Annexure – ‘B’

Aerial bunched cable of size 3Cx95+1\*70+1\*70 sq. mm

### 1 GENERAL PARTICULARS OF THE SYSTEM

The following are the general particulars governing the design and working of the complete system of which the Works will form a part.

The system will be in continuous operation during the varying atmospheric and climatic conditions occurring at all seasons.

**1.1**

**STANDARDS:**

The cable covered under this specification shall conform in all respect with the latest editions of IS-14255: 1995, IS-398 (part-4)-1979, IS: 10810(series): & IS: 8130-

1984 or IEC equivalent thereof. The aluminium conductor complying to IS: 8130-1984 shall be used.

**1.2 CLIM ATIC**

**CONDITIONS:**

The cable shall work satisfactorily under the following climatic conditions:-

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **i)** | **Location** | | | | **At various locations in the**  **state of Jharkhand** |
| ii) | Maximum ambienttemperature (oC) | | | | 60 |
| iii) | Minimum ambientair temperature (oC) | | | | -5 |
| iv) | Maximum average daily ambient temperature (oC) | | | | 40 |
| v) | Maximum yearly temperature (oC) | weighed | average | ambient | 32 |
| vi) | Maximum altitude above mean sea level (m) | | | | 1000 |
| vii) | Minimum Relative Humidity (%) | | | | 26 |
| viii) | Maximum Relative Humidity (%) | | | | 95 |
| ix) | Average no of Rainy days/ year | | | | 120 |
| x) | Average annual rainfall | | | | 900 mm |
| xi) | Maximum wind pressure | | | | 195 kg/m sq. |

The equipment shall be for use in moderately hot and humid tropical climate, conducive to rust and fungus growth

* 1. **TECHNICAL PARTIC U L A R S: -**

Aerial Bunched Cable with cross-linked polyethylene (XLPE) insulation & bare messenger wire conductor (for Earthing and neutral) along with one street light phase

for voltages up to & including 1100 volts on solidly earthed system shall be m anufactured in accordance with IS: 14255:1995 with latest amendments. The insulated phase conductors shall be twisted around high strength bare Aluminium alloy messenger wire, which shall carry the main weight and take all the mechanical stress. The aluminium conductor shall comply with requirem ents specified in IS: 8130-1984 with latest am endm ents. The XLPE insulation shall be of Type conform ing to the requirem ents as required in latest edition of IS-14255: 1995.

* + 1. **PHASE CONDU C T O R : -**

The phase & street lighting conductor shall be of H2 or H4 grade Alum inium and the power/outer insulated neutral/street lighting conductors shall conform to flexibility class-2 com plying with the require me n ts of IS: 8130:1984.

* + - 1. The phase conductors shall be provided with one, two and three ‘Ridges’ for quick identification.
      2. The tensile strength of the Aluminium wires used in the conductors shall not be less than 90 N/mm².
      3. Not more than two joints shall be allowed in any of the wires forming every complete length of conductor and no joint shall be within 300 m m of any other joint in the sam e layer. The joint shall be brazed silver soldered or electric or gas welded. No joint shall be made in the conductor once it has been stranded.
    1. **MESSENGER (Neutral Conductor)**
       1. The bare m essenger wire shall be m ade of Alum inium alloy containing 0.5% m agnesium and approx. 0.5% silicon conform ing to IS:398 (Part-IV)-1979 com posed of 7 strands and shall be suitably com pacted to have round surface to avoid damage to the cross-linked polyethylene insulation of the phase conductors twisted around the messenger.
       2. There shall be no joints in any wire of the stranded messenger conductor except those m ade in the base rod or wires before final drawing. The direction of outer layer of wires in messenger conductor.
       3. The size of the messenger conductor and its breaking load shall be as per IS:14255 given in the following Table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **S.No.** | **Nominal Cros sectional Area of Phas conductor (mm²)** | **Messenger conductor** | | |
|  |  | **Nomina l Cross sectional Area (mm²)** | **Maximum DC Resistance at 20o C**  **(Ohm/K m )** | **Minimu m Breaking Load (kN)** |
| 1. | 16 | 25 | 1.38 | 7.0 |
| 2. | 25 | 25 | 1.38 | 7.0 |
| 3. | 35 | 25 | 1.38 | 7.0 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 4. | 50 | 35 | 0.986 | 9.8 |
| 5. | 70 | 50 | 0.689 | 14.0 |
| 6. | 95 | 70 | 0.492 | 19.7 |
| 7 | 120 | 70 | 0.253 | 20.6 |

* 1. **CORE IDENTIFICATION:**

The phase conductors shall be provided with three ‘ridges’ for quick identification. The street lighting conductor & messenger conductor may not have any identification mark. The manufacturer shall be identified throughout the length of the cable by m eans of a tape bearing the m anufacturer’s nam e or tradem ark, year of m anufacture, legend ‘XPLE 90’ and with the legend ‘Property of JBVNL.

* 1. **CROSS LINKED POLYET H YL E NE INSULATION:**

The conductor shall be provided with weather resistant cross-linked polyethylene insulation applied by extrusion. The average thickness of insulation shall not

be less than the nominal value as mentioned in the table below: -

|  |  |  |
| --- | --- | --- |
| **S.No.** | **Nominal Area of Conductor**  **(mm²)** | **Three Core Aerial Bunched Cable with messenger wire & Street light phase conductor Nominal thickness (ti)**  **(mm)** |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1. | 16 | 1.2 |
| 2. | 25 | 1.2 |
| 3. | 35 | 1.2 |
| 4. | 50 | 1.5 |
| 5. | 70 | 1.5 |
| 6. | 95 | 1.5 |
| 7 | 120 | 1.6 |

The insulation shall be so applied that it fits closely on the conductor and it shall be possible to rem ove without damage to the conductor. The above m entioned values shall not fall below the nominal values ti mm by more than 0.1 mm + 0.1( tI ). The colour of insulation shall be Black. The XPLE insulation parameters should conform to IS: 14255 : 1995. The insulation shall be stablised against deterioration caused by exposure to

direct sunlight & UV radiation.

* 1. **ASSEM BLY (Laying Up)**
     1. The core shall be laid as per relevant IS over the neutral conductor. Three insulated phase conductors, one neutral conductor and a street lighting conductor shall be twisted around the bare m essenger conductor without fillers with a lay not exceeding 35 times the diameter of the insulated phase conductor.
     2. The direction of lay shall be right hand.
     3. **TESTS FOR PHASE/ST R E ET LIGHT CONDUCTORS**
     4. **Type Tests: -**

The m aterial offered should be type tested. Type test report (not m ore than five years old reckoned from the date of bid opening) in respect of the following tests, carried out in accordance with IS:14 2 5 5 -19 9 5 , IS-8130-1984, IS:3989 (part-4) 1979 & IS:10810 (series), from Govt./Govt. approved test house, shall be submitted along with bid:

1. **Test on phase/s tr e et light conductor**
2. Tensile Test (for Aluminium).
3. Wrapping Test (for Aluminum

). (iii) Conductor resistance test

1. **Test on Messenger conductor**
2. Breaking Load
3. Elongation test
4. Resistance test
5. **Physical tests for XLPE Insulation**
6. Tensile strength and elongation at break
7. Ageing in air oven
8. Hot set test
9. Shrinkage test
10. Water absorption (Gravim etric)
11. **Test for thickness insulation**
12. **Insulation resistance (Volume resistivity) test f) High voltage test**
    * 1. **Acceptance tests**

The following shall constitute acceptance test in addition to check of diameter values as per relevant ISS:-

a) Tensile tests (for phase/street light conductor) b) Wrapping test (for phase/street light conductor) c)

Breaking load test for messenger conductor

1. Elongation test for messenger conductor
2. Conductor resistance test
3. Test for thickness of insulation
4. Tensile strength and elongation at break test
5. Hot set test for XLPE insulation
6. Insulation resistance test
7. High voltage test including water immersion test
   * 1. **Routine Tests**
8. Conductor resistance test
9. High voltage test

All routine and acceptance tests shall be carried out as per relevant IS in the presence of Nigam’s representative.

**1.10. PACKING & MARKING: -**

The cable shall be supplied in non-returnable wooden drums as per IS: 10418:1982, so constructed, as to enable the cable to be transported on each drum . The drum s shall be of such construction as to assure delivery of conductor in the field free from displacem ent & damage and should be able to withstand all stresses due to handling and the stringing operation so that cable is not dented, scratched or dam aged in any way during transport & erection. The cable shall be properly lagged on the drum s. The cable wound on such drum shall be one continuous length. The ends of cables shall be sealed by means of non- h yg ros co pic sealing material.

The marking on the drum shall have the following information:

1. Reference to Indian standard & cable code.
2. Name of the man ufa ctu re r & trade name / brand name.
3. Nominal cross section area of phase conductor for the cable.
4. Type of the cable & voltage grade.
5. Length of Cable on the drum.
6. Direction of rotation of drum(by means of an arrow)
7. Appro xim at e gross weight.
8. Running end of cable
9. Net weight of the cable.
10. Drum identifi ca tio n number.
11. P.O. No. & Date
12. Year of manufacture
    1. **SAMPLING: -**
       1. In any consignm ent the cables of the sam e size m anufactured under essentially similar conditions of production shall be grouped together to constitute a lot.

1.12.2 Sam ples shall be taken and tested from each lot for ascertaining the conform ity of the lot to the require m e nt s of the specification.

1.13.3 The number of drum (n) to be selected from the lot of drums (N) of consignm ent of cables shall be in accordance with the following Table. The samples shall be taken at random .

Suitable length of test sam ple shall be taken from each of the drum s selected. These test samples shall be subjected to each of the acceptance tests. A test sam ple shall be called defective if it fails in any of the acceptance tests. If the num ber of defectives is less than or equal to the corresponding permissible number (a) the lot shall be declared as conform ing to the requirem ents of acceptance tests, otherwise not.

|  |  |  |
| --- | --- | --- |
| **No. of Drums in the Lot (N)** | **Number of Drums to be taken as Sample (n)** | **Permis sib le number of Defectives (a)** |
| Up to 50 | 2 | 0 |
| 51 to 100 | 5 | 0 |
| 101 to 300 | 13 | 0 |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 301 to 500 | 20 | 1 |
| 501 and above | 32 | 2 |

* 1. **AERIAL BUNCHED CONDU C T O R ACCESSORIES**
  2. **BASIC FEATURES**

The accessories for Aerial Bundled Conductor (ABC) are specified below and they shall satisfy all the loadings and tests as stipulated therein. All the accessories for ABC shall have the electrical and M echanical characteristics conform ing to the relevant standards specified.

* 1. **SUSPE N SION SMALL ANGLE ASSEM BLY**

Each assembly shall include:-

\* One number suspension bracket.

\* Suspension clamp and movable (articulated link)

* + 1. **Suspension bracket**

Suspension bracket shall be single piece m ade of alum inium alloy suitable for attachm ent to a pole by either single 16 m m galvanized steel bolt or by two stainless steel strap 20x0.7 m. An upper budge prevent the clamp from turning over on the bracket.

* + 1. Suspension Assembly shall be rated for 15 KN minimum and it should withstand a load for one minute minimum and break-down/deform ation should not

occur before 12 KN. It should accom m o d a te deviation angle of 45 degree.

* + 1. **Suspen sio n clamp and movable (articulated link)**

The suspension clam p and the m ovable connecting link shall be m ade of weather resistant and m echanically strong therm oplastic insulating material without any steel component.

This device shall have the capacity for the suspension and the tightening a neutral insulating messenger.

Bolts shall not be used to clam p the neutral m essenger conductor to the suspension clamp.

* 1. **Dead End Assembly**

Each assembly shall include :-

* One number tension bracket.
* One number wedge type tension clamp.
  + 1. **Tension-bracket**

Tension bracket shall be single piece made of Aluminium alloy suitable for attachm ent to a pole by either 16 m m galvanized steel bolt or by two 20x0.7 m m stainless steel straps.

* + 1. **Wedge type tension (dead-end) clamp**

Wedge type tension clamp shall be made of mechanical and weather resisting thermoplastic insulating material. Neither bolt for clamping the neutral messenger nor loose parts are allowed.

No tools shall be required for installation of the clamp in the field. To ease the torsional movement involved in the ABC system, the clamp shall be supplied with a flexible attachm ent to the above bracket by means of a stainless steel flexible braid.

The clam p shall be exclusive m ade of weather resistant plastic m aterial and shall be designed to withstand without slipping the breaking load of the neutral m essenger and not less than what is specified in the relevant standard.

All the components of the material shall be made of corrosion resistant materials.

* 1. Dead End clamp and Suspension Clamp which have been tested for mechanical test should withstand 6 KV for 1 minute applied between metal part/bracket and conductor of messenger.
     1. The connector should withstand 6 KV for one minute applied between cable

conductor and water bath while im mersed 30 cms under water after 30 mtr. Immersion.

* 1. **Insulated Tee-Off piercing connectors**

Tee-off connectors are required for connection of service conductor to bundled conductors and for tee-offs of bundled conductors.

The connectors shall be of water proof design. To achieve the required water tightness, a special rubber seal shall be provided around the teeth of the connector and the connector shall be greased with neutral grease in order to prevent moisture

penetration.

The housing shall be m ade entirely of m echanical and weather resistant plastic insulation m aterial and no m etallic part outside the housing is acceptable except for the tightening bolt.

It is absolutely necessary that none of the energized parts of the connector can be reached directly by the operator during installation of piercing connector on live

lines.

These connectors shall be of simultaneous insulation piercing on main and

tap conductors.

The piercing connectors bolts shall be provided with over torque shear head and the over torque shear head shall allow adequate clamping torque to achieve proper connection to the ABC.

stainless steel).

The bolt and washer shall be of corrosion resistant type (either galvanized steel or

The connector shall have removable end cap enabling tapping on either side of the

connector with the connector being in its vertical position with bolt head upwards. The end cap shall be rigid, of slide type enabling each positioning and unloosable after the tap cable is positioned. The end cap shall be equipped with a water tightness seal.