# TECHNICAL SPECIFICATION

# FOR

# LT XLPE POWER CABLES

## (Applicable for Maitree project)

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| 00 | 18.12.18 | RPS | MKV | VNS | Fresh issue |

1.0.0 **SCOPE:**

1.1.0 The scope of supply of power cables including design, manufacture, inspection at manufacturer's works, proper sea-worthy packing and delivery of cables as mentioned in different sections of this specification and enquiry.

1.1.1 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respect to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation.

2.0.0 **APPLICATION:**

2.1.0 The cable to be supplied under this specification is intended to use as power cables in plant.

**3.0.0 TECHNICAL SPECIFICATION FOR LT XLPE POWER CABLE**

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| 1.0 Type of Cable | Flame Retardant Low Smoke (FRLS) |
| 2.0 Standard applicable in general (Latest amendment to be referred if any) | IEC 60502-1, IEC 60228, IEC 60287, IEC 60949, ASTMD:2843, ASTMD:2863, IEC-754-1, IEC:60332 (Part-1), IEC:60332-3-23, IEEE:60383 & other relevant IEC |
| 3.0 Voltage Grade | 0.6 /1.0 (1.2 ) kV |
| 4.0 Number of cores, cross sectional area of conductors and quantities | As per ENQUIRY |
| 5.0 FAULT CHARACTERISTICS | |
| Fault Level | 50kA |
| Fault Clearing Time | 1 sec |
| 6.0 CONDUCTOR | |
| (a) Material | Copper |
| Grade and Class | Stranded, annealed plain high conductivity, Class 2 |
| (b) Standard Applicable | IEC 60228 |
| (c) Shape | Circular / shaped as per IEC 60228 |
| (d) Min. number and diameter of strands for Main and neutral conductor | As per Table-2 of IEC-60228 |
| 7.0 INSULATION | |
| (a) Material | Cross-Linked Polyethylene (XLPE) |
| (b) Standard Applicable | IEC-60502 (Part-1) |
| (c) Continuous withstand temperature | 90°C |
| (d) Short-circuit withstand temperature | 250°C |
| (e) Method of application | By extrusion; sleeve extrusion not permitted. |

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| (f) Method of curing | Dry/ Steam/ Gas/ Sioplas |
| (g) Nominal Thickness of insulation | As per IEC-60502 (Part-1) |
| 8.0 CORE IDENTIFICATION | Colour coding as per relevant IEC |
| 9.0 INNER SHEATH | |
| (a) Material | PVC Type ST-2 |
| (b) Standard Applicable | IEC-60502 (Part-1) |
| (c) Colour | Black |
| (d) Whether FRLS | NO |
| (e) Inner sheath applicable for single core cable | NO |
| (f) Fillers | Acceptable |
| (g) Material of fillers (if permitted) | Same as inner sheath (Material of filler to be compatible with that of inner sheath) |
| (h) Method of application | |
| (1) Multi-core cables: | |
| (i) With fillers | Pressure/ Vacuum extruded |
| (2) Single-core cables: | NA |
| 10.0 ARMOUR | |
| (a) Applicable | NOT APPLICABLE |
| 11.0 OUTERSHEATH | |
| (a) Material | PVC Type ST2 as per IEC-60502 (Part-1) |
| (b) Colour | Black |
| (c) Whether FRLS | Yes |
| (d) Method of application | Extruded |
| (e) Thickness of outer sheath | As per IEC-60502 (Part-1) |
| (f) Marking | Cable size (cross section area and no. of cores) and voltage grade @ 5m (by embossing)<br>Word "XLPE" "FRLS" @ 5m (by embossing)<br>Manufacturer's name and/ or trade name, and year of manufacture @ 5m (by embossing)<br>'BHEL-BAP' and 'CUSTOMER' Name @5m (by embossing) Progressive sequential marking @ 1m (by embossing/ printing) |
| 12.0 FRLS CHARACTERISTICS | |
| (a) Oxygen index | Min 29 (As per Relevant IEC / ASTMD 2863) |
| (b) Temperature index | Min. 250 DegC (As per Relevant IEC / ASTMD 2863) |
| (c) Acid gas generation | Max. 20% by weight (As per IEC 60502-1/ IEC 60754-1) |
| (d) Smoke density rating | Max. 60% (As per IEC 60502-1/ IEC 61034-2 / ASTMD 2843) |
| (e) Flammability Test | |
| (i) Flammability test for single cable | YES As per IEC-60332 Part-1 |
| (ii) Flammability test | as per IEEE: 60383 YES |
| (iii) Swedish Chimney test | SEN-SS-424-1475-F3 YES |

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| 13.0 Anti-rodent and Termite repulsion Test | YES |
| 14.0 Anti-Fungal Test | YES |
| 15.0 TOLERANCE ON OUTER DIAMETER | Up to 30mm; + 1.5 mm<br>Above 30mm; + 5% or + 2mm, whichever is less. |
| 16.0 MINIMUM BENDING RADIUS | |
| (a) Single core cables | 15 x O.D. |
| (b) Multi core cables | 12 x O.D. |
| 17.0 SAFE PULLING FORCE | |
| (a) Copper conductor cable | 50 N/ sq. mm. |
| 18.0 CABLE DRUMS | |
| (a) Type of Drum | Steel (Non- returnable) |
| (b) Standard drum length, drum tolerance | 1000m, (±) 5% for sizes upto 3Cx120 sq.mm<br>500m, (±) 5% for sizes above 3Cx120 sq.mm |
| (c) Painting | Entire surface to be painted |
| (d) Outermost Layer | To be covered with waterproof polyethylene |
| 19.0 SEA WORTHY PACKING | YES |

7.0.0 **GENERAL REQUIREMENTS:**

7.1.0 The cable shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transient operation conditions. The cable shall be suitable for laying in wet & dry locations in trays, conduits, ducts, trenches etc.

7.1. 1 Repaired cables shall not be offered and the same will not be accepted. Cut bits are not acceptable.

7.1.2 Non – hygroscopic PVC/ POLYTHELENE sheet shall be provided on the surface of the barrel of the drum & over outermost layer of the cable.

7.1.3 Over all quantity tolerance against each size shall be +0%, -2%.

7.1.0 **ADDITIONAL REQUIREMENTS**

7.1.1 The cables must be resistant to solar radiation, the effect of oil, seawater, bacterial action, insects and rodents.

8.0.0 **PACKING AND MARKING:**

8.1.0 Sea Worthy packing as per specification ref: PE-TS-888-100-A001 shall be provided. Over all quantity tolerance against each size shall be +0%, -2%.

8.1.1 The steel drum shall be provided as per relevant IEC & entire surface to be painted.

8.1.2 The ends of the cable shall be sealed by means of non-hygroscopic sealing material.

8.1.3 Each drum shall carry manufacturer's name, purchaser's name, address and contract no., item no. & type, size & length of cable and net gross weight stencilled on both sides of drum. A tag containing same information shall be attached to the leading end of the cable. An arrow & suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.

8.1.4 Cables shall be supplied in non-returnable heavy construction steel drums. New or practically new cable drums made of steel and painted with epoxy resin paint are to be used. Cable ends are carefully protected before packing.

8.1.5 Polyethylene sheet shall be wrapped over the cables and then sealed properly. Bidder to choose appropriate dimensions of steel drums to suite various sizes/weight/ lengths of LT XLPE power cables.

## 9.0.0 QUALITY ASSURANCE REQUIREMENTS:

9.0.1 Bidder shall confirm compliance with NTPC Type Test Requirements & Quality Plan/Check Lists Requirement Plan (SAP/QR/ R4NO P&C:009 Rev 00 dated 27 07 2018) as attached with the specification without any deviations.

9.0.2 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved Quality Plan.

9.0.3 Type testing requirements, routine/ acceptance testing and special testing requirements shall be as per Annexure to QP. Charges for all these tests for all the equipment & components shall be deemed to be included in the bid price.

9.0.5 Cost of cables consumed for testing shall be to bidder's account.