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TECHNICAL SPECIFICATIONS

AND

GUARANTEED TECHNICAL PARTICULARS

FOR

ACSR CONDUCTOR OF VARIOUS SIZES FOR OVERHEAD POWER DISTRIBUTION LINES

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This Tender Specification and Guaranteed Technical Particulars are for tendering purpose only and may be subjected to the modification by the purchaser as per actual field requirement. Contractor/Supplier to submit the Guaranteed Technical Particulars (GTP) and Drawings, after the award of the Contract, for approval of the Purchaser.

In case any discrepancy is noticed in this Specification/GTP, please report to Chief Engineer P&P, KPDCL.

CLIMATIC AND ISOCERAUNIC CONDITIONS (CIC)

1.	The climatic and Isoceraunic conditions at the site of work are approximately given as under:	
	Description	Kashmir
i)	Max. temp of air in shade	30.6^0 C
ii)	Min. temp of air in shade	-20^0 C
iii)	Max. temp of air in sun	45^0 C
iv)	Height above sea level (App.)	1600 meter
v)	Max. relative humidity	90%
vi)	Min. relative humidity	15%
vii)	Average no. of thunderstorm days per year	54
viii)	Average rainfall	80 cm
ix)	Wind Zone	WZ –3
x)	Average number of rainy days per year	106
xi)	Seismic Zone	SZ–5
xii)	Area of installation	Heavy Snow Zone
2.	**Communication and Transport:** The nearest railway station is Udhampur on the broad gauge line and is connected to the Divisional Stores by a metal road. The equipment is required to pass en-route through various tunnels on NH-44 (Nandni, Nashri and Jawahar Tunnel). The weight and maximum dimensions of the packages suitable for transportation through tunnel route are as follows: - 1. Length =7.0 m 2. Width =3.0 m 3. Height =4.55 m 4. Weight =40 MT The supplier shall get the permissible weight and dimensions confirmed from the Highway Authorities before proceeding with the manufacture of the equipment. It will be the responsibility of the supplier to ensure timely and proper delivery of the equipment on door delivery basis, at Srinagar, through road transport. The supplier shall also ensure that the weight and dimensions of the packages which are suitable to be carried by road transport up to Srinagar.	
3.	**Additional conditions**	
i	Permitted Noise Level	45 dB
ii	Induced Electromagnetic disturbance	1.6 kV
iii	Pollution class/Creepage distance	III/ 25mm/ kV
iv	Isoceraunic Level (days/year)	50
v	Condensation	Occasional

TECHNICAL SPECIFICATION OF ACSR CONDUCTOR OF VARIOUS SIZES

SECTION 'A'

1. SCOPE:

1.1 This specification covers design, manufacture, testing before dispatch, packing, supply and delivery of Steel Reinforced Aluminium Conductor (ACSR) of sizes 200 mm^2 (Panther),150 mm^2 (Wolf),100 mm^2 (Dog), 50 mm^2 (Rabbit) and 30 mm^2 (Weasel) for use on 33/11/0.433 kV overhead Sub Transmission and Distribution Lines.

1.2 It is not the intent to specify completely herein all details of the design and construction of the equipment/material. However, the equipment/material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing continuous commercial operation up to the bidder's guarantee in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specifications and shall have the discretion to reject any work or material which, in his judgment, is not in accordance there with.

2. STANDARDS:

The Conductor shall also comply in all respects with the IS: 398 (Part-2)-1996 with latest amendments unless and otherwise stipulated in this specification or any other International Standards which ensure equal or higher quality material.

The ACSR Conductor shall also conform to the following standards.

S No.	Indian Standards	Title	International
1	IS:209-1979	Specification for Zinc	BS-3436-1961
2	IS:398-1996	Specification for aluminium conductors for overhead lines.	
	Part-2	Aluminium conductors	IEC-209-1966
		Galvanized steel reinforced	BS-215 (Part-II)
3	IS:1521-1972	Method of Tensile Testing of Steel wire	ISO/R89-1959
4	IS:1778-1980	Reels and Drums for Bare conductors	BS-1559-1949
5	IS:1841-1978	E.C. Grade Aluminium rod produced by rolling	
6	IS:2629-1966	Recommended practice for Hot Dip Galvanizing of iron and steel	

7	IS:2633-1986	Method of testing uniformity of coating of zinc coated articles.	
8	IS:4826-1968	Galvanized coatings on round steel wires.	ASTM A472-729
9	IS:5484-1978	E.C. Grade Aluminium rod produced by continuous casting and rolling.	
10	IS:6745-1972	Methods of determination of weight of zinc-coating of zinc coated iron and steel articles	BS-443-1969

Offers conforming to standards other than IS-398 (amended upto date) shall be accompanied by the English version of relevant standards in support of the guaranteed technical particulars to be furnished as per the format enclosed.

3. GENERAL TECHNICAL REQUIREMENTS:

The Guaranteed Technical Particulars are given in Section- B. The ACSR Conductor shall conform to these Guaranteed Technical Particulars.

The ACSR Conductor shall be suitable for being installed directly in air supported on suspension/string insulators, pin insulators, shackle insulators or anchored through tension insulator strings at the cross arms of 33/11/0.433 kV overhead Sub Transmission and Distribution Lines.

The conductor shall therefore be suitable for satisfactory operation under the climatic conditions listed above under Climatic and Isoceraunic Conditions.

The bidder shall furnish Guaranteed Technical Particulars to Purchaser in the format given in section – C of Technical Specifications.

3.1. MATERIAL/WORKMANSHIP:

3.1.1. The material offered shall be of best quality and workmanship. The steel core aluminium conductor strands shall consist of hard drawn aluminium wire manufactured from not less than 99.5% pure electrolytic aluminium rods of E.C. grade and copper content not exceeding 0.04%. They shall have the same properties and characteristics as prescribed in IEC 889:1987 (amended up to date). The steel wire shall be made from material produced either by the acid or basic open hearth process or by electric furnace process or basic oxygen process. Steel wire drawn from Bessemer process shall not be used.

3.1.2 The steel wires shall be evenly and uniformly coated with electrolytic high grade, 99.95% purity zinc complying with the latest issue of IS-209 (amended up to date) for zinc. The uniformity of zinc coating and the weight of coating shall be in accordance with standard mentioned in Cl.2 of this section and shall be tested and determined according to the latest IS-

2633 (amended up to date) or any other authoritative standard.

3.1.3 The steel strands shall be hot dip galvanized as per IS:4826 (amended up to date). The coating shall be smooth, continuous, and of uniform thickness, free from imperfections and shall withstand minimum three dips after stranding in standard Preece test. The steel strands shall be pre formed and post formed in order to prevent spreading of strands in the event of cutting of composite core wire. The properties and characteristics of finished strands and individual wires shall be as prescribed in IEC 888:1987 (amended up to date). If tested after stranding, reference shall also be made to Cl. 4.1.1 and Cl. 4.2.3 of IS: 4826 (amended up to date).

4. CONDUCTOR PARAMETERS:

The Parameters of individual strands and composite steel core aluminium conductor shall be in accordance with the values given in Section-B "Guaranteed Technical Particulars".

Creep in a conductor is attributed partly due to settlement of strands and partly due to non-elastic elongation of metal when subjected to load. The manufacturer of conductor shall furnish the amount of creep which will take place in 10, 20, 30, 40 and 50 years along with the supporting calculations. The calculations should be based on everyday temperature of 32 ^{o}C and everyday tension of 25% of UTS of conductor of 33/11 kV Lines.

5. TOLERANCES:

The tolerances on standard diameter of Aluminium and Steel wires shall be as per IS- 398 (Part-2) 1996 (amended up to date).

The cross-section of any wire shall not depart from circularity by more than an amount corresponding to the tolerance on the standard diameter.

The details of diameters, lay ratios of Aluminium and steel wires shall be in accordance with the Section-B "Guaranteed Technical Particulars"

6. SURFACE CONDITIONS:

All aluminium and steel strands shall be smooth, and free from all imperfections, spills and splits. The finished conductor shall be smooth, compact, uniform and free from all imperfections including spills and splits, die marks, scratches, abrasions, scuff marks, kinks (protrusion of wires), dents, pressmarks, cut marks, wire cross-over, over-riding looseness, pressure and/or unusual bangle noise on tapping, material inclusions, white rust, powder formation or black spots (on account of reaction with trapped rain water etc.,), dirt, grit, etc. The surface of conductor shall be free from points, sharp edges, abrasions or other departures from smoothness or uniformity of surface contour that would increase radio interference and corona losses. When subjected to tension up to 50% of the ultimate strength of the conductor, the surface shall not depart from the cylindrical form or any part of the component parts or strands move relative to each other in such a way as to get out of place and disturb the longitudinal smoothness of the conductor.

7. JOINTS IN WIRES:

7.1. Aluminium wires:

During stranding, no aluminium wire welds shall be made for the purpose of achieving the required conductor length.

No joint shall be permitted in the individual aluminium wires in the outer most layer of the finished Conductor. However, joints in the 12 wire & 18 wire inner layer of the conductor are permitted but these joints shall be made by the cold pressure butt welding and shall be such that no two such joints shall be within 15 meter of each other in the complete stranded conductor.

7.2. Steel wires:

There shall be no joints in finished steel wires forming the core of the steel reinforced aluminium conductor.

8. STRANDING:

The wires used in construction of the stranded conductor, shall, before stranding, satisfy all requirements of IS-398 (Part-2) 1996 (amended up to date).

In all constructions, the successive layers shall be stranded in opposite directions. The wires in each layer shall be evenly and closely stranded round the underlying wire or wires. The outer most layer of wires shall have a right hand lay. The lay ratio of the different layers shall be within the limits given under Section-B "Guaranteed Technical Particulars".

9. PACKING:

9.1. The conductor shall be supplied in non-returnable strong wooden drums provided with lagging of adequate strength constructed to protect the conductor against any damage and displacement during transit, storage and subsequent handling and stringing operations in the field. The drums shall generally conform to IS-1778-1980 (amended up to date) except otherwise specified hereinafter. The conductor drums shall be adequate to wind one or more standard length of ACSR conductor.

9.2. The drums shall be suitable for wheel mounting and for letting off the conductor under a minimum controlled tension of the order of 5 kN. The conductor drums shall be provided with necessary clamping arrangements so as to be suitable for tension stringing of power conductor.

9.3. After placement of letter of award, the Manufacturer shall submit four copies of fully dimensioned drawings in the form of hard copies as well as soft copies (PDF format and Auto CAD format) of the drum for Purchaser's approval. After getting approval from the Purchaser, Manufacturer shall submit 30 more copies of the approved drawings for further distribution

and field use.

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 shall be applied to the entire drum with preservatives of a quality which is not harmful to the conductor.

9.5. All flanges shall be 2-ply construction with 64 mm thickness. Each ply shall be nailed and clenched together at approximately 90 degrees. Nails shall be driven from the inside face of the flange, punched and then clenched on the outer face. Flange boards shall not be less than the nominal thickness by more than 2 mm. There shall not be less than 2 nails per board in each circle.

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.

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

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

9.10. Before reeling, card board or double corrugated or thick bituminized waterproof bamboo paper or HDPE sheet shall be secured to the drum barrel and inside of flanges of the drum by means of a suitable commercial adhesive material. The paper should be dried before use. After reeling the conductor, 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 and handling and also to prevent ingress of rain water during storage/transport.

9.11. A minimum space of 75 mm shall be provided between the inner surface of the external protective lagging and outer layer of the conductor. Outside the protective lagging, there shall be minimum of two binders consisting of hoop iron/galvanized steel wire. Each protective lagging shall

have two recesses to accommodate the binders.

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. The conductor ends shall be properly sealed and secured with the help of U-nails on one side of the flanges.

9.14. Only standard lengths of conductor shall be wound on each drum. The method of lagging to be employed shall be clearly stated in the tender.

9.15. As an alternative to wooden drum Bidder may also supply the conductors in non-returnable Painted steel drums. The painting shall conform to IS:9954-1981, reaffirmed in 1992 (amended up to date). Wooden/Steel drums will be treated at par for evaluation purpose and accordingly the Bidder should quote the package.

10. LABELLING AND MARKING:

The drum number shall be branded or gauged or stenciled into the flange. An arrow shall be marked on the sides of the drum, together with the words "Roll this way". Each drum shall have the following information provided on the outside of the flange stenciled with indelible ink.

i) Manufacturer's name and address.
ii) Purchasers Reference number.
iii) Size and type of conductor.
iv) Net weight of the conductor.
v) Gross weight of the conductor and drum.
vi) Length of the conductor.
vii) Position of the conductor end.
viii) Drum and lot number.
ix) Name and address of the consignee.
x) Month and year of manufacture.
xi) The drum may also be marked with standard specification as per which the conductor is manufactured.

11. STANDARD LENGTHS:

11.1. The standard length of the conductor (for Panther and Wolf) shall be 1400 meters and the standard length of the conductor for (Dog, Rabbit and Weasel) shall be 2500 meters. A tolerance of ± 5% on the standard length offered by the bidder shall be permitted. All lengths outside this limit of tolerance shall be treated as random lengths.

11.2. Random lengths will be accepted provided no length is less than 70% of the

standard length and total quantity of such random length shall not be more than 10% of the total quantity order. When one number random length has been manufactured at any time, five (5) more individual lengths, each equivalent to the above random length with a tolerance of ± 5% shall also be manufactured and all above six random lengths shall be dispatched in the same shipment. At any point, the cumulative quantity supplied including such random lengths shall not be more than 12.5% of the total cumulative quantity supplied, including such random lengths. However, the last 20% of the quantity ordered shall be supplied only in standard length as specified.

11.3. Bidder shall also indicate the maximum single length, above the standard length, he can manufacture in the guaranteed technical particulars of offer. This is required for special stretches like river crossing etc. The Employer reserves the right to place orders for the above lengths on the same terms and conditions applicable for the standard lengths during the pendency of the Contract.

12. QUALITY ASSURANCE PLAN:

A Quality Assurance Plan including customer hold points covering the manufacturing activities of the material shall be required to be submitted by the tenderer to the Purchaser along with the tender. The Quality Assurance Plan after the same is found acceptable will be approved by the Purchaser.
The contractor shall follow the approved Quality Assurance Plan in true spirit. If desired by the Purchaser, he shall give access to all the documents and materials to satisfy the Employer that the Quality Assurance Plan is being properly followed.

13. TESTING:

13.1. SELECTION OF TEST SAMPLES FOR TYPE TESTS:

13.1.1. The samples shall be taken from a continuous length of conductor and subjected to all the tests specified in clause 14.

13.2 SELECTION OF TEST SAMPLES FOR ACCEPTANCE TESTS:

13.2.1 Before dispatch from the works individual wire and finished steel cored aluminium conductor shall be subjected to the tests as specified in IS:398 (amended up to date) or any other authoritative standard.

13.2.2 Sample for individual wires for test shall be taken before stranding from outer ends of not less than ten per cent of the spools in the case of aluminium wire and ten per cent of the wire 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 ends of the finished conductor from not more than 10 per cent of the finished reels.

13.2.3 The routine tests shall be same as acceptance test. The manufacturer will draw samples for routine tests as per Cl. 13.1.1 or 13.1.2 of IS: 398 (Part 2 amended up to date) and will maintain the record of routine tests for buyer's review. For acceptance tests, the sample shall be taken as per Cl.13.1.2 of IS: 398 (Part 2 amended up to date).

14 TESTS:

The Type, Acceptance, Routine tests and other tests if specifically demanded by KPDCL and tests during manufacture shall be carried out on the conductor free of cost. Providing of all facilities for the departmental representative nominated by KPDCL to carry out tests including to and fro air travel, lodging and boarding to be borne by the supplier.

The following tests shall be carried out on sample/samples of conductor.

14.1 **Type Tests:**

(i) Visual examination
(ii) Measurement of diameters of individual aluminium and steel wires.
(iii) Measurement of lay ratio of each layer
(iv) Breaking load test
(v) Ductility test
(vi) Wrapping test
(vii) Resistance test on aluminium wires.
(viii) DC resistance Test on aluminium wires.
(ix) Galvanizing test
(x) Surface condition test
(xi) Stress Strain test
(xii) Procedure qualification test on welded joint of Aluminium Strands.

NOTE:
The type test reports carried out from any of the CPRI/NABL Accredited laboratory shall not be older than TEN years and shall be valid up to the expiry of validity of offer.

14.2 **Acceptance tests and Routine tests:**

(ii) Visual and dimensional check on drum.
(iii) Visual examination
(iv) Measurement of diameters of individual aluminium and steel wires.
(v) Measurement of lay ratio of each layer
(vi) Breaking load test
(vii) Ductility test
(viii) Wrapping test

(ix) Resistance test on aluminium wires.
(x) DC resistance Test on Composite Conductor.
(xi) Galvanizing test.

14.3 **Tests during Manufacture:**

The following tests during manufacture shall be carried out.

(i) Chemical analysis of zinc used for galvanizing.
(ii) Chemical analysis of aluminium used for making aluminium strands.
(iii) Chemical analysis of steel used for making steel strands.

14.4 **Visual examination:**

The conductor shall be examined visually for good workmanship and general surface finish of the conductor. The conductor drums shall be rewound in the presence of Inspecting Officer. The Inspector will initially check for Scratches, Joints etc., and that the conductor shall generally conform to the requirements of the specifications/IS 398(Part-2)-1996 (amended up to date).

14.5 **Measurement of diameters of individual Aluminium and Steel Wires:**

The diameters of individual Aluminium and Steel Wires shall be checked to ensure that they conform to the requirements of this specification.

14.6 **Measurement of lay-ratios:**

The lay-ratios of each layer of the conductor shall be measured and checked to ensure that they conform to the requirements of this specification and IS:398 (Part-2)-1996 (amended up to date).

14.7 **Breaking load test:**

a) **Breaking load test on complete conductor:**

Circles perpendicular to the axis of the conductor shall be marked at two places on a sample of conductor of minimum 5 m length between fixing arrangement suitably fixed on a tensile testing machine. The load shall be increased at a steady rate up to 50% of minimum specified UTS and held for one minute. The circles drawn shall not be distorted due to relative movement of strands. Thereafter the load shall be increased at steady rate to 100% of UTS and held for one minute. The Conductor sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

b) **Breaking load test on individual aluminium and galvanized steel wires:**

This test shall be conducted on both Aluminium and Galvanized steel wires. The breaking load of one specimen cut from each of the samples taken shall be determined by means of suitable tensile testing machine. The load shall be applied gradually and the rate of separation of the jaws of the testing machine shall be not less than 25 mm/min and not greater than 100 mm/min. The ultimate breaking load of the specimens shall be not less than the values as specified in the Section-B "Guaranteed Technical Particulars".

14.8 **Ductility Test:**

For the purpose of this test both torsion and elongation tests shall be carried out on galvanized steel wires only.

14.9 **Torsion Test:**

One specimen cut from each of the samples taken shall be gripped in two vices exactly 15 cm apart. One of the vices shall be made to revolve at a speed not exceeding one revolution per second and the other shall be capable of moving longitudinally to allow for contraction or expansion during testing. A small tensile load not exceeding 2% of the breaking load of the wire shall be applied to the samples during testing. The test shall be continued until fracture occurs and the fracture shall show a smooth surface at right angles to the axis of the wire. After fracture, the specimen shall be free from helical splits. The sample shall withstand a number of twists equivalent to not less than 18 on length equal to 100 times the diameter. When twisted after stranding the number of complete twists before fracture occurs shall be not less than 16 on a length equal to 100 times the diameter of the wire. In case test sample length is less or more than 100 times the stranded diameter of the strand, the minimum number of twists will be proportioned to the length and if number comes in the fraction then it will be rounded off to the next higher whole number. The fracture shall show a smooth surface at right angles to the axis of the wire.

14.10 **Elongation Test:**

The elongation of one specimen cut from each of the samples taken under 13.1.1 or 13.1.2 shall be determined. The specimen shall be straightened by hand and an original gauge length of 200 mm. shall be marked on the wire. A tensile load shall be applied as described in Cl.13.3.1 of IS 398 (Part-2)-1996 (amended up to date) and the elongation shall be measured after the fractured ends have been fitted together. If the fracture occurs outside the gauge marks, or within 25 mm of either mark or the required elongation is not obtained, the test shall be disregarded and another test conducted. When tested before stranding, the elongation shall not be less than 4% and when tested after stranding, the elongation shall not be less than 3.5 %.

14.11 **Wrapping Test:**

This test shall be conducted on both Aluminium and Galvanized steel wires.

14.11.1 **Aluminium wires:**

One specimen cut from each of the samples of aluminium wires shall be wrapped round a wire of its own diameter to form a close helix of 8 turns. Six turns shall then be unwrapped and closely wrapped in the same direction as before. The wire shall not break or show any crack.

14.11.2 **Galvanized steel wires:**

One specimen cut from each of the samples of galvanized steel wire taken shall be wrapped round a mandrel of diameter equal to 4 times the wire diameter to form a close helix of 8 turns. Six turns shall then be unwrapped and again closely wrapped in the same direction as before. The wire shall not break.

14.12 **Resistance Test:**

This test shall be conducted on aluminium wires only, conforming to procedure as per IEC 889:1987 (amended upto date). The electrical resistance of one specimen of aluminium wire cut from each of the samples taken shall be measured at ambient temperature. The measured resistance shall be corrected to the value corresponding to 20˚C. by means of following formula.

$$R_{20} = R_T / \{1 + \alpha \times (T-20)\}$$

Where

R_{20} = Resistance corrected at 20˚C.

R_T = Resistance measured at T˚C.

α = Constant mass temperature coefficient of resistance 0.004 /˚C.

T = Ambient temperature during measurement

This resistance calculated to 20˚C shall be not more than the maximum value specified in Section-B "Guaranteed Technical Particulars".

14.13 **Galvanizing Test:**

This test shall be conducted on galvanized steel wires only. The uniformity of Zinc coating and the weight of coating shall be in accordance with IS 4826-1979 (amended up to date).

14.14 **Surface Condition Test:**

A sample of the finished conductor for use in 11/33 kV system having a minimum length of 5 meter with compression type dead end clamps compressed on both ends in such manner as to permit the conductor to take its normal straight line shape, shall be subjected to a tension of 50% of the UTS of the conductor. The surface shall not depart from its cylindrical shape nor shall the strands move relative to each other so as to get out of place or disturb the longitudinal smoothness of conductor. The measured diameter at any place shall be not less than the sum of the minimum specified diameters of the individual aluminium and steel strands as indicated in Section-B "Guaranteed Technical Particulars".

14.15 **Test for Ultimate Breaking Load on Stranded Conductor**:

This test is applicable to conductors of nominal Aluminium area 100 mm^2 and above. A sample of conductor of minimum 5 meter length suitably clamped at either end. The load shall be increased at a steady rate upto rated ultimate breaking load and held for one minute. When so tested the conductor shall not show any facture. The applied load shall then be increased until the failing load is reached and the value recorded. A re- test up to a total of three tests may be made if wire fracture occurs within one centimeter of the end fitting and the tensile strength falls below the specified breaking strength requirement.

14.16 **Stress-Strain Test:**

The test is contemplated only to collect the creep data of the conductor from the manufacturer. A sample of conductor of minimum 10 meter length shall be suitably compressed with dead end clamps. (Applicable only for conductors of nominal aluminium area 100 mm^2 and above).

15 TEST SET-UP:

15.1 The test sample shall be supported in a trough over its full length and the trough adjusted so that the conductor will not be lifted by more than 10 mm under tension. This shall be ascertained by actual measurement.

15.2 The distance between the clamp and the sleeve mouth shall be monitored with calipers during the test to ensure that, after the test, it does not change by more than 1mm +0.1 mm from the value before the test.

15.3 The conductor strain shall be evaluated from the measured displacements at the two ends of the gauge length of the sample. The gauge reference targets shall be attached to the clamps which lock the steel and aluminium wires together. Target plates may be used with dial gauges or displacement transducers and care shall be taken to position the plate's perpendicular to the conductor. Twisting the conductor, lifting it and moving it from side- to-side by the maximum amounts expected during the test should introduce no more than 0.3 mm error in the reading.

16 TEST LOADS FOR COMPLETE CONDUCTOR:

The loading conditions for repeated stress-strain tests for complete conductor shall be as follows:

16.1 1 kN load shall be applied initially to straighten the conductor. The load shall be removed after straightening and then the strain gauges are to be set at zero tension.

16.2 For non-continuous stress-strain data, the strain readings at 1kN intervals at lower tensions and 5 kN intervals above 30% of UTS shall be recorded.

16.3 The sample shall be reloaded to 30% of UTS and held for 1 hour. Readings are to be noted after 5, 10, 15, 30, 45 and 60 minutes during the hold period. The load shall be released then after the hold period.

16.4 The sample shall be reloaded to 50% of UTS and held for 1 hour. Readings are to be noted after 5, 10, 15, 30, 45 and 60 minutes during the hold period. The load shall be released then after the hold period.

16.5 Reloading up to 70% of UTS shall be done and held for 1 hour. Readings are to be noted after 5, 10, 15, 30, 45 and 60 minutes. The load shall be released.

16.6 Reloading up to 85% of UTS shall be done and held for 1 hour. Readings are to be noted after 5, 10,15, 30, 45 and 60 minutes and the load shall be released then.

16.7 Tension shall be applied again and shall be increased uniformly until the actual breaking strength is reached. Simultaneous readings of tension and elongation shall be recorded up to 90% of UTS at the intervals described under Clause 16.6.

17 TEST LOADS FOR STEEL CORE ONLY (applicable only for conductors of nominal aluminium area 100 mm^2 and above):

The loading conditions for repeated stress-strain tests for the steel core of ACSR shall be as follows:

17.1 The test shall consist of successive applications of load applied in a manner similar to that for the complete conductor at 30%, 50%, 70% and 85% of UTS.

17.2 The steel core shall be loaded until the elongation at the beginning of each hold period corresponds to that obtained on the complete conductor at 30%, 50%, 70% and 85% of UTS respectively.

18. STRESS-STRAIN CURVES:

The design stress-strain curve shall be obtained by drawing a smooth curve through the 0.5 and 1 hour points at 30%,50% and 70% of UTS loadings. The presence of any aluminium slack that can be related to any observed extrusion entering the span from the compression dead ends shall be removed from the lower ends of the design curves. Both the laboratory and standard stress-strain curves shall be submitted to the Employer along with test results. The stress-strain data obtained during the test shall be corrected to the standard temperature i.e. 20˚C.

19. DC RESISTANCE TEST ON COMPOSITE CONDUCTOR:

On a conductor sample of minimum 5 meter length, two contact clamps shall be fixed with a pre-determined bolt torque. The resistance of the sample shall be measured by a Kelvin double bridge by placing the clamps initially zero meter and subsequently one meter apart. The test shall be repeated at least five times and the average value recorded. The value obtained shall be corrected to the value at 20˚C as per clause no. 12.8 of IS:398 (Part-2)-1982/1996 (amended up to date). The corrected resistance value at 20˚C shall conform to the requirements of this specification.

20 PROCEDURE QUALIFICATION TEST ON WELDED ALUMINIUM STRANDS:

Two Aluminium wires shall be welded as per the approved quality plan and shall be subjected to tensile load. The breaking strength of the welded joint of the wire shall not be less than the guaranteed breaking strength of individual strands.

21 CHEMICAL ANALYSIS OF ALUMINIUM AND STEEL:

Samples taken from the Aluminium and Steel ingots/coils/strands shall be chemically/spectrographically analyzed. The same shall be in conformity with the requirements stated in this specification.

22. CHEMICAL ANALYSIS OF ZINC:

Samples taken from the zinc ingots shall be chemically/spectrographically analyzed. The same shall be in conformity with the requirements stated in this specification.

23. **VISUAL AND DIMENSIONAL CHECK ON DRUMS:**

The drums shall be visually and dimensionally checked to ensure that they conform with the requirements stated in this specification.

24. REJECTION AND RETEST:

a. In case of failure in any type test, the Manufacturer is either required to manufacture fresh sample lot and repeat all the tests successfully once or repeat that particular type test three times successfully on the sample selected from the already manufactured lot at his own expenses. In case a fresh lot is manufactured for testing then the lot already manufactured shall be rejected.

b. If samples are taken for test after stranding and if any selected reel fails in the retest, the manufacturer may test each and every reel and submit them for further inspection. All rejected material shall be suitably marked and segregated.

25. CHECKING AND VERIFICATION OF LENGTH OF CONDUCTOR:

The contractor should arrange for inspection by the representative of the Purchaser specially authorized for this purpose. At least 50% of the total number of drums of conductor subject to minimum of two taken at random should be checked to ascertain the length of conductor.

Arrangements should be made available in the works of the manufacturer for transferring the conductor from one reel to another at the same time measuring the length of the conductor so transferred by means of a meter.

26. ADDITIONAL TESTS:

The Purchaser reserves the right of having any other test(s) (**at bidder's expenses**) of reasonable nature carried out at Bidder's premises, at site, or in any other standard Laboratory in addition to the aforesaid type, acceptance and routine tests to satisfy himself that the materials comply with the specifications.

27. TESTING EXPENSES:

a. The breakup of the testing charges for the type tests specified shall be indicated separately.

b. Bidder shall indicate the laboratories in which they propose to conduct the type test. They shall ensure that adequate facilities are available in the laboratories and the tests can be completed in these laboratories within the time schedule guaranteed by them.

c. The entire cost of testing for the acceptance and routine tests and tests during manufacture specified herein and providing of all facilities for the departmental representative nominated by KPDCL to carry out tests including to and fro air travel, lodging and boarding shall be treated as included in the quoted unit price of the conductor.

d. In case of failure in any type test, if repeat type tests are required to be conducted then all the expenses for deputation of Purchaser's representative shall be deducted from the contract price. Also if on receipt of the Manufacturer's notice of testing, the Purchaser's representative does not find 'plant' to be ready for testing, the expenses incurred by the Purchaser for re - deputation shall be deducted from contract price.

28. TEST REPORTS:

Copies of type test reports shall be furnished in at least six copies along with one original copy. One copy will be returned duly certified by the Purchaser only after which the commercial production of the material shall start.

28.1 Record of Routine test reports shall be maintained by the Manufacturer at his works for periodic inspection by the Purchaser's representative.

28.2 Test certificates of Tests during manufacture shall be maintained by the Manufacturer. These shall be produced for verification as and when desired by the Purchaser.

29. TEST FACILITIES:

The following additional test facilities shall be available at the Manufacturer's works:

(i) Calibration of various testing and measuring equipment including tensile testing machine, resistance measurement facilities, burette, thermometer, barometer, etc.

(ii) Standard resistance for calibration of resistance bridges.

(iii) 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 be free of vibrations, jerks etc. with traverse laying facilities.

30. INSPECTION:

30.1 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 Bidder's works, raw materials and process of manufacture and conducting necessary tests as detailed herein.

30.2 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.

30.3 The contractor will intimate the Purchaser about carrying out of the tests at least 45 days in advance of the scheduled date of tests during which the Purchaser will arrange to depute his representative/s to be present at the time of carrying out of the tests. Six (6) copies of the test reports shall be submitted.

30.4 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 employer in writing. In the latter case also, the conductor shall be dispatched only after satisfactory testing for all tests specified herein has been completed and approved by the Purchaser.

30.5 The acceptance of any quantity of material shall in no way relieve the Bidder 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.

30.6 At least 50% 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:

"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 and Cyclometer. The difference in the average length thus obtained and as declared by the Bidder in the packing list shall be applied to all the drums if the conductor is found short during checking".

31. CHALLENGE CLAUSE:

Purchaser reserves the right to have the material, received after the inspection by the authorized inspecting officer, again tested for any parameter(s) from the approved/NABL Accredited testing house/in house technique of the Purchaser. The results if found deviating/unacceptable or in non-compliance with the approved GTP, the lot shall be rejected and bidder shall arrange to replace the rejected LOT within thirty (30) days of such detection at his cost including to and fro transportation.

SECTION -B

GUARANTEED TECHNICAL PARTICULARS FOR ACSR CONDUCTOR OF VARIOUS SIZES

1. ACSR PANTHER (200 mm²)

S. No:	Particulars and Wire Code	ACSR Panther (200 mm²)
1.	(a) Aluminium Rod (b) HTGS Wire (c) Complete Conductor	IS-5484 of 1997 (2nd Revision) IS-4826 of 1979 (Amended upto date) As per IS-398-II of 1996, (amended up to date)
2.	Stranding & Wire Diameter (mm) (a) Aluminium (b) Galvanized Steel.	 30/3 7/3
3.	Sectional Area of Aluminium (mm²) Sectional Area of Steel (mm²)	212.1 49.48
4.	Nominal Aluminium area (mm²)	200
5.	Total sectional area of ACSR Conductor (mm²)	261.6
6.	Cross sectional area of nominal dia wire (mm²) a) Aluminium (b) Steel wire	 7.069 7.069
7.	Approximate diameter of conductor (mm)	21.00
8.	Breaking load of conductor (kN)	89.67
9.	Breaking load for single wire (kN) a) Aluminium: Before/After stranding (b) Steel wire: Before/After stranding	 1.19/1.11 9.29/8.83
10.	Minimum weight of zinc coating (g/m²) No. of dips and duration	240 3 dips of 1 min
11.	Mass (kg/km) a) Aluminium Rod (b) HTGS Wire (c) Conductor	 586 388 974
12.	Modulus of elasticity of conductor (GN/m²)	80
13.	Coefficient of linear expansion of conductor (/˚C)	17.8×10^{-6}
14.	Resistance at 20˚C (ohm/km) ACSR Conductor	 0.139

15.	**Lay Ratios**	**Aluminium Wire** a) **Outermost layer** Min Max 10 14 **b) Layer beneath outermost layer** Min Max 10 16 **c) Steel wire** Min Max 13 28
16.	Packing Wooden Drum for conductor	Shall be wound on reels or drums. Reels and drums conforming to IS-1778 of 1981 with latest amendments thereof.
17.	IS Applicable	IS-398 (part-II) of 1996 with latest amendments.
18.	Other requirements to be followed by Tenderer: - i) The EC grade Aluminium rods for use in the manufacture of Aluminium wire shall conform to IS:5484: 1997 (2nd revision) amended up to date. ii) The reels/drums on which the conductor shall be supplied have to be marked as per clause 16 of this specification.	

2. **ACSR WOLF (150 mm²)**

S. No:	Particulars and Wire Code	ACSR WOLF (150 mm²)
1.	a) Aluminium Rod b) HTGS Wire c) Complete Conductor	IS -5854 OF 1997 (2nd revision) IS-4826 of 1979 (Amended upto date) As per IS -398-2 OF 1996 (amended upto date)
2.	Stranding & Wire Diameter (mm) a) Aluminium b) Galvanized Steel.	 30/2.59 7/2.59
3.	Sectional Area of Aluminium (mm²) Sectional Area of Aluminium (mm²)	158.1 36.88
4.	Nominal Aluminium area (mm²)	150.0
5.	Total sectional area of ACSR Conductor (mm²)	194.9
6.	Cross sectional area of nominal dia wire (mm²) a) Aluminium wire b) Steel wire	 5.269 5.269
7.	Overall Dia of ACSR conductor (mm)	18.13
8.	Breaking load of ACSR conductor (kN)	67.34
9.	Min. breaking load in kN for single wire a) Aluminium (Before/after stranding) b) Steel wire (Before/after stranding)	 0.89/0.85 6.92/6.57
10.	Minimum weight of zinc coating (g/m²) No. of dips and duration	230 2 dips of 1 min each and 1 dip of ½ min
11.	Mass (kg/km) a) Aluminium wire b) HTGS Wire c) ACSR Conductor	 437 289 726
12.	Modulus of elasticity of conductor in (GN/m²)	80
13.	Coefficient of linear expansion of conductor (/˚C)	17.8×10^{-6}
14.	Resistance at 20˚C (ohm/km) ACSR Conductor	 0.187

15.	**Lay Ratios**	**Aluminium Wire** a) **First Layer** Min Max 10 16 b) **Second layer** Min Max 10 14 c) **Steel wire** **Min Max** 13 28
16.	IS Applicable	IS -398 (PART-)of 1996 with latest amendments
17.	Packing wooden drum for conductor	Shall be wound on reels of drums .reels and drums conforming to IS -1778 of 1981 with latest amendments thereof.
18.	Other requirements to be followed by Tenderer: - i) The EC grade Aluminium rods for use in the manufacture of Aluminium wire shall conform to IS: 5484: 1997 (2nd revision) amended up to date. ii) The reels/drums on which the conductor shall be supplied, have to be marked as per clause 17 of this specification.	

3. ACSR DOG (100 mm²)

S. No:	Particulars and Wire Code	ACSR Dog (100 mm²)
1.	(a) Aluminium Rod (b) HTGS Wire (c) Complete Conductor	IS-5484 of 1997 (2nd Revision) IS-4826 of 1979 (Amended upto date) As per IS-398-II of 1996, (amended up to date)
2.	Stranding & Wire Diameter (mm) (a) Aluminium (b) Galvanized Steel.	 6/4.72 7/1.57
3.	Sectional Area of Aluminium (mm²) Sectional Area of Steel (mm²)	105 13.55
4.	Nominal Aluminium area (mm²)	100
5.	Total sectional area of ACSR Conductor (mm²)	118.6
6.	Cross sectional area of nominal dia wire in (mm²) a) Aluminium (b) Steel wire	 17.5 1.936
7.	Approx dia of conductor (mm)	14.15
8.	Breaking load of conductor (kN)	32.41
9.	Breaking load for single wire (kN) a) Aluminium Before/after stranding (b) Steel wire Before/after stranding	 2.78/2.64 2.70/2.57
10.	Minimum weight of zinc coating (g/m²) No. of dips and duration	275 3 dips of 1 min each and 1 dip of ½ min
11.	Mass (Kg/Km) a) Aluminium Rod (b) HTGS Wire (c) Conductor	 288 106 394
12.	Modulus of elasticity of conductor (GN/m²)	75
13.	Coefficient of linear expansion of conductor (/˚C)	19.8×10^{-6}
14.	Resistance at 20˚C (ohm/km) ACSR Conductor	 0.2792

15.	**Lay Ratios**	**Aluminium Wire** **a) Outermost layer** Min Max 10 14 **b) Steel wire** Min Max 13 28
16.	Packing Wooden Drum for conductor	Shall be wound on reels or drums. Reels and drums conforming to IS-1778 of 1981 with latest amendments thereof.
17.	IS Applicable	IS-398 (part-II) of 1996 with latest amendments.
18.	Other requirements to be followed by Tenderer:- i) The EC grade Aluminium rods for use in the manufacture of Aluminium wire shall conform to IS: 5484: 1997 (2nd revision) amended up to date. ii) The reels/drums on which the conductor shall be supplied, have to be marked as per clause 16 of this specification.	

4. ACSR RABBIT (50 mm²)

S. No:	Particulars and Wire Code	ACSR Rabbit (50 mm²)
1.	a) Aluminium Rod b) HTGS Wire c) Complete Conductor	IS-5484 of 1997 (2nd Revision) IS-4826 of 1979 (Amended upto date) As per IS-398-II of 1996, (amended up to date)
2.	Stranding & Wire Diameter (mm) a) Aluminium b) Galvanized Steel.	 6/3.35 1/3.35
3.	Sectional Area of Aluminium (mm²) Sectional Area of Steel (mm²)	52.88 8.81
4.	Nominal Aluminium area in (mm²)	50
5.	Total sectional area of ACSR Conductor (mm²)	61.70
6.	Cross sectional area of nominal dia wire (mm²) a) Aluminium wire b) Steel wire	 8.814 8.814
7.	Approx. dia of ACSR conductor (mm)	10.05
8.	Approx. breaking load of ACSR conductor (kN)	18.25
9.	Min. breaking load for single wire (kN) a) Aluminium (Before/after stranding) b) Steel wire (Before/after stranding)	 1.43/1.36 11.58/11
10.	Minimum weight of zinc coating (g/m²) No. of dips and duration	250 3 dips of 1 min each
11.	Approx. Mass (kg/km) a) Aluminium wire b) HTGS Wire c) ACSR Conductor	 145 69 214
12.	Modulus of elasticity of conductor in (GN/m²)	79
13.	Coefficient of linear expansion of conductor (/°C)	19.1×10^{-6}

14.	Resistance at 20˚C (ohm/km) ACSR Conductor	0.5524
15.	**Lay Ratios**	**Aluminium Wire** a) **Outermost Layer** Min Max 10 14
16.	Packing Wooden Drum for conductor	Shall be wound on reels or drums. Reels and drums conforming to IS-1778 of 1981 with latest amendments thereof.
17.	IS Applicable	IS-398 (part-II) of 1996 with latest amendments.
18.	Other requirements to be followed by Tenderer: - i) The EC grade Aluminium rods for use in the manufacture of Aluminium wire shall conform to IS: 5484: 1997 (2nd revision) amended up to date. ii) The reels/drums on which the conductor shall be supplied, have to be marked as per clause 16 of this specification.	

3. ACSR WEASEL (30 mm²)

S.No:	Particulars and Wire Code	3. ACSR Weasel (30 mm²)
1.	a) Aluminium Rod b) HTGS Wire c) Complete Conductor	IS-5484 of 1997 (2nd Revision) IS- 4826 of 1979 (Amended upto date) As per IS-398-II of 1996, (amended up to date)
2.	Stranding & Wire Diameter (mm) a) Aluminium b) Galvanized Steel.	 6/2.59 1/2.59
3.	Sectional Area of Aluminium (mm²) Sectional Area of Steel (mm²)	31.61 5.27
4.	Nominal Aluminium area (mm²)	30
5.	Total sectional area of ACSR Conductor (mm²)	36.9
6.	Cross sectional area of nominal dia wire (mm²) a) Aluminium wire b) Steel wire	 5.269 5.269
7.	Approx. dia of ACSR conductor (mm)	7.77
8.	Approx. breaking load of ACSR conductor (kN)	11.12
9.	Min. breaking load for single wire (kN) a) Aluminium (Before/after stranding) b) Steel wire (Before/after stranding)	 0.89/0.85 6.92/6.57
10.	Minimum weight of zinc coating (g/m²) No. of dips and duration	230 2 dips of 1 min each and 1 dip of ½ min
11.	Approx. Mass kg/km a) Aluminium wire b) HTGS Wire c) ACSR Conductor	 87 41 128
12.	Modulus of elasticity of conductor in (GN/m²)	79
13.	Coefficient of linear expansion of conductor (/˚C)	19.1×10^{-6}
14.	Resistance at 20˚C (ohm/km) ACSR Conductor	 0.9289

15.	**Lay Ratios**	**Aluminium Wire** a) **Outermost Layer** Min Max 10 14
16.	Packing Wooden Drum for conductor	Shall be wound on reels or drums. Reels and drums conforming to IS-1778 of 1981 with latest amendments thereof.
17	IS Applicable	IS-398 (part-II) of 1996 with latest amendments.
18	Other requirements to be followed by Tenderer: - i) The EC grade Aluminium rods for use in the manufacture of Aluminium wire shall conform to IS: 5484: 1997 (2nd revision) amended up to date. ii) The reels/drums on which the conductor shall be supplied, have to be marked as per clause 16 of this specification.	

SECTION -C
GUARANTEED TECHNICAL PARTICULARS
(To be filled by the Bidder)

S. No:	Particulars and Wire Code	ACSR 200 mm² (PANTHER)
1.	a) Aluminium Rod b) HTGS Wire c) Complete Conductor	
2.	Stranding & Wire Diameter in mm a) Aluminium b) Galvanized Steel.	
3.	Sectional Area of Aluminium (mm^2) Sectional Area of Steel (mm^2)	
4.	Nominal Aluminium area (mm^2)	
5.	Total sectional area of ACSR Conductor (mm^2)	
6.	Cross sectional area of nominal dia wire (mm^2) a) Aluminium wire b) Steel wire	
7.	Overall Dia of ACSR conductor (mm)	
8.	Breaking load of ACSR conductor (kN)	
9.	Min. breaking load in kN for single wire a) Aluminium (Before/after stranding) b) Steel wire (Before/after stranding)	
10.	Minimum wt. of Zn coating (g/m^2) No. of dips and duration	
11.	Mass kg/km a) Aluminium wire b) HTGS Wire c) ACSR Conductor	
12.	Modulus of elasticity of conductor in GN/m^2	
13.	Coefficient of linear expansion of conductor (/˚C)	
14.	Resistance of ACSR Conductor in ohm/km at 20 ˚C	

15.	Lay Ratios	**<u>Aluminium Wire</u>** a)**<u>Outermost Layer</u>** Max Min b) **<u>Layer beneath outermost layer</u>** Max Min **<u>Steel wire</u>** Max Min
16.	IS Applicable	
17.	Packing wooden drum for conductor	

S. No:	Particulars and Wire Code	ACSR 150 mm² (WOLF)
1.	a) Aluminium Rod b) HTGS Wire c) Complete Conductor	
2.	Stranding & Wire Diameter in mm a) Aluminium b) Galvanized Steel.	
3.	Sectional Area of Aluminium (mm^2) Sectional Area of Steel (mm^2)	
4.	Nominal Aluminium area (mm^2)	
5.	Total sectional area of ACSR Conductor (mm^2)	
6.	Cross sectional area of nominal dia wire (mm^2) a) Aluminium wire b) Steel wire	
7.	Overall Dia of ACSR conductor (mm)	
8.	Breaking load of ACSR conductor (kN)	
9.	Min. breaking load in kN for single wire a) Aluminium (Before/after stranding) b) Steel wire (Before/after stranding)	
10.	Minimum wt. of Zn coating (g/m^2) No. of dips and duration	
11.	Mass kg/km a) Aluminium wire b) HTGS Wire c) ACSR Conductor	
12.	Modulus of elasticity of conductor in GN/m^2	
13.	Coefficient of linear expansion of conductor (/˚C)	
14.	Resistance of ACSR Conductor in ohm/km at 20 ˚C	
15.	**Lay Ratios**	**Aluminium Wire** a)**Outermost Layer** Max Min b) **Layer beneath outermost layer** Max Min **Steel wire** Max Min
16.	IS Applicable	
17.	Packing wooden drum for conductor	

S. No:	Particulars and Wire Code	ACSR 100 mm² (DOG)
1.	a) Aluminium Rod b) HTGS Wire c) Complete Conductor	
2.	Stranding & Wire Diameter in mm a) Aluminium b) Galvanized Steel.	
3.	Sectional Area of Aluminium (mm^2) Sectional Area of Steel (mm^2)	
4.	Nominal Aluminium area (mm^2)	
5.	Total sectional area of ACSR Conductor (mm^2)	
6.	Cross sectional area of nominal dia wire (mm^2) a) Aluminium wire b) Steel wire	
7.	Overall Dia of ACSR conductor (mm)	
8.	Breaking load of ACSR conductor (kN)	
9.	Min. breaking load in kN for single wire a) Aluminium (Before/after stranding) b) Steel wire (Before/after stranding)	
10.	Minimum wt. of Zn coating (g/m^2) No. of dips and duration	
11.	Mass kg/km a) Aluminium wire b) HTGS Wire c) ACSR Conductor	
12.	Modulus of elasticity of conductor in GN/m^2	
13.	Coefficient of linear expansion of conductor (/˚C)	
14.	Resistance of ACSR Conductor in ohm/km at 20 ˚C	
15.	**Lay Ratios**	**Aluminium Wire** a)**Outermost Layer** Max Min **Steel wire** Max Min
16.	IS Applicable	
17.	Packing Wooden Drum for conductor	

S. No:	Particulars and Wire Code	ACSR 50 mm² (RABBIT)
1.	a) Aluminium Rod b) HTGS Wire c) Complete Conductor	
2.	Stranding & Wire Diameter in mm a) Aluminium b) Galvanized Steel.	
3.	Sectional Area of Aluminium (mm^2) Sectional Area of Steel (mm^2)	
4.	Nominal Aluminium area (mm^2)	
5.	Total sectional area of ACSR Conductor (mm^2)	
6.	Cross sectional area of nominal dia wire (mm^2) a) Aluminium wire b) Steel wire	
7.	Overall Dia of ACSR conductor (mm)	
8.	Breaking load of ACSR conductor (kN)	
9.	Min. breaking load in kN for single wire a) Aluminium (Before/after stranding) b) Steel wire (Before/after stranding)	
10.	Minimum wt. of Zn coating (g/m^2) No. of dips and duration	
11.	Mass kg/km a) Aluminium wire b) HTGS Wire c) ACSR Conductor	
12.	Modulus of elasticity of conductor in GN/m^2	
13.	Coefficient of linear expansion of conductor (/˚C)	
14.	Resistance of ACSR Conductor in ohm/km at 20 ˚C	
15.	a) Aluminium Rod b) HTGS Wire c) Complete Conductor	**Aluminium Wire** a)**First Layer** Max Min
	Stranding & Wire Diameter in mm a) Aluminium b) Galvanized Steel.	
16.	Sectional Area of Aluminium (mm^2) Sectional Area of Steel (mm^2)	
17.	Nominal Aluminium area (mm^2)	

S. No:	Total sectional area of ACSR Conductor (mm^2)	**ACSR 30 mm^2 (WEASEL)**
1.	Cross sectional area of nominal dia wire (mm^2) a) Aluminium wire b) Steel wire	
2.	Overall Dia of ACSR conductor (mm)	
3.	Breaking load of ACSR conductor (kN)	
4.	Min. breaking load in kN for single wire a) Aluminium (Before/after stranding) b) Steel wire (Before/after stranding)	
5.	Minimum wt. of Zn coating (g/m^2) No. of dips and duration	
6.	Mass kg/km a) Aluminium wire b) HTGS Wire c) ACSR Conductor	
7.	Modulus of elasticity of conductor in GN/m^2	
8.	Coefficient of linear expansion of conductor (/˚C)	
9.	Resistance of ACSR Conductor in ohm/km at 20 ˚C	
10.	a) Aluminium Rod b) HTGS Wire c) Complete Conductor	
11.	Stranding & Wire Diameter in mm a) Aluminium b) Galvanized Steel.	
12.	Sectional Area of Aluminium (mm^2) Sectional Area of Steel (mm^2)	
13.	Nominal Aluminium area (mm^2)	
14.	Total sectional area of ACSR Conductor (mm^2)	
15	**Lay Ratios**	**Aluminium Wire** a)**Outermost Layer** Max Min

16.	IS Applicable	
17.	Packing Wooden Drum for conductor	