

Tender Notice No-NESCO/IAP/01 dt 18.01.12

SECTION-VI

TECHNICAL SPECIFICATION

(LT XLPE AB Cables)

Part-1:

1. SCOPE:

This specification covers the design, manufacturing, testing, supply, delivery and performance requirements of LV overhead ISI marked Aerial Bunched Cable (ABC) of different sizes indicated in our Schedule of Requirements for use in the LV network of NESCO.

The materials offered shall have been successfully type tested and the design shall have been in satisfactory operation for a period of not less than two years on the date of bid opening. Compliance shall be demonstrated by submitting with the bid (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

However where the bidder offers similar but not identical material but higher size to that which has been type tested, the difference shall be stated in Test Certificate Schedule. The purchaser shall adjudge whether to accept or reject the offered material and type test data presented.

The scope of supply includes the provision of type tests. Rates for type tests shall be given in the appropriate price schedule of the bidding document and shall be considered for evaluation. The purchaser reserves the right to waive type tests as indicated in the section on Quality Assurance, Inspection and Testing in this specification.

The Aerial Bunched Cable shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or material, which, in his judgment is not in full accordance therewith.

2. STANDARDS:

Except where modified by this specification, the Aerial Bunched Cable shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

| <u>IES/ISO</u> | <u>Indian Standard</u> | <u>Material</u> |
|----------------|------------------------|---------------------------------------------------------------------------------|
| IEC: 1089 | IS: 398/1994 | Round wire concentric lay Overhead electrical Stranded Conductors. |
| | IS: 398(Part-4)/1994 | All Aluminum Alloy Conductors, Quality Management Systems. |
| ISO: 9000 | IS: 8130/1984 | Conductors for insulated Electric cables. |
| | IS: 10810/1984 | Method of Tests for cables. |
| IEC: 502 | IS:7098/1998 | XLPE Insulated PVC. Sheathed power cables. |
| | IS:14255/1995 | Aerial Bunched Cables for working voltage up to and including 1100 volts. |

The Bidder may propose alternative standards, provided it is demonstrated that they give a degree of quality and performance equivalent to or better than the referenced standards. The purchaser shall adjudge whether to accept or reject any standards.

The Bidder shall furnish a copy of the alternative standard proposed along with his bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard.

In case of conflict the order of the precedence shall be (1) IEC or ISO standards, (2) Indian Standards, (3) Other alternative standards. This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Contractor or the necessity of providing the goods complying with other relevant standards or recommendation.

3.0 SERVICE CONDITIONS:

The service conditions shall be as follows:

| | |
|--------------------------------------------------------------|-------|
| ■ Maximum altitude above sea level | 500m |
| ■ Maximum ambient air temperature | 50°C |
| ■ Maximum daily average ambient air temperature | 35°C |
| ■ Maximum ambient air temperature | 5°C |
| ■ Maximum temperature attainable by an object exposed to sun | 60°C |
| ■ Maximum yearly weighted average ambient temperature | 32°C |
| ■ Maximum relative humidity | 100% |
| ■ Average number of thunderstorm days per annum | 70 |
| ■ Average number of rainy days per annum | 120 |
| ■ Average annual rainfall | 150cm |
| ■ Wind pressure as per IS:5613(Part-I/Sec.I) 1985 | |

| Wind Zones IS:5613 Part-I/Sec-I | Light | Medium | Heavy |
|------------------------------------|-----------------------|-----------------------|-----------------------|
| Terrain Category | 100 Kg/m ² | 150 Kg/m ² | 200 Kg/m ² |

Environmentally, the region where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators.

Therefore, outdoor material shall be designed and protected for use in exposed, heavily polluted salty corrosive and humid coastal atmosphere.

4. SYSTEM CONDITIONS:

The materials shall be suitable for installation in supply systems of the following characteristics.

| | |
|----------------------------------------------------|-----------------|
| ▪ Frequency | 50Hz |
| ▪ Nominal System Voltage | 400/230V |
| ▪ Maximum System Voltage LV System | 440/250 V |
| ▪ Minimum LV Voltage | 370 V |
| ▪ Power frequency one minute withstand (set & dry) | 2KV |
| ▪ Neutral Earthing arrangement LV System | Solidly earthed |

Part-2: TECHNICAL

5.0 GENERAL/ TECHNICAL

The design of Aerial Bunched Cable offered shall comprise a compacted, standard, hard drawn H2 / H4 grade aluminum phase conductor as applicable under IS-8130 / 84 with cross linked polyethylene (XLPE) insulation 0.65 to 1.1. KV class, having of carbon black content $2.5\% \pm 0.5\%$.

The sizes and number of cores required are:

■ $3 \times 50\text{mm}^2 + 1 \times 16\text{mm}^2 + 1 \times 55\text{mm}^2$ (catenaries type)

▪ $3 \times 35\text{mm}^2 + 1 \times 16\text{mm}^2 + 1 \times 25\text{mm}^2$ (catenaries type)

The type of Bunched Cables shall be three phase and street lighting insulated bundled. All Aluminum Conductors combined with a neutral and catenaries (bare) which shall be of heat treated aluminum magnesium silicon alloy wires containing approximately 0.5% each of magnesium and silicon respectively. The catenaries must have an ultimate tensile stress of not less than that specified in the table of technical requirements.

The Bidder shall specify the standard to which this bundle shall be manufactured.

The conductor bundle offered shall be designed to meet the requirements set out in this specification taking note of safety factors pertaining to conductor or catenary tensioning and NESC specification: General Technical Requirements for LV overhead lines.

However, a bid of Aerial Bunched Cables shall not be considered, unless it is accompanied by a list of all special tools and equipments necessary to complete the installation.

6.0 CONDUCTORS:

(a) The phase & street light conductors shall be of multi-stranded aluminum of compacted circular cross section. The aluminum shall comply with IS 8130:1984. The messenger conductor shall be of multi-stranded Aluminum Alloy conforming to IS 398 (Part 4) - 1994.

In addition to meeting all requirement of relevant ISS the LT XLPE AB Cables supplied shall satisfy following general requirements.

FOR PHASE AND STREET LIGHT CONDUCTORS

| Sl. No. | Specified Cross Sectional Area (mm ²) | No. of Strands | Minimum Dia Of each strand in mm | Minimum. Over all dia. Of conducting part of the compacted conductor. (mm) | Maxm. D.C Resistance at 20 degree centigrade.(Ohm / Km) | Nominal Insulation thickness (mm) |
|---------|---------------------------------------------------|----------------|----------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------|
| 1 | 16 | 7 | 1.75 | 5.25 | AS PER ISS / GTP | 1.2 |
| 2 | 25 | 7 | 2.14 | 6.42 | | 1.2 |
| 3 | 35 | 7 | 2.54 | 7.6 | | 1.2 |
| 4 | 50 | 7 | 3.05 | 9.15 | | 1.5 |
| 5 | 70 | 19 | 2.18 | 10.9 | | 1.5 |
| 6 | 95 | 19 | 2.54 | 12.7 | | 1.5 |

FOR MESSANGER CONDUCTORS

| Sl. No. | Phase Conductor Size of the LT AB Cable in mm ² | Specified Cross Sectional Area of the Messenger Conductor (mm ²) | No. of Strands | Nominal dia Of each strand | Appx. Over all dia. Of conducting part of the compacted conductor. (mm) | Maxm. D.C Resistance of the messenger at 20 degree centigrade.(Ohm / Km) | Appx. Mass (Kg / Km.) for the messenger |
|---------|------------------------------------------------------------|------------------------------------------------------------------------------|----------------|----------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------------|
| 1 | 16 | 25 | 7 | 2.14 | 6.0 | AS PER ISS/GTP | 65 |
| 2 | 50 | 35 | 7 | 2.54 | 7.6 | | 95 |
| 3 | 70 | 50 | 7 | 3.05 | 9.15 | | 136 |
| 4 | 95 | 70 | 7 | 3.6 | 10.8 | | 191.8 |

6.0 (b) The bidder must take required precaution to ensure that the average diameter of each strand of conductor shall be ascertained through physical measurement of dimensions of finished cables at ambient temperature during pre-dispatch inspection or / and verification at NESCO Store by consignee and the value so obtained shall have a tolerance limit with reference to the nominal diameter of each strand of conductor as stated in the tables above.

7.0 TOLERANCES:

The measurement of strand diameter of the finished AB Cable shall not be less 0.03mm for strands up to and including 3.00mm diameter. For strands above that size, measurement of strand diameter shall not be less than 1% of the nominal strand diameter.

For the purpose of checking compliance with the above requirement, the diameter shall be determined by two measurements at right angles taken at the same cross section. The physical measurement of strands shall be conducted after opening the strands of a finished AB Cable offered for inspection.

8.0 SPLICES IN WIRES:

Splices in Wires shall generally comply with requirements of IEC 1089.

The aluminum alloy rods may be spliced by cold pressure but welding before drawing provided the manufacturer can guarantee that the splice can develop 90% of the tensile strength of the un sliced rod. Wires which break during stranding may be sliced by cold pressure butt-welding provided that:

No two splices in the completed conductor occur within 15m of each other and no two splices in any individual wire are less than 150m apart.

The splice shall be done with high skilled workmanship. The finished splice shall be smooth and at no point shall the cross sectional area be less than that of the un sliced wire.

Splicing of the alloy wires on the stranding machine in order to utilize lengths of wires on reels shall not be permitted.

9.0 STRANDING AND CORE LAY:

The conductor cores shall be stranded and the direction of lay must be as defined in IEC: 1089.

10.0 INSULATION:

The Aerial Bunched Cables shall be insulated for a voltage class of 0.65/1.1 KV and shall be capable of operating permanently at 1.2KV.

The insulation wall thickness shall be determined in accordance with Table-4 (Clause-7.2 and Clause 7.3) of IS: 14255/1995.

The insulating material shall be black and suitable to resist ultra violet radiation, salt laden sprays, chemical pollution, ageing effects, abrasion and mechanical shocks and mechanical and electrical stress at temperature up to 90°C in normal operation and 250°C under short circuit conditions per IEC: 502/1994.

The carbon black content in the XLPE insulation shall be $2.5\% \pm 0.5\%$

11.0 PHASE IDENTIFICATION:

The individual insulated conductors within a bundle shall be identified by means of longitudinal projections.

The three phase conductors shall be marked by one, two or three longitudinal projections, indicating the red, yellow and blue phases.

The projections shall have the following dimensions.

- The distance between the tips of two adjacent projections, where there is more than one, shall be between 1.0 and 1.5.
- The width of the projection at the base shall be 1.0mm; and
- The height of the projections shall be 0.5mm.

12.0 INSULATION MARKINGS:

Each individual conductor comprising a bundle shall have the range of non-erasable distinct markings listed below legibly printed on the insulation surface at one meter intervals. The embossing should be very clear & easily visible to naked eye.

- ISI Mark, IS 14255-95, Manufacturer"s B.I.S License No. legibly embossed on the insulation.
- Name of the Purchaser.
- P.O No. & Date
- Manufacturer"s trademark identification for example "UCXLPE50"
- Year of manufacture: last two digits are sufficient:
- Designation of conductor type
- Size: for example "3x50"
- Shape of conductor.
- Rated voltage class: 0.65/1.1KV
- Back up conductor identification: conductors with one, two and three projections shall be marked R, Y and B respectively. The conductor with no projection shall be marked N and
- The height of the printed lettering shall be not less than 20% of the overall diameter of the conductor

The markings shall be made in the sequence indicated above. Thus if the manufacturer were XY, the aerial bunched cable had been manufactured in 1994, size $3 \times 50 \text{mm}^2 + 1 \times 35 \text{mm}^2 + 1 \times 16 \text{mm}^2$ with conductors of circular cross section and with a bundle of the self supporting type, manufactured to a recognized international standard then the core with two projections would be marked as follows:

Where, N is the international standard, F indicates overhead cable, A is aluminum alloy conductor and 2X refers to XLPE insulation, „r“ means round core, „m“ self-supporting and „y“ the phase identification.

13.0 TWIST:

The direction of lay of the conductors comprising the bundle shall be left-handed and the lay ration shall comply with IEC: 1089.

With a bare catenaries configuration the insulated phase cables together with the street lighting cores shall be twisted round the neutral catenaries to form the ABC. This cable bundle is then strung directly onto the distribution poles supported by the catenaries with standard approved hardware.

14.0 CABLE DRUM LENGTH:

The cable shall be supplied in 500m .Drum Lengths as the case may be for different sizes of LT XLPE AB Cable.

15.0 TESTS:

15.1 General

Where not specified, all tests and test results shall conform to the requirements of IEC 502/1994 or IS 7098 (Part-I) 1998, IS 10810/1984, IS: 398(Part-IV) and IS: 14255/1955.

Unless expressly stated otherwise, the ambient temperature for routine tests as well as voltage tests shall be $20 \pm 15^{\circ}\text{C}$ and for all other tests be $20 \pm 15^{\circ}\text{C}$.

The frequency of the alternating test voltage shall be 49 Hz to 51Hz. The voltage wave form should be sinusoidal.

15.2 Type Tests

The test sample shall be 10m to 15m in length. All cores of the bundles shall be tested.

- Insulation resistance at ambient temperature.

- Insulation resistance at operating temperature.
- AC voltage test.

The insulation resistance test at ambient temperature shall be carried out in a water bath at ambient temperature.

The insulation resistance test at a operating temperature shall be conducted in a water bath at 90°C.

The longitudinal projections used for phase identification shall be ignored. The results of this test shall be used to calculate the volume receptivity and the results conform to the requirements of IEC:502/1994 or IS 10810 (Part-43).

The AC voltage test shall be carried out by applying 1.95KV ($3U_0$) for four hours to the sample, which shall be submerged in a water bath at ambient temperature, having been steeped for a period not less than one hour. The test shall only be deemed to have been passed if no breakdown occurs.

Furthermore, the following non-electrical type tests shall also be carried out:

- Insulation wall thickness: the longitudinal projections used for phase 1 identifications shall be ignored as per IS 10810 (Part-6);
- Ageing test, consisting of an evaluation of the retention of the mechanical properties of the insulation after ageing.
- Wrapping test: as per IS 10810 (Part-3);
- Tests for bleeding and blooming of pigment as per IS 10810 (Part-9)
- Thermal expansion of insulation.
- Measurement of carbon black content as per IS 10810 (Part-32).
- Water absorption by the XLPE insulation, shrinking of the XLPE insulation.
- Tensile test: adhesion between conductor and insulation.

The adhesion test requires a tensile testing machine. A sample of at least 300mm length shall be selected and straightened out. The insulation shall be removed for a length of 150mm. The insulated end shall be held in the upper grip head and the bare conductor on the lower grip head. Tension shall be applied at a speed of 500mm/ min until the conductor first begins to slide within the insulation. The test shall have been passed if the conductor and insulation combination can stand 75N/mm² without slippage occurring.

The neutral conductor/catenaries shall be type tested in accordance with the requirements of IS 398 (Part-IV) 1994.

15.3 Routine Tests

The following measurement or tests shall be carried out on all drums and coils of Bunched cable:

- Conductor resistance
- Voltage test.

The conductor to be tested for conductor resistance shall be stored for at least 12 hours in a room at particular constant temperature. If it cannot be established that the conductors have reached the room temperature, the test should be postponed for a period of further 12 hours. Alternatively, the test can be carried out on short sample after remaining one hour in a temperature controlled water bath. The test shall be carried out and the conversion factors used to convert the resistance value to a base of 200°C and one Km. The DC resistance of each conductor shall not exceed the appropriate maximum values specified in IEC:228/IS:6474.

The voltage test shall be conducted by applying to each core 3.5KV AC (2.5 U₀ plus 2 KV) or 8.4 KV DC for 5 minutes with the specimen lying in a water bath at ambient temperature. The conductor shall pass the test if no electrical breakdown occurs.

15.4 Acceptance Tests

The following sample check, measurements and test shall be carried out in addition to the Acceptance Tests as per IS 14255 - 1955, IS : 398 (Part - IV) 1994, IS 8130 / 1984

- Measurement of insulation wall thickness;

- Measurement of diameter of each strand, overall outside dia & Cross Sectional Area of the conducting Part out of the finished product during pre-dispatch inspection.
- Thermal expansion test;
- Check of physical characteristics
- Tensile strength of individual wires of conductor.
- High Voltage Test on drums immersed in water(apply voltage 3.5 KV AC for 5 min)

These tests should be carried out on one length from each production batch of the same sample.

The thickness of the insulation wall shall be measured on a piece removed from each end of the sample length. If either mean or minimum values are not met, two further samples shall be removed at 0.5m from the end corresponding to the failed specimen. If these samples do not satisfy the mean and minimum thickness requirements, the test shall be deemed to have been failed.

The longitudinal projections used for phase identifications shall be ignored.

The thermal expansion test need only be carried out on one core.

In relation to the tensile test, the tensile strength of the aluminum wires before stranding and that of the finished conductor shall comply with IEC:1089.

15.5 Test on the Catenary (messenger) Conductor

Breaking load, elongation and resistance tests shall be completed on the aluminum alloy catenaries conductor in accordance with the requirements of IS:398 (Part-IV)/1994 or IEC:1089.

15.6 Bending Test on a complete cable

This test shall be performed on a sample of completed cable. The sample shall be bent around a test mandrel at room temperature for at least one turn. It shall then be unwound and the process shall be repeated after turning the cable sample around its axis by 180°. This process shall be repeated twice more. There shall be no signs of breaking or cracking of the cable insulation during this test.

The diameter of the mandrel shall be:

$$10 (D+d)$$

Where D = Actual diameter of the cable (mm)

d = Actual diameter of the conductor (mm)

15.7 Rejection and Retests

Should any one of the test pieces first selected fail to pass the tests, two further samples from the same batch shall be selected for testing, one of which shall be from the length from which the original test sample was taken unless the length has been withdrawn by the supplier.

Should the test pieces from both of these additional samples satisfy the requirements of the tests, the batch represented by these samples shall be deemed to comply with the standard. Should the test pieces from either of the two additional samples fail, the batch represented shall be deemed to have failed.

16.0 COMPLIANCE WITH SPECIFICATION:

The Aerial Bunched Cable shall comply in all respects with the requirements of this specification. However, any minor departure from the provisions of the specification shall be disclosed at the time of bidding in the Non-compliance Schedule of this document.

17.0 COMPLIANCE WITH REGULATIONS:

All the cables shall comply in all respects with the Indian Regulations and Acts in force. The cables and connections shall be designed and arranged to minimize the risk of fire and any damage, which might be caused in the event of fire.

18.0 Non-conforming Product

The Purchaser reserves the right for decisions regarding acceptance, modification or rejection of non-conforming items.

19.0 Inspection and Testing

The Purchaser or his authorized representative has free entry at all times, while work on the contract is being performed, to all parts of the manufacturer's works which concerns the processing of the cables ordered. The manufacturer shall afford the the

Purchaser or his authorized representatives without charge, all reasonable facilities to ensure that the cable being furnished is in accordance with these specifications.

The cables shall successfully pass all the type tests, routine tests & acceptance Tests referred to in the section on tests and those listed in the most recent edition of the standards given in the specification.

The Purchaser reserves the right to reject any of the cables if the test results do not comply with the values specified or with the date given in the Technical data schedule.

Type tests shall be carried out at an independent testing laboratory or at the manufacturer's works if such facilities are available and to be witnessed by the purchaser. The contractor, at no extra cost at the manufacturer's work shall carry out routine and Acceptance tests in presence of the Purchaser's representatives.

Type Test Certificates for the tests conducted earlier shall be submitted with the bid for evaluation. The requirements of additional type tests will be at the discretion of the Purchaser

The Purchaser may witness routine and type tests. In order to facilitate this, the contractor shall give the purchaser of 15days notice that the material is ready for inspection & testing. The supplier shall extend all assistance to the representative of the Purchaser during his inspection & testing of samples at his works. The materials shall be dispatched only after approval of such Test Reports and issue of Despatch clearance by the Purchaser. However the Purchaser reserves the right to retest the materials after delivery at any NABL Accredited Testing Laboratory in case of any disputes regarding size & quality of supplied materials at a later date during guarantee period. The cost of such retesting shall be borne by the supplier.

All costs in connection with the testing, including any necessary retesting shall be borne by the Contractor, who shall provide the Purchaser with all the test shall have the right to select the samples for test and shall also have the right to ensure that the testing apparatus is correct. Measuring apparatus for routine tests shall be calibrated at the expense of the contractor at an approved laboratory and shall be approved by the purchaser before testing.

The Contractor shall be responsible for the proper testing of the materials supplied by sub- Contractor to the same extent as if the materials were completed or supplied by the contractor.

Any cost incurred by the Purchaser in connection with inspection or retesting as a result of failure of the equipment under test or damaged during transport or off loading shall be to the account of the Contractor.

The Contractor shall submit to the Purchaser three signed copies of the test Certificates, giving the results of the tests as required. No materials shall be dispatched until the Purchaser has received the test certificate and the contractor has been informed that they are acceptable.

The test certificate must show the actual values obtained from the tests, in the units used in this specification, and must merely confirm that the requirements have been met.

In the case of components for which specific type tests or routine tests are not given in this specification, the Contractor shall include a list of the tests normally required for these components. All materials used in the Contract shall withstand and shall be certified to have satisfactorily passed such tests.

No inspection or lack of inspection or passing by the Purchaser's representative of equipment or materials whether supplied by the Contractor or sub- Contractor, shall relieve the contractor from his liability to complete the contract works in accordance with contract or exonerate him from any of his guarantees.

20.0 GUARANTEE:

The contractor shall guarantee the following:

- Quality and strength of materials used.
- Satisfactory operation during the guarantee period of 24 months from the date of commissioning or 30 months from the date of receipt of the cables at NESCO, whichever is earlier.
- Performance figures as supplied by the bidder in the technical data sheet.

21.0 PACKING AND SHIPPING:

The cable shall be wound on strong drums or reels capable of withstanding all normal transportation and handing.

22.0 PERMANENT EMBOSSING:

All equipments and materials supplied/erected shall bear distinct mark of " NESCO and Purchase Order No & Date "by way of embossing/punching/casting etc.including other information mentioned in GTP. This should be clearly visible to naked eye.

GUARANTEED TECHNICAL PARTICULARS FOR LT XLPE AB CABLES

| Sl No | Description | 3X35 + 1X16 + 1X25mm ² | 3X 50 + 1X16 + 1X55 mm ² |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| | | Requirement | Requirement |
| 1 | Ref. ISS / IEC followed | IS 14255/95, IS 398 Part IV | IS 14255/95, IS 398 Part IV |
| 2 | Phase Conductor material / Insulation type | H2 / H4 E.C grade aluminium as per IS 8130/84 / XLPE insulation (IS 14255/95) | H2 / H4 E.C grade aluminium as per IS 8130/84 / XLPE insulation (IS 14255/95) |
| 3 | Material of Neutral Catenary | Aluminum alloy as per IS 398 Pt - IV | Aluminum alloy as per IS 398 Pt - IV |
| 4 | Voltage Class | 0.65/1.1 KV | 0.65/1.1 KV |
| | No. of Strands of Phase Conductor | 7 | 7 |
| 5 | No. of strands/ Average /Minimum Strand Dia. In mm. (Finished Phase conductor.) | 7/2.54 | 7/3.05 |
| 6 | Approximate Overall Dia. Of compacted phase conductor after removal of insulation.(in mm.) | 7.6 | 9.15 |
| 7 | No. Of Strands / Average Strand Dia. In mm. (Neutral Catenary.) | 7 / 2.15 | 7/3.15 |
| 8 | Minimum Overall Dia. of compacted Bare Neutral Catenary .(in mm.) | 6.0 | 9.45 |
| a | Minimum Specific mass of Bare Neutral Catenary .(in Kg/Km) | 65 | 149.2 |
| 9 | No. Of Strands / Average strand dia. / Nomunal cross sectional area of conducting part In No / mm ² . (St. Light Conductor) | 7 /1.75 / 16mm ² | 7 /1.75 / 16mm ² |
| 10 | Minimum average thickness of insulation of phase Cond. (mm) | 1.2 | 1.5 |
| 11 | Minimum thickness of insulation of Phase Cond. At any point (mm) | 0.98 | 1.25 |
| 12 | Minimum thickness of insulation at any point in street light conductor (mm) | 0.98 | 0.98 |

| | | | |
|----|---------------------------------------------------------------|-------|------|
| 13 | Maximum DC resistance of Phase conductor at 20 °C ohm/ KM | 0.868 | 0.64 |
| 14 | Maximum DC resistance of street light conductor Ω / Km | 1.91 | 1.91 |

| | | | |
|----|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15 | Maximum DC resistance of neutral cond. Ω / Km | 1.38 | 0.6210 |
| 16 | Ultimate tensile strength of neutral conductor (KN) | 7.4 | 16.03 |
| 17 | Maximum temperature (Continuous) | 90°C for phase and 75 °C for neutral | 90°C for phase and 75 °C for neutral |
| 18 | Embossing on insulation at each one meter interval | Distinct Non-erasable ISI Mark, IS 14255-95, Manufacturer"s B.I.S License No., Name of the Purchaser, Name of the manufacturer, Size of cable, voltage Grade along with sequential marking of length. | Distinct Non-erasable ISI Mark, IS 14255-95, Manufacturer"s B.I.S License No., Name of the Purchaser, Name of the manufacturer, Size of cable, voltage Grade along with sequential marking of length.. |
| 19 | Cable drum length with tolerance of (+-)5% | 500/1000 m | 1000/2000 m |
| 20 | Volume Resistivity of insulation at 27°C | $1 \times 10^{13} \Omega$ - cm min. | $1 \times 10^{13} \Omega$ - cm min. |
| 21 | Volume Resistivity of insulation at 70°C | $1 \times 10^{11} \Omega$ - cm min. | $1 \times 10^{11} \Omega$ - cm min. |

- N.B : 1) For values not available in relevant ISS, values indicated in our GTP/ Tender Specification shall be valid.**
- 2) In case of discrepancies between values of ISS & GTP, better will prevail.**
- 3) Average diameters of strands of each cable shall be ascertained by physical measurement after opening the strands of each phase of a finished AB Cable offered for inspection.**

**GENERAL MANAGER (O&M, Purchase, Store)
NESCO, BALASORE, ODISHA**

