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TECHNICAL SPECIFICATION FOR ACSR Panther Conductor

1.0 SCOPE:

1.1 This specification provides for design, manufacture, engineering inspection stage testing and testing before despatch, packing and delivery unloading and stacking of ISI Marked Aluminimum conductor Steel reinforced (ACSR) as per IS-398 Part-II at destination stores in **AP PDCL.**

1.2 The tenderer shall furnish a copy of valid BIS license for ISI marking together with their offer, without which the offer shall be treated as non-responsive

2.0 STANDARD:

The power conductor shall conform to the following Indian/ International Standards, which shall mean latest revisions, amendments/ changes adopted and published, unless otherwise specified here in before. International and Internationally recognized standards to which these standards generally correspond are also listed below.

Sl. No.	Indian Standard	Title
1.	IS:398 (II) :1996	Aluminium Conductors for Overhead Transmission Purposes - Aluminium Conductors, Galvanised Steel Reinforced.
2.	IS:1778:1980	Specification for Reels and Dimensions for Bare Conductor
3.	IS:5484:1997	E.C.Grade Aluminium Rod produced by Continuous Casting and Rolling

2.1 CONFLICT OF STANDARDS

Equipment conforming to other internationally accepted standards, which ensure equal or higher quality than the standards mentioned above, would also be acceptable. In case the Bidder who wish to offer material conforming to the other standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. Four copies of such standards with authentic English Translations shall be furnished along with the offer. In case of conflict the order of precedence shall be (i) IS (ii) IEC (iii) Other standards. In case of any difference between provisions of these standards and the provisions contained in this specification shall prevail.

3.0. CLIMATIC CONDITIONS:

The conductor is being installed directly in air with the support of towers and with the help of hardware and accessories and insulators the conductor shall be therefore suitable for satisfactory operation under the following tropical climatic conditions.

i) Peak ambient temperature in shade	:	50 deg. C
ii) Maximum average ambient temperature over a 24 hours period in shade	:	40 deg. C
iii) Maximum temperature attainable by an object exposed to sun	:	70 deg. C
iv) Minimum Ambient Air temperature	:	7.5 deg. C
v) Maximum Relative Humidity (%)	:	100
vi) Average umber thunderstorm days per annum	:	50
vii) Average number of dust storms	:	10
viii) Average number of rainy days per annum	:	90
ix) Average annum Rainfall (mm)	:	925
x) Number of months of tropical monsoon condition	:	4 months
xi) Maximum Wind Pressure (Kg/ Sq.mm)	:	260
xii) Attitude not exceeding	:	1000Mtrs above MSL
ix) Seismic Level (Horizontal Acceleration)	:	0.10g

4.0. PRINCIPAL PARAMETERS:

4.1. The details of conductors are tabulated below:

Sl No.	*PARAMETER*	**Panther**
a).	Stranding and Wire Diameter	30/3.00 mm Aluminium 7/3.00mm Steel
b).	Number of Strands Central Steel Wire 1st Steel Layer 1st Aluminium Layer 2nd Aluminium Layer	 1 6 12 18
c).	Sectional Area of Aluminium (Sq.mm)	212.10
d).	Total Sectional Area (Sq.mm)	261.50
e).	Overall Diameter (mm)	21.00
f).	Approximate Weight (Kg/ Km)	974
g)	Calculated Maximum D.C Resistance at 20 deg. C (Ohm/ Km)	0.139
h).	Minimum UTS (KN)	89.67
i).	Modulus of Elasticity (GN/ Sq. Meter)	80
j).	Coefficient of Liner Expansion per deg C	17.80×10^{-6}

The details of Aluminium Strand are as follows:

Sl No.	*PARAMETER*	**Panther**
a).	Minimum Breaking Load of Strand Before Stranding (KN)	1.17
b).	Minimum Breaking Load of Strand After Stranding (KN)	1.11
c).	Maximum D.C Resistance of Strand at 20 deg. C (Ohm/ KM)	4.079
d).	Diameter mm (Standard/ Max/ Min)	3.00/3.03/2.97
e).	Mass (Kg/ KM) (at Normal Diameter)	19.11

The details of Steel Strand are as follows:

Sl No.	*PARAMETER*	**Panther**
a).	Minimum Breaking Load of Strand Before Standing (KN)	9.29
b).	Minimum Breaking Load of Strand After Standing (KN)	8.83
c).	Diameter mm (Standard/ Max/ Min)	3.00/3.06/2.94
d).	Zinc Coating Testing	3 /dips of 1mm each
e).	Maximum Weight of Zinc Coating (Gm/ Sq.mm)	250
f).	Mass of Steel at Normal Diameter (Kg/ KM)	55.13

5.0. GENERAL TECHNICAL REQUIREMENT:

5.1. The ACSR Conductor shall be suitable for being installed directly in air supported on suspension insulator strings or anchored through tension insulator string at the power cross arms of single circuit and double circuit transmission line towers.

5.2. The conductor shall therefore be suitable for satisfactory operation under the tropical climatic conditions listed under the clause 3.0.

5.3. **Physical constants of materials.**

5.3.1. Physical constants for Hard drawn Aluminium are taken as per latest edition of IS-398 Part-II

5.3.2. Resistivity: The resistivity of Aluminium depends upon its purity and its physical conditions. For the purpose of this specification the maximum value permitted is 0.028264 Ohm. Sq.mm/m at 20 degree centigrade and this value has been used for calculation of the maximum permissible value of resistance.

Note: It is not intended to check the resistivity from the measured values of resistance.

5.3.3. Density: At a temperature of 20 degree centigrade the density of hard drawn Aluminium has been taken as 2.703/ g/ cubic cm.

5.3.4. Constant – Mass Temperature Co-efficient of Resistance: At a temperature of 20 deg C the constant-mass temperature co-efficient of resistance of hard drawn Aluminium measured between two potential points rigidly fixed to the wire, the metal being allowed to expand freely, has been taken as 0.00403 per degree, Celsius.

5.3.5 Co-efficient of Linear expansion**:** The co-efficient of linear expansion of hard-drawn Aluminium at zero degree centigrade has been taken as 23.0 x 10^{-6} per degree centigrade. This value holds good for all practical purposes over the range of temperatures from zero degree centigrade to highest safe operating temperature.

5.4. **Physical constants for Galvanized Steel Wire:**

5.4.1 Density: At a temperature of 20 degree centigrade, the density of galvanized steel wire is to be taken as 7.80 g/cubic cm.

5.4.2 Co-efficient of Linear Expansion**:** The co-efficient of linear expansion of galvanized steel wire at zero degree centigrade has been taken as 11.5 x 10^{-6} per degree C. This value holds good for all practical purposes over the range of temperatures from zero degree centigrade to highest safe operating temperature.

5.5 **MATERIALS:**

5.5.1 The conductor shall be manufactured from E.C grade Aluminium rods suitably hard-drawn on wire drawing machines. The rods used shall comply with IS: 5484:1997. The mechanical and electrical properties of Aluminium wire shall comply with the requirements given in relevant standard. The Aluminium wire shall be manufactured from not less than 99.5% pure electrolytic Aluminium rods of E.C Grade.

5.5.2 Galvanized Steel Wire shall be drawn from high carbon steel Rod produced by either acidic or basic open health process, electric furnace process or basic oxygen process. The mechanical and electrical properties of wire shall comply with the requirements given in relevant standard. The chemical composition of high carbon steel wire is given below for guidance only.

Element	% Composition
Carbon	0.50 to 0.85
Manganese	0.50 to 1.10
Phosphorus	Not more than 0.035
Sulphur	Not more than 0.045
Silicon	0.10 to 0.35

5.5.3 The zinc used for galvanizing shall be electrolytic high grade zinc not less than 99.95 percent purity. It shall conform to and satisfy all the requirements of IS: 209-1979. Galvanizing may be done either by hot dipped process or electrolytic process. Neutral grease may be applied between the layers of wires.

Note: Lithium soap grease corresponding to grade II of IS-7623-1974 (Specification for lithium soap greases) is suitable for such application.

5.6 **FREEDOM FROM DEFECTS:**

The wires shall be smooth and free from all imperfections such as spills, splits, slag inclusion, die marks, scratches, fittings, below-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 standing.

5.7 **WIRE SIZES:**

5.7.1 Nominal Size**:** The Aluminium and galvanized steel wires for the stranded conductor covered by this standard shall have diameter specified in clause – 4.1. This diameter of the steel wire shall be measured over the zinc coating.

5.7.2 Tolerances on Normal Size:

5.7.2.1 Aluminium Wire: A tolerance of ±1 % is permitted on the nominal diameter of conductor.

5.7.2.2 Galvanized Steel Earth Wire: A tolerance of ±2 % per cent is permitted on the nominal diameter. The variation from the weights shall not be more than ±5 % percent.

Note: In order to maintain the circularity of the wires the tolerance allowed in 5.7.2.1 and 5.7.2.2 shall apply to both measurements at right angles taken at the same cross-section as per clause 2.0 of IS: 398 (Part-II) (Third Revision).

5.8 JOINTS IN WIRES

5.8.1 Aluminium Wires: No joints shall be permitted in the Aluminium Wire 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 meters apart in the complete stranded conductor. Such joints shall be made by cold pressure butt-welding.

Note: Joints are not permitted in the outermost layer of the conductor in order to ensure a smooth conductor finish and reduce radio interference levels and corona losses on the extra high voltage lines.

5.8.2 Galvanized 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 reinforced aluminum conductors.

Note: Joints have not been permitted in the steel wires 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.

5.9 STRANDING:

5.9.1 The wires used in construction of galvanized steel reinforced Aluminium conductor shall, before stranding, satisfy all the relevant requirements of this specification.

5.9.2 The lay ratio of the different layers shall be within the limits given in the table below:-

No. of Wires		Ratio of Aluminium Wire Diameter to Steel Wire Diameter	Lay Ratios for Steel Core (6 Wire Layer)		Lay Ratios for Aluminium Wire			
					Outside Layer		Layer Immediate by beneath Outside Layer	
Al.	St		Min	Max	Min	Max	Min	Max
30	7	1.1	13	28	10	14	10	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 this table.

5.9.3 In all constructions, the successive layers shall have opposite directions of layer the outermost layer being right-handed. The wires in each layer shall be evenly and closely stranded.

5.9.4 In conductors having multiple layers of Aluminium Wires, the lay ratio of any Aluminium layer shall not be grater than the lay ratio of the Aluminium layer immediately beneath it.

5.10 STANDARD LENGTH

5.10.1 The standard length of the Panther ACSR Conductor shall be 1300 meters. A tolerance of ±5 % on the standard length shall be permitted. All lengths outside this limit of tolerance shall be treated as random lengths.

5.10.2 Random lengths will be permissible to supply not more than 10 percent of the lengths on any one order in random lengths. But none of them shall be shorter than one third of nominal length.

5.10.3 Tenderer shall also indicate the maximum single length above the standard length, he can manufacture, in the guaranteed technical particulars. This is required for special stretches like river crossing etc. The purchaser reserve the right to place orders for the above length to the extent of 5 percent of the total ordered quantity on the same terms and conditions applicable for the standard lengths during the pendency of the contract.

Note: "The Guaranteed Technical Particulars for the conductor being supplied shall be provided with tender as specified in the technical specification. The tenders without the Guaranteed Technical Particulars shall be treated as non responsive".

6.0 TESTS:

6.1 Type test acceptance and routine tests and tests during manufacture, shall be carried out on the conductor as per the IS-398 (Part-II) of 1996 or latest revision.

The type tests as specified in the IS should be carried out not later than 5 years from the date of opening of bid.

6.1.1 All the quoted conductor shall be fully type tested by the Bidder as per the relevant standard including the type tests mentioned below. The type tests must have been conducted on the Panther conductor from recognized test laboratory. The bidder shall furnish two sets of type test reports as per relevant standards for each type of conductor offered along with the bid. The offers received without these type test reports shall be treated as non-responsive.

6.1.2 Acceptance Test shall mean those tests, which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purposes of acceptance of that lot.

6.1.3 Routine Tests shall mean those tests, which are to be carried out on each stand /spool/length of the conductor to check requirements, which are likely to vary during production.

6.1.4 Tests during manufacture shall mean those test, which are to be carried out during the process of manufacture and end inspection by the Bidder to ensure the desired quality of the end product to be supplied by him.

6.1.5 Samples for individual wire for tests shall be taken before standing from not less than ten percent of the spools in the case of aluminium wires and ten percent of the coils in the case of steel wires. If samples are taken after stranding, they shall be obtained by cutting 1.2 meters from the outer end of the finished conductor from not more than ten percent of the finished reels.

6.1.6 For all type and acceptance test, the acceptance values shall be the values guaranteed by the Supplier in the proforma for "Guaranteed Technical Particulars", furnished in this Specification or acceptance value specified in this specification, whichever is more stringent for that particular test.

6.2 Testing Expenses:

6.2.1 In case of failure in any type test, the Supplier is required to modify the design of the material and the material shall be type tested again for the modified design, with out any extra cost to the purchaser. No delivery extension shall be given for this additional testing.

6.2.2 Bidders shall indicate the laboratories in which they propose to conduct the type tests. They shall ensure that the tests can be completed in these

laboratories within the time schedule guaranteed by them in the appropriate schedule.

6.2.3 The entire cost of testing for the acceptance and routine test and tests during manufacture specified herein shall be treated as included in the quoted unit price of conductor.

6.3 **Additional Tests:**

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

6.4.1 The Bidder is required to carry out all the acceptance tests successfully in the presence of Purchaser's representative before dispatch.

6.5 **Test Reports:**

6.5.1 Copies of acceptance test reports shall be furnished in at least four (4) copies along with one original. After approval of Test Certificates by the Purchaser only the material will be dispatched.

6.5.2 Record of routine test reports shall be maintained by the Bidder at his works for periodic inspection by the Purchaser's representative.

6.5.3 Test Certificates of tests conducted during manufacture shall be maintained by the Bidder. These shall be produced for verification as and when desired by the Purchaser.

6.6 **Test Facilities:**

6.6.1 The following additional test facilities shall be available at Bidder's works.

a) The Calibration of all the testing equipments in the laboratory of the conductor manufacturer should be done only by NABL accredited calibration laboratories, without exception.

b) The standard resistance for calibration of the resistance measuring equipment shall be of 0.001 ohms and should be calibrated by NABL accredited laboratory.

c) Finished conductor shall be checked for length verification and surface finish on separate rewinding machine at reduced speed (variable from 8 to 16 meters per minute) The rewinding facilities shall have appropriate clutch system and shall be free from vibrations, jerks etc., with transverse layering facilities.

7.0 INSPECTION

7.1 The purchaser's representative shall, at all times, be entitled to have access to the works and all places of manufacture where conductor shall be manufactured and the representative shall have full facilities for unrestricted inspection of the tenderers works, raw materials and process of manufacture and conduction necessary tests as detailed here in.

The bidder shall keep the purchaser informed in advance of the time of starting and of the progress of manufacture of conductor in its various stages so that arrangements can be made for inspection.

The supplier shall give 15 days advance intimation to enable the purchaser to depute his representative for witnessing acceptance and routine test.

No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested, unless the inspection is waived off by the Purchaser in writing. In the later case also, the conductor shall be dispatched only after satisfactory testing for all tests specified herein has been completed and approved by the Purchaser.

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

The supplier shall furnish the following documents as proof of purchase of RAW material along with each inspection offer.

a). Invoice of the supplier,
b). Supplier Test Certificate.
c) Packing List.
d). Bill of Landing.
e). Bill of Entry Certificate by Custom.
f). Description of material, electrical analysis, physical inspection, certificate of surface defects, thickness and width of material wherever applicable.

7.2 At least 5% of the total number of drums subject to minimum of two in any lot put up for inspection shall be selected at random to ascertain the length of conductor by the following method.

7.3 At the works of the manufacturer of the conductor, the conductor shall be transferred from one drum to another at the same time measuring its length with the help of a graduated pulley & cyclometer. The difference in the average length thus obtained and as declared by the tenderer in the packing list shall be applied to all the drums if the conductor is found short during checking.

7.4 At least 10% of the total drums in any lot put up for inspection, shall be selected at random as per clause 6.1.5 of this technical specification to conduct the "Acceptance Tests" by the inspector. The acceptance tests shall be carried out on all the samples drawn from the sampling drums selected as above. If any sample drawn does not pass the Acceptance tests, the drum from which the sample is drawn will be rejected and another drum from the same lot shall be selected at random to repeat the "Acceptance Tests". If the second sample also fails in the same Test, the entire lot offered for inspection will be rejected.

7.4 The acceptance of any quantity of material shall in no way relieve the tenders of any of his responsibilities for meeting all requirements of the specification and shall not prevent subsequent rejection if such material is later found to be defective.

8.0 Approval of drawings and test certificates by purchaser shall not relieve the tenderer of his responsibility and liability for ensuring correctness and correct interpretation of the latest revision of applicable standards, rules and codes of practices. The material shall conform in all respects to high standards of engineering design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject any work or material which in his judgment is not in full accordance there with.

9.0 PACKING & FORWARDING

9.1 The conductor shall be supplied in non-returnable, strong wooden drums provided with lagging of adequate strength capable of withstanding displacement during transit storage and subsequent handling and stringing operations in the field. The drums shall generally conform to IS-1778-1980 except otherwise specified here in after.

9.2 The drums shall be suitable for wheel mounting and for jetting off the conductor under a minimum controlled tension of the order of 6 KN.

9.3 The Bidder shall submit the proposed drum drawings along with the bid. However, the same shall be in line with the requirements as stated herein. After placement of the Letter of Award, the Bidder shall submit four copies of fully dimensioned drawing of the drum he wishes to supply, for purchaser's approval before taking up manufacturing of conductor. After getting approval from the Purchaser, the Bidder shall submit 10 more copies of the approved drawing to Purchaser for further distribution and field use at Purchaser's end.

9.4 All wooden components shall be manufactured out of seasoned soft wood free from defects that may materially weaken the component parts of the drums. Preservative treatment for anti-termite/anti fungus (Aldrime / Aldruse) shall be applied to the entire drum with preservatives of a quality, which is not harmful to the conductor.

9.5 The flanges shall be of two/three ply construction with each ply at right angles to the other and nailed together. The nails shall be driven from the inside face flange, punched and then clenched on the outer face. The tolerance in thickness of each ply shall be + 3 mm only. There shall be at least 3 nails per plank of ply with maximum nail spacing of 75mm. Where a slot is cut in the flange to receive the inner end of the conductor, the entrance shall be in line with the periphery of the barrel.

9.6 The wooden battens used for making the barrel of the conductor shall be of segmental type. These shall be nailed to the barrel supports with at least two nails. The battens shall be closely butted and shall provide a round barrel with smooth external surface. The edges of the battens shall be rounded or chamfered to avoid damage to the conductor.

9.7 Barrel studs shall be used for construction of drums. The flanges shall be holed and the barrel supports slotted to receive them. The barrel studs shall be threaded over a length on either end, sufficient to accommodate washers, spindle plates and nuts for fixing flanges at the required spacing. Barrel studs should be tack welded with the nuts after tightening.

9.8 Normally, the nuts on the studs shall stand proud of the flanges. All the nails used on the inner surface of the flanges and the drum barrel shall be countersunk. The ends of barrel shall generally be flushed with the top of the nuts.

9.9 The inner check of the flanges and drum barrel surface shall be painted with bitumen based paint.

9.10 Before reeling, cardboard or double corrugated or thick bitumen zed 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 Kraft paper shall be used in between the layers of the conductors. After reeling the conductors, the exposed surface of the outer layer of conductor shall be wrapped with thin polythene sheet across the flanges to preserve the conductor from dirt, grit and damage during transportation/ storage and handling and also to prevent ingress of rain water.

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

9.12 Each batten shall be securely nailed across grains as far as possible to the flange edges with at least 2 nails per end. The length of the nails shall not be less than twice the thickness of the battens. The nail shall not protrude above the general surface and shall not have exposed sharp edges or allow the battens to be released due to corrosion.

9.13 Outside the protective layer, there shall be a minimum of two binders consisting of hoop iron/galvanized steel wire. Each protective layer shall have two recess to accommodate the binders.

9.4 The conductor ends shall be properly sealed and secured with the help of u-nails on one side of the flanges. The end securing shall be done by taking out at least 500 mm of steel core on either ends by u-nails. The composite conductor shall be lunged by use of galvanized steel wire/ Aluminium Wire at three locations at least 75 mm apart or more covered with PVC adhesive tape so as to avoid loosening of conductor layers in transit and handling.

9.5 Only one length of conductor shall be wound on each drum.

9.6 **PACKING AND MARKING:**

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

a). Manufacture's Name

b). Trade Mark, if any

c). Drum number of Identification number.

d). Size of Conductor.

e). Number and lengths of piece of conductor in each drum (no/Meters)

f). Gross mass of the packing (kg.)

g). Net mass of conductor (kg.)

h). ISI Specification Mark, the purchase order number containing and identification mark and letters "AP PDCL" and consignee address.

i) An arrow marking for unwinding should be indicated.

GUARANTEED TECHNICAL PARTICULARS

PANTHER ACSR CONDUCTOR (30 + 7/3.00 mm)

Sl. No.	Item	AP_PDCL requirement	To be furnished by bidder
1.	Material Description	Panther	
2.	Maker's Name and Address a). Aluminium wire b). Steel Wire. c). Complete conductor.		
3.	Stranding and Wire Diameter Standard/ Maximum/Minimum)mm a). Aluminium b). Steel	 3.00/3.03/2.97 3.00/3.06/2.94	
4.	Standard Nominal Copper area in Sq.mm	129	
5.	Calculated Equivalent Aluminium area in Sq.mm	200	
6.	Actual Aluminium area in Sq.mm	212.1	
7	Standard area of Cross-section in Sq.mm a. Aluminium Strand b. Steel strand. c. Conductor.	 7.069 7.069 261.553	
8	Diameter of complete Conductor in mm	21.00	
9.	Minimum Ultimate Tensile Stress of strand in kg/ Sq.mm a) Aluminium Strand b) Steel Strand	 16.80 134.04	
10.	Guaranteed Ultimate Tensile Strength of Conductor in Kg	9127.00	
11.	Minimum Breaking Load in KN for a) Aluminium Strand. b) Steel Strand	 1.11 8.83	
12.	Purity of Aluminium Rods in %	99.6%	
13.	Zinc Coating of Steel Strand a) Thickness of coating number and duration of dips (precede test) b) Minimum weight of coating in gms/ Sq. mm.	 3 dips of 1 min. each 240	
14.	Maximum Working Tension	2286	
15	Weight in Kg per KM (Max/ Min) a) Aluminium b) Steel c) Conductor	586 388 974(Normal), 947(Minimum), 1002(Maximum)	

Sl. No.	Item	AP_PDCL requirement	To be furnished by bidder
16	Maximum Resistance in Ohms per Km at 20 deg.C a) Aluminium Stand b) Conductor	 4.079 0.1390	
17.	a) Continuous Maximum Current Rating of Conductor in Still Air at 45 deg. C ambient temperature (Amps) b) Temperature rise for the above current (deg. C)	486 $30^{o}C$	
18	LAV Ratio Steel Core : 6 Wire Aluminium : 12 Wire Layer 18 Wire Layer	**Max.** **Min.** 28 13 16 10 14 10	
19	Whether the Drum on which the conductor is wound conforms to the specification and whether the detailed dimensioned drawing submitted with the tender.	IS 1778:1980 Yes	
20	Moulds of Elasticity of a) Aluminium Strand : Kgs/ Sq.mm b) Steel Strand : Kgs/ Sq.mm c) Conductor Strand : Kgs/ Sq.mm	 0.7031×10^{6} 1.969×10^{6} 8.0×10^{6}	
21	Co-efficient of Liner Expansion per Degree Centigrade for a) Aluminium Stand. b) Steel Strand. c) Conductor	 23.00×10^{-6} 11.50×10^{-6} 17.80×10^{-6}	
22	Percentage of Carbon in Steel Wire	0.50 to 0.85%	
23	Standard length of each piece in KM	1.300	
24	Maximum Single Length of Conductor which can be manufactured (km)	2.000	
25	Tolerance, if any on Standard Lengths.	$\pm$ 5%	
26	No. of Standard Lengths in One Reel	1	
27	Dimension of the Reel in Cm.	137 x 60 x 71	
28	Weight of the Conductor in One Reel in Kg	1266	
29	Weight of the Reel in Kg	225	
30	Gross Weight of the Reel including weight of the Conductor (kg)	1500	
31	Standard According to Which the Conductor Will be Manufactured and Tested.	IS:398 (Part-II) 1996	
32	Other Particulars.	----	