

MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.  
SCHEDULE - 'A'

TECHNICAL SPECIFICATION FOR  
ALL ALUMINIUM ALLOY STRANDED CONDUCTOR  
SPECIFICATION NO: DIST/MM-I/AAA CONDUCTOR/2008  
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SEAL AND SIGNATURE OF THE TENDERER

MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.

TECHNICAL SPECIFICATION FOR  
ALL ALUMINIUM ALLOY STRANDED CONDUCTOR

SPECIFICATION NO: DIST/MM-I/AAA CONDUCTOR/2008

1. SCOPE :

This specification covers details of all aluminium alloy stranded conductors for use on 33 kV , 22 kV,11 kV and LT overhead lines in rural electric distribution system. All sizes of conductor shall be supplied with ISI mark.

2. SERVICE CONDITIONS :

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

a) Maximum ambient temperature (Degree C)	.....	50
b) Maximum temperature in shade (Degree C)	.....	45
c) Minimum temperature of air in shade (Degree C)	.....	3.5
d) Relative Humidity (%)	.....	10 to 100
e) Maximum Annual Rainfall (mm)	.....	1450
f) Maximum Wind Pressure (kg/sq.m.)	.....	150
g) Maximum altitude above mean sea level (meter)	.....	1000
h) Isoceraunic level (days/ year)	.....	50
i) Seismic level ( Horizontal acceleration)	.....	0.3 g
j) Moderately hot and humid tropical climate conductive to rust and fungus growth	.....	

3. CONDUCTOR SIZES :

i) 7/ 2.00 mm	( 22 sq.mm. )
ii) 7/ 2.50 mm	( 34 sq.mm. )
iii) 7/ 3.15 mm	( 55 sq.mm. )
iv) 7/ 3.81 mm	( 80 sq.mm. )
v) 7/4.26 mm	( 100 sq.mm )
vi) 19/ 3.15 mm	( 148 sq.mm )
vii) 19/ 3.94 mm	( 232 sq.mm )

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4. APPLICABLE STANDARDS :

Unless otherwise stipulated in this specification , the conductor shall conform to the following Indian Standards (amended upto date ).

SR. NO.	INDIAN STANDARDS	TITLE
1	IS : 398 ( Part IV) / 1994	Specification for aluminium conductors for overhead transmission purpose.
2	IS : 1778	Reels and drums for bare conductors.
3	IS : 1841	E.C.Grade Aluminium rod produced by rolling.
4	IS : 5484	E.C.Grade Aluminium rod produced by continuous casting and rolling.

5. PROPERTIES OF CONDUCTOR :

The properties of stranded all aluminium alloy conductors of various sizes shall be as in Table - I.

TABLE - I ALUMINIUM ALLOY STRANDED CONDUCTOR

Actual Area	Stranding & wire dia.	Approx. overall dia.	Approx. mass	Calculated resistance at 20 d.c. (max.)	Approx. calculated Breaking Load	Reactance per km	Current Rating
1	2	3	4	5	6	7	8
mm.sq.	mm	mm	Kg/km	Ohm/km	kN	Ohms	Amps
22	7/ 2.00	6.00	60.16	1.5410	6.45	0.3556	115
34	7/ 2.50	7.50	94.00	0.9900	10.11	0.3556	150
55	7/ 3.15	9.45	149.20	0.6210	16.03	0.3556	234
80	7/ 3.81	11.43	218.26	0.4250	23.41	0.3394	270
100	7/ 4.26	12.78	272.86	0.3390	29.26	0.3394	325
148	19/ 3.15	15.75	406.91	0.2290	43.50	0.3238	440
232	19 / 3.94	19.70	636.67	0.1471	68.05	0.3146	520

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6 (a) PROPERTIES OF WIRES :

The properties of aluminium alloy wires to be used in the construction of the Stranded conductors shall be as in Table - II.

TABLE - II ALUMINIUM ALLOY WIRES USED IN THE CONSTRUCTION OF STRANDED ALUMINIUM ALLOY CONDUCTORS.

Diameter		Cross sectional area of nominal dia. wire	Mass	Minimum breaking load after stranding	Resistance at 20 deg.c.
Nom.	Max.				
mm	mm	mm.sq.	kg/km	kN	Ohm/km
2.00	2.02	3.142	8.482	0.92	10.653
2.50	2.53	4.909	13.25	1.44	6.845
3.15	3.18	7.793	21.04	2.29	4.290
3.81	3.85	11.400	30.78	3.34	2.938
3.94	3.98	12.190	32.92	3.58	2.746
4.26	4.30	14.250	38.48	4.18	2.345

6 (b) TOLERANCE ON NOMINAL SIZES :

No negative tolerance shall be permitted on the nominal diameter aluminium wire used in the manufacture of AAC. However , positive tolerance in this respect shall be as provided in IS: 398 (Part IV)/1994 ( amended upto date ).

7. FREEDOM FROM DEFECTS :

The wire shall be smooth and free from all imperfections such as spills , splits, slag inclusion , dia. marks scratches, fittings, blow holes, projections, looseness, overlapping of strands, chipping of aluminium layers etc. and all such other defects which may hamper the mechanical and electrical properties of the conductor. Special care should be taken to keep away dirt, grit etc. during stranding.

8. JOINTS. IN WIRES :

8.1 Conductors containing seven wires :-

There shall be no joint in any wire of a stranded conductor containing seven wires , except those made in the base rod or wire before final drawing.

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8.2 Conductors containing more than seven wires :-

In conductors containing more than seven wires, joints in individual wires are permitted in any layer except the outermost layer ( in addition to those made in the brass rod or wire before final drawing) but no two such joints shall be less than 15 m apart in the complete stranded conductor, such joint shall be made by resistance or cold pressure butt welding. They are not required to fulfill the mechanical requirement of unjointed wires. Joints made by resistance butt welding shall , subsequent to welding , be annealed over a distance of at least 200 mm on each side of the joint.

9. STRANDING :-

9.1 The wires used in the construction of a stranded conductor shall , before stranding satisfy all the relevant requirements of this standard .

9.2 The lay ratio of the different layers shall be within the limits given in the Table-III .

TABLE - III : LAY RATIOS FOR ALUMINIUM ALLOY STRANDED CONDUCTORS

No. of wires in Conductors	Lay Ratio in			
	6 - wire layer		12 - wire layer	
	Min.	Max.	Min.	Max.
7	10	14	-	-
19	10	16	10	14

9.3 In all constructions, the successive layers shall have opposite directions of lay , the outer most layer being right handed . The wires in each layer shall be evenly and closely stranded .

9.4 In aluminium alloy stranded conductors having multiple layers of wires , the lay ratio of any layer shall not be greater than the lay ratio of the layer immediately beneath it.

10. TESTS :

The samples of individual wires for the test shall normally be taken before stranding . The manufacture shall carry out test on samples taken out at least from 10 % of the aluminium wire spools. However , when desired by the purchaser , the test sample may be taken from the stranded wires. The wires used for alloy conductors shall comply with the following tests as per IS : 398 ( Part - IV ) / 1994 ( amended upto date ):

- i) Breaking load test
- ii) Elongation test
- iii) Resistance test

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## 11. PACKING AND MARKING :

The conductors shall be wound in reels or drums conforming to the latest versions of IS : 1778 - 1961 ( amended upto date ), ' Specification for Reels and Drums for bare wire .

### 11.1 PACKING :

11.1.1 The gross mass of packing for various conductors shall not exceed by more than 10% of the values given in the following table .

Conductor Size in sq.mm.	Gross Mass in kg
22 ( 7/ 2.00 mm )	1100
34 ( 7/ 2.50 mm )	1100
55 ( 7/ 3.15 mm )	1500
80 ( 7/ 3.81 mm )	1600
100 ( 7/ 4.26 mm )	2000
148 (19/ 3.15 mm )	2000
232 (19/ 3.94 mm )	2400

11.1.2 The normal length of various conductors shall be as given in the following table:

Conductor Size in sq.mm.	Normal Length in km
22 ( 7/ 2.00 mm )	2.0
34 ( 7/ 2.50 mm )	2.0
55 ( 7/ 3.15 mm )	2.0
80 ( 7/ 3.81 mm )	2.0
100 ( 7/ 4.26 mm )	2.0
148 (19/ 3.15 mm )	2.0
232 (19/ 3.94 mm )	2.0

#### 11.1.2.1 LENGTHS AND VARIATION IN LENGTHS :

The standard length of AAA Conductor shall be 2 ( two ) kms. Tolerance of +/- 5%( plus or minus five percent )shall be permitted in this standard length. All the lengths outside these limits of tolerances shall be treated as random length.

Random length shall not be less than 80%( eighty percent ) of the standard length specified as above and the total acceptable quantity of such random lengths shall be within 7%( seven percent ) quantity of the allotted quantity to each consignee of the respective size of the conductor.

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## 11.2 MARKING :

The following information be marked on each package :

- Manufacturer's name
- b) Trade mark ,if any
- c) Drum or identification number
- d) Size of conductor
- e) Number and lengths of conductors
- f) Gross mass of the package
- g) Net mass of conductor
- h) ISI certification mark .

## 12 . INSPECTION :

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

## 13 . VERIFICATION OF LENGTH OF CONDUCTOR :

- i) The Company shall ascertain the length of AAA Conductor at supplier's works and at the receiving store centers by measuring the actual length by length measuring machine used for the purpose. The supplier should ensure that length measuring machine is available for measurement of the length by our inspecting officer.
- ii) Both ends of the AAA Conductor will be sealed by the supplier and seals will be contained in the drum and not exposed out of drum.
- iii) The declared length will be measured between manufacturer's seals at both ends of AAA Conductor.
- iv) The weight of AAA Conductor will also be checked for ensuring correct lay and length of the AAA Conductor .
- v) For the verification of the length of the conductor, 10 %of total lot (in Drums) should be selected at the works. The physical verification of the length of the conductor should be carried out for maximum up to 5 (five) drums. If there are anymore drums left for verification, then weight of each verified drum should be carried out and average weight may be calculated.

Then the weight of each of all the remaining selected drums may be taken and if these weights are matching with the average weight, then that particular lot may be accepted otherwise rejected.

- vi) Verification of length of conductor will also be carried out at each stores center for two drums out of each lot. If the average length is found correct or more, the lot will be accepted. If the average length is found to be less than the declared, the percentage of such short length will be applied for reduction for the entire quantity supplied in the lot at respective stores for acceptance.

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vii ) In case of dispute, joint inspection alongwith the representative of the supplier shall be carried out after giving 10 (ten) days notice to the supplier to remain present at stores center for the purpose. If the representative fails to attend on stipulated date for joint inspection, the decision of the consignee shall be final and binding.

14. REJECTION :

i ) While measuring the length , the sample piece from each length shall be taken for carrying out the test as per IS: 398 (Part IV) / 1994 ( amended upto date ). All the values of each sample should not exceed the value as per the relevant IS. In case of deviation , whole lot will be rejected at works.

ii ) Specific resistivity of Aluminium Alloy wire used should not exceed 0.0328 ohm sq.mm./m at 20 degree centigrade as prescribed in IS: 398 ( Part IV )/1994 ( amended upto date ). If the results are at variance , whole lot shall be rejected.

15. BIS CERTIFICATION MARK :

The AAA Conductor with BIS ( ISI ) marking only is required by the MSEDCL against this tender specification and as such , only those tenderers who hold valid BIS license for AAA Conductor need quote against this invitation of tender.

16. SCHEDULES :

The tenderer shall fill in the following schedules which form part of the tender specification and offer.

Schedule ' C ' ----- Schedule of Tenderer's Experience.

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**SCHEDULE 'C'**

**SCHEDULE OF TENDERER'S EXPERIENCE**

Tenderer shall furnish here a list of similar orders executed/under execution by him to whom a reference may be made by Purchaser in case he considers such a reference necessary.

Sr. No.	Name of Client & Description.	Value of order	Period of supply and commissioning	Name & Address to whom reference may be made
1	2	3	4	5

NAME OF FIRM \_\_\_\_\_

NAME & SIGNATURE OF TENDERER \_\_\_\_\_

DESIGNATION \_\_\_\_\_

DATE \_\_\_\_\_

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