



Maharashtra State Electricity Distribution Company Limited

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SPECIFICATION NO. T & QC: MSC-I/ Indoor and Outdoor Termination Kit for  
HT Cables/2019/08

Technical Specification

Of

Indoor and Outdoor Termination for 11 kV, 22 kV and 33kV Cables

Used in

MSEDCL

Distribution System

<b>I N D E X</b>
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## **MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.**

### **Technical Specification of Heat Shrinkable Indoor and Outdoor Termination Kit for 11 kV, 22 kV and 33kV Cables**

#### **1.0 Scope:**

- 1.1** This specification covers design, manufacture, assembly, testing before supply, inspection, packing and delivery and other basic technical requirements in respect of Heat Shrinkable Indoor and Outdoor Termination for dissimilar cables suitable for armoured, HT, PVC/XLPE, Aluminum/Copper conductor cables as per IS:13573,2011. The Heat Shrinkable Indoor and Outdoor Termination for 11 kV, 22 kV and 33 kV Cables to be used for jointing termination of various sizes of 11kV, 22kV and 33kV Cable in MSEDCL, Maharashtra. The Heat Shrinkable Indoor and Outdoor Termination to be supplied against this specification are required for vital installations where continuity of service is very important. The design, materials and manufacture of the Indoor and Outdoor Termination shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.
- 1.2** The Heat Shrinkable Indoor and Outdoor Termination offered shall be complete with all parts necessary for their effective and trouble-free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.
- 1.3** It is not the intent to specify herein complete details of design and construction of Heat Shrinkable Indoor and Outdoor Termination. The Heat Shrinkable Indoor and Outdoor Termination offered shall conform to the relevant standards and be of high quality, sturdy, robust and of good design and workmanship complete in all respects and capable to perform continuous and satisfactory operations in the actual service conditions at site and shall have sufficiently long life in service as per statutory requirements.
- 1.4** The Heat Shrinkable Indoor and Outdoor Termination offered shall be reliable, fast and easy-to-install jointing termination system to assure and maintain high network reliability in the most severe conditions and under high electrical, thermal, mechanical and environmental stress.

#### **2.0 System Particulars:**

- 2.1 Nominal System Voltage : 11kV, 22kV, 33kV
- 2.2 Voltage variation on supply side :  $\pm 10\%$
- 2.3 Corresponding Highest System Voltage: 12kV, 24kV, 36kV
- 2.4 Frequency : 50 Hz with  $\pm 3\%$  tolerance
- 2.5 Transient condition : -20 % or + 10 % combined variation of voltage and frequency.
- 2.6 Number of Phase : 3 Phases
- 2.7 Neutral earthing : Solidly earthed.
- 2.8 Fault level (minimum) kA : 12.5, 25, 25 --- for 3 sec.
- 2.9 Lightning Impulse Withstand Voltage (kVp) : 75, 125, 170

2.10 One minute dry/wet power frequency  
withstand voltage primary (kV rms) : 24.5, 50.8 76

2.11 Rated Dynamic Withstand Current for  
1 second duration (kAp) : 62.5 62.5 65.5

**3.0 Service Conditions :**

A) The Heat Shrinkable Indoor and Outdoor Termination for 11 kV, 22 kV and 33kV Cables to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

- 3.1 Maximum ambient temperature (Degree C) 50
- 3.2 Maximum temperature in shade (Degree C) 45
- 3.3 Minimum Temperature (Degree C) 3.5
- 3.4 Relative Humidity (percent) 10 to 95
- 3.5 Maximum Annual rain fall (mm) 1450
- 3.6 Maximum wind pressure (kg/sq.m) 150
- 3.7 Maximum altitude above mean sea level ( Meter) 1000
- 3.8 Isoceranic level (days per year) 50
- 3.9 Seismic level (Horizontal Acceleration) 0.3 g

Moderately hot and humid tropical climate conducive to rust and fungus growth ....

B) The climatic conditions are prone to wide variations in ambient conditions and hence the Heat Shrinkable Indoor and Outdoor Termination for 11 kV, 22 kV and 33kVCables shall be of suitable design to work satisfactorily under these conditions.

**4.0 Applicable Standards :**

4.1 The design, manufacture and performance of the Heat Shrinkable Indoor and Outdoor Termination shall comply with all currently applicable statutes, regulations and safety codes.

Nothing in this specification shall be construed to relieve the bidder off his responsibilities.

4.2 Unless otherwise specified, the Heat Shrinkable Indoor and Outdoor Termination offered shall conform to the latest applicable Indian, IEC, British, U.S.A. or International Standards and in particular, to the following:-

Sr. No.	Standards	Particulars
1.	IS: 13573- Part 2, 2011	Type Test and Performance requirement for Cable Termination & Joints on XLPE cable for 6.6KV up-to 33KV
2.	ESI09-13 issue 1:1981	Performance specifications for higher voltage Heat shrinkable components for use with High Voltage Solid Cables up-to and including 33KV
3.	IEC 61238-1- Class A	Mechanical Connectors for Power Cable

## 5.0 Principal Technical Parameters of Heat Shrinkable Indoor and Outdoor Termination:

- a) The Heat Shrinkable Indoor and Outdoor Termination materials & components shall be offered in the form of kits. The kits shall be supplied complete with all necessary tubing components (Non Tracking Main Tube / Stress Control Tubing / Mechanical Connector / Earthing / Non tracking Rain Skirts( For Outdoor Joints) / Cable Preparation, etc) to form a ready to energize Heat Shrinkable Indoor and Outdoor Termination.
- b) Heat Shrinkable Indoor and Outdoor Termination suitable for overhead application type tested as per IS: 13573- Part 2, 2011. Jointing kit with less numbers of components without affecting function and performance of Joints are preferred.
- c) The Heat Shrinkable Indoor and Outdoor Termination covered under this specification shall conform to specific parameters given below:

### i) Heat Shrinkable Non Tracking Main Tube and Stress control tubing:

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 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.

The tubes must be extruded and expanded by irradiation process only.

The tube material shall conform to the requirements of ASTM-D-2303, and copies of test report shall be furnished. Molded tubing is not acceptable.

Stress Control Tubing shall have below characteristics:

- 1) Volume resistivity : 5 X 10<sup>10</sup> Ohm-CM min
- 2) Dielectric constant : 15 min
- 3) Tensile Strength : 10 MPa min
- 4) Ultimate Elongation : 200% min
- 5) Accelerated Ageing : 168 hrs. at (120±2)°C
- 6) Tensile Strength after aging : 8 MPa min
- 7) Ultimate Elongation after aging : 100% min
- 8) The impedance of stress control tubing shall not change over a range of temperature from 0°C to 125°C.

### ii) Heat Shrinkable Non tracking Rain Skirts:

The material for Heat Shrinkable Non tracking Rain Skirts shall be Polyolefin

The basic resin is mixed with chemical additives offering protection against fire, oxidation, ozone and other environmental effects. The sealant is a butyl rubber based red mastic which is water-proof, electrical insulating and anti-tracking.

The Heat Shrinkable Non tracking Rain Skirts sheds whose dimension shall shrink to a predetermined size upon the application of heat above 125°C. Color of the HV sheds is red. The HV sheds shall be electrically insulating, anti tracking, erosion resistant, weather proof and flame retardant. The HV sheds shall be supplied with an anti-tracking red sealant coating covered with release paper.

The Heat Shrinkable Non tracking Rain Skirts are used for extending the creepage path for the medium voltage cable termination, thereby saving the length of the cable and reducing the size of the switch gear cabinet required for this purpose. Single sheds are suitable for termination of the complete range of electrical cables of XLPE and PILC types.

Minimum creepage distance shall be 25 mm / kV.

The Heat Shrinkable Non tracking Rain Skirts shall provide extension creepage length and to avoid continuity during rainy season and to avoid short circuiting of the electrical net words as case to case bases as per system requirement.

The properties of Heat Shrinkable Non tracking Rain Skirts shall be as follow:

Sr. No.	Properties	Value	Standard
A.	Thermal		
1.	Continuous Temperature Limit	-55°C to 125°C	
2.	Shrink Temperature	>125°C	
3.	Heat shock Test (30 Mint. at 200°C)	No Cracking/ No Flow	
4.	Low Temp. Flexibility (4 hours at - 40°C)	No Cracking	ASTM D-2671
B.	Physical		
1.	Tensile Strength	>8 N /mm <sup>2</sup> (min)	ASTM D 638
2.	Elongation	>=200 %(min)	ASTM D 638
3.	Hardness	28 Shore D	
4.	Water Absorption	<=0.5 %	
C.	Electrical		
1.	Volume resistivity	1 x 10 <sup>12</sup> Ohm cm	ASTM D-257
2.	Dielectric Strength	10 kv / mm(Min.)	ASTM D-149

### iii) Mechanical Lug with Shear bolt:

- 1) The Mechanical Lugs with Shear bolt shall be made from a high-tensile, tin-plated aluminum alloy suitable for both aluminum & copper conductor as per IEC 61238-1 Class -A. The internal surfaces of the conductor holes are grooved. The Mechanical Connector with Shear bolt should be type tested product as per IEC 61238-1 Class -A.
- 2) The shear head bolts to be made of a special aluminum alloy, these contact bolts should be shear-head bolts with hexagon heads. The bolts are to be treated with a highly lubricating agent. A mechanical connector with bolts that shear off when proper torque is applied. Maintain smooth surface over connector after cut the shear head bolt. Contact bolts are irremovable once their heads have been sheared off.
- 3) The Mechanical Lugs with Shear bolt should be designed with removable inserts so as to accommodate lower cross section cable conductors & centre it.
- 4) The Mechanical Lugs with Shear bolt should be range taking with 3 to 4 sizes covering 25 sq.mm to 400 sq.mm.
- 5) Bidder should furnish necessary drawings/ catalogues for reference.

- 6) Raychem, Tyco, Pfisterer, Niled, Sicame, Nexan, REPL OR equivalent make of Mechanical Lug with Shear bolt shall be acceptable. Make of Mechanical Lug with Shear bolt must be technically approved by MSEDCL before supply in jointing kit.

**iv) Environmental Sealing:**

Adhesives and sealants shall be provided in the Indoor and Outdoor Termination kits for environmental sealing against ingress of moisture and aggressive gases. The adhesives and sealants shall flow due to heating of heat shrinkable components or otherwise during installation and shall fill all voids and adhere to metal components and cable sheaths.

**v) Yellow Mastic:**

The stress control tubing in combination with the stress grading mastic at the screen cut provide a precisely defined impedance characteristic which smoothens the electrical field. For ease of installation, stress control mastic (high Permittivity mastic) is applied around the connector which shall also be used as void filler over the connector.

Dielectric constant of mastic = 5 min – 20 max testing as per ENA 09-13.

**vi) Non Tracking Red Mastic:**

The Non-Tracking Red Mastic shall be used in 11 kV, 22 kV and 33 kV Heat Shrink Joint Indoor and Outdoor Terminations for providing a water-tight seal between heats shrink components and the cable parts. The Non-Tracking Red Mastic shall be electrically insulating, non-tracking and water resistant. The Non-Tracking Red Mastic shall be self-fusing and can be used for filling voids and irregular shapes. The color of the Non-Tracking sealant is red. The Non-Tracking Red Mastic shall be water resistant and has high adhesion property to connectors and cable components. The Non-Tracking Red Mastic shall provide excellent sealing functions.

The base material of the non-tracking sealant is thermally stabilized, blended rubber. The base rubber is mixed with chemical additives offering non-tracking and insulating properties.

- a) Insulating and Non- Tracking: Good insulating and non-tracking properties
- b) Service Temperature Range: -20°C to 100°C, Overload temperature 120°C max.
- c) Environment Resistant: Resistance to water and humidity
- d) Installation: Self-fusing Viscous-Elastic Property.
- e) Non-Tracking Red Mastic tested as per ESI 09-13.

**vii) Screen, Earth continuity:**

Screen continuity and earth continuity by using tinned copper braids of appropriate sizes, shall be provided for transfer screen / earth in Heat Shrink Indoor and Outdoor Terminations.

**6.0 Properties of Heat Shrinkable Components:**

Sr. No.	Properties	Anti Tracking Tubing	Stress Control Tubing
1.	Dimensions		
	a) Wall Thickness Ration	0.6 Min	0.6 Min
	b) Longitudinal Change	10% Max	10% Max
	c) Length - Expanded	As per Size of Cable	As per Size of Cable
	d) Internal Dia. - Expanded	As per Size of Cable	As per Size of Cable
	e) Internal Dia. - Fully Recovered	As per Size of Cable	As per Size of Cable

2.	Electric Strength	Min. 10 kV / mm	N/A
3.	Heat Shock	No splitting, cracking, dripping of flowing after 30 mins at 200°C Min	No splitting, cracking, dripping of flowing after 30 mins at 200°C Min
4.	Low Temperature Flexibility	No cracking after 4 hours at - 20°C Max	No cracking after 4 hours at - 20°C Max
5.	Relative Permittivity	3 Min. to 5 Max.	15 Min.
6.	Tensile Strength	6 N/ mm <sup>2</sup> Min.	10 N/ mm <sup>2</sup> Min.
7.	Ultimate Elongation	200% Min.	200% Min.
8.	Thermal Aging	500 hours Min. at 120 ± 3°C.	500 hours Min. at 120 ± 3°C.
	Tensile Strength	7 N/ mm <sup>2</sup> Min	8 N/ mm <sup>2</sup> Min
	Ultimate Elongation	100 % Min.	100 % Min.
9.	Visual Examination	Free from pin holes, cracks, inclusions and other visible defects	Free from pin holes, cracks, inclusions and other visible defects
10.	Volume Resistivity	1 x 10 <sup>10</sup> ohm meters Min.	1 x 10 <sup>10</sup> ohm meters Min.
11.	Water Absorption	0.5 Max. 24 hr. @ 25°C 1.0 Max. 24 hr. @ 50°C	0.5 Max. 24 hr. @ 25°C 1.0 Max. 24 hr. @ 50°C
12.	Tracking Resistance	2.5 kV, 0.15 ml/min for 1 Hours. 2.75 kV, 0.15 ml/min for 1 Hours. 3.0 kV, 0.30 ml/min for 1 Hours. 3.25 kV, 0.30 ml/min for 20 minutes.	NA

### 7.0 Heat Shrinkable Indoor Terminations Kit Contents:

Heat Shrinkable Indoor Terminations Kit required for 11kV, 22kV and 33kV Cables to be used for various sizes of 11kV, 22kV and 33kV armoured, HT, PVC/XLPE, Aluminum/Copper conductor cables.

a) The contents of each 11kV Heat Shrinkable Indoor Terminations Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 11 kV Indoor Cable		3C X 120 sq.mm to 240 sq.mm 11 kV Indoor Cable		3C X 240 sq.mm to 400 sq.mm 11 kV Indoor Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Non Tracking Main Tube	38/12 mm L - 450mm	3 Nos.	38/12 mm L - 450mm	3 Nos.	50/16 mm L - 450mm	3 Nos.
2.	H.S. stress control tubing	26/12mm L - 130mm	3Nos.	32/14mm L - 130mm	3Nos.	46/19mm L - 130mm	3Nos.
3.	H.S. Non tracking Lug Seal Tube with Non Tracking Adhesive coated.	38/12mm L - 100mm	3 Nos.	50/16mm L - 120mm	3 Nos.	50/16mm L - 150mm	3 Nos.
4.	H.S. Breakout with Adhesive		1 Nos.		1 Nos.		1 Nos.
5.	Stress control mastic	W-20mm L-100mm	3 Nos.	W-20mm L-100mm	3 Nos.	W-20mm L-120mm	3 Nos.
6.	Non Tracking Red Mastic	W-25mm L-100mm	3 Nos.	W-25mm L-150mm	3 Nos.	W-25mm L-300mm	3 Nos.
7.	Armour earthing						
	i)T.C. earthing braid with lug	25sqmm L-500mm	1 Nos.	25sqmm L-500mm	1 Nos.	25sqmm L-500mm	1 Nos.



	ii)G.I. Back up ring	54 mm x 50 mm	1 Nos.	71 mm x 50 mm	1 Nos.	85 mm x 50 mm	1 Nos.
	iii)S.S. Clips	50 – 90 mm	2 Nos.	50 – 90 mm	2 Nos.	80 – 120 mm	2 Nos.
8.	Metal screen continuity						
	i) T.C. earthing braid	7 sqmm L-150mm	3 Nos.	7 sqmm L-150mm	3 Nos.	7 sqmm L-150mm	6 Nos.
	ii) Roll Spring	Range 17 mm -28 mm	3 Nos.	Range 17 mm - 28 mm	3 Nos.	Range 25 mm -40 mm	3 Nos.
9.	Mechanical Lug with torque controlled shear head bolts	25sqmm to 95 sqmm L-60mm	3 Nos	95 sqmm to 240 sqmm L-112mm	3 Nos	185sqmm to 400 sqmm L-137mm	3 Nos
10.	Filler putty for Mechanical connector		1 Nos.		1 Nos.		1 Nos.
11.	Silicon grease	6 grams	1 Nos.	6 grams	1 Nos.	6 grams	1 Nos.
12.	Aloxide Paper P80	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.
	Aloxide Paper P150	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.
	Aloxide Paper P220	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.
13.	Nylon string for cutting XLPE Insulation	1 Meter	1 Nos.	1 Meter	1 Nos.	1 Meter	1 Nos.
14.	PVC adhesive tape	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.
15.	Core cleaning solvent		1 Nos.		1 Nos.		1 Nos.
16.	Cleaning Cloth	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.
17.	Copper binding wire	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.
18.	Copper binding wire	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.
19.	Packing List		1 Nos.		1 Nos.		1 Nos.
20.	Instruction Manual		1 Nos.		1 Nos.		1 Nos.

b) The contents of each 22 kV Heat Shrinkable Indoor Terminations Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 22 kV Indoor Cable		3C X 120 sq.mm to 240 sq.mm 22 kV Indoor Cable		3C X 240 sq.mm to 400 sq.mm 22 kV Cable Indoor	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Non Tracking Main Tube	38/12 mm L – 650mm	3 Nos.	50/16 mm L – 650mm	3 Nos.	50/16 mm L – 650mm	3 Nos.
2.	H.S. stress control tubing	31/14mm L – 190mm	3Nos.	46/19mm L – 190mm	3Nos.	46/19mm L – 190mm	3Nos.
3.	H.S. Non tracking Lug Seal Tube with Non Tracking Adhesive coated.	38/12mm L – 100mm	3 Nos.	50/16mm L – 120mm	3 Nos.	50/16mm L – 150mm	3 Nos.
4.	H.S. Breakout with Adhesive		1 Nos.		1 Nos.		1 Nos.
5.	Stress control mastic	W-20mm L-100mm	3 Nos.	W-20mm L-120mm	3 Nos.	W-20mm L-120mm	3 Nos.
6.	Non Tracking Red Mastic	W-25mm L-150mm	3 Nos.	W-25mm L-300mm	3 Nos.	W-25mm L-300mm	6 Nos.
	H.S. Non tracking Rain Skirts		3Nos		3Nos		3Nos
7.	Armour earthing						
	i)T.C. earthing braid with lug	25sqmm L-500mm	1 Nos.	25sqmm L-500mm	1 Nos.	25sqmm L-500mm	1 Nos.
	ii)G.I. Back up ring	66 mm x 50 mm	1 Nos.	85 mm x 50 mm	1 Nos.	92 mm x 50 mm	1 Nos.

	iii)S.S. Clips	50 – 90 mm	2 Nos.	80 – 120 mm	2 Nos.	80 – 120 mm	2 Nos.
8.	Metal screen continuity						
	i) T.C. earthing braid	7 sqmm L-150mm	3 Nos.	7 sqmm L-150mm	3 Nos.	7 sqmm L-150mm	6 Nos.
	ii) Roll Spring	Range 17 mm -28 mm	3 Nos.	Range 25 mm - 40 mm	3 Nos.	Range 25 mm -40 mm	3 Nos.
9.	Mechanical Lug with torque controlled shear head bolts	25sqmm to 95 sqmm L-60mm	3 Nos	95 sqmm to 240 sqmm L-112mm	3 Nos	185sqmm to 400 sqmm L-137mm	3 Nos
10.	Filler putty for Mechanical connector		1 Nos.		1 Nos.		1 Nos.
11.	Silicon grease	6 grams	1 Nos.	6 grams	1 Nos.	6 grams	1 Nos.
12.	Aloxide Paper P80	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.
	Aloxide Paper P150	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.
	Aloxide Paper P220	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.
13.	Nylon string for cutting XLPE Insulation	1 Meter	1 Nos.	1 Meter	1 Nos.	1 Meter	1 Nos.
14.	PVC adhesive tape	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.
15.	Core cleaning solvent		1 Nos.		1 Nos.		1 Nos.
16.	Cleaning Cloth	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.
17.	Copper binding wire	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.
18.	Copper binding wire	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.
19.	Packing List		1 Nos.		1 Nos.		1 Nos.
20.	Instruction Manual		1 Nos.		1 Nos.		1 Nos.

c) The contents of each 33 kV Heat Shrinkable Indoor Terminations Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 33 kV Indoor Cable		3C X 120 sq.mm to 240 sq.mm 33 kV Indoor Cable		3C X 240 sq.mm to 400 sq.mm 33 kV Indoor Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Non Tracking Main Tube	50/16 mm L – 800mm	3 Nos.	50/16 mm L – 800mm	3 Nos.	62/21 mm L – 800mm	3 Nos.
2.	H.S. stress control tubing	46/19mm L – 260mm	3Nos.	46/19mm L – 260mm	3Nos.	54/24mm L – 260mm	3Nos.
3.	H.S. Non tracking Lug Seal Tube with Non Tracking Adhesive coated.	50/16mm L – 100mm	3 Nos.	50/16mm L – 120mm	3 Nos.	62/21mm L – 150mm	3 Nos.
4.	H.S. Breakout with Adhesive		1 Nos.		1 Nos.		1 Nos.
5.	Stress control mastic	W-20mm L-120mm	3 Nos.	W-20mm L-120mm	3 Nos.	W-20mm L-150mm	3 Nos.
6.	Non Tracking Red Mastic	W-25mm L-150mm	3 Nos.	W-25mm L-300mm	3 Nos.	W-25mm L-300mm	6 Nos.
	H.S. Non tracking Rain Skirts		6Nos		6Nos		6Nos
7.	Armour earthing						
	i)T.C. earthing braid with lug	35sqmm L-500mm	1 Nos.	35sqmm L-500mm	1 Nos.	35sqmm L-500mm	1 Nos.
	ii)G.I. Back up ring	77 mm x 50 mm	1 Nos.	92 mm x 50 mm	1 Nos.	105 mm x 50 mm	1 Nos.
	iii)S.S. Clips	50 – 90 mm	2 Nos.	80 – 120 mm	2 Nos.	90 – 150 mm	2 Nos.
8.	Metal screen continuity						

	i) T.C. earthing braid	7 sqmm L-150mm	3 Nos.	7 sqmm L-150mm	3 Nos.	7 sqmm L-150mm	6 Nos.
	ii) Roll Spring	Range 25 mm -40 mm	3 Nos.	Range 25 mm - 40 mm	3 Nos.	Range 36 mm -60 mm	3 Nos.
9.	Mechanical Lug with torque controlled shear head bolts	25sqmm to 95 sqmm L-60mm	3 Nos	95 sqmm to 240 sqmm L-112mm	3 Nos	185sqmm to 400 sqmm L-137mm	3 Nos
10.	Filler putty for Mechanical connector		1 Nos.		1 Nos.		1 Nos.
11.	Silicon grease	6 grams	2 Nos.	6 grams	2 Nos.	6 grams	2 Nos.
	Aloxide Paper P80	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.
	Aloxide Paper P150	40cmX25mm	3 Nos.	40cmX25mm	3Nos.	40cmX25mm	3 Nos.
12.	Aloxide Paper P220	40cmX25mm	3 Nos.	40cmX25mm	3 Nos.	40cmX25mm	3 Nos.
13.	Nylon string for cutting XLPE Insulation	1 Meter	1 Nos.	1 Meter	1 Nos.	1 Meter	1 Nos.
14.	PVC adhesive tape	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.
15.	Core cleaning solvent		1 Nos.		1 Nos.		1 Nos.
16.	Cleaning Cloth	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.
17.	Copper binding wire	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.
18.	Copper binding wire	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.
19.	Packing List		1 Nos.		1 Nos.		1 Nos.
20.	Instruction Manual		1 Nos.		1 Nos.		1 Nos.

### 8.0 Heat Shrinkable Outdoor Terminations Kit Contents:

Heat Shrinkable Outdoor Terminations Kit required for 11kV, 22kV and 33kV Cables to be used for various different sizes of 11kV, 22kV and 33kV armoured, HT, PVC/XLPE, Aluminum/Copper conductor cables.

- a) The contents of each 11 kV Heat Shrinkable Outdoor Terminations Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 11 kV Outdoor Cable		3C X 120 sq.mm to 240 sq.mm 11 kV Outdoor Cable		3C X 240 sq.mm to 400 sq.mm 11 kV Outdoor Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Non Tracking Main Tube	38/12 mm L - 650mm	3 Nos.	38/12 mm L - 650mm	3 Nos.	50/16 mm L - 650mm	3 Nos.
2.	H.S. stress control tubing	26/12mm L - 130mm	3Nos.	32/14mm L - 130mm	3Nos.	46/19mm L - 130mm	3Nos.
3.	H.S. Non tracking Lug Seal Tube with Non Tracking Adhesive coated.	38/12mm L - 100mm	3 Nos.	50/16mm L - 120mm	3 Nos.	50/16mm L - 150mm	3 Nos.
4.	H.S. Breakout with Adhesive		1 Nos.		1 Nos.		1 Nos.
5.	Stress control mastic	W-20mm L-100mm	3 Nos.	W-20mm L-100mm	3 Nos.	W-20mm L-120mm	3 Nos.
6.	Non Tracking Red Mastic	W-25mm L-150mm	3 Nos.	W-25mm L-300mm	3 Nos.	W-25mm L-300mm	3 Nos.
7.	H.S. Non tracking Rain Skirts		6 Nos.		6 Nos.		6 Nos.
8.	Armour earthing						
	i)T.C. earthing braid with lug	25sqmm L-500mm	1 Nos.	25sqmm L-500mm	1 Nos.	25sqmm L-500mm	1 Nos.
	ii)G.I. Back up ring	54 mm x 50 mm	1 Nos.	71 mm x 50 mm	1 Nos.	85 mm x 50 mm	1 Nos.

	iii)S.S. Clips	50 – 90 mm	2 Nos.	50 – 90 mm	2 Nos.	80 – 120 mm	2 Nos.
9.	Metal screen continuity						
	i) T.C. earthing braid	7 sqmm L-150mm	3 Nos.	7 sqmm L-150mm	3 Nos.	7 sqmm L-150mm	6 Nos.
	ii) Roll Spring	Range 17 mm - 28 mm	3 Nos.	Range 17 mm - 28 mm	3 Nos.	Range 25 mm -40 mm	3 Nos.
10.	Mechanical Lug with torque controlled shear head bolts	25sqmm to 95 sqmm L-60mm	3 Nos	95 sqmm to 240 sqmm L-112mm	3 Nos	185sqmm to 400 sqmm L-137mm	3 Nos
11.	Filler putty for Mechanical connector		1 Nos.		1 Nos.		1 Nos.
12.	Silicon grease	6 grams	1 Nos.	6 grams	1 Nos.	6 grams	1 Nos.
	Aloxide Paper P80	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.
	Aloxide Paper P150	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.
13.	Aloxide Paper P220	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.
14.	Nylon string for cutting XLPE Insulation	1 Meter	1 Nos.	1 Meter	1 Nos.	1 Meter	1 Nos.
15.	PVC adhesive tape	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.
16.	Core cleaning solvent		1 Nos.		1 Nos.		1 Nos.
17.	Cleaning Cloth	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.
18.	Copper binding wire	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.
19.	Copper binding wire	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.
20.	Packing List		1 Nos.		1 Nos.		1 Nos.
21.	Instruction Manual		1 Nos.		1 Nos.		1 Nos.

b) The contents of each 22 kV Heat Shrinkable Outdoor Terminations Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 22 kV Outdoor Cable		3C X 120 sq.mm to 240 sq.mm 22 kV Outdoor Cable		3C X 240 sq.mm to 400 sq.mm 22 kV Outdoor Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Non Tracking Main Tube	38/12 mm L – 800mm	3 Nos.	50/16 mm L – 800mm	3 Nos.	50/16 mm L – 800mm	3 Nos.
2.	H.S. stress control tubing	32/14mm L – 190mm	3Nos.	46/19mm L – 190mm	3Nos.	46/19mm L – 190mm	3Nos.
3.	H.S. Non tracking Lug Seal Tube with Non Tracking Adhesive coated.	38/12mm L – 100mm	3 Nos.	50/16mm L – 120mm	3 Nos.	50/16mm L – 150mm	3 Nos.
4.	H.S. Breakout with Adhesive		1 Nos.		1 Nos.		1 Nos.
5.	Stress control mastic	W-20mm L-100mm	3 Nos.	W-20mm L-120mm	3 Nos.	W-20mm L-120mm	3 Nos.
6.	Non Tracking Red Mastic	W-25mm L-150mm	3 Nos.	W-25mm L-300mm	3 Nos.	W-25mm L-300mm	3 Nos.
7.	H.S. Non tracking Rain Skirts		9 Nos.		9 Nos.		9 Nos.
8.	Armour earthing						
	i)T.C. earthing braid with lug	25sqmm L-500mm	1 Nos.	25sqmm L-500mm	1 Nos.	25sqmm L-500mm	1 Nos.
	ii)G.I. Back up ring	66 mm x 50 mm	1 Nos.	85 mm x 50 mm	1 Nos.	92 mm x 50 mm	1 Nos.
	iii)S.S. Clips	50 – 90 mm	2 Nos.	80 – 120 mm	2 Nos.	80 – 120 mm	2 Nos.
9.	Metal screen continuity						
	i) T.C. earthing braid	7 sqmm	3 Nos.	7 sqmm	3 Nos.	7 sqmm	6 Nos.

		L-150mm		L-150mm		L-150mm	
	ii) Roll Spring	Range 17 mm -28 mm	3 Nos.	Range 25 mm - 40 mm	3 Nos.	Range 25 mm -40 mm	3 Nos.
10.	Mechanical Lug with torque controlled shear head bolts	25sqmm to 95 sqmm L-60mm	3 Nos	95 sqmm to 240 sqmm L-112mm	3 Nos	185sqmm to 400 sqmm L-137mm	3 Nos
11.	Filler putty for Mechanical connector		1 Nos.		1 Nos.		1 Nos.
12.	Silicon grease	6 grams	1 Nos.	6 grams	1 Nos.	6 grams	1 Nos.
	Aloxide Paper P80	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.
	Aloxide Paper P150	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.
13.	Aloxide Paper P220	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.	40cmX25mm	2 Nos.
14.	Nylon string for cutting XLPE Insulation	1 Meter	1 Nos.	1 Meter	1 Nos.	1 Meter	1 Nos.
15.	PVC adhesive tape	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.
16.	Core cleaning solvent		1 Nos.		1 Nos.		1 Nos.
17.	Cleaning Cloth	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.
18.	Copper binding wire	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.
19.	Copper binding wire	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.
20.	Packing List		1 Nos.		1 Nos.		1 Nos.
21.	Instruction Manual		1 Nos.		1 Nos.		1 Nos.

c) The contents of each 33 kV Heat Shrinkable Outdoor Terminations Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 33 kV Outdoor Cable		3C X 120 sq.mm to 240 sq.mm 33 kV Outdoor Cable		3C X 240 sq.mm to 400 sq.mm 33 kV Outdoor Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Non Tracking Main Tube	50/16 mm L - 1200mm	3 Nos.	50/16 mm L - 1200mm	3 Nos.	62/21 mm L - 1200mm	3 Nos.
2.	H.S. stress control tubing	46/19mm L - 260mm	3Nos.	46/19mm L - 260mm	3Nos.	54/24mm L - 190mm	3Nos.
3.	H.S. Non tracking Lug Seal Tube with Non Tracking Adhesive coated.	50/16mm L - 100mm	3 Nos.	50/16mm L - 120mm	3 Nos.	62/21mm L - 150mm	3 Nos.
4.	H.S. Breakout with Adhesive		1 Nos.		1 Nos.		1 Nos.
5.	Stress control mastic	W-20mm L-120mm	3 Nos.	W-20mm L-120mm	3 Nos.	W-20mm L-150mm	3 Nos.
6.	Non Tracking Red Mastic	W-25mm L-150mm	3 Nos.	W-25mm L-300mm	3 Nos.	W-25mm L-300mm	6 Nos.
7.	H.S. Non tracking Rain Skirts		15 Nos.		15 Nos.		15 Nos.
8.	Armour earthing						
	i)T.C. earthing braid with lug	35sqmm L-500mm	1 Nos.	35sqmm L-500mm	1 Nos.	35sqmm L-500mm	1 Nos.
	ii)G.I. Back up ring	77 mm x 50 mm	1 Nos.	92 mm x 50 mm	1 Nos.	105 mm x 50 mm	1 Nos.
	iii)S.S. Clips	50 - 90 mm	2 Nos.	80 - 120 mm	2 Nos.	90 - 150 mm	2 Nos.
9.	Metal screen continuity						
	i) T.C. earthing braid	7 sqmm L-150mm	3 Nos.	7 sqmm L-150mm	3 Nos.	7 sqmm L-150mm	6 Nos.
	ii) Roll Spring	Range 25 mm -40 mm	3 Nos.	Range 25 mm - 40 mm	3 Nos.	Range 36 mm -60 mm	3 Nos.

10.	Mechanical Lug with torque controlled shear head bolts	25sqmm to 95 sqmm L-60mm	3 Nos	95 sqmm to 240 sqmm L-112mm	3 Nos	185sqmm to 400 sqmm L-137mm	3 Nos
11.	Filler putty for Mechanical connector		1 Nos.		1 Nos.		1 Nos.
12.	Silicon grease	6 grams	2 Nos.	6 grams	2 Nos.	6 grams	2 Nos.
	Aloxide Paper P80	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.	40cmX25mm	1 Nos.
	Aloxide Paper P150	40cmX25mm	3 Nos.	40cmX25mm	3Nos.	40cmX25mm	3 Nos.
13.	Aloxide Paper P220	40cmX25mm	3 Nos.	40cmX25mm	3 Nos.	40cmX25mm	3 Nos.
14.	Nylon string for cutting XLPE Insulation	1 Meter	1 Nos.	1 Meter	1 Nos.	1 Meter	1 Nos.
15.	PVC adhesive tape	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.	W-25mm L-5Meter	1 Nos.
16.	Core cleaning solvent		1 Nos.		1 Nos.		1 Nos.
17.	Cleaning Cloth	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.	300mm X 300mm	1 Nos.
18.	Copper binding wire	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.	18 SWG x 2000 mm	1 Nos.
19.	Copper binding wire	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.	20 SWG x 1000 mm	1 Nos.
20.	Packing List		1 Nos.		1 Nos.		1 Nos.
21.	Instruction Manual		1 Nos.		1 Nos.		1 Nos.

### 9.0 Details of Heat Shrinkable Indoor and Outdoor Terminations Kit Contents:

- i) The above mentioned Heat Shrinkable Indoor and Outdoor Terminations are specified for general guidance. However bidder / supplier shall include necessary components in the Heat Shrinkable Indoor and Outdoor Terminations kit for improving performance and thorough Heat Shrinkable Indoor and Outdoor Terminations of HV cables thereby restoring continuity of the cable parts giving same performance as that of cable. The bidder shall give full justification for inclusion of necessary components in the Terminations kit.
- ii) The bidder shall furnish complete list of components describing functioning of each component along with the offer. Various tapes, wires etc. listed above shall be supplied in standard lengths, sizes etc.
- iii) All these components shall have adequate dimensions and also electrical, chemical, mechanical and physical properties, generally as per prevailing/applicable standards amended to-date, to ensure reliability of joints to be installed.
- iv) The Heat Shrinkable Indoor and Outdoor Terminations kits shall be suitable for storage without deteriorating at a temperature upto 50<sup>0</sup> Celsius under normal conditions of storage and shall have unlimited shelf storage life. The certificate of shelf life shall be submitted along with the offer. The jointing procedure should be quick, simple and absolutely reliable.
- v) For identification purpose, a suitable name plate made of acrylic sheet (Thickness: 04 to 05 mm , Size:- Width: 50 mm, Length: 70 mm) shall be provided below the crutch region. Nameplate shall be suitably packed in polyethylene bag/aluminum foil pouch (with sealing arrangement at one end) and shall be provided for each termination kit on which following information shall be engraved. Also holes shall be provided at four corners of identification tag for fixing the tag.

Make -----, Brand-----

P.O.no./date -----, Lot no.----- Supply month/year -----.

### 10.0 Routine Test Certificates of components and Marking on kit:

#### 10.1 Routine Test Certificates:

Certificates regarding routine tests carried out in India, by the supplier on randomly selected vital components such as Self Amalgamating Insulating Tape, Self Amalgamating Semi-

conducting Tape and other vital components generally representing the lot/supply; shall be furnished along with the lot offered for the records of the MSEDCL.

**10.2 Packing of the kit and marking of kit components:**

- a) Each component shall be supplied in separately sealed package. All components together shall form complete jointing kit and packed in cartons bearing legible kit description. Packing cartons shall be sufficiently strong to withstand damage during transport, storage and handling.
- b) For the purpose of identification, each component shall bear legible description such as name of the component, supplier's name, component serial number, batch reference etc. Electrically conducting components shall be marked as "conducting" clearly and permanently.
- c) Instruction manual and bill of materials strictly as per kit contents indicating component dimensions and quantity supplied shall be furnished with the kit.
- d) Instruction manual shall clearly bring out detailed procedure in steps for cable preparation and joint installation with the help of necessary drawings.

**11.0 Tests :**

**A) Type Test:**

The Heat Shrinkable Indoor and Outdoor Terminations Kit offered in the Bid should have been successfully type tested at NABL laboratories for the tests indicated as follow in line with the IS:13573(Part 2),2011; IS:13573(Part 3),2011 and technical specification. These Type Tests should have been carried out within five years prior to the date of opening of tender. The bidder shall be required to submit complete set of the type test reports along with the offer.

In case these type tests are conducted earlier than five years, all the type tests as per the relevant standard shall be carried out by the successful bidder at NABL in presence of purchaser's representative free of cost before commencement of supply. The undertaking to this effect should be furnished along with the offer without which the offer shall be liable for rejection.

If there is any change in the design/ type of old type tested Heat Shrinkable Indoor and Outdoor Terminations Kit to be offered against this specification, then the offer is considered for placement of order. However, successful bidders have to carry out the said type tests on offered Heat Shrinkable Indoor and Outdoor Terminations Kit before commencement of supply at their own expense.

Type Tests:

- 1) Conductor Resistance.
- 2) AC or DC Voltages Test.
- 3) AC (Wet)Test.
- 4) Test at Elevated Temperature.
- 5) Partial Discharge Test.
- 6) Impulse Voltage Test.
- 7) Heating Cycle Test in air.
- 8) Thermal Short Circuit Test (Conductor).
- 9) Impulse Withstands.
- 10) Dynamic Short Circuit Test.

- 11) Humidity.  
 12) Salt Fog  
 13) Examination.

**B. Test Sequences and Requirements for Terminations**

Sr. No.	Test	Requirements	Test Method as IS:13573 (Part 2)	Test Sequence				
				1.1	1.2	1.3	1.4	1.5
1.	Conductor Resistance	-----	4.1	X	X	X	X	X
2.	a) AC or DC Voltages	Ac for 5 min at $4.5U_0$ or DC for 15 min at $4U_0$	4.2 or 5	X	X	X	---	---
	b) AC(Wet)	1 minute at $4U_0$ ref.2	4.2	X	---	---	---	---
3.	Partial Discharge	10pC max at $1.73U_0$	7	X	---	---	---	---
4.	Impulse at $\ominus_t$ , ref.3	10 impulses of each polarity	6	X	---	---	---	---
5.	Heating Cycles in air	60 cycles ref.4 at $\ominus_t$ , ref.3 and $2.5U_0$	9.1 and 9.2	X	---	---	---	---
6.	Partial Discharge at $\ominus_t$ , ref.3,5 and ambient temperature	10pC max at $1.73U_0$	7	X	---	---	---	---
7.	Thermal Short Circuit Test (Screen) ref.6	Two short circuit at $I_{sc}$ of the cable screen. No visible deterioration.	10	---	X	X Ref 7	---	---
8.	Thermal Short Circuit Test (Conductor)	Two short circuit to raise conductor to $\ominus_{sc}$ of the cable. No visible deterioration.	11	---	X	X Ref 7	---	---
9.	Dynamic Short Circuit ref.8	One short circuit at $I_d$ . No visible deterioration.	12	---	---	X Ref 7	---	---
10.	Impulse	10 impulses at each polarity	6	X	X	X	---	---
11.	AC voltage	15 min. at $2.5U_0$	4.2	X	X	X	---	---
12.	Humidity ref. 9, 10	300 hrs at $1.25U_0$	13	---	---	---	X	---
13.	Salt Fog ref. 2, 10	1000 hrs at $1.25U_0$	13	---	---	---	---	X
14.	Examination	For information only.ref 7.	-----	X	X	X	X	X

1) Unless otherwise specified, tests shall be carried out at ambient temperature.



- 2) For Outdoor Terminations only.
  - 3)  $\theta_t$  is the maximum cable conductor temperature in normal operation from +5 to +10°C.
  - 4) 8 h total with  $\geq 2$  h steady and  $\geq 3$  h cooling.
  - 5) Measurement is made at the end of the heating period.
  - 6) This test is only required for terminations that are equipped with a connection to, or adaptor for, the metallic screen of the cable.
  - 7) Thermal short circuit may be combined with the dynamic short circuit.
  - 8) Only required for single core cable accessories designed for initial peak currents  $i_p > 80$  kA and three core cable accessories designed for  $i_p > 63$  kA. Value of  $i_d$  shall be declared by manufacturer.
  - 9) For Indoor Terminations only. Not required for compound filled terminal boxes. Shrouded terminations shall be tested in a three phase condition.
  - 10) Not required for terminations having porcelain insulators.
  - 11) It is advised that the accessory is examined for signs of any of following:
    - a) Cracking in the filling media and / or tape or tube components; and / or
    - b) A moisture path across a primary seal; and / or
    - c) Corrosion and / or tracking and / or erosion which would, in time, lead to failure of accessory; and / or
    - d) Leakage of any insulating material.
- B) Routine Test:**
- 1) Electric Strength test for Anti tracking tubing.
  - 2) Elongation tests for all types of tubing.
  - 3) Tensile Strength.
- C) Acceptance Tests:**
- 1) Visual Inspection: The offered kits shall be free from any visible defects.
  - 2) Physical verification of contents: All the contents shall be checked as per kit contents list enclosed by the Bidder.
  - 3) Electric Strength test for insulation tubing.
  - 4) Elongation tests for all types of tubing.
  - 5) Wall thickness ratio in expanded condition.
  - 6) Longitudinal change after full recovery.
  - 7) Tracking and corrosion resistance test.
  - 8) Verification of bill of material.
  - 9) Tensile Strength.
  - 10) Volume resistivity.

## 12.0 Inspection :

- i) The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative at any reasonable time when the work is in progress. All facilities must be made available by supplier/ manufacturer for unrestricted inspection of the works, raw material & manufacture of all the accessories & for conducting necessary tests as declared therein.
- ii) The supplier shall keep the purchaser informed, in advance, of the time of starting and of the progress of manufacture of Heat Shrinkable Indoor and Outdoor Terminations Kit in its various stages so that arrangement should be made for inspection.

- iii) No Heat Shrinkable Indoor and Outdoor Terminations Kit shall be dispatched from its point of manufacture unless the Heat Shrinkable Indoor and Outdoor Terminations Kit has been satisfactorily inspected and tested.
- iv) Inspection and acceptance of any Heat Shrinkable Indoor and Outdoor Terminations Kit under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing Heat Shrinkable Indoor and Outdoor Terminations Kit in accordance with the specification and shall not prevent subsequent rejection, if the Heat Shrinkable Indoor and Outdoor Terminations Kit is found to be defective.

**13.0 Qualifying requirements:-**

The Bidder should have proven experience of not less than 5 years in design, manufacture, supply, and testing at works for the Heat Shrinkable Indoor and Outdoor Terminations Kit offered of equal or higher voltage class. The Heat Shrinkable Indoor and Outdoor Terminations Kit offered by the Bidder should be in successful operation at least for 2 years as on the date of submission of the tender.

**14.0 Quality Assurance Plan :-**

- A) The Bidder shall invariably furnish the following information along with his offer, failing which his offer shall be liable for rejection. Information shall be given for offered Heat Shrinkable Indoor and Outdoor Terminations Kit.
  - i) Statement giving list of important raw materials, including but not limited to:
    - a. Conductor
    - b. Insulation
    - c. Sealing material
  - ii) Names of sub suppliers for the raw materials, list of standards according to which the raw materials are tested, list of Tests normally carried out on raw materials in presence of bidder's representative, copies of Test Certificates. Information and copies of Test Certificates as in (i) above in respect of bought out materials.
  - iii) List of manufacturing facilities available.
  - iv) List of areas in manufacturing process, where inspections are normally carried out for quality control and details of such tests and inspections.
  - v) Special features provided in the Heat Shrinkable Indoor and Outdoor Terminations to make it maintenance free.
- B) The successful Bidder shall, within 30 days of placement of order, submit following information to the Purchaser.
  - i) List of raw materials as well as bought out accessories and the names of sub suppliers selected from those furnished along with offer.
  - ii) Test Certificates of the raw material and bought out accessories.
  - iii) Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plan and purchaser's hold points shall be discussed between the purchaser and supplier, before the QAP is finalized.
- C) The successful Bidder shall submit the routine test certificates of bought out accessories at the time of routine testing of the Heat Shrinkable Heat Shrinkable Indoor and Outdoor Terminations Kit. The successful bidder shall also be required to submit copies of central excise gate passes for raw material.

**15.0 Performance Guarantee :-**

The Heat Shrinkable Heat Shrinkable Indoor and Outdoor Terminations Kits shall be suitable for storage without deteriorating at a temperature up to 50° Celsius under normal conditions of storage and shall have unlimited shelf storage life. The stored joints Kits materials found defective, it shall be replaced by the supplier free of cost within one month of receipt of intimation.

The Heat Shrinkable Indoor and Outdoor Terminations Kit offered shall be guaranteed for satisfactory performance for a period of 60 months from the date of satisfactory commissioning. In case of failure within this period, the supplier shall make necessary replacement of the faulty Heat Shrinkable Heat Shrinkable Indoor and Outdoor Terminations Kit at no extra cost to the purchaser.

If the faulty, defective stored Terminations Kits materials are not replaced as per the above guarantee clause, the Company shall recover an equivalent amount plus 15% supervision charges from any of the supplier's bills.

**16.0 Documentation :-**

**A) List of Documents :-**

The bidder shall furnish two sets of the following Documents along with his offer.

- a) Type Test reports in case the Heat Shrinkable Indoor and Outdoor Terminations Kit has already been type tested.
  - b) Test reports, literature, pamphlets of the bought out items, and raw material
  - c) Bill of material and packing list.
- B)** The successful bidders shall submit one set of Type Test reports for purchaser's approval after placement of LOI. The purchaser shall communicate his comments / approval on the Type Test reports to the supplier within one weeks. Chief Engineer (Testing and Quality Control) will convey the Type Test reports approval.
- C)** Adequate copies of Test Certificates, duly approved by the purchaser, shall accompany the dispatched consignment.
- D)** The manufacturing of the Heat Shrinkable Indoor and Outdoor Terminations Kit shall be strictly in accordance with the approved Type Test reports and no deviation shall be permitted without the written approval of the purchaser.
- E)** One set of nicely printed and bound volume of operation, maintenance and erection manuals in English language per Heat Shrinkable Indoor and Outdoor Terminations of each voltage rating shall be submitted by the supplier to respective consignees along with the dispatch documents of each unit. The manual shall contain all the drawings and information required for erection, operation and maintenance of the Heat Shrinkable Indoor and Outdoor Terminations. The manual shall also contain a set of all the approved Type Test reports etc.
- F)** Approval of Type Test reports by purchaser shall not relieve the supplier of his responsibility and liability for ensuring correctness and correct interpretation for meeting the requirement of the Technical Specification, latest revision of applicable standards, rules and codes of practices. The Heat Shrinkable Indoor and Outdoor Terminations shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject any work or materials which, in his judgment, is not in full accordance therewith.

**17.0 Information to be filled / furnished invariably by Bidder:**

The offer shall be complete in all respects, failing which the same are liable for rejection. Guaranteed technical particulars for Heat Shrinkable Indoor and Outdoor Terminations Kit shall be elaborate and complete in all respects. It may be noted that the technical evaluation of the tender is made mainly based on the guaranteed technical particulars and deviations from the specifications furnished along with the technical offer.

**18.0 Guaranteed Technical Particulars :**

The bidder should fill up the details in Schedule 'A-1 to A-6' - 'Guaranteed Technical Particulars' and the statement such as "as per drawing enclosed", "as per MSEDCL requirement", "as per IS", "as per specification" etc. shall be considered as details not furnished and such offers will be rejected.

**19.0 Schedules :**

The bidder shall fill in the following Schedule which forms part of the Tender Specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule - 'A' -Guaranteed Technical Particulars of the Heat Shrinkable Indoor and Outdoor Terminations.

Schedule - 'B' - Bidder's Experience

The Bidder shall submit the list of orders for similar Heat Shrinkable Indoor and Outdoor Terminations Kit executed or under execution during last five years, with full details, in the schedule of Bidders experience (Schedule "B") to enable the purchaser to evaluate the tender. In case the Heat Shrinkable Indoor and Outdoor Terminations Kit are being designed and manufactured in collaboration with other manufacturer, the following additional information shall be submitted by the Bidder along with his offer.

- (i) Copy of collaboration agreement executed between the bidder and the collaborator.
- (ii) List of orders for similar Heat Shrinkable Indoor and Outdoor Terminations Kits, executed / being executed by the collaborator during last ten years and performance certificate for seven years of satisfactory operation.

**SCHEDULE 'A'****Guaranteed Technical Particulars for HT Heat Shrinkable Indoor and Outdoor Terminations kit**

<b>Sr. No.</b>	<b>Particulars of GTP Parameter</b>	<b>MSEDCL Requirement</b>	<b>Offer</b>
1.	Manufacturer's Name and Address		TEXT
2.	Manufacturer's kit Type		TEXT
3.	Rated Voltage in KV	11kV, 22kV and 33kV	NUMERICAL
4.	Frequency (HZ)	50 Hz	NUMERICAL
5.	Equipment Conforming to Standards	IS: 13573- Part 2, 2011	TEXT
6.	Kit Storage Temperature	50° C max	TEXT
7.	Material to be used	Polyolefin	TEXT
8.	Type Of Kit Offered	a) Indoor Termination b) Outdoor Termination	TEXT
9.	Shelf life of components in the kit	Unlimited	TEXT
10.	Time Required for energization after completion of joint	Immediate	TEXT
11.	Conductor resistance test(As per cable cross section area)	Conductor resistance shall not vary more than 10% of initial value	NUMERICAL
12.	A.C. withstand voltage ph/ground) @ 4.5 U <sub>o</sub>	4.5 U <sub>o</sub> for 5 min	NUMERICAL
13.	Heat Cycle in air 8 hours total with > 2hours steady heating and >3 hours cooling	60 Cycles at 2.5U <sub>o</sub>	NUMERICAL
14.	Partial discharge test @ 1.73 U <sub>o</sub> 10 <sub>p</sub> C max at max temp as well as room temperature	Max 10 pC	NUMERICAL
15.	Triple extruded hybrid tube	Size as per specification	TEXT
16.	Dielectric Strength for 1) Anti tracking Tubing.	1) 18 Min.	NUMERICAL
17.	Dielectric constant for 1) Stress control tube. 2) Anti tracking Tubing. 3) Stress control mastic	1) 15 Min. 2) 3.5 Min. 3) 9.0 Min.	NUMERICAL
18.	Tensile strength for 1) Stress control tube. 2) Anti tracking Tubing.	8N/mm <sup>2</sup> (common for each)	NUMERICAL
19.	Ultimate Elongation for	1) 50%.	NUMERICAL

	1) Stress control tube. 2) Anti tracking tube	2) 100%.	
20.	Water Absorption for 1) Stress control tube. 2) Anti tracking Tubing. 3) Stress control mastic	1) 0.3%. 2) 0.3%. 3) 0.5%.	NUMERICAL
21.	Longitudinal Change for 1) Stress control tube. 2)Anti tracking tube	10%.	NUMERICAL
22.	Heat Shock for 1) Stress control tube. 2) Anti tracking Tubing.	30 min. @ 200°C.	NUMERICAL
23.	Mechanical Lug with Shear bolt	As per specification	
24.	Service Temperature for Stress control mastic	90°C	NUMERICAL
25.	List Of Contents Of Kit(To be Furnished Separately)	Detailed component list with Quantity etc.	TEXT

Note:

These values are indicated in IS-13573 part-II at clause no.4.4.2, 4.5.2&5.1,  
IS-13573 part-III at clause no.4.1(in accordance with IS -10810) 7.1,9&13

**Schedule 'B'**  
**Schedule of Bidder's Experience**

Bidder shall furnish here a list of similar orders executed/under execution by him to whom a reference may be made by Purchaser in case he considers such a reference necessary.

Sr. No.	Name of Client & Description order	Value of order along with size & qty	Period of supply and commissioning	Name & Address to whom reference may be made
1.				
2.				
3.				
4.				
5.				
6.				
7.				

Name of the firm\_\_\_\_\_

Signature of the bidder\_\_\_\_\_

Designation\_\_\_\_\_

Date\_\_\_\_\_