

MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.



MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

LT XLPE POWER CABLE FOR
DISTRIBUTION NETWORK

TECHNICAL SPECIFICATION NO.

CE/ T & QC /MSC-I/LT XLPE POWER CABLE/2019, DATE: 15.06.2019

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SCHEDULE – 'C'

Guaranteed Technical particular

1.00 SCOPE

This specification covers design, manufacture, shop testing, packing and delivery of 1100 Volts grade, Aluminium conductor, XLPE insulated multi core power cables by road/rail to the designated Stores in the State of Maharashtra.

The cable shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and / or the commercial order or not.

2.00 SERVICE CONDITIONS

The cable to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Maximum ambient temperature (Degree C)	50
Maximum temperature in shade (Degree C)	45
Minimum temperature of Air in Shade (Degree C)	3.5
Relative Humidity (Percent)	10 to 100
Maximum annual rain fall (mm)	1450
Maximum wind pressure (Kg/sq.mm.)	150
Maximum altitude above mean sea level (Metre)	1000
Isoceraunic level (days per year)	50
Seismic level (Horizontal Acceleration)	0.3 g

Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.

3.00 STANDARDS

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the LT XLPE power cables shall conform to the latest revisions available at the time of placement of order of all the relevant standards as listed in, but not limited to standards as below.

IS: 7098 (Part 1) / 1988 (amended upto date) suitable for working voltages upto and including 1100 Volts.

IS: 5831 / 1984 modified upto date in all respects with regard to PVC insulation and sheath of electric cables

IS: 8130 / 1984 - PVC insulated for conductors for insulated electric cables and flexible cords.

IS: 3975 / 1988 for Mild Steel wires, formed wires and tapes for armouring of cables

IS: 10462 (Part I) / 1983 - Fictitious calculation method for determination of dimensions of protective covering of cables.

4.00 GENERAL TECHNICAL REQUIREMENT

System Voltage

The cable shall be suitable for operation on three phase, 440 Volts, 50 Hz, solidly earthed system.

For the above system, the cable shall be suitable for continuous 10% over-voltages.

The cable shall bear ISI mark.

5.00 CONSTRUCTION

5.01 ARMOURED CABLES

1100 Volts Grade L.T. cable with stranded H2/H4 grade aluminium conductor, XLPE insulated, colour coded, laid up with fillers and / or binder tape wherever necessary provided with extruded PVC inner sheath, **Single Galvanized steel strip armoured** and provided with PVC outer sheath. Both, inner and outer sheaths shall be of Type ST-2 as per IS: 5831/1984. The cable shall conform to IS: 7098

(Part 1) / 1988 (amended upto date) and must bear ISI mark.

5.02 INSULATION, INNER SHEATH AND OUTER SHEATH

Insulation, inner sheath and outer sheath shall be applied by separate extrusion. Inner sheath shall be applied by extrusion only. Bedding of PVC tape for inner sheath is not acceptable. Colour of outer sheath shall be black. The quality of insulation shall be good and insulation shall not be deteriorated when exposed to the climatic conditions.

5.03 SEQUENTIAL MARKING ON THE LENGTH OF CABLE

Non erasable sequential marking of length shall be provided by embossing on outer sheath of the cable for each meter length as brought out elsewhere in this specification.

5.04 CONTINUOUS AC CURRENT CAPACITY

The continuous ac current capacity shall be as per Table given below.

1.1 KV SINGLE CORE AL/COPPER COND,XLPE INSULATED CABLES as per IS 3961 part (6) Table 2									
Cross-sectional area (Sq MM)	ARMoured CABLE								
	Overall Diameter (mm)	Normal Current Rating in Amps						Short Circuit Current Rating for 1Sec.duration in KA	
		Aluminum Conductor			Copper Conductor			Aluminum	Copper
		Ground	Duct	Air	Ground	Duct	Air		
1cX4	10	37	34	33	47	43	41	0.376	0.572
1cX 6	11	47	43	43	58	53	52	0.56	0.858
1cX10	12	59	54	55	77	70	71	0.94	1.43
1cX16	13	76	69	72	98	89	94	1.50	2.29
1cX25	14	98	89	98	126	114	126	2.35	3.58
1cX 35	15	116	106	119	150	136	154	3.29	5.01
1cX50	17	137	124	145	177	160	187	4.70	7.15
1cX70	19	168	151	185	216	195	238	6.58	10.01
1cX 95	22	202	181	235	260	233	303	8.93	13.59
1cX120	24	230	206	276	295	264	354	11.28	17.16
1cX150	25	256	229	314	329	294	403	14.10	21.45
1cX185	28	290	258	366	371	330	468	17.39	26.46
1cX240	30	335	298	434	427	379	553	22.56	34.32
1cX300	33	376	333	500	477	422	634	28.20	42.90
1cX400	38	429	378	589	537	473	737	37.60	57.20

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1.1 KV Two CORE AL/COPPER COND,XLPE INSULATED as per 3961 part 6 (Table 3)									
Cross-sectional area (Sq MM)	ARMOURED CABLE								
	Overall Diameter (mm)	Normal Current Rating in Amps						Short Circuit Current Rating for 1Sec.duration in KA	
		Aluminum Conductor			Copper Conductor			Aluminum	Copper
		Ground	Duct	Air	Ground	Duct	Air		
2cX4	15	42	36	38	54	45	48	0.376	0.572
2cX 6	16	55	46	50	67	56	61	0.564	0.858
2cX10	18	68	57	64	89	75	83	0.940	1.430
2cX16	19	89	74	83	115	96	108	1.50	2.29

1.1 KV Three & Half CORE AL/COPPER COND,XLPE INSULATED As per IS 3961 (Part-6) Table 4.									
Cross-sectional area (Sq MM)	ARMOURED CABLE								
	Overall Diameter (mm)	Normal Current Rating in Amps						Short Circuit Current Rating for 1Sec.duration in KA	
		Aluminum Conductor			Copper Conductor			Aluminum	Copper
		Ground	Duct	Air	Ground	Duct	Air		
3.5X25	25	95	79	93	122	102	119	2.35	3.58
3.5X35	27	114	94	114	146	122	147	3.29	5.01
3.5X50	30	134	112	138	173	144	179	4.70	7.15
3.5X70	35	164	137	115	212	177	226	6.58	10.01
3.5X95	38	197	164	216	254	212	279	8.93	13.59
3.5X120	42	223	187	244	287	240	320	11.28	17.16
3.5X150	46	249	209	284	321	269	365	14.10	21.45
3.5X185	51	282	238	329	362	304	422	17.39	26.46
3.5X240	56	327	276	392	418	352	500	22.56	34.32
3.5X300	60	369	312	452	469	396	514	28.20	42.90
3.5X400	71	420	356	426	528	442	662	37.60	57.20
3.5X500	79	478	412	612	593	511	760	47.00	71.50
3.5X630	88	542	468	712	661	571	870	59.22	90.09

1.1 KV Four CORE AL/COPPER COND,XLPE INSULATED CABLES As per IS 3961 (Part-6) Table 4									
Cross-sectional area (Sq MM)	ARMOURED CABLE								
	Overall Diameter (mm)	Normal Current Rating in Amps						Short Circuit Current Rating for 1Sec.duration in KA	
		Aluminum Conductor			Copper Conductor			Aluminum	Copper
		Ground	Duct	Air	Ground	Duct	Air		
4cX4	18	35	30	32	45	38	41	0.376	0.572
4cX 6	19	46	38	42	56	47	52	0.564	0.858
4cX 10	21	57	48	54	74	62	70	0.940	1.430
4cX16	22	74	61	69	95	79	89	1.50	2.29

6.00 TESTS

6.01 TYPE TESTS

The cable offered shall have successfully passed all type tests described in the IS: 7098 (Part 1) / 1988 (amended upto date).

The Type Test Certificate shall clearly indicate the constructional features of the type-tested cable. The Type Test Certificate of the cable shall be same as the cable offered. Separate Type Test Certificate for each offered size of cable shall be submitted.

All the Type Tests shall be carried out from Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, ERDA, ERTL, etc. to prove that the cable meets the requirements of specification.

Type Test conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The Type Test Certificate as per IS: 7098 (Part 1) / 1988 (amended upto date) shall be submitted along with the offer. The Type Test Certificate carried out during last five years shall be valid.

Further purchaser reserves the right to pick up cable at random from the lots offered / supplied and get the cable tested for some or all the Type Tests in presence of purchasers' representative at third party NABL lab at the sole discretion of the purchaser. For this purpose, the tenderer shall quote unit rates for carrying out each Type Test. However, such unit rates will not be considered for evaluation of the offer. It shall be the responsibility of the supplier to arrange such tests and purchaser shall be informed of the date and time of conduction of tests well in advance to enable him to witness such tests. Test charges of the testing authority, for such successful repeat type tests, shall be reimbursed at actual by the Purchaser. The supplier shall have no right to contest the test results of the third party lab for additional tests. In case the cable fails in the type tests, the complete supply shall be rejected. The supplier has to replace / take corrective action at the cost of the supplier.

6.02 ROUTINE TESTS

All the Routine tests as per IS: 7098 (Part 1) - 1988 amended upto date shall be carried out on each and every delivery length of cable. The result shall be given in test report.

The details of facility available in the manufacturer's works in this connection shall be given in the bid.

6.03 ACCEPTANCE TESTS

All Acceptance tests as per IS: 7098 (Part-I) 1988 as amended upto date including the optional test as per clause no 15.4 and Flammability Test as per clause No. 16.3 shall be carried out on sample taken from the delivery lot.

6.04 ADDITIONAL ACCEPTANCE TESTS

The following additional acceptance test shall be carried out on PVC compounds used for outer sheath as per IS: 5831 / 1984 (amended upto date).

1. Hot Deformation Test.

7.00 PURCHASER'S AND MANUFACTURER'S IDENTIFICATION

The manufacturer and the Company shall be identified throughout the length of cable by embossing the manufacturer's name, the Company's name on the P.V.C. sheath. The manufacturer's name/ trade mark and M.S.E.D.C.Ltd. shall be embossed at least once on every meter length of cable, along with sequential marking for each meter length.

8.00 SIZE OF CABLE

The size of cables with voltages grade shall be as per schedule of requirement.

9.00 TESTING FACILITIES AND DETAILS OF EQUIPMENT

The supplier / tenderer shall clearly state as to what testing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out type, routine and acceptance tests mentioned in IS: 7098 (Part-1) / 1988 (amended upto date) on the cable including test as per clause No. 6.04 of specification.

The facilities shall be provided by the bidder to purchaser's representative for witnessing the tests in the manufacturer's works.

If any test cannot be carried out at manufacturer's works reason shall be clearly stated in the tender.

10.00 PRE DESPATCH INSPECTIONS

All the type tests in accordance with IS: 7098 (Part-1) - 1988 (amended upto date) and additional acceptance test as per specification shall be performed on a sample of each size of cable ordered from the first lot of supply at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase.

The sample for type tests of each size of cable ordered from the first lot of supply shall be drawn by purchaser representative.

The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification.

The MSEDCL's representative / Engineer attending the above testing will carry out testing in accordance with IS: 7098 (Part 1) - 1988 (amended upto date) and additional acceptance test as per this specification and issue test certificate approval to the manufacturer and give clearance for dispatch.

11.00 PACKING AND MARKING

11.01 UPTO 120 SQ. MM. SIZE

Cables shall be supplied in continuous standard length of 500 meters with plus minus 5% (five percent) tolerance wound on non returnable wooden drums of good quality or on non-returnable steel drums without any extra cost to the purchaser.

11.02 ABOVE 120 SQ.MM. SIZE

Cables shall be supplied in continuous standard length of 250 meters with plus minus 5% (five percent) tolerance wound on non returnable wooden drums of good quality or on non-returnable steel drums without any extra cost to the purchaser.

11.03 NON STANDARD LENGTH

5% (five percent) of the ordered quantity of respective size shall be acceptable in non-standard length which shall not be less than 100 meters in length.

11.04 In addition to the requirement as per IS, the following particulars shall be properly legibly embossed on the cable sheath at the intervals of not exceeding one meter through out the length of the cable. The cables

with poor and illegible embossing shall be liable for rejection.

- (a) Manufactures name.
- (b) Voltage grade.
- (c) Year of manufacture.
- (d) Name of purchaser: M.S.E.D.C.L.
- (e) Successive Length.
- (f) Size of cable
- (g) Cable Identification: Electric
- (h) ISI mark

11.05 Packing and marking shall be as per clause No. 18 of IS 7098 (Part I) / 1988 amended up to date.

11.06 Supplier shall provide statistical data regarding cables of all sizes viz.-

- (i) Weight of one meter of finished product of cable of various sizes and ratings.
- (j) Weight of one meter of bare conductor used for cables of various sizes and ratings.

12.00 PERFORMANCE GUARANTEE:

The cable offered shall be guaranteed for satisfactory performance for a period of 30 months from the date of receipt of complete cable at site in good condition or 24 months from the date of satisfactory commissioning, whichever is earlier. In case of failure within this period, the supplier shall make good the faulty cable at no extra cost to the purchaser.

13.00 QUALITY CONTROL

The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of cable as per this specification. The team shall be given all assistance and co-operation for inspection and testing at the bidder's works. The cable supplied shall give service for a long period without drifting from the original calibration & performance must be near to zero percent failure.

14.00 QUALITY ASSURANCE PLAN

A detailed list of bought out items which got into the manufacture of

cables shall be furnished indicating the name of the firms from whom these items are procured. The bidder shall enclose the quality assurance plan invariably along with offer followed by him in respect of the bought out items, items manufactured by him & raw materials in process as well as final inspection, packing & marking. The Company may at its option order the verification of these plans at manufacturer's works as a pre qualification for technically accepting the bid. During verification if it is found that the firm is not meeting with the quality assurance plan submitted by the firm, the offer shall be liable for rejection.

15.00 SCHEDULES

The tenderer shall fill in the following schedule which forms the part of the offer.

Schedule `C' ... Tenderer's Experience.

The tenderer shall submit the list of orders for similar type of equipments, executed or under execution during the last three years, with full details in the schedule of Tenderer's experience (Schedule 'C') to enable the purchaser to evaluate the tender.

SCHEDULE – ‘C’

SCHEDULE OF TENDERER'S EXPERIENCE

The tenderer shall submit the list of orders for similar type of orders executed or under execution during the last three years, with full details in the schedule to whom a reference may be made by purchaser in case he considers such a reference necessary to enable the purchaser to evaluate the tender.

Sr. No.	Name of client and description	Value of order	Period of supply and commissioning	Name and address to whom reference may be made
1	2	3	4	5

NAME OF FIRM _____

NAME & SIGNATURE OF TENDERER _____

DESIGNATION _____

DATE _____

Guaranteed Technical Particular

Sr.No	Guaranteed technical particular	To be fill by Bidder
	DESCRIPTION of Cable	
1	GENERAL	
	Name of Manufacturer	
	Address	
	Brand	
	Applicable Standards (IS)	
	Voltage Grade (KV)	
2	CONDUCTOR (Phase)	
	Material	
	grade	
	Shape	
	Cross sectional Area (Sq. mm.)	
	No. of Cores	
	Minimum No of Strand (Nos)	
	Single strand Dia Before stranding (mm)	
	Maximum D.C.resistance at 20 deg.c ohm/km(Phase)	
3	INSULATION (Phase)	
	Material	
	Nominal Thickness (mm)	
	Colour	
4	ARMOURING	
	Material	
	Types of Armouring	
	Nonimal size of Armouring (mm)	
5	OUTER SHEATH	
	Material	
	Minimum Thickness (mm)	
	Colour	
6	Approximate Overall Diameter. (mm)	
7	Approximate Net Weight of cable. (Kg/Km.)	
8	Embossing on cable at regular interval along its length	
9	Standard Drum Length (mtr)	
10	Drums Type	
11	Continious AC Current Carrying Capacity	
	When laid in ground (30 Deg.C) Amps	
	When laid in air (40 Deg.C) Amps	
12	Short Current Raiting Of Conductor - Duaration of 1 Sec in (KA)	
13	Minimum Bending Radius	

