolerancelimit of the total delivered quantity** shall be **minus (-) 1%** against item wise purchase ordered quantity for each Purchase Orderand the same shall be taken care of **while offering last lot of inspection.**

7.14	End Sealing	:	H.S. Caps (See Clause 8.11) (Heat Shrinkable)
7.15 a)	Max. tan-delta at room temp., at nominal Phase to Neutral Voltage (Uo)	:	0.004
b)	Maxm. Increment of tan-delta between 0.5 Uo to 2 Uo at room temp	:	0.002
7.16	Partial Discharge Value	:	10 pC (Max^{m}.) at 1.73 Uo for Routine/Acceptance Test and 5 pC (Max^{m}.) for Type Test as per IS: 7098(II)/2011.
7.17	Impulse Tests	:	**170 KV for 33 KV** as per IS: 7098 (Part-II)/ 2011.
7.18	H.V. Tests between Conductors & Screen/Armour	:	**63 KV (rms)** for 33 KV for 5 minutes as per IS7098 (Part-II): 2011.
7.19	Maximum D.C Resistance per KM at 20^{0}C	:	As per relevant I.S. 8130/1984
7.20	Current Carrying Capacity of conductor in air at 40 degree C	:	For 1C x 400 sq. mm. shall be as per IS 3961(Part-7)

8.0 **CABLE CONSTRUCTION**:

8.1 XLPE Underground Cable is to be manufactured in catenary continuous vulcanization process at controlled elevated temperature and pressure in inert atmosphere with use of suitable materials for Conductor screening, XLPE main insulation and insulation screening. The cable to be manufactured through Triple Extrusion method and Cured in Dry Nitrogen atmosphere and to be cooled in CCV line. Water swellable yarn, tape (semi-conductive and non-conductive) must be included as per the description given above.

8.2 **CONDUCTOR SCREEING**:

A semi-conducting cross-linked polyethylene (XLPE) screening shall be extruded over the conductor to act as an electrical shield which together with the elimination of the so called "Skin Effect" prevents to a great extent air ionization on the surface of the conductor.
Semi-Conducting water swellable tape with 50% overlap over compacted conductor should be provided.

8.3 **INSULATION**:

The main insulation of the Cable shall be extruded unfilled, chemically cross-linked polyethylene (XLPE) inert gas cured satisfying the requirement of IS: 7098(Part-II).

8.4 **INSULATING SCREEN**:

The screen shall be made up as given in 7.10. The metal screen eliminates tangential stress of rotating electrostatic field surrounding the conductor and uniform electrical stress in the insulation.
The semi-conducting polyethylene (XLPE) screen shall be extruded over the main polyethylene insulating wall to prevent partial discharge at the surface of the insulation.**Conducting Water swellable tape Shall be applied helically over extruded semi-conducting layer with 50 % overlap. Non-Magnetic Armour to be used as metallic part of the Screen**

8.5 The mechanical and chemical properties of the materials for semi conducting screens are much more important than their electrical properties, but for obtaining the high overall degree of electrical properties of an H.V. cable, the inner and outer semi conducting screens and the main polyethylene insulation between the screens shall be simultaneously extruded during the manufacturing process known as "triple extrusion". The advantages are:

i) The partial discharge level at the surface of the insulation is brought to a minimum.
ii) There will be no displacement of the semi conducting screen and insulation during expansion and contraction due to load cycles and bending.
iii) The semi conducting screens are easily removable during jointing and termination operations.

8.6 **ARMOUR CUM METALLIC SCREEN** :

Single layer of round hard drawn aluminum wires (2.5 mm Dia) with more than 90% coverage (Armour wires shall be applied as closely as practicable so that gap between the armour wires should be less than the diameter of the single wire). Non-conducting water swellable tape shall be applied over armour with 50% overlap.

8.7 **OUTER SHEATH**:

A reliable serving shall be necessary for maintaining conductivity of the armour particularly under corrosive condition in the form of jacket. The cable shall therefore be finished with an extruded PVC oversheath of thickness as per para 7.12.

The quality of PVC oversheath (Jacket) shall be ensured for service reliability against moisture intrusion and shall conform to type ST-2 of IS:5831.

The colour of the outer sheath shall be **GREEN**

The sheaths shall be protected against white ants, vermin and termites by suitable, reliable and durable measures.

The supplier shall suggest suitable materials for use, in the event of damage to the oversheath to prevent passage of moisture along the cable.

8.8 **CABLE IDENTIFICATION**:

The following shall be embossed on the outer sheath of the cable throughout the length of cable at 1.0 meter spacing for identification.

a) Manufacturer's Name or Trade Mark.
b) Type of Cable / Cable Code
c) Voltage Grade.
d) Type of insulation& Material of conductor (XLPEArmoured, PVC sheathed Aluminium).
e) Nominal section and number of crores.
f) Month &Year of manufacture.
g) Inscription for length of cables at 1.0 meter interval on outer sheath by printing/ engraving.
h) Name of the purchaser : WBSEDCL
i) Marking "Electric".

8.9 **SEALING OF CABLE ENDS** :

The cable ends of cable in the wooden/ steel drum for delivery shall be sealed with heat shrinkable caps.

9.0 **DRUMS**:

The Cable shall be packed in non-returnable wooden. Non-returnable Steel Drum may also be accepted in place of non-returnable Wooden Dum without implication of additional cost.

9.1 The following information shall be marked on each drum.

a) Drum identification No.
b) Manufacturer's Name, Trade Name/Trade Mark, if any.
c) IS reference i.e 7098 (part-II)/2011
d) Nominal sectional area of the conductor of the cable.
e) No. of Cores.
f) Type of Cable and Voltage Grade with Cable Code.
g) Colour of outer sheath
h) Length of the Cable in Cable Drum.

i) Direction of rotation of Drum (by means of an arrow)
j) Approximate Weight : Tare : Gross
k) Month &Year of Manufacture.
l) Purchase Order No.& date
m) Month of Delivery
n) Name of the Purchaser : WBSEDCL

Drums shall be proofed against attack by white ants or termite conforming to IS : 10418. The Drums may also be marked with ISI Certificate Mark, if applicable.

9.2 **Safe Pulling Force:** 30 N/mm^2(approx. 3 kg/mm^2)for cable pulled by gripping the cable directly with pulling eye onAluminium area and for cable pulled with stockingshould be $P=9D^2$where P= Pulling force in Newton, D= Outer Diameter of Cable in MM

10.0 **Tests to be performed as per IS: 7098 (Part-II)/2011 & IS:8130/1984 and its amendments.**

10.1A Type Test:All the tests mentioned below are to be made as per details given in IS:10810. The party shall submit Type Test report from CPRI or ERDA or Any NABL accredited third party LAB as per IS:7098/II/2011 and it latest amendment and other relevant IS/ IEC for each offered item of identical type, voltage grade, size, material and design, carried out **within 5 years** from the due date of opening of tender. Type Test Certificate should bear NABL Logo. Accreditation of NABL LAB should be displayed in the official website of NABL

a) Tests on conductor
   i) Tensile Test (for aluminium)(not applicable for compacted conductor as per IS:8130-1984)
   ii) Wrapping Test (for aluminium) (not applicable for compacted conductor as IS:8130-1984)
   iii) Resistance Test.
b) Tests for armouring Wires.

c) Test for thickness of insulation and sheath

d) Physical test for insulation.
   i) Tensile strength and elongation at break.
   ii) Ageing in air oven.
   iii) Hot set test.
   iv) Shrinkage test
   v) Water absorption (Gravimetric)

e) Physical tests for outer sheath
   i) Tensile strength and elongation at break.
   ii) Ageing in air oven.
   iii) Shrinkage test.
   iv) Hot deformation.
   v) Heat shock.
   vi) Loss of mass in air oven.
   vii) Thermal stability.

f) Partial discharge test.
g) Bending test.
h) Dielectric power factor test.

   i) As a function voltage.
   1) As a function of temperature.

i) Insulation resistance (Volume resistivity) Test.

j) Heating cycle test.
k) Impulse with stand test.
l) High voltage test.
m) Flammability test.
n) *Water penetration test (with heating cycle) as per IEC 60502*

10.1B The following tests on screened cable shall be performed successively on the same test sample of completed cable, not less than 10m. in length between the test accessories.

a) P.D. Test.
b) Bending Test followed by P.D. Test.
c) Dielectric power factor as a function of voltage.
d) Dielectric power factor as a function of temperature.
e) Heating cycle test followed by dielectric power factor as a function of voltage and P.D.tests.
f) Impulse withstand test and
g) High voltage test as per para 7.18 and if sample fails in that test then provision of one more sample shall be taken as per relevant IS.

10.2 **Acceptance Test**: The following shall constitute Acceptance Tests:

a) Conductor resistance test.
b) Test for thickness of insulation(eccentricity) and sheath.
c) Hot set test for insulation.
d) Tensile strength and elongation at break test for insulation and outer sheath.
e) P.D.test (for screened cables) only on full drum length.
f) High Voltage test (4 hours Test as per IS 7098 (Part 2):2011 Section 20.7.1 with latest amendment no. 2 April 2022 & 5 min test on all samples as per Section 20.7.2 of the said IS).
g) Insulation resistance (VOLUME RESISTIVITY) TEST
h) Flammability test
i) *Water penetration test (with three heating cycle) as per IEC 60502.*
j) Visual marking and length checking in 01 (one) drum of offered lot.

10.3 **ROUTINE TESTS**:

The routine test shall be carried out on all cables manufactured in accordance with this specification.

The following routine tests shall be made on cable length as specified in the ISS.

a) Conductor resistance test.
b) Partial discharge test on full drum length.
c) High voltage test as per Para 7.18

10.4 **TEST WITNESS**:

1. All Tests shall be performed in presence of Purchaser's representative if so desired by the Purchaser.
2. The contractor, shall give at least fifteen (15) days advance notice for witnessing such tests.

11. **TEST CERTIFICATE**:

11.1 Certified copies of all routine tests carried out at Works shall be furnished in Six (6) copies for approval of the purchaser.

11.2 The cables shall be dispatched from Works only after receipt of Purchaser's written approval of shop test reports.

11.3 Type Test Certificates of the Cable offered shall be furnished. Otherwise the cable shall have to be type tested on similar rating as per Clause – 10 free of any charges to prove the design.

12. **DESCRIPTIVE LITERATURES, TEST RESULTS ETC.**:

The following details for the cable shall be submitted with bid.

a) Manufacturer's Catalogue giving cable construction details and characteristics.

b) Manufacturing process in detail for cables highlighting the steps to control.
   i) Contamination.
   ii) Formation of water trees.
   iii) Effects of byproducts of cross-linking.
   iv) Stress control etc.

c) Cross section drawing of the cable.

d) Cable current ratings for different types of installation inclusive of all de rating factors due to ambient temperature, grouping etc.

e) Over-Load characteristics of the cable without endangering the normal life and electrical quality of the insulation.

f) Complete technical data of the cables.

g) List of Customers to whom the Cable of similar rating have been supplied.

h) Copy of Type Test Report carried out within last 5 years from the due date of opening of Tender on similar type of Cable in a NABL accredited/Govt. approved Test House or Laboratory is to be submitted along with the tender otherwise tender may be rejected.

Type Test (after placement of order) : Besides submission of Type Test Report carried out **within last 5 years** as per tender specification, type test at the discretion of the ordering authority shall have to be arranged by the successful contractor from any lot offered for inspection sample chosen at random after successful routine test by our inspection team as per relevant ISS from CPRI/NABL accredited/Govt. recognized Test House or Laboratory in presence of WBSEDCL's representative.
However the necessary cost of the type test charges will be reimbursed to the party on production of necessary supporting documents.

i) Valid Calibration Certificate of instruments/equipment used for Testing purpose conducted by NABL accredited Laboratory provided the certificate bears an accreditation body logo. For testing equipment where NABL accreditation is not available, calibration certificate from educational institutions like IIT's, NIT's, J.U., C.U., B.H.U. only can be accepted provided they demonstrate traceability.

j) Documents to be submitted at the time of physical delivery at consignee stores :
The following documents are to be submitted by the venders to the consignee storesat the time of dispatch to stores by the venders :
   a) Copy of Purchase Order
   b) Copy of dispatch instruction
   c) Inspection Test certificate
   d) Guarantee certificate
   e) Proforma Invoice
   f) Calculation Sheet for price variation on the basis of IEEMA or CACMAI as applicablewith base date of order
   g) Seal list and packing list
   h) Challan in triplicate

k) Way Bill, if applicable

With Name of the Firm

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR 33 KV ARMOURED ALUMINIUM XLPE CABLES
(To be filled in by the Supplier)

1	**NAME OF MANUFACTURER**		
	FACTORY ADDRESS		
2	**Voltage Grade.**	:	**19/ 33 KV (for 33 KV sys.)**
3	Core & Cross Section No x sq. mm.	:	**1CX400**
4	Type & Designation (as per ISS)	:	**A2XWaY**
5	List of Standards applicable with latest amendment	:	**IS: 7098(PT-2) 2011,** IS: 8130 -1984, IS:5831 – 1984, IS:3975 – 1999, IS: 10810 – 1984 & IS: 10418 – 1982 , IEC 60502 and all the said IS with latest amendment
6	**System suitable for**		
a	Service Voltage	:	**33KV**
b	Neutral Earthing	:	**Non-Effectively Earthed System**
7	**Maximum. Conductor temperature**	:	
a	Continuous (in Deg. C)	:	90 Deg C
b	Short time (in Deg.C)	:	250 Deg C
8	**Conductor**	:	
a	Material to IS-8130(Class/Grade) and core	:	**Aluminium (H4 Grade) Conductor** (confirming to Class-2 of IS: 8130/84) **of Water Tight Type conductor core**
b	Size (Sq.mm.)	:	400
c	Nominal diameter of wires in each. Conductor strand before stranding & compaction (mm.)	:	
d	Overall Diameter of compacted Conductor(in MM)	:	
e	No. of Strand (Approx)	:	
f	Shape of conductor	:	Stranded Compacted Circular
9	**Shielding/screening on Conductor**	:	
a	Material	:	Black Semi-conducting compound
b	Type	:	Extruded
c	Whether thermosetting?	:	
d	Thickness		**1.0 mm (Min)**
10	**Insulation**	:	
a	Material	:	XLPE as per IS 7098 PT-II 2011
b	Type	:	Extruded
c	Thickness (mm)	:	**8.8mm (nominal)**
11	**Shielding / screening on insulation**	:	
a	Material for Nonmetallic part	:	**Combination of black extruded semi-conducting compound & semi-conducting tape**
	i) Type	:	Extruded
	ii) Thickness (mm)	:	**0.5 mm(min)**
12	**Water Blocking Tape (for longitudinal water- blocking)**	:	
a	Over Insulation Screen	:	
i.	Material	:	**Semiconducting Water Swellable tape**

ii.	Type	:	Shall be applied helically over extruded semiconducting layer with **50% overlap**.
iii.	Min. Thickness in mm	:	
(b)	Over Armour		
i.	Material	:	**Nonconducting Water Swellable tape**
ii.	Type	:	Shall be applied helically over Armour with **50% overlap**.
iii.	Nom. Thickness in mm	:	
13	**Armouring**	:	
a	Material	:	**Single layer Hard drawn Aluminium Round Wire**
b	Nom. Dia. (mm)	:	**2.5 mm**
c	Max. D.C. resistance at 20 deg.C (Ohm/Km.)	:	
d	Armour Coverage Percentage	:	**More than 90%**
14	**Overall Sheath**	:	
a	Material	:	Extruded PVC (Green Colour) as per IS:5831/84
b	Type	:	ST-2
c	Thickness (mm.)		
d	Colour of Sheath	:	**Green**
15	**Approx. overall diameter of the Cable (mm.)**	:	
16	**Continuous current rating for standard condition, laid direct**	:	
a	In ground at temp 30 deg.C	:	
b	In duct at temp 30 deg.C	:	
c	In air at temp40 deg.C	:	
17	**Charging current attracted system voltage A/KM**	:	
18	**Short Circuit Current in KA (Maxm.)**	:	
a	for 1 sec	:	
19	**Combine Earth Fault Current for Screen cumArmour in KA for 1 sec**		
20	**Electrical Parameters**	:	
a	Maxm. D.C. resistance of conductor at 20 deg.C (Ohm/Km)	:	**0.0778**
b	AC resistance of conductor at 90 deg.C(approx.) (Ohm/Km)	:	
c	Reactance (approx.) (Ohm/Km)	:	
d	Capacitance (approx.) (um/Km)	:	
e	Di-electric losses at rated (Uo/U) system KV, 50 cycles/sec in Watts/KV/Phase)	:	
f	i) tan-delta at 0.5 Uo	:	
	ii) tan-Delta at Uo	:	
	iii) tan-Delta at 1.5 Uo	:	
	iv) tan-Delta at 2 Uo	:	
g	Partial discharge value		**10 PC (max) at test voltage 1.73 Uo for Routine Test/Acceptance test & 5pc for Type Test.**
21	**Vol. Resistivity at 27 deg.C(ohm-Cm)**	:	**$1X10^{14}$**
22	**Recommended minimum bending radius**	:	20 x Over all dia. of cable

23	**Derating factor for following ambient temperature in Air/Ground**	:	
a	at30 deg. C	:	
b	at35 deg. C	:	
c	at45 deg. C	:	
d	at 50 deg.C	:	
24	**Cable Drums**	:	
a	Standard Length of Cable/Drum (Mtrs)		**500±5%**
b	Net weight of cable/Drum (kg)		
c	Dimension of Drum		Generally, as per IS: 10418-1982
d	Shipping weight (Kg) /drum		
25	**Overall tolerance in total quantity**	:	**-1%**
26	**Safe pulling force (Kg.)**	:	
27	**Details of the protective measures against attack by white ante varmints etc. to the PVC outer sheath during manufacture**	:	
28	**Type of curing of XLPE insulations**	:	Inert Gas (Nitrogen) curing through CCV Line
29	**Cut ends of the Cable shall be sealed**	:	Heat shrinkable and caps
30	**Cable identification & sequential length marking**	:	**Cable identification by Embossing** The following shall be embossed on the outer sheath of the cable throughout the length of cable at 1.0 meter spacing for identification: a) Manufacturer's Name or Trade Mark. b) Type of Cable / Cable Code c) Voltage Grade. d) Type of insulation & Material of conductor (**XLPE, Armoured, PVC sheathed Aluminium Cable**) e) Nominal x-section & and number of crores. f) Month & Year of manufacture. g) Inscription for length of cables at 1.0-meter interval on outer sheath by printing/ engraving. h) Name of the purchaser: **WBSEDCL** i) Marking **"Electric"**.
31	**Marking on each drum**	:	a) Drum identification No. b) Manufacturer's Name, Trade Name/Trade Mark, if any. c) IS reference i.e 7098 (part-II)/2011 d) Nominal sectional area of the conductor of the cable. e) No. of Cores. f) Type of Cable and Voltage Grade with Cable Code. g) Colour of outer sheath h) Length of the Cable in Cable Drum. i) Direction of rotation of Drum (by means of an arrow) j) Approximate Weight : Tare : Gross k) Month & Year of Manufacture. l) Purchase Order No. & date m) Month of Delivery n) Name of the Purchaser :**WBSEDCL**

Signature with Designation & Seal
With Name of the Firm