INDEX-BID DOCUMENTS- LT XLPE POWER CABLE for 1 X 660 MW BHUSAWAL TPP

BHEL	**1x660 MW BHUSAWAL UNIT-6, TPS** **PRE-QUALIFICATION REQUIRMENTS FOR LT XLPE POWER CABLES**	PE-PQ-415-507-E002 REVISION NO. 0 DATE: 01.02.2023 SHEET NO. 1 OF 1

ITEMS: LT XLPE Power Cable

SCOPE: Supply : YES; Erection & Commissioning : NO

1	Bidder should be a manufacturer of LT Power cables
2	Availability of test reports of tests on LT 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	Capacity of manufacturing 10 km of LT power cables per month
4	Manufactured and supplied at least one (1) km of FRLS cables.
5	Manufactured and supplied LT power cable sizes of minimum 630sq.mm. conductor for single core cable.
6	Manufactured and supplied at least 15 km of LT power cables in one or more orders and at least 05 km in one single order.
7	Bidder should have supplied/provided **LT XLPE POWER CABLES** for at least one thermal power plant of 500 MW or above capacity which has completed one year of commercial operation and the equipment supplied should have completed the contractual guarantee period or should have supplied **LT XLPE POWER CABLES** of rating/type/size as required under the contract to any power plant.
8	LT XLPE POWER CABLES shall be in successful operation for similar duty condition and similar application for minimum one (1) year as on 06.08.2018.
9	Minimum two (2) nos. purchase orders for LT XLPE Power cables shall be submitted which should not be more than five (5) years old from the date of techno- commercial bid opening for establishing continuity in business.

Notes (General points):

1. Consideration of offer shall be subject to customer's approval of bidders, if applicable.
2. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
3. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
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. PQR 7 & 8 is in line with customer provenness criteria.

PREPARED BY	CHECKED BY	REVIEWED BY	APPROVED BY
Chandrajeet 01/02/23 NAME: CHANDRAJEET RATHAUR DESIGNATION: MGR.	01/02/2023 NAME: KANHAIYA KUMAR DESIGNATION: SR. MGR.	02/02/2023 NAME: PRAVEEN DUTTA DESIGNATION: AGM	02/2/23 NAME: DEBASISA RATH DESIGNATION: DH(ELECT)

VOLUME-II

MAHARASTRA STATE POWER GENERATION CO. LTD.

1X660MW BHUSAWAL TPS UNIT#6

TECHNICAL SPECIFICATION

FOR

LT XLPE POWER CABLE

SPECIFICATION NO: ***PE-TS-415-507-E002***

REVISION: **0**

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

CONTENTS

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 is 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 'BOQ-Cum-Price schedule' of the specification shall not be considered (i.e., technical description & quantities as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS

1.0 SCOPE OF ENQUIRY

1.1 Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of LT XLPE Power Cable conforming to this specification.

1.2 It is not the intent to specify herein all the details of design & manufacture of material. However, the material shall conform in all respects to high standard of design, engineering & workmanship and shall be capable of performing in continuous commercial operation at site condition.

1.3 General technical requirements of the LT XLPE Power cables are indicated in Section-II & Datasheet-A. Project specific technical/ quality requirements / changes are listed in Section-I.

1.4 The stipulation of Data Sheet-A shall prevail in case of any conflict between the stipulations of Data Sheet-A & Section-II.

1.5 The documents shall be in English Language and MKS system of units.

2.0 BILL OF QUANTITIES

Quantity requirements shall be as per 'BOQ-cum-price schedule' as part of NIT.

3.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

3.1 After placement of order, documents shall be submitted for BHEL & customer's approval as specified in NIT.

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

DATA SHEET-A

1.0	Type of Cable	Flame Retardant Low Smoke halogen (FR-LSH)	
2.0	Standard applicable in general(Latest amendment to be referred if any)	IS:7098 (Part-1), 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	
3.0	Voltage Grade	1.1kV	
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ-Cum-Price Schedule	
5.0	FAULT CHARACTERISTICS		
	Fault Level	50kA RMS	
	Fault Clearing Time	1.0 sec	
6.0	CONDUCTOR		
(a)	Material	Aluminium	Copper
	Grade and Class	Stranded, compacted, H2 Class 2	Stranded, plain annealed high conductivity, Class 2
(b)	Standard Applicable	IS: 8130	
(c)	Shape	Aluminium	Copper
		Circular/ Shaped – as per IS	Circular- for all sizes
(d)	Min. number and diameter of strands for main and neutral conductor [Neutral conductor cross section w.r.t main conductor shall be as per Table-2 of IS: 7098 (Part-1)]	As per Table-2 of IS: 8130	
7.0	INSULATION		
(a)	Material	Cross-Linked Polyethylene(XLPE)	
(b)	Standard Applicable	IS: 7098 (Part-1)	
(c)	Continuous withstand temperature	90°C	
(d)	Short-circuit withstand temperature	250°C	
(e)	Method of application	By extrusion; sleeve extrusion not permitted.	
(f)	Nominal Thickness of insulation	As per IS: 7098 (Part-1)	
8.0	CORE IDENTIFICATION	By colour coding as per IS: 7098 - Part -1	
9.0	INNER SHEATH		
(a)	Material	Extruded HRPVC Type ST-2	
(b)	Standard Applicable	IS: 7098 (Part-1) & IS: 5831	
(c)	Colour	Black	
(d)	Whether FR-LSH	Yes	
(e)	Inner sheath applicable for single core cable	No	
(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	Pressure/ Vacuum extruded
(ii)	Without fillers	Pressure extruded
(2)	Single-core cables:	NOT APPLICABLE
10.0	ARMOUR	
(a)	Applicable	Yes
(b)	Material:	
(i)	Single core cables	Non Magnetic Hard drawn Aluminium Round Wire H4 grade to IS: 8130 (as specified in BOQ cum price schedule)
(ii)	Multi-core cables	Galvanised Steel Round Wire conforming to IS 7098 Part-I (as specified in BOQ cum price schedule)
(iii)	Standard Applicable	Dimension as per IS: 7098 (Part-1) Table-6 and tolerance on dimension as per IS:3975
(c)	Minimum Coverage	90%
(d)	Gap between armour wires	Shall not exceed one armour wire space (No cross-over/ over-riding)
(e)	Breaking load of joint	95 % of normal armour
11.0	OUTERSHEATH	
(a)	Material	HRPVC Type ST2 as per IS: 5831
(b)	Colour	Black
(c)	Whether FR-LSH	Yes
(d)	Method of application	Extruded
(e)	Thickness of outer sheath	As per Table-8 of IS: 7098 (Part-1)
(f)	Marking	Cable size (cross section area and no. of cores), voltage grade and Reference IS @ 1m (by embossing) Word "XLPE", "FR-LSH" @ 1m (by embossing) Manufacturer's name and/ or trade mark, year of manufacture @ 1m (by embossing) 'BHEL-PEM' and 'MAHAGENCO' name @ 1m (by embossing) Progressive sequential marking of length of the cable in metres @ 1m (by embossing/ printing) The embossing shall be progressive, automatic, in line and marking shall be legible and indelible
12.0	FR-LS CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per IS 7098-I /ASTMD 2863)
(b)	Temperature index	Min. 250^{o}C(As per IS 7098-I /ASTMD 2863)
(c)	Acid gas generation	Max. 20% by weight (As per IS 7098-I /IEC-60754-1)
(d)	Smoke density rating	Max. 60% (As per IS 7098-I /ASTM D 2843)
(e)	Flammability Test	
(i)	Flammability test for single cable	YES As per IEC-60332 Part-1
(ii)	Flammability test for bunched cables	YES As per IEC-60332 Part-3-23, CAT-B
(iii)	Flammability test as per IEEE: 60383	YES

(iv)	As per Swedish Chimney test SEN-SS-424-1475-F3	YES
13.0	Anti-rodent and Termite repulsion Test	YES
15.0	TOLERANCE ON OUTER DIAMETER	± 2mm
16.0	MINIMUM BENDING RADIUS	
(a)	Single core cables	15 x O.D.
(b)	Multi core cables	12 x O.D.
17.0	SAFE PULLING FORCE	
(a)	Aluminium conductor cable	30 N/ sq. mm.
(b)	Copper conductor cable (if applicable)	50 N/ sq. mm
18.0	CABLE DRUMS	
(a)	Type of Drum	Wooden (heavy construction) as per IS 10418
(b)	Standard drum length	500m (±) 5% / 1000m (±) 5%. (as specified in BOQ-Cum-Priced Schedule)
(c)	Painting	Entire surface to be painted
(d)	Outermost Layer	To be covered with waterproof polyethylene
(e)	Construction details	*Clause no 4.2 of Section-II of this technical specification*
(f)	Particular details on Drum	*Clause no 4.3 of Section-II of this technical specification* *Further customer specific marking requirement (if any) shall be informed later.*
(g)	Cable packing	Please refer Clause no 4.2 of Section-II of this technical specification. It may be noted that the outer most cable layer shall be covered with water proof cover polythene followed by complete drum covering with wooden plank of suitable thickness across flanges. (Refer typical drawing of cable drum packing, attached in section -II)
19.0	Sea Worthy packing	No

DATASHEET C

GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)

S.No.		Unit	Description
A	**GENERAL**	-	
1	Name of manufacturer	-	
2	Place of Manufacture	-	
3	Current rating of cables conforms to	-	
4	Short circuit rating conforms to	-	
5	Formula for calculating short circuit current for different duration	-	
6	Permissible conductor temperature		
	(a) Maximum continuous rating	deg. C	
	(b) Short circuit rating	deg. C	
7	(a) Installation Conditions at site		
	i) Ambient air temperature	deg. C	
	ii) Ground temperature	deg. C	
	iii) Depth of laying of cables buried in ground	cm	
8	CHARACTERISTICS OF FRLS SHEATH		
	(a) Oxygen index	%	
	(b) Temperature index	deg. C	
	(c) Acid gas generation	%	
	(d) Smoke density rating	%	
9	CABLE DRUMS		
	(a) Type & construction	-	
	(b) Standard drum length	Mtr	
	(c) Tolerance on drum length	%	
B	**INFORMATION TO BE FILLED IN FOR EACH SIZE CABLE IN THE FORM OF TABLE**		
1	No. of cores x size	No. x sq.mm	
2	Voltage grade (Uo/U)	kV	
3	Base current ratings (*) based on Sl. (A) 7.0		
	(a) In air	Amp	
	(b) In ground	Amp	
	(c) ducts	Amp	

4	Short circuit rating for 1 sec duration	kA	
5	(a) D.C. resistance of conductor at 20 deg C (main / neutral)	ohm/km	
	(b) A.C. resistance of conductor at 90 deg. C (main / neutral)	ohm/km	
	(c) Reactance of cable at Normal frequency	ohm/km	
	(d) Electrostatic capacitance of cable at normal frequency	µF/km	
6	CONDUCTOR		
	(a) Material type	-	
	(b) Grade	-	
	(c) No & dia of wires in each core before stranding	no x mm	
	(d) Shape	-	
7	INSULATION		
	(a) Material	-	
	(b) Nominal thickness (main / neutral)	mm	
	(c) Minimum thickness (main / neutral)	mm	
	(d) Minimum volume resistivity at 27 deg. C	Ohm-cm	
	(e) Minimum volume resistivity at 90 deg. C	Ohm-cm	
8	INNERSHEATH		
	(a) Material	-	
	(b) Whether FRLS	-	
	(c) Thickness (min.)	mm	
	(d) Method of application for multi-core cables	-	
	(e) Type and shape of fillers (if used)	-	
	(f) Colour	-	
9	ARMOUR		
	(a) Material	-	
	(b) Type of armour	-	
	(c) Size/ dimensions (Nominal dia of wire)	mm	
	(d) Minimum no. of round / formed wires	No.	
	(e) Minimum coverage	%	
	(f) Gap between armour wire/strip	-	
	(g) Breaking load of joint	-	
	(h) Maximum resistivity of GS formed / Round wire	Ohm-cm	
	(i) Maximum resistivity of Aluminium round wire	Ohm-cm	
10	OUTERSHEATH		
	(a) Material	-	
	(b) Whether FRLS	-	
	(c) Minimum thickness	mm	

	(d) Colour	-	
	(e) Method of application	-	
11	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	
	(e) Tolerance on overall diameter	(±) mm	
12	Ovality	mm	
13	Minimum bending radius	x O.D	
14	Safe Pulling Force	N/mm^2	
15	Weight of cable	kg./km	
16	Dimension of drum	mm	
17	Shipping weight (approx.)	kg	
18	Cable marking on outer sheath	-	
19	Marking on drum	-	

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

SECTION-II

STANDARD TECHNICAL REQUIREMENTS

1.0 CODES AND STANDARDS

1.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.

1.2 The design, material, construction, manufacture, inspection and testing of LT XLPE POWER Cable shall conform to the latest revision of relevant standards as per Data Sheet-A.

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

2.0 TECHNICAL REQUIREMENTS

2.1 LT XLPE POWER Cable shall be supplied as per technical particulars specified in Data Sheet – A.

3.0 QUALITY ASSURANCE, TESTING & INSPECTION

3.1 Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-507-E002, Rev-02) as attached with the specification without any deviations. At contract stage (project specific), 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, routine / acceptance testing and special testing requirements shall be as per Annexure –A to QAP. Charges for all these tests for all the equipments & 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 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 wooden.

4.2 For 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. 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 Each drum shall carry manufacturer's name, purchaser's name, address and contract no., item no. & type, size & length of cable and net gross weight stencilled on both sides of drum. A tag containing same information shall be attached to the leading end of the cable. An arrow & suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-507-E002, REV 02.	
	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 1 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
1.0	**RAW MATERIALS**													
1.1	**Aluminium /Copper Rods**	**GENERAL :**												
	(Conductor/ Armour Wire)	1. Physical properties	MA	Physical Tests	Sample/ Batch	Sample / Batch	IS:8130 (Al), IS:613 (Cu)	IS:8130 (Al), IS:613 (Cu)	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	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P	V	-	
		b) Grade	MA	-do-	-do-	-do-	IS:8130 (Al), IS:613 (Cu)	IS:8130 (Al), IS:613 (Cu)	-do-	✓	P	V	-	
		c) Resistivity	MA	Electrical Tests	Manufacturer std.	Manufacturer std.	IS:613 (Cu), IS:5082 (Al)	IS:613 (Cu), IS:5082 (Al)	-do-	✓	P	V	-	
1.2	**XLPE Compound for insulation**	**GENERAL :**												
		1. Physical properties	MA	Physical Tests	Sample/ Batch	Sample / Batch	IS 7098-I	IS 7098-I	Test Cert.	✓	P	V	-	

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	18.03.2020	VIKAS KUMAR SINGH	Checked by:	19/03/20	KUNAL GANDHI		
Reviewed by:	18/03/20	MANISH SHUKLA	Reviewed by:	19/03/2020	RITESH KUMAR JAISWAL		

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-E002, REV 02.	
	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 2 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		2. Elec. Properties	MA	Electrical Tests	Sample/ Batch	Sample / Batch	-do-	-do-	-do-	✓	P	V	-	
		SPECIFIC CHECKS:												
		a) Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P/ V	V	-	
		b) Type/ Grade	MA	-do-	-do-	-do-	-do-	-do-	-do-	✓	P/ V	V	-	
		c) Shelf life/ Storage condition	MA	-do-	-do-	-do-	-do-	-do-	-do-	✓	P/ V	V	-	
1.3	**PVC Compound (for sheath)**	**GENERAL:**												
		1. Physical properties	MA	Physical Tests	Sample/ Batch	Sample / Batch	IS 5831	IS 5831	Test Cert.	✓	P/ V	V	-	
		2. Elec. Properties	MA	Electrical Tests	Sample/ Batch	Sample / Batch	-do-	-do-	-do-	✓	P/ V	V	-	
		3. FRLS Properties (as applicable)	CR	Chemical/ Environ.	Sample/ Batch	Sample / Batch	Approved datasheet	Approved datasheet	-do-	✓	P/ V	V	-	
		SPECIFIC CHECKS:												

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	18.03.2020	VIKAS KUMAR SINGH	Checked by:	19/3/20	KUNAL GANDHI		
Reviewed by:	18/03/20	MANISH SHUKLA	Reviewed by:	19/3/2020	RITESH KUMAR JAISWAL		

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-E002, REV 02.	
	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 3 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					6				*		**			
1	2	3	4	5	M	C/N	7	8	9	D	M	C	N	
		a) Make	MA	Verify	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	-	
1.4	**Fillers (as applicable)**	1. Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P	V	-	Fillers material chosen shall be compatible with the temperature rating of the cable and shall have no deleterious effect on any other

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	18.03.2020	VIKAS KUMAR SINGH	Checked by:	19/3/20	KUNAL GANDHI		
Reviewed by:	18/03/20	MANISH SHUKLA	Reviewed by:	19/3/2020	RITESH KUMAR JAISWAL		

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-E002, REV 02.	
	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 4 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					6				*		**			
1	2	3	4	5	M	C/N	7	8	9	D	M	C	N	
														component of cable)
		2. Type/ Grade	MA	-do-	-do-	-do-	Appd. Data Sheet	Appd. Data Sheet	-do-	✓	P/ V	V	-	
1.5	**Galvanised steel wire/strip for Armour (as applicable)**	**GENERAL:**												
		1. Make	MA	Verify	Manufacturer std.	Manufacturer std.	Manufacturer approved source	Manufacturer approved source	Test Cert.	✓	P	V	-	
		2. Dimension	MA	Measurement	-do-	-do-	Appd. Data Sheet	Appd. Data Sheet	-do-		P/ V	-	-	
		3. Phy.and Elec. Properties	MA	Physical & Electrical Tests	Sample*	Sample*	-do-	-do-	-do-	✓	P/ V	V	-	
		4.Galvanization Quality	MA	Galv.Tests	-do-	-do-	IS 3975	IS 3975	-do-		P/ V	-	-	
1.6	**Wooden Drum**	1. Phy. & Constructional checks	MA		Mfr's Plant Std.	Mfr's Plant Std.	IS 10418	IS 10418	Test Cert.	✓	P	V	-	

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	Vikas 18.03.2020	VIKAS KUMAR SINGH	Checked by:	Kunal Gandhi 19/3/20	KUNAL GANDHI		
Reviewed by:	Manish 18/03/20	MANISH SHUKLA	Reviewed by:	19/3/2020	RITESH KUMAR JAISWAL		

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	Sign & Date	Name	Seal
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Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-507-E002, REV 02.	
	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 5 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		2. Anti termite treatment	MA	Chem.	Mfr's Plant Std.	Mfr's Plant Std.	Mfr's Plant Std.	Mfr's Plant Std.	-do-	✓	P	V	-	
1.7	**Steel Drum #**	1. Dimension	MA	Meas.	Mfr's Plant Std.	Mfr's Plant Std.	Approved drg	Approved drg	Test Cert.	✓	P	V	-	# If required, as per spec.
		2. Surface finish	MA	Visual	-do-	-do-	-	Surface shall be smooth	-do-	✓	P	V	-	
2.0	**IN PROCESS**													
2.1	Wire Drawing	1. Size	MA	Dimensional	Plant Mfg. Std.	Plant Mfg. Std.	Approved datasheet	Approved datasheet	Inspection Report/ Test report	✓	P	V	-	
		2. Surface finish	MA	Visual	-do-	-do-	Surface shall be smooth	Surface shall be smooth	-do-	✓	P	V	-	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	18.03.2020	VIKAS KUMAR SINGH	Checked by:	19/3/20	KUNAL GANDHI
Reviewed by:	18/03/20	MANISH SHUKLA	Reviewed by:	19/3/2020	RITESH KUMAR JAISWAL

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Seal	

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	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 6 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		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	Plant Mfg. Std.	Plant Mfg. Std.	Appd. Datasheet	Appd. Datasheet	Inspection Report/ Test report	✓	P	V	-	
		2. Resistance	CR	Electrical	-do-	-	-do-	-do-	-do-	-do-	P	-	-	
		3. Sequence, lay length & Direction	MA	Visual, Meas.	One Sample of each size/ lot	-	Mfrs Std.	Mfrs Std.	-do-		P	-	-	
		4. Surface Finish	MA	Visual	100%	-	Surface shall be smooth	Surface shall be smooth	-do-		P	-	-	
		5. Dimension	MA	Measurement	One Sample of each size/ lot	-	Appd. Datasheet	Appd. Datasheet	-do-		P	-	-	
2.3	**Core Insulation (XLPE)** (No repair permitted)													

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
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Reviewed by:	Manish 18/03/20	MANISH SHUKLA	Reviewed by:	19/3/2020	RITESH KUMAR JAISWAL		

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	CUSTOMER :		QP NO.: PE-QP-999-507-E002, REV 02.	
	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 7 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					6				*		**			
					M	C/N				D	M	C	N	
1	2	3	4	5			7	8	9					
		1. Surface finish	MA	Visual	100%	100%	Free from bulging, burnt particles, lumps, cuts & scratches	Free from bulging, burnt particles, lumps, cuts & scratches	Inspection Report/ Test report	✓	P	V	-	
		2. Eccentricity & Ovality #	CR	Measurement	One Sample of each size/ lot	One Sample of each size/ lot	Mnfr's Std	Mnfr's Std	-do-	✓	P	V	-	
		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:1554-I, IS:5831	IS:1554-I, IS:5831	-do-		P	-	-	
		6. Spark Test or Water immersion test	CR	Electrical	100%	-	Mnfr's Std	Mnfr's Std	-do-	Mnfr's Std	P	-	-	
2.4	**Core Laying**	1. Dia over laid up core	MA	Measurement	One Sample of each size/ lot	-	Appd. Datasheet	Appd. Datasheet	Inspection Report/ Test report		P	-	-	

BHEL						BIDDER/ SUPPLIER	
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Reviewed by:	18/03/20	MANISH SHUKLA	Reviewed by:	19/3/2020	RITESH KUMAR JAISWAL		

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Reviewed by:			
Approved by:			

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	CUSTOMER :		QP NO.: PE-QP-999-507-E002, REV 02.	
	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 8 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		2. Sequence of lay & direction	MA	Visual & Meas.	-do-	-	IS 7098-I & Mfr. Std.	IS 7098-I & Mfr. Std.	-do-		P	-	-	
						-								
2.5	**Inner Sheath Extrusion (as applicable)**	1. Surface finish	MA	Visual	100%	-	Surface shall be smooth	Surface shall be smooth	Inspection Report/ Test 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	-	-	
2.6	**Armour(as applicable)**	1. No.of wires/Strips	MA	Counting	At the start of the process	-	Mnfr's Std	Mnfr's Std	Inspection Report/ Test report		P	-	-	
		2. Lay length / Direction	MA	Visual & Meas.	-do-	-	Mfr. Std.	Mfr. Std.	-do-		P	-	-	
		3. Dia over armouring	MA	Measurement	-do-	-	Appd. Datasheet	Appd. Datasheet	-do-		P	-	-	

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Reviewed by:	18/03/20	MANISH SHUKLA	Reviewed by:	19/3/2020	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-507-E002, REV 02.	
	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 9 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		4. Coverage	MA	Measurement	-do-	-	-do-	-do-	-do-		P	-	-	
2.7	**Outer Sheath Extrusion (No repair permitted)**	1. Surface finish	MA	Visual	100%	-	Surface shall be smooth	Surface shall be smooth	Inspection Report/ Test report		P	-	-	
		2. Sheath Thickness	CR	Measurement	One Sample of each size/ lot	-	Appd. Datasheet	Appd. Datasheet	-do-		P	-	-	
		3. Dia over outer sheath	MA	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		4. Embossing/ Sequencial Marking	MA	Visual	100%	-	Approved data sheet	Approved data sheet	-do-		P	-	-	
3.0	**Final Inspection (INTERNAL)**	**1. Routine Test (Refer Note-H)**	CR	Electrical Tests & Measurement	100%	100%	#	#	-do-	✓	P	V	V	#: Refer Annexure-A to QP

BHEL					
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Reviewed by:	18/03/20	MANISH SHUKLA	Reviewed by:	19/3/2020	RITESH KUMAR JAISWAL

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	CUSTOMER :		QP NO.: PE-QP-999-507-E002, REV 02.	
	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 10 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					6				*		**			
					M	C/N				D	M	C	N	
1	2	3	4	5			7	8	9					
4.0	**Final Inspection (EXTERNAL)**	**1. Finish & Length (Cable & cable drum)**	MA	Visual	One drum in each Lot	One drum in each Lot	Appd. Datasheet	Free from Porosity, Bulging, Burnt particles, lumps, cuts & scratches	Inspection Report/ Test report	✓	P	W	W	
		2. Dimension	MA	-do-	IS 7098-I	IS 7098-I	Appd. Datasheet	Appd. Datasheet	-do-	✓	P	W	W	
		3. Armouring - Coverage & No.of Wires/Strips	MA	Visual & Meas.	-do-	-do-	-do-	-do-	-do-	✓	P	W	W	
		4. Marking & Colour Coding	MA	Visual	-do-	-do-	-do-	-do-	-do-	✓	P	W	W	
		5. Acceptance Tests (Refer Note-H)	CR	Phy, Elect. Tests & FRLS Tests	Sample #	Sample #	#	-do-	-do-	✓	P	W	W	
		6. Type Tests (Refer Note-H)	CR	Physical & Electrical Tests	Sample #	Sample #	-do-	-do-	-do-	✓	P	W	W	

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Reviewed by:	18/03/20	MANISH SHUKLA	Reviewed by:	19/3/2020	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
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	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 11 OF 12

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					6				*		**			
1	2	3	4	5	M	C/N	7	8	9	D	M	C	N	
5.0	**Packing**	**End sealing / Polythene wrapping**	MA	Visual	100%	100%	Appd. Datasheet	Appd. Datasheet	-do-	✓	P	W		

NOTES:

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 to be prepared in line with this standard QP.
N. In case of export jobs, sea worthy packing as per BHEL technical specification shall be carried out.

LEGENDS:

BHEL					
ENGINEERING			QUALITY		
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Prepared by:	18.03.2020	VIKAS KUMAR SINGH	Checked by:	19/3/20	KUNAL GANDHI
Reviewed by:	18/03/20	MANISH SHUKLA	Reviewed by:	19/3/2020	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
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	PROJECT:		PO NO.:	
	ITEM: LT XLPE POWER CABLE	SYSTEM: CABLE	SECTION: II	SHEET 12 OF 12

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

*RECORDS, IDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,

** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, B: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **C**: CUSTOMER,

P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE

MA: MAJOR, **MI**: MINOR, **CR:** CRITICAL

D: DOCUMENTATION

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Approved by:			

ANNEXURE-A TO QAP

TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS FOR LT XLPE POWER CABLES

TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS

A. Type Test Conduction:

1. Tests for which "T" is indicated in the 'Test Conduction Required As' column below shall be conducted as Type Test.

2. Sampling:
   a) Type test to be conducted on each type & size of cable on one drum out of every 10 drums for every lot (CU/AL conductor)
   b) Flammability Test to be conducted only on one sample/ lot.

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:
   Acceptance tests to be conducted on one drum out of every 10 drums/ lot for every size & type.

3. Flammability Test to be conducted only on one sample/ lot (Project specific sampling plan shall be informed later)

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. Routine test shall be conducted on 100% drum

D. Tests listed in S.No-7.0 & 8.0 shall be conducted only on one sample / lot.

Note: LOT shall be considered as per IS: 7098 Part-I, appendix-B.

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	***Internal in process Test Report to be furnished for acceptance test***
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	

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
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	
V.	Winding / Adhesion 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	Applicable for Aluminium wire & GS wire	**A**	IS 10810 Pt 3	
3.0	**Physical Tests for XLPE Insulation & PVC sheath**				
I.	Test for thickness	Applicable for XLPE insulation, PVC inner sheath & PVC outer sheath	**T, A**	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for XLPE insulation & PVC outer sheath			
(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 & PVC outer sheath	**T**	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	For PVC outer sheath only	**T**	IS 10810 Pt 10	
V.	Hot deformation test	For PVC outer sheath only	**T**	IS 10810 Pt 15	
VI.	Heat shock test	For PVC outer sheath only	**T**	IS 10810 Pt 14	
VII.	Shrinkage test	For XLPE insulation & PVC outer sheath only	**T**	IS 10810 Pt 12	
VIII.	Thermal stability test	For PVC outer sheath only	**T**	IS 10810 Pt 60	
IX.	Cold Impact test	For PVC outer sheath only	**T**	IS 5831/1984	
X.	Bleeding and Blooming test	For PVC outer sheath only	**T**	IS 5831/1984	
XI.	Hot set test	For XLPE insulation only	**T, A**	IS 10810 Pt 30	
XII.	Water absorption (gravimetric) test	For XLPE insulation only	**T**	IS 10810 Pt 33	
4.0	**Improved Fire performance (FR-LSH) Tests**				

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
I.	Oxygen index test	For PVC outer sheath only	**T, A**	IS 10810 Pt 58 / ASTMD 2863/ NES 715-I	**Applicable for Inner Sheath also, if the same is indicated in Datasheet-A**
II.	Smoke density test	For PVC outer sheath only	**T, A**	IS 10810 Pt 63 / ASTMD 2843	
III.	Acid gas generation test	For PVC outer sheath only	**T, A**	IS 10810 Pt 59 / IEC-754-1	
IV.	Temperature Index Test	For PVC outer sheath only	**T, A**	IS 10810 Pt 64 / ASTMD 2863	
5.0	**Flammability Tests**				
I.	Flammability test for bunched cables	For complete cable	**T**	IS 10810 Pt 62/ IEC-60332 (Part-3-23-Cat-B	**Test & Category applicable as indicated in Datasheet-A**
II.	Flammability test for single cable	For complete cable	**T,A**	IS: 10810 Pt 61 / 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	
6.0	**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	
7.0	**Anti-rodent and Termite Repulsion test**	For PVC outer sheath only	**A**	Refer Note	

Note: A few chipping of the PVC compound is slowly ignited on a porcelain dish or cubicle in a muffle furnace at about 600 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.

TYPICAL DRAWING OF CABLE DRUM PACKING

PROJECT:	**1 X 660 MW MAHAGENCO BHUSAWAL TPS**
PACKAGE:	**LT XLPE POWER CABLE**
GEM BID No.:-	

A	1.1KV, Cu conductor, XLPE insulated, Galvanised Steel Round Wire Armoured for multi-core cables (Non Magnetic Hard drawn Aluminium Round Wire Armoured conforming to H4 grade for single core cables), INNER SHEATH: Extruded HRPVC compound conforming to type ST2 of IS: 5831 for multicore cable & no inner sheath for single core cables, OVERALL SHEATH: Extruded FRLS HRPVC compound conforming to type ST2 of IS: 5831 & black in colour.

SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTITY (IN METER)	DRUM LENGTH (IN METER)	HSN CODE	UNIT EX-WORKS PRICE (DULY PACKED) (INR)	TOTAL EX-WORKS PRICE (DULY PACKED) (INR)	FREIGHT CHARGES WITHOUT GST@ …….% OF TOTAL EX WORKS (INR)	APPLICABLE GST RATE % ON (TOTAL EX WORKS + FREIGHT) (INR)	GST Amount on Total Ex-works + Freight (Rs.)	TOTAL FOR SITE PRICE (INR)
1	2	3	4	5	6	7	9	10	11	12	13	14
A1	507-28009-A	1C - 630- CU ARMOURED	METER	500	500	8544						
A2	507-28130-A	1C - 35-CU ARMOURED	METER	13500	500	8544						
B	**GRAND TOTAL (Rs.)**											

NOTE:-

1.The standard drum length shall be 500/1000 meters as indicated above. Tolerance on individual drum length shall be ±5%.

2. Overall tolerance on total dispatched quantity of each size shall be (-) 2% and (+) 0% except where the total ordered quantity is one single drum length of 500/1000m, in which case it shall be -5% to 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 (except where the total ordered quantity is one single drum length of 500/1000m). The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).

4. In case of the quantities cleared by BHEL for manufacturing are manufactured and offered for inspection by successful bidder in more than one batch, BHEL reserves the right to witness type testing on all batches without any price implications.

5. Unit price of cables quoted by bidder shall be inclusive of type test charges. No separate charges shall be payable for type tests.

6. For any clarification please refer Technical Specification No--PE-TS-415-507-E002 REV 00.

7- Quantity variation shall be as per clause of GeM Bid.

Annexure-A

DEFAULT/ BREACH OF CONTRACT, INSOLVENCY AND RISK PURCHASE

In case of delays (beyond the maximum late delivery period as per LD clause) in supplies, or if there be defective supplies or non-fulfilment of any other terms and conditions of the Contract as enumerated subsequently in this clause, then, without prejudice to its right to recover any expenses, losses or damages to which the Buyer may be put to incur or sustain by reason of the Seller/Contractor's default or breach of Order/Contract or to suspend business dealings with the Seller/Contractor in terms of the Buyers' Guidelines for Suspension of Business Dealings as applicable from time to time, the Buyer shall also be entitled to cancel the Order/ Contract either in whole or portion thereof without compensation to Seller. On the occurrence of any of the acts/omissions mentioned below, the Buyer may if it so desires, procure upon such terms and in such manner as deemed appropriate, plant/ equipment/ stores not so delivered or others of similar description where plant/ equipment/ stores exactly complying with particulars are not, in the opinion of the Buyer (which shall be final), readily procurable, at the risk and cost of the Seller.

The Seller shall be liable to the Buyer for any excess costs incurred thereof and the Seller shall continue the performance of the Order/Contract to the extent not cancelled under the provisions of this clause. The Seller shall on no account be entitled to any gain on such repurchases. If the Bidder does not agree to this Risk Purchase clause, BHEL reserves the right to reject the bid/offer of the Bidder.

The order/contract may be cancelled in whole or part thereof and Risk & Cost Clause in line with terms and conditions of PO/Contract may be invoked by the Buyer in any of the following cases:

i. If the Seller/Contractor fails to deliver the goods or materials or any installment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/services vis-à-vis delivery/execution timeline as stipulated in the contract, backlog attributable to the Seller including unexecuted portion of supply does not appear to be executable within balance period available;
ii. delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications/execution methodology;
iii. withdrawal from or repudiation/abandonment of the supply/services by the Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the order/Contract either in whole or in part or otherwise fails to perform the Order/Contract.
iv. Non supply by the Seller within scheduled completion/delivery period as per contract or as extended from time to time for reasons attributable to the Seller;
v. Termination of Contract on account of any other reason(s) attributable to the Seller.
vi. Assignment, transfer, sub-letting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
vii. If the Seller be an individual or a Sole Proprietorship, in the event of death or insanity of the Seller.
viii. If the Seller/Contractor being an individual or if a partnership firm thereof, shall at any time be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
ix. If the Seller/Contractor being a Company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager
x. Non- Compliance to any contractual condition or any other default attributable to the Seller.

Such defaulting vendor/Seller shall not be eligible to participate in re-tendering conducted on account of risk purchase made due to fault of such vendor/Seller.

BHEL's right to go for Risk and Cost, Calculation of Risk and Cost amount & LD, recovery options to BHEL are given in detail in Annexure-V hereto.

ANNEXURE-V

(RISK AND COST CLAUSE)

1. BHEL reserves the right to terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor *after due notice of a period of 14 days' by BHEL* in any of the following cases:

   i) If the Seller/Contractor fails to deliver the goods or materials or any instalment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/ services vis-a-vis delivery/execution timeline as stipulated in the Contract, backlog attributable to seller including unexecuted portion of supply does not appear to be executable within balance available period;
   ii) Delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications;
   iii) Withdrawal from or repudiation/ abandonment of the supply/ services by Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the Order/Contract either in whole or in part or otherwise fails to perform the Order/Contract;
   iv) Non-supply by the Seller within scheduled completion/delivery period as per Contract or as extended from time to time, for the reasons attributable to the Seller;
   v) Termination of Contract on account of any other reason (s) attributable to Seller.
   vi) Assignment, transfer, subletting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
   vii) If the Seller be an individual or a sole proprietorship Firm, in the event of the death or insanity of the Seller;
   viii) If the Seller/Contractor being an individual or if a firm on a partnership thereof, shall at any time, be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the Order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
   ix) If the Seller/Contractor being a company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances shall have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager;
   x) Non-compliance to any contractual condition or any other default attributable to Seller.

1.1 **Risk & Cost Amount against Balance Work:**

Risk & Cost amount against balance work shall be calculated as follows:

Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,
A= Value of Balance scope of Work (*) as per rates of new contract
B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.
H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

1.2 *** Balance scope of work (in case of termination of contract):**

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount.

Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.

Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose.

Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: In case portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

1.3 **LD against delay in executed work in case of Termination of Contract:**

LD against delay in executed work shall be calculated in line with LD clause no. 16 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of LD against delay in executed work in case of termination of contract" is given below.

i. Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
ii. Let the value of executed work till the time of termination of contract = X
iii. Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
iv. Delay in executed work attributable to contractor i.e. T2 = [1-(X/Y)] x T1
v. LD shall be calculated in line with LD clause (clause 16) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2. <u>Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor</u>

Without prejudice to the other means of recovery of such dues from the Seller recoveries from the Seller on whom risk & cost has been invoked shall be made from the following:

a) Dues available in the form of Bills payable to seller, SD, BGs against the same contract.
b) Dues payable to seller against other contracts in the same Region/Unit/ Division of BHEL.
c) Dues payable to seller against other contracts in the different Region/Unit/ division of BHEL.

In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

Delivery Schedule-BHUSAWAL-LT XLPE POWER CABLE

Sl. No.	Package Code	Package name	DEPTT	BHEL Drawing No	Drawing Title	Primary/Secondary	Drg Sch for Vendors	Standard Delivery Terms for Supply Portion
1	507-28000-A	LT XLPE POWER CABLES	ELECT	PE-V0-415-507-E113	CROSS SECTION DRGS. - LT XLPE POWER CABLES	Primary	R-0 within 14 days from PO & subsequent revisions within 10 days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.	**For PO qty:** Within Four (04) months from date of CAT-1 approval of Primary drawing/documents, subjected to drawing/document submission/re-submission schedule as stipulated, in case of any delay in submission/re-submission of Primary drawings/documents, then same shall be reduced from the given delivery period. **For Subsequent Lots (If any):** Within 3 months from Lot clearance by BHEL.
				PE-V0-415-507-E913	QUALITY PLAN - LT XLPE POWER CABLES	Primary		
				PE-V0-415-507-E111	TECHNICAL DATA SHEET - LT XLPE POWER CABLES	Primary		
				PE-V0-415-507-E114	TYPE TEST CERTIFICATES - LT XLPE POWER CABLES	Secondary	Within 1 week after conduction of type test	

(ON COMPANY LETTER HEAD)

To,
M/s Bharat Heavy Electricals Ltd.,
Project Engineering Management,
Power Project Engineering Institute,
HRD & ESI Complex,
Plot No 25, Sector-16 A, Noida-201301

Dear Sir,

This has reference to:

1. Our offer for LT XLPE POWER CABLE for 1 X 660 MW BHUSAWAL TPP, GeM BID No. ……..Dtd. 10.02.2023
2. Ministry of Finance circular dated 23.07.20, 08.02.21 & 06.09.22 reg. restriction under rule 144 (xi) of GFR.

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India. I hereby certify that M/s …….…… (bidder name) is not from such a country and is eligible to be considered/participate in tender enquiry for against aforesaid tender enquiry.

Sign & Signature (Not below Director/owner of the company)
Date:
Place:

LOCAL CONTENT CERTIFICATE
(ON COMPANY LETTER HEAD)

To,
Bharat Heavy Electricals Limited
PEM, PPEI Building, Plot No 25,
Sector 17 A, Noida (U.P)-201301

Subject: - Certification regarding local content

Reference: GeM Bid No.: ……..Dtd. 10.02.2023
Name of Package: LT XLPE POWER CABLE
Project Name: 1 X 660 MW BHUSAWAL TPP

Dear Sir,
We hereby certify that items offered by us for LT XLPE POWER CABLE for 1 X 660 MW BHUSAWAL TPP has local content of _____**%**

Further, it is also certified that the local content % certified above is in line with definition of local content given in Public Procurement (Preference to Make in India), Order 2017-revision, having ref no. P45021/2017/-PP (BE-II) dtd. 04.06.20 & 16.09.20 and we qualify as Class_____ supplier.
We further confirm that address of the location at which the local value addition is made will be as follows:
_____
_____
_____
_____
_____

Thanking You,
Yours faithfully,

M/s _____

(ON COMPANY LETTER HEAD)

To,
Bharat Heavy Electricals Limited
PEM, PPEI Building, Plot No 25,
Sector -I6A, Noida (U.P)-201301

Subject: - No Deviation Certificate

Reference: GeM Bid No.: ……Dtd. 10.02.2023
Name of Package: LT XLPE POWER CABLE
Project Name: 1 X 660 MW BHUSAWAL TPP.
Dear Sir,
We hereby confirm that we have not taken any deviation in the above referred tender enquiry.
If any deviation in any part of our offer is found same shall be null & void.

Thanking You,
Yours faithfully,

M/s _____

ANNEXURE-C

Price Variation Formulae
1 X 660 MW BHUSAWAL TPP
LT XLPE POWER CABLE

1. Prices shall be variable as per following PVC formulae as per IEEMA. The price shall be limited to +20% of total Ex-works price actually supplied (cable size wise) & -ve price variation shall be unlimited.PVC shall be limited for the metals for which rates published by IEEMA.

CABLE TYPE	CONDUCTOR	FORMULA	TABLE REF
LT XLPE POWER Cables	(Cu conductor,)	P= P0+ CuF(Cu-Cuo)+ XLFCU(CC-CCo) CCFCu(PVCC-PVCCo)+FeW (Fe-Feo)+ AlF (Al-Alo)	as applicable as per IEEMA

Note:

1. **Quantity Variation**: Quantity variation shall be as per NIT.
2. **PVC** shall be applicable for Order Qty. and subsequent lots**.**
3. Base date for prices (as per **IEEMA):**

   Initial Price:
   Base date shall be **JAN-2023**

   Final Price:
   The first working day of month, one month prior to the **date of delivery**.

   Note: The date of delivery is the date on which the cable is notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer's dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

4. PVC shall be payable within agreed contractual delivery period. In case of delay is attributable to vendor, for the payment purpose, the PVC shall be calculated based on rates applicable as on the date of expiry of contractual delivery date or actual delivery date, whichever is beneficial to BHEL.

Applicable Factors-

S. NO	Size	CuF	CCFCU	XLFCU	FeW	AlF
1	1C - 35- CU ARMOURED	0.332	0	0.035	0	0.108
2	1C - 630- CU ARMOURED	6.012	0	0.318	0	0.537

Maharashtra State Power Generation Company Limited			
Bhusawal Project (1x660MW)			
Proforma of Vendor Approval			
Sr. No.	Information/ Particulars required	Details furnished along with documents thereof	Remarks if any
1	Name of System /Package/Item:		
2	Name of agency on whom order for the main work is placed		
3	Approval for (Name of construction material)		
4	Name of the vendors specified in contract document for this material		
5	Name of the proposed Sub Contractor(Vendor)		
6	Reasons for asking new vendor		
7	Details of supporting documents in lieu of above reasons		
8	Specific requirement of material in terms of dia, size, quantity etc.		
9	When the material is required & for which structure		
10	Whether vendor is Partnership/ Pvt./Public Ltd. Company		
11	Particular of registration with Government		
	i) GST registration No.		
	ii) Company registration No. & Incorporation Certificate		
	iii) PF & ESIC Certificate.		
	iv) Pan No.		
12	Address of vendor's factory		
13	Contact No. of vendor's representative for additional information		
14	Production Business Area		
16	Average annual turnover for last three years as per CA's Certificate		
17	Name of Companies where the vendor is registered		
18	Details of orders completed last 3 years (Quantity & amount)		
19	Details of orders in hand (Quantity & amount)		
20	Maximum value & quantity of work executed during last 3 years		
21	Name of the reputed, well known clients to whom the vendor has supplied the material		
22	End users Performance Certificate (Name & documents) along with the relevant PO.		
23	Any additional information		
24	Recommendation		

M/s BHEL Sub-Contractor