Date: -28.08.2024

Corrigendum No. – 2

Tender Enquiry No- TPSODL/OT/2024-25/020

Work Description - Rate Contract for Underground cable fault detection and maintenance.

Clause 1.3: Dates in Calendar of events revised as below

(a)	Last Date of receipt of Tender Fee	29.08.2024 up to 18:00 Hours
(b)	Date & Time of Pre-Bid Meeting (If any)	NA
(c)	Last Date of receipt of pre-bid queries, if any	NA
(d)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	NA
(e)	Last date and time of receipt of Bids	31.08.2024 up to 17:30 Hours
(f)	Date & Time of opening technical bids & EMD	Will be notified to the bidders through our website / e-mail.
(g)	Date & Time of opening of Price of qualified bids	Will be notified to the successful bidders through our website / e-mail.

Regards,

Rajkishore Tripathy | Contracts

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TP SOUTHERN ODISHA DISTRIBUTION LIMITED
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2nd Floor| Khodasingi | Ambapua | Berhampur | Odisha - 760 010

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1010

Specification Name : ENG-ELC-005- SPECIFICATION FOR 33kV XLPE ARMOURED CABLE- R1

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Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPWODL	TPNODL	TPCODL	TPSODL	TPWODL	TPWODL
10-12-2022	10-12-2022	12-12-2022	12-12-2022	13-12-2022	13-12-2022

CONTENTS

1. SCOPE:

This specification covers technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store, performance of 33 kV XLPE armoured cable for trouble free and efficient operations.

Inclusive Sizes: -

3 CORE CABLE	1 CORE CABLE
3CX 35 sq.mm	1C X 300 sq.mm
3CX 50 sq.mm	1C X 400 sq.mm
3CX 70 sq.mm	1C X 630 sq.mm.
3CX 95 sq.mm	1C X 1000 sq.mm.
3C X 300 sq.mm	
3C X 185 sq.mm	
3C X 240 sq.mm	
3C X 400 sq.mm	

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IS 7098 (Part 2)	Cross-linked Polyethylene (XLPE) insulation for Cables
IS 8130	Conductors for insulated electrical cables and flexible cords
IS 10418	Specification for Drums for Electric cables
IEC 60228	Conductor for insulated cables
IS 3975	Low carbon galvanized steel wires, formed wires and tapes forarmoring of cables
IS 5831	Specification for PVC insulation sheath for electric cables
IEC-60811	Test methods for insulations and sheaths of electric cables andcords.
ASTM D 6097	Standard test method for relative resistance to vented water treegrowth in Solid Dielectric insulating materials
ICEA T 31-610	Test method for conducting longitudinal water penetrationresistance tests on blocked conductors
IS 10810	Methods of tests for cables
IS 4905	Methods for random sampling
IS 4984	High density polyethylene pipes for water supply
IS 2530	Methods of test for polyethylene moulding materials and polyethylene compounds
IS 4826	Specification for hot dipped galvanized coatings on round steel wires
IS 5:2007	Colors for ready mixed paints and enamels

ASTM 2863	Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics
	(Oxygen Index)
IEC 60754	Apparatus and procedure for the measurement of the amount of halogens evolved during the combustion of materials taken fromelectric or optical fiber cable constructions
IEC-60502 (Part-2)	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: 22kV Cables for rated voltages from 6 kV (Um = 7.2 kV) up to 30 kV (Um= 36 kV).
IEC 332	Test on electric cables on the fire conditions
ASTM 2843	Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden.On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

The atmosphere is generally laden with mild acid and dust in suspension during thedry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces as mentioned above.

4. GENERAL TECHNICAL REQUIREMENTS:

S. No.	Description	Requirement	
		3 CORE CABLE	1 CORE CABLE
1	Voltage grade	33 kV (Earthed system)	
2	Max System voltage	36 kV	
3	Frequency	50 Hz	
4	Variation in frequency	+/- 3%	
5	Conductor	Watertight Stranded Aluminum (compacted circular)	
6	Conductor screen	Semi conducting tape and screen	
7	Insulation	XLPE	
8	Insulation screen	Shall have three layers:	Shall have three layers:
9		a) Bonded Semiconducting, b) Semiconducting water swellable tape, c) Metallic copper tape	a) Bonded Semiconducting b)Semiconducting water swellable tape, c) Metallic copper tape d) Polyester transparent tape over copper screen
10	Core identification strip	Beneath copper screen	NA
11	Inner sheath	Pressure Extruded PVC ST- 2 with PP fillers	Extruded PVC ST-2
12	Armour	GI wire round binded with rubberized cotton binding tape	Aluminum wire binded by rubberized cotton tape
13	Outer sheath	PVC ST-2 FRLSH type of color 'Yellow Lemon shade' code: 355 asper IS 5:2007	

5. GENERAL CONSTRUCTION:

The cross-linked polyethylene insulated (XLPE) 33 kV Cable Dry cured & water cooled shall be manufactured and tested strictly in accordance with the Indian Standard IS 7098 (Part – 2)/ Relevant IEC/ International standards and its latest amendments.

All material used in the manufacturing of cables shall be new and shall be selected as the best available for the intended use.

The rating factors for variation in ground and air temperature, depth of laying, thermal resistivity of soil and different laying configuration of cables shall be provided by the Bidder.

5.1 Conductor

S.No.	Parameter	Requirement						
1	Conductor	As per IS 8130						
2	Class	Class II						
3	Material	Plain Aluminium, grade H2/H4						
4	Shape	Stranded Compacted Circular						
5	Nominal size of conductormm2	95	185	240	300	400	630	1000
6	Min. number of strands	15	30	30	30	53	53	30
7	Max. DC resistance @ 20deg C (Ohm/km)	0.32	0.164	0.125	0.1	0.0778	0.0469	0.0291
8	Conductor Short circuit current rating for 1 second (KA)	9	17.4	22.6	28.3	37.7	59.4	94.3
9	Min. weight of conductor(kg/km/core)	244	481	624	780	1080	1650	2600
10	Longitudinal water sealing ofconductor	a) Non-conductive water swellable yarn/ tape/ combination of both shall be provided in between interstices of the conductor. b) Also, this water swellable tape and yarn shall be compatible to withstand conductor continuous temperature of 90 deg C and short circuit temperature of 250 deg C without any decay. c) It shall not affect the electrical conductivity of the conductor.						

S.No.	Parameter	Requirement
11	Cleanliness and uniformity	a) Before stranding, the cross-section of the Aluminium conductor shall be circular, and shall have uniform smooth surface, free from sharp edges and free from any defects. b) Stranded Conductor shall be free from oil traces & aluminum dust. Conductor (after stranding) shall be super cleaned c) Traces of aluminum dust on conductor or conductor screen shall not be acceptable.
12	Conductor jointing	Not acceptable in any strand or in any conductor after it is stranded.
13	Raw material supplier	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta
14	Diameter of conductor	To be specified by bidder

5.2 Conductor Screen:

S. No.	Parameter	Requirement
1	Material	**1st layer:** Semi-conducting tape **2nd layer:** Semi-conducting compound
2	Configuration	**1st layer:** Semi-conducting tape shall be applied over conductor with nominal thickness of 0.2 mm. **2nd layer:** Semi-conducting compound screen shall be applied through triple extrusion process.
3	Min. thickness	Minimum thickness of semi-conducting compound screen shall be 0.5 mm at any point of measurement.
4	Resistivity	Resistivity of semiconducting conductor screen shall not exceed 1000 Ω-m
5	Uniformity on interfacial region	Interfacial region between conductor screen and insulation shall be uniform. Protrusion/ convolution/ other defects are not acceptable in the region.
6	Raw material supplier	Semiconducting compound shall be procured fromreputed raw material suppliers viz., Dow/Borealis/Hanwa

5.3 Insulation:

S. No.	Parameter	Requirement
1	Material and extrusion process	XLPE insulation shall be applied through CCV/VCVline by triple extrusion process with 'Dry Curing' and 'Water Cooling'.

2	Raw material supplier	a) XLPE compound shall be procured from reputed raw material suppliers viz., Dow/Borealis/Hanwa b) Both XLPE and semi conductive compounds shall be used from same raw material supplier.
3	Thickness and Eccentricity	a) Nominal thickness shall be 8.8 mm. b) Minimum thickness shall be 7.82 mm at any point of measurement. c) Eccentricity of insulation shall not exceed 10%.
4	Thermal stability	The insulation properties shall be stable under thermal conditions arising out of continuous operation at conductor temperature of 90 deg. C rising momentarily to 250 deg. C under short circuit conditions.
5	Cleanliness and uniformity	Interfacial region between insulation and insulation screen shall be uniform. Protrusion/convolution/ other defects are not acceptable. Core shall be free from void and contamination.

5.4 Insulation Screen & Core identification strip:

S. No.	Parameter	Requirement
1	Material	a) **1st layer:** Semi-conducting compound b) **2nd layer**: Semi-conducting water swellable tape c) **3rd layer:** Annealed copper tape

	Configuration	**a) 1st layer: Non-Metallic Part:** Extruded Insulation semiconducting screen shall be bonded type. Resistivity shall not exceed 500 Ω-meter. Surface of insulation screen shall be smooth, free from cavity/ nicks/scratches/ other visible defects. Min. thickness shall be 0.5 mm at any point of measurement. **b) 2nd layer: Water Swellable tape:** Semi-conducting water swellable tapes shall be applied over non-metallic screen. Minimum thickness of water swellable shall be 0.3 mm and minimum overlapping shall be 15%. **Core identification strip:** **For 3 Core Cable** Each of the three core identification strips shall be applied longitudinally beneath copper screen. Width of the colored strip shall be 7-10 mm. R, Y, B
		For 1 Core Cable NA c) **3rd layer: Metallic Part**: Annealed copper tape, helically wound over the water swellable tape with minimum 15% overlap. Minimum thickness shall be 0.045 mm at any point of measurement.
3	Raw material supplier	Semiconducting compound shall be procured from reputed raw material suppliers viz., Dow/ Borealis/ Hanwa
4	Diameter of cores	To be specified by bidder
5	Weight of cores/km (approx.)	To be specified by bidder
6	Weight of copper tape/km (approx.)	To be specified by bidder

5.5 Fillers:

S. No.	Parameter	Requirement	
		3 CORE CABLE	1 CORE CABLE
1	Material	Virgin Polypropylene fibers of natural color	NA
2	Configuration	Virgin Polypropylene fibers shall be tightly filled in empty space asfillers.	

5.6 Inner Sheath:

S. No.	Parameter	Requirement	
		3 CORE CABLE	1 CORE CABLE
1	Material	Black colored Polyvinyl chloride (PVC) type ST-2 compound	
2	Configuration	The laid-up cores shall be provided with *pressure extruded* Polyvinyl chloride (PVC) type ST- 2 compound conforming to IS: 5831 with latest amendments. Pressurized extrusion is required to remove any gaps remaining in between the fillers and to make the cable as circular as possible. It shall be applied to fit closely on to the laid-up cores and shall be possible to remove easily without causing any damage to the underlying insulated cores and screens.	Extruded PVC ST-2 type conforming to IS: 5831. It shall be applied to fit closely and shall be possible to remove easily without causing any damage to the underlying insulated cores and screens.
3	Raw material supplier	PVC compound shall be procured from reputed raw material suppliers viz., Shakun, Kalpana, KLJ, DCM ShriRam. PVC compound from cable manufacturer shall be considered only after factory evaluation for the same.	
4	Min. thickness at any point of measurement	**3 CORE CABLE**	

35 sq. mm.	50 sq. mm..	70 sq. Mm.	95 sq.mm.	185 sq.mm	240 sq.mm	300 sq.mm.	400 sq.mm.
0.7mm	0.7mm	0.7mm	0.7 mm	0.7mm	0.7mm	0.7 mm	0.7 mm

1 CORE CABLE			
300 sq.mm.	400 sq.mm.	630 sq.mm.	1000 sq.mm.
0.5mm	0.5 mm	0.6 mm	0.7 mm

5.7 Armour:

S. No.	Parameter	Requirement	
		3 CORE CABLE	**1 CORE CABLE**
1	Material	Low carbon annealed hot dippedgalvanized round steel wires	H4 Grade Aluminium wires
2	Compliance to Standard	It shall comply with the requirements ofIS 3975 along with latest amendments.Hot dipped galvanizing layer shall be uniform on low carbon annealed steel wires. Zinc coating shall be 290 g/m2 as per IS 4826:1979.	It shall comply with the requirements of IS 8130 alongwith latest amendments.

3	Nominal Dimensions				**3 Core cable**				
		35 sq.mm	50 sq.mm	70 sq.mm	95 sq.mm	185 sq.mm	240 sqmm	300 sq.mm	400 sq.mm
		3.15 (GIWire	3.15 (GI Wire)	3.15 (GI Wire)	3.15 (GI Wire)	4.00 (GI Wire)	4.00 (GI Wire)	4.00 (GI Wire)	4.00 (GI Wire)

S. No.	Parameter	Requirement					
		3 CORE CABLE			**1 CORE CABLE**		
		1 Core cable					
		300 sq.mm	400 sq.mm	630 sq.mm	1000 sq.mm		
		2 mm (Aluminum wire)	2 mm (Aluminum wire)	2.5 mm (Aluminum wire)	3.15 mm (Aluminum wire)		
4	Approx. Armor Short circuit rating in kA for 1 sec	**3 Core cable**					
		95 sq.mm		185 sq.mm	240 sq.mm	300 sq.mm.	400 sq.mm
		9		20	20	20	20
		1 Core cable					
		400 sq.mm		630 sq.mm	1000 sq.mm		
		20		20	20		
		Fault current for the armour with minimum 90 % coverage.					

5	Jointing in the armour wires	Not acceptable in any armour wire	
6	Laying of armour	The armor wires shall be applied as closely as practicable. Shall not be less than 90% of total circumference.	
7	Binding	The rubberized cotton binding tape shall be applied to bind the armor wires such that it shall not affect the electrical properties of the armor wires and the overall cable.	
8	Weight of armor	To be furnished by Bidder	
9	Raw material supplier	Steel armour shall be procured fromreputed raw material suppliers viz., TATA Steel, Jindal Steel, SAIL	Aluminium armour shall be procured from reputed raw material suppliers viz., TATA/ BALCO/ HINDALCO/ NALCO/ Vedanta

5.8 Outer Sheath

S.No.	Parameter	Requirement							
1	Material	Polyvinyl chloride (PVC) ST-2 **FRLSH** type compound with **'lead naphthenate'** additive							
2	Configuration	Polyvinyl chloride (PVC) ST-2 FRLSH type compound with **'lead naphthenate'** additive as 'termite & rodent repellent' applied by extrusion process.							
3		**3 CORE CABLE**							
	Min. Thickness at any point of measurement	35 sq.mm	50 sq.mm	70 sq.mm	95 sq.mm	185 sq.mm	240 sq.mm	300 sq.mm	400 sq.mm
		2.52 mm	2.52 mm	2.68 mm	2.68 mm	3.0 mm	3.0 mm	3.0 mm	3.0 mm
		1 CORE CABLE							
		300 sq. mm.		400 sq.mm		630 sq.mm		1000 sq.mm	
		2.04 mm		2.04 mm		2.36 mm		2.52 mm	
4	Color	Yellow Lemon color, color code: 355 as per IS 5:2007.							
5	Surface uniformity	Surface of outer sheath shall be free from cavity/ nicks/ other visible defects.							
6	Raw material supplier	PVC compound shall be procured from reputed raw materialsuppliers viz., Shakun, Kalpana, KLJ, DCM ShriRam. PVC compound from cable manufacturer shall be considered onlyafter factory evaluation for the same.							

7	Weight of outer sheath/km	To be provided by bidder

5.9 Sealing End Cap:

S.No.	Parameter	Requirement
1	Material	Adhesive coated polyolefin heat shrinkable
2	Configuration	Adhesive coated polyolefin heat shrinkable end cap shall be provided at both ends of the cable.
3	Additional requirements	2 nos. additional cable end caps shall be provided with each drum and placed in the drum.

5.10 Other Requirements:

S.No.	Parameter	Requirement
1	Overall diameter of cable in mm	To be provided by bidder
2	Weight of Overall cable in kg/km	To be provided by bidder

6. MARKING:

Steel drums shall be provided. Drum shall be free from sharp edges and visual defect.

Stencil plate on one flange side of the drum and laminated paper sheet on other side flange of drum.

Cable length on one drum shall be 250 meters max. +/- 5%. As per PO terms

I. Following details shall be provided on flanges of drum:

a) Manufacturer's name
b) Type of Cable
c) Size of Cable
d) Voltage Grade
e) Length of the cable on the drum
f) Direction of the rotation of the drum
g) Gross mass
h) Country of manufacture
i) Year and month of manufacture
j) Purchase Order no.
k) Drum No.

II. Following details shall be embossed on the outer sheath:

At interval of every 1 meter, following details to be embossed:

i) TPWODL/ TPCODL/ TPNODL/ TPSODL

ii) Manufacturer name
iii) Month & Year of Manufacture
iv) Voltage grade
v) Size of the cable
vi) Purchase Order no.
vii) Cable code

Note: - Sequential meter marking shall be printed.

7. TESTS:

The bidder shall be required to submit complete set of the following test reports along with the offer:

7.1 ACCEPTANCE TESTS

Test on Conductor

- Conductor resistance test
- Test for non-conductivity of water swellable tape/yarn of conductor
- Visual inspection for conductor cleanliness
- Conductor water penetration test

Test on Conductor Screen

- Thickness of semi-conducting tape over conductor
- Test for conductivity of semi-conducting tape over conductor
- Resistivity of extruded semi-conducting conductor screen
- Thickness of extruded semi-conducting conductor screen

Test on Insulation

- Tensile strength & Elongation at break (before ageing)
- Insulation thickness
- Eccentricity and Ovality of insulation
- Hot set test
- Volume resistivity
- Void & contamination test on core (by silicon oil dip method)
- Surface smoothness of insulation

Test on Insulation Screen

- Resistivity of insulation screen
- Thickness of insulation screen
- Visual inspection for any convolution/ protrusion between conductor screen and XLPE insulation, XLPE insulation and insulation screen
- Thickness & % Overlapping of semi-conducting water swellable tape
- Thickness & % Overlapping of copper tape

Test on Inner Sheath

- PVC thickness
- Color of inner sheath

Test on Armour (For 3 Core)

- Tensile test
- Mass of zinc coating
- Uniformity of zinc coating
- Adhesion test
- Diameter and no. of wires
- Coverage %

Test on Armour (For 1 Core)

- Tensile test
- Wrapping test
- Resistance test
- Diameter and no. of wires
- Coverage %

Test on Outer sheath

- Thickness
- Tensile strength and Elongation at break (before ageing)
- Color of outer sheath
- Surface uniformity of outer sheath (on full drum)/ shall be free from any damage- void, nick, cavity

- Presence of lead naphthenate in PVC outer sheath
- Flammability test
- Oxygen index
- Temperature index
- Acid gas generation
- Smoke density

Test on Complete Cable

- Partial discharge test
- High voltage test
- Raw material consumption verification

7.2 ROUTINE TESTS

- Conductor resistance test
- Partial discharge
- High voltage test with power frequency
- Resistance test for Aluminium armour

7.3 TYPE TESTS

Tests on Conductor

- Conductor resistance test
- Conductor water penetration test

Tests on Insulation

- Tensile strength & Elongation at break (before ageing)
- Ageing in air oven
- Tensile strength & Elongation at break
- Tests for thickness of insulation
- Eccentricity and Ovality of insulation
- Hot set test
- Shrinkage test
- Gravimetric test (Water absorption)
- Volume resistivity/ Insulation Resistance

Tests on Inner Sheath

- PVC thickness

Tests on Extruded semi-conducting screen

- Volume resistivity test of conductor screen
- Volume resistivity test of core screen

Tests on Outer Sheath (PVC)

- Flammability test for outer sheath
- Thickness
- Tensile strength and Elongation at break (before ageing)
- Tensile strength and Elongation at break (after ageing)
- Variation due to ageing
- Loss of mass test
- Shrinkage test
- Hot deformation test
- Heat shock test
- Thermal stability test
- Flammability test
- Oxygen index
- Temperature index
- Acid gas generation
- Smoke density

Tests on Armour for 3 Core Cable

- Tensile test
- Torsion test
- Wrapping test
- Resistance test
- Mass of zinc coating
- Uniformity of zinc coating
- Adhesion test

Tests on Armour for 1 Core Cable

- Tensile test
- Torsion test
- Wrapping test
- Resistance test

Tests on complete cable

- Partial discharge test
- Thermal ageing test
- Bending test
- Dielectric power factor test
- High voltage test
- Heat cycle test
- Impulse withstand test

Additional Tests

- Raw material consumption
- Color coding identification over copper screen (for 3C cable)
- Sequential marking check
- Cable drum length verification
- Packaging of cable on cable drum
- Weight of conductor/km
- Diameter of Conductor
- Weight of XLPE insulation plus semiconducting screen (of conductor & insulation)/ km
- Diameter over core
- Weight of core
- Weight of copper tape/km
- Diameter over inner sheath
- Weight of armour/ km
- Cable sealing end caps
- Weight of outer sheath/ km
- Diameter of complete cable

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA as per relevant IS. Type tests should have been conducted during the period not exceeding 10 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPWODL/ TPCODL/ TPNODL/ TPSODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPWODL/ TPCODL/ TPNODL/ TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and theequipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPWODL/ TPCODL/ TPNODL/ TPSODL's representatives at alltimes when the work is in progress. Inspection by the TPWODL/ TPCODL/ TPNODL/ TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPWODL/ TPCODL/ TPNODL/ TPSODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPWODL/ TPCODL/ TPNODL/ TPSODL
c) TPWODL/ TPCODL/ TPNODL/ TPSODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPWODL/ TPCODL/ TPNODL/ TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copyof the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an

integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning or 72 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by TATA utilities.

12. PACKING:

a) **Standard length of Cable:** The cable shall be supplied in continuous standard length of 250 (3 cores) & 500 (Single core) running meters with +/- 5% tolerance.

b) **Filling condition:** Drum shall not be overfilled.

c) **Cable drum:** The cable shall be wound on non-returnable steel drums without any extra cost to TPWODL/ TPCODL/ TPNODL/ TPSODL as per IS 10418 and its latest amendments.

d) **Sealing of cable ends:** The ends of the cable shall be sealed by means of heat shrinkable polyolefin end caps. Additional 2 nos. end caps shall be provided with each drum.

e) **Requirements for Cable drums:** Cable drums shall be so constructed as to have required mechanical strength so that the drum flanges and other components do not break during transport, in actual use or in storage. The flanges and the outside surface of the barrel shall be free from protruding materials/projections/ unevenness/ sharp edges that can damage the cable or hands of the operator during rotation of drums.
A metal preservation shall be applied to the entire drum.

f) Bottom end of cable should be clamped on drum by jute or nylon rope.

g) All ferrous metal parts used shall be treated with a suitable rust-free finish or coating to avoid rusting during transit or storage. The drums shall withstand normal handling and transport.

h) **Rail/ Road transportation:** The bidder shall ensure that the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit.

i) **Packaging shall be as per climate change perspective. Cable wound on cable drum shall be covered by recyclable PVC sheet for dust proof.**

13. TENDER SAMPLE:

Not Applicable

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations
b) Work Experience details
c) Type test certificates.
d) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

Bidder to submit clause wise compliance.

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2007

Specification Name : ENG-ELC-006- TECHNICAL SPECIFICATION FOR 11KV XLPE ARMOURED CABLE- R1

JYOTIPRAKASH MOHANTY	SHANTAPRIYA JENA	SATYA PRASAD NAYAK	Ranjan Kumar Sahoo	VARUN BHATNAGAR	VARUN BHATNAGAR
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPWODL	TPNODL	TPCODL	TPSODL	TPWODL	TPWODL
10-12-2022	10-12-2022	12-12-2022	12-12-2022	13-12-2022	13-12-2022

CONTENTS

1. SCOPE:

This specification covers technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store, performance of 11 kV XLPE ARMOURED cable, for trouble free and efficient operations.

Inclusive sizes: -

3 CORE CABLE	1 CORE CABLE
3C X 95 sq.mm.	1C X 300 sq.mm.
3C X 120 sq.mm.	1C X 400 sq.mm.
3C X 185 sq.mm.	
3C X 150 sq.mm.	1C X 630 sq.mm.
3C X 300 sq.mm.	
3C X 400 sq.mm.	1C X 1000 sq.mm.
3C X 400 sq.mm. (co-extruded cable)	

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IS 7098 (Part 2)	Cross-linked Polyethylene (XLPE) insulation for Cables
IS 8130	Conductors for insulated electrical cables and flexible cords
IS 10418	Specification for Drums for Electric cables
IEC 60228	Conductor for insulated cables
IS 3975	Low carbon galvanized steel wires, formed wires and tapes for armoring of cables
IS 5831	Specification for PVC insulation sheath for electric cables
IEC-60811	Test methods for insulations and sheaths of electric cables and cords.
ASTM D 6097	Standard test method for relative resistance to vented water tree growth in Solid Dielectric insulating materials
ICEA T 31-610	Test method for conducting longitudinal water penetration resistance tests on blocked conductors
IS 10810	Methods of tests for cables
IS 4905	Methods for random sampling
IS 4984	High density polyethylene pipes for water supply
IS 2530	Methods of test for polyethylene moulding materials and polyethylene compounds

IS 4826	Specification for hot dipped galvanized coatings on round steel wires
IS 5:2007	Colors for ready mixed paints and enamels
ASTM 2863	Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
IEC 60754	Apparatus and procedure for the measurement of the amount of halogens evolved during the combustion of materials taken from electric or optical fiber cable constructions
IEC-60502 (Part-2)	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: 22 kV Cables for rated voltages from 6 kV (Um = 7.2 kV) up to 30 kV (Um= 36 kV).
IEC 332	Test on electric cables on the fire conditions
ASTM 2843	Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.

14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted,salty, corrosive and humid coastal atmosphere.

The atmosphere is generally laden with mild acid and dust in suspension during thedry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

4. GENERAL TECHNICAL REQUIREMENTS:

S. No.	Description	Requirement	
		3 CORE CABLE	1 CORE CABLE
1	Voltage grade	11 kV (Earthed system)	
2	Max System voltage	12 kV	
3	Frequency	50 Hz	
4	Variation in frequency	+/- 3%	
5	Conductor	Watertight Stranded Aluminum (compacted circular)	
6	Conductor screen	Semi conducting tape and screen	
7	Insulation	XLPE	
8	Insulation screen	Shall have three layers:	Shall have three layers:
9		a) Bonded Semiconducting, b) Semiconducting water swellable tape, c) Metallic copper tape	a) Bonded Semiconducting, b) Semiconducting water swellable tape, c) Metallic copper tape d) Polyester transparent tape over copper screen
10	Core identification strip	Beneath copper screen	NA
11	Inner sheath	Pressure Extruded PVC ST- 2 with PP fillers	Extruded PVC ST-2
S. No.	Description	Requirement	
		3 CORE CABLE	1 CORE CABLE

12	Armour	GI wire round binded with rubberized cotton binding tape	Aluminum wire binded by rubberized cotton tape
13	Outer sheath	PVC ST-2 FRLSH type of color 'Crimson Red shade' code:355 as per IS 5:2007	
14	Outer sheath (for co-extruded cable)	a) Inner layer: HDPE ST-7, Crimson Red shade b) Outer sheath: HDPE ST-7, Black color	NA
15	Guarantee	up to a period of 60 months from the date of commissioning or 72 months from the date of last supplies made under the contract whichever is earlier.	

5. GENERAL CONSTRUCTION:

The cross-linked polyethylene insulated (XLPE) 11 kV Cable (Dry cured & water cooled) shall be manufactured and tested strictly in accordance with the Indian Standard IS 7098 (Part – 2)/ Relevant IEC/International standards and its latest amendments.

All material used in the manufacturing of cables shall be new and shall be selected as the best available for the intended use.

The rating factors for variation in ground and air temperature, depth of laying, thermal resistivity of soil and different laying configuration of cables shall be provided by the Bidder.

5.1 Conductor

S. No.	Parameter	Requirement							
1	Conductor	As per IS 8130							
2	Class	Class II							
3	Material	Plain Aluminium, grade H2/H4							
4	Shape	Stranded Compacted Circular							
5	Nominal size ofconductor mm2	95	120	150	185	300	400	630	1000
6	Min. number ofstrands	15	15	15	30	30	53	53	53
7	Max. DC resistance@ 20 deg C (Ohm/km)	0.32	0.25	0.206	0.164	0.1	0.08	0.047	0.03
8	Conductor Short circuit current ratingfor 1 second	9 kA	11.3 kA	14.2 kA	17.5 kA	28.3 kA	37.7 kA	59.4 kA	94.3 kA
9	Min. weight ofconductor (kg/km/core)	244	308	390	480	780	1080	1650	2600

10	Longitudinal water sealing of conductor	a) Non-conductive water swellable yarn/ tape/ combination of both shall be provided in between interstices of the conductor. b) Also, this water swellable tape and yarn shall be compatible to withstand conductor continuous temperature of 90 deg C and short circuit temperature of 250 deg C without any decay. c) It shall not affect the electrical conductivity of the conductor.
11	Cleanliness anduniformity	a) Before stranding, the cross-section of the Aluminium conductor shall be circular, and shall have uniform smooth surface, free from sharp edges and free from any defects. b) Stranded Conductor shall be free from oil traces & aluminum dust. Conductor (after stranding) shall be super cleaned c) Traces of aluminum dust on conductor or conductor screen shall not be acceptable.
12	Conductor jointing	Not acceptable in any strand or in any conductor after it is stranded.
13	Raw material supplier ,	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta / Equivalent (in-line with TS)
14	Diameter of conductor	To be specified by bidder

5.2 Conductor Screen:

S. No.	Parameter	Requirement
1	Material	**1st layer:** Semi-conducting tape **2nd layer:** Semi-conducting compound
2	Configuration	**1st layer:** Semi-conducting tape shall be applied over conductor with nominal thickness of 0.2 mm. **2nd layer:** Semi-conducting compound screen shall be applied through triple extrusion process.
3	Min. thickness	Minimum thickness of semi-conducting compound screen shall be 0.5 mm at any point of measurement.
4	Resistivity	Resistivity of semiconducting conductor screen shall not exceed 1000 Ω-m
5	Uniformity on interfacial region	Interfacial region between conductor screen and insulation shall be uniform. Protrusion/ convolution/ other defects are not acceptable in the region.
6	Raw material supplier	Semiconducting compound shall be procured from reputed raw material suppliers viz. Dow/ Borealis/ Hanwa/ Equivalent (in-line with TS)

5.3 Insulation:

S. No.	Parameter	Requirement
1	Material and extrusion process	XLPE insulation shall be applied through CCV/VCV line by triple extrusion process with 'Dry Curing' and 'Water Cooling'.
2	Raw material supplier	**a) XLPE compound shall be super cleaned and procured from reputed raw material suppliers viz. Dow/Borealis/Hanwa/** Equivalent (in-line with TS) b) Both XLPE and semi conductive compounds shall be used from same raw material supplier.
3	Thickness and Eccentricity	a) Nominal thickness shall be 3.6 mm. b) Minimum thickness shall be 3.14 mm at any point of measurement. c) Eccentricity of insulation shall not exceed 10%.
4	Thermal stability	The insulation properties shall be stable under thermal conditions arising out of continuous operation at conductor temperature of 90 deg. C rising momentarily to 250 deg. C under short circuit conditions.
5	Cleanliness and uniformity	Interfacial region between insulation and insulation screen shall be uniform. Protrusion/convolution/ other defects are not acceptable. Core shall be free from void and contamination.

5.4 Insulation Screen & Core identification strip:

S. No.	Parameter	Requirement
1	Material	a) **1st layer:** Semi-conducting compound b) **2nd layer**: Semi-conducting water swellable tape c) **3rd layer:** Annealed copper tape
2	Configuration	**a) 1st layer: Non-Metallic Part:** Extruded Insulation semiconducting screen shall be bonded type. Resistivity shall not exceed 500 Ω-meter. Surface of insulation screen shall be smooth, free from cavity/ nicks/scratches/ other visible defects. Min. thickness shall be 0.3 mm at any point of measurement. **b) 2nd layer: Water Swellable tape:** Semi-conducting water swellable tapes shall be applied over non-metallic screen. Minimum thickness of water swellable shall be 0.3 mm and minimum overlapping shall be 15%. **Core identification strip:** **3 CORE CABLE: -** Each of the three core identification strips shall

S. No.	Parameter	Requirement
		be applied longitudinally beneath copper screen. Width of the colored strip shall be 7-10 mm. R, Y, B. **1 CORE CABLE: - NA** c) **3rd layer: Metallic Part**: Annealed copper tape, helically wound over the water swellable tape with minimum 15% overlap. Minimum thickness shall be 0.045 mm at any point of measurement.
3	Raw material supplier	Semiconducting compound shall be procured from reputed raw material suppliers viz.,Dow/Borealis/Hanwa / Equivalent (in-line with TS)
4	Diameter of cores	To be specified by bidder
5	Weight of cores/km (approx.)	To be specified by bidder
6	Weight of copper tape/km (approx.)	To be specified by bidder

5.5 Fillers:

S. No.	Parameter	Requirement	
		3 CORE CABLE	**1 CORE CABLE**
1	Material	Virgin Polypropylene fibers of natural color	NA
2	Configuration	Virgin Polypropylene fibers shall be tightly filled in empty space as fillers.	

5.6 Inner Sheath:

S. No.	Parameter	Requirement	
		3 CORE CABLE	**1 CORE CABLE**
1	Material	Black colored Polyvinyl chloride (PVC) type ST-2 compound	
2	Configuration	The laid-up cores shall be provided with *pressure extruded* Polyvinyl chloride (PVC) type ST-2 compound conforming to IS: 5831 with latest amendments. Pressurized extrusion is required to remove any gaps remaining in between the fillers and to make the cable as circular as possible. It shall be applied to fit closely on to the laid-up cores and shall be possible to remove easily without causing any damage to the underlying insulated cores and screens.	Extruded PVC ST-2 type conforming to IS: 5831. It shall be applied to fit closely and shall be possible to remove easily without causing any damage to the underlying insulated cores and screens.

3	Raw material supplier	PVC compound shall be procured from reputed suppliers viz, Shakun, Kalpana, KLJ, DCM ShriRam/ Equivalent (in line with TS). PVC compound from cable manufacturer shall be considered only after factory evaluation for the same.

4	Min. thickness at anypoint of measurement	**3 CORE CABLE**					
		95 sq.mm.	120 sq.mm.	150 sq.mm.	185 sq.mm.	300 sq.mm.	400 sq.mm.
		0.6 mm	0.6 mm	0.6 mm	0.7mm	0.7 mm	0.7 mm
		1 CORE CABLE					
		300 sq. mm.	400 sq.mm.	630 sq.mm.		1000 sq.mm.	
		0.4 mm(min)	0.4 mm	0.5 mm		0.6 mm	

5.7 Armour:

S. No.	Parameter	Requirement					
		3 CORE CABLE				**1 CORE CABLE**	
1	Material	Low carbon annealed hot dippedgalvanized round steel wires				H4 Grade Aluminum wires	
2	Compliance to Standard	It shall comply with the requirements of IS 3975 along withlatest amendments. Hot dipped galvanizing layer shall be uniform on low carbon annealed steel wires. Zinc coating shall be 290g/m2 as per IS 4826:1979.				It shall comply with the requirements of IS8130 along with latest amendments.	
3	Nominal Dimensions	**3 Core cable**					
		95 sq.mm	120 sq.mm	150 sq.mm	185 sq. mm.	300 sq.mm	400 sq.mm.
		2.5 (GI Wire)	2.5 (GI Wire)	2.5 (GI Wire)	3.15(GI WIRE)	3.15 (GI Wire)	4.00 (GI Wire)
		1 CORE CABLE					
		300 sq. mm.	400 sq.mm	630 sq.mm			1000 sq.mm
		2 mm (Aluminum wire)	2 mm (Aluminum wire)	2 mm (Aluminum wire)			3.15 mm (Aluminum wire)
4	Approx. Armor Short circuitrating in kAfor 1 sec	**3 Core cable**					
		95 sq.mm	120 sq.mm	150 sq.mm		300 sq.mm	400 sq.mm.
		9	12	15		15	15
		1 CORE CABLE					
		300 sq. mm	400 sq.mm	630 sq.mm			1000 sq.mm
		15	15	15			15
		Fault current for the armour with minimum 90 % coverage.					

5	Jointing in the armour wires	Not acceptable in any armour wire
6	Laying of armour	The armor wires shall be applied as closely as practicable. Shall not be less than 90% of total circumference.
7	Binding	The rubberized cotton binding tape shall be applied to bind the armor wires suchthat it shall not affect the electrical properties of the armor wires and the overall cable.
8	Weight of armor	To be furnished by Bidder
9	Raw material supplier	Steel armour shall be procured from reputed raw material suppliers viz., TATA Steel, Jindal Steel, SAIL/ Equivalent (in-line with TS) / Aluminium armour shall be procuredfrom reputed raw material suppliers viz TATA/ BALCO/HINDALCO/NALCO/Vedanta Only/ Equivalent (in-line with TS)

5.8 Outer Sheath (for Normal cable)

S. No.	Parameter	Requirement					
1	Material	Polyvinyl chloride (PVC) ST-2 **FRLSH** type compound with **'lead naphthenate'** additive					
2	Configuration	Polyvinyl chloride (PVC) ST-2 FRLSH type compound with **'lead naphthenate'** additive as 'termite & rodent repellent' applied by extrusion process.					
3	Min. Thickness at any point of measurement	**3 CORE CABLE**					
		95 sq.mm	120 sq.mm	150 sq. mm	185 sq. mm.	300 sq.mm	400 sq.mm.
		2.2 mm	2.2 mm	2.36 mm	2.52 mm	2.84 mm	3.0 mm
		1 CORE CABLE					
		300 sq. mm.	400 sq.mm	630 sq.mm			1000 sq.mm
		1.56 mm	1.72 mm	1.88 mm			2.2 mm
4	Color	Crimson Red color, color code: 540 as per IS 5:2007.					
5	Surface uniformity	Surface of outer sheath shall be free from cavity/ nicks/ other visible defects.					
6	Raw material supplier	**PVC compound shall be procured from reputed raw material suppliers viz.,** Shakun, Kalpana, KLJ, DCM ShriRam. Equivalent (in-line with TS) PVC compound from cable manufacturer shall be considered only after factory evaluation for the same.					
7	Weight of outer sheath/km	To be provided by bidder					

5.9 Outer Sheath (for Co extruded 3C Cable)

S. No.	Parameter	Requirement
1	Inner layer	HDPE ST-7, Crimson red of color code 540, Minimum thickness at any point of measurement – 3 mm

2	Outermost layer	HDPE ST-7, Black color, Nominal Thickness at any point of measurement – 2 mm. Carbon content shall be as per IS 7098
3	Surface uniformity	Surface of outer sheath shall be free from cavity/ nicks/ other visible defects.
4	Raw material supplier	**HDPE shall be procured from reputed raw material suppliers viz., Shakun, Kalpana, KLJ, SCJ Plastics, and Borealis**, Equivalent (in-line with TS)
5	Weight of outer sheath/km	To be provided by bidder
6	Weight of HDPE/km	To be provided by bidder

5.10 Sealing End Cap:

S. No.	Parameter	Requirement
1	Material	Adhesive coated polyolefin heat shrinkable
2	Configuration	Adhesive coated polyolefin heat shrinkable end cap shall be provided at both ends of the cable.
3	Additional requirements	2 nos. additional cable end caps shall be provided with each drum and placed in the drum.

5.11 Other Requirements:

S. No.	Parameter	Requirement
1	Overall diameter of cable in mm	To be provided by bidder
2	Weight of Overall cable in kg/km	To be provided by bidder

6 MARKING:

Steel drums shall be provided. Drum shall be free from sharp edges and visual defect. Stencil plate on one flange side of the drum and laminated paper sheet on other side flange of drum.

Cable length on one drum shall be 250 meters max. +/- 5%. (As per PO Terms.)

I. Following details shall be provided on flanges of drum:

a) Manufacturer's name
b) Type of Cable
c) Size of Cable
d) Voltage Grade
e) Length of the cable on the drum
f) Direction of the rotation of the drum
g) Gross mass
h) Country of manufacture
i) Year and month of manufacture

j) Purchase Order no.

k) Drum No.

II. Following details shall be embossed on the outer PVC Jacket (For normal Cable) & HDPE layer (for co-extruded cable):

Embossing may be clearly visible**.** At interval of every 1 meter, following details to be embossed:

i) TPWODL/ TPCODL/ TPNODL/ TPSODL

ii) Manufacturer's name

iii) Month & Year of Manufacturing

iv) Voltage grade

v) Size of the cable

vi) Purchase Order no.

vii) Cable code

Note: - Sequential meter marking shall be printed.

7 TESTS:

The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

Test on Conductor

7.1.1 Conductor resistance test

7.1.2 Test for non-conductivity of water swellable tape/yarn of conductor

7.1.3 Visual inspection for conductor cleanliness

7.1.4 Conductor water penetration test

Test on Conductor Screen

7.1.5 Thickness of semi-conducting tape over conductor

7.1.6 Test for conductivity of semi-conducting tape over conductor

7.1.7 Resistivity of extruded semi-conducting conductor screen

7.1.8 Thickness of extruded semi-conducting conductor screen

Test on Insulation

7.1.9 Tensile strength & Elongation at break (before ageing)

7.1.10 Insulation thickness

7.1.11 Eccentricity and Ovality of insulation

7.1.12 Hot set test

7.1.13 Volume resistivity

7.1.14 Void & contamination test on core (by silicon oil dip method)

7.1.15 Surface smoothness of insulation

Test on Insulation Screen

7.1.16 Resistivity of insulation screen

7.1.17 Thickness of insulation screen

7.1.18 Visual inspection for any convolution/ protrusion between conductor screen and XLPEinsulation, XLPE insulation and insulation screen

7.1.19 Thickness & % Overlapping of semi-conducting water swellable tape

7.1.20 Thickness & % Overlapping of copper tape

Test on Inner Sheath

7.1.21 PVC thickness

7.1.22 Color of inner sheath

Test on Armour (For 3 Core)

7.1.23 Tensile test

7.1.24 Mass of zinc coating

7.1.25 Uniformity of zinc coating

7.1.26 Adhesion test

7.1.27 Diameter and no. of wires

7.1.28 Coverage %

Test on Armour (For 1 Core)

7.1.29 Tensile test

7.1.30 Wrapping test

7.1.31 Resistance test

7.1.32 Diameter and no. of wires

7.1.33 Coverage %

Test on Outer sheath (for Normal cable)

7.1.34 Thickness

7.1.35 Tensile strength and Elongation at break (before ageing)

7.1.36 Color of outer sheath

7.1.37 Surface uniformity of outer sheath (on full drum)/ shall be free from any damage- void,nick, cavity

7.1.38 Presence of lead naphthenate in PVC outer sheath

7.1.39 Flammability test

7.1.40 Oxygen index

7.1.41 Temperature index

7.1.42 Acid gas generation

7.1.43 Smoke density

Test on Outer sheath (for 3 Core extruded cable)

INNER LAYER

7.1.44 Thickness

7.1.45 Tensile strength and Elongation at Break (before ageing)

7.1.46 Color

OUTER LAYER

7.1.47 Thickness

7.1.48 Tensile strength and Elongation at Break (before ageing)

7.1.49 Carbon Content

7.1.50 Color

7.1.51 Surface uniformity of outer sheath (on full drum)/ shall be free from any damage- void,nick, cavity

Test on Complete Cable

7.1.52 Partial discharge test

7.1.53 High voltage test

7.2 ROUTINE TESTS

i) Conductor resistance test

ii) Partial discharge

iii) High voltage test with power frequency

iv) Resistance test for Aluminium armour

7.3 TYPE TESTS

Tests on Conductor

7.3.1 Conductor resistance test

7.3.2 Conductor water penetration test

Tests on Insulation

7.3.3 Tensile strength & Elongation at break (before ageing)

7.3.4 Ageing in air oven

7.3.5 Tensile strength & Elongation at break

7.3.6 Tests for thickness of insulation

7.3.7 Eccentricity and Ovality of insulation

7.3.8 Hot set test

7.3.9 Shrinkage test

7.3.10 Gravimetric test (Water absorption)

7.3.11 Volume resistivity/ Insulation Resistance

Tests on Inner Sheath

7.3.12 PVC thickness

Tests on Extruded semi-conducting screen

7.3.13 Volume resistivity test of conductor screen

7.3.14 Volume resistivity test of core screen

Tests on Outer Sheath (PVC)

7.3.15 Flammability test for outer sheath

7.3.16 Thickness

7.3.17 Tensile strength and Elongation at break (before ageing)

7.3.18 Tensile strength and Elongation at break (after ageing)

7.3.19 Variation due to ageing

7.3.20 Loss of mass test

7.3.21 Shrinkage test

7.3.22 Hot deformation test

7.3.23 Heat shock test

7.3.24 Thermal stability test

7.3.25 Flammability test

7.3.26 Oxygen index

7.3.27 Temperature index

7.3.28 Acid gas generation

7.3.29 Smoke density

Tests on Outer Sheath - HDPE ST 7 (for Co-extruded cable)

7.3.30 Thickness

7.3.31 Tensile strength and Elongation at break (before ageing)

7.3.32 Tensile strength and Elongation at break (after ageing)

7.3.33 Shrinkage test

7.3.34 Carbon Black Content

Tests on Armour for 3 Core Cable

7.3.35 Tensile test

7.3.36 Torsion test

7.3.37 Wrapping test

7.3.38 Resistance test

7.3.39 Mass of zinc coating

7.3.40 Uniformity of zinc coating

7.3.41 Adhesion test

Tests on Armour for 1 Core Cable

7.3.42 Tensile test

7.3.43 Torsion test

7.3.44 Wrapping test

7.3.45 Resistance test

Tests on complete cable

7.3.46 Partial discharge test

7.3.47 Thermal ageing test

7.3.48 Bending test

7.3.49 Dielectric power factor test

7.3.50 High voltage test

7.3.51 Heat cycle test

7.3.52 Impulse withstand test

Additional Test (To be checked by Inspector)

7.3.53 Raw material consumption

7.3.54 Color coding identification over copper screen (for 3C cable)

7.3.55 Sequential marking check

7.3.56 Cable drum length verification

7.3.57 Packaging of cable on cable drum

7.3.58 Diameter over outermost sheath of co-extruded cable

7.3.59 Weight of outer sheath of co-extruded cable/ km

7.3.60 Weight of total HDPE of co-extruded cable/ km.

8 TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA as per relevant IS. However, TPWODL/ TPCODL/ TPNODL/ TPSODL/ TATA-POWER reserves the right to allow any other NABL accredited/ Govt. lab report under exceptional circumstances after due diligence/ scrutiny by DISCOM. Tests should have been conducted during the period not exceeding 10 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPWODL/ TPCODL/ TPNODL/ TPSODL.

9 PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPWODL/ TPCODL/ TPNODL/ TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPWODL/ TPCODL/ TPNODL/ TPSODL's representatives at all times when the work is in progress. Inspection by the TPWODL/ TPCODL/ TPNODL/ TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPWODL/ TPCODL/ TPNODL/ TPSODL.

Following documents shall be sent along with material.

a) Test reports

b) MDCC issued by TPWODL/ TPCODL/ TPNODL/ TPSODL

c) TPWODL/ TPCODL/ TPNODL/ TPSODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue.
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10 INSPECTION AFTER RECEIPT AT STORE:

The material received at TPWODL/ TPCODL/ TPNODL/ TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copyof the report shall be sent to Engineering department.

11 GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning or 72 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

12 PACKING:

a) **Standard length of Cable:** The cable shall be supplied in continuous standard length of 250 (3 cores) & 500 (Single core) running meters with +/- 5% tolerance.
b) **Filling condition:** Drum shall not be overfilled.
c) **Cable drum:** The cable shall be wound on non-returnable steel drums without any extra cost to TPWODL/ TPCODL/ TPNODL/ TPSODL as per IS 10418 and its latest amendments.
d) **Sealing of cable ends:** The ends of the cable shall be sealed by means of heat shrinkable polyolefin end caps. Additional 2 nos. end caps shall be provided with each drum.
e) **Requirements for Cable drums:** Cable drums shall be so constructed as to have required mechanical strength so that the drum flanges and other components do not break during transport, in actual use or in storage. The flanges and the outside surface of the barrel shall be free from protruding materials/projections/ unevenness/ sharp edges that can damage the cable or hands of the operator during rotation of drums.

A metal preservation shall be applied to the entire drum.

f) Bottom end of cable should be clamped on drum by jute or nylon rope.

g) All ferrous metal parts used shall be treated with a suitable rust-free finish or coating to avoid rusting during transit or storage. The drums shall withstand normal handling and transport.

h) **Rail/ Road transportation:** The bidder shall ensure that the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit.

i) **Packaging shall be as per climate change perspective. Cable wound on cable drum shall be covered by recyclable PVC sheet for dust proof.**

13 TENDER SAMPLE:

Not Applicable

14 QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15 TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

16 MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17 SPARES, ACCESSORIES AND TOOLS

Not applicable.

18 DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B"

Deviations

b) Work Experience details

c) Type test certificates.

d) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

19 SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

Bidder to submit clause wise compliance.

20 SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation