

## ANNEXURE-I

### HT POWER CABLE

#### SECTION – 1

#### 1.0 Specification

- i) 11 KV XLPE cables suitable for 11/11KV, 3 phase, 50 Hz solid earthed system. 11/11KV heavy duty power cable, 3 – core, with compact circular stranded (rm/V) Al. Conductor with extruded conductor shielding of semi conducting materials, XLPE insulated, with insulation shielding over individual cores consisting of extruded semi conducting compound followed by lapped semi conducting material and copper tape, cores standard together with a holding tape provided with a common covering of extruded inner sheath of type ST1 compound galvanized round/flat steel wire armoured and PVC outer sheath of type ST2 compound for 11/11KV System as per IS 7098 ( Part II) – 1973 as amended up to date, Copper screen will be suitable to carry 1 KA E/F current for one second.
- ii) Aluminium conductor used for power cable shall be electrical purity conductor of H1 temper.
- iii) Cables shall be suitable for system particulars, site conditions and environment conditions specified (ie) Cables shall be suitable for laying in metal trays, racks, conduits, ducts or for direct burial in ground both in wet and dry conditions.
- iv) Cable shall be capable of operating satisfactorily under the power supply and frequency variations as specified.
- v) The insulation of phase conductors shall be colored red, yellow and blue and the neutral ( if applicable) black.
- vi) Cable drums will be stored in the open yard at site where it will be subjected to rains and other climatic variations. Then wooden drums shall not deteriorate and collapse during storage for atleast 2 years.

#### 2.0 CONSTRUCTION

2.1 Cable constructions shall generally conform to the latest edition of applicable standard. For specific requirements refer technical particulars.

2.2 Identification marks on cable

The following particulars shall be embossed on the outer sheath at intervals of one metre throughout the length of cables.

- i) Manufacturer's name and/ or trade name.
- ii) Year of manufacture
- iii) Type of cable and the voltage class

- iv) Nominal cross sectional area of conductor and number of cores.

### 3.0 Tests

- i) Routine Tests of cables shall be in accordance with relevant Indian standards.
- ii) Type tests shall be conducted on one drum each size of cable offered.
- iii) Test certificates shall be furnished
- iv) Inspection & testing quality assurance
- v) All materials shall be tested as per standard quality plan
- vi) All testing instruments shall be periodically calibrated and calibration certificates shall be shown

### 3.1 Core identification

Cables shall be colour coded for core identification as per IS:1554 ( part-1)

### 3.2 Packing & Marking

- i) Cables shall be supplied in non-returnable drums. The drums shall be of heavy construction. All wooden parts shall be manufactured from durable quality wood duly seasoned and treated with copper Naphthenate or Zinc Naphthenate for preserving the wood ( ref. IS:401). All ferrous parts shall be treated with suitable rust protective finish or coating to avoid rusting during transit and storage.
- ii) Cable shall be wound and packed on drums in such a manner that it will be protected from injury during transit. Each end of the cables shall be properly sealed and firmly secured to the drum. The ends of each length shall be capped by special PVC/rubber cap and end embedded in the cable drum flange. The embedded cable ends in drum flange shall be covered by metal sheet.
- iii) The standard drum lengths shall be as indicated in Technical particulars
- iv) The tolerance on the dispatched cable length on each drum verified and accepted by inspector shall be limited to  $\pm 5\%$  of the standard drum length. However the overall tolerance on the total dispatched quantity of each size shall be  $\pm 5\%$  Cables consumed for testing & inspection will be to bidder's account.
- v) A clear space of min. 40mm shall be left between the cables and logging.
- vi) A label shall be securely attached to each end of reel indicating the Purchaser's order number, length, type, voltage grade, conductor size and number of cores of the cable. A tag containing the same information shall

be attached to the leading end of the cable inside.

### 3.3 Drawings, Data & Documents Required

The following information shall be furnished with technical bid

- a) Catalogue, cross-sectional drawings
- b) Filled up schedules as per Technical particulars
- c) Quality plan with seal of acceptance
- d) Unfilled price schedule

### 3.4 The following information shall be furnished within two weeks after award of contract, for Purchaser's approval:

- a) Technical Particulars filled by the contractors
- b) Manufacturing drawings/ details
- c) Recommended field quality plan covering site handling, storing, laying, testing etc.
- d) Final Quality Plan.

### 3.5 The following information shall be furnished after testing and inspection.

Requisite copies of type test, special test, routing and acceptance test reports in bound volume.

#### **Preferable Makes:**

- **Universal cables, CCI, Delton, Ploycab, Nicco, Paramount, Havells.**
- **If vendor offers any other brands of cable, he should enclose the acceptance of the same brand by any of the BHEL manufacturing units.**

## SECTION – II

### TECHNICAL PARTICULARS OF HT CABLES

- |        |                        |   |   |
|--------|------------------------|---|---|
| (I)    | System Voltage         | : | 11/11 kV, 3 Ph solid earthed neutral  |
| (ii)   | Highest system voltage | : | 12 kV   |
| (iii)  | System neutral         | : | solid earthed   |
| (iv)   | Fault level            |   |   |
|        | a) Symmetrical RMS     | : | 18.4 kA/35 kA   |
|        | b) Peak                | : | 47 kA/80 kA   |
| (v)    | Installation           | : | Outdoor (buried directly in ground)<br>Laid on cable trays in open air cable<br>Channels. |
| (vi)   | Ambient temperature    | : |   |
|        | a) Max. daily average  | : | 50 deg.C  |
|        | b) Design ambient      | : | 50 deg C  |
| (vii)  | Ground temperature     | : | 35 deg.C  |
| (viii) | Insulation             | : | XLPE  |
| (ix)   | Conductor material     | : | Aluminium   |
| (x)    | Armour                 | : | Steel tape/wire armour  |
| (xi)   | Sheath material        | : | PVC inner and outer sheath  |
| (xii)  | Additional information |   |   |
|        | (a) Voltage variation  | : | +/- 10%   |

SECTION - II

- (b) Frequency variation : + 3%, - 5%
- (xiii) Cable size : As specified
- (xiv) Voltage rating of the cable : 11 kV
- (xv) Number of cores : 3 core

SECTION -III

TECHNICAL PARTICULARS TO BE FURNISHED BY VENDORS  
FOR HT CABLES

1. Conductor Resistance at 20 deg C :
2. (a) Thickness of insulation (nom)mm :  
(b) Thickness of sheath mm :
  - i. Inner (Mn) :
  - ii. Outer (min) :
3. Insulation resistance :
4. Tensile strength of conductor (grade) :
5. (a) Tensile strength at break of (min) :
  - i. Insulation (Type-C) :
  - ii. Inner sheath ( Type ST-2) :
  - iii. Outer sheath (Type ST-2) :  
(b) Elongation at break of (min) % :
  - i. Insulation :
  - ii. Inner sheath :
  - iii. Outer sheath :
6. Applicable Standard :
7. Voltage Grade :
8. Maximum Conductor Temperature :
  - (a) Continuous, ° C :
  - (b) Short Time, ° C :
9. Conductor :
  - (a) Material :
  - (b) Size, mm<sup>2</sup> :
10. Shielding on Conductor :
  - (a) Material :

- (b) Type :
  - (c) Thickness, mm :
  - (d) Whether extruded :
11. Insulation :
- (a) Material :
  - (b) Type :
  - (c) Thickness, mm Main/Neutral :
12. Shielding on insulation
- (a) Material :
  - (b) Type :
  - (c) Thickness, mm :
13. Inner Sheath :
- a) Material :
  - b) Type :
  - c) Thickness, mm (min) :
  - d) Extruded :
  - e) Approx, outside dia over Sheath,mm Colour :
14. Armouring
- a) Material :
  - b) Size, No.x.Dimsn :
  - c) DC Resistance at 20 ° C, :
15. Outer Sheath
- a) Material :
  - b) Type :
  - c) Thickness, mm Colour :
16. Approximate overall diameter,mm :
17. Standard drum length with Tolerance, mm + or - 5% :
18. Net weight or Cables, kg/km :
19. Continuous current rating for standard IS Condition laid Direct
- a) In Ground :
  - b) In Duct :

- c) In Air :
20. a) Short circuit current for 1 sec. KA :  
 b) Conductor temperature allowed for the short circuit duty :
21. Electrical parameters at maximum operating temperature i.e. 90 ° C :
- a) Conductor resistance, ohm/km at 20 deg C :  
 b) Insulation resistance, ohm/km :  
 c) Reactance, at 50C/s, ohm/km :
22. Recommended minimum bending: Radius :
23. Derating factor for following ambient temperature in Air/Ground :
- a) At 30 ° C :  
 b) At 35 ° C :  
 c) At 40 ° C :  
 d) At 45 ° C :  
 e) At 50 ° C :
24. Group Factor for following nos. of Cables laid touching/ 2x diameter Center to center apart :
- a) 3 Nos :  
 b) 4 nos :  
 c) 5 Nos :  
 d) 6 Nos :
25. Single line to ground fault current With stand capability of screen :
26. Single line to ground fault current withstand capability of armour :
27. The cables shall be tested as specified :
28. Whether type test certificates for similar type of cables enclosed with the Bid? :

29. Cable sectional details submitted :

**Note: Quality plan has to be attached by the vendor along with their offer.**

## SECTION - 1

### Specification

The cable shall be of the type specified in the Bill of Materials (BOM) and shall conform to the specifications of the Indian Standard IS 1565 for 11 kV cables. The cable shall be of the type specified in the BOM and shall conform to the specifications of the Indian Standard IS 1565 for 11 kV cables. The cable shall be of the type specified in the BOM and shall conform to the specifications of the Indian Standard IS 1565 for 11 kV cables. The cable shall be of the type specified in the BOM and shall conform to the specifications of the Indian Standard IS 1565 for 11 kV cables.

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### 1.2. CONSTRUCTION

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