	2 x 660 MW UDANGUDI STPP STAGE-1												
				ВО	Q-CUM-PRICE	SCHEDU	LE FOR HT X	LPE POWER	CABLES				
Sr. No.	Item code	Item description	Unit	PEM TOTAL BOQ	PEM Drum Length (Meters)	ISG TOTAL BOQ	ISG Drum Length (Meters)	TOTAL REQUIREME NT (PEM+ISG)	UNIT PRICE (EX-WORKS) (Rs)	TOTAL PRICE (EX- WORKS) (Rs)	Freight %age interms of Total Ex- Works	GST %age	REMARKS
1.0		11/11 KV AL.	CONDUC	CTOR/ XLPE	NSULATED/ AR	MOURED	/ UNEARTHEI	GRADE POV	VER CABLE				
1.1	507-27025-A	1C-630	MTR	72750	500M X 114 + 750 M X21			72750					
1.2	507-27014-A	1C-300	MTR	30250	500M X 59 + 750MX 1			30250					
1.3	507-27037-A	3C-240	MTR	14250	500M X 15 + 750MX9			14250					
2.0		6.6/6.6 KV AL	. CONDL	ICTOR/ XLPE	INSULATED/ A	RMOURE	D/ UNEARTHI	ED GRADE PO	WER CABLE.				
2.1	507-27113-A	1C-630	MTR	35000	750M x 46 + 500M X 1			35000					
2.2	507-27117-A	3C-150	MTR	20500	500M X 41	25750	500M X 50 +750M X 1	46250					
2.3	507-27125-A	3C-240	MTR			2000	500M X 4	2000					
2.4	507-27129-A	3C-300	MTR			3750	500M X 6 +750M X 1	3750					
Notes:													
1	1 Standard drum length shall be 750 & 500 metres. Tolerance on individual drum length shall be ±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 quar		•		curing (in a lot) a	re manuf	actured and c	ffered for ins	pection by su	ccessful bidde	er in more tha	n one batch, I	BHEL reserves



PRE - QUALIFYING REQUIREMENTS

ENQUIRY NO:	
PROJECT:	2 X 660 MW UDANGUDI
PACKAGE:	HT XLPE CABLES

CRITERIA FOR EVALUATION - FINANCIAL:

Average annual financial turnover during the last Three Financial Years should not be less than

Amount (in Rs.)
Rs.12,71,00,000/-

RUPEES TWELVE CRORE SEVENTY ONE LAKH ONLY

Notes:-

- a) The bidder has to submit financial accounts (audited, if applicable comprising of Audit report, Balance Sheet, Profit & Loss A/c Statement and Notes/Schedules pertaining to Turnover/Sales/Revenue), for last three years (or from the date of incorporation, whichever is less) as on tender due date to review the above criteria. In case the incorporation of vendor is less than 3 years, average annual financial turnover shall be calculated based on available information as below:-
- i) If the accounts are available for <= 1 Financial Year, the Average Annual Turnover shall be calculated based on available information divided by 1 (One).
- ii) If the accounts are available for >1 but < = 2 Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 2 (Two).
- iii) If the accounts are available for >2 but <= 3 Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 3 (Three).
- b) Foreign bidder is to submit a latest report from reputed third party business rating agency like Dun & Bradstreet, Credit reform etc. in addition to the documents mentioned at point (a) above for review of above criteria.
- c) Other Income shall not be considered for arriving at Annual Turnover/Sales. For evaluation purpose, turnover figure excluding taxes shall be considered.
- d) For evaluation of foreign bidder, exchange rate (TT selling rate of SBI) as on scheduled date of tender opening (Part-I bid in case of two part bid) shall be considered.



2X660 MW UDANGUDI STPP PRE-QUALIFICATION REQUIRMENTS FOR HT XLPE POWER CABLES

PE-PQ-435-507-E011

REVISION NO. 0 DATE 31/03/2023

SHEET NO. 1 OF 1

	: HT XLPE Power Cable : 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.

PREPARED R

NAME: MSSRAJPAL DESIGNATION:

MANAGER

NAME: MEGHA **DESIGNATION:**

MANAGER

NAME: ÁYAN SAHA

REVIEWED BY

DESIGNATION: DGM

SANDEEP LODH

SR. DGM

APPROVED BY

NAME: DEBASISA RATH

DESIGNATION: AGM-ELECT

FOR HT XLPE POWER CABLES

VOLUME-II

SPECIFICATION NO: PE-TS-435-507-E001

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

TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES

SPECIFICATION NO. PE-TS- 435-507-E001

VOLUME II

SECTION
REVISION 00 DATE: 31.03.2023

SHEET -

CONTENTS

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01	SECTION - I	
a)	COMPLIANCE CERTIFICATE	01
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c)	DATA SHEET-A	03
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02	SECTION - II	
a)	STANDARD TECHNICAL SPECIFICATION	01
b)	ANNEXURE- A TO SECTION-II (STEEL DRUM DRAWING, TYPICAL)	02
c)	ANNEXURE- B TO SECTION-II (TYPICAL DRAWING OF CABLE DRUM	
	PACKING)	01
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DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES

SPECIFICATION NO. PE-TS- 435-507-E001

VOLUME II

SECTION I

REVISION - 00 DATE: 31.03.2023

SHEET -

SECTION – I SPECIFIC TECHNICAL REQUIREMENTS



DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES

SPECIFICATION NO. PE-TS- 435-507-E001					
VOLUME II					
SECTION I					
REVISION - 00	DATE: 31.03.2023				
SHFFT -					

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 STAN	ЛР & SIGNATU	RE	



DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES

SPECIFICATION NO. PE-TS- 435-507-E001					
VOLUME II					
SECTION I					
REVISION - 00	DATE: 31.03.2023				
SHEET 1 of 1					

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 BOQ-cum-price schedule as part of NIT.
- 2.2 Vendor shall submit the drawing/document submission/resubmission schedule after approval of documents.
- 2.3 In BOM each of the item to be uniquely identified with item code no. or item SI. No. Supplier to ensure that all the items which will find separate mention in the packing list are covered in detailed BOM.
- 2.4 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:

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

3.3 Quality/ Inspection:

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

1.1 Vigit of Cable 2. STANDARDS APPLICABLE 3. STANDARDS APPLICABLE 4. STANDARDS APPLICABLE 5. STANDARDS APPLICABLE 6. CONDUCTOR 6. STANDARDS APPLICABLE 6. STANDARDS APPLICA	S.No. Parti 1 Type 1.1 Volta 2 STAN 2.1 Stand 2.2 Currer 2.3 Short 2.4 Formul 3 INST. 3.1 Ambie 3.2 Groun 3.3 Depth 5.1 Mater 5 CONI 5.1 Mater 5.2 Cable 5.3 Shape 6 CONI 6.1 Mater 7 XLPE 7.1 Nomin 7.2 Extrus 7.3 Contin 7.4 Short- 8 INSUI 8.1 Type of	TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES DATA SHEET-A articulars The pe of Cable Ditage Grade TANDARDS APPLICABLE Tandard applicable in general (Latest amendment to be referred if any) Terrent rating of cables conforms to Terrent rating of cables conforms to Terrent rating of cables conforms to Terrent rating of cables buried in ground temperature Terrent rating conforms to Terrent rating of cables buried in ground temperature Terrent rating conforms to Terrent rating of cables buried in ground temperature Terrent rating conforms to Terrent rating of cables buried in ground temperature Terrent rating conforms to Terrent rating of cables buried in ground temperature Terrent rating conforms to Terrent rating conforms to Terrent rating of cables buried in ground temperature Terrent rating conforms to Te	VOLUME II SECTION I REVISION 00 SHEET OF Unit YES deg. C deg. C	DATE: 31.03.2023 Description Flame Retardant-Low Smoke (FR-LSH) HT CABLE 6.6/6.6 kV (unearthed)/ 11/11 kV (unearthed) 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 As per IS:3961 (P-7)/2017 IEC 60949 KxA/√t K Amp (Where A =Total area of Conductor in mm2 & t = time in seconds , K=
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3.1 Ambient air temperature deg. C S0 3.2 Ground temperature deg. C 30 3.3 Depth of laying of cables buried in ground om 90 3.4 Thermal resistivity of soil deg. C cm/W 150 5 CONDUCTOR H2 Grade Stranded Aluminium Conductor Class-2 of IS:8130/2013 5.2 Cable Size As per BOQ-Cum-Price Schedule 5.3 Shape - Compacted Circular 6 CONDUCTOR SCREEN Extruded layer of Semi Conducting Compound 6.2 Minimum thickness mm 0.3 7 XLPE INSULATION Extruded XLPE compound as per IS:7098 (P-2)/201 7.1 Nominal thickness of insulation mm As per IS:7098 (P-2)/201 7.2 Extrusion & method of curing - Extrusion & conductor screen and insulation screen shall conductor screen and insulation in a si operation by triple extrusion process) by G curing/Steam curing 7.3 Continuous withstand temperature 90°C 8 INSULATION SCREEN For both single core cable and Multicore or Insulation screen shall consist of two parts: 1. Non-Metallic Part 8.1 Type of screen Insulation screen shall consist of two parts: 1. Non-Metallic Part 8.2 Material and thickness (minimum and nominal) mm 8.2.1 Metallic Copper Tape applied helically on core (No thickness 0.10 mm with tolerance (±) 10% No. of tapes and Minimum overlapping Extruded Semi Conducting Compound sha bonded type. Semiconducting Compound sha bonded type. Semiconducting Compound sha bonded type. Semiconducting Tape shall a bonded type. Semiconducting Compound sha bonded type. Semiconducting Tape shall a bonded type. Semiconducting Tape shall a bonded type. Semiconducting Compound sha bonded type. Semiconducting Tape shall a bonded t	3.1 Ambie 3.2 Groun 3.3 Depth 3.4 Therm 5 CONI 5.1 Mater 5.2 Cable 5.3 Shape 6 CONI 6.1 Mater 6.2 Minim 7 XLPE 7.1 Nomin 7.2 Extrus 7.3 Contin 7.4 Short- 8 INSUI 8.1 Type of	nbient air temperature ound temperature epth of laying of cables buried in ground ermal resistivity of soil DNDUCTOR	deg. C	
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Thermal resistivity of soil deg. C cm/W 150	3.4 Therm 5 CONI 5.1 Mater 5.2 Cable 5.3 Shape 6 CONI 6.1 Mater 6.2 Minim 7 XLPE 7.1 Nomin 7.2 Extrus 7.3 Contin 7.4 Short- 8 INSUI 8.1 Type of	ermal resistivity of soil ONDUCTOR		30
Section Conductor Class-2 of IS-8130/2013	5 CONI 5.1 Mater 5.2 Cable 5.3 Shape 6 CONI 6.1 Mater 6.2 Minim 7 XLPE 7.1 Nomir 7.2 Extrus 7.3 Contir 7.4 Short- 8 INSUI 8.1 Type of	ONDUCTOR	cm	90
State Conductor	5.1 Mater 5.2 Cable 5.3 Shape 6 CONE 6.1 Mater 6.2 Minim 7 XLPE 7.1 Nomir 7.2 Extrus 7.3 Contir 7.4 Short- 8 INSUI 8.1 Type of		deg. C cm/W	150
5.1 Material type & grade 5.2 Cable Size 5.3 Shape - Compacted Circular 6.1 Material 6.2 Minimum thickness 7. XLPE INSULATION 7.1 Nominal thickness of insulation 8.2 Extrusion & method of curing 7.2 Extrusion & method of curing 7.3 Continuous withstand temperature 7.4 Short-circuit withstand temperature 8.1 Type of screen 8.1 Type of screen 8.2 Material and thickness (minimum and nominal) 8.2.1 Metallic No. of tapes and Minimum overlapping - Conspace Compacted Circular - Compacted Circular - Compacted Circular - Extruded layer of Semi Conducting Composition on the Extruded XLPE compound as per IS:7098 (P-2)/201 - Extruded XLPE compound as per IS:7098 (P-2)/201 - Triple Extrusion (Extruded Semi-conducting compound conductor screen and insulation screen sha applied along with XLPE insulation in a sin operation by triple extrusion process) by Germing/Steam curing - 3 Continuous withstand temperature 90°C 7.4 Short-circuit withstand temperature - 1. Non-Metallic Part 8.2 Material and thickness (minimum and nominal) mm - Copper Tape applied helically on core (No thickness 0.10 mm with tolerance (±) 10% No. of tapes and Minimum overlapping - 1. No. of tapes and Minimum overlapping Extruded Semi Conducting Compound sha bonded type. Semiconducting Tape shall all consists of two parts and thinkness of the process of the pr	5.2 Cable 5.3 Shape 6 CONE 6.1 Mater 6.2 Minim 7 XLPE 7.1 Nomin 7.2 Extrus 7.2 Extrus 8 INSUI 8.1 Type (starial tuna 0 arada		
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5.3 Shape - Compacted Circular	6 CONE 6.1 Mater 6.2 Minim 7 XLPE 7.1 Nomin 7.2 Extrus 7.3 Contin 7.4 Short- 8 INSUI 8.1 Type of	able Size		
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7.4 Short-circuit withstand temperature 8 INSULATION SCREEN For both single core cable and Multicore cab	7.4 Short- 8 INSUI 8.1 Type			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) by Gas
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8.1 Type of screen - Insulation screen shall consist of two parts: 1. Non-Metallic Part 2. Metallic Part 8.2 Material and thickness (minimum and nominal) mm Copper Tape applied helically on core (No thickness 0.10 mm with tolerance (±) 10% No. of tapes and Minimum overlapping Extruded Semi Conducting Compound shabonded type. Semiconducting Tape shall as	8.1 Type	ort-circuit withstand temperature		250°C
8.1 Type of screen - 1. Non-Metallic Part 2. Metallic Part 8.2 Material and thickness (minimum and nominal) mm Copper Tape applied helically on core (Northickness 0.10 mm with tolerance (±) 10% No. of tapes and Minimum overlapping Extruded Semi Conducting Compound shabonded type. Semiconducting Tape shall at	,,	SULATION SCREEN		For both single core cable and Multicore cables
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8.2.1 Metallic - Copper Tape applied helically on core (No thickness 0.10 mm with tolerance (±) 10% No. of tapes and Minimum overlapping - 1. No. of tapes and Minimum overlapping Extruded Semi Conducting Compound shabonded type. Semiconducting Tape shall at	O.Z IIVIGIO	aterial and thickness (minimum and nominal)	mm	
Extruded Semi Conducting Compound sha bonded type. Semiconducting Tape shall a		,		Copper Tape applied helically on core (Nominal thickness 0.10 mm with tolerance (±) 10%)
bonded type. Semiconducting Tape shall a	No. of		-	1. No. of tapes and Minimum overlapping 10%
Thickness of Semi Conducting Compound mm (Min.)	8.2.2 Non-n	o. of tapes and Minimum overlapping	-	. /
8.3 Earth fault current withstand capacity (calculation to be furnished) kA, sec. Sound A, 1 sec	8.3 Earth		kA 000	(For multi-core cables, screen of each core shall
	8.4 Extrus	on-metallic	KA, Sec.	be rated individually for the above value).

9.0 NNERSHEATH For both single core cable and Multicore 19.1 Malaretal 29.2 Standard Applicable 19.3 Cature 19.4 Whether FRLSH 19.5 Inner sheeth applicable for single core cable 19.6 Fillies 19.6 Fillies 19.7 Malaretal of fillers (if permitted) 19.8 Malaretal 19.9 Malaretal				
Material Extruded HRPVC Type ST-2	8.5	CORE IDENTIFICATION		By coloured strips of Red, yellow & Blue colour applied on the cores
2.2 Sandard Applicable S. 7098 (Pent.2) & IS : 5831 9.3 Colour Slandard Applicable Slandard Ap	9.0	INNERSHEATH		For both single core cable and Multicore cables
3.3 Colour Block 4.4 Whether FRLSH 5.5 Inner shearth applicable for single core cable 7.6 Filters Acceptable Same as lines shearth (Material of filler to be or with that of fillers (if permitted) 8.8 Method of application 9.8.1 Multi-core cables: 9.8.1.1 With Multi-core cables: 9.8.1.2 Without fillers 9.8.1.2 Without fillers 9.8.1.2 Without fillers 9.8.1.2 Without fillers 9.8.1.3 Without fillers 9.8.1.3 Without fillers 9.8.1.4 Without fillers 9.8.1.2 Without fillers 9.8.1.2 Without fillers 9.8.1.2 Without fillers 9.8.1.2 Without fillers 9.8.1.3 Without fillers 9.8.1.3 Without fillers 9.8.1.3 Without fillers 9.8.1.4 Without fillers 9.8.1.2 Without fillers 9.8.1.2 Without fillers 9.8.1.2 Without fillers 9.8.1.3 Without fillers 9.8.1.4 Without fillers 9.8.1.2 Without fillers 9.8.1.3 Without fillers 9.8.1.3 Without fillers 9.8.1.4 Without fillers 9.8.1.2 Without fillers 9.8.1.3 Without fillers 9.8.1.4 Without fillers 9.8.1.5 Without fillers 9.8.1.5 Without fillers 9.8.1.5 Without fillers 9.8.1.6 Without fillers 9.8.1.6 Without fillers 9.8.1.7 Without fillers 9.8.1.7 Without fillers 9.8.1.8 Without fillers 9.8.1.1 Without fillers 9.8.1.1 Without fillers 9.8.1.1 Without fillers 9.8.1.1 Without fillers 9.8.1.2 Without fillers 9.8.1.3 Without fillers 9.8.1.3 Without fillers 9.8.1.4 Without fillers 9.8.1.5 Without fillers 9.8.1.5 Without fillers 9.8.1.5 Without fillers 9.8.1.1 Without fillers 9.8.1.2 Without fillers 9.8.1.2 Without fillers 9.8.1.3 Without fillers 9.8.1.3 Without fillers 9.8.1.4	9.1	Material		Extruded HRPVC Type ST-2
Wether FRLSH No YES	9.2	Standard Applicable		IS: 7098 (Part-2) & IS: 5831
Method FRLSH No YES	9.3			Black
9.5 Inner sheath applicable for single core cable YES 9.6 Fillies Acceptable 9.7 Malerial of filliers (if permitted) Same as inner sheath (Material of fillier to be or with that of inner sheath) 9.8 Method of application 9.8.1 With Milliscore cables: Pressure of actual of the pressure of actual of the pressure intended 9.8.1.1 With Milliscore cables: Pressure extruded 9.8.1.2 Without fillers Pressure extruded 9.8.2 Single-core cables: Pressure actualed 9.8 ARMOUR ARMOUR As per Table-5 of IS: 7098 (Part-2) 10.1 Material Non-Magnetic hard drawn H4 grade Alus Single Round Wire to IS: 8130/2013 10.2 Standard Applicable Non-Magnetic hard drawn H4 grade Alus Single Round Wire to IS: 8130/2013 10.3 Tolerance on formed wire dimension - 210.9% 10.4 Millimm Coverage 900% 10.5 Gajo between amour wire Shall not exceed one armour wire space (cross over / Over riding) 10.6 Breaking load of Joint 975% of normal armour 10.8 Macrimum resistivity of Shound wire Ohm-cm 14.5 s. 10.6 10.9 Macrimum resistivity of Air round wire Ohm-cm 14.5 s. 10.6 10.1 Maintend Pressure of normal drawn wire Ohm-cm 14.5 s. 10.6 10.2 Single-between amour wire Ohm-cm 14.5 s. 10.6 10.3 Macrimum resistivity of Air round wire Ohm-cm 14.5 s. 10.6 10.4 Maintend Pressure of normal drawn wire Ohm-cm 14.5 s. 10.6 10.6 Macrimum resistivity of Air round wire Ohm-cm 14.5 s. 10.6 10.7 Maintend Pressure of normal drawn wire Ohm-cm 14.5 s. 10.6 10.8 Macrimum resistivity of Air round wire Ohm-cm 14.5 s. 10.6 10.9 Black Order riding Ohm-cm 14.5 s. 10.6 11.0 Maintend Pressure of normal drawn wire Ohm-cm 14.5 s. 10.6 11.1 Milling Ohm-cm 14.5 s. 10.6 11.2 Olor Order sheath Ohm-cm 14.5 s. 10.6 11.3 Macrimum resistivity of Air round wire Ohm-cm 14.5 s. 10.6 11.4 Milling Ohm-cm 14.5 s. 10.6 11.5 Thickness of outer sheath Ohm-cm 14.5 s. 10.6 11.6				
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9.8 Method of application 9.8.1 Molificore cacles: 9.8.1 Molificore cacles: 9.8.2 Without fillers 9.8.2 Single-core cables: 9.8.3 Single-core cables: 9.8.3 Single-core cables: 9.8.3 Single-core cables: 9.8.4 Single-core cables: 9.8.2 Single-core cables: 9.8.3 Non-Magnetic hard drawn H4 grade Alux Single Round Wire to IS: 8130/2013 for single core cables: 9.8.3 Single-core cables: 9.8.4 Single-Round Wire to IS: 8130/2013 for single-core cables: 9.8.4 Galvanised Steel Flat Strip to IS: 3975/1: per Table-6 of IS: 7098 [Part-2] Table-6 and ordinension as per IS: 7098 [Part-2] Table-7 ordinension	3.0	1 11613		· ·
Matticore cables:		* * * *		· · · · · · · · · · · · · · · · · · ·
Without filters				
9.8.12 Without fillers Pressure extruded Pressur	9.8.1			
9.8.2 Single-core cables:	9.8.1.1	With fillers		Pressure/Vacuum extruded
9.9 Thickness of inner sheath	9.8.1.2	Without fillers		Pressure extruded
10.1 Material Non-Magnetic hard drawn H4 grade Alux Single Round Wire to IS: 8130/2013 for single core cables Galvamied Steet Flat Stript to IS: 3975/1 per Table-6 of IS 7098 part-2, for multi-core cables Galvamied Steet Flat Stript to IS: 3975/1 per Table-6 of IS 7098 part-2, for multi-core cables Galvamied Steet Flat Stript to IS: 3975/1 per Table-6 of IS 7098 part-2, for multi-core cables Galvamied Steet Flat Stript to IS: 3975/1 per Table-6 of IS 7098 part-2, for multi-core cables on dimension as per IS: 3975 10.4 Minimum Coverage	9.8.2	Single-core cables:		Pressure extruded
Non-Magnetic hard drawn H4 grade Alux Single Round Wire to IS: 8130/2013 for single core cables Galvanised Steel Flat Strip to IS: 3975/1; per Table-6 of IS 7098 part-2; for multi-core cables Galvanised Steel Flat Strip to IS: 3975/1; per Table-6 of IS 7098 part-2; for multi-core cables Dimension as per IS: 7098 (Part-2) Table-6 and on dimension as per IS: 3976 (Part-2) Table-6 and on dimens	9.9	Thickness of inner sheath		As per Table-5 of IS: 7098 (Part-2)
Material Single Round Wire to IS: 8130/2013 for single core cables for multi-core cables	10	ARMOUR		
10.3 Tolerance on formed wire dimension 1.	10.1	Material	-	for single core cables Galvanised Steel Flat Strip to IS: 3975/1999 as per Table-6 of IS 7098 part-2.
10.4 Minimum Coverage 10.5 Gap between armour wire 10.6 Breaking load of Joint 10.7 Maximum resistivity of GS Round wire 10.8 Maximum resistivity of Al round wire 10.8 Maximum resistivity of Al round wire 10.8 Maximum resistivity of Al round wire 11.1 Outersheath 11.1 Extruded HRPVC 11.1 Extruded HRPVC 11.2 Colour 11.3 Whether FR-LSH 11.4 Method of application 11.5 Thickness of outer sheath 11.6 Marking/Embossing on Outersheath 11.6 Marking/Embossing on Outersheath 11.6 Marking/Embossing on Outersheath 11.6 Marking/Embossing on Outersheath 11.7 EFLSH CHARACTERISTICS 12.1 Oxygen index 13.2 FR-LSH CHARACTERISTICS 14.2 Smoke density rating 15.3 Max. 20% by weight (As per IS 7098-2 /ASTMD 2863) 15.4 Smoke density rating 16.4 Smoke density rating 17.5 Smoke density rating 18.5 Max. 20% by weight (As per IS 7098-2 /ASTMD 2863) 18.5 Flammability Test	10.2	Standard Applicable		Dimension as per IS: 7098 (Part-2) Table-6 and tolerance on dimension as per IS:3975
10.4 Minimum Coverage 10.5 Gap between armour wire 10.6 Breaking load of Joint 10.7 Maximum resistivity of GS Round wire 10.8 Maximum resistivity of AI round wire 10.8 Maximum resistivity of AI round wire 10.8 Maximum resistivity of AI round wire 11.1 OuterSHEATH 11.1 Extruded HRPVC 11.2 Colour 11.3 Whether FR-LSH 11.4 Method of application 11.5 Thickness of outer sheath 11.5 Thickness of outer sheath 11.6 Marking/Embossing on Outersheath 11.6 Marking/Embossing on Outersheath 11.6 Marking/Embossing on Outersheath 11.7 EFLSH CHARACTERISTICS 12.1 Oxygen index 13.2 FR-LSH CHARACTERISTICS 14.2 FR-LSH CHARACTERISTICS 15.3 Shall not exceed one armour wire space (cross over / Over riding) 16.4 Sper IS 7098-2 /ASTMD 2863) 17.5 Temperature index 18.6 Max. 20% by weight (As per IS 7098-2 /ASTMD 2863) 17.5 Shook density rating 18.6 Max. 20% by weight (As per IS 7098-2 /ASTMD 2863) 18.5 Flammability Test	10.3	Tolerance on formed wire dimension	-	±10 %
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10.6 Breaking load of Joint 95% of normal armour 10.7 Maximum resistivity of GS Round wire 0hm-mm²/km 28.264 11 OUTERSHEATH 11.1 Material Extruded HRPVC 11.2 Colour Extruded HRPVC 11.3 Whether FR-LSH YES 11.4 Method of application Extruded As per Table-7 of IS: 7098 (Part-2) 11.5 Thickness of outer sheath BIS Mark, Owner's name, Manufacturer's name amark, year of manufacture, Cable code, Type of covoltage class, nominal cross section area of conductors in line and marking, @ 1M (by embossing/printing) for 6.6 kV Cables. Cable shall be marked as having outer sheath at every 5 Meters for 11kV & 6.6 kV (The embossing/printing shall be progressive, a in line and marking shall be legible and indellible) 12 FR-LSH CHARACTERISTICS 12.1 Oxygen index Min. 250°C(As per IS 7098-2 /ASTMD 2863) 12.2 Temperature index Max. 60% (As per IS 7098-2 /ASTMD 2863) 12.3 Acid gas generation Max. 60% (As per IS 7098-2 /ASTMD 2843) 12.5 Flammability Test		-		
10.6 Breaking load of Joint 95% of normal armour	10.5	Gap between armour wire		
10.7 Maximum resistivity of GS Round wire 10.8 Maximum resistivity of AI round wire 11.0 OUTERSHEATH 11.1 Material 11.1 Material 11.2 Colour 11.3 Whether FR-LSH 11.4 Method of application 11.5 Thickness of outer sheath 11.6 Marking/Embossing on Outersheath 11.6 Marking/Embossing on Outersheath 11.6 Marking/Embossing on Outersheath 11.7 FR-LSH CHARACTERISTICS 12.1 Oxygen index 13.2 Smoke density rating 14.5 x 10 ⁻⁶ 14.5 x 10 ⁻⁶ 14.5 x 10 ⁻⁶ 15.5 Nm-m ⁻⁷ /km 16.5 Extruded HRPVC 17.9 ST2 as per IS: 5831 18.6 Extruded 19.6 Extruded 11.7 As per Table-7 of IS: 7098 (Part-2) 11.8 BIS Mark, Owner's name, Manufacturer's name a mark, year of manufacture, Cable code, Type of a voltage class, nominal cross section area of conding no. of cores, BHEL-PEM, etc. and Progressive is length marking, @ 11M (by embossing/printing) of 6.6 kV Cables. Cable shall be marked as having outer sheath at every 5 Meters for 11kV 8.66 kV (The embossing/printing shall be legible and indelible) 12. FR-LSH CHARACTERISTICS 13.1 Oxygen index 14.2 Smoke density rating 15.2 Smoke density rating 16.3 Max. 60% (As per IS 7098-2 /ASTMD 2843) 17.3 Smoke density rating 18.4 Smoke density rating 18.4 Max. 60% (As per IS 7098-2 /ASTM D 2843) 18.5 Flammability Test	10.6	Breaking load of Joint		6/
10.8 Maximum resistivity of Al round wire Ohm-mm ² /km 28.264 11.0 OUTERSHEATH Extruded HRPVC Type ST2 as per IS: 5831 11.2 Colour Black 11.3 Whether FR-LSH 11.4 Method of application Thickness of outer sheath 11.5 Thickness of outer sheath BIS Mark, Owner's name, Manufacturer's name a mark, year of manufacture, Cable code, Type of colour voltage class, nominal cross section area of conding. Or cores, 'BHEL-PEM', etc. and Progressive Selength marking, @ 1M (by embossing/printing) for 6.6 kV Cables. Cable shall be marked as having outer sheath at every 5 Meters for 11kV & 6.6 kV (The embossing/printing shall be legible and indelible) 12 FR-LSH CHARACTERISTICS 12.1 Oxygen index 12.2 Temperature index Min 29 (As per IS 7098-2 /ASTMD 2863) 12.3 Acid gas generation Max. 60% (As per IS 7098-2 /ASTMD 2843) 12.5 Flammability Test		-	Ohm om	
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11.3 Whether FR-LSH 11.4 Method of application 11.5 Thickness of outer sheath 11.5 Thickness of outer sheath 11.6 Marking/Embossing on Outersheath 12.6 KV Cables. Cable shall be marked as having outer sheath at every 5 Meters for 11kV & 6.6 kV (The embossing/printing shall be progressive, a in line and marking shall be legible and indelible) 12. FR-LSH CHARACTERISTICS 12.1 Oxygen index 13.2 Temperature index 14.3 Acid gas generation 15.5 Max. 20% by weight (As per IS 7098-2 /ASTMD 2863) 16.4 Smoke density rating 17.5 Max. 60% (As per IS 7098-2 /ASTM D 2843) 17.5 Flammability Test				Type ST2 as per IS: 5831
11.4 Method of application 11.5 Thickness of outer sheath BIS Mark, Owner's name, Manufacturer's name a mark, year of manufacture, Cable code, Type of a voltage class, nominal cross section area of condition, of cores, 'BHEL-PEM', etc. and Progressive Stength marking, Qi 1M (by embossing/printing) for 6.6 kV Cables. Cable shall be marked as having outer sheath at every 5 Meters for 11kV & 6.6 kV. (The embossing/printing shall be progressive, as in line and marking shall be legible and indelible) 12 FR-LSH CHARACTERISTICS 12.1 Oxygen index Min 29 (As per IS 7098-2 /ASTMD 2863) 12.2 Temperature index Min 250°C(As per IS 7098-2 /ASTMD 2863) 12.3 Acid gas generation Max. 20% by weight (As per IS 7098-2 /ASTM D 2843) 12.5 Flammability Test				Black
11.5 Thickness of outer sheath As per Table-7 of IS: 7098 (Part-2) BIS Mark, Owner's name, Manufacturer's name a mark, year of manufacture, Cable code, Type of a voltage class, nominal cross section area of condino. of cores, 'BHEL-PEM', etc. and Progressive S length marking, @ 11/4 (by embossing/printing) fo 6.6 kV Cables. Cable shall be marked as having outer sheath at every 5 Meters for 11/4 V & 6.6 kV (The embossing/printing shall be progressive, a in line and marking shall be legible and indelible) 12 FR-LSH CHARACTERISTICS 12.1 Oxygen index Min 29 (As per IS 7098-2 /ASTMD 2863) 12.2 Temperature index Min. 250°C(As per IS 7098-2 /ASTMD 2863) 12.3 Acid gas generation Max. 20% by weight (As per IS 7098-2 /ASTM D 2843) 12.5 Flammability Test	11.3	Whether FR-LSH		YES
BIS Mark, Owner's name , Manufacturer's name a mark, year of manufacture, Cable code, Type of a voltage class, nominal cross section area of condino. of cores, 'BHEL-PEM', etc. and Progressive S length marking, @ 1M (by embossing/printing) fo 6.6 kV Cables. Cable shall be marked as having outer sheath at every 5 Meters for 11kV & 6.6 kV (The embossing/printing shall be progressive, a in line and marking shall be legible and indelible) 12 FR-LSH CHARACTERISTICS 12.1 Oxygen index 12.2 Temperature index Min 29 (As per IS 7098-2 /ASTMD 2863) 12.3 Acid gas generation Max. 20% by weight (As per IS 7098-2 /IEC-6075-2) 12.4 Smoke density rating Max. 60% (As per IS 7098-2 /ASTM D 2843) 12.5 Flammability Test				Extruded
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12.2 Temperature index Min. 250°C(As per IS 7098-2 /ASTMD 2863) 12.3 Acid gas generation Max. 20% by weight (As per IS 7098-2 /IEC-60754) 12.4 Smoke density rating Max. 60% (As per IS 7098-2 /ASTM D 2843) 12.5 Flammability Test				Min 20 /An nor IC 7000 2 /ACTMD 2002)
12.3 Acid gas generation Max. 20% by weight (As per IS 7098-2 /IEC-60754 12.4 Smoke density rating Max. 60% (As per IS 7098-2 /ASTM D 2843) 12.5 Flammability Test				
12.4 Smoke density rating Max. 60% (As per IS 7098-2 /ASTM D 2843) 12.5 Flammability Test				
12.5 Flammability Test				,
		•		
13 FLAMMABILITY				
13.1 Flammability test for single cable YES (As per: IEC-60332 Part-1)				VEC. (As now IEC 60222 Part 4)

13.2	Flammability test for bunched cables		YES (As per: IEC-60332 Part-3, CAT-B)
13.3	Flammability test as per IEEE: 60383		YES
13.4	As per Swedish Chimney test SEN-SS-424-1475-F3		YES
14	Anti-rodent and Termite repulsion Test		YES
15	Anti-Fungal Test		NO (self certification by supplier for Anti-fungal properties)
16	Special Tests		
16.1	Hydrolytic Stability as per ASTM D 3137 :81 (Duration:- 14 days)		NO (Only type test report to be submitted)
16.2	UV Radiation Test as per BS EN ISO 4892-2 (Duration:- 14 days)		NO (Only type test report to be submitted)
16.3	UV Radiation Test as per ASTM G 154 (Duration:- 14 days)		NO (Only type test report to be submitted)
17	DIAMETERS		
17.1	Tolerance on overall diameter	(±) mm	(±)2 mm. over the declared value
18	Cable Drum Details	,	
18.1	Type of Drum		Wood/ Steel
18.2	Standard drum length		500m (±)5% / 750M (±) 5% (as specified in BOQ-Cum- Priced Schedule).
18.3	Details of 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	Cable packing		Please refer Clause no 4 of Section-II of this technicalSpecification. 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)

	DOCUMENT TITLE		NO. PE-TS- 435-507-E001
र्वा एस इं सम	TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	VOLUME II SECTION I	
11//11	TECHNICAL SPECIFICATION FOR HT ALPE POWER CABLES	REVISION 00	DATE: XX:XX:XXXX
	DATA SHEET-C	SHEET OF	DATE. AA.AA.AAAA
OTE: DA	TA SHEET C TO BE SUBMITTED BY SUCCESSFUL BIDDER . ONLY PAI		ICATED AS VENDOR TO FURNISH (VTF) TO BE FILLEI
S.No.	Particulars	Unit	Description
1	GENERAL		
1.1	Name of Manufacturer		Vendor to furnish (VTF)
1.2	Place of Manufacture		Vendor to furnish (VTF)
2	Type of Cable		Flame Retardant-Low Smoke (FR-LSH) HT CABLE
2.1	Voltage Grade		6.6/6.6 kV (unearthed)/ 11/11 kV (unearthed)
3	STANDARDS APPLICABLE		
3.1	Standard applicable in general (Latest amendment to be referred if any)	YES	IS:7098 (Part-2), IS:8130, IS:5831, IS:10810, IS:3975, ASTMD:2843, ASTMD:2863, IEC-7541, IEC:60332 (Part-1), IEC:60332-3-23, IEEE:60383
3.2	Current rating of cables conforms to	-	As per IS:3961 (P-7)/2017
3.3	Short circuit rating conforms to	-	IEC 60949
3.4	Formula for calculating short circuit current for different durations	-	KxA/\sqrt{t} K Amp (Where A =Total area of Conductor in mm2 & t = time in seconds , K= 0.094 for Al)
4	INSTALLATION CONDITIONS AT SITE		
4.1	Ambient air temperature	deg. C	50
4.2	Ground temperature	deg. C	30
4.3	Depth of laying of cables buried in ground	cm	90
5	Thermal resistivity of soil INFORMATION TO BE FILLED IN FOR EACH SIZE CABLE IN THE FORM OF TABLE	deg. C cm/W	150
5.1	No. of cores x size		Vendor to furnish (VTF)
5.2	Voltage grade (Uo/U)		Vendor to furnish (VTF)
5.3	Base current ratings (*) based on Clause No. 3.0		
5.3.1	In air		Vendor to furnish (VTF)
5.3.2	In ground		Vendor to furnish (VTF)
5.3.3	ducts		Vendor to furnish (VTF)
5.4	Short circuit rating		Vendor to furnish (VTF)
5.5	Properties		
5.5.1	D.C. resistance of conductor at 20 deg. C		Vendor to furnish (VTF)
5.5.2	A.C. resistance of conductor at 90 deg. C		Vendor to furnish (VTF)
5.5.3	Reactance of cable at normal frequency		Vendor to furnish (VTF)
5.5.4	Electrostatic capacitance of cable at normal frequency		Vendor to furnish (VTF)
6	CONDUCTOR		
6.1	Material type & grade	-	H2 Grade Stranded Aluminium Conductor, Clas 2 of IS:8130/2013
6.2	No & dia of wires in each core before stranding	no x mm	Vendor to furnish (VTF)
6.3	Shape SCREEN	-	Compacted Circular
7	CONDUCTOR SCREEN Meterial		Entered address of Construction Construction
7.1	Material Minimum thickness	- mm	Extruded layer of Semi Conducting Compound 0.3
8	XLPE INSULATION	mm	Extruded XLPE compound as per IS:7098 (P-2)/2011
8.1	Nominal thickness of insulation	mm	Vendor to furnish (VTF)
8.2	Extrusion & method of curing	-	Triple Extrusion (Extruded semi-conducting compound conducto screen and insulation screen shall be applied alo with XLPE insulation in a single operation by triple extrusion process) by Gas curing/Steam curing
8.3	Continuous withstand temperature		90°C
8.4	Short-circuit withstand temperature		250°C
9	INSULATION SCREEN		For both single core cable and Multicore cables
9.1	Type of screen	-	Insulation screen shall consist of two parts: 1. Non-Metallic Part 2. Metallic Part

9.2	Material and thickness (minimum and nominal)	mm	
9.2.1	Metallic (Vendor to furnish exact calculation based on actual thickness)		Copper Tape applied helically on core (Nominal
9.2.1	interaction to furnish exact calculation based on actual trickness)	-	thickness 0.10 mm with tolerance (±) 10%)
9.2.2	No. of tapes and Minimum overlapping	-	1. No. of tapes and Minimum overlapping 10%
9.3	Non-metallic	-	Extruded Semi Conducting Compound shall be bonded type. Semiconducting Tape shall also be provided & it should be easily strippable. Thickness of Semi Conducting Compound - 0.3 mm (Min.)
9.4	Earth fault current withstand capacity (calculation to be furnished)	kA, sec.	300A,1 sec (For multi-core cables, screen of each core shall be rated individually for the above value).
9.5	Extrusion & method of curing		Same as that, mentioned for Insulation above.
9.6	CORE IDENTIFICATION		By coloured strips of Red, yellow & Blue colour applied on the cores
10.0	INNERSHEATH		For both single core cable and Multicore cables
10.1	Material		Extruded HRPVC Type ST-2
10.2	Standard Applicable		IS: 7098 (Part-2) & IS: 5831
10.3	Colour		Black
10.4	Whether FR-LSH		NO
10.5	Inner sheath applicable for single core cable		YES
10.6	Fillers		Acceptable
10.7	Material of fillers (if permitted)		Same as inner sheath (Material of filler to be
	, ,		compatible with that of inner sheath)
10.8	Method of application		
10.9	Multi-core cables:		
10.9.1	With fillers		Vendor to furnish (VTF)
10.9.2	Without fillers		Pressure extruded
10.10	Single-core cables:		Vendor to furnish (VTF)
10.11	Type & Shape of fillers (if used)		Vendor to furnish (VTF)
10.12	Thickness (min.)	mm.	Vendor to furnish (VTF)
11	ARMOUR		
11.1	Material	-	Non-Magnetic hard drawn H4 grade Aluminium Single Round Wire to IS: 8130/2013 for single core cables Galvanised Steel Flat Strip to IS: 3975/1999 as per Table-6 of IS 7098 part-2. for multi-core cables
11.2	Standard Applicable		Dimension as per IS: 7098 (Part-2) Table-6 and tolerance dimension as per IS:3975
11.3	Size/ dimensions	-	Vendor to furnish (VTF)
11.4	Minimum no. of wires/ formed wires	-	Vendor to furnish (VTF)
11.5	Tolerance on formed wire dimension	-	±10 %
11.6	Minimum Coverage		90%
11.7	Gap between armour wire		Shall not exceed one armour wire space (No cross ove Over riding)
11.8	Breaking load of Joint		95% of normal armour
11.9	Maximum resistivity of GS Round wire	Ohm-cm	14.5 x 10-6
11.10	Maximum resistivity of Al round wire	Ohm-mm ² /km	28.264
12	OUTERSHEATH		
12.1	Material		Extruded HRPVC
14.1	matorial		Type ST2 as per IS: 5831
12.2	Colour		Black
12.3	Whether FR-LSH		YES
12.4	Method of application		Extruded
12.5	Thickness of outer sheath		Vendor to furnish (VTF)
13	DIAMETERS		
13.1	Diameter of insulated conductor	mm.	Vendor to furnish (VTF)
13.2	Cable diameter under armour	mm.	Vendor to furnish (VTF)
13.3	Cable diameter over armour	mm.	Vendor to furnish (VTF)
13.4	Overall diameter of cable	mm.	Vendor to furnish (VTF)
13.5	Tolerance on overall diameter	(±) mm	±2.0
13.6	Minimum bending radius	x O.D.	Vendor to furnish (VTF)
13.7	Safe pulling force	kg.	Vendor to furnish (VTF)
13.8	Weight of cable	kg./km	

13.8.1	Weight of conductor	MT./km	Vendor to furnish (VTF)
13.8.2	Weight of XLPE insulation	MT./km	Vendor to furnish (VTF)
13.8.3	Weight of PVC (Inner Sheath & Fillers)	kg./km	Vendor to furnish (VTF)
13.8.4	Weight of Aluminium Round Wire / GS formed Wire (Approx)	kg./km	Vendor to furnish (VTF)
13.8.5	Weight of PVC (Outer Sheath)	kg./km	Vendor to furnish (VTF)
13.9	Dimension of drum (F X B X T) (Approx)	mm.	Vendor to furnish (VTF)
13.10	Shipping weight (Approx)	kg	Vendor to furnish (VTF)
14	Cable marking on outer sheath	-	vendor to furnish (v 11)
- 14	Cable marking on outer sheath	-	
14.1	Marking/Embossing on Outersheath (VTF Manufacturer's Name and Trade Mark)		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 & 6.6 kV Cables. Cable shall be marked as having FRLSH outer sheath at every 5 Meters for 11kV & 6.6 kV Cables. (The embossing/printing shall be progressive, automatic, in line and marking shall be legible and indelible)
15	FR-LSH CHARACTERISTICS		
15.1	Oxygen index		Min 29 (As per IS 7098-2 /ASTMD 2863)
15.2	Temperature index		Min. 250oC(As per IS 7098-2 /ASTMD 2863)
15.3	Acid gas generation		Max. 20% by weight (As per IS 7098-2 /IEC-60754-1)
15.4	Smoke density rating		Max. 60% (As per IS 7098-2 /ASTM D 2843)
15.5	Flammability Test		
16	FLAMMABILITY		
16.1	Flammability test for single cable		YES (As per: IEC-60332 Part-1)
16.2	Flammability test for bunched cables		YES (As per: IEC-60332 Part-3, CAT-B)
16.3	Flammability test as per IEEE: 60383		YES
16.4	As per Swedish Chimney test SEN-SS-424-1475-F3		YES
17	Anti-rodent and Termite repulsion Test		YES
18	Anti-Fungal Test		NO (self certification by supplier for Anti-fungal properties)
19	Special Tests		
19.1	Hydrolytic Stability as per ASTM D 3137 :81 (Duration:- 14 days)		NO (Only type test report to be submitted)
19.2	UV Radiation Test as per BS EN ISO 4892-2 (Duration:- 14 days)		NO (Only type test report to be submitted)
19.3	UV Radiation Test as per ASTM G 154 (Duration:- 14 days)		NO (Only type test report to be submitted)
20	Cable Drum Details		(Only type test report to be submitted)
20.1	Type of Drum		Wood/ Steel
20.1	Type of Druff		
20.2	Standard drum length		500m (±)5% / 750M (±) 5% (as specified in BOQ-Cum- Priced Schedule).
20.3	Details of marking on Drum (VTF Manufacturer's Name and Trade Mark)		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.
21	Cable packing		Please refer Clause no 4 of Section-II of this technicalSpecification. It may be noted that the outer mos cable layer shall be covered with water proof cover polythene followed by complete drum covering with wooden plank o suitable thickness across flanges. (Please refer typica drawing of cable drum packing, attached in section -II)



DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES

SPECIFICATION NO. PE-TS-XXX-507-E001								
VOLUME II								
SECTION II								
REVISION 00	DATE: 31.03.2023							
SHEET -								

SECTION-II STANDARD TECHNICAL SPECIFICATION



DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES

SPECIFICATION N	O. PE-TS-XXX-507-E001
VOLUME II	
SECTION II	
REVISION 00	DATE: 31.03.2023
SHEET 1 of 1	

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

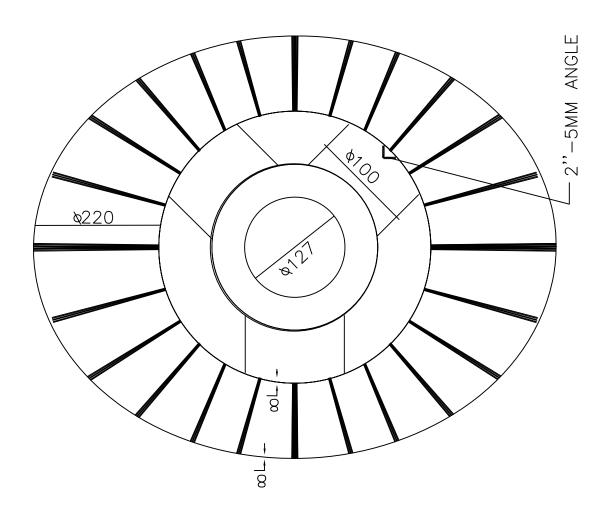
- 3.1 Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-507-E001A) as attached with the specification without any deviations. At contract stage, the successful bidder shall submit the same QP for BHEL/ ultimate customer's approval. In case bidder has reference QP agreed with 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).
- The charges of UV Radiation test & Hydrolytic Stability test (if applicable as per data sheet-A and if these tests are performed) 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.

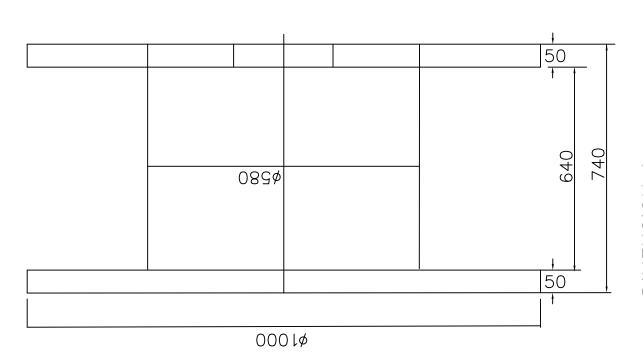
4.0 Packing

- 4.1 Cables shall be supplied in non-returnable drums. Material of cable drums shall be as specified in Datasheet-A.
- In case of wooden drums, all wooden parts shall be manufactured from seasoned wood treated with copper napthenates / zinc napthenates (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.
- 4.4 Cable drums to be secured with wooden planks to avoid any sharp cuts/damages to the wrapped cable (Refer annexure-C to section-II)

Annexure-A to Section II

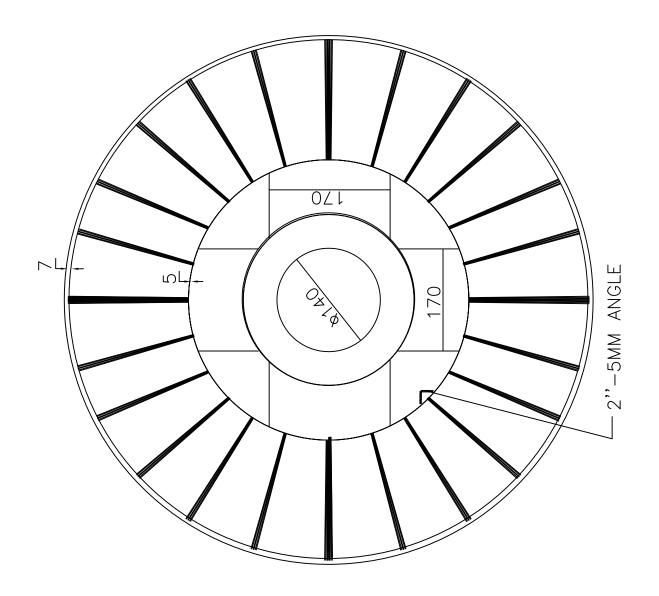
(Sheet 1 of 2)

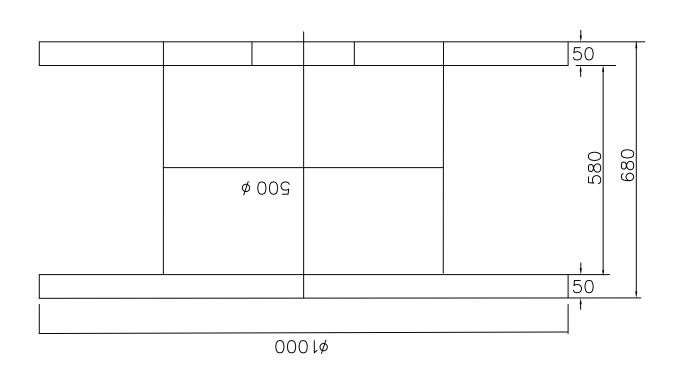




DIMENSION in mm

Annexure-A to Section II (Sheet 2 of 2)





DIMENSION in mm

TYPICAL DRAWING OF CABLE DRUM PACKING 1393793/2023/PS-PEM-EL Annexure-B of Section-II





DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES

SPECIFICATION NO. PE-TS- 435-507-E001								
VOLUME II								
	SECTION II							
	REVISION 00	DATE: 31.03.2023						
SHEET -								

QUALITY PLAN

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11			PROJI	ECT:				PO NO.:							
BH			ITEM:	HT XLPE Cab	es	SYSTEM: CAB	LE	SECTION: II				SHEET 1 OF 11			
	COMPONENTS & OPERATIONS	CHARACTERSTICS		—	~~		ACCE NORM	PTANCE IS	FORMAT RECORD		AGENCY	REMARKS			
1	2	3	4	5	6 M C/N	7		8	9	* D	** M C N				

1.0	RAW MATERIAL	S & BOUGHT OUT ITE	MS_											
		GENERAL:	_											
	Aluminium/cop	Physical properties			IS 5082/ IS 613	Test Cert.	✓	P/V	V	-				
		2. Elec .Properties MA		Electrical Tests	Sample/ Batch	Sampl e/ Batch	- do-	-do-	-do-	1	P/V	٧	-	
1.1	per Rods	SPECIFIC CHECKS:												
1.1	(Conductor/Ar mour Wire)	a) Make	MA	Physical verification			Manufacturer approved source	Manufacturer approved source	Test Cert.	√	Р	٧	-	
		b) Grade	MA	- do-	-do-	-do-	IS 8130	IS 8130	-do-	✓	Р	V	-	
		I C) Resistivity MA		Electrical Tests	Manufa cturer std.	Manufa cturer std.	IS 5082 / IS 613	IS 5082/ IS 613	-do-	1	Р	٧	-	
		GENERAL:	1		1		T			1				Г
	XLPE	1. Physical properties	МА	Physical Tests	Sample/ Batch	Sampl e/ Batch	IS 7098-II	IS 7098-II	Test Cert.	✓	Р	V	-	
1.2	Compound for insulation	2. Elec. Properties	MA	Electrical Tests	Sample/ Batch	Sampl e/ Batch	-do-	-do-	-do-	1	Р	٧	-	
		SPECIFIC CHECKS:	•		•	•	•	•	•		•	•	•	

BHEL														
	ENGINEERING		QUALITY											
	Sign & Date	Name		Sign & Date	Name									
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by:				n,c+N Date 2020,08.25 11:35:17 +05:30*	GANDHI									
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by:	C+N Date 2020,08,21 13:57:3 +05'30'	SHUKLA	by:	INICMAL	PRM, postal Code=301301, int-Uttar Fradesh, 2.5.4.20=16672x381523b78b4side 18c5cd8bb1897775 330095349x69d719139651174, 58tal Number=8cfadd001b4875x6b03a31b000e93f2x05									
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Sign & Date											
Seal											

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RH	FI			PROJECT:							PO NO.:							
<i>-77</i>				ITEM: HT XLPE Cables				SYSTEM: CABLE SECTION: II		<u>!I </u>					SHEET 2 OF 11			
SI. No.	COMPONENTS & OPERATIONS	CHARACTE	RSTICS	CLAS S	TYPE			QUANTUM (REFERENCE DOCUMENT	ACC NOR	EPTANCE MS	FORMAT RECORD		AGEN	ICY		REMARKS
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	I	I			<u>I</u>	J				L				<u> </u>				
		a) Make		MA	Physic verifica		1009	%	100%	Manufacturer approved source		nufacturer roved source	Test Cert.	✓	P/V	V	-	
		b) Type/ Gra	de	MA	-(do-	-d	0-	-do-	Approved datasheet		roved asheet	-do-	✓	P/V	٧	-	
		c) Shelf life/ condition	Storage	MA	-(do-	-d	0-	-do-	-do-		-do-	-do-	✓	P/V	V	-	
		GENERAL:																
1.3	Semi Conducting Compound	1. Physical properties		MA	Physic	cal Tests	Sam Batc		Sampl e/ Batch	IS 7098-II	IS 7	'098-II	Inspect ion Report/ Test Cert.	✓	Р	V	-	
		SPECIFIC C	HECKS:						·									
		1. Make		MA	Physic verifica		100	0%	100%	Manufacturer approved source		nufacturer roved source	-do-	✓	Р	V	-	
		2. Type/ Gra	de	MA	-0	do-	-d	0-	-do-	IS 7098-II	IS 7	'098-II	-do-	✓	Р	٧	-	
		3. Shelf life/ condition	3. Shelf life/ Storage condition		-do-		-d	-dodo-		Compound Manufacturer std.		npound nufacturer std.	-do-	✓	Р	V	-	
		GENERAL :																
1.4	Copper Tape	1. Physical properties		MA	Physic	al Tests	Sam		Sampl e/ Batch	IS 7098-II & Approved datasheet	App	7098-II & proved asheet	Inpecti on Report/	√	Р	V	-	
	•	BH	IEL		•					DER/ SUPPLIER				TOMER	REVIEW	& APPI	ROVA	<u> </u>
	ENGINEERING			<u> </u>	UALITY			Sign	& Date	-		Doc No:						
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Reviewed MANISH		MANISH	Reviewed	RITESH	I KUMAR	Discount of HTM AUS Discount of the HTM AUS PEN, postal code 201301, sel-Usia 23.4 20.10092/a31523617856666 3200906349686719149651174	VV A _ps- Pradicish, 18c5cd08c1897775					Approved						

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4			PROJ	ECT:					PO NO.:			·			
			ITEM	: HT XLPE Cabl	es		SYSTEM: CAB	BLE	SECTION:	II					SHEET 3 OF 11
	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLAS S		QUANTUN CHECK	/I OF	REFERENCE DOCUMENT	ACCE NORI	EPTANCE MS	FORMAT		AGEN	CY		REMARKS
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					M	C/N	<u> </u>				D	M	С	N	
										Test Cert.					
		2. Elec. Properties	MA	Electrical Tests	Sample/ Batch	Sampl e/ Batch	-do-		-do-	-do-	✓	Р	٧	-	
		3. Dimension	MA	Measurement	- do-	-do-	-do-		-do-	-do-	✓	Р	V	-	
		3. Continuity	MA	Electrical Tests	- do-	-do-	-do-		-do-	-do-	✓	Р	V	-	
		SPECIFIC CHECKS:		1	1		1	-		l .					1
		1. Resistivity	MA	Electrical Tests	Sample/ Batch	Sampl e/ Batch	IS 613	IS 61	13	-do-	1	Р	V	-	
.5	Fillers (as applicable)	1. Make	MA	Physical verification	100%	100%	Manufacturer approved source		ufacturer oved 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
		2. Type/ Grade	MA	-do-	-do-	-do-	Approved datasheet	Appr	oved sheet	-do-	✓	P/V	٧	-	other comp. of cable)
		BHEL				BIDD	ER/ SUPPLIER			FOR CUS	STOMER	REVIEW 8	& APPF	ROVAL	
	ENGINEERING			QUALITY	Sign	& Date			oc No:						
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BH			ITEM:	HT XLPE Cab	es	SYSTEM: CAB	LE	SECTION: I	l				SHEET 4 OF 11
	COMPONENTS & OPERATIONS	CHARACTERSTICS		—			ACCE NORM		FORMAT RECORD		AGEN	ICY	REMARKS
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		GENERAL:												
		Physical properties	MA	Physical Tests	Sample/ Batch	Sampl e/ Batch	IS 5831	IS 5831	Test Cert.	√	P/V	V	-	
		2. Elec. Properties	MA	Electrical Tests	- do-	-do-	-do-	-do-	-do-	>	P/V	V	-	
	PVC	3. FRLS Properties (as applicable)	CR	Chemical/ Environ.	-do-	-do-	Approved datasheet	Approved datasheet	-do-	>	P/V	٧	-	
1.6	Compound (for	SPECIFIC CHECKS:												
	sheath)	a) Make	MA	Physical verification	100%	100%	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	Р	V	-	
		b) Type/ Grade	МА	-do-	-do-	-do-	Approved datasheet	Approved datasheet	-do-	>	Р	٧	-	
		c) Shelf life/ Storage condition	MA	-do-	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	>	Р	V	ı	
		OFNEDAL												
	Galvanised steel	GENERAL: 1. Make	MA	Physical verification	Manufa cturer std.	Manufa cturer std.	Manufacturer approved source	Manufacturer approved source	Test Cert.	√	Р	V	-	
1.7	formed wire strip/ Aluminium													
'.'	round wire for Armour (as	2. Dimension	MA	Measurement	- do-	-do-	Approved datasheet	Approved datasheet	-do-	✓	P/V	٧	-	
	applicable)	3. Phy.and Elec. Properties	МА	Physical & Electrical Tests	Sample	Sampl e*	-do-	-do-	-do-	✓	P/V	٧	-	*: SAMPLE FROM EACH ARMOUR

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Hļ,				: HT XLPE Cab	les		SYSTEM: CAE	BLE	SECTION: I	I					SHEET 5 OF 11
SI. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLAS S	TYPE OF CHECK	QUANTUI CHECK	M OF	REFERENCE DOCUMENT	ACCI NOR	EPTANCE MS	FORMAT RECORD		AGEN	ICY		REMARKS
1	2	3	4	5	M	C/N	7		8	9	* D	** M	С	N	-
															SIZE/ BATCH
		4.Galvanization Quality	MA	Galv. Tests	- do-	-do-	IS 3975	IS 3	975	-do-	√	P/V	V	-	7201
1.8	Steel Drum (as	1. Phy. & Constructional checks	MA	Measurement	Mfr's Plant Std.	Mfr's Plant Std.	Approved drawing of steel drum		roved ving of steel n	Inspect ion Report	√	Р	V	-	
	applicable)	2. Surface finish	MA	Visual	-do-	-do-	-	Surf smo	ace shall be oth	-do-	✓	Р	V	-	
1.9	Wooden Drum	1. Phy. & Constructional checks	MA	Measurement	Mfr's Std.	Mfr's Std.	IS 10418	IS 1	0418	Inspect ion Report	√	P	V	-	
	(as applicable)	2. Anti-termite treatment	MA	Chem.	Mfr's Std.	Mfr's Std.	Mfr's Std.	Mfr's	s Std.	-do-	✓	Р	٧	-	
2.0 I	N PROCESS														
		1. Size	MA	Dimensional	Mfr's Std.	Mfr's Std.	Appd. Datasheet		od. Datasheet	Inspect ion Report	√	Р	V	-	
2.1	Wire Drawing	2. Surface finish	МА	Visual	-do-	-do-	-	Surf	ace shall be oth	-do-	✓	Р	V	-	
		3. % of Elongation	MA	Mechanical	-do-	-do-	IS 8130	IS 8	130	-do-	✓	Р	٧	-	
2.2	Stranding of wires	1. No. of wires	MA	Counting	Mfr's Std.	Mfr's Std.	Appd. Datasheet	App	od. Datasheet	Inspect ion Report	√	Р	V	-	
		Busi					DED / CLIDDLIED		•	FOR CUE					

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SI. No.	COMPONENTS & OPERATIONS	CHARACTE	RSTICS	CLAS S	TYPE OF CHECK	QUAN		OF	REFERENCE DOCUMENT	ACC NOR	EPTANCE		RMAT ECORD		AGEN	1CY		REMARKS
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						•	•			•		•					•	
		2. Resistanc	е	CR	Electrical	-d	0-	-do-	-do-		-do-		-do-	✓	Р	V	-	
		3. Sequence length & Dire		MA	Visual, Meas.	One Sam of ea size	ple ach	-	Mfrs Std. / Appd. Datasheet	Data	s Std. / App asheet		-do-		Р	-	-	
		4. Surface F	inish	MA	Visual	1009	%	-	-	Sur	face shall b ooth	ре	-do-		Р	-	-	
		5. Dimension	1	MA	Measurement	One Sam of ea size	ple ach	-	Appd. Datasheet	Арр	od. Datashe	eet	-do-		Р	-	-	
	Conductor	1. Surface F	inish	MA	Visual	100	0%	-	-	Sur	face shall b ooth	oe o	npecti n Report		Р	-	-	
2.3	Conductor Screening	2. Radial Thi	ckness	CR	Mechanical	One Sam of ea	ple ach	-	IS 7098-II & Appd. Datasheet		7098-II & od. Datashe		-do-		Р	-	-	
2.4	Core Insulation (XLPE)	1. Surface fir	nish	MA	Visual	100	0%	100%	-	bulg part	e from ging, burnt ticles, lump s & scratche	s, lic R T	nspect on Report/ est eport	√	Р	V	-	
	(No repair permitted)	2. Eccentrici Ovality #	ty &	CR	Measurement	Or San of e size	nple	One Sampl e of each	Mnfr's Std	Mn	fr's Std		-do-	✓	Р	V	-	# To be checked at starting & finished
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1	2	3	4	5	6 M	C/N	7		8	9	* D	** M	С	N I	
					IVI	C/N						IVI	C	IN	
						size/									end of extruded length.
		3. Insulation Thickness	CR	Measurement	- do-	-	Appd. Datasheet	Арр	d. Datasheet	-do-		Р	-	-	
		4. Dia over insulation	MA	Measurement	- do-	-	-do-	-do-		-do-		Р	-	-	
		5. Tensile Strength & % Elongation	MA	Mechanical	100%	-	IS:7098-II	IS:7	098-II	-do-		Р	-	-	
		NON METTALIC													
		1. Surface finish	MA	Visual	100%	100%	-	Surf	ace shall be oth	Inspect ion Report	✓	Р	V	-	
		2. Thickness	CR	Measurement	One Sample of each size/ lot	-do-	Appd. datasheet	Арр	d. datasheet	-do-	√	Р	V	-	
2.5	Insulation	METALLIC													
2.0	Screening	1. Dimension of tape	CR	Measurement	One Sample of each size/ lot	One Sampl e of each size/ lot	Appd. datasheet	Арр	d. datasheet	Inspect ion Report/ Test report	√	Р	V	-	
		2. Overlap of Tape Band	MA	- do-	-do-	-do-	Mfs Std.	Mfs	Std.	-do -	✓	Р	V	-	
		3. Tightness of Tape	MA	Visual	-do-	-do -	Mfs Std.	Mfs	Std.	-do-	✓	Р	V	-	

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-77			ITEM	HT XLPE Cab	les	SYSTEM: CAB	LE	SECTION: I	I				SHEET 8 OF 11
	COMPONENTS & OPERATIONS	CHARACTERSTICS	1	TYPE OF CHECK	QUANTUM OF CHECK	1	ACCE NORI		FORMAT RECORD		AGEN	ICY	REMARKS
1	2	3	4	5	6 M C/N	- 7		8	9	* D	** M	C N	

2.6	Core Laying	1. Dia over laid up core	MA	Measurement	One Sample of each size/ lot	One Sampl e of each size/ lot	Appd. Datasheet	Appd. Datasheet	Inspect ion Report	√	Р	V	-	
		2. Sequence of lay & direction	MA	Visual & Meas.	-do-	-do-	IS 7098-II & Mfr. Std.	IS 7098-II & Mfr. Std.	-do -	√	Р	٧	-	
		3. Lay Length	MA	Measurement	- do-	-do-	-do-	-do-	-do-	✓	Р	V	-	
									_					
		1. Surface finish	MA	Visual	100%	-	-	Surface shall be smooth	Inspect ion Report		Р	-	-	
2.7	InnerSheath Extrusion (as applicable)	2. Thickness	CR	Measurement	One Sample of each size/ lot	-	Appd. Datasheet	Appd. Datasheet	-do-		Р	-	-	
		3. Dia over inner sheath	MA	- do-	-do-	-	-do-	-do-	-do-		Р	-	-	
		1. No.of wires/Strips	MA	Counting	At the start of process	-	Mfr. Std.	Mfr. Std.	Inspect ion Report		Р	-	-	
2.8	Armour(as applicable)	2. Lay length & Direction	MA	Visual & Meas.	-do-	-	-do-	-do-	-do-		Р	-	-	
	,,,	3. Dia over armouring	MA	Measurement	- do-	-	Appd. Datasheet	Appd. Datasheet	-do-		Р	-	-	
		4. Coverage	MA	Measurement	-do-	-	-do-	-do-	-do-		Р	-	-	

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SI. No.	COMPONENTS	CHARACTERSTICS	CLAS		QUANTUM	1 OF	REFERENCE		EPTANCE	FORMAT		AGEN	ICV		REMARKS
	& OPERATIONS		S	CHECK	CHECK		DOCUMENT	NOR	MS	RECORD			101		TEMARKS
1	2	3	4	5	6 M	C/N	7		8	9	* D	** M	С	N	
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	Outor Sheath	1. Surface finish	MA	Visual	100%	-	-	Surf	ace shall be oth	Inspect ion Report/ Test report		Р	-	-	
2.9	2.9 Outer Sheath Extrusion (No repair permitted)	2. Sheath Thickness	CR	Measurement	One Sample of each size/ lot	-	Appd. Datasheet	Арр	d. Datasheet	-do-		Р	-	-	
		3. Dia over outer sheath	MA	-do-	-do-	-	-do-		-do-	-do-		Р	-	-	
		4. Embossing/ Sequencial Marking	MA	Visual	100%	-	Approved data sheet	App shee	roved data et	-do-		Р	-	-	
3.0	Finished Cable (INTERNAL)	1. Routine Test (Refer Note-H)	CR	Electrical Tests & Measurement	100%	100%	#		#	-do-	✓	Р	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	Pord Burr lum	e from osity, Bulging, nt particles, os, cuts & tches	Inspect ion Report	>	Р	W	W	
	(EXTERNAL)	2. Dimension	MA	-do-	As per IS 7908-II	As per IS 7908-II	Appd. Datasheet	Арр	d. Datasheet	-do-	✓	Р	W	w	

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SI. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLAS S		QUANTUN CHECK	/I OF	REFERENCE DOCUMENT	ACCE NORI	EPTANCE MS	FORMAT RECORE		AGEN	ICY		REMARKS
1	2	3	4	5	M 6	C/N	7		8	9	* D	** M	С	N	I
				1		0/11	L				l.	1			
		3. Armouring - Coverage No. of Wires/Strips	MA	Visual & Meas.	As per IS 7908-II	As per IS 7908-II	Appd. Datasheet	Арро	d. Datasheet	-do-	1	Р	W	w	
		4. Marking & Colour Coding	MA	Visual	As per IS 7098-II	As per IS	As per IS 7098-II	Appi Shee	roved Data et	-do-	1	Р	w	w	
		5. Acceptance Tests (Refer Note-H)	CR	Phy, Elect. Tests & FRLS Tests	-do-	-do-	#		- do-	-do-	1	Р	W	w	#: Refer Annexure-A to QP.
		6. Type Tests (Refer Note-H)	CR	Physical & Electrical Tests	#	#	-do-		-do-	-do-	√	Р	w	w	#: Refer Annexure-A to QP.
5.0	Packing	1. Sealing Identification	МА	Visual	100%	100%	As per IS 7098-II	As p	er IS 7098-II	_	✓	Р	W	-	
5.5	I acking	2. Cable drums	MA	Visual	100%	100%	Appd. Datasheet	Appo	d. Datasheet	-	✓	Р	W	_	

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- 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.

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*Records, identified with "Tick" $(\sqrt{\ })$ 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

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Annexure: C

2 x 660 MW UDANGUDI STPP STAGE-I

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) Sampling for Type test as per D-2.2 of Annexure-D of IS 7098-2.
- 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 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	REFERENCE	REMARKS
<u>3. NO.</u>	11231	ALL LICABLE LOK	CONDUCTION	STANDARD	KLIMAKKS
			REQUIRED AS	STANDARD	
1.0	Tests for Conductor		KEQOIKED 710		
I.	Tensile test	For aluminium conductor only	T, A	IS 10810 Pt 2	
		(Not applicable for compacted	·		
		circular or shaped conductor)			
II.	Wrapping test	For aluminium conductor only	T, A	IS 10810 Pt 3	
		(Not applicable for compacted			
		circular or shaped conductor)			
III.	Resistance test	For Al	T, A, R	IS 10810 Pt 5	
2.0	Tests for Armour Wires/Strips				
I,	Measurement of dimensions	Applicable for Aluminium wire &	T,A	IS 10810 Pt 36	
		GS wire/Strip			
II.	Tensile test	Applicable for Aluminium wire &	T, A	IS 10810 Pt 37	
		GS wire/Strip			
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	
V.	Winding test	For GS strip only	T, A	IS 10810 Pt 39	
VI.	Resistivity test	Applicable for Aluminium wire &	T, A	IS 10810 Pt 42	
		GS wire			
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip only	Т, А	IS 10810 Pt 40	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 41	

6.0

Flammability Tests

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<u>S. No.</u>	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
IX.	Wrapping Test	For Aluminium wires only	Т, А	IS 10810 Pt 3	
3.0	Physical Tests for XLPE Insulation & PVC sheath				
l.	Test for thickness & Eccentricity	Applicable for XLPE insulation, PVC inner sheath & For PVC inner/outer sheath only	T, A	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for XLPE insulation & For PVC <i>inner/outer sheath</i> only			
(a)	Before ageing		T, A	IS 10810 Pt 7	
(b)	After ageing		T, A	IS 10810 Pt 7	
İII.	Ageing in air oven	Applicable for XLPE insulation & For PVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	For PVC <i>inner/outer sheath</i> only	Т	IS 10810 Pt 10	
V.	Hot deformation test	For PVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 15	
VI.	Heat shock test	For PVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 14	
VII.	Shrinkage test	For XLPE insulation & For PVC inner/outer sheath only	Т	IS 10810 Pt 12	
VIII.	Thermal stability test	For PVC <i>inner/outer sheath</i> only	Т	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	
4.0	Tests On Extruded Semi- conducting Screen				
l.	Test for Strippability	Applicable for Semi-conducting Strippable screen	Т	IS 7098-II	Not applicable since it is bonded type
II.	Volume Resistivity	Applicable for Semi-conducting Strippable screen	T	IS 7098-II	
III.	Test for Crosslinking		А	IS 7098-II	
<u>5.0</u>	Improved Fire performance (FR-LSH) Tests				
l.	Oxygen index test	For outer sheath only	T, A	IS 10810 Pt 58 / ASTMD 2863	Sample shall be as per IS 7098,Part 2
II.	Smoke density test	For outer sheath only	T, A	ASTMD 2843	
III.	Acid gas generation test	For outer sheath only	T, A	IS 10810 Pt 59 / IEC-754-1	
IV.	Temperature Index Test	For outer sheath only	T,A	IS 10810 Pt 64 / ASTMD 2863	
, <u> </u>	F1 1.00 T 1		1	1	1

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<u>S. No.</u>	<u>TEST</u>	APPLICABLE FOR	<u>TEST</u>	<u>REFERENCE</u>	<u>REMARKS</u>
			CONDUCTION	<u>STANDARD</u>	
			REQUIRED AS	150 1000 15	
l.	Flammability test for bunched	For complete cable	T,A	IEC-60332 (Part-3	
<u></u>	cables			of 23 CAT-B)	
11.	Flammability test for single cable	For complete cable	T,A	IEC:60332 Part-1	
III.	Swedish chimney test	For complete cable	Α	SEN SS 424 1475	
				(Class F3)	
IV.	Flammability test	For complete cable	A	IEEE: 60383	
7.0	Electrical Tests				
l.	High Voltage Test(Water	For complete cable	T, A, R	IS 10810 Pt 45	
	immersion)				
II.	Insulation Resistance Test	For complete cable	T, A	IS 10810 Pt 43	
	(Volume resistivity method)				
III.	Partial discharge test (shall be		T,A,R	IS 10810 Pt 46	
	carried out on full drum length)		_	10 10010 D: 50	
IV.	Bending Test followed by Partial		Т	IS 10810 Pt 50	
	Discharge test		<u> </u>		
V.	Dielectric Power Factor Test		T	IS 10810 Pt 48	
	(i) As a function of voltage				
	(ii) As a function of temperature		_	10 10010 D: 10	
VI.	Heat Cycle Test		<u>T</u>	IS 10810 Pt 49	
VII.	Impulse Withstand Test		<u>T</u>	IS 10810 Pt 47	
VIII.	Thermal ageing test	For complete cable	T	IS 7098-II	
IX.	Flammability Test	For PVC sheathed cable	T	IS 10810 Pt 53	
<u>8.0</u>	Anti-rodent and Termite	For PVC <i>outer sheath</i> only	T		
	Repulsion test				