



Maharashtra State Electricity Distribution Company Limited

SPECIFICATION NO. T & QC: MSC-I/ Heat Shrinkable Straight through joints and Transition joints for HT Cables/2019/06

Technical Specification

of

Heat Shrinkable Straight through joints and Transition joints for
11 kV, 22 kV and 33kV Cables

For

Distribution System

In

MSEDCL

I N D E X

Clause No.	Contents
1.	Scope
2.	System Particulars
3.	Service Condition
4.	Applicable Standards
5.	Principle Technical Parameters of Heat Shrinkable Straight through joints and Transition joints
6.	Properties of Heat Shrinkable Components
7.	Heat Shrinkable Straight through joints Kit Contents
8.	Heat Shrinkable Transition joints Kit Contents
9.	Details of Heat Shrinkable Straight through joints and Transition joints Kit Contents
10.	Routine Test Certificates of components and Marking on kit
11.	Tests
12.	Inspection
13.	Qualifying requirements
14.	Quality Assurance Plan
15.	Performance Guarantee
16.	Documentation
17.	Information to be filled / furnished invariably by Bidder
18.	Guaranteed Technical Particulars
19.	Schedules
	Schedule 'A' ... Guaranteed and technical particulars .
	Schedule 'B' ... Tender's experience

MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.

Technical Specification of Heat Shrinkable Straight through joints and Transition joints 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 Straight through joints and Transition joints for dissimilar cables suitable for Armoured, HT, PVC/XLPE, Aluminum/Copper conductor cables as per IS:13573:2011. The Heat Shrinkable Straight through joints and Transition joints for 11 kV, 22 kV and 33kV Cables in MSDDL, Maharashtra. The Heat Shrinkable Straight through joints and Transition joints 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 Straight through joints and Transition joints shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.
- 1.2** The Heat Shrinkable Straight through joints and Transition joints 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 Straight through joints and Transition joints. The Heat Shrinkable Straight through joints and Transition joints 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 Straight through joints and Transition joints offered shall be reliable, fast and easy-to-install jointing 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

Specification of Heat Shrinkable Straight through joints and Transition joints for 11kV, 22kV and 33kV Cables

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 Straight through joints and Transition joints 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	Isoceran 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 Straight through joints and Transition joints 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 Straight through joints and Transition joints 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 Straight through joints and Transition joints 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 Straight through joints and Transition joints:

Specification of Heat Shrinkable Straight through joints and Transition joints for 11kV, 22kV and 33kV Cables

- a) The Heat Shrinkable Straight through joints and Transition joints materials & components shall be offered in the form of kits. The kits shall be supplied complete with all necessary tubing components (Stress Control Tubing / Mechanical Connector / Earthing / Cable Preparation, etc) to form a ready to energize Heat Shrinkable Straight through joints and Transition joints.
- b) Heat Shrinkable Straight through joints and Transition joints suitable for underground burial 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 Straight through joints and Transition joints covered under this specification shall conform to specific parameters given below:
 - i) **Heat Shrink Joint Sleeve and Stress control tubing:**

Heat Shrink Joint Sleeve shall be a triple extruded, heat-shrinkable, elastomeric joint sleeve component.

 - 1) Elastomeric inner insulation layer.
 - 2) Heat shrinkable middle insulation layer.
 - 3) Heat shrinkable outer conductive layer.
 - a. The material for Heat Shrink Joint Sleeve shall be Polyolefin or Ethylene Propylene Diene Monomer (EPDM) Heat Shrinkable Joint Sleeve must be Extruded & Expanded by Irradiation process only as per Energy Networks Associations (ENA) Technical Specification 09-13, Issue 1: 1981.
 - b. The single- triple extruded tubing combining heat shrink and elastomeric technology shall be provided for insulation & screening function for both Heat Shrinkable Straight through joints which minimize interfaces. The single- triple extruded tubing combining should allow extremely tight electrical interfaces due to the shrink force generated. The elastomeric insulation characteristic combined with the rigid outer heat shrinkable screen layer should enable the joint to follow the thermally induced dimensional changes of the cable insulation. The inner layer of elastomer and outer two layers of heat shrink shall provide a tight interface and an active pressure on the cable. The outer heat shrink layer shall be conductive.

Stress Control Tubing shall have below characteristics:

- 1) Volume resistivity : 5 X 10¹⁰ 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) Mechanical Connector with Shear bolt:

- 1) The Mechanical Connector 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 Mechanical Connectors with Shear bolt are to be chamfered at the edges and available with or without oil barrier (as blocked for Transition Joint and unblocked types) depending on the application requirements.
- 3) 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.
- 4) The Mechanical Connectors with Shear bolt should be designed with removable inserts so as to accommodate lower cross section cable conductors & centre it.
- 5) The Mechanical Connector with Shear bolt should be range taking with 3 to 4 sizes covering 25 sq.mm to 400 sq.mm.
- 6) Bidder should furnish necessary drawings/ catalogues for reference.
- 7) Raychem, Tyco, Pfisterer, Niled, Sicame, Nexan Or equivalent make of Mechanical Connector with Shear bolt shall be acceptable. Make of Mechanical Connector with Shear bolt must be technically approved by MSEDCL before supply in jointing kit.

iii) Environmental Sealing:

- 1) Adhesives and sealants shall be provided in the jointing 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.
- 2) The outer black colored heat shrinkable flexible polymeric tubing shall be pre-coated with adhesives to provide sealing of the exposed metallic components / earth connections.

iv) Metallic Shielding:

Metallic shielding shall be made from tinned copper mesh of adequate cross section.

v) Black Mastic Strip:

Black Mastic Strip shall be taped for sealing of the ends of each screened tubing's. Stretch the mastic while applying. Start from 20 mm over the copper tape shield and continue over the semi screen and with 20 mm overlap onto the screened tubing.

vi) Yellow Mastic:

The stress control tubing at each cable end 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.

vii) Screen, Earth continuity, Mechanical protection & outer jacketing:

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. G.I. Metallic Canister (VB Can) is to be provided for mechanical protection.

Adhesive lined, abrasion resistant re-jacketing heat shrink sleeves shall be used for outer jacketing & sealing. Adhesives and sealants shall be provided 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.

viii) Insulation and Screen Reinstatement for Joints:

Bidder shall provide single- triple extruded tubing for straight through which joints to ensure a void-free bond between the rebuilt insulation and non-metallic screen enables the final

insulating layer to be installed complete with a conductive polymeric screen in one step. This single- triple extruded tubing shall be offered with joints. Insulating Sleeves coated with conductive material shall not be permitted. Bidder must provide:-

- Proof that single- triple extruded tubing's are manufactured by means of co-extrusion.
- Conformation of minimum thickness of insulation provided over the connector for maximum size of conductor for which tubing is supplied.
- Proof of accelerated and long term field usage to confirm the retention of key properties within permissible limits due to thermal ageing. Minimum key properties before and after ageing have to be stated.

6.0 Properties of Heat Shrinkable Components:

Sr. No.	Properties	Internal Insulating And External Protective 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	2 Min. to 5 Max.	15 Min.
6.	Tensile Strength	8 N/ mm ² Min.	10 N/ mm ² 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	8 N/ mm ² Min	8 N/ mm ² 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 ¹⁰ ohm meters Min.	1 x 10 ¹⁰ 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

7.0 Heat Shrinkable Straight through joints Kit Contents:

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

- a) The contents of each 11kV Heat Shrinkable Straight through joints Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 11KV Cable		3C X 120 sq.mm to 240 sq.mm 11KV Cable		3C X 300 sq.mm to 400 sq.mm 11KV Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Outer jacketing sleeve	95/25mm L – 750mm	2 Nos.	115/34mm L – 1000mm 115/34mm L – 750mm	1 Nos. 1 Nos.	160/50mm L – 1000mm	2 Nos.
2.	H.S. stress control tubing(Black)	26/12mm L – 100mm	6 Nos.	32/14mm L – 100mm	6 Nos.	46/19mm L – 100mm	6 Nos.
3.	H.S. single- triple extruded tubing combining heat shrink and elastomer technology. Outer layer Heat shrink Conductive, Middle layer Heat shrink Insulation, Inner layer elastomeric Insulation	35/13mm L – 320mm 10mm min. Full recovered thickness	3 Nos.	45/17mm L – 320mm 12mm min. Full recovered thickness	3 Nos.	50/21mm L – 380mm 12mm min. Full recovered thickness	3 Nos.
4.	G.I. wire mesh	6 Meter	2 Rolls	16 Meter	1 Roll	18 Meter	1 Roll
5.	Stress control mastic	W-20mm L-100mm	6 Nos.	W-20mm L-120mm	6 Nos.	W-20mm L-150mm	6 Nos.
6.	Stress Relife patch	110mm X 110mm	3 Nos.	150mm X 150mm	3 Nos.	150mm X 200mm	3 Nos.
7.	Armour earthing						
	i)T.C. earthing braid	25sqmm L-1000mm	1 Nos.	25sqmm L-1200mm	1 Nos.	25sqmm L-1400mm	1 Nos.
	ii)G.I. Back up ring	54mmX50mm	2 Nos.	71mmX50mm	2 Nos.	85mmX50mm	2 Nos.
	iii)S.S. Clips	50-90mm	4 Nos.	50-90mm	4 Nos.	80-120mm	4 Nos.
8.	Metal screen continuity						
	i) Copper woven flexible mesh tape	W-50mm L-2000mm	3 Rolls	W-50mm L-3000mm	3 Rolls	W-50mm L-3000mm	3 Rolls
	ii) Roll Spring	RANGE 17mm -28mm	6 Nos.	RANGE 17mm - 28mm	6 Nos.	RANGE 25 mm - 40 mm	6 Nos.
9.	Mechanical connectors with torque controlled shear head bolts	25 to 95sq.mm L-65mm	3 Nos.	95 to 240sq.mm L-125mm	3 Nos.	185 to 400sq.mm L-170mm	3 Nos.
10.	Filler putty for Mechanical connector	-----	1 Nos.	-----	1 Nos.	-----	1 Nos.
11.	Mastic sealing tape	W-30mm L-200mm	6 Nos.	W-30mm L-300mm	6 Nos.	W-30mm L-300mm	6 Nos.
12.	Silicon grease	6 grams	2 Nos.	6 grams	2 Nos.	6 grams	2 Nos.
13.	Aloxide Paper P80	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
	Aloxide Paper P150	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
	Aloxide Paper P220	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
14.	Nylon string for cutting PVC / XLPE Insulation	1 Meter	1 Nos.	1 Meter	1 Nos.	1 Meter	1 Nos.
15.	PVC adhesive tape	W-25mm L-	1 Nos.	W-25mm L-	1 Nos.	W-25mm L-	1 Nos.

Heat Shrinkable Straight through joints and Transition joints for HT Cables /2019/06

		5Meter		5Meter		5Meter	
16.	Mopping cloth	W-50mm L-5000mm	1 Nos.	W-50mm L-5000mm	1 Nos.	W-50mm L-5000mm	1 Nos.
17.	Core cleaning solvent with cloth		1 Nos.		1 Nos.		1 Nos.
18.	Copper binding wire	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.
19.	Copper binding wire	20SWG x 1000 mm	1 Nos.	20SWG x 1000 mm	1 Nos.	20SWG 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 Straight through joints Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 22KV Cable		3C X 120 sq.mm to 240 sq.mm 22KV Cable		3C X 300 sq.mm to 400 sq.mm 22KV Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Outer jacketing sleeve	115/34mm L - 1000mm	2 Nos.	140/42mm L - 1000mm	2 Nos.	160/50mm L - 1000mm 160/50mm L - 750mm	1 Nos. 2 Nos.
2.	H.S. stress control tubing(Black)	32/14mm L - 120mm	6 Nos.	46/19mm L - 120mm	6 Nos.	46/19mm L - 120mm	6 Nos.
3.	H.S. single- triple extruded tubing combining heat shrink and elastomer technology. Outer layer Heat shrink Conductive, Middle layer Heat shrink Insulation, Inner layer elastomeric Insulation	45/17mm L - 320mm 15mm min. Full recovered thickness	3 Nos.	45/17mm L - 360mm 15mm min. Full recovered thickness	3 Nos.	50/21mm L - 400mm 15mm min. Full recovered thickness	3 Nos.
4.	G.I. wire mesh	6 Meter	2 Rolls	18 Meter	1 Roll	10 Meter	2 Rolls
5.	Stress control mastic	W-20mm L-100mm	6 Nos.	W-20mm L-120mm	6 Nos.	W-20mm L-150mm	6 Nos.
6.	Stress Relife patch	110mm X 110mm	3 Nos.	150mm X 150mm	3 Nos.	150mm X 200mm	3 Nos.
7.	Armour earthing						
	i)T.C. earthing braid	25sqmm L-1200mm	1 Nos.	25sqmm L-1400mm	1 Nos.	25sqmm L-1500mm	1 Nos.
	ii)G.I. Back up ring	66 mm X 50mm	2 Nos.	85 mmX50mm	2 Nos.	92mmX50mm	2 Nos.
	iii)S.S. Clips	50-90mm	4 Nos.	80-120mm	4 Nos.	80-120mm	4 Nos.
8.	Metal screen continuity						
	i) Copper woven flexible mesh tape	W-50mm L-3000mm	3 Rolls	W-50mm L-3000mm	3 Rolls	W-50mm L-4000mm	3 Rolls
	ii) Roll Spring	RANGE 17mm -28mm	6 Nos.	RANGE 25mm - 40 mm	6 Nos.	RANGE 25 mm - 40 mm	6 Nos.
9.	Mechanical connectors with torque controlled shear head bolts	25 to 95sq.mm L-65mm	3 Nos.	95 to 240sq.mm L-125mm	3 Nos.	185 to 400sq.mm L-170mm	3 Nos.
10.	Filler putty for Mechanical connector	-----	1 Nos.	-----	1 Nos.	-----	1 Nos.
11.	Mastic sealing tape	W-30mm L-300mm	6 Nos.	W-30mm L-400mm	6 Nos.	W-30mm L-400mm	6 Nos.
12.	Silicon grease	6 grams	2 Nos.	6 grams	2 Nos.	6 grams	2 Nos.
13.	Aloxide Paper P80	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.

Specification of Heat Shrinkable Straight through joints and Transition joints for 11kV, 22kV and 33kV Cables

Heat Shrinkable Straight through joints and Transition joints for HT Cables /2019/06

	Aloxide Paper P150	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
	Aloxide Paper P220	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
14.	Nylon string for cutting PVC / 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.	Mopping cloth	W-50mm L- 5000mm	1 Nos.	W-50mm L- 5000mm	1 Nos.	W-50mm L- 5000mm	1 Nos.
17.	Core cleaning solvent with cloth		1 Nos.		1 Nos.		1 Nos.
18.	Copper binding wire	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.
19.	Copper binding wire	20SWG x 1000 mm	1 Nos.	20SWG x 1000 mm	1 Nos.	20SWG 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 Straight through joints Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 33KV Cable		3C X 120 sq.mm to 240 sq.mm 33KV Cable		3C X 300 sq.mm to 400 sq.mm 33KV Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Outer jacketing sleeve	140/42mm L – 1000mm	2 Nos.	160/50mm L – 1000mm 160/50mm L – 500mm	2 Nos. 1 Nos.	180/50mm L – 1500mm	2 Nos. 2 Nos.
2.	H.S. stress control tubing(Black)	46/19mm L – 370mm	3 Nos.	60/24mm L – 430mm	3 Nos.	60/24mm L – 480mm	3 Nos.
3.	H.S. single- triple extruded tubing combining heat shrink and elastomer technology. Outer layer Heat shrink Conductive, Middle layer Heat shrink Insulation, Inner layer elastomeric Insulation	50/21mm L – 360mm 18mm min. Full recovered thickness	3 Nos.	65/26mm L – 430mm 18mm min. Full recovered thickness	3 Nos.	65/26mm L – 430mm 18mm min. Full recovered thickness	3 Nos.
4.	G.I. wire mesh	12 Meter	2 Rolls	10 Meter	3 Rolls	16 Meter	2 Rolls
5.	Stress control mastic	W-20mm L-120mm	6 Nos.	W-20mm L-150mm	6 Nos.	W-20mm L-200mm	6 Nos.
6.	Stress control mastic over connector	W-30mm L-600mm	6 Nos.	W-30mm L-600mm	6 Nos.	W-30mm L-600mm	6 Nos.
7.	Armour earthing						
	i)T.C. earthing braid	35sqmm L-1400mm	1 Nos.	35sqmm L-1900mm	1 Nos.	35sqmm L-1900mm	1 Nos.
	ii)G.I. Back up ring	77 mm X 50mm	2 Nos.	92 mmX50mm	2 Nos.	105mmX50mm	2 Nos.
	iii)S.S. Clips	50-90mm	4 Nos.	80-120mm	4 Nos.	90-150mm	4 Nos.
8.	Metal screen continuity						
	i) Copper woven flexible mesh tape	W-50mm L- 4000mm	3 Rolls	W-50mm L-6000mm	3 Rolls	W-50mm L- 6000mm	3 Rolls
	ii) Roll Spring	RANGE 25mm -40mm	6 Nos.	RANGE 25mm - 40 mm	6 Nos.	RANGE 36 mm - 60 mm	6 Nos.
9.	Mechanical connectors with torque controlled shear head bolts	25 to 95sq.mm L-65mm	3 Nos.	95 to 240sq.mm L-125mm	3 Nos.	185 to 400sq.mm L-170mm	3 Nos.
10.	Filler putty for Mechanical connector	-----	1 Nos.	-----	1 Nos.	-----	1 Nos.

Specification of Heat Shrinkable Straight through joints and Transition joints for 11kV, 22kV and 33kV Cables

11.	Mastic sealing tape	W-30mm L-400mm	6 Nos.	W-30mm L-600mm	6 Nos.	W-30mm L-600mm	6 Nos.
12.	Silicon grease	6 grams	2 Nos.	6 grams	2 Nos.	6 grams	2 Nos.
13.	Aloxide Paper P80	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
	Aloxide Paper P150	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (2No Each)	2 Nos.	40cmX25mm (2No Each)	2 Nos.
	Aloxide Paper P220	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (2No Each)	2 Nos.	40cmX25mm (2No Each)	2 Nos.
14.	Nylon string for cutting PVC / 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.	Mopping cloth	W-50mm L- 5000mm	1 Nos.	W-50mm L- 5000mm	1 Nos.	W-50mm L- 5000mm	1 Nos.
17.	Core cleaning solvent with cloth		1 Nos.		1 Nos.		1 Nos.
18.	Copper binding wire	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.
19.	Copper binding wire	20SWG x 1000 mm	2 Nos.	20SWG x 1000 mm	2 Nos.	20SWG x 1000 mm	2 Nos.
20.	Packing List		1 Nos.		1 Nos.		1 Nos.
21.	Instruction Manual		1 Nos.		1 Nos.		1 Nos.

8.0 Heat Shrinkable Transition joints Kit Contents:

Heat Shrinkable Transition joints Kit required for 11kV, 22kV and 33kV Cables to be used for jointing of 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 Transition joints Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 11KV Cable		3C X 120 sq.mm to 240 sq.mm 11KV Cable		3C X 300 sq.mm to 400 sq.mm 11KV Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Outer jacketing sleeve	95/25mm L – 750mm	2 Nos.	115/34mm L – 1000mm 115/34mm L – 750mm	1 Nos. 1 Nos.	160/50mm L – 1000mm	2 Nos.
2.	H.S. stress control tubing(Black)	26/12mm L – 100mm	6 Nos.	32/14mm L – 100mm	6 Nos.	46/19mm L – 100mm	6 Nos.
3.	H.S. single- triple extruded tubing combining heat shrink and elastomer technology. Outer layer Heat shrink Conductive, Middle layer Heat shrink Insulation, Inner layer elastomeric Insulation	35/13mm L – 320mm 10mm min. Full recovered thickness	3 Nos.	45/17mm L – 320mm 12mm min. Full recovered thickness	3 Nos.	50/21mm L – 380mm 12mm min. Full recovered thickness	3 Nos.
4.	G.I. wire mesh	6 Meter	2 Rolls	16 Meter	1 Roll	18 Meter	1 Roll
5.	Stress control mastic	W-20mm L-100mm	6 Nos.	W-20mm L-120mm	6 Nos.	W-20mm L-150mm	6 Nos.
6.	Stress Relife patch	110mm X 110mm	3 Nos.	150mm X 150mm	3 Nos.	150mm X 200mm	3 Nos.
7.	Armour earthing						
	i)T.C. earthing braid	25sqmm L-1000mm	1 Nos.	25sqmm L-1200mm	1 Nos.	25sqmm L-1400mm	1 Nos.
	ii)G.I. Back up ring	54mmX50mm	2 Nos.	71mmX50mm	2 Nos.	85mmX50mm	2 Nos.

Specification of Heat Shrinkable Straight through joints and Transition joints for 11kV, 22kV and 33kV Cables

Heat Shrinkable Straight through joints and Transition joints for HT Cables /2019/06

	iii)S.S. Clips	50-90mm	4 Nos.	50-90mm	4 Nos.	80-120mm	4 Nos.
8.	Metal screen continuity						
	i) Copper woven flexible mesh tape	W-50mm L-2000mm	3 Rolls	W-50mm L-3000mm	3 Rolls	W-50mm L-3000mm	3 Rolls
	ii) Roll Spring	RANGE 17mm -28mm	6 Nos.	RANGE 17mm - 28mm	6 Nos.	RANGE 25 mm - 40 mm	6 Nos.
9.	Mechanical connectors with torque controlled shear head bolts	25 to 95sq.mm L-65mm	3 Nos.	95 to 240sq.mm L-125mm	3 Nos.	185 to 400sq.mm L-170mm	3 Nos.
10.	Filler putty for Mechanical connector	-----	1 Nos.	-----	1 Nos.	-----	1 Nos.
11.	Mastic sealing tape	W-30mm L-200mm	6 Nos.	W-30mm L-300mm	6 Nos.	W-30mm L-300mm	6 Nos.
12.	Silicon grease	6 grams	2 Nos.	6 grams	2 Nos.	6 grams	2 Nos.
13.	Aloxide Paper P80	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
	Aloxide Paper P150	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
	Aloxide Paper P220	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
14.	Nylon string for cutting PVC / 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.	Mopping cloth	W-50mm L-5000mm	1 Nos.	W-50mm L-5000mm	1 Nos.	W-50mm L-5000mm	1 Nos.
17.	Core cleaning solvent with cloth		1 Nos.		1 Nos.		1 Nos.
18.	Copper binding wire	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.
19.	Copper binding wire	20SWG x 1000 mm	1 Nos.	20SWG x 1000 mm	1 Nos.	20SWG 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 Transition joints Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 22KV Cable		3C X 120 sq.mm to 240 sq.mm 22KV Cable		3C X 300 sq.mm to 400 sq.mm 22KV Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Outer jacketing sleeve	115/34mm L – 1000mm	2 Nos.	140/42mm L – 1000mm	2 Nos.	160/50mm L – 1000mm 160/50mm L – 750mm	1 Nos. 2 Nos.
2.	H.S. stress control tubing(Black)	32/14mm L – 120mm	6 Nos.	46/19mm L – 120mm	6 Nos.	46/19mm L – 120mm	6 Nos.
3.	H.S. single- triple extruded tubing combining heat shrink and elastomer technology. Outer layer Heat shrink Conductive, Middle layer Heat shrink Insulation, Inner layer elastomeric Insulation	45/17mm L – 320mm 15mm min. Full recovered thickness	3 Nos.	45/17mm L – 360mm 15mm min. Full recovered thickness	3 Nos.	50/21mm L – 400mm 15mm min. Full recovered thickness	3 Nos.
4.	G.I. wire mesh	6 Meter	2 Rolls	18 Meter	1 Roll	10 Meter	2 Rolls

Specification of Heat Shrinkable Straight through joints and Transition joints for 11kV, 22kV and 33kV Cables

Heat Shrinkable Straight through joints and Transition joints for HT Cables /2019/06

5.	Stress control mastic	W-20mm L-100mm	6 Nos.	W-20mm L-120mm	6 Nos.	W-20mm L-150mm	6 Nos.
6.	Stress Relife patch	110mm X 110mm	3 Nos.	150mm X 150mm	3 Nos.	150mm X 200mm	3 Nos.
7.	Armour earthing						
	i)T.C. earthing braid	25sqmm L-1200mm	1 Nos.	25sqmm L-1400mm	1 Nos.	25sqmm L-1500mm	1 Nos.
	ii)G.I. Back up ring	66 mm X 50mm	2 Nos.	85 mmX50mm	2 Nos.	92mmX50mm	2 Nos.
	iii)S.S. Clips	50-90mm	4 Nos.	80-120mm	4 Nos.	80-120mm	4 Nos.
8.	Metal screen continuity						
	i) Copper woven flexible mesh tape	W-50mm L- 3000mm	3 Rolls	W-50mm L- 3000mm	3 Rolls	W-50mm L- 4000mm	3 Rolls
	ii) Roll Spring	RANGE 17mm -28mm	6 Nos.	RANGE 25mm - 40 mm	6 Nos.	RANGE 25 mm - 40 mm	6 Nos.
9.	Mechanical connectors with torque controlled shear head bolts	25 to 95sq.mm L-65mm	3 Nos.	95 to 240sq.mm L-125mm	3 Nos.	185 to 400sq.mm L-170mm	3 Nos.
10.	Filler putty for Mechanical connector	-----	1 Nos.	-----	1 Nos.	-----	1 Nos.
11.	Mastic sealing tape	W-30mm L- 300mm	6 Nos.	W-30mm L- 400mm	6 Nos.	W-30mm L- 400mm	6 Nos.
12.	Silicon grease	6 grams	2 Nos.	6 grams	2 Nos.	6 grams	2 Nos.
13.	Aloxide Paper P80	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
	Aloxide Paper P150	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
	Aloxide Paper P220	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
14.	Nylon string for cutting PVC / 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.	Mopping cloth	W-50mm L- 5000mm	1 Nos.	W-50mm L- 5000mm	1 Nos.	W-50mm L- 5000mm	1 Nos.
17.	Core cleaning solvent with cloth		1 Nos.		1 Nos.		1 Nos.
18.	Copper binding wire	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.
19.	Copper binding wire	20SWG x 1000 mm	1 Nos.	20SWG x 1000 mm	1 Nos.	20SWG 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 Transition joints Kit shall include the following components:

Sr. No.	Description	3C X 35 sq.mm to 95 sq.mm 33KV Cable		3C X 120 sq.mm to 240 sq.mm 33KV Cable		3C X 300 sq.mm to 400 sq.mm 33KV Cable	
		Size	Quantity	Size	Quantity	Size	Quantity
1.	H.S. Outer jacketing sleeve	140/42mm L – 1000mm	2 Nos.	160/50mm L – 1000mm 160/50mm L – 500mm	2 Nos. 1 Nos.	180/50mm L – 1500mm	2 Nos. 2 Nos.
2.	H.S. stress control tubing(Black)	46/19mm L – 370mm	3 Nos.	60/24mm L – 430mm	3 Nos.	60/24mm L – 480mm	3 Nos.
3.	H.S. single- triple	50/21mm	3 Nos.	65/26mm	3 Nos.	65/26mm	3 Nos.

Specification of Heat Shrinkable Straight through joints and Transition joints for 11kV, 22kV and 33kV Cables

Heat Shrinkable Straight through joints and Transition joints for HT Cables /2019/06

	extruded tubing combining heat shrink and elastomer technology. Outer layer Heat shrink Conductive, Middle layer Heat shrink Insulation, Inner layer elastomeric Insulation	L – 360mm 18mm min. Full recovered thickness		L – 430mm 18mm min. Full recovered thickness		L – 430mm 18mm min. Full recovered thickness	
4.	G.I. wire mesh	12 Meter	2 Rolls	10 Meter	3 Rolls	16 Meter	2 Rolls
5.	Stress control mastic	W-20mm L-120mm	6 Nos.	W-20mm L-150mm	6 Nos.	W-20mm L-200mm	6 Nos.
6.	Stress control mastic over connector	W-30mm L-600mm	6 Nos.	W-30mm L-600mm	6 Nos.	W-30mm L-600mm	6 Nos.
7.	Armour earthing						
	i)T.C. earthing braid	35sqmm L-1400mm	1 Nos.	35sqmm L-1900mm	1 Nos.	35sqmm L-1900mm	1 Nos.
	ii)G.I. Back up ring	77 mm X 50mm	2 Nos.	92 mmX50mm	2 Nos.	105mmX50mm	2 Nos.
	iii)S.S. Clips	50-90mm	4 Nos.	80-120mm	4 Nos.	90-150mm	4 Nos.
8.	Metal screen continuity						
	i) Copper woven flexible mesh tape	W-50mm L- 4000mm	3 Rolls	W-50mm L-6000mm	3 Rolls	W-50mm L- 6000mm	3 Rolls
	ii) Roll Spring	RANGE 25mm -40mm	6 Nos.	RANGE 25mm - 40 mm	6 Nos.	RANGE 36 mm - 60 mm	6 Nos.
9.	Mechanical connectors with torque controlled shear head bolts	25 to 95sq.mm L-65mm	3 Nos.	95 to 240sq.mm L-125mm	3 Nos.	185 to 400sq.mm L-170mm	3 Nos.
10.	Filler putty for Mechanical connector	-----	1 Nos.	-----	1 Nos.	-----	1 Nos.
11.	Mastic sealing tape	W-30mm L-400mm	6 Nos.	W-30mm L-600mm	6 Nos.	W-30mm L-600mm	6 Nos.
12.	Silicon grease	6 grams	2 Nos.	6 grams	2 Nos.	6 grams	2 Nos.
13.	Aloxide Paper P80	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (1No Each)	1 Nos.
	Aloxide Paper P150	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (2No Each)	2 Nos.	40cmX25mm (2No Each)	2 Nos.
	Aloxide Paper P220	40cmX25mm (1No Each)	1 Nos.	40cmX25mm (2No Each)	2 Nos.	40cmX25mm (2No Each)	2 Nos.
14.	Nylon string for cutting PVC / 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.	Mopping cloth	W-50mm L- 5000mm	1 Nos.	W-50mm L- 5000mm	1 Nos.	W-50mm L- 5000mm	1 Nos.
17.	Core cleaning solvent with cloth		1 Nos.		1 Nos.		1 Nos.
18.	Copper binding wire	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.	18SWG x 2000 mm	1 Nos.
19.	Copper binding wire	20SWG x 1000 mm	1 Nos.	20SWG x 1000 mm	2 Nos.	20SWG x 1000 mm	2 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 Straight through joints and Transition joints Kit Contents:

- i) The above mentioned Heat Shrinkable Straight through joints and Transition joints are specified for general guidance. However bidder / supplier shall include necessary components in the Heat Shrinkable Straight through joints and Transition joints kit for improving performance and thorough Heat Shrinkable Straight through joints and Transition joints 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 jointing 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 Straight through joints and Transition joints kits shall be suitable for storage without deteriorating at a temperature upto 50° 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 at either end of the completed joint and in case of termination, same 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 jointing kit/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 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 Straight through joints and Transition joints 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 Specification of Heat Shrinkable Straight through joints and Transition joints for 11kV, 22kV and 33kV Cables

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 Straight through joints and Transition joints 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 type equipment before commencement of supply at their own expense.

Type Tests:

- 1) Conductor Resistance.
- 2) AC Voltage withstands Test(Air).
- 3) DC Voltage withstands Test.
- 4) Test at Elevated Temperature.
- 5) Partial Discharge Test.
- 6) Impulse Voltage Test.
- 7) Heating Cycle Test in air and water.
- 8) Thermal Short Circuit Test (Screen).
- 9) Thermal Short Circuit Test (Conductor).
- 10) Impulse Withstands.
- 11) Dynamic Short Circuit Test.
- 12) Examination.

B.Test Sequences and Requirements for Straight through joints and Transition joints

Sr. No.	Test	Requirements	Test Method as IS:13573(Part 3)	Test Sequence		
				2.1	2.2	2.3
1.	Conductor Resistance	-----	4.1	X	X	X
2.	AC withstand or DC withstand	Ac for 5 min at U_0 or DC for 15 min at U_0	4.2 or 5	X	X	X
3.	Partial Discharge	10pC max at $1.73 U_0$	7	X	---	---
4.	Impulse at \otimes_t , ref.2	10 impulses at each polarity	6	X	---	---
5.	Heating Cycles in air	30 cycles $_{ref\ 3}$ at \otimes_t , ref.2 and $2.5 U_0$	9	X	---	---
6.	Heating Cycles under water	30 cycles $_{ref\ 3}$ at \otimes_t , ref.2 and $2.5 U_0$	9	X	---	---
7.	Partial Discharge at \otimes_t , ref.2,4 and ambient temperature	10pC max at $1.73 U_0$	7	X	---	---
8.	Thermal Short Circuit Test (Screen)	Two short circuit at I_{sc} of the cable screen. No visible deterioration.	10	---	X	X Ref 5
9.	Thermal Short Circuit Test (Conductor)	Two short circuit to raise conductor to \otimes_{sc}	11	---	X	X Ref 5

Specification of Heat Shrinkable Straight through joints and Transition joints for 11kV, 22kV and 33kV Cables

		of the cable. No visible deterioration.				
10.	Dynamic Short Circuit	One short circuit at I_d . No visible deterioration.	12	---	---	X
11.	Impulse	10 impulses at each polarity	6	X	X	X
12.	AC voltage	10pC max at $2.5 U_0$	4.2	X	X	X
13.	Examination	For information only. ^{7.} _{ref}	-----	X	X	X

- 1) Unless otherwise specified, tests shall be carried out at ambient temperature.
- 2) ϑ_t is the maximum cable conductor temperature in normal operation from +5 to +10°C.
- 3) 8 h total with ≥ 2 h steady and ≥ 3 h cooling.
- 4) Measurement is made at the end of the heating period.
- 5) Thermal short circuit may be combined with the dynamic short circuit.
- 6) 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.
- 7) 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 insulation 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 Straight through joints and Transition joints Kit in its various stages so that arrangement should be made for inspection.
- iii) No Heat Shrinkable Straight through joints and Transition joints Kit shall be dispatched from its point of manufacture unless the Heat Shrinkable Straight through joints and Transition joints Kit has been satisfactorily inspected and tested.
- iv) Inspection and acceptance of any Heat Shrinkable Straight through joints and Transition joints Kit under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing Heat Shrinkable Straight through joints and Transition joints Kit in accordance with the specification and shall not prevent subsequent rejection, if the Heat Shrinkable Straight through joints and Transition joints 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 Straight through joints and Transition joints Kit offered of equal or higher voltage class. The Heat Shrinkable Straight through joints and Transition joints 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 Straight through joints and Transition joints 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 stage inspections are normally carried out for quality control and details of such tests and inspections.
 - v) Special features provided in the equipment 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 Straight through joints and Transition joints 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 Straight through joints and Transition joints 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 Straight through joints and Transition joints 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 Straight through joints and Transition joints Kit at no extra cost to the purchaser.

If the faulty, defective stored joints 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 equipment 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 Straight through joints and Transition joints 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 Straight through joints and Transition joints 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 Straight through joints and Transition joints. 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 Straight through joints and Transition joints 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 Straight through joints and Transition joints 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' – '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 Straight through joints and Transition joints.

Schedule – 'B' - Bidder's Experience

The Bidder shall submit the list of orders for similar Heat Shrinkable Straight through joints and Transition joints 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 Straight through joints and Transition joints 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 equipments, 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 Straight through joints and Transition joints kit**

Sr. No.	Particulars of GTP Parameter	MSEDCL Requirement	Offer
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	Ethylene Propylene Diene Monomer (EPDM) or Polyolefin	TEXT
8.	Type Of Kit Offered	a) Straight through Joint. b) Transition joint.	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 _o	4.5 U _o for 5 min	NUMERICAL
13.	Heat Cycle in air 8 hours total with > 2hours steady heating and >3 hours cooling	30 Cycles at 2.5U _o	NUMERICAL
14.	Heat Cycle in water 8 hours total with >2 hours steady heating and >3 hours cooling	30 Cycles at 2.5U _o	NUMERICAL
15.	Partial discharge test @ 1.73 U _o 10 _p C max at max temp as well as room temperature	Max 10 pC	NUMERICAL
16.	Triple extruded tube	Size as per specification	TEXT
17.	Dielectric Strength for 1) Insulating Tube. 2) Triple wall tube.	1) 10kV/mm Min. 3) 10kV/mm Min.	NUMERICAL
18.	Dielectric constant for 1) Stress control tube.	1) 15 Min.	NUMERICAL

Specification of Heat Shrinkable Straight through joints and Transition joints for 11kV, 22kV and 33kV Cables

	2) Triple wall Tube. 3) Stress control mastic	2) 3.5 Min. 3) 9.0 Min.	
19.	Tensile strength for 1) Stress control tube. 2) Triple wall tube.	8N/mm ² (common for each)	NUMERICAL
20.	Ultimate Elongation for 1) Stress control tube. 2) Insulating tube. 3) Anti tracking tube 4) Triple wall tube.	1) 50%. 2) 100%. 3) 100%. 4) 200%.	NUMERICAL
21.	Water Absorption for 1) Stress control tube. 2) Triple wall tube. 3) Stress control mastic	1) 0.3%. 2) 0.3%. 3) 0.5%.	NUMERICAL
22.	Longitudinal Change for 1) Stress control tube. 2) Insulating tube. 3) Anti tracking tube 4) Triple wall tube.	10%.	NUMERICAL
23.	Heat Shock for 1) Stress control tube. 2) Triple wall tube.	30 min. @ 200°C.	NUMERICAL
24.	Mechanical Connector with Shear bolt	As per specification	
25.	Service Temperature for Stress control mastic	90°C	NUMERICAL
26.	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_____