



**2X660 MW UDANGUDI STPP STAGE-1  
PRE-QUALIFICATION REQUIREMENTS FOR  
HT XLPE POWER CABLES**

PE-PQ-435-507-E011

REVISION NO. 0 DATE 23/05/2022

SHEET NO. 1 OF 1

**ITEMS : HT XLPE Power Cable**

**SCOPE : Supply : YES; Erection & Commissioning : NO**

1.0	Vendor should be a manufacturer of HT power cables.
2.0	Availability of test reports on HT XLPE FRLS power cables to establish in-house capability to carry out all routine, type & acceptance tests as per relevant IS/ International Standards (except UV radiation & hydrolytic stability test which can be conducted at Govt. Lab/ Govt. approved Independent lab).
3.0	Capacity of manufacturing 40 km of HT XLPE power cables per month.
4.0	Manufactured and supplied at least One (1) Km. FRLS Cables.
5.0	Manufactured and supplied HT XLPE power cable sizes of minimum 240 sq. mm for 3/3.5 core and minimum 630 sq. mm for single core cable.
6.0	Manufactured & supplied at least 50 km of 11kV/6.6kV/3.3kV grade XLPE power cables in one or more orders and at least 15 km in one single order.
7.0	Minimum two (2) nos. purchase orders for HT XLPE Power cables shall be submitted which should not be more than five (5) years old from date of techno- commercial bid opening for establishing continuity in business.

**NOTE:**

1. Consideration of offer shall be subject to customer's approval of bidders, if applicable.
2. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
3. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
4. After satisfactory fulfillment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.
5. Bidder to submit test reports as per PQR Clause No. 2 to establish vendor has in-house facility to conduct all tests including impulse withstand test.

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**2 x 660 MW UDANGUDI STPP STAGE-1**

**BOQ-CUM-UNPRICED SCHEDULE FOR HT XLPE POWER CABLES**

Sr. No.	Item code	Item description	Unit	Order Quantity (metres)	Drum Length (Meters)	UNIT PRICE (EX-WORKS) (Rs)	TOTAL PRICE (EX-WORKS) (Rs)	Freight % age in terms of Total ex-Works	GST % age
<b>1.0</b>		<b>11/11 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMOURED/ UNEARTHED GRADE POWER CABLE</b>							
1.1	507-27025-A	1C-630	MTR	15500	500M X 31				
1.2	507-27025-A	1C-300	MTR	10500	500M X 21				
1.3	507-27037-A	3C-240	MTR	5500	500M X 11				
<b>2.0</b>		<b>6.6/6.6 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMOURED/ UNEARTHED GRADE POWER CABLE.</b>							
2.1	507-27117-A	3C-150	MTR	6500	500M X 13				
<b>Notes:</b>									
1	Standard drum length shall be 750 & 500 metres. Tolerance on individual drum length shall be $\pm 5\%$ .								
2	Overall tolerance on total dispatched quantity of each size shall be (-) 2% and (+) 0%. Cables consumed for testing and inspection shall be to bidder's account.								
3	For each individual cable size, one short length of not less than 200m may be accepted only in the final drum length to complete the supply. The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).								
4	Bidder shall indicate unit price of cables inclusive of type test charges. No separate Type Test charges are to be quoted by bidder.								
5	In case the quantities cleared by BHEL for manufacturing (in a lot) are manufactured and offered for inspection by successful bidder in more than one batch, BHEL reserves the right to witness type testing on all batches.								

**TECHNICAL SPECIFICATION**  
**FOR**  
***HT XLPE POWER CABLES***

**VOLUME-II**


**SPECIFICATION NO: *PE-TS-435-507-E001A***

***REVISION: 00***

**TANGEDCO**  
**2 x 660 MW UDANGUDI STPP STAGE-1**



**BHARAT HEAVY ELECTRICALS LIMITED**  
**POWER SECTOR**  
**PROJECT ENGINEERING MANAGEMENT**  
**NOIDA, UP (INDIA) – 201301**

	DOCUMENT TITLE		SPECIFICATION NO. PE-TS- 435-507-E001A		
	<b>TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES</b>		VOLUME II		
			SECTION -		
			REVISION 00	DATE: 27.04.2022	
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851069/2022/PS-PEM-EL



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR  
HT XLPE POWER CABLES**

SPECIFICATION NO. PE-TS- 435-507-E001A

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## SECTION – I

### SPECIFIC TECHNICAL REQUIREMENTS



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**TECHNICAL SPECIFICATION FOR  
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**COMPLIANCE CERTIFICATE**

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.
2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in Annexure-A [BOQ-Cum-Price schedule] of the specification shall not be considered (i.e., technical description & quantities as per specification shall prevail).

-----  
BIDDER'S STAMP & SIGNATURE

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### 1.0 SCOPE OF ENQUIRY

- 1.1 This specification covers the Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of HT XLPE POWER CABLES.
- 1.2 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation at site conditions.
- 1.3 General technical requirements of the HT XLPE POWER CABLE are indicated in Section-II. Project specific technical/ quality requirements / changes are listed in Section-I.
- 1.4 The stipulations of Section-I, followed by those of Data Sheet-A shall prevail in case of any conflict between the stipulations of Section-I, Data Sheet - A & Section-II.
- 1.5 The documents shall be in English Language and MKS system of units

### 2.0 BILL OF QUANTITIES:

- 2.1 Quantity requirements shall be as per Annexure for Bill of Quantities (BOQ) enclosed as part of NIT.
- 2.2 Supplier to also give the following undertaking in the BOM: "The BoM provided herewith completes the scope (in content and intent) of material supply under PO No. -----, dated --- ---. Any additional material which may become necessary for the intended application of the supplied item(s)/package will be supplied free of cost in most reasonable time."

### 3.0 TECHNICAL REQUIREMENTS

- 3.1 List of primary and secondary documents and their submission schedule shall be as per NIT
- 3.2 Specific Technical Requirement:

<b><u>S.No.</u></b>	<b><i>Reference Clause No. of Section- II (if any)</i></b>	<b><i>Specific Requirement/ Change</i></b>
1		
2		

- 3.3 Quality/ Inspection:

<b><u>S.No.</u></b>	<b><i>Reference Clause No. of Section- II (if any)</i></b>	<b><i>Specific Requirement/ Change</i></b>

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DATASHEET A


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## DATASHEET-A


1.0	Type of Cable	Flame Retardant-Low Smoke (FR-LSH)		
2.0	Standard applicable in general(Latest amendment to be referred if any)	IS:7098 (Part-2), IS:8130, IS:5831, IS:10810, IS:3975, ASTM:2843, ASTM:2863, IEC-754-1, IEC:60332 (Part-1), IEC:60332-3-23, IEEE:60383		
3.0	Voltage Grade	6.6/6.6 kV (unearthed)	11/11 kV (unearthed)	
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ-Cum-Price Schedule		
5.0	CONDUCTOR			
(a)	Material	Aluminium		
	Grade and Class	Stranded, H2, Class 2		
(b)	Standard Applicable	IS: 8130		
(c)	Shape	Compacted Circular		
(d)	Min. number and diameter of strands	As per Class-2 of IS: 8130		
(e)	Conductor screen			
(i)	Material	Extruded Cross-linked Semi-conducting compound		
(ii)	Minimum thickness	0.3 mm		
6.0	INSULATION			
(a)	Material	Extruded Cross-Linked Polyethylene(XLPE)		
(b)	Standard Applicable	IS: 7098 (Part-2)		
(c)	Continuous withstand temperature	90°C		
(d)	Short-circuit withstand temperature	250°C		
(e)	Nominal Thickness of Insulation	As per table 4 of 7098-II		
7.0	INSULATION SCREEN			
(a)	Non-metallic			
(i)	Material	Extruded Cross-linked Semi-conducting compound		
(ii)	Type of Semiconducting compound	Bonded		
(iii)	Minimum thickness	0.3 mm		
(b)	Metallic			
(i)	Material	Copper		
(ii)	Type	Tape		
(iii)	Size	Nominal thickness 0.1mm with tolerance ( $\pm$ ) 10%		
(iv)	Minimum Overlap	10%		
(c)	Earth fault current withstand capacity	300A, 1 sec (For multi-core cables, screen of each core shall be rated individually for the above value).		
8.0	EXTRUSION (Insulation and Screens)			
(a)	Process	Triple Extrusion (Extruded semi-conducting compound conductor screen and insulation screen shall be applied along with XLPE insulation in		

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		a single operation by triple extrusion process).
(b)	Method of Curing	<i>Gas curing/Steam curing</i>
9.0	CORE IDENTIFICATION	By coloured strips of Red, yellow & Blue colour applied on the cores
10.0	INNER SHEATH	Both for Single and Multi core cables
(a)	Material	Extruded HRPVC Type ST-2
(b)	Standard Applicable	IS: 7098 (Part-2) & IS: 5831
(c)	Colour	<i>Black</i>
(d)	Whether FR-LSH	<i>NO</i>
(e)	Inner sheath applicable for single core cable	<i>YES</i>
(f)	Fillers	Acceptable
(g)	Material of fillers (if permitted)	Same as inner sheath (Material of filler to be compatible with that of inner sheath)
(h)	Method of application	
(1)	Multi-core cables:	
(i)	With fillers	<i>Pressure/Vacuum extruded</i>
(ii)	Without fillers	<i>Pressure extruded</i>
(2)	Single-core cables:	<i>Pressure extruded</i>
(i)	Thickness of inner sheath	As per Table-5 of IS: 7098 (Part-2)
11.0	ARMOUR	
(a)	<i>Applicable</i>	<i>YES</i>
(b)	Material:	
(i)	Single core cables	Aluminium Round Wire H4 grade to IS: 8130
(ii)	<i>Multi-core cables</i>	<i>Galvanised Steel Strip</i> conforming to (i) Table-6 of IS 7098 part-2
(iii)	Standard Applicable	Dimension as per IS: 7098 (Part-2) Table-6 and tolerance on dimension as per IS:3975
(c)	Minimum Coverage	90%
(d)	Gap between armour wires	Shall not exceed one armour wire space (No cross-over/ over-riding)
(e)	Breaking load of joint	95 % of normal armour
12.0	OUTERSHEATH	
		Outer Sheath shall be resistant to water, UV Radiation, fungus etc.
(a)	Material	Extruded <i>HRPVC</i> Type ST2 as per IS: 5831
(b)	Colour	<i>Black</i>
(c)	Whether FR-LSH	Yes
(d)	Method of application	Extruded
(e)	Thickness of outer sheath	As per Table-7 of IS: 7098 (Part-2)
(f)	Marking	<i>BIS Mark, Owner's name ,Manufacturer's name and trade mark, year of manufacture, Cable code, Type of cable and voltage class, nominal cross section area of conductor and no. of cores, 'BHEL-PEM', etc. and Progressive Sequential length marking, @ 1M (by embossing/printing) for 11kV &amp; 6.6 kV Cables. Cable shall be marked as having FRLSH outer sheath at every 5 Meters for 11kV &amp; 6.6 kV Cables. (The embossing/printing shall be progressive, automatic, in line and</i>

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		<i>marking shall be legible and indelible)</i>
13.0	FR-LSH CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per IS 7098-2 /ASTMD 2863)
(b)	Temperature index	Min. 250°C(As per IS 7098-2 /ASTMD 2863)
(c)	Acid gas generation	Max. 20% by weight (As per IS 7098-2 /IEC-60754-1)
(d)	Smoke density rating	Max. 60% (As per IS 7098-2 /ASTM D 2843)
(e)	Flammability Test	
(i)	<i>Flammability test for single cable</i>	<i>YES As per: IEC-60332 Part-1</i>
(ii)	<i>Flammability test for bunched cables</i>	<i>YES As per: IEC-60332 Part-3, CAT-B</i>
(iii)	<i>Flammability test as per IEEE: 60383</i>	<i>YES</i>
(iv)	<i>As per Swedish Chimney test SEN-SS-424-1475-F3</i>	<i>YES</i>
14.0	<i>Anti-rodent and Termite repulsion Test</i>	<i>YES</i>
15.0	<i>Anti-Fungal Test</i>	<i>No (self certification by supplier for Anti-fungal properties)</i>
16.0	Special Tests	
(a)	<i>Hydrolytic Stability as per ASTM D 3137 :81 (Duration:- 14 days)</i>	<i>No (Only type test report to be submitted)</i>
(b)	<i>UV Radiation Test as per BS EN ISO 4892-2 (Duration:- 14 days)</i>	<i>No (Only type test report to be submitted)</i>
(c)	<i>UV Radiation Test as per ASTM G 154 (Duration:- 14 days)</i>	<i>No (Only type test report to be submitted)</i>
17.0	TOLERANCE ON OUTER DIAMETER	(±)2 mm. over the declared value
18.0	CABLE DRUMS	
(a)	<i>Type of Drum</i>	Wood/Steel
(b)	Standard drum length	<i>500m (+) 5% / 750M (±) 5% (as specified in BOQ-Cum-Priced Schedule).</i>
©	Marking on drum	Each drum shall carry manufacturer's name, Owner's name, address and contract number, Type of cable & voltage grade, Year of manufacture, Type of insulation / sheath e.g. XLPE /HRPVC FRLS as applicable, No. of core and size of cables, Cable code, Length of cable on drum, Approx. gross mass stencilled on both side of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.
19.0	Cable packing	Please refer Clause no 4 of Section-II of this technical Specification. It may be noted that the outer most cable layer shall be covered with water proof cover polythene followed by complete drum covering with wooden plank of suitable thickness across flanges. ( Please refer typical drawing of cable drum packing, attached in section -II)


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**DATASHEET C**

**GUARANTEED TECHNICAL PARTICULARS  
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)**


S.No.	Particulars	Unit	Description
<b>1.0</b>	<b>GENERAL</b>		
1.1	Name of Manufacturer	-	
1.2	Place of Manufacture	-	
<b>2.0</b>	<b>STANDARDS APPLICABLE</b>		
2.1	IS: 7098 Part-2 For general specification of XLPE Cables	YES	
2.2	IS: 8130 For conductor material	YES	
2.3	IS: 5831 For material of innersheath & outersheath	YES	
2.4	IS: 3975 / IS: 8130 For armour of 3 core/ single core cables	YES	
2.5	IS: 10810 For method of tests	YES	
2.6	ASTMD-2863 For oxygen index test	YES	
2.7	SS:424-14-75 & IEC-60332-3 & IEC-60332-1 & IEEE: 60383 For flammability test	YES	
2.8	IEC-60754-1 For acid gas generation test	YES	
2.9	ASTMD-2843 For smoke generation test	YES	
2.10	Current rating of cables conforms to	-	
2.11	Short circuit rating conforms to	-	
2.12	Formula for calculating short circuit current for different durations	-	
<b>3.0</b>	<b>INSTALLATION CONDITIONS AT SITE</b>		
3.1	Ambient air temperature	deg. C	
3.2	Ground temperature	deg. C	
3.3	Depth of laying of cables buried in ground	cm	
3.4	Thermal resistivity of soil	deg. C cm/W	
<b>4.0</b>	<b>INSTALLATION CONDITIONS FOR CURRENT RATING</b>		

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

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	SPECIFIED AT CLAUSE 7.3		
<b>5.0</b>	<b>CHARACTERISTICS OF FR-LSH SHEATH</b>		
5.1	Oxygen index	-	
5.2	Temperature index	-	
5.3	Acid gas generation	-	
5.4	Smoke density rating	-	
<b>6.0</b>	<b>CABLE DRUMS</b>		
6.1	Type & construction	-	
6.2	Standard drum length	-	
6.3	Tolerance on drum length	-	
<b>7.0</b>	<b>INFORMATION TO BE FILLED IN FOR EACH SIZE CABLE IN THE FORM OF TABLE</b>		
7.1	No. of cores x size	-	
7.2	Voltage grade (U <sub>0</sub> /U)	kV	
7.3	Base current ratings (*) based on Clause No. 3.0		
a)	In air	Amp	
b)	In ground	Amp	
c)	ducts	Amp	
7.4	Short circuit rating	kA, sec	
7.5	Properties		
a)	D.C. resistance of conductor at 20 deg. C	ohm/km	
b)	A.C. resistance of conductor at 90 deg. C	ohm/km	
c)	Reactance of cable at normal frequency	ohm/km	
d)	Electrostatic capacitance of cable at normal frequency	mF/km	
7.6	CONDUCTOR		
a)	Material type & grade	-	
b)	No & dia of wires in each core before stranding	no x mm	
c)	Shape	-	
7.7	CONDUCTOR SCREEN		
a)	Material	-	

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b)	Minimum thickness	mm	
7.8	XLPE INSULATION		
a)	Nominal thickness of insulation	mm	
b)	Method of curing	-	
7.9	INSULATION SCREEN		
a)	Type of screen	-	
b)	Material and thickness (minimum and nominal)	mm	
i)	Metallic	-	
	No. of tapes and Minimum overlapping	-	
ii)	Non-metallic	-	
iii)	Earth fault current withstand capacity (calculation to be furnished)	kA, sec.	
7.10	PVC ST2 INNERSHEATH		
a)	Material	-	
b)	Thickness (min.)	mm.	
c)	Method of application	-	
1)	Multi-core cables		
i)	With fillers	-	
ii)	With out fillers	Pressure Extruded	
2)	Single core cables		
d)	Type & Shape of fillers (if used)	-	
e)	Colour	-	
7.11	ARMOUR		
a)	Material	-	
b)	Size/ dimensions	-	
c)	Minimum no. of wires/ formed wires	-	
d)	Tolerance on formed wire dimension	-	
e)	Maximum resistivity of GS formed wire	-	
f)	Maximum resistivity of Al round wire	-	
7.12	PVC/POLYETHYLENE ST2 FR-LSH OUTERSHEATH		
a)	Nominal thickness of outer sheath	mm.	
7.13	DIAMETERS		
a)	Diameter of insulated conductor	mm.	
b)	Cable diameter under armour	mm.	

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c)	Cable diameter over armour	mm.	
d)	Overall diameter of cable	mm.	
7.14	Tolerance on overall diameter	(±) mm	
7.15	Minimum bending radius	x O.D.	
7.16	Safe pulling force	kg.	
7.17	Weight of cable	kg./km	
a)	Weight of conductor	MT./km	
b)	Weight of XLPE insulation	MT./km	
c)	Weight of PVC (Inner Sheath & Fillers)	kg./km	
d)	Maximum resistivity of GS formed wire	kg./km	
e)	Weight of PVC/Polyethylene (Outer Sheath & Fillers)	kg./km	
7.18	Dimension of drum	mm.	
7.19	Shipping weight	kg	
7.20	Cable marking on outer sheath	-	

(\*) For single core cables, the continuous current rating shall be furnished separately for armour earthed at one end and at both ends.

:

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



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**SECTION-II****STANDARD TECHNICAL SPECIFICATION**

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## 1.0 TECHNICAL REQUIREMENTS

1.1 Technical requirements for HT XLPE POWER CABLES shall be as indicated in this section, in addition to those specified in Section I & Datasheet-A.

## 2.0 CODES & STANDARDS

2.1 The design, material, construction, manufacture, inspection, testing and performance of HT XLPE POWER CABLES shall conform to the latest revision of relevant standards and codes of practices mentioned in Data Sheet – A.

2.2 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

## 3.0 QUALITY ASSURANCE REQUIREMENTS

3.1 Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-507-E001A) as attached with the specification without any deviations. At contract stage, the successful bidder shall submit the same QP for BHEL/ ultimate customer's approval. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ultimate customer's approval. There shall be no commercial implication to BHEL on account of minor changes in QP during contract stage.

3.2 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved Quality Plan.

3.3 Type testing requirements, routine / acceptance testing and special testing requirements shall be as per Annexure to QAP. Charges for all these tests for all the equipment & components shall be deemed to be included in the bid price (except UV Radiation & Hydrolytic Stability test).

3.4 The charges of UV Radiation test & Hydrolytic Stability test (if applicable) shall be reimbursed extra at actual against original money receipt of Govt. Lab. (CPRI/ ERDA etc).

3.5 Cost of cables consumed for testing shall be to bidder's account.

## 4.0 Packing

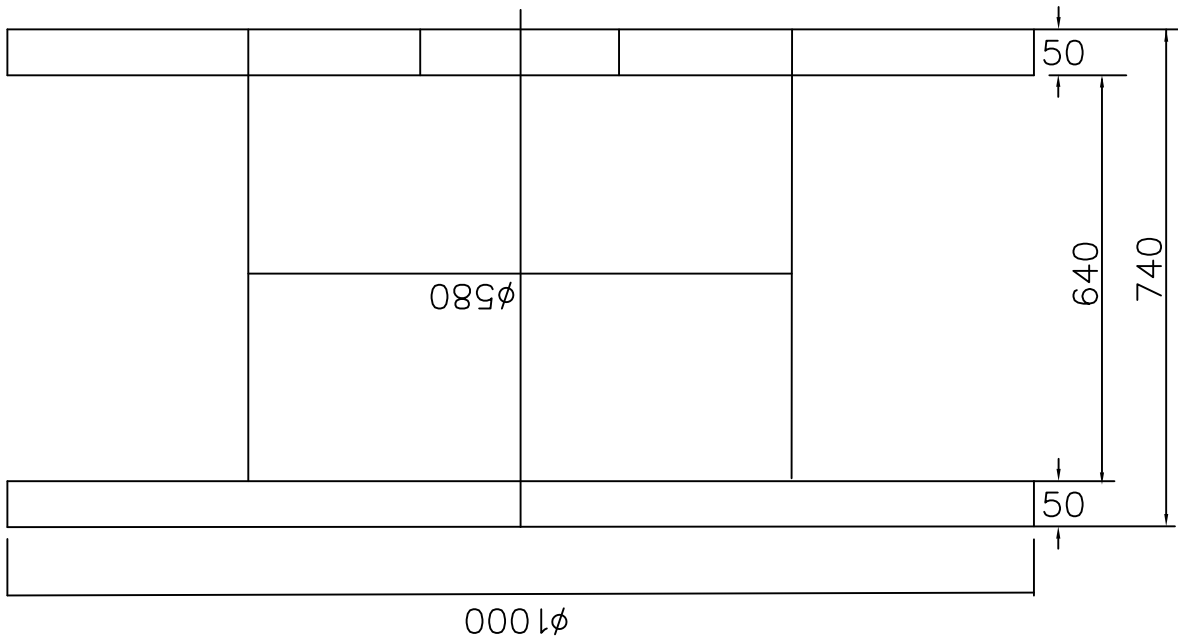
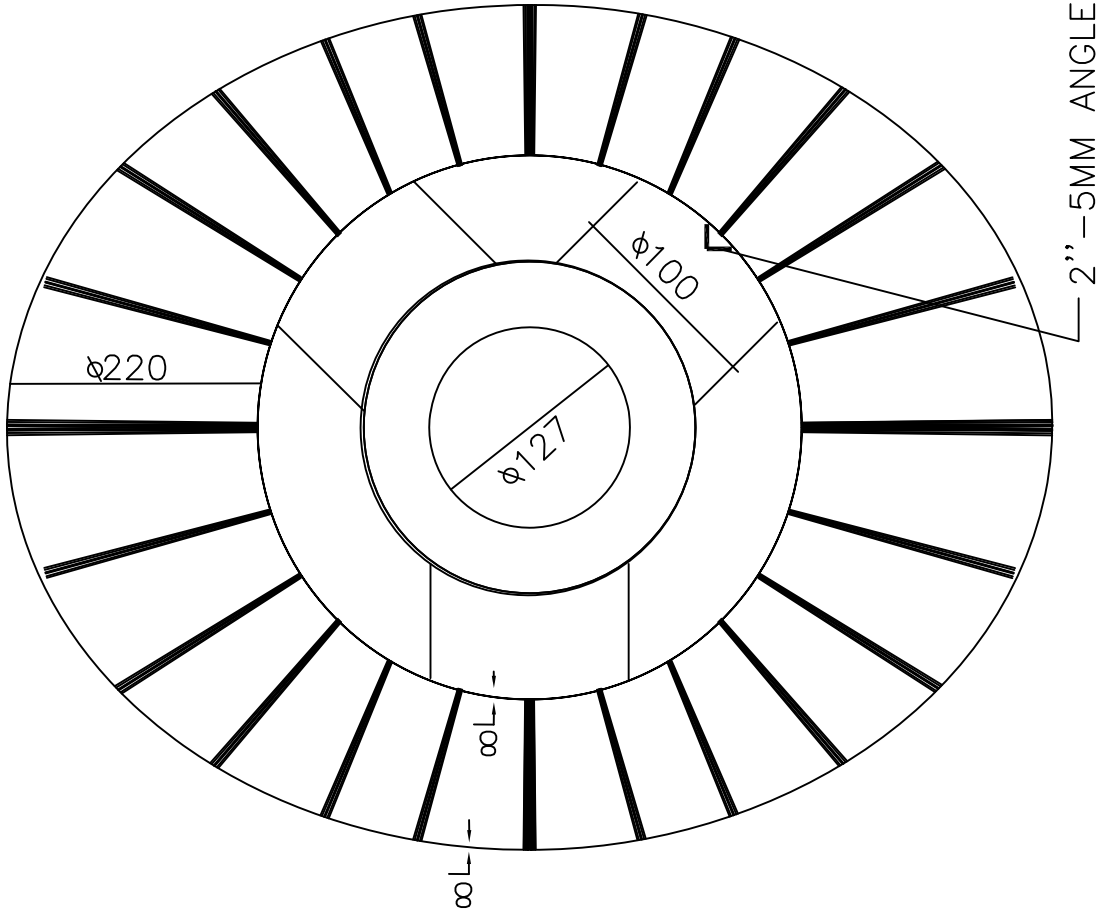
4.1 Cables shall be supplied in non-returnable drums. Material of cable drums shall be as specified in Datasheet-A.

4.2 In case of wooden drums, all wooden parts shall be manufactured from seasoned wood treated with copper naphthenates / zinc naphthenates (refer IS: 401) and anti-termite. The surface of the drum and the outer most cable layer shall be covered with water proof cover polythene followed by complete drum covering by wooden plank. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Dimensions of wooden drums shall be as per IS 10418. All ferrous parts shall be treated with suitable rust protective finish or coating to avoid rusting during transit and storage. BIS certification mark shall be stamped on each cable drum.

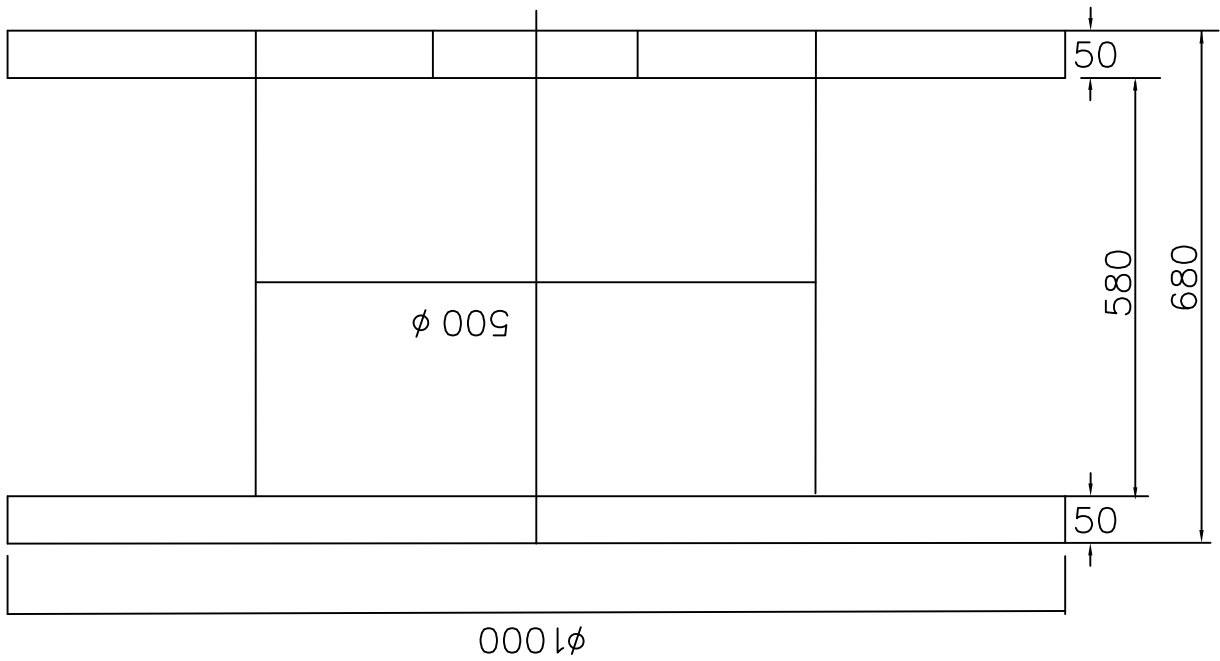
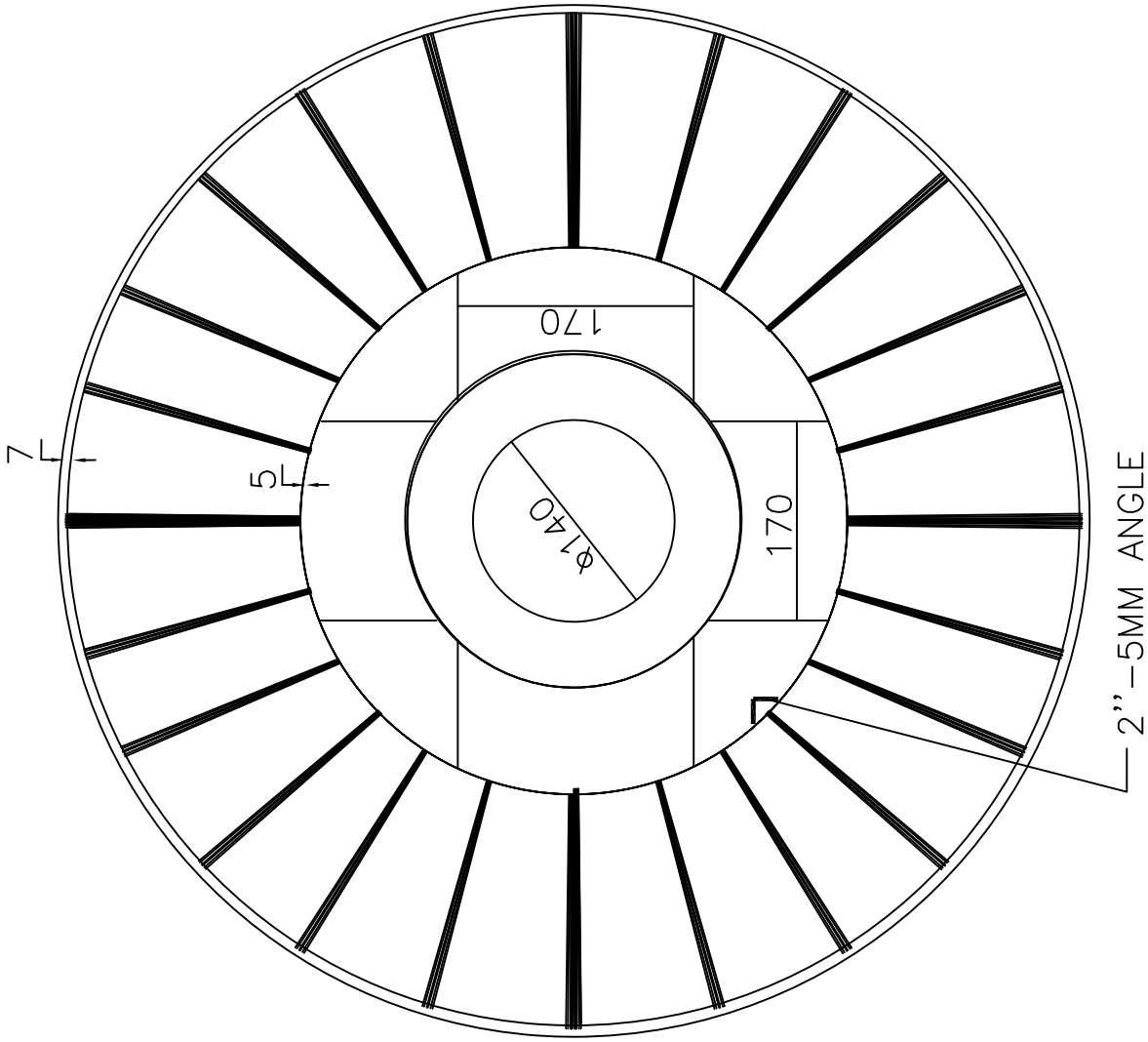
4.3 In case of Steel drums, New or practically new cable drums made of steel and painted with epoxy resin paint are to be used. Cable ends are carefully protected before packing. Over the cables polyethylene sheet shall be wrapped and then sealed properly. For Typical details of Steel drums, Annexure-B to Section-II, may be referred by the bidder. Bidder may modify, to choose appropriate dimensions of steel drums to suite various sizes/weight/ lengths of HT XLPE POWER CABLES. BIS certification mark shall be stamped on each cable drum.

Annexure-C to Section II

(Sheet 1 of 2)



DIMENSION in mm



DIMENSION in mm



851069/2022/PS-PEM-EL



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR HT  
XLPE POWER CABLES**

SPECIFICATION NO. PE-TS- 435-507-E001A

VOLUME II


SECTION II

REVISION 00

DATE: 27.04.2022

SHEET -

**ANNEXURE-II****QUALITY PLAN**

	<b>MANUFACTURER/ BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>	<b>STANDARD QUALITY PLAN</b>			<b>SPEC. NO :</b>			<b>DATE:</b>		
		<b>CUSTOMER :</b>			<b>QP NO.:</b> PE-QP-999-507-E001, R1.					
		<b>PROJECT:</b>			<b>PO NO.:</b>					
		<b>ITEM:</b> HT XLPE Cables		<b>SYSTEM:</b> CABLE		<b>SECTION: II</b>			<b>SHEET 1 OF 11</b>	


Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**		
					M	C/N				D	M	C	N

<b>1.0 RAW MATERIALS &amp; BOUGHT OUT ITEMS</b>														
1.1	Aluminium/copper Rods (Conductor/Armour Wire)	<b>GENERAL :</b>												
		1. Physical properties	MA	Physical Tests	Sample/ Batch	Sample/ Batch	IS 5082 / IS 613	IS 5082/ IS 613	Test Cert.	✓	P/V	V	-	
		2. Elec .Properties	MA	Electrical Tests	Sample/ Batch	Sample/ Batch	-do-	-do-	-do-	✓	P/V	V	-	
		<b>SPECIFIC CHECKS :</b>												
		a) Make	MA	Physical verification	Sample/ Batch	Sample/ Batch	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P	V	-	
		b) Grade	MA	-do-	-do-	-do-	IS 8130	IS 8130	-do-	✓	P	V	-	
1.2	XLPE Compound for insulation	<b>GENERAL :</b>												
		1. Physical properties	MA	Physical Tests	Sample/ Batch	Sample/ Batch	IS 7098-II	IS 7098-II	Test Cert.	✓	P	V	-	
		2. Elec. Properties	MA	Electrical Tests	Sample/ Batch	Sample/ Batch	-do-	-do-	-do-	✓	P	V	-	
		<b>SPECIFIC CHECKS :</b>												

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ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:	MANISH H	MANISH SHUKLA	Reviewed by:	RITESH KUMAR JAISWAL	R.K. JAISWAL



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Sign & Date	
Seal	

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Doc No:			
Reviewed by:	Sign & Date	Name	Seal
Approved by:			

	<b>MANUFACTURER/ BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>	<b>STANDARD QUALITY PLAN</b>				<b>SPEC. NO :</b>			<b>DATE:</b>		
		<b>CUSTOMER :</b>				<b>QP NO.:</b> PE-QP-999-507-E001, R1.					
		<b>PROJECT:</b>				<b>PO NO.:</b>					
<b>ITEM:</b> HT XLPE Cables				<b>SYSTEM:</b> CABLE		<b>SECTION: II</b>			<b>SHEET 2 OF 11</b>		


Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N			9	* D	** M	C	N	

		a) Make	MA	Physical verification	100%	100%	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P/V	V	-	
		b) Type/ Grade	MA	-do-	-do-	-do-	Approved datasheet	Approved datasheet	-do-	✓	P/V	V	-	
		c) Shelf life/ Storage condition	MA	-do-	-do-	-do-	-do-	-do-	-do-	✓	P/V	V	-	
1.3	Semi Conducting Compound	<b>GENERAL :</b>												
		1. Physical properties	MA	Physical Tests	Sample/ Batch	Sample/ Batch	IS 7098-II	IS 7098-II	Inspection Report/ Test Cert.	✓	P	V	-	
		<b>SPECIFIC CHECKS :</b>												
		1. Make	MA	Physical verification	100%	100%	Manufacturer approved source	Manufacturer approved source	-do-	✓	P	V	-	
		2. Type/ Grade	MA	-do-	-do-	-do-	IS 7098-II	IS 7098-II	-do-	✓	P	V	-	
		3. Shelf life/ Storage condition	MA	-do-	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	✓	P	V	-	
1.4	Copper Tape	<b>GENERAL :</b>												
		1. Physical properties	MA	Physical Tests	Sample/ Batch	Sample/ Batch	IS 7098-II & Approved datasheet	IS 7098-II & Approved datasheet	Inspection Report/	✓	P	V	-	

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ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		ABHISHEK	Checked by:		KUNAL GANDHI
Reviewed by:	MANISH SHUKLA	MANISH SHUKLA	Reviewed by:	RITESH KUMAR JAISWAL	R.K. JAISWAL



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Approved by:			

	<b>MANUFACTURER/ BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>		<b>STANDARD QUALITY PLAN</b>				<b>SPEC. NO :</b>			<b>DATE:</b>	
			<b>CUSTOMER :</b>				<b>QP NO.:</b> PE-QP-999-507-E001, R1.				
			<b>PROJECT:</b>				<b>PO NO.:</b>				
			<b>ITEM:</b> HT XLPE Cables		<b>SYSTEM:</b> CABLE		<b>SECTION: II</b>			<b>SHEET 3 OF 11</b>	

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N			9	* D	** M	C	N	

									Test Cert.					
		2. Elec. Properties	MA	Electrical Tests	Sample/ Batch	Sample/ Batch	-do-	-do-	-do-	✓	P	V	-	
		3. Dimension	MA	Measurement	-do-	-do-	-do-	-do-	-do-	✓	P	V	-	
		3. Continuity	MA	Electrical Tests	-do-	-do-	-do-	-do-	-do-	✓	P	V	-	
<b>SPECIFIC CHECKS :</b>														
		1. Resistivity	MA	Electrical Tests	Sample/ Batch	Sample/ Batch	IS 613	IS 613	-do-	✓	P	V	-	
1.5	Fillers (as applicable)	1. Make	MA	Physical verification	100%	100%	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P/V	V	-	Fillers material chosen shall be compatible with the temperature rating of the cable and shall have no deleterious effect on any other comp. of cable)
		2. Type/ Grade	MA	-do-	-do-	-do-	Approved datasheet	Approved datasheet	-do-	✓	P/V	V	-	


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ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		ABHISHEK	Checked by:		KUNAL GANDHI
Reviewed by:	MANISH SHUKLA	MANISH SHUKLA	Reviewed by:	RITESH KUMAR JAISWAL	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	Seal

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Doc No:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			



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 DN: cn=Ritesh K, o=, email=riteshk@bhel.com, ou=BHEL, c=IN  
 Date: 2023.08.25 11:36:17 +05'30'

Digitally signed by R.K. JAISWAL  
 DN: cn=Ritesh Kumar Jaiswal, o=, email=riteshk@bhel.com, ou=BHEL, c=IN  
 Date: 2023.08.25 12:42:52 +05'30'

	<b>MANUFACTURER/ BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>	<b>STANDARD QUALITY PLAN</b>			<b>SPEC. NO :</b>			<b>DATE:</b>			
		<b>CUSTOMER :</b>			<b>QP NO.:</b> PE-QP-999-507-E001, R1.						
		<b>PROJECT:</b>			<b>PO NO.:</b>						
<b>ITEM:</b> HT XLPE Cables			<b>SYSTEM:</b> CABLE			<b>SECTION: II</b>			<b>SHEET 4 OF 11</b>		

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	

1.6	PVC Compound (for sheath)	<b>GENERAL :</b>												
		1. Physical properties	MA	Physical Tests	Sample/ Batch	Sample/ Batch	IS 5831	IS 5831	Test Cert.	✓	P/V	V	-	
		2. Elec. Properties	MA	Electrical Tests	-do-	-do-	-do-	-do-	-do-	✓	P/V	V	-	
		3. FRLS Properties (as applicable)	CR	Chemical/ Environ.	-do-	-do-	Approved datasheet	Approved datasheet	-do-	✓	P/V	V	-	
		<b>SPECIFIC CHECKS :</b>												
		a) Make	MA	Physical verification	100%	100%	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P	V	-	
		b) Type/ Grade	MA	-do-	-do-	-do-	Approved datasheet	Approved datasheet	-do-	✓	P	V	-	
c) Shelf life/ Storage condition	MA	-do-	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	✓	P	V	-			
1.7	Galvanised steel round wire/ formed wire strip/ Aluminium round wire for Armour (as applicable)	<b>GENERAL :</b>												
		1. Make	MA	Physical verification	Manufacturer std.	Manufacturer std.	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P	V	-	
		2. Dimension	MA	Measurement	-do-	-do-	Approved datasheet	Approved datasheet	-do-	✓	P/V	V	-	
		3. Phy.and Elec. Properties	MA	Physical & Electrical Tests	Sample *	Sample *	-do-	-do-	-do-	✓	P/V	V	-	*: SAMPLE FROM EACH ARMOUR


BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Prepared by:		ABHISHEK	Checked by:		KUNAL GANDHI
Reviewed by:	MANISH	MANISH SHUKLA	Reviewed by:	RITESH KUMAR	R.K. JAISWAL

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Sign & Date	Seal

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

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	<b>MANUFACTURER/ BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>	<b>STANDARD QUALITY PLAN</b>					<b>SPEC. NO. :</b>			<b>DATE:</b>		
		<b>CUSTOMER :</b>					<b>QP NO.:</b> PE-QP-999-507-E001, R1.					
		<b>PROJECT:</b>					<b>PO NO.:</b>					
		<b>ITEM:</b> HT XLPE Cables			<b>SYSTEM:</b> CABLE		<b>SECTION: II</b>			<b>SHEET 6 OF 11</b>		

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N			9	* D	** M	C	N	



		2. Resistance	CR	Electrical	-do-	-do-	-do-	-do-	-do-	✓	P	V	-	
		3. Sequence, lay length & Direction	MA	Visual, Meas.	One Sample of each size/ lot	-	Mfrs Std. / Appd. Datasheet	Mfrs Std. / Appd. Datasheet	-do-		P	-	-	
		4. Surface Finish	MA	Visual	100%	-	-	Surface shall be smooth	-do-		P	-	-	
		5. Dimension	MA	Measurement	One Sample of each size/ lot	-	Appd. Datasheet	Appd. Datasheet	-do-		P	-	-	
2.3	Conductor Screening	1. Surface Finish	MA	Visual	100%	-	-	Surface shall be smooth	Inspection Report		P	-	-	
		2. Radial Thickness	CR	Mechanical	One Sample of each size/ lot	-	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-		P	-	-	
2.4	Core Insulation (XLPE) (No repair permitted)	1. Surface finish	MA	Visual	100%	100%	-	Free from bulging, burnt particles, lumps, cuts & scratches	Inspection Report/ Test report	✓	P	V	-	
		2. Eccentricity & Ovality #	CR	Measurement	One Sample of each size/ lot	One Sample of each	Mnfr's Std	Mnfr's Std	-do-	✓	P	V	-	# To be checked at starting & finished

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ENGINEERING			QUALITY		Sign & Date		Doc No:			
	Sign & Date	Name	Checked by:	Sign & Date	Name	Seal		Sign & Date	Name	Seal
Prepared by:		ABHISHEK	Checked by:		KUNAL GANDHI					
Reviewed by:	MANISH	MANISH SHUKLA	Reviewed by:	RITESH KUMAR JAISWAL	R.K. JAISWAL					

	<b>MANUFACTURER/ BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>	<b>STANDARD QUALITY PLAN</b>				<b>SPEC. NO :</b>			<b>DATE:</b>		
		<b>CUSTOMER :</b>				<b>QP NO.:</b> PE-QP-999-507-E001, R1.					
		<b>PROJECT:</b>				<b>PO NO.:</b>					
		<b>ITEM:</b> HT XLPE Cables		<b>SYSTEM:</b> CABLE		<b>SECTION: II</b>			<b>SHEET 7 OF 11</b>		


Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	*	**		
					M	C/N				D	M	C	N

					size/lot									end of extruded length.
		3. Insulation Thickness	CR	Measurement	-do-	-	Appd. Datasheet	Appd. Datasheet	-do-		P	-	-	
		4. Dia over insulation	MA	Measurement	-do-	-	-do-	-do-	-do-		P	-	-	
		5. Tensile Strength & % Elongation	MA	Mechanical	100%	-	IS:7098-II	IS:7098-II	-do-		P	-	-	
		<b>NON METTALIC</b>												
		1. Surface finish	MA	Visual	100%	100%	-	Surface shall be smooth	Inspect ion Report	✓	P	V	-	
		2. Thickness	CR	Measurement	One Sample of each size/ lot	-do-	Appd. datasheet	Appd. datasheet	-do-	✓	P	V	-	
		<b>METALLIC</b>												
		1. Dimension of tape	CR	Measurement	One Sample of each size/ lot	One Sample of each size/ lot	Appd. datasheet	Appd. datasheet	Inspect ion Report/ Test report	✓	P	V	-	
		2. Overlap of Tape Band	MA	-do-	-do-	-do-	Mfs Std.	Mfs Std.	-do-	✓	P	V	-	
		3. Tightness of Tape	MA	Visual	-do-	-do-	Mfs Std.	Mfs Std.	-do-	✓	P	V	-	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		ABHISHEK	Checked by:		KUNAL GANDHI
Reviewed by:	MANISH SHUKLA	MANISH SHUKLA	Reviewed by:	RITESH KUMAR JAISWAL	R.K. JAISWAL





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	<b>MANUFACTURER/ BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>	<b>STANDARD QUALITY PLAN</b>			<b>SPEC. NO :</b>			<b>DATE:</b>		
		<b>CUSTOMER :</b>			<b>QP NO.:</b> PE-QP-999-507-E001, R1.					
		<b>PROJECT:</b>			<b>PO NO.:</b>					
		<b>ITEM:</b> HT XLPE Cables		<b>SYSTEM:</b> CABLE		<b>SECTION: II</b>			<b>SHEET 8 OF 11</b>	

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N			9	* D	** M	C	N	





2.6	Core Laying	1. Dia over laid up core	MA	Measurement	One Sample of each size/ lot	One Sample of each size/ lot	Appd. Datasheet	Appd. Datasheet	Inspection Report	✓	P	V	-	
		2. Sequence of lay & direction	MA	Visual & Meas.	-do-	-do-	IS 7098-II & Mfr. Std.	IS 7098-II & Mfr. Std.	-do-	✓	P	V	-	
		3. Lay Length	MA	Measurement	-do-	-do-	-do-	-do-	-do-	✓	P	V	-	
2.7	InnerSheath Extrusion (as applicable)	1. Surface finish	MA	Visual	100%	-	-	Surface shall be smooth	Inspection Report		P	-	-	
		2. Thickness	CR	Measurement	One Sample of each size/ lot	-	Appd. Datasheet	Appd. Datasheet	-do-		P	-	-	
		3. Dia over inner sheath	MA	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
2.8	Armour (as applicable)	1. No.of wires/Strips	MA	Counting	At the start of process	-	Mfr. Std.	Mfr. Std.	Inspection Report		P	-	-	
		2. Lay length & Direction	MA	Visual & Meas.	-do-	-	-do-	-do-	-do-		P	-	-	
		3. Dia over armouring	MA	Measurement	-do-	-	Appd. Datasheet	Appd. Datasheet	-do-		P	-	-	
		4. Coverage	MA	Measurement	-do-	-	-do-	-do-	-do-		P	-	-	

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Sign & Date	Name	Sign & Date	Name	Seal		Sign & Date	Name	Seal	
Prepared by: 	ABHISHEK	Checked by: 	KUNAL GANDHI						
Reviewed by: MANISH 	MANISH SHUKLA	Reviewed by: RITESH KUMAR JAISWAL 	RITESH KUMAR JAISWAL						

	<b>MANUFACTURER/ BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>	<b>STANDARD QUALITY PLAN</b>					<b>SPEC. NO :</b>			<b>DATE:</b>		
		<b>CUSTOMER :</b>					<b>QP NO.:</b> PE-QP-999-507-E001, R1.					
		<b>PROJECT:</b>					<b>PO NO.:</b>					
		<b>ITEM:</b> HT XLPE Cables			<b>SYSTEM:</b> CABLE		<b>SECTION: II</b>			<b>SHEET 9 OF 11</b>		


Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**		
					M	C/N				D	M	C	N

2.9	Outer Sheath Extrusion (No repair permitted)	1. Surface finish	MA	Visual	100%	-	-	Surface shall be smooth	Inspection Report/ Test report		P	-	-	
		2. Sheath Thickness	CR	Measurement	One Sample of each size/ lot	-	Appd. Datasheet	Appd. Datasheet	-do-		P	-	-	
		3. Dia over outer sheath	MA	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		4. Embossing/ Sequential Marking	MA	Visual	100%	-	Approved data sheet	Approved data sheet	-do-		P	-	-	
3.0	Finished Cable (INTERNAL)	1. Routine Test (Refer Note-H)	CR	Electrical Tests & Measurement	100%	100%	#	#	-do-	✓	P	V	V	#: Refer Annexure-A to QP
4.0	Final Inspection (EXTERNAL)	1. Finish & Length (cable & drum)	MA	Visual	One drum in each Lot	One drum in each Lot	Appd. Datasheet	Free from Porosity, Bulging, Burnt particles, lumps, cuts & scratches	Inspection Report	✓	P	W	W	
		2. Dimension	MA	-do-	As per IS 7908-II	As per IS 7908-II	Appd. Datasheet	Appd. Datasheet	-do-	✓	P	W	W	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		ABHISHEK	Checked by:		KUNAL GANDHI
Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	



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Approved by:			

	<b>MANUFACTURER/ BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>	<b>STANDARD QUALITY PLAN</b>			<b>SPEC. NO :</b>			<b>DATE:</b>			
		<b>CUSTOMER :</b>			<b>QP NO.:</b> PE-QP-999-507-E001, R1.						
		<b>PROJECT:</b>			<b>PO NO.:</b>						
<b>ITEM:</b> HT XLPE Cables			<b>SYSTEM:</b> CABLE			<b>SECTION: II</b>			<b>SHEET 10 OF 11</b>		

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	


		<b>3. Armouring - Coverage No. of Wires/Strips</b>	MA	Visual & Meas.	As per IS 7908-II	As per IS 7908-II	Appd. Datasheet	Appd. Datasheet	-do-	✓	P	W	W	
		<b>4. Marking &amp; Colour Coding</b>	MA	Visual	As per IS 7098-II	As per IS	As per IS 7098-II	Approved Data Sheet	-do-	✓	P	W	W	
		<b>5. Acceptance Tests (Refer Note-H)</b>	CR	Phy, Elect. Tests & FRLS Tests	-do-	-do-	#	-do-	-do-	✓	P	W	W	#: Refer Annexure-A to QP.
		<b>6. Type Tests (Refer Note-H)</b>	CR	Physical & Electrical Tests	#	#	-do-	-do-	-do-	✓	P	W	W	#: Refer Annexure-A to QP.
<b>5.0</b>	<b>Packing</b>	<b>1. Sealing Identification</b>	MA	Visual	100%	100%	As per IS 7098-II	As per IS 7098-II	-	✓	P	W	-	
		<b>2. Cable drums</b>	MA	Visual	100%	100%	Appd. Datasheet	Appd. Datasheet	-	✓	P	W	-	

**NOTES:**

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		ABHISHEK	Checked by:		KUNAL GANDHI
Reviewed by:	MANISH	MANISH SHUKLA	Reviewed by:	RITESH KUMAR JAISWAL	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Reviewed by:			
Approved by:			

	<b>MANUFACTURER/ BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>		<b>STANDARD QUALITY PLAN</b>				<b>SPEC. NO :</b>			<b>DATE:</b>		
			<b>CUSTOMER :</b>				<b>QP NO.:</b> PE-QP-999-507-E001, R1.					
			<b>PROJECT:</b>				<b>PO NO.:</b>					
			<b>ITEM:</b> HT XLPE Cables		<b>SYSTEM:</b> CABLE		<b>SECTION: II</b>			<b>SHEET 11 OF 11</b>		
<b>Sl. No.</b>	<b>COMPONENTS &amp; OPERATIONS</b>	<b>CHARACTERISTICS</b>	<b>CLASS</b>	<b>TYPE OF CHECK</b>	<b>QUANTUM OF CHECK</b>	<b>REFERENCE DOCUMENT</b>	<b>ACCEPTANCE NORMS</b>	<b>FORMAT OF RECORD</b>	<b>AGENCY</b>	<b>REMARKS</b>		
1	2	3	4	5	6	7	8	9	*	**		
					M	C/N			D	M	C	N

- A). Joints in conductors & armour shall be as permitted by IS: 8130 & IS: 7098-I respectively.
- B). No repair of core insulation permitted.
- C). Cable ends shall be sealed.
- D). Record of raw material, process & all stages shall be certified by vendors' QC and are liable to audit check by purchaser.
- E). Fillers/dummy cores etc. shall be as per BHEL specification.
- F). Wherever extent of check for stage is mentioned as 'sample' & not defined in QP, the same shall be as per vendors sampling plan agreed by purchaser.
- G). Vendor shall furnish compliance certificate to the inspection agency confirming the packing as per IS/ BHEL specification.
- H). For lists of routine tests, acceptance tests & type tests refer annexure to QAP.
- I). Cable manufacturer to maintain records to show co-relation of raw materials to finished cables i.e. raw material batch/ lot no. should be traceable to the final cable drum number or batch no.
- J). Cable manufacturer to maintain all quality records identified as per all QP stages enumerated below whether it is identified for BHEL verification or witness or not.
- K). BHEL reserves the right to perform repeat test, if required.
- L). Photographs of cable to be despatched shall be sent to BHEL Purchase Group for review prior to issue of MDCC.
- M). Project specific QP shall be developed based on customer requirement.
- N). For export jobs, BHEL Technical Specification for Seaworthy Packing for Export Jobs is to be followed.
- O). Packing shall be suitable for storage at site in tropical climate conditions.
- P). Latest revision/ year of issue of all the standards (IS/ ASME/ IEC etc.) indicated in QP shall be referred.



**LEGENDS:**

\*Records, identified with "Tick"(√) shall be essentially included by supplier in QA documentation.

\*\* **M:** Supplier/ Manufacturer/ Sub-Supplier, **C:** Main Supplier/ BHEL/ Third Party Inspection Agency, **N:** Customer

**P:** Perform, **W:** Witness, **V:** Verification, as appropriate

**MA:** Major, **MI:** Minor, **CR:** Critical, **D:** Documentation

BHEL				BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Doc No:			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name	Seal
Prepared by:		ABHISHEK	Checked by:		KUNAL GANDHI	Reviewed by:			
Reviewed by:	MANISH	MANISH SHUKLA	Reviewed by:	RITESH KUMAR JAISWAL	R.K. JAISWAL	Approved by:			

## Annexure "A" to Quality Plan

## TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS

## A. Type Test Conduction:

1. Tests for which "T" is indicated in the 'Test Conduction Required As' column below shall be conducted as Type Test.
2. Sampling:
  - a) Type test to be conducted on 1 drum for every 10 drums or less of each type and size of cable/ lot.
  - b) Electrical tests to be conducted on one drum of every size & voltage grade of cables.
  - c) FRLS test & Flammability Test to be conducted on every size & voltage grade of cables. Sampling quantity as per appendix -D of IS 7098-2, D2.2.

## B. Acceptance Test Conduction:

1. Tests for which "A" is indicated in the 'Test Conduction Required As' column below shall be conducted as Acceptance tests.
2. Sampling:
  - a) Sampling for acceptance tests shall be as per D-2.2 of Annexure-D of IS-7098-2.
  - b) FRLS test & Flammability Test to be conducted on every size & voltage grade of cables. Sampling quantity as per appendix -D of IS 7098-2, D2.2.

## C. Routine Test Conduction:

1. Tests for which "R" is indicated in the 'Test Conduction Required As' column below shall be conducted as Routine tests.
2. Sampling: Routine tests shall be conducted on 100% cable drums.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
1.0	<b>Tests for Conductor</b>				
I.	Annealing test	For copper conductor only	T, A	IS 10810 Pt 1	<i>Internal in process Test Report to be furnished for acceptance test</i>
II.	Tensile test	For aluminium conductor only (Not applicable for compacted circular or shaped conductor)	T, A	IS 10810 Pt 2	
III.	Wrapping test	For aluminium conductor only (Not applicable for compacted circular or shaped conductor)	T, A	IS 10810 Pt 3	
IV.	Resistance test	For Al/Cu	T, A, R	IS 10810 Pt 5	
2.0	<b>Tests for Armour Wires/Strips</b>				
I.	Measurement of dimensions	Applicable for Aluminium wire & GS wire/Strip	T, A	IS 10810 Pt 36	
II.	Tensile test	Applicable for Aluminium wire & GS wire/Strip	T, A	IS 10810 Pt 37	
III.	Elongation at break test	Applicable for GS wire/Strip only	T, A	IS 10810 Pt 37	
IV.	Torsion test	For GS round wire only	T, A	IS 10810 Pt 38	

## Annexure "A" to Quality Plan

<u>S. No.</u>	<u>TEST</u>	<u>APPLICABLE FOR</u>	<u>TEST CONDUCTION REQUIRED AS</u>	<u>REFERENCE STANDARD</u>	<u>REMARKS</u>
V.	Winding test	For GS strip only	T, A	IS 10810 Pt 39	
VI.	Resistivity test	Applicable for Aluminium wire & GS wire	T, A	IS 10810 Pt 42	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 40	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 41	
IX.	Wrapping Test	For Aluminium wires only	T, A	IS 10810 Pt 3	
<b>3.0</b>	<b><u>Physical Tests for XLPE Insulation &amp; PVC sheath</u></b>				
I.	Test for thickness & Eccentricity	Applicable for XLPE insulation, HRPVC inner sheath & For HRPVC <i>inner/outer sheath</i> only	T, A	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for XLPE insulation & For HRPVC <i>inner/outer sheath</i> only			
(a)	Before ageing		T, A	IS 10810 Pt 7	
(b)	After ageing		T, A	IS 10810 Pt 7	
III.	Ageing in air oven	Applicable for XLPE insulation & For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 10	
V.	Hot deformation test	For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 15	
VI.	Heat shock test	For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 14	
VII.	Shrinkage test	For XLPE insulation & For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 12	
VIII.	Thermal stability test	For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 60	
IX.	Hot set test	For XLPE insulation only	T, A	IS 10810 Pt 30	
X.	Water absorption (gravimetric) test	For XLPE insulation only	T	IS 10810 Pt 33	
XI.	Cold Impact test	For <i>inner &amp; outer sheath</i> only	T, A	IS 5831	
<b>4.0</b>	<b><u>Tests On Extruded Semi-conducting Screen</u></b>				
I.	Test for Strippability	Applicable for Semi-conducting Strippable screen	T	IS 7098-II	<u>Not applicable since it is bonded type</u>
II.	Volume Resistivity	Applicable for Semi-conducting Strippable screen	T	IS 7098-II	
III.	Test for cross linking		A	IS 7098-II	
<b>5.0</b>	<b><u>Improved Fire performance (FR-LSH) Tests</u></b>				
I.	Oxygen index test	For <del>inner</del> <i>inner/outer sheath</i> only	T, A	IS 10810 Pt 58 / ASTM D 2863	<i>Sample shall be as per IS 7098, Part 2</i>

## Annexure “A” to Quality Plan

<u>S. No.</u>	<u>TEST</u>	<u>APPLICABLE FOR</u>	<u>TEST CONDUCTION REQUIRED AS</u>	<u>REFERENCE STANDARD</u>	<u>REMARKS</u>
II.	Smoke density test	<i>For <del>inner</del>/outer sheath only</i>	T, A	ASTMD 2843	
III.	Acid gas generation test	<i>For <del>inner</del>/outer sheath only</i>	T, A	IS 10810 Pt 59 / IEC-754-1	
IV.	Temperature Index Test	<i>For <del>inner</del>/outer sheath only</i>	T,A	IS 10810 Pt 64 / ASTMD 2863	
<b>6.0</b>	<b><u>Flammability Tests</u></b>				
I.	Flammability test for bunched cables	For complete cable	T,A	IEC-60332 (Part-3 of 23 CAT-B)	
II.	Flammability test for single cable	For complete cable	T,A	IEC:60332 Part-1	
III.	Swedish chimney test	For complete cable	A	SEN SS 424 1475 (Class F3)	
IV.	Flammability test	For complete cable	A	IEEE: 60383	
<b>7.0</b>	<b><u>Electrical Tests</u></b>				
I.	High Voltage Test (water immersion)	For complete cable	T, A, R	IS 10810 Pt 45	
II.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T, A	IS 10810 Pt 43	
III.	Partial discharge test (shall be carried out on full drum length)		T,A,R	IS 10810 Pt 46	
IV.	Bending Test followed by Partial Discharge test		T	IS 10810 Pt 50	
V.	Dielectric Power Factor Test (i) As a function of voltage (ii) As a function of temperature		T	IS 10810 Pt 48	
VI.	Heat Cycle Test		T	IS 10810 Pt 49	
VII.	Impulse Withstand Test		T	IS 10810 Pt 47	
VIII.	Thermal ageing test	For complete cable	T	IS 7098-II	
IX.	<i>Flammability Test</i>	<i>For HRPVC sheathed cable</i>	<i>T</i>	<i>IS 10810 Pt 53</i>	
<b>8.0</b>	<b><u>Anti-rodent and Termite Repulsion test</u></b>	For HRPVC <i>outer sheath</i> only	T	Refer Note	<b><u>Test applicable as indicated in Datasheet-A</u></b>
<b>9.0</b>	<b><u>Anti-Fungal Test</u></b>	For HRPVC outer sheath only	A	<b><u>Self-certification by vendor for anti-fungal property.</u></b>	
<b>10.0</b>	<b><u>Special Test</u></b>				
I.	Hydrolytic Stability	For Complete Cable	A (**)	ASTM D 3137	<b><u>Test applicable as indicated in Datasheet-A</u></b>
II.	Ultraviolet Test	For Complete Cable	A (**)	BS EN ISO 4892-2	

**\*\* These tests shall be conducted on one sample for the entire contract and duration of these tests shall be 14 days.**

Note: A few chipping of the PVC compound is slowly ignited on a porcelain dish or cubicle in a muffle furnace at about 60-degree C. The resulting ignited ash is boiled with a little ammonium acetate solution (10%). Place a drop of aqueous sodium sulphide solution on a thick filter paper and allow soaking. Touch the spot with a drop of above extract. A black spot indicates the presence of lead, the anti-termite and rodent compound.