

CHAPTER- E9 – 3-1

TECHNICAL SPECIFICATIONS FOR CABLE TERMINATIONS AND JOINTING KITS (33kV)

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OF
CABLE TERMINATIONS AND JOINTING KITS (33kV)

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TECHNICAL SPECIFICATION FOR CABLE TERMINATIONS AND JOINTING KITS (33kV)**1. SCOPE:**

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store and performance of 33kV Power Cable-Heat Shrinkable Straight through joint & termination with all accessories and necessary training for trouble free & efficient performance.

The materials shall conform to the technical particulars furnished below and to be procured from vendors as per the list in **chapter -E23**

It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform to practices consistent with sound environmental management and local statues. It is also expected that equipment shall comply in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to the OPTCL, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

2. APPLICABLE STANDARDS:

The equipments covered in this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest revisions of relevant Indian Standards/ IEC and shall conform to the regulations of local statutory authorities.

Sl.No	IEC/IS	Description
1	IS-13573 (part2): 2011	Test Requirements-Cable Accessories for Extruded Power Cables (for working voltages from 3.3 kV up to and including 33 KV)
2	IS7098(part2): 2011	Cross-linked polyethylene insulated thermoplastic sheathed cables (for working voltages from 3.3 kV up to and including 33 KV)
3	IS 692: 1994	Paper insulated lead sheathed cables for rated voltages up to and including 33 KV
4	IEC 60502: 2009	Power cables with extruded insulation and their accessories for rated voltages from 1 kV up to 30 kV
5	ASTM D-2303	Standard Test Methods for Liquid Contaminant, Inclined plane tracking and Erosion of insulating materials
6	ASTM D-2671	Standard Test Methods for Heat Shrinkable Tubing
7	ENA TS 09-13.1981	High Voltage Heat Shrinkable Components for use with HV solid type cables up to and including 33 kV

8	IEC 61238 (part1): 2003	Test methods and requirements - Compression and mechanical connectors for power cables for rated voltages up to 30 kV
9	IS 2633:1986	Method for testing of uniformity of zinc coating
10	IS 4826: 1979	Hot dipped galvanized coatings on round steel wires
11	IS 12444:1988	Continuously Cast and Rolled Electrolytic Copper Wire Rods for electrical conductors
12	IS 191	Copper
13	IS 10810	Methods of test for cables
14	IEC 60216 part 2	Determination of thermal endurance properties of electrical insulating materials
15	IEC 60216 part 8	Instructions for calculating thermal endurance characteristics using simplified procedures

3. CLIMATIC CONDITIONS:

1	Maximum ambient temperature	50 °C
2	Max. Daily average ambient temp	35 °C
	Min Ambient Temperature	0 °C
4	Maximum Humidity	95%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
1	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

OPTCL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed up to 300 Kmph. The atmosphere is generally laden with mild acid, dust in suspension during the dry months, and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS:

General design and sizes of 33 kV XLPE/PILC insulated cables operated in OPTCL Network are as mentioned below:

A). XLPE Insulated Underground Cables as per IS 7098-2: 33 KV(E)

A2XCWY-(Aluminum stranded compacted conductor, XLPE insulation, copper tape screen, wire GI armour, PVC sheath)

A2XCWAY (Aluminum stranded compacted conductor, XLPE insulation, copper tape screen, wire Aluminum armour, PVC sheath)

- i. 3CX300 sq.mm. A2XCWY
- ii. 3CX400 sq.mm. A2XCWY
- iii. 1CX400 sq.mm. A2XCWaY
- iv. 1CX630 sq.mm. A2XCWaY
- v. 1CX1000 sq.mm. A2XCWaY

B). PILCA Insulated Cables as per IS 692: 33 kV(E)

Screened APLST (Al stranded sector shaped, paper insulated, lead sheath, steel tape sheath 3CX300 sq.mm

According to standard sizes of cables, following types of cable joints and terminations shall be required. Tinned coated Mechanical Lugs and mechanical connectors are applicable for all sizes of 33 kV cable terminations and straight through joints respectively.

Type & Size of cable	Type of Joint
3CX300 and 400 sq.mm. XLPE insulated cable	Indoor termination with tinned coated 300-400mm ² mechanical lugs
	Indoor termination joint GIS
	Outdoor termination with tinned coated 300-400mm ² mechanical lugs
3CX300 and 400 sq.mm. XLPE insulated cable	Straight through Joint 300-400 sq.mm. with mechanical connector
1CX4000 & 1CX630 Sq.mm XLPE Insulated Cable	Indoor termination joint GIS
	Indoor termination screen type (for RMU) with tinned coated mechanical lugs
	Outdoor termination with tinned coated mechanical lugs
	Straight through joint with mechanical connector
1CX1000 Sq.mm XLPE Insulated Cable	Indoor termination joint GIS
	Outdoor termination with tinned coated mechanical lugs
	Straight through joint with mechanical connector
PILCA to XLPE transition joints	Screened Transition joint 3CX300/400 sq.mm. XLPE insulated cable with 3CX300/400 sq.mm PILCA cable (with mechanical connector)

The jointing kit containing heat shrinkable tubing, mastics and other accessories for making a complete joint and termination shall be designed to meet OPTCL specification, ENA TS 09-13, IEC 60502 and IS 13573, part 2 and other relevant standards. Cable Joint and termination material shall not be adversely affected in any manner even after contact with material used in cable construction and material used as accessories in the construction of cable joints and terminations and there will be no chance of corrosion developing on any metal surface.

Assembled jointing kit components shall perform without distress in system with parameters (mentioned below):

S. No.	Parameter	Units	Requirement
1	Max Withstand System Voltage	KV	36
2	Partial Discharge at 1.73 U ₀	pC (Pico-coulombs)	<10
3	Impulse Peak Withstand	KV	170
4	Continuous operation withstand Temperature	°C	90 °C
	Short Circuit withstand temperature	°C	250 °C
5	Withstand short circuit current	KA/1Sec	a) 3CX300 Sq.mm Cable: 28.2 kA b) 3CX400 sq.mm Cable:37.7 KA c) 1CX1000 Sq.mm Cable: 94.0 KA d) 1CX630 Sq mm Cable:59.4 KA e) 1CX400 Sq.mm Cable:37.6 kA
6	Storage Temperature Range	°C	-10°C to +45°C
7	Shelf life of kit components excluding mastic and solution	Years	Min 5
8	Shelf life of mastic and solution	Years	Min 2

A. General Technical Particular for Heat Shrinkable Insulation Tubing/Sleeves/Wrap around Sleeve:

S. No.	Parameter	Requirement
1	Visual Examination	Free from protrusions, pin holes, cracks, nicks and other visible defects.
2	Wall thickness Ratio	0.6 or 60% (Minimum at any two points of measurements)
3	Internal dia of tube after full recovery	Shall not be higher than as specified in approved BOM/GTP
4	Longitudinal change	10% Max.
5	Electric Strength	10KV/MM(Min.)
6	Tensile Strength	10N/mm ² (Min.) [8N/mm ² for anti-tracking]
7	Ultimate Elongation	200%(Min.)
8	Heat Shock	No Splitting, Cracking, Dripping or flowing after 30 mins. At 200 °C (Min.) (For stress control tube: 30 Mins. At 200 °C Minimum)
9	Low Temperature Flexibility	No cracking after 4 Hrs at -20Deg.C (Max.)
10	Tracking Resistance	No tracking, erosion to top surface or flame failure after 1 hr. @ 2.5KV 1 hr. @ 2.7KV 1 hr. @ 3KV 20 min @ 3.25KV
11	Volume Resistivity	1x10 ¹⁰ Ohm-meter (min.) For stress control tube VR: 1X10 ⁷ Ohm-meter Min.)
12	Flame Retardant (Applicable only for Anti tracking Tubes/ sleeves)	After 1 min. burn: Burnt or charred length 250mm Max.

B. General Technical Particular for Heat Shrinkable Moulded Components / Breakouts / Weather Sheds:

Sl. No.	Parameter	Requirement
1	Visual Examination	Free from protrusions, pin holes, cracks, nicks and other visible defects.
2	Wall thickness Ratio	0.6 or 60% (Minimum at any two points of measurements)
3	Internal dia of tube after full recovery	Shall not be higher than as specified in approved BOM/GTP
4	Longitudinal change	25% Max.
5	Electric Strength	10KV/MM(Min.)
6	Tensile Strength	8N/mm ² (Min.)
7	Ultimate Elongation	200 % (Min.)
8	Heat Shock	No Splitting, Cracking, Dripping or flowing after 30 mins. At 250 °C Min.
9	Low Temperature Flexibility	No cracking after 4 Hrs at -20°C(Max.)
10	Volume Resistivity	1x10 ¹⁰ Ohm-meter(min.)
11	Flame Retardant (for anti-tracking moulded components)	After 1 min. burn: Burnt or charred length 250mm Max.

Service Support

Bidder shall have own setup in Odisha for jointing & termination services along with supervision and necessary allied services for ensuring quality of installed jointing & terminations.

5. GENERAL CONSTRUCTION:

- a. Termination kit shall be designed based on heat shrink technology and shall be suitable for installation for 33 kV, three core and single core aluminum conductor, XLPE insulated (in line with OPTCL Specification for underground IS 7098-part 2. IS 13573 Part 2 &3).
- b. Length of 33 KV terminations (from bottom of breakout to center of lug hole) shall be:
 - i) 1core cable I/D & O/D and 3 core cable (I/D) Indoor terminations: 1500 mm
 - ii) 3 core cable O/D (Outdoor terminations): 3000 mm

Sl. No.	Components	Requirement
1	Tinned coated Mechanical Lugs	Mechanical Lugs: <ul style="list-style-type: none"> - Tinned coated Aluminium 300-400 mm²/ 630mm²/1000mm² - As per IEC 61238(part1): 2003. - Dimensions shall be as annexure-I of this specification.
2	Lug Seal, Anti-tracking tube, weather sheds, Stress control tube	<ul style="list-style-type: none"> - Heat Shrinkable - Fire resistant and weather resistant as per ENA TS 09-13 – for lug seals, weather sheds and Anti-tracking tubes
3	Mastic tape	<ul style="list-style-type: none"> - Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant. - Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS 09-13.
4	Heat Shrink Breakout	<ul style="list-style-type: none"> - Fire resistant and weather resistant as per ENA TS 09-13. - Adhesive coated Breakouts shall be provided on outer sheath of the cable to prevent water ingress.
5	Tinned coated copper braid	<ul style="list-style-type: none"> - Shall be completely insulated by adhesive coated fire retardant and weather resistant HS tube/sleeve up to copper lug. - Fire resistant and weather resistant as per ENA TS 09-13.

		<ul style="list-style-type: none"> - Size and length is as follows: For 3C cables: 70 mm² X 750 mm X 1 Run for 300/ 400 mm² cables. For 1C cables: 50 mm² X 750 mm X 1 Run for 400 mm², 630 mm² & 1000 mm² cables. Additionally 3 nos. X 150 mm² Al lugs with sealing sleeves/ mastic for armor back fold for earth bonding.
6	Tinned coated copper braid as a Leakage Current Collector	<ul style="list-style-type: none"> - Leakage current collector tinned copper braid - 1R X 7 mm² X 150 mm per core shall be provided for terminations.
7	Tinned copper wire mesh	<ul style="list-style-type: none"> - Minimum 2.5mm² tinned copper mesh shall be provided on armour circumference beneath the copper braid. - Length of copper wire mesh shall be provided in BOM submission.
8	Sub-kit components	<ul style="list-style-type: none"> - Tapes, Mastic, GI back-up rings, Worm Drive clip/ Jubilee clip of stainless steel, adhesive cloth, cleaning solvents and other necessary items. - Compatible Supporting ring with SS jubilee clips shall be provided to connect tinned copper braids. - Soldering on copper screen is not acceptable. - Roll spring shall be provided for screen connections. - Plumb earthing on PILCA side is unacceptable. Constant pressure roll spring should be used for same.
9	Submission of BOM and instruction sheet	<ul style="list-style-type: none"> - Participating bidder shall submit BOM (during pre-bid) with dimensions of each size and quantity of HS joint and termination. Also instruction sheet shall be provided in each kit. - *Note: BOM shall be approved by OPTCL.

5.2. Components of Straight Through jointing kit:

Sl. No.	Components	Requirement
1	Heat Shrinkable insulating tube/ Sleeve	<ul style="list-style-type: none"> - Surface of material: shall be smooth and free from protrusion, voids and nicks. - Recovered thickness: Recovered thickness of insulation tubes over ferrule or connector circumference shall not be less than 10.56 mm at any point of measurement. - Wall thickness ratio (before recovery) of all sleeves/ tubes shall not be less than 60% at any two points of measurement.
2	Mechanical Connectors	<ul style="list-style-type: none"> - Aluminum Mechanical connectors 300-400 m²/630mm²/1000mm² as per IEC 61238. - Dimensions as per Annexure-I of this Specification - Conductivity of ferrules/mechanical connectors shall be as per IEC 61238(part1).
3	Mastic Tape	<ul style="list-style-type: none"> - Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant. - Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS 09-13.
4	Tinned coated copper braid for GI armour continuity/ Ferrules for Aluminium armour continuity	<p>Tinned coated copper braid for GI armour continuity: Uniformly tinned coated copper braid shall be provided for armour continuity.</p> <ul style="list-style-type: none"> - Wrap tinned copper wire mesh with 50% overlap around the joint area and continue 25 mm over the copper screen on both sides. Bind the copper wire mesh on copper screen. - Uniformly tinned coated copper braid shall be provided for armor continuity.

		<ul style="list-style-type: none"> - Tinned copper braid shall be provided for wrapping over armour circumference beneath the copper braid and size shall be: <p>For 3C Cables: 70 mm² X1 Run for 300/ 400mm² cables. Length of copper braid shall be submitted in the BOM.</p> <p>For 1C Cables: In single core cables, 1CX400,1CX630 and 1CX1000 sq.mm. cables,</p> <p>Aluminium armor continuity shall be done using 2 nos. each size of 150 sq.mm. and 185 sq.mm. ferrules respectively.</p>
5	Tinned copper wire mesh	<ul style="list-style-type: none"> - Uniformly tinned coated copper mesh shall be provided for screen continuity. - Minimum 2.5mm² tinned copper mesh shall be provided on both sides of armour circumference beneath the copper braid. - Length of copper wire mesh shall be provided in BOM submission.
6	GI wire mesh/ Copper wire mesh	<ul style="list-style-type: none"> - Mechanical protection shall be provided in GI armored cables by means of heavily zinc coated GI mesh as per IS 4826. - In 1C Aluminium armored cables, for mechanical protection, copper wire mesh shall be provided.
7	Breakouts	<ul style="list-style-type: none"> - Adhesive coated Breakouts shall be provided on outer sheath at both sides on the cable to prevent water ingress.
8	Wrap around insulating tube/Sleeve as outer most tube	<ul style="list-style-type: none"> - Material: cross-linked polyolefin (Heat Shrinkable) as a waterproof seal. - Shape: Wrap around form with hot-melt adhesive liner on the inner surface of the sleeve (Upon heating, the sleeve shrinks and the adhesive melts, creating a water-tight bond between the sleeve and the cable). - Stainless steel channel shall be provided along the wrap around to close the sleeve during installation. - Excellent mechanical and corrosion protection, and atmospheric sealing. - High split resistance. - *Note: Overlapping of wrap around sleeve is not acceptable. - Additionally, adhesive coated sleeve approx. 300 mm length shall be provided at ferrule joint area beneath the wrap around sleeve.
9	Sub-kit Components	<ul style="list-style-type: none"> - Tapes, Mastic, GI back-up rings, Worm Drive clip/ Jubilee clip of stainless steel, adhesive cloth, cleaning solvents and other necessary items. - Compatible support rings (Aluminium for single core and GI for three core cables) with four nos. SS jubli clips shall be provided to connect tinned copper braid. - For copper screen bonding, roll spring shall be provided. - Plumb earthing on PILCA side is unacceptable. Constant pressure roll spring shall be provided for earthing continuity.
10	Submission of BOM and instruction sheet	<ul style="list-style-type: none"> - Participating bidder shall submit BOM (during pre-bid) with dimensions of each size and quantity of HS joint and termination. Also instruction sheet shall be provided in each kit. <p>*Note: BOM shall be approved by OPTCL.</p>

6. MARKING:

Following details shall be printed in the box:

- Manufacture's name and address.
- Month & Year of Manufacturing
- Voltage Grade

HS Sleeves/tubes and breakout components shall be embossed with:

- Manufacture's name and address.
- Month & Year of Manufacturing
- Batch No. / Lot No.
- Shrink Ratio
- Size
- Type

7. TESTS:

All Routine, Acceptance & Type tests shall be carried out in accordance with the Relevant IS/IEC/ ENA TS 09-13. All the components shall also be type tested as per the relevant standards mentioned below. Following tests shall be necessarily conducted on the Joint and Termination Kits In addition to others specified in IS/IEC/ENA-TS 09-13 standards:

A. Type Tests:**(I) Terminations & Straight Through joints:**

Test	Clause No.	Reference Standard
Conductor resistance with Ferrule/Lugs/Mechanical connectors	4.1	IS 13573(Part-2)
AC Voltage withstand Test (Air)	4.2	IS 13573(Part-2)
AC Voltage withstand test (under wet conditions) (for outdoor termination only)	4.2	IS 13573(Part-2)
Partial Discharge	7.0	IS 13573(Part-2)
Impulse voltage test	6	IS 13573(Part-2)
Heat Cycle test in air and water	9.1 and 9.2	IS 13573(Part-2)
Thermal Short Circuit Test for Screen	10	IS 13573(Part-2)
Thermal Short Circuit Test for Conductor	11	IS 13573(Part-2)
DC Voltage Withstand	5	IS 13573(Part-2)
Dynamic short circuit test	12	IS 13573(Part-2)
Thermal Endurance test	IEC 60216 part 2 & 8	
Salt fog test (Only for Outdoor terminations only)	13	IS 13573(Part-2)

(II) Kit Components**a) For Tubing and Moulded Components:**

Test	Clause No.	Reference Standard
Corrosion Resistance	3.1	ENA -TS 09-13
Density	3.2	ENA -TS 09-13
Dimensions	3.3	ENA -TS 09-13

Electric Strength	3.4	ENA -TS 09-13
Flame Retardance	3.5	ENA -TS 09-13
Heat Shock	3.7	ENA -TS 09-13
Low temperature flexibility	3.8	ENA -TS 09-13
Relative Permittivity	3.9	ENA -TS 09-13
Tensile strength and Ultimate elongation	3.12	ENA -TS 09-13
Thermal Ageing	3.13	ENA -TS 09-13
Tracking Resistance	3.14	ENA -TS 09-13
Visual Examination	3.15	ENA -TS 09-13
Volume Resistivity	3.16	ENA -TS 09-13
Water Absorption	3.17	ENA -TS 09-13

b) For Mechanical lugs and connectors:

Test	Clause No.	Reference Standard
Conductivity test	as per IEC 61238, part - 1	

B. Routine Tests:

Test	Clause No.	Reference Standard
Visual inspection of tubing and moulded components for free from pin holes, cracks, nicks, protrusion and other defects	3.15	ENA -TS 09-13
Dimension check	As per OPTCL approved BOM	
Electric Strength	3.4	ENA -TS 09-13
Ultimate Elongation	3.12	ENA -TS 09-13
Tensile Strength	3.12	ENA -TS 09-13
Volume Resistivity	3.16	ENA -TS 09-13
Wall thickness ratio	3.3	ENA -TS 09-13
Expanded and recovered diameters of tubes	3.3	ENA -TS 09-13

C. Acceptance tests:

Test	Clause No.	Reference Standard
Visual inspection	3.15	ENA -TS 09-13
Physical verification of kit contents and dimensions	As per OPTCL approved BOM	
Electric Strength test	3.4	ENA -TS 09-13
Ultimate Elongation tests	3.12	ENA -TS 09-13
Tensile Strength	3.12	ENA -TS 09-13
Volume Resistivity	3.16	ENA -TS 09-13
Wall thickness ratio	3.3	ENA -TS 09-13
Expanded and recovered diameters	3.3	ENA -TS 09-13
Longitudinal change after recovery	3.3	ENA -TS 09-13
Heat shock test	3.7.1/3.7.2	ENA -TS 09-13
Low temperature flexibility	4.5	ENA -TS 09-13
Insulation build up thickness after shrink on Ferrule	8.1	IS 10810 -6
Flame retardant test on anti-tracking tubes and anti-tracking moulded components and earth braid protective tube after shrink on	3.5.1/ 3.5.2	ENA -TS 09-13

mandrill for terminations		
Area measurement of tinned copper braids (Area of one wire x no. of wires x no. of carriers)	As per OPTCL specification/ approved BOM	
Conductivity test on ferrules/ connectors/ lugs	8.3	IS 8309
Uniformity of zinc coating on GI mesh	4.1	IS 2633

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA as per relevant IS. Type tests should have been conducted in certified Test laboratories during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to OPTCL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the OPTCL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to OPTCL's representatives at all times when the work is in progress. Inspection by the OPTCL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by OPTCL.

Following documents shall be sent along with material.

- a) Test reports
- b) MDCC issued by OPTCL
- c) OPTCL Invoice in duplicate
- d) Packing list
- e) Drawings & catalogue
- f) Guarantee / Warrantee card
- g) Delivery Challan
- h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at OPTCL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Project Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect found within a period of 24 months from the date of handing over (after successful commissioning), Bidder shall be liable to

replace/rectify such defects at their own costs, to the entire satisfaction of the Owner, failing which the Owner will be at liberty to get it replaced/rectified at Bidder's risks & costs and recover all such expenses plus the Owner's own charges, from the Bidder or from the "Performance Deposit" of the Bidder as the case may be.

For any 'Latent Defects' if noticed and reported by Owner, Bidder shall further be responsible for free replacement / rectification during such period mentioned in the Tender Document, from the end of the guarantee period.

12. PACKING AND TRANSPORT:

Supplier shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

13. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

14. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

15. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

16. DRAWINGS AND DOCUMENTS:

Sl. No.	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	BOM (at the time of pre-bid)	√		
3	Drawing showing Joints Details	√		√
5	Termination drawings	√		
6	Manual/Catalogues		√	√
7	Transport/ Shipping dimension drawing		√	√
8	QA & QC Plan	√	√	√
9	Routine, Acceptance and Type Test Certificates	√	√	√

17. SCHEDULE- “A” GUARANTEED TECHNICAL PARTICULARS:

Sl. No.	Parameter	Units	To be Furnished by Bidder
1	Max Withstand System Voltage		
2	Partial Discharge at 1.73 U _o		
3	Impulse Peak Withstand		
4	Continuous operation withstand Temperature		
	Short Circuit withstand temperature		
5	Withstand short circuit current		
6	Storage Temperature Range		
7	Shelf life of kit components excluding mastic and solution		
8	Shelf life of mastic and solution		

A. General Technical Particular for Heat Shrinkable Insulation Tubing/Sleeves/Wrap around Sleeve:

S. No.	Parameter	To be Furnished by Bidder
1	Visual Examination	
2	Wall thickness Ratio	
3	Internal dia of tube after full recovery	
4	Longitudinal change	
5	Electric Strength	
6	Tensile Strength	
7	Ultimate Elongation	
8	Heat Shock	
9	Low Temperature Flexibility	
10	Tracking Resistance	
11	Volume Resistivity	
12	Flame Retardant (Applicable only for Anti tracking Tubes/ sleeves)	

B.General Technical Particular for Heat Shrinkable Moulded Components/Breakouts/Weather Sheds:

Sl. No.	Parameter	To be Furnished by Bidder
1	Visual Examination	
2	Wall thickness Ratio	
3	Internal dia of tube after full recovery	
4	Longitudinal change	
5	Electric Strength	
6	Tensile Strength	
7	Ultimate Elongation	
8	Heat Shock	

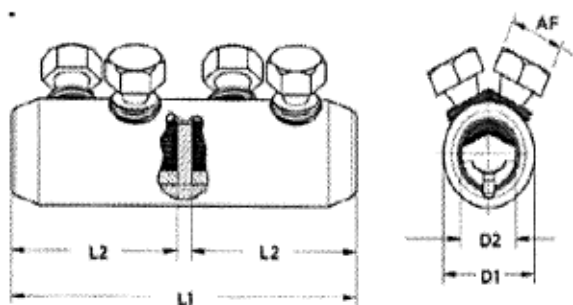
9	Low Temperature Flexibility	
11	Volume Resistivity	
12	Flame Retardant (for anti-tracking moulded components)	

Annexure-I

Annexure- Dimensions Mechanical connectors & Mechanical Lugs

Aluminium Mechanical connectors

Cable Size in MM ²	$\phi D1$ (mm)	$\phi D2$ (mm)	L (mm)
185-400	42	25.5-26	170-200
500- 630	50	33- 33.5	180-230
1000	60	40	180-230



Tinned Aluminium Mechanical Lugs

Cable Size in MM ²	ϕLB (mm)	$\phi D1$ (mm)	$\phi D2$ (mm)	L (mm)
185-400	17	42	25.5-26	137-150
500- 630	17	50	33- 33.5	150-180
1000	2x17	60	40- 40.5	180- 240

