



MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION FOR H.T. AERIAL BUNCHED CABLES FOR DISTRIBUTION NETWORK IN MAHARASHTRA

TECHNICAL SPECIFICATION NO.

CE/MMC/MSC-III/HT A.B. CABLE/01

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TECHNICAL SPECIFICATION FOR H.T. AERIAL BUNCHED CABLES

1.0 SCOPE:

This specification covers requirements of XLPE insulated, 11 KV Aerial Bunched Cables for overhead lines in rural electrification system.

2.0 COMPOSITION OF THE CABLE:

The composite cable shall comprise three single-core cables twisted around a bare aluminium alloy messenger wire, which will carry the weight of the cable.

3.0 RATED VOLTAGE:

The rated voltage of the cables shall be 6.35KV/11KV and the maximum operating voltage shall be 12 KV.

4.0 SERVICE CONDITIONS:

4.1 Equipment to be supplied against the specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

4.1.1	Maximum ambient temperature (Degree C)	50
4.1.2	Maximum temperature in shade (Degree C)	45
4.1.3	Minimum temperature of Air in Shade (Degree C)	3.5
4.1.4	Relative Humidity (Percent)	10 to 100
4.1.5	Maximum annual rain fall (mm)	1450
4.1.6	Maximum wind pressure (Kg/sq.mm.)	150
4.1.7	Maximum altitude above mean sea level (Metres)	1000
4.1.8	Isoceraunic level (day per year)	50
4.1.9	Seismic level (Horizontal Acceleration)	0.3 g
4.1.10	General nature of the Climate: Moderately hot and humid tropical climate, Conducive to rust and fungus growth	

5.0 APPLICABLE STANDARDS:

Unless otherwise stipulated in this Specification, the following Standards shall be applicable:

- i) IS: 7098 (Part-II) - 1985 – Cross linked Polyethylene Insulated PVC Sheathed Cables
- ii) IS: 8130-1984 - Conductors for Insulated Cables'
- iii) IS: 398 (Part-IV) - 1979 - Aluminium Alloy Conductors
- iv) IEC- 60502 (Part-II) 2005 - Polyethylene Outer Sheath

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6.0 GENERAL TECHNICAL REQUIREMENTS:

6.1 DETAILS OF SINGLE-CORE CABLE

6.1.1 Cable conductors

The cable conductors shall be of round, stranded and compacted aluminium of nominal cross sectional area 35 mm² / 70 mm² / 95 mm² / 120 mm². Corresponding nominal conductor diameter and number of wires in the conductor shall be as given in clause 6.1.7.

6.1.2 Conductor Screen

The conductor screen shall be of extruded semi-conducting cross linked polyethylene compound of thickness not less than 0.5 mm.

6.1.3 Insulation

The insulation shall be of extruded cross linked polyethylene (XLPE), Dry Gas cured, of nominal insulation thickness 3.6 mm and its properties shall conform to IS: 7098 (Part-II).

6.1.4 Insulation Screen

The insulation screen shall comprise extruded semi-conducting compound and/or semiconducting tape. Thickness of the screen shall be not less than 0.6 mm.

6.1.5 Metallic Screen

The metallic screen shall consist of Copper tape of thickness not less than 0.045mm.

6.1.6 Outer Sheath

The outer sheath shall be black polyethylene. The nominal thickness of sheath shall be 2 mm and it shall conform to the technical requirements of ST-7 of IEC-60502 (Part-II) 2005.

6.1.7 Dimensional and Electrical Data

The dimensional and electrical data for single-core cable is given below:

Sr. No.	Description	Nominal Area of Conductors			
		35 mm ²	70 mm ²	95 mm ²	120 mm ²
i)	Nominal conductor diameter (mm) / No. of wires in conductor	6.8/6	10/12	11.5/15	13.1/15

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ii)	Approx. over dia. of cable (mm)	22	25	26	28
iii)	Max. D.C resistance at 20°C Ohm/Km	0.868	0.443	0.320	0.253
iv)	Max. SC current for 1 sec. kA	3.3	6.6	8.96	11.32
v)	Max. Continuous load (Amps.)	120	180	230	260

7.0 MESSENGER (NEUTRAL CONDUCTOR)

- 7.1 The bare messenger wire shall be of 70 mm² / 80 mm²/ 100 mm² (nominal area) aluminium alloy, generally conforming to IS:398 (Part-IV) - 1994, comprising of 7 strands and shall be suitably compacted/non compacted to have smooth round surface to avoid damage to the outer insulating sheath of single-core phase cables twisted around the messenger.
- 7.2 There shall be no joints in any wire of the stranded messenger conductor except those made in the base rod or wires before finally drawing.
- 7.3 The technical characteristics of the messenger wire shall be as follows:

Sr. No.	Item	Nominal Area of Messenger		
		70	80	100
i)	Nominal sectional area (mm ²)	70	80	100
ii)	No. of wires	7	7	7
iii)	Nominal dia. of wires / compacted conductor (Approx.) mm	3.5/10.5	3.81/11.43	4.26/12.78
iv)	Approx. mass Kg/Km	184	218.26	272.86
v)	DC resistance at 20° C Ohm/Km	0.493	0.425	0.339
vi)	Breaking load (KN)	20	23.41	29.26
Note: The value in item (v) above is to be guaranteed. A tolerance of (-) 5% is permissible on the value in item (vi) above.				

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8.0 DESIGNATION AND PARAMETERS OF FINISHED CABLES

The designation and parameters of finished cables are given in the following table:

Sr. No.	Designation	Complete Bunched Cable	
		Overall dia. (approx.) mm	Total mass (approx.) Kg/Km
i)	3 x 35 mm ² + 70 mm ²	53	1450
ii)	3 x 70 mm ² + 70 mm ²	59	1900
iii)	3 x 95 mm ² + 80 mm ²	62.5	2250
iv)	3 x 120 mm ² + 100 mm ²	67	2650

Note:
The first part of the designation refers to the number and size of phase conductor and the second to the size of messenger wire. The sizes shown represent the nominal cross sectional areas in mm.

9.0 TESTS:

All the cable sizes i.e. items offered should have been fully type tested as per the relevant standards at any NABL accredited/Govt. of India's recognized Laboratory. The bidder shall furnish the type test reports along with the offer. These type tests must have been conducted within last five years prior to date of Bid opening.

For any change in design/type, already type tested and the design / type offered against this specification, the purchaser reserves the right to demand repetition of type tests without any extra cost. The purchaser also reserves the right to have tests carried out at his own cost by an independent agency, whenever there is a dispute regarding the quality of supply.

9.1 The following Type tests shall be carried out on the cables as per IS: 7098 (Part-II) & Type tests certificates shall be furnished invariably with the offer.

9.1.1 Type Tests:

- a) Tests on conductor:
 - i) Tensile test
 - ii) Wrapping test

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- iii) Resistance test
- b) Tests for thickness of insulation and sheath
- c) Physical tests for insulation:
 - i) Tensile strength and elongation at break
 - ii) Ageing in air oven
 - iii) Hot test
 - iv) Shrinkage test
 - v) Water absorption
- d) Tests for outer sheath: As per IEC-60502 (Part-II) 2005
 - i) Tensile strength and elongation at break
 - ii) Ageing in air oven
 - iii) Shrinkage test
 - iv) Hot deformation
 - v) Carbon black content
 - vi) UV Stability as per ASTM G53 / DIN : 53387
- e) Partial discharge test
- f) Bending test
- g) Dielectric power factor test:
 - i) As a function of voltage
 - ii) As a function of temperature
- h) Insulation resistance test
- i) Heating cycle test
- j) Impulse withstand test
- k) High voltage test

9.1.2 **Acceptance Test**

- a) Tensile test
- b) Wrapping test
- c) Conductor resistance test
- d) Test for thickness of insulation and sheath
- e) Hot set test for insulation
- f) Tensile strength and elongation at break test for insulation and sheath

- g) Partial discharge test
- h) High Voltage test
- i) Insulation resistance (volume resistivity) test

9.1.3 Routine Tests

- a) Conductor resistance test
- b) Partial Discharge test
- c) High voltage test

9.2 The following tests shall be carried out on the bare messenger wire in accordance with IS: 398 (Part-IV).

Type Tests/Acceptance Tests

- a) Breaking Load Test (on finished wire)
- b) Elongation Test
- c) Resistance Test

10.0 PACKING AND MARKING:

10.1 Packing:

Cables shall be supplied in wooden drums conforming to IS: 10418 and packed in drums suitable for vertical / horizontal transport, as the case may be and shall be suitable to withstand rough handling during transport and outer storage. The outer surface of the drum shall be painted with white aluminum paint. Similarly, the inside surface of drum shall have the protective layer of varnish / paint to protect it from white ants. The standard length of the bunched cable in each drum shall be 500 Mtrs (\pm) 5 %. The wooden drums shall be reinforced with steel bends and strips for better protection. The ends of the cable shall be sealed by means of non-hygroscopic sealing materials.

10.2 Marking:

The cable drum shall carry the information as per the requirements of IS: 7098 (Part-II). The following information may be stenciled on the drum with either water proof ink or oil paint:

- i. Reference of IS / IEC standard.
- ii. Manufacturer's name or trademark.
- iii. Type of cable and voltage grade.
- iv. No. of cores.
- v. Nominal cross-sectional area of conductor.

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- vi. Cable code.
- vii. Length of cable on the drum
- viii. No. of lengths on the drum (if more than one)
- ix. Direction of rotation of drum (by means of an arrow)
- x. Position of outer end of cable
- xi. Gross weight
- xii. Country of manufacture
- xiii. Year of manufacture
- xiv. Reference of A/T No. & date
- xv. Property of MSEDCL
- xvi. Name of consignee and the destination.

Over and above, name plate of aluminum of suitable size and thickness, containing all the above information, shall be fixed on the drum in addition to the painting.

- 10.3 Suitable identification marks shall be given on the outer sheath to clearly distinguish three phases of the bunched cable.
- 10.4 Following details of Identification shall be embossed at interval of length of one meter of cable outer sheath.
- (a) Name of Manufacturer
 - (b) Year of Manufacturer
 - (c) Voltage grade
 - (d) Name of Purchaser "MSEDCL".

11.0 INSPECTION:

11.1 STAGE INSPECTION:

The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative at reasonable time, when the work is in progress. Inspection and acceptance, of any cables under this specification by the purchaser, shall not relieve the supplier of his obligation of supplying cable in accordance with the specification and shall not prevent subsequent rejection, if the cables are found defective.

The supplier shall keep the purchaser informed in advance about the programme of manufacturing of cables so that arrangement can be made for inspection.

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The purchaser reserves the right to insist for witnessing the acceptance / routing tests of the bought out items.

11.2 LOT INSPECTION:

All the acceptance tests and inspection shall be made at the place of manufacture unless otherwise especially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturers shall afford the inspector representing the purchaser all reasonable facilities without charge, to satisfy him that material is being furnished in accordance with the Specification.

The purchaser has the right to have tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

12.0 DOCUMENTATION:

The bidder shall furnish following documents along with his offer.

- 12.1 Sectional view, showing the General constructional feature with conductor / conductor screen / insulation / insulation screen and outer sheath etc.
- 12.2 Drawing of cable drums with details of material dimension shall be submitted.
- 12.3 All the required type test reports for offered items tested at any NABL Accredited /Govt. of India's recognized Laboratory as stated under Clause No. 7.1.
- 12.4 Literature, pamphlets for the record items.
- 12.5 List of orders (size wise) executed during last five years for supply of specified sizes of HT Aerial Bunch/XLPE cables, supplied to State Electricity Boards, Private firms & MGVCL/DGVCL /UGVCL /PGVCL/GETCO/GUVNL(formerly GEB) etc. along with quantity, value of the orders, year of supply and delivery schedule. List of orders executed and under execution shall be submitted separately. The annual turn over in rupees, of the firms to whom the cables have been supplied during last two years shall be stated.

13.0 PACKING:

- 13.1 The firm shall be responsible for any damage to the cables during transit due to improper and inadequate packing. Wherever necessary, proper arrangement for lifting, such as lifting hooks, shall be provided. Any cable found short inside the packing cases shall be supplied by the supplier, without any extra cost.

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13.2 Each consignment shall be accompanied by a detailed packing list, containing the following information:

- (a) Name of consignee
- (b) Details of consignment
- (c) Destination
- (d) Total weight of consignment
- (e) Handling and unpacking instruction
- (f) Bill of materials, indicating contents of each package.

14.0 TECHNICAL AND GUARANTEED PARTICULARS:

The bidder shall furnish all Guaranteed Technical Particulars, as called for, in Schedule A of this Specification. Particulars, which are subject to guarantee, shall be clearly identified. Offer not containing this information will not be considered for acceptance.

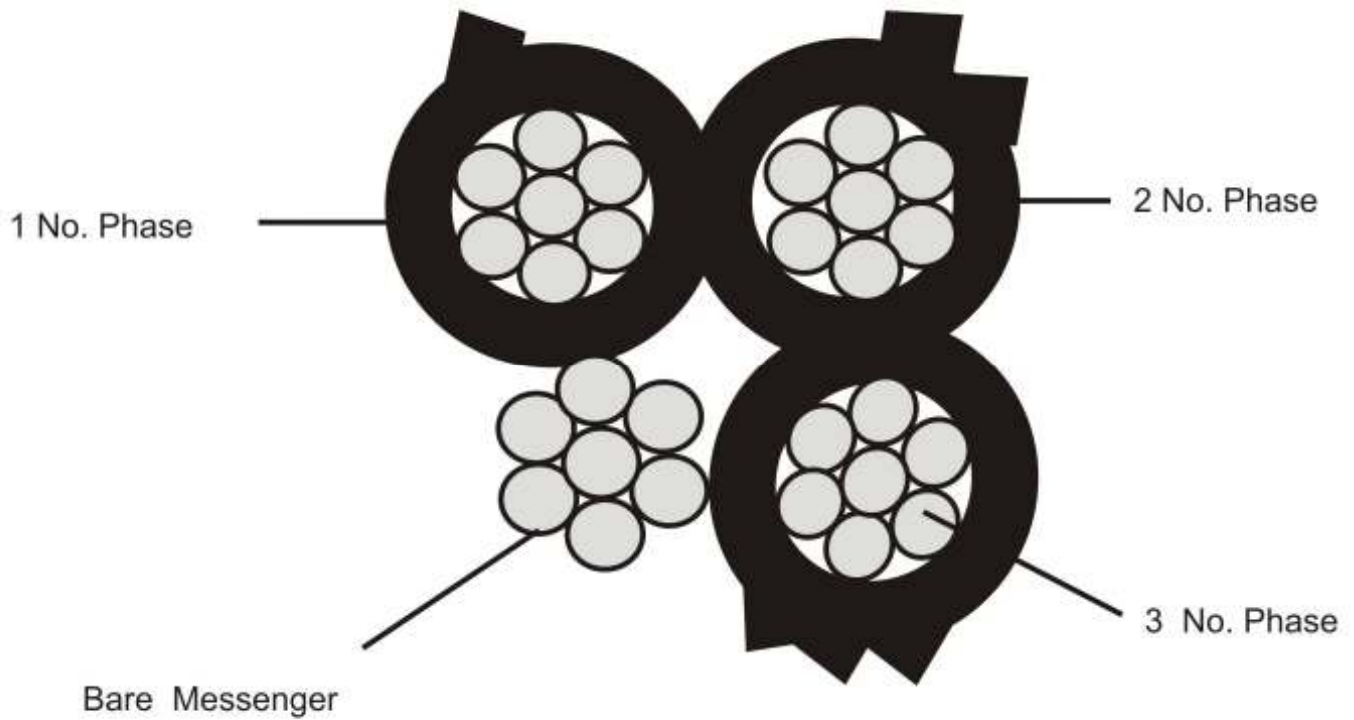
15.0 PERFORMANCE CERTIFICATE:

Bidders shall also submit performance reports for the specified size of cables supplied to other State Electricity Boards / reputed firms, with the clear indication of the period since when the cables performed satisfactory service.

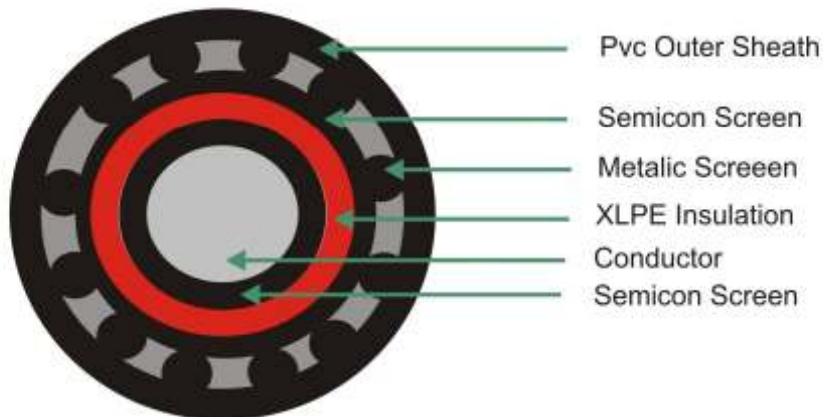
16.0 LEGIBLE SUBMISSION:

Only required relevant, legible documents shall be submitted to avoid delay due to back reference.

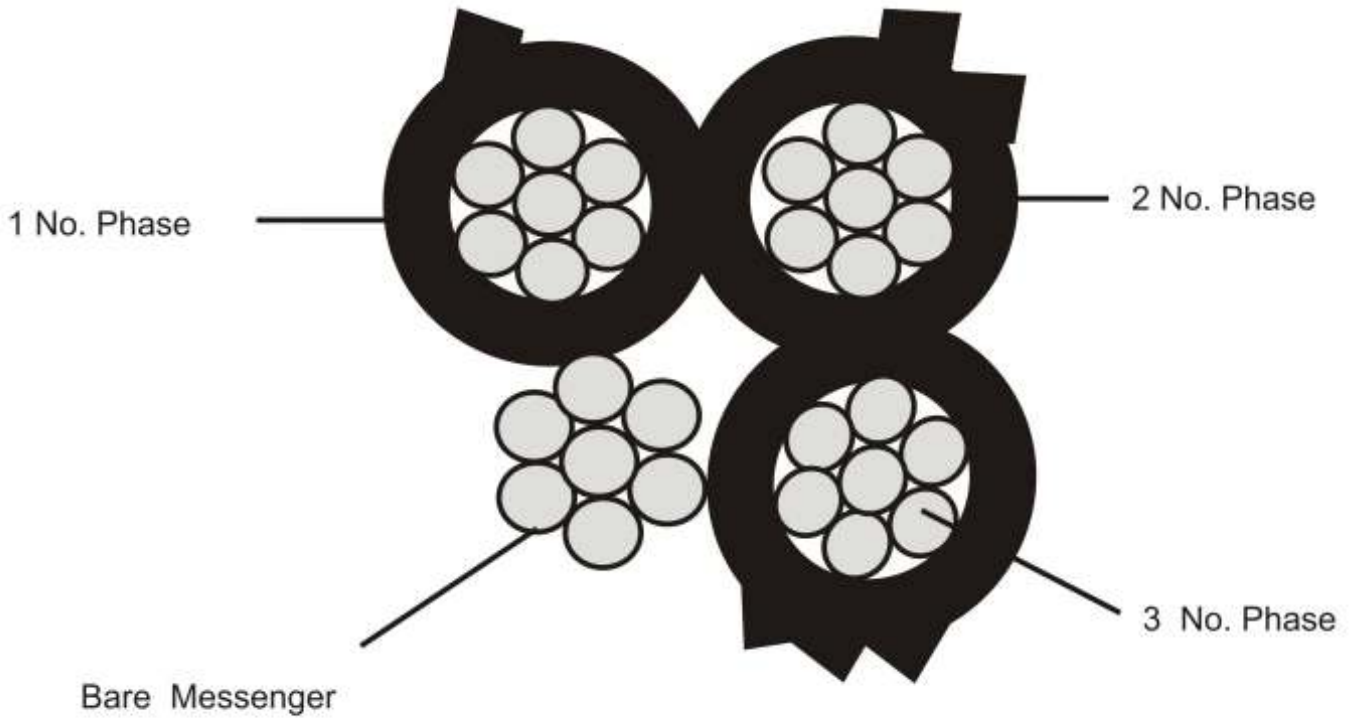
Cross Sectional Drawing of 11 kV 3Core x 50 + 70 Sq.mm



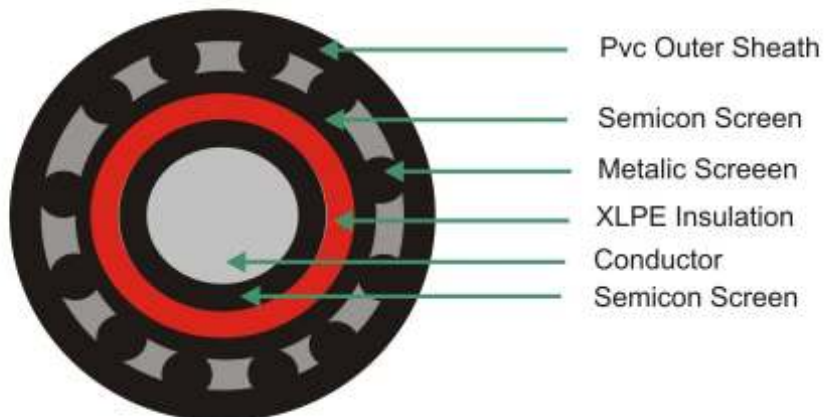
Cross Section of Core



Cross Sectional Drawing of 11 KV 3Core x 70 + 100 Sq.mm



Cross Section of Core



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SCHEDULE – ‘A’

GUARANTEED TECHNICAL PARTICULARS FOR 11KV AERIAL BUNCH CABLE

(To be filled in and signed by the Tenderer)

SR. NO	PARAMETER NAME	PARAMETER TYPE
1.0	GENERAL	
1.2	BRAND NAME OR TRADE MARK :	
1.3	NAME & ADDRESS OF MANUFACTURER	
1.4	RATED VOLTAGE	
2.0	PHASE CONDUCTOR	
2.1	MATERIAL :	
2.2	CLASS / GRADE :	
2.3	SHAPE OF CONDUCTOR :	
2.4	NOMINAL CROSS SECTION AREA (MM SQ.):	
2.5	APPROXIMATE DIA. OF CONDUCTOR (MM) :	
2.6	MAXIMUM DC RESISTANCE AT 20°C OHM /KM	
3.0	CONDUCTOR SCREENING:	
3.1	MATERIAL :	
3.2	MINIMUM THICKNESS (MM) :	
4.0	INSULATION:	
4.1	MATERIAL :	
4.2	NOMINAL THICKNESS (MM) :	
4.3	TOLERANCE ON THICKNESS :	
5.0	INSULATION SCREENING:	

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5.1	MATERIAL 1) NON METALLIC 2) METALLIC	
5.2	THICKNESS (MM): 1) NON METALLIC 2) METALLIC	
6.0	POLYETHYLENE SHEATH OVER CORE:	
6.1	MATERIAL :	
6.2	NOMINAL THICKNESS (MM) :	
7.0	MESSENGER WIRE :	
7.1	MATERIAL & ITS APPLICABLE STANDARD :	
7.2	SHAPE OF CONDUCTOR :	
7.3	NOMINAL CROSS SECTION AREA (MM SQ.):	
7.4	NO OF STRANDS IN CONDUCTOR :	
7.5	DIAMETER OF EACH STRANDS (MM) :	
7.6	APPROXIMATE COND. DIAMETER (MM) :	
7.7	DC RESISTANCE AT 20°C (OHM/KM)	
7.8	APPROXIMATE BREAKING LOAD (KN) :	
8.0	CABLES:	
8.1	CONTINUOUS CURRENT CARRYING CAPACITY IN AIR AT AMBIENT TEMP.40° C (AMP)	
8.2	MAXIMUM SHORT CIRCUIT CURRENT FOR 1 SEC.(KA)	
8.3	IDENTIFICATION OF POWER CORE. :	
8.4	LAYING UP OF POWER CORE AND WITH AAAC MESSENGER WIRE	

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8.5	APPROXIMATE OVERALL DIAMETER OF CABLE :	
8.6	APPROXIMATE TOTAL WEIGHT OF CABLE KG / KM.	
8.7	STANDARD LENGTH OF CABLE IN EACH DRUM IN METER TOLERANCE ON DRUM LENGTH.	
8.8	MAX. CONDUCTOR TEMP. DURING SHORT CIRCUIT.	
8.9	BENDING RADIUS OF THE CABLE. :	
8.10	MANUFACTURER IDENTIFICATION MARK. :	
9.0	WHETHER DETAILS SHALL BE EMBOSSSED AS STATED UNDER CL. 10.3 & 10.4 OF TECHNICAL SPECIFICATION (YES/NO)	
10.0	WHETHER TYPE TEST REPORTS SUBMITTED, AS STATED UNDER CL. 9.1 OF TECHNICAL SPECIFICATION (YES/ NO)	
11.0	WHETHER DRAWINGS SUBMITTED. (YES/ NO)	
12.0	WHETHER UNPRICED SCHEDULE OF OFFERED ITEMS SUBMITTED WITH TECHNICAL OFFER (YES/ NO)	