#### Annexure – ‘A’

**Technical Specification of** Termination kit for 11 KV 3Cx 400 sqmm HT XPLE Cable

**Scope:** Heat Shrinkable Cable outdoor termination kit for 11 KV 3Cx 400 sqmm HT XPLE Cable

1. Termination Kits & Joints shall be heat shrinkable type for 11 kV XLP E cables suitable for Outdoor End Terminations .
2. It is not the intent to specify completely herein all the details of the design, manufacture & assembly of cable accessories however, cable accessories shall confirm in all respects to a high standard of design & workmanship and be capable of performing in continuous commercial operation up to bidders guarantee in a manner acceptable to the purchaser, who will interpret the meanings of the drawings and specifications and shall have the power to reject any works or material which in his judgment are not in accordance therewith. The cable accessories offered sha ll be complete with all components necessary for the effective and trouble- free operations. Such components shall be deemed to be within the scope of supplier's supply irrespective of whether they are specifically brought out in this specification and/ or in the commercial order or not.
3. SYSTEM PARAMETERS
4. Nominal operating voltage 3 kV rms 11kV rms
5. Maximum system voltage : 3 kV rms 12 kV rms Frequency (Hz.): so +/- l.S so +/- l.S Number of Phases 3 Type of Earthing Solid

Environmental conditions Humid Tropical Climate with polluted atmosphere ,and/or , direct burial in after- logged ground. Basic Insulation Level 170 kV (Peak) 75 kV (Peak)

4. SERVICE CONDITIONS

1. The cable accessories to be supplied against this specification shall be suitable for continuous & satisfactory operation under climatic conditions listed below:

* Maximum ambient temperature : 50 °C
* Maximum ambient temperature in shade : 45 °C
* Relative Humidity : 10 to 95%
* Maximum annual rainfall : 1450 mm
* Maximum wind pressure : 150 Kg/m.sq
* Maximum altitude above mean seal level : 1000 meters
* Isoceraunic level : 50 days/year
* Seismic level (Horizontal acceleration) : 0.3g
* Moderately hot and humid tropical climate

1. The kits shall be provided with protection against rodent and termite attacks. 5.5.DESIGN FEATURES.

The following considerations shall be taken into account in the design of the product, material properties and the components of the jointing and termination kits.

1. Electrical stresses at the screen cut back in case of XLPE cables shall be controlled to a safe value.

The stress control may be either through stress control tubing I stress control cone or other suitable means. The bidder shall furnish details of the technique employed by them for stress control in cable- end terminations I straight-through joints. The application of stress control system shall be safe, foolproof and independent of cable jointers' skills. The stress control method used should withstand expansion and contraction of the cable during load cycling.

1. The cable end termination and jointing kits shall be so designed so as to prevent discharge/leakage at the cut back and nicks I scratches on XLPE insulations. Full details of the method of discharge prevention shall be indicated by the bidder in their offer. HS TYPE CABLE JOINTING & TERMINATION KITS FOR AND 11 KV XLPE CABLES
   1. TYPE
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1. The cable end termination and jointing kits shall be so designed so as to prevent discharge/leakage at the cut back and nicks I scratches on XLPE insulations. Full details of the method of discharge prevention shall be indicated by the bidder in their offer.
2. The cable end termination and jointing kits shall be so designed so as to give track - resistant erosion and weather resistant protection to the cable insulation. The outdoor end terminations and straight through joints shall be totally sealed against ingress of moisture of environment.
3. All Outdoor End Termination kits as well as 11 kV Indoor End Termination kits shall be provided with rain (weather) sheds or creepage-extending petticoats. These shall be non-tracking , weather resistant, hydrophobic and have smooth surface to deflect any water/ dirt etc. The design of these rain (weather) sheds or creepage-extending petticoats shall avoid any shed to shed conducting path under heavy rain conditions.
4. The cable end terminations & jointing kits shall be class 1 as defined in IEEE stand ard

48/1996 with latest amendments. Documentary proof shall be required to prove compliance in this regard without which the bid may be ignored.

1. The lugs and ferrules provided should be suitable for compacted conductors and

should withstand thermal short circuit of 250 deg. centigrade.

5.5.1. GENERAL REQUIREMENT FOR CABLE END TERMINATIONS / STRAIGHT- THROUGH JOINTS. i.

The term heat shrinkable refers to extruded or moulded polymeric materials which are cross

linked to develop elastic memory by irradiation method and supplied in expanded or otherwise deformed

sizes/ shapes, subsequently heating in a strained state to a temperature above the shrink temperature resulting in the material recovering or shrinking to its original shape.

ii. a) The stress control tubes used in heat shrinkable cable accessories shall have volume resistivity of minimum1,00,00,000 ohm meters for both terminations & straight through joints. The relative permittivity shall be minimum 15. Bidder shall furnish documentary evidence confirming adherence to these along with the offer. Further, impedance of stress control tubes shall not change over a range of temperature from 0 °C to 125 °C. The stress control tubes must have a thermal endurance equivalent to 35 years life. The impedance should also remain constant in spite of

the difference in stress which will exist within the sleeve due to heating effect within the conductor and the temperature of the environment.

b) Bidder must submit graph showing effect on the impedance value of stress control tube due to effects of stress, temperature variations and thermal ageing of minimum 10,000 Hrs. with the offer.1. The heat shrinkable polymeric material to be used for external leakage insulation between the high voltage conductors and grounds should be non-tracking, weather and erosion resistant and hydro- phobic in nature. A heat- shrinkable flexible polymeric tubing, preferably coloured red, and possessing non-tracking erosion and weather resistant properties shall work as an external covering for the cable covers. Rain - Sheds (skirts) provided should be of same material as the non- tracking tube specified in the paragraph above. Copies of test reports, confirming the non-tracking tubes and rain-sheds (skirts) meeting the above requirements shall be furnished along with the offer.

1. Since the sealants or adhesives to be used between the heat shrinkable materials and XLPE cable shall be exposed to high electrical stresses, they must be track resistant. Documentary evidence shall be furnished in this regard along with the offer.
2. All cuts/ nicks inadvertently occurred to XLPE insulation must be rendered discharge free by using suitable discharge suppression compound.
3. The heat shrinkable tubes may be either extruded or moulded type.
4. The higher wall-thickness of heat shrinkable tubes I sleeves shall be preferred to counter the effect of erosion due to pollution.
   1. OTHER REQUIREMENTS
5. The kit shall be suitable for storage without deterioration at a temperature up to 50 Deg. C and shall have unlimited shelf life. Conducting paints having limited shelf life are not acceptable.
6. Proper stress control, stress grading and non tracking arrangement in the termination shall be offered by means of proven methods, details of which shall be elaborated in the offer. Detailed sectional view of assemblies shall be submitted along with the offer.
7. The straight through joints shall be suitable for underground buried installation with incorporated back-fill and chances of flooding by water. The straight through joints should be absolutely impervious to the entry of water. The manufacturer shall use proven technology and design to prevent entry of water or any other liquid inside the straight through joints and cables.
8. The end termination kits shall provide for total environmental sealing of the cable crutch and at the lugs end. The details of the environmental sealing provided shall be submitted along with the offer.
9. Provisions for effective screening over each core shall be made and the bidder shall categorically confirm this aspect in the offer.
10. The materials and components not specifically stated in the specification but which are essential for satisfactory operation of the cable shall be deemed to be included in the kit without any extra cost.
11. The terminations I joints shall be of better tracking resistant properties and fully reliable earthi ng system to maintain continuous contacts with screening/ armouring as the case may be.
12. The armour I earthing terminations/joints and shall tape or tube. arrangement shall form part of the be

protected from erosion either by suitable.

1. The terminations/ jointing kits shall have provision for shield connection and earthing

whichever required.

1. The fault level as well as duration withstand capacity of termination I jointing kits should be strictly matching with the parameters of cables for which the kits are intended to be used.
2. The trade I brand name of the manufacturer, shall be embossed I engraved or suitably marked with indelible ink I paint for the purpose of identification on the tubings and components which are visible from the outside. The words "JBVNL" along with the trade I brand name of the manufacturer,TN No. , month I year of manufacture, size etc. shall be suitably printed I marked on the kit packing/Cartoon.
3. Suitable creepage extension/ rain protection sheds for outdoor cable end terminations shall be provided. xiii. Adequate provisions for eliminating the chances of entrapment of air at steps formed by semi con

screen shall be made.

1. The terminations/ joints shall be supplied in kit form. All insulation and sealing materials, consumable items, conductor fittings, earthing arrangements and lugs etc. should be provided .
2. The bidder shall furnish the constructional features of material offered.
3. An instruction manual in English and , optionally in Hindi script, indicating the complete method/ proceedings adopted for installation of kits, preferably with more diagrams/ pictorial presentation shall be supplied with each kit. Various items, quantity thereof included in each kit must be indicated in the instruction manual I packing slip provided in the kit packing.
   1. CABLE SIZE AND ITS REQUIREMENT

If the design of the cable jointing kits is such that same kit is suitable for more than one of the cable sizes mentioned at clause 1.6, then the bidder shall furnish the details of kit number and corresponding cable sizes for which the kit is suitable.

* 1. CIRCULAR SHAPED CONDUCTOR:-The terminations/ jointing kits offered shall be suitable to be used on circular compacted XLPE cable conductor.
  2. LUGS/ FERRULES

Requisite number and size of lugs/ ferrules depending upon the type of the cable shall be provided in the kit. Lugs and

Ferrules shall be of crimping type, shall confirm to the relevant standards in case of XLPE cables.

* 1. EARTH/SCREEN CONTINUITY
     1. Screen continuity by using tinned copper mesh and earth continuity by tinned copper braids of appropriate size shall be provided for transfer of screen/ earth in straight through joints.
     2. Tinned copper braids of appropriate size along with copper lugs of proper size shall be provided for the continuity of screen/ armour along with adequate clamping arrangement.
  2. EARTHING

Earthing shall be as per relevant standards and the details of the earthing arrangement offered for the cable accessories shall be submitted along with the offer.

* 1. FIRE RESISTANCE

The cable end terminations and straight-through joints shall be fire resistant. The components of kits shall have flame retardant property.

* 1. INTERCHANGEABILITY

The components of different size of the kits shall be interchangeable between more than one cable sizes in case the need so arises. Bidders should indicate the range /limits of such interchangeability.iii. The cable end termination and jointing kits shall be so designed so as to give track - resistant erosion

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