

**MAHARASHTRA STATE ELECTRICITY  
DISTRIBUTION COMPANY LTD.**

**SCHEDULE-A**

**TECHNICAL SPECIFICATION**

**FOR**

**0.2 ACSR “PANTHER” CONDUCTOR**

**SPECIFICATION NO.: DIST./MM-I/PANTHER/2006**

**Dt.: 19.09.2006.**

**TECHNICAL SPECIFICATION FOR 0.2 ACSR “PANTHER”  
CONDUCTOR FOR HIGH VOLTAGE LINES .**

**1. SCOPE**

This specification provides for design, manufacture, engineering, inspection and testing before dispatch, packing and delivery of 0.2 ALUMINIUM CONDUCTOR STEEL REINFORCED (ACSR) Conductor ( PANTHER ) for High Voltage overhead lines Under MSEDCL in Maharashtra State.

**2. SERVICE CONDITIONS**

The conductor to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical climatic conditions:

<b>Sr.No.</b>	<b>Particulars</b>	<b>Values</b>
(a)	Maximum Ambient Temperature in open air	50 Degree C.
(b)	Maximum Ambient Temperature in shade	45 Degree C.
(c)	Minimum Ambient Temperature in shade	3.5 Degree C.
(d)	Relative Humidity	10 % to100%
(e)	Maximum Annual Rainfall	1450 mm.
(f)	Maximum Altitude above Mean Sea level.	1000 metres
(g)	Maximum Wind Pressure	150Kg/Sq.m.
(h)	Isoceraunic level	50 days/year.
(i)	Seismic level (Horizontal acceleration )	0.3 g
(j)	General nature of climate	Moderately hot and humid tropical climate, conductive to rust and fungus growth

### 3. STANDARDS

Except as modified in this Specification, the conductor shall conform to the following Indian Standards ( Amended upto date ).

Sr.No.	Indian Standards	Title
1	IS:398 Part II /1996	Specification for Aluminum conductors for overhead Transmission purpose.
2	IS:1778 / 1980	Reels and Drums for Bare conductors.
3	IS:2629	Recommended practice for Hot Dip Galvanising of Iron and Steel.
4	IS:4826	Galvanised Coating on Round Steel Wire.
5	IS:5484	EC grade Aluminium rod produced by continuous casting and rolling (First Revision).

### 4. PROPERTIES OF CONDUCTOR

4.1 The details of ACSR “Panther” conductor are tabulated below:

Sr.No.	Particulars	Values
(a)	Stranding and wire diameter	Aluminium: 30/3.00 mm., Steel: 7/3.00 mm.
(b)	Number of Strands	
	(i) Steel Centre	1
	(ii) Ist Steel Layer	6
	(iii) Ist Aluminium Layer	12
	(iv) 2nd Aluminium Layer	18
(c)	Sectional area of Aluminium in sq. mm.	212.1
(d)	Sectional area of Steel in sq. mm.	49.4
(e)	Total sectional area in sq.mm.	261.5
(f)	Overall Diameter in mm.	21.00
(g)	Approximate weight in kg/km.	974
(h)	Calculated D.C. Resistance at 20 degree Celsius in Ohm/km.	0.139
(i)	Minimum Breaking load in kN	89.67
(j)	Modulus of Elasticity in GN/sq.metre.	80.00

4.2 The details of Aluminium Strands are as below:

<b>Sr.No.</b>	<b>Particulars</b>	<b>Values</b>
(a)	Minimum Breaking Load of Strand before stranding in kN	1.17
(b)	Minimum Breaking Load of Strand after stranding in kN.	1.11
(c)	Maximum D.C. Resistance of Strand at 20 Degree Celsius in Ohm/km.	4.079

4.3 The details of Steel Strands are as below:

<b>Sr. No.</b>	<b>Particulars</b>	<b>Values</b>
(a)	Minimum Breaking Load of Strand before stranding in kN.	9.29
(b)	Minimum Breaking Load of Strand after stranding in kN.	8.83
(c)	Minimum weight of Zinc Coating after stranding in gm/sq. Metre.	260

## **5. WIRE SIZE**

### **5.1 NOMINAL SIZE**

The aluminium and galvanised steel wires for the stranded conductor covered by this standard shall have diameters specified in Clause 4.1 The diameter of the galvanized steel wires shall be measured over the zinc coating.

### **5.2 TOLERANCE ON NORMAL SIZE**

- (i) **ALUMINIUM WIRES:** No negative tolerance shall be permitted on the nominal diameter of Al wires. However, the diameter as per IS:398 ( part-2) amended upto date.
- (ii) **GALVANISED STEEL WIRES:** A tolerance of +/- 2 % is permitted on the nominal diameter.

## **6. FREEDOM FROM DEFECTS**

The wires shall be smooth and free from all imperfections such as spills, spilts, slag inclusion, die 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.

7. **JOINTS IN WIRES**

(i) Aluminium Wires: No joints shall be permitted in the aluminium wires in the outermost layer of the ACSR conductor. Joints in the inner layers are permitted, in addition to those made in the base rod or wire before final drawing, but no two such joints shall be less than 15 metre apart in the complete stranded conductor. Such joints shall be made by cold pressure butt-welding.

*Joints are not permitted in the outermost layer of the conductor in order to ensure a smooth conductor finish.*

(ii) Galvanised Steel Wires: There shall be no joints except those in the base rod or wire before final drawing, in steel wires forming the core of the steel re-inforced aluminium conductor.

*Joints are not permitted in the steel wires after final drawing in order to avoid reduction in the breaking strength of the conductor that may occur as a result of failure of the joints.*

8. **STRANDING**

(i) The wires used in the construction of galvanised steel reinforced aluminium conductor shall before stranding, satisfy all the relevant requirements of this specification.

(ii) The lay-ratio of the different layers shall be within the limit given in the following table:

**LAY-RATIO OF ALUMINIUM CONDUCTORS GALVANISED STEEL REINFORCED 'PANTHER' CONDUCTOR**

(1) Number of Wire: Aluminium: 30  
Steel: 7

(2) Ratio of Diameter: 1.0

(3) Lay-Ratio for Steel Core (6 Wire Layer): Minimum: 13  
Maximum: 28

(4) Lay-Ratio for Aluminium Wires:

(i) Outermost Layer: -Minimum: 10  
- Maximum: 14

(ii) Layer immediately beneath outermost- Minimum: 10  
Layer: -Maximum: 16

NOTE: For the purpose of calculation, the mean lay-ratio shall be taken as the arithmetic mean of the relevant minimum and maximum values given in the above table.

- (iii) While stranding, pre forming and post forming method should be used for stranded steel core. In order to relieve the residual tension in core wire to avoid flaring of conductor.
- (iv) In all constructions, the successive layers shall have opposite directions of lay, the outermost layer being right-handed. The wires in each layer shall be evenly and closely stranded.
- (v) In conductors having multiple layers of aluminium wires, the lay-ratio of any aluminium layer shall not be greater than the lay-ratio of aluminium layer immediately beneath it.

**9. CONDUCTOR DRUM :**

The conductor shall be supplied in non-returnable strong wooden drums provided with lagging of adequate strength and displacement during transit, storage and subsequent handling and stringing operation in the field. The drums shall generally conform to IS:1778-1980, amendment No.1, June 1989, except otherwise specified hereinafter.

Each drum shall have the following information stenciled on it in indelible ink along with other essential data:

- (a) Contract/Award letter number :
- (b) Name and address of consignee :
- (c) Manufacturer's name and address :
- (d) Drum Number :
- (e) Size of Conductor :
- (f) Length of Conductor in metres :
- (g) Gross weight of drum with Conductor:
- (h) Weight of empty drum with lagging :
- (i) Arrow marking for unwinding :
- (j) I.S.I. Marking :

Note: The conductor offered shall bear valid ISI Certification mark. The Bidder shall furnish copies of documentary proof to this effect along with his offer.

Before reeling, card board or double corrugated or thick bituminised waterproof bamboo paper shall be secured to the drum barrel and inside of flanges or the drum by means of a suitable commercial adhesive material. The paper should be dried before use. Medium grade craft paper shall be used in between the layers of the conductor. After reeling the conductor, the exposed surface of the outer layer conductor shall be wrapped with thin polythene sheet across the flanges to preserve the conductor from dirt, grit and damage during transportation and handling and also to prevent ingress of rain water during storage/transport.

A minimum space of 75 mm shall be provided between the inner surface of the external protective layer and outer layer of the conductor.

The conductor ends shall be properly sealed and secured with the help of nails or bolts on one side of the flanges to avoid loosening of conductor layers in transit and handling. The supplies effected without complying the above packing condition shall not be accepted.

## **10 LENGTH OF THE CONDUCTOR**

### **(i) STANDARD LENGTH:**

The standard length of the “Panther” conductor shall be minimum 2000 metres. Tolerance of +/- 5 % in standard length offered by the bidders shall be permitted. All length outside this limit of tolerance shall be treated as random length.

### **(ii) RANDOM LENGTHS:**

Random length will be accepted provided no length is less than 80 % of the standard length specified and the total quantity of such random lengths shall not be more than 7 % of the total quantity allotted to each consignee . The maximum continuous length of conductor should not be more than 105 % of the standard length prescribed above.

## **11. Verification of length of conductor:**

- i) Company shall ascertain the length of 0.2 ACSR “PANTHER” conductor at supplier’s works and at the receiving store centres 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 0.2 ACSR "PANTHER" conductor will be sealed by supplier and the 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 ACSR conductor.
- iv) Weight of the 0.2 ACSR "PANTHER" conductor will also be checked for ensuring correct lay and length of the 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 stores center for two drums out of each lot. If the length is found correct or more, the lot will be accepted. If the 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 various stores for payment.

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 centre for the purpose. If the representative fails to attend on stipulated date for joint inspection, the decision of consignee shall be final and binding.

## **12. TYPE TESTS**

The following Type Tests shall be conducted free of cost once on each sample/samples of conductor for every 500 kms. or part thereof of production from each manufacturing facility as per I.S. 398 ( Part-II ), 1996 ( Amended upto date ).

(a) TEST FOR SURFACE CONDITION

(b) TEST FOR ULTIMATE BREAKING LOAD ON STRANDED CONDUCTOR.

(c) RESISTANCE TEST



**13. ACCEPTANCE TESTS :**

The acceptance tests shall be conducted on the sample in presence of the purchaser's representative as per IS:398 ( part-2 ) :1996 amended upto date before despatch.

**14. ROUTINE TESTS :**

- (a) Check to ensure that the joints are as per specification.
- (b) Check that there are no cuts etc. on the strands.
- (c) Check that drums are as per specification.
- (d) All acceptance tests mentioned as above shall be carried out on each coil and the record of the same shall be kept by the supplier and same shall be produced at the time of inspection.

**15. ADDITIONAL TESTS :**

The purchaser reserves the right of having , at his own expenses, any other test(s) of reasonable rating carried out at supplier's premises , at site, or at any other place in addition to the aforesaid type, acceptance and routine tests to satisfy himself, that the materials complies with the specification.

**16 TESTS CERTIFICATES:**

The tenderer shall furnish detailed type test reports of the offered conductor for the tests as per clause 12 of this specification. All the above Type Tests shall be carried out as per the procedures given in relevant IS. at laboratories which are accredited by the National Accreditation Board of Testing and Calibration Laboratories( NABL) of Government of India to prove that the 0.2 ACSR " PANTHER " conductor offered meet the requirements of the specification. These type tests should have been carried out within five years prior to the date of opening of this tender. However, the tenderers who have supplied the said conductor to this Company against order from Central Purchase Agency of M.S.E.D.C.L. shall be exempted from submission of type test reports against this tender provided

- (i) their offered conductor is already fully type tested at Laboratories accredited by the National Accreditation Board for Testing and Calibration Laboratories( NABL) within five years prior to the date of opening of the tender
- (ii) there is no change in the design of type tested conductor and those offered against this tender

- (iii) such tenderers complying (i) and (ii) above shall furnish an undertaking in the format scheduled 'F' enclosed herewith.

The detailed type test reports alongwith the relevant certified drawings etc. or undertaking seeking exemption from their submission in the format schedule 'F', are to be submitted in sealed cover on or before 14.00 hours on the same date of the month one month after the date of tender opening (e.g. if the tender is opened on 3<sup>rd</sup> June, the submission of type test reports shall be on or before 3<sup>rd</sup> July ) or the next working day in case the same date is a holiday duly super scribed on it following details :

" Type Test Reports of 0.2 ACSR "PANTHER" conductor against Tender No. ----- opened on ----- "

The sealed covers shall be opened at 15.00 hours on the same day in presence of the tenderers who choose to be present.

The purchaser reserves the right to demand repetition of some or all the Type Tests in presence of purchaser's representative at purchaser's cost. 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. In case the unit fails in the type tests, the complete supply shall be rejected.

The successful tenderer shall take approval / waiver of type tests from C.E.( Dist.), M.S.E.D.C.L., Prakashgad, Bandra , Mumbai prior to commencement of supply.

#### **17. 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.

#### **18. 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- 2):1996 amended upto date. All the values of each sample should not exceed the values of the relevant IS read with specification. In case of deviation, whole lot will be rejected at works.

ii) Specific resistivity of Aluminum used should not exceed 0.028264 ohm.sq.mm/m at 20 degree centigrade as prescribed in clause No.4.1 of IS-398(part-2): 1996. If the results are at variance, the whole lot shall be rejected.

**19. BIS CERTIFICATION MARK:**

The ACSR conductors with BIS ( ISI ) marking only is required by the Company against this tender specification and as such only those tenderers who hold valid BIS license for ACSR conductor need quote against this invitation of tender. A copy of BIS license valid on the due date of the tender should be submitted with the offer, duly attested failing which, the offer shall be rejected.

**20. SCHEDULES:**

The tenderer shall fill in the following schedule which is part and parcel of the tender specification and offer.

- |                 |                         |
|-----------------|-------------------------|
| Schedule – ‘C’- | Tenderer’s experience   |
| Schedule – F -  | Proforma of Undertaking |

## *SCHEDULE 'C'*

### **SCHEDULE OF TENDERER'S EXPERIENCE**

Tenderer shall furnish here a list of similar orders executed under execution by him during the last five years and name/s and address/es of person/s to who a reference may be made by purchaser in case he consider such a reference necessary.

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

Name of the firm \_\_\_\_\_

Signature of tenderer \_\_\_\_\_

Designation \_\_\_\_\_

Date:- \_\_\_\_\_

## SCHEDULE – " F "

### PROFORMA OF UNDERTAKING

We hereby confirm that 0.2 ACSR “ PANTHER” conductor offered by us against this tender are of the same design and type as have been supplied to M.S.E.D.C.L. against earlier order No. \_\_\_\_\_ dated \_\_\_\_\_ and all the type test reports thereof were approved by C.E.(Dist.) vide letter No.: \_\_\_\_\_ dated \_\_\_\_\_ (copy enclosed).

We further confirm that the said type tests have been carried out at the laboratories accredited by NABL within five years prior to the date of opening of the present tender.

Name of the firm \_\_\_\_\_

Signature of tenderer \_\_\_\_\_

Designation \_\_\_\_\_

Date:- \_\_\_\_\_