

## **TECHNICAL SPECIFICATION FOR 11KV (UE) STRAIGHT THROUGH JOINTS FOR ALUMINIUM ARMoured XLPE CABLES.**

**1.1** The instructions given hereunder are in addition to / super session of the instructions given elsewhere in the tender documents and these are to be treated as final requirements in this regard wherever any ambiguity arises.

### **1.2 SCOPE:**

This specification covers design, manufacture, testing, packing, inspection and delivery anywhere of cable terminations and joints employing Heat Shrinkable technology suitable for 11KV (UE), three core XLPE insulated screened and armored cables as per IS 7098, having compacted circular stranded aluminum conductors of size 95 sq.mm.

Tenderer has to submit all relevant papers, copies of test reports from CPRI as required. Failure to do so may amount to the bids being considered non-responsive and outright rejection. The information as asked for, is to be mentioned specifically and not be narrated like 'as per IS, relevant standard, reference to other pages of tender bid etc.'

### **1.3 APPLICABLE STANDARDS:**

Applicable standards for testing of heat shrink joints and terminations along with material proportions of components:

- a) IS – 13573/1992 – Including Amendment 1 & 2 – Joints & Terminations, for polymeric cables for working voltages 6.6 kV up to and including 33 kV – Type test requirements.
- b) ESI – 09 – 13 – Electricity Supply Industry Specification – Performance requirements of heat shrinkable components.
- c) IEEE – 48 – Standards Test Procedures and requirements for high voltage alternating current cable termination.

### **1.4 DESIGN REQUIREMENTS:**

#### **Class of Termination and Straight Through Joint**

The heat shrinkable cable terminations (Indoor and Outdoor type) offered shall be Class-I terminations as defined in IEEE standard 48, and the straight through joints must be suitable for direct burial, uncontrolled backfill, water logging, and open trays/trenches.

#### **Stress Control**

The stress control function at the screen cut back shall be provided by heat shrinkable tubing having volume resistivity of minimum  $10^7 \Omega$ -meter for both termination and joint. Also, the relative permittivity shall be minimum 15. The length of the stress control tubing should be minimum 110 mm in Termination and 270 mm in Joints for 6.6 KV(UE) and 140mm in termination and 330mm in joints for 11 KV(UE). Bidder shall furnish documentary evidence confirming adherence to these, along with his bid. Failure to submit the documentary evidence will result in disqualification of offer

The impedance of stress control tubing shall not change over a range of temperature from 0 deg. C to 125 deg. C. The stress control tubes must have a thermal endurance equivalent to 35 years of life. This shall be confirmed through graphical depiction of variation in impedance with accelerated thermal ageing of 10,000 hours. Bidder must submit

documentary evidence including graphs showing the effects of stress, temperature and aging on the impedance of the stress control tubing along with the bid.

For straight through joints prior to the installation of the stress control tubing, high permittivity mastic must be applied over the ferrule, overlapping the insulation by 3 mm. The minimum permittivity of this mastic shall be 15

At the steps caused by semi-conductive screen cut back, high permittivity hot melt mastic is to be provided to prevent discharge activity at the step. The minimum permittivity of the mastic should be 15. **Semiconducting paints are not acceptable.**

Fluorinated silicone grease shall be provided for filling up the nicks and scratches on the surface of XLPE insulation.

**Non-tracking erosion and weather resistant protection.**

The entire surface, from the high voltage point (lug) to the earthing point of the XLPE core/ cable shall be non-tracking, weather and erosion resistant, and hydrophobic in nature.

Heat shrinkable flexible polymeric tubing, preferably colored red, and possessing non-tracking erosion and weather resistant properties shall be used as an external covering for the cable cores for both indoor and outdoor terminations. Rain sheds should be the integral and homogeneous part of tubing. Designs with rain sheds glued on the outer tubing or supplied separately shall be rejected.

The material of the non-tracking, erosion and weather resistant tubes and rain sheds shall meet the requirement of ASTM D2303. Copies of test report thereof to be submitted with offer.

The material used for manufacturing the non-tracking tubing's and rain sheds (skirts) material shall have an assessed life exceeding 40 years. Test reports pertaining to accelerated weathering tests of at least 5,000 hours (minimum) shall be submitted in support of this assessment. Longer duration accelerated testing wherever conducted shall be given preference. Load cycling tests alone, shall not be considered sufficient basis for such life assessment.

**1.5 ENVIRONMENTAL SEALING:**

Adhesives and sealants shall be provided in the termination and jointing kits for environmental sealing against ingress of moisture and aggressive gases. The adhesives and sealants will flow due to heating of heat shrinkable components or otherwise during installation and will fill all voids and adhere to metal components and cable sheaths. For terminations the design should provide for long finger breakout with the total length of 425mm (min) and finger length of 280mm (min).

For terminations: The sealing of the strands between the lug barrel and cable termination shall be provided by:

- a) Non-tracking, erosion and weather resistant non-tracking sealant coated over the inner side of heat shrinkable outer tubing.
- b) Non-tracking sealant strips.
- c) The sealants must have unlimited shelf life.

For Joints: Heat shrinkable flexible polymeric tubing, preferably black colored, pre-coated with adhesives shall be provided for sealing the exposed metallic sheaths and sheath / earth connections.

### **1.6 INSULATION AND SCREEN REINSTATEMENT FOR JOINTS.**

To ensure a void-free bond between the rebuilt insulation and nonmetallic screen the bidder shall supply a single co-extruded dual-wall tubing which enables the final insulating layer to be installed complete with a conductive polymeric screen in one step. This dual walled tubing must be a co-extruded and shall be offered with joints. Bidders must confirm they are offering co-extruded dual wall tubing for straight through joints as indicated above.

The total installed thickness (excluding the stress control layer) of the insulation, over the ferrule, shall be at least 50% more than the cable insulation thickness. Preference will be given to joint designs where this thickness is achieved using minimum number of layers.

### **1.7 EARTH/SCREEN CONTINUITY/TERMINATION SYSTEM.**

Screen continuity by using tinned copper mesh and earth continuity by using tinned copper braids of appropriate sizes, shall be provided for transfer screen / earth in straight through joints.

In terminations, tinned copper braids of appropriate sizes along with copper lugs of appropriate sizes shall be provided for the continuity of screen / armor along with adequate clamping arrangements.

### **1.8 LUGS / FERRULES:**

The requisite number and type (Aluminum/copper) of Lugs / Ferrules for compact circular stranded conductors shall be provided for terminations / joints

Lugs and ferrules shall be of crimping type heavy duty and shall be rated for the current carrying capacity of the XLPE cable conductors and shall conform to the relevant standards.

### **1.9 PACKING OF THE KIT**

All the components shall be sealed separately and marked clearly for the purpose of identification of each component.

Components shall be supplied in a single package as a complete kit for one termination/joint and shall bear the manufacturer's name and the cable sizes or kit sizes for which it can be used, voltage grade.

Besides above identification marking on packing, following identification marking shall be made on stress control tubes, dual wall tubes, outer jacketing tubes(in straight through joints), breakouts, rain sheds, non-tracking tubes :

- a) Batch No. to co-relate with the raw materials used to manufacture the components.
- b) Shrink ratio.
- c) "Stress Control", "Conductive" as the case may be (only for stress control tubes and dual wall tubes)
- d) Manufacturer's name.

Detailed Bill of Materials and Installation Instructions shall be provided with each kit.

### **1.10 PERFORMANCE TESTS:**

The XLPE terminations and joints of the identical type brand and design as offered in the bids shall have been tested for all the tests covered under IS13573 standard (with amendments to date). Type test certificate showing satisfactory results shall be furnished along with the bid from any of the following:

- a) CPRI, Bangalore or any other reputed approved Government test house.

Failure to submit the above test certificates will result in rejection of offer.

**1.11 SPECIAL REQUIREMENTS.**

The kits shall be suitable for storage without deterioration at a temperature up to 50 degrees C and shall have unlimited shelf life.

The heat shrink system of the identical type brand as offered in the bids shall have proven performance of at least 15 years in Indian conditions.

The kit shall be designed to suit modern compact equipment with less space for cable compartment. A single component shall replace three heat shrinkable components (non-tracking tubing, stress control tubing and skirts).

**1.12 PRE QUALIFICATION CRITERIA**

The vendor should have executed two different orders for the item previously. Two different PO copies of previous supplies to be enclosed along with the technical offer as documentary proof. Failure to provide the above documents may lead to technical disqualification of the offer.

Required Items:

**HY8340224212 – 3C X 95 sq. mm, Aluminum, Armored, 11KV (UE) Straight Through Joint Kits – 10 nos.**

**Make: Raychem / 3M**