

VOLUME II

UPRVUNL

1 X 660 MW PANKI TPS

TECHNICAL SPECIFICATION

FOR

HT XLPE POWER CABLES

SPECIFICATION NO: *PE-TS-426-507-E001*

REVISION: 0



BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA, UP (INDIA) – 201301

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	SPECIFICATION NO. PE-TS- 426-507-E001	
		VOLUME II	
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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 deviations 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 'BOQ-Cum-Price schedule' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

BIDDER'S STAMP & SIGNATURE

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SECTION –I

SPECIFIC TECHNICAL REQUIREMENTS



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1.0 SCOPE OF ENQUIRY

- 1.1 Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of HT XLPE Power Cables conforming to this specification.
- 1.2 General technical requirements of the HT XLPE Power cables are indicated in Section-II. Project specific technical/ quality requirements / changes are listed in Section-I.
- 1.3 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.
- 1.4 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 'BOQ-cum-price schedule' as part of NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENTS

S.No.	Reference Clause No. of Section- II	Specific Requirement/ Change
1.	4.0 (In continuation to Clause 4.1 -4.3, Clause 4. 4-4.6 shall be read as)	4.4 Cables shall be supplied in non-returnable drums. The drums shall be of heavy construction as per relevant IS. All ferrous parts used shall be treated with suitable rust preventive finish or coating to avoid rusting during transit or storage. 4.5 Cable shall be wound and packed on drums in such a manner that it will be properly sealed and firmly secured to the drum. The ends of each length shall be sealed before shipment. Heat shrinkable cable seals shall be used for this purpose. 4.6 A label shall be securely attached to each end of the reel indicating the details mentioned below. A tag containing the same information shall be attached to the leading end of the cable inside. Drum numbers are to be indicated on cable drums.

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

- 4.1 Following documents/drawings shall be submitted after placement of order for BHEL & customer's approval:-

SL. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.	Document Type	Submission Schedule
1	Cross Section Drawing-HT XLPE Power Cables	PE-V0-426-507-E103	Primary	R0 within 14 days from PO & subsequent revisions within 10 days of comments received from BHEL. BHEL shall furnish comments/approval on each submission within 18 days from receipt.
2	Technical Data Sheet -HT XLPE Power Cable	PE-V0-426-507-E101	Primary	
3	Quality Plan- HT XLPE Power Cables	PE-V0-426-507-E912	Primary	
4	Type Test Certificates-HT XLPE Power Cables	PE-V0-426-507-E104	Secondary	Submission within 1 week from conducting Type Tests & resubmission within 1 week of comments.



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Note:

1. The above list of drawings and documents is indicative.
2. Document schedule shall be as per NIT.
3. After receiving LOI, the vendor shall submit drawings/documents in requisite number of copies as per NIT.

* Standard Quality Plan as enclosed in the technical specification is to be appended with cover sheet bearing document number and description as stated above. The signed and stamped copy of the same shall be submitted to BHEL without making any changes in the contents of the document.

- 4.2 Drawings/documents shall be submitted through Document Management System (DMS).

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DATASHEET A



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1.0	Type of Cable	Flame Retardant-Low Smoke Halogen (FR-LSH)	GOLDEN PARAMETER
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, ASTMD:2843, ASTMD:2863, IEC-754-1, IEC:60332 (Part-1), IEC:60332-3-23, IEEE:60383, IS:3961, IS:4905, IEC:60	
3.0	Voltage Grade	11/11kV(UE) & 3.3/3.3kV(UE)	GOLDEN PARAMETER
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ cum price schedule (part of NIT)	
5.0	CONDUCTOR		GOLDEN PARAMETER
(a)	Material	Aluminium	
	Grade and Class	Multi-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		GOLDEN PARAMETER
(a)	Material	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 IS 7098 Part-2	
7.0	INSULATION SCREEN	For both SINGLE CORE & MULTI CORE cables	GOLDEN PARAMETER
(a)	Non-metallic		
(i)	Material	Extruded Cross-linked Semi-conducting compound	
(ii)	Minimum thickness	0.3 mm	
(b)	Metallic	Armour shall constitute metallic part of screening for single	



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		core armoured cable	
(i)	Material	Copper	
(ii)	Size	Minimum thickness 0.1mm	
(iii)	Minimum Overlap	10%	
(c)	Earth fault current withstand capacity	300A,2 sec (For multi-core cables, screen of each core shall be rated individually for the above value).	
8.0	EXTRUSION (Insulation and Screens)		GOLDEN PARAMETER
(a)	Process	Triple Extrusion (Extruded semi-conducting compound conductor screen and insulation screen shall be applied along with XLPE insulation in a single operation by triple extrusion process).	
(b)	Method of Curing	Dry curing using Nitrogen	
9.0	CORE IDENTIFICATION	By coloured strips applied on the cores or by numerals printing on the cores	
10.0	INNER SHEATH	For Single/ Multi core cables	GOLDEN PARAMETER
(a)	Material	Extruded HRPVC Type ST-2	
(b)	Standard Applicable	IS: 7098 (Part-2) & IS: 5831	
(c)	Colour	Black	
(d)	Whether FR-LSH	YES	
(e)	Inner sheath applicable for single core cable	YES	
(f)	Fillers	Not Acceptable (except for centre filler)	
(g)	Material of fillers (if permitted)	Same as inner sheath	
(h)	Method of application		
(1)	Multi-core cables:		
(i)	With fillers	[☒] Pressure extruded	
(ii)	Without fillers	Pressure extruded	
(i)	Thickness of inner sheath	As per Table-5 of IS: 7098 (Part-2)	



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11.0	ARMOUR	Applicable, as per BOQ cum price schedule (part of NIT)		GOLDEN PARAMETER
a)	Material	Galvanised Steel		
(i)	Multicore cables	Strip Armour (Armour dimensions as per Sl. No.(ii) of table – 6 of IS 7098 Part-II.		
(ii)	Single core cables	Aluminium Round Wire H4 grade to IS: 8130 with maximum resistivity of 0.028264 ohm-sq.mm/mtr at 20 deg. C Types and sizes of aluminium armouring shall be same as mentioned for galvanized steel (11.0 (iii))		
(iii)	Multi Core Cable	Calculated Nominal Dia of Cable under Armour	Size and Type of Armour	
		Upto 13mm	1.4 mm Dia GS Wire	
		Above 13mm & upto 25 mm	0.8mm thick GS formed wire/ 1.6mm dia GS Wire	
		Above 25mm & upto 40 mm	0.8mm thick GS formed wire/ 2.0mm dia GS Wire	
		Above 40mm & upto 55 mm	1.4mm thick GS formed wire/ 2.5mm dia GS Wire	
		Above 55mm & upto 70 mm	1.4mm thick GS formed wire/ 3.15mm dia GS Wire	
		Above 70 mm	1.4mm thick GS formed wire/ 4.0mm dia GS Wire	
b)	Minimum coverage	90%		
c)	Gap between armour wires	Shall not exceed one armour wire space (No cross-over/over-riding)		
d)	Breaking load of joint	>95% of normal armour		
e)	Armour joint surface	To be applied with Zinc rich paint		
12.0	OUTERSHEATH			GOLDEN PARAMETER
(a)	Material	Extruded HRPVC (Type ST2 as per IS: 5831)		
(b)	Colour	Black		



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(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	BHEL-PEM and UPRVUNL, Manufacturer's name and /or trade mark, voltage grade, year of manufacture, Type of insulation, Cable size (cross section area of conductor and no. of cores), Cable Code IS Number(s), ISI MARK, Type of inner & outer sheath e.g. "FRLSH" etc. @ 5 m (by embossing), Progressive sequential marking of length of cable in meters @ 1m (by printing) for 11kV & 3.3 kV Cables.	
13.0	FR-LSH CHARACTERISTICS		GOLDEN PARAMETER
(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)	Flammability test for single cable	YES As per: IEC-60332 Part-1	
(ii)	Flammability test for bunched cables	YES As per IEC-60332 Part-3, CAT-B	
(iii)	Flammability test as per IEEE: 60383	YES	
(iv)	As per Swedish Chimney test SEN-SS-424-1475-F3	YES, as applicable	
(f)	Anti-rodent and Termite repulsion Test	YES	
(g)	Anti Fungal Test	No	
(h)	Special Tests		
(i)	Hydrolytic Stability as per ASTM D 3137 :81 (Duration:- 14 days)	No	
(ii)	UV Radiation Test as per BS EN ISO 4892-2 (Duration:- 14 days)	No	
(iii)	UV Radiation Test as per ASTM G 154	No	



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	(Duration:- 14 days)		
14.0	TOLERANCE ON OUTER DIAMETER	(±)2 mm. over the declared value	
15.0	CABLE DRUMS		GOLDEN PARAMETER
(a)	Type of Drum	[√] Steel as per relevant IS	
(b)	Standard drum length	As per Price Schedule	
(c)	Painting	Entire surface to be painted	
(d)	Outermost Layer	To be covered with waterproof polyethylene	
(e)	Others	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.	
(f)	Particular information on Drum	BHEL-PEM and UPRVUNL, Manufacturer's name and /or trade mark, voltage grade, year of manufacture, Type of insulation, Type of inner & outer sheath e.g. "FRLSH" etc Cable size (cross section area of conductor and no. of cores), Cable Code IS/IEC Number(s), Length of Cable, ISI Mark, Direction of rotation by Arrow, Approx Gross Mass.	

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DATASHEET C

GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)

S.No.	Particulars	Unit	Description
1.0	GENERAL		
1.1	Name of Manufacturer	-	
1.2	Place of Manufacture	-	
2.0	STANDARDS APPLICABLE		
2.1	IS: 7098 Part-2 For general specification of XLPE Cables	YES	
2.2 I	S: 8130 For conductor material	YES	
2.3 I	S: 5831 For material of innersheath & outersheath	YES	
2.4	IS: 3975 / IS: 8130 For armour of 3 core/ single core cables	YES	
2.5 I	S: 10810 For method of tests	YES	
2.6 AST	MD-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 I	EC-60754-1 For acid gas generation test	YES	
2.9 AST	MD-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	-	
3.0	INSTALLATION CONDITIONS AT SITE		
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	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

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4.0	INSTALLATION CONDITIONS FOR CURRENT RATING SPECIFIED AT CLAUSE 7.3		
5.0	CHARACTERISTICS OF FR-LSH SHEATH		
5.1	Oxygen index	-	
5.2	Temperature index	-	
5.3	Acid gas generation	-	
5.4	Smoke density rating	-	
6.0	CABLE DRUMS		
6.1	Type & construction	-	
6.2	Standard drum length	-	
6.3	Tolerance on drum length	-	
7.0	INFORMATION TO BE FILLED IN FOR EACH SIZE CABLE IN THE FORM OF TABLE		
7.1	No. of cores x size	-	
7.2	Voltage grade (Uo/U)	kV	
7.3	Base current ratings (*) based on Clause No. 3.0		
a)	In air	Amp	
b)	In ground	Amp	
c)	ducts Am	p	
7.4	Short circuit rating	kA, sec	
7.5 Prop	erties		
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 COND	UCTOR		
a)	Material type & grade	-	
b)	No & dia of wires in each core before stranding	no x mm	
c)	Shape	-	

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7.7 COND	DUCTOR SCREEN		
a)	Material	-	
b) M	Minimum thickness	mm	
7.8	XLPE INSULATION		
a)	Nominal thickness of insulation	mm	
b)	Method of curing	-	
7.9 I	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.	

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7.13	DIAMETERS		
a)	Diameter of insulated conductor	mm.	
b)	Cable diameter under armour	mm.	
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.	
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GENERAL 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 Standard Quality Plan (PE-QP-999-507-E001, R1) 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 – A to QP. Charges for all these tests for all the equipment & components shall be deemed to be included in the bid price (except UV Radiation & Hydraulic Stability test).

3.4 The charges of UV Radiation test & Hydraulic 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). 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. Over the cables polyethylene sheet shall be wrapped and then sealed properly.

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.

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SHEET -

QUALITY PLAN

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

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

1.0 RAW MATERIALS & BOUGHT OUT ITEMS

1.1	Aluminium/copper Rods (Conductor/Armour Wire)	GENERAL :												
		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	-	
		SPECIFIC CHECKS :												
		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	-	
		c) Resistivity	MA	Electrical Tests	Manufacturer std.	Manufacturer std.	IS 5082 / IS 613	IS 5082/ IS 613	-do-	✓	P	V	-	
1.2	XLPE Compound for insulation	GENERAL :												
		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	-	
		SPECIFIC CHECKS :												

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Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL

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		CUSTOMER :				QP NO.: PE-QP-999-507-E001, R1.					
		PROJECT:				PO NO.:					
		ITEM: HT XLPE Cables		SYSTEM: CABLE		SECTION: II		SHEET 2 OF 11			

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLAS S	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					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	GENERAL :												
		1. Physical properties	MA	Physical Tests	Sample/ Batch	Sampl e/ Batch	IS 7098-II	IS 7098-II	Inspect ion Report/ Test Cert.	✓	P	V	-	
		SPECIFIC CHECKS :												
		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	GENERAL :												
		1. Physical properties	MA	Physical Tests	Sample/ Batch	Sampl e/ Batch	IS 7098-II & Approved datasheet	IS 7098-II & Approved datasheet	Inspecti on Report/	✓	P	V	-	

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Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLAS S	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					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	-	
		SPECIFIC CHECKS :												
		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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		ITEM: HT XLPE Cables		SYSTEM: CABLE		SECTION: II		SHEET 4 OF 11			

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

1.6	PVC Compound (for sheath)	GENERAL :												
		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	-	
		SPECIFIC CHECKS :												
		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)	GENERAL :												
		1. Make	MA	Physical verification	Manufa cturer std.	Manufa cturer 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 *	Sampl e*	-do-	-do-	-do-	✓	P/V	V	-	*: SAMPLE FROM EACH ARMOUR

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

														SIZE/ BATCH /LOT
		4.Galvanization Quality	MA	Galv. Tests	-do-	-do-	IS 3975	IS 3975	-do-	✓	P/V	V	-	
1.8	Steel Drum (as applicable)	1. Phy. & Constructional checks	MA	Measurement	Mfr's Plant Std.	Mfr's Plant Std.	Approved drawing of steel drum	Approved drawing of steel drum	Inspect ion Report	✓	P	V	-	
		2. Surface finish	MA	Visual	-do-	-do-	-	Surface shall be smooth	-do-	✓	P	V	-	
1.9	Wooden Drum (as applicable)	1. Phy. & Constructional checks	MA	Measurement	Mfr's Std.	Mfr's Std.	IS 10418	IS 10418	Inspect ion Report	✓	P	V	-	
		2. Anti-termite treatment	MA	Chem.	Mfr's Std.	Mfr's Std.	Mfr's Std.	Mfr's Std.	-do-	✓	P	V	-	

2.0 IN PROCESS

2.1	Wire Drawing	1. Size	MA	Dimensional	Mfr's Std.	Mfr's Std.	Appd. Datasheet	Appd. Datasheet	Inspect ion Report	✓	P	V	-	
		2. Surface finish	MA	Visual	-do-	-do-	-	Surface shall be smooth	-do-	✓	P	V	-	
		3. % of Elongation	MA	Mechanical	-do-	-do-	IS 8130	IS 8130	-do-	✓	P	V	-	
2.2	Stranding of wires	1. No. of wires	MA	Counting	Mfr's Std.	Mfr's Std.	Appd. Datasheet	Appd. Datasheet	Inspect ion Report	✓	P	V	-	

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Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLAS S	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					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	Inspect ion 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	Inspect ion Report/ Test report	✓	P	V	-	
		2. Eccentricity & Ovality #	CR	Measurement	One Sample of each size/ lot	One Sampl e of each	Mnfr's Std	Mnfr's Std	-do-	✓	P	V	-	# To be checked at starting & finished

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1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					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	-	-	
2.5	Insulation Screening	<u>NON METTALIC</u>												
		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	-	
		<u>METALLIC</u>												
		1. Dimension of tape	CR	Measurement	One Sample of each size/ lot	One Sampl e 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	-	

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

2.9	Outer Sheath Extrusion (No repair permitted)	1. Surface finish	MA	Visual	100%	-	-	Surface shall be smooth	Inspect ion 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	Inspect ion 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					
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Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLAS S	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					M	C	N	

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

NOTES:

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					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:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:		ABHISHEK	Checked by:		KUNAL GANDHI			Reviewed by:			
Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL			Approved by:			

Annexure-A to QAP

11.03.00 TYPE TESTS :-

11.03.01 The type test as per applicable standards and as given below shall be conducted on one drum selected on random basis out of every 10 drums or less of each type and size of cable. Size shall mean area of cross section in sq.mm read in conjunction with the number of cores. Type shall mean type of insulation, sheath, volt grade FRLS/FS etc. In case, facilities of any of the type tests are not available at the works of the supplier, then such type tests shall be carried out by the supplier at independent recognized Govt. approved laboratory at the cost of supplier.

1. Tensile test (for aluminium) as per IS:8130
2. Wrapping test (for aluminium) as per IS:8130

Note:- In the case of compacted circular & shaped conductors these tests shall be carried out before compacting/shaping for ensuring use of H2 grade aluminium.

3. Conductor Resistance test as per IS:8130.
4. Test for armour wire/strip as per IS:3975
- 5) Test for thickness of XLPE Insulation and HRPVC,FR-LSH sheath :-

Requirements and methods of tests for the thickness of insulation, inner sheath and outer sheath shall be as per IS: 7098 (Part-2).

- 6) Tensile strength and elongation test for insulation & sheath :-



1 x 660 MW - Panki Thermal Power Station

Bidding Doc. No. : 14A14-SPC-G-0001



This test shall be carried out as per IS:7098 Part-2 for XLPE cable.

7) Ageing test for insulation and sheath:-

The method of test shall be as per the relevant IS standard. The period of test shall be 168 hours (7 days). At the end of the ageing period, the tensile strength and elongation test shall be carried out as per Sr.No.(6) above. The value obtained must not differ from the corresponding values obtained before ageing by more than + or - 25% in case of XLPE compound.

8) Loss of mass test for HRPVC, FR-LSH sheath :-

This test shall be carried out as per IS 583/1984 012 IEC 540 & IEC 502, on cables of all voltage grades. The maximum permissible loss of mass is 2 mg/sq.cm for PVC.

9) Shrinkage test for XLPE insulation & HRPVC FR-LSH sheath:-

This shall be carried out as per IS:5831 – 1984 for sheathed and as per IS 7098 (Part 2) 1985 for XLPE insulation.

10) Hot deformation test for HRPVC,FR-LSH sheath :-

This shall be carried out as per IS:5831 / 1984.

11) Cold Impact test for HRPVC,FR-LSH sheath :-

This shall be carried out as per IS:5831.

12) Heat shock test for HRPVC,FR-LSH sheath :-

This test shall be carried out as per IS 5831 / 1984 and IEC 540 and IEC 502 & sheath shall pass the requirements of this test.

13) Thermal stability test for HRPVC,FR-LSH sheath :-

This test shall be carried out on cables as per IS 5831 / 1984 and IEC 540 and cables shall pass the minimum requirements of 80 minutes for sheath.

14) Hot set test for XLPE Insulation :-

This test shall be carried out as per IS:7098 Part-1 and Part-2 and cable shall pass the requirements given therein.

15) Test for bleeding and blooming of Pigments for HRPVC,FR-LSH Sheath :-

This shall be carried out as per IS:5831 / 1984.

16) Fire Resistance Test

This test is compulsory and shall comply with the relevant clause of applicable IS.



- 17) Partial Discharge Test for XLPE Cables:-
The partial discharge test for XLPE insulation shall be carried out as per IS:7098 (Part-II).
- 18) Bending Test for XLPE Cables :-
The test method and test requirement shall be as per IS:7098 (Part-II). On completion of this test, the sample shall be subjected to partial discharge measurement and comply with the requirements given in above sub-clause 17.
- 19) Insulation Resistance / Volume resistivity -
As per IS 7098 Part-2 / 1985.
- 20) Dielectric Power Factor Test
As per IS 7098 Part-2 / 1985.
- 21) Heating cycle test for XLPE Cables :-
This test shall be as per IS:7098 (Part-II)
- 22) High Voltage Test
This test shall be performed as per the relevant Indian Standard 7098 Part 2 / 1985.
- 23) Test for Rodent & Termite Repulsion Property of Sheath :-
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 to soak. Touch the spot with a drop of above extract. A black spot indicates the presence of lead, the anti-termite and rodent compound.
- 24) Impulse Withstand Test
As per IS – 7098 (2) (amended upto date).
- 25) Water Absorption Test
As per IS 7098 Part-2 / 1985.
- 11.03.02 The normal sequence of the electrical tests shall be as per Clause 16.1.1 of IEC-502/1978 and / or as per IS 7098 Part – 2 / 1985 . All the tests listed herein shall be applied successively to the same sample.
- 11.03.03 The inner and outer sheath of the XLPE insulated cable shall be subjected to all the tests applicable for PVC sheath as per IS 5831 / 1984.
- 11.04.00 SPECIAL TESTS ON HRPVC 'FR-LSH' MATERIAL



All the sizes of XLPE power cables of the 'FRLS' HRPVC sheathed type shall pass following special test requirements. Inner sheath wherever applicable shall also be of the 'FR-LSH' type 'HRPVC' to meet these special tests.

i) Oxygen/Temperature Index test on sheath material :-

This test shall be carried out as per American National Std. A STM-D-2863/77.

The minimum oxygen index shall be 29 at room temperature.

For determination of the temp.index, the oxygen index test shall be carried out at different temperature upto 250°C. However, the test shall be carried out by extra-polation method beyond temperature at which the material of sheath may start deformation. The minimum temp. index (i.e. the temperature at which the oxygen index is minimum 21) shall be 250°C generally as per BICC Hand Book Chapter-6.

ii) Acid gas emission test on sheath material :-

This test shall be carried out as per IEC Std. 754-1. The maximum acid gas emission shall be less than 20 by weight.

iii) Smoke density test on sheath material :-

This test shall be carried out as per American National Standard ASTM-D-2843/1977 and also as per UITP method (3M cube test on finished cable sample). The ASTM test method is compulsory. For passing this test, the requirement of light transmission shall be minimum 40% after the test.

iv) Flammability test on finished cable sample :-

This test shall be carried out as per the following method :

Swedish Std.SS:424-14-75 Class-F3. This test known as Swedish Chimney test is compulsory.

IEEE std. 383-1974 – This test known as the vertical tray flame propagation test shall be conducted if insisted by purchaser.

IEC Std: 332-1. – The cable should meet the requirement of all the above standards.

12.00.00 ROUTINE TESTS :

The following tests shall be carried out as Routine tests on each and every drum length of cable, as per IS 7098 (Part 2) / 1985.

- High Voltage Test
- Conductor Resistance Test
- Partial discharge test (for screened cables) – on full drum length.



13.00.00 ACCEPTANCE TEST :

The following test shall be carried out as Acceptance Test in the presence of UPRVUNL Inspecting Engineer on samples taken from the delivery lot. One drum out of every 10 number of drums or less shall be selected at random sampling basis in each lot for the Acceptance Tests which shall be carried out at manufacturer's/supplier's cost.

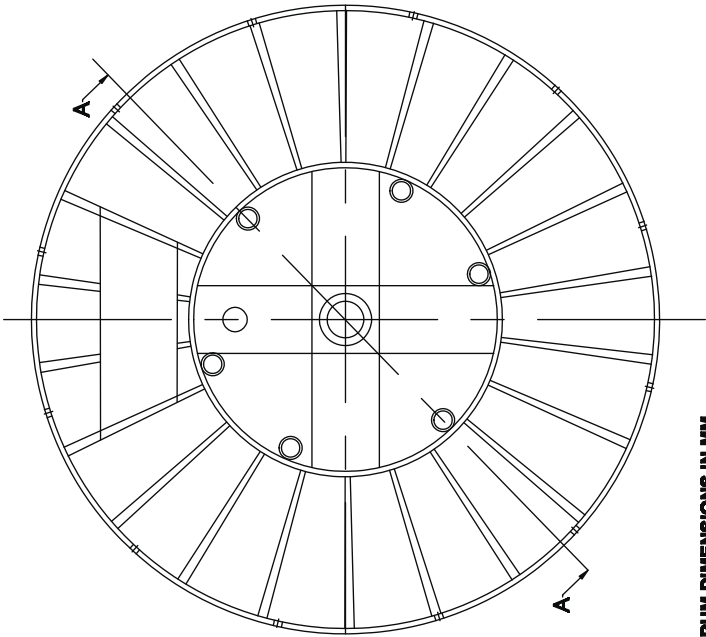
1. High Voltage Test
2. Conductor Resistance Test
3. Tensile / wrapping test.
4. Partial discharge test (In screened cables).
5. Insulation Resistance/Volume resistivity test
6. Measurement of thickness of insulation and sheath and other dimensions
7. Tensile strength & elongation at break for insulation & sheath.
8. Hot set test on XLPE insulation
9. Flammability test as per Swedish standard SS:424-15-75 Class-F-3 (Swedish Chimney test)
10. Acid gas generation test as per IEC-754-1.
11. Smoke density test as per ASTM-D-2843/1977
12. Oxygen index test as per ASTM-D 2863/1977
13. Temp. index test as per ASTM-2863/77



STEEL DRUM DRAWING (TYPICAL)

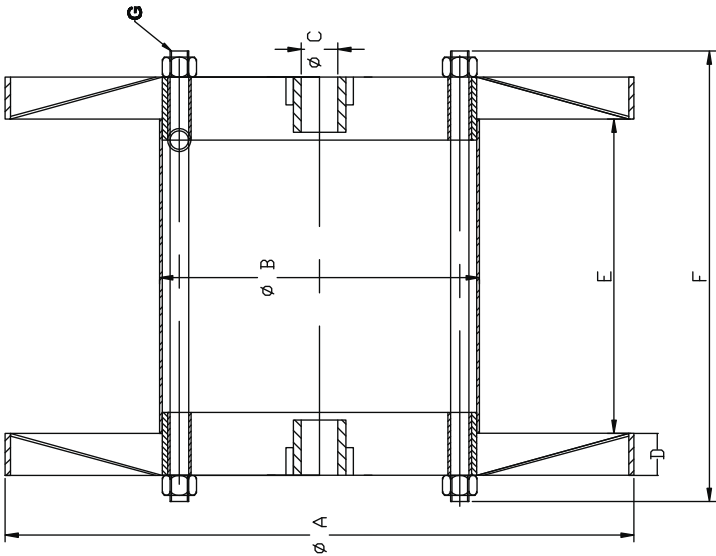
ANNEXURE-C TO SECTION-II

- Dwg. not to scale.
- ALL DIMENSIONS ARE IN MM.



APPROXIMATE DRUM DIMENSIONS IN MM
ALL DIMENSIONS AND VALUES ARE
TYPICAL AND ARE DEPENDENT ON
CABLE WEIGHT.

A	FLANGE	2200
B	BARREL	1200
C	CENTRAL HOLE	100
D	FLANGE	50
E	TRAVERSE	1400
F	GROSS WIDTH	1600
G	STUD SIZE	16 MM.



1X660 MW PANKI TPS
BOQ-CUM-PRICE SCHEDULE FOR HT XLPE POWER CABLES

Sr. No.	Item code	Item description	Unit	Order Quantity (metres)	Drum Length (Meters)	Unit Price (Ex-Works)	Total Price	REMARKS
1.0		11/11kV (UE), AL CONDUCTOR XLPE INSULATED ARMoured POWER CABLES						
1.1	507-27037-A	3C-240	MTR	15000	500	0.4738*X/15000	0.4738*X	
1.2	507-27017-A	1C-400	MTR	11500	500	0.1735*X/11500	0.1735*X	
1.3	507-27025-A	1C-630	MTR	8500	500	0.1955*X/8500	0.1955*X	
2.0		3.3/3.3 KV (UE), AL CONDUCTOR XLPE INSULATED ARMoured POWER CABLES						
2.1	507-27081-A	3C-240	MTR	6500	500	0.1572*X/6500	0.1572*X	

Notes:

- 1 Bidder has to quote only Total Value 'X'. Based on this price, unit price shall be derived for all items as per formula indicated above.
- 2 Standard drum length shall be 500 metres for single core cables and for three core cables. Tolerance on individual drum length shall be $\pm 5\%$.
- 3 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.
- 4 Unit price of cables quoted by bidder shall be inclusive of type test charges. No separate charges shall be payable for type tests.
- 5 Quantities indicated above (in Coloum-E) shall be known as Order Quantities. Quantity variation shall be as per NIT.
- 6 Manufacturing of the cables shall be taken up by the successful bidder only after approval of technical and quality documentations as stipulated in the technical specification.
- 7 Delivery schedule shall be as per NIT.

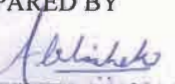
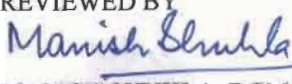
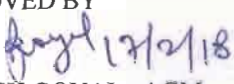
- 8 The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ in the Price Schedule. The unit price shall apply for adjustment of variation in quantity as stipulated above.
- 9 For each individual cable size, one short length of not less than 200m may be accepted only in the final drum length to complete the supply (except where the total ordered quantity is one single drum length of 1000m). The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).
- 10 In case of the quantities offered for inspection by successful bidder in more than one batch, BHEL reserves the right to witness type testing on all batches without any price implications

	PRE-QUALIFICATION REQUIREMENTS FOR HT XLPE POWER CABLES	PE-PQ-999-507-E011
		REVISION NO. 03 DATE 17/02/2018
		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 the date of application for registration or date of techno- commercial bid opening (as applicable) for establishing continuity in business.

Notes (General points):

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. Any other project specific requirement shall be as per Annexure-I and bidder shall submit relevant supporting documents.
4. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
5. 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.

PREPARED BY  ABHISHEK, MANAGER (CONVENOR)	REVIEWED BY  MANISH SHUKLA, DGM (APPROVER)	APPROVED BY  RAJNISH GOYAL, AGM (DH)
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BHEL PEM-ELECTRICAL
PRE-QUALIFYING REQUIREMENTS FOR HT XLPE POWER CABLE

ANNEXURE –I

PROJECT SPECIFIC CRITERIA AGAINST ENQUIRY

PROJECT: 1X660MW PANKI TPS

The bidder should have manufactured and supplied following cables prior to the date 02.11.2015:

- At least 50kms of XLPE insulated power cables of 6.35/11 KV or higher voltage grade, executed in one or more orders.
- At least one (1) Km of flame retardant low smoke cables of any voltage level.

Note: In case of any conflict of project specific PQR with main PQR, vendor to furnish documents meeting the stringent requirement between the main PQR & project specific PQR.

**Pratik
Vinayaka**
 Dealing Engineer
 Pratik Vinayaka
 Dy. Manager-Electrical

Digitally signed by Pratik Vinayaka
 DN: cn=Pratik Vinayaka, o=BHEL, ou=PS-PEM, email=pratikvinayaka@bhel.in, c=IN
 Date: 2020.09.28 10:37:16 +05'30'

okumar
 Controlling Officer
 Omkar Kumar
 DGM-Electrical

Digitally signed by okumar
 DN: cn=okumar, o=bhel, ou=bhel, email=okumar@bhel.in, c=IN
 Date: 2020.09.28 16:57:43 +05'30'

**PRAVEEN
DUTTA**
 Section Head
 Praveen Dutta
 Sr. DGM-Electrical

Digitally signed by PRAVEEN DUTTA
 DN: c=IN, o=BHARAT HEAVY ELECTRICALS LIMITED, ou=PS PEM, postalCode=201301, st=UTTAR PRADESH, 2.5.4.20=da8948aa0c3e2703a98a0aaca2aedd61d068dbf4c976429c5c374e3b47b930, cn=PRAVEEN DUTTA
 Date: 2020.09.28 17:20:00 +05'30'

**DEBASISA
RATH**
 Deptt. Head
 Debasisa Rath
 AGM (Electrical)

Digitally signed by DEBASISA RATH
 DN: c=IN, o=BHARAT HEAVY ELECTRICALS LIMITED, ou=BHEL PS PEM Noida, postalCode=201301, st=UTTAR PRADESH, 2.5.4.20=d6a841891eca23b359e7779ae76bd0329ed707fa00caba422c815ea7fd, cn=DEBASISA RATH
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