

**TELANGANA STATE POWER GENERATION
CORPORATION LIMITED**

5X800MW YADADRI TPS

VOLUME -II

***TECHNICAL SPECIFICATION
FOR
HT XLPE POWER CABLE***

**SPECIFICATION NO: PE-TS-417-507-E001
REVISION: 00**



**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- 417-507-E001

VOLUME II

CONTENT

REVISION 0

DATE: 03.07.2021

SHEET 1 of 1

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	(INCLUDING COVER/ SEPARATOR SHEETS)	



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VOLUME II

COMPLIANCE CERTIFICATE

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DATE: 03.07.2021

SHEET 1 of 1

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

385177/2021/PS-PEM-EL



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HT XLPE POWER CABLES

SPECIFICATION NO. PE-TS- 417-507-E001

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SECTION I

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SHEET 1 OF 3

SECTION –I

SPECIFIC TECHNICAL REQUIREMENTS



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SECTION I

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SHEET 2 OF 3

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
3.1 TECHNICAL

S.No.	Reference Clause No. of Section- II	Specific Requirement/ Change
1.	3.5, 3.6, 3.7	The type tests are required to be conducted as indicated in Annexure to QAP and the same shall be offered for inspection (conduction of type tests shall be witnessed by BHEL/Customer). Bidder to indicate unit price of cables inclusive of type test charges. No separate charges shall be payable for type tests.
2.	3.8	Refer S. No. 1 above.

3.2 QUALITY/INSPECTION

S.No.	Reference Clause No. of Section- II	Specific Requirement/ Change
1.	3.7	All Tests shall be conducted as per contract. Conduction of Testing requirements mentioned in datasheet-A & Annexure to QAP.

- 3.3 The successful bidder shall submit the standard list of raw material suppliers/ sub-vendors for approval without any commercial implications. Changes to the same, if proposed by any bidder, shall be to BHEL approval.
- 3.4 Quality Plan applicable for project:
BHEL Standard Quality Plan no. PE-QP-999-507-E001, R1 (Enclosed with specification)
- 3.5 A label shall be securely attached to each end of the reel indicating the length, type, voltage grade, conductor size and number of core of the cable. Also Weight of cable drum with and without cables and type of end sealing to be indicated. A tag containing the same information shall be attached to the leading end of the cable inside. An arrow and necessary instructions shall be marked on the drum indicating the direction in which it should be rolled.

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

- 4.1 Documents/drawings shall be submitted after placement of order for BHEL and customer approval which has been specified in NIT.

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SHEET 3 OF 3

NOTE-

1. Vendor shall submit the dates for drawing/document submission/BHEL comments/ resubmission after approval of documents.
 2. In BOM each of the item to be uniquely identified with item code no. or item Sl. No. Supplier to ensure that all the items which will find separate mention in the packing list are covered in detailed BOM. Supplier to give following undertaking in BOM: " The BOM provided here completes the scope (in content and intent) of material supply under PO no. ---- dtd ----- Any additional material which may become necessary for the intended application of supplied item/package will be supplied free of cost in most reasonable time."
- 4.2 Drawings/ documents shall be submitted through Document Management System (DMS).

* 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.

385177/2021/PS-PEM-EL



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XLPE POWER CABLES

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SECTION I

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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	

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

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



BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

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


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	*	**			
					M	C/N				D	M	C	N	

		a) Make	MA	Physical verification	100%	100%	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P/V	V	-	
		b) Type/ Grade	MA	-do-	-do-	-do-	Approved datasheet	Approved datasheet	-do-	✓	P/V	V	-	
		c) Shelf life/ Storage condition	MA	-do-	-do-	-do-	-do-	-do-	-do-	✓	P/V	V	-	
1.3	Semi Conducting Compound	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	-	

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



BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	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 3 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					

									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	-	

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



BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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

	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 4 OF 11

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

1.6	PVC Compound (for sheath)	<u>GENERAL :</u>													
		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	-		
		<u>SPECIFIC CHECKS :</u>													
		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)	<u>GENERAL :</u>													
		1. Make	MA	Physical verification	Manufacturer std.	Manufacturer std.	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P	V	-		
		2. Dimension	MA	Measurement	-do-	-do-	Approved datasheet	Approved datasheet	-do-	✓	P/V	V	-		
		3. Phy.and Elec. Properties	MA	Physical & Electrical Tests	Sample *	Sample *	-do-	-do-	-do-	✓	P/V	V	-	*: SAMPLE FROM EACH ARMOUR	

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


JAISWAL

Digitally signed by R. K. JAISWAL
DN: cn=R. K. JAISWAL, o=BHEL, ou=Engineering, email=rajaiswal@bhel.co.in, c=IN
Date: 2020.08.25 11:36:48 +05'30'

Digitally signed by RITESH KUMAR
DN: cn=RITESH KUMAR, o=BHEL, ou=Engineering, email=riteshk@bhel.co.in, c=IN
Date: 2020.08.25 12:43:28 +05'30'

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Sign & Date	
Seal	

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	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	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 5 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					

														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	-	


BHEL				BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Doc No:			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name	Seal
MANISH		ABHISHEK	RITESH KUMAR		KUNAL GANDHI	Approved by:			
Digitally signed by MANISH SHUKLA, DN: cn=MANISH, o=BHEL, ou=QA, email=manishshukla@bhel.co.in, c=IN, Date: 2020.08.25 11:57:17 +05'30'		Digitally signed by RITESH KUMAR, DN: cn=RITESH KUMAR, o=BHEL, ou=QA, email=riteshkumar@bhel.co.in, c=IN, Date: 2020.08.25 11:57:17 +05'30'		Digitally signed by KUNAL GANDHI, DN: cn=KUNAL GANDHI, o=BHEL, ou=QA, email=kungalgandhi@bhel.co.in, c=IN, Date: 2020.08.25 11:57:17 +05'30'		Digitally signed by MANISH SHUKLA, DN: cn=MANISH, o=BHEL, ou=QA, email=manishshukla@bhel.co.in, c=IN, Date: 2020.08.25 11:57:17 +05'30'			

	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 6 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	*	**			
					M	C/N				D	M	C	N	



		2. Resistance	CR	Electrical	-do-	-do-	-do-	-do-	-do-	✓	P	V	-	
		3. Sequence, lay length & Direction	MA	Visual, Meas.	One Sample of each size/ lot	-	Mfrs Std. / Appd. Datasheet	Mfrs Std. / Appd. Datasheet	-do-		P	-	-	
		4. Surface Finish	MA	Visual	100%	-	-	Surface shall be smooth	-do-		P	-	-	
		5. Dimension	MA	Measurement	One Sample of each size/ lot	-	Appd. Datasheet	Appd. Datasheet	-do-		P	-	-	
2.3	Conductor Screening	1. Surface Finish	MA	Visual	100%	-	-	Surface shall be smooth	Inspecti on 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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Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL			Approved by:			

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


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
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					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	NON METTALIC											
		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	-
		METALLIC											
		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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

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1	2	3	4	5	6	7	8	9	* D	** M C N
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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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



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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	**			
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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	

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

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		ITEM: HT XLPE Cables	SYSTEM: CABLE	SECTION: II	SHEET 10 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	**
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		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 7098-II	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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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). 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

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

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TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS**A. Type Test Conduction:**

- Tests for which "T" is indicated in the 'Test Conduction Required As' column below shall be conducted as Type Test.
- Sampling:
 - Type test to be conducted on 1 drum for every 10 drums or less of each type and size of cable/ lot.
 - Electrical tests to be conducted on one drum of every size & voltage grade of cables.
 - 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:

- Tests for which "A" is indicated in the 'Test Conduction Required As' column below shall be conducted as Acceptance tests.
- Sampling:
 - Acceptance tests shall be as per 1 drum for every 10 drums or less of each type and size of cable/ lot.
 - 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:

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

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



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Annexure "A" to Quality Plan

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
V.	Winding test	For GS strip only	T, A	IS 10810 Pt 39	
VI.	Resistivity test	Applicable for Aluminium wire & GS wire	T, A	IS 10810 Pt 42	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 40	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 41	
IX.	Wrapping Test	For Aluminium wires only	T, A	IS 10810 Pt 3	
3.0	Physical Tests for XLPE Insulation & PVC sheath				
I.	Test for thickness & Eccentricity	Applicable for XLPE insulation, HRPVC inner sheath & For HRPVC <i>inner/outer sheath</i> only	T, A	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for XLPE insulation & For HRPVC <i>inner/outer sheath</i> only			
(a)	Before ageing		T, A	IS 10810 Pt 7	
(b)	After ageing		T, A	IS 10810 Pt 7	
III.	Ageing in air oven	Applicable for XLPE insulation & For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 10	
V.	Hot deformation test	For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 15	
VI.	Heat shock test	For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 14	
VII.	Shrinkage test	For XLPE insulation & For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 12	
VIII.	Thermal stability test	For HRPVC <i>inner/outer sheath</i> only	T	IS 10810 Pt 60	
IX.	Hot set test	For XLPE insulation only	T, A	IS 10810 Pt 30	
X.	Water absorption (gravimetric) test	For XLPE insulation only	T	IS 10810 Pt 33	
XI.	Degree of cross-linking	For XLPE insulation only	T	IS 7098-II	
4.0	Tests On Extruded Semi-conducting Screen				
I.	Test for Strippability	Applicable for Semi-conducting Strippable screen	T	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 cross linking		A	IS 7098-II	
5.0	Improved Fire performance (FR-LSH) Tests				
I.	Oxygen index test	For inner/outer sheath only	T, A	IS 10810 Pt 58 / ASTM D 2863	Sample shall be as per IS 7098, Part 2

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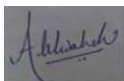
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Annexure "A" to Quality Plan

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

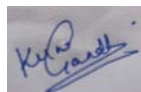
**** These tests shall be conducted on one sample for the entire contract and duration of these tests shall be 14 days.**

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



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DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR HT
XLPE POWER CABLES

SPECIFICATION NO. PE-TS-417-507-E001

VOLUME II

SECTION I

REVISION 00

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DATASHEET A



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1.0	Type of Cable	Flame Retardant-Low Smoke (FRLS)
2.0	Standard applicable in general (Latest amendment to be referred if any)	IS:7098 (Part-2), IS:8130, IS:5831, IS:10810, IS:3975, ASTM:2843, ASTM:2863, IEC-754-1, IEC:60332 (Part-1), IEC:60332-3-23, IEEE:60383
3.0	Voltage Grade	11/11kV(UE) & 3.3/3.3kV(UE)
4.0	Number of cores, cross sectional area of conductors and quantities	3CX240 sq.mm(11/11kV, ARMOURED) 1CX630 sq.mm(11/11kV, ARMOURED) 1CX240 sq.mm(11/11kV, ARMOURED) 3CX185 sq.mm(3.3/3.3kV, ARMOURED) 1CX240 sq.mm(3.3/3.3kV, ARMOURED) As per BOQ cum price schedule (part of NIT)
5.0	CONDUCTOR	
(a)	Material	Aluminium
	Grade and Class	H2, Class 2
(b)	Standard Applicable	IS: 8130
(c)	Shape	Compacted Circular, Stranded
(d)	Min. number and diameter of strands	As per Class-2 of IS: 8130
(e)	Conductor screen	
(i)	Material	Extruded Cross-linked Semi-conducting compound
(ii)	Minimum thickness	0.3 mm
6.0	INSULATION	
(a)	Material	Extruded (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
(a)	Non-metallic	
(i)	Material	Extruded semiconducting compound shall be bonded type. Semiconducting tape shall also be provided and it should be easily strippable.
(ii)	Minimum thickness	0.3 mm
(b)	Metallic	
(i)	Material	Copper
(ii)	Type	Tape
(iii)	Size	Nominal thickness 0.1mm with tolerance (\pm) 10%
(iv)	Minimum Overlap	10%
(c)	Earth fault current withstand capacity	0.3kA, 2 sec. (For multi-core cables, screen of each core shall be rated individually for the above value).
8.0	EXTRUSION (Insulation and Screens)	
(a)	Process	Triple Extrusion (Extruded semi-conducting compound conductor screen and



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		insulation screen shall be applied along with XLPE insulation in a single operation by triple extrusion process).
(b)	Method of Curing	Triple Extrusion Dry Cure (CCV) process using pressurized Nitrogen.
9.0	CORE IDENTIFICATION	By coloured strips applied on (For three core cables) cores.
10.0	INNER SHEATH	Applicable for all Cables
(a)	Material	Extruded FRLS HRPVC compound conforming to type ST2 of IS: 5831 for three and single core cables.
(b)	Standard Applicable	IS: 7098 (Part-2) & IS: 5831
(c)	Colour	Black
(d)	Whether FRLS	YES
(e)	Inner sheath applicable for single core cable	YES
(f)	Fillers	Acceptable
(g)	Material of fillers (if permitted)	Same as inner sheath (Material of filler to be compatible with that of inner sheath)
(h)	Method of application	
(1)	Multi-core cables:	
(i)	With fillers	[<input checked="" type="checkbox"/>] Pressure extruded [<input checked="" type="checkbox"/>] Vacuum extruded
(ii)	Without fillers	Pressure extruded
(2)	Single Core Cable	[<input checked="" type="checkbox"/>] Pressure extruded [<input checked="" type="checkbox"/>] Vacuum extruded
(i)	Thickness of inner sheath	As per Table-5 of IS: 7098 (Part-2)
11.0	ARMOUR	
a)	Material	
(i)	Multicore cables	Galvanised single round steel wire armour for twin and multicore cables.
(ii)	Single core cables	Non-magnetic hard drawn aluminium single round wire conforming to H4 Grade of IS-8130 latest
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
12.0	OUTERSHEATH	
(a)	Material	Extruded FRLS HRPVC compound conforming to type ST2 of IS: 5831
(b)	Colour	Black
(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	Cable size (cross section area of conductor and no. of cores), voltage grade, Manufacturer's name and /or trade mark, year of manufacture, Type of insulation, Type of inner & outer sheath, "FRLS" word etc. Owner's identification mark i.e. "TSGENCO", "BHEL-PEM" and IS number @ 5m (by embossing). Progressive sequential marking @ 1m (by



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		printing)
13.0	FRLS CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per ASTM-D 2863-77)
(b)	Temperature index	Min. 250°C at oxygen index 21(As per NES-715)
(c)	Acid gas generation	Max. 20% (IEC-60754-1)
(d)	Smoke density rating	Max. 60% (As per ASTM D 2843-7)
(e)	Flame retardance properties	After the test, there should be no visible damages on the test specimen within 300mm from its upper end. After burning has ceased, the cables should be wiped clean and the charred or affected portion should not have reached a height exceeding 2.5 meter above the bottom edge of the burner, measured at the front and rear of the cable assembly.
(f)	Test for specific optical density of smoke	The cables shall meet the requirements of IS/IEC.
(g)	Rodent & Termite Test	The test shall be carried out to note the presence of rodent and termite repelling chemical in PVC compound. Normal procedure is that a few chippings of the PVC compound are slowly ignited in a porcelain dish or crucible in a muffle furnace at about 600°C. The resulting ignited ash is boiled with a little ammonium acetate solution (10%). A drop of aqueous sodium sulphide solution is placed on a thick filter paper and it is allowed to soak. The spot is touched with a drop of above extract. A black spot indicates the presence of anti-termite & rodent compound.
(h)	Flammability test	The test shall be carried on finished cables as per following Standards a) Swedish Chimney test – SS: 424-14-75 b) IEEE std.383 – 1974 latest c) IEC std. 332-1, 332-3 and IEC 331
14.0	TOLERANCE ON OUTER DIAMETER	(±)2 mm. over the declared value
15.0	CABLE DRUMS	
(a)	Type of Drum	[√] Steel as per relevant IS
(b)	Standard drum length	As per BOQ cum Price Schedule
(c)	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. Wood preservative anti-termite treatment shall be applied to the entire drum.
(d)	Particular information on Drum	Owner's identification mark i.e. "TSGENCO" and "BHEL-PEM", Manufacturer's name and /or trade mark, Type of Cable & Voltage Grade, year of manufacture, Type of insulation, No. of core & Cable size, cable code, length of cable on drum, No. of length on drum (if more than one), direction of rotation(by arrow), approx. gross mass, IS/IEC number and ISI mark.


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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	IS: 8130 For conductor material	YES	
2.3	IS: 5831 For material of innersheath & outersheath	YES	
2.4	IS: 3975 / IS: 8130 For armour of 3 core/ single core cables	YES	
2.5	IS: 10810 For method of tests	YES	
2.6	ASTMD-2863 For oxygen index test	YES	
2.7	SS:424-14-75 & IEC-60332-3 & IEC-60332-1 & IEEE: 60383 For flammability test	YES	
2.8	IEC-60754-1 For acid gas generation test	YES	
2.9	ASTMD-2843 For smoke generation test	YES	
2.10	Current rating of cables conforms to	-	
2.11	Short circuit rating conforms to	-	
2.12	Formula for calculating short circuit current for different durations	-	
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	Amp	
7.4	Short circuit rating	kA, sec	
7.5	Properties		
a)	D.C. resistance of conductor at 20 deg. C	ohm/km	
b)	A.C. resistance of conductor at 90 deg. C	ohm/km	
c)	Reactance of cable at normal frequency	ohm/km	
d)	Electrostatic capacitance of cable at normal frequency	mF/km	
7.6	CONDUCTOR		
a)	Material type & grade	-	
b)	No & dia of wires in each core before stranding	no x mm	
c)	Shape	-	

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

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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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SECTION – IIGENERAL 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 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. Bidders shall submit their list of proven sub-vendors for raw materials, which will be reviewed by BHEL/Customer.
- 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 & Hydrolytic Stability test (if applicable) shall be reimbursed extra at actual against original money receipt of Govt. Lab. (CPRI/ ERDA etc.).
- 3.5 The bidder shall furnish the reports of all the type tests listed in Annexure to QAP (enclosed with quality plan) carried out in within last five years of the date of bid opening. These reports should be for the tests conducted either in government approved third party laboratory or witnessed by client (such as major utilities/ industries) on identical/ similar cables to those ordered under this contract. (Refer Section-I, Cl. No. 3.1.1, S. No.1)
- 3.6 In case bidder is not able to submit report of type test(s) conducted in last five years, or in case type tests report(s) are not found to be meeting the specification/ relevant standard requirements, then all such tests shall be conducted under this contract by the bidder free of cost to BHEL, and reports shall be submitted for approval. No charges shall be paid for testing under such circumstances. (Refer Section-I, Cl. No. 3.1.1, S. No.1).
- 3.7 Irrespective of the bidder furnishing type test report as indicated above, BHEL may get type tests as indicated in Annexure to QAP (enclosed with quality plan) on the lots offered for inspection. Separate price shall be quoted for the conduction of type testing per lot, which shall be used for cost comparison. A maximum of three lots shall be considered for price comparison purposes on account of type testing. However, type-testing charges shall be paid as per type test conducted. (Refer Section-I, Cl. No. 3.1.1, S. No.1).
- 3.8 Minor changes in the final Type Test Procedures (which shall be to approval during contract stage) shall be without any commercial implication.
- 3.9 Cost of cables consumed for testing shall be to bidder's account.



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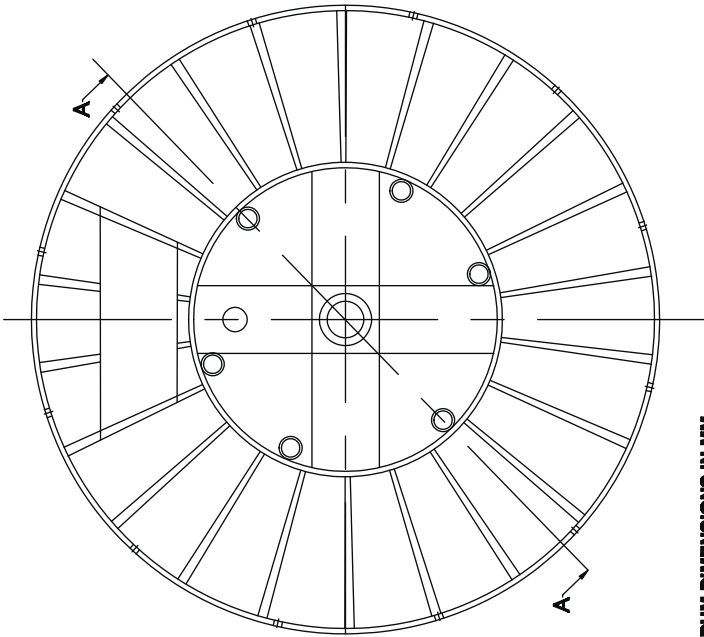
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- 3.10 Acceptance tests shall be conducted on every lot offered for inspection as per details indicated in Datasheet A & **Quality Plan**.
- 3.11 Routine testing shall be conducted in line with the applicable standards and as per the Manufacturing Quality Plan approved for the project for every lot offered for inspection.
- 3.12 Cost of conduction of routine and acceptance testing shall be deemed to have been included in the quoted supply prices.
- 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.

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.

