RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

2X660 MW SURATGARH STPP, UNIT # 7 & 8

TECHNICAL SPECIFICATION
FOR

HT XLPE POWER CABLES

SPECIFICATION NO : *PE-TS-392-507-E001*
REVISION : *0*

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

CONTENTS:

IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO, & THAT THERE ARE NO TECHNICAL DEVIATIONS.

BIDDER'S STAMP & SIGNATURE
(REFER INSTRUCTION NO. 1 OF 'INSTRUCTIONS TO BIDDERS)

INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. In line with clause no. 4.1 of Section-D, Volume-II-B of the specification,Two signed and stamped copies of the following shall be furnished by all bidders as technical offer:

    a. Unpriced BOQ-Cum-Price Schedule ("Quoted" words against items") with bidder's signature and company stamp.

    b. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer")

    c. A copy of previous sheet ("List Of Contents"), with bidder's signature and company stamp.

    d. A copy of Datasheet-A with bidder's signature and company stamp.

    e. A copy of "Quality Plan including Annexure to QAP" sheet, with bidder's signature and company stamp.

2. No technical submittal such as copies of type test certificates, technical literature, etc. is required during tender stage. Any such submission, even if made, shall not be considered as part of offer.

3. Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/ covering letter of technical offer shall not be considered by BHEL.

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 cable description/ quantities from those given in Annexure-A [BOQ-Cum-Price schedule] of the specification shall not be considered (i.e., technical description & quantities as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

PREAMBLE

1 The Tender documents contain three (3) volumes. The bidder shall meet the requirements of all three volumes.

1.1 VOLUME - I CONDITIONS OF CONTRACT

This consists of four parts as below:

Volume – IA This part contains Instructions to bidders for making bids to BHEL.

Volume – IB This part contains General Commercial Conditions of the Tender & includes provision that vender shall be responsible for the quality of item supplied by their sub-vendors.

Volume – IC This part contains Special Conditions of Contract.

Volume – ID This part contains Commercial Conditions for Erection & Commissioning site work, as applicable.

1.2 VOLUME – II TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume – II, which comprises of:-

Volume – IIA General Technical Conditions.

Volume – IIB Technical Specification including Drawings, if any.

1.3 VOLUME – IIB

This volume is sub-divided in to following sections:-

Section – A: This section outlines the Intent of Specification.

Section – B: This section provides “Projection Information”.

Section – C: This section indicates Technical Requirements specific to Contract, not covered in Section – D.

Section – D: This section comprises of Technical Specifications of equipment complete with Data Sheets A and C.

Data Sheet-A: Specific data and other requirements pertaining to the equipments.

Data sheet–C: Indicates data / documents to be furnished after the award of Contract as per agreed schedule by the vendor (as applicable)

1.4 VOLUME – III TECHNICAL SCHEDULES (If Applicable)

This volume contains Technical Schedule and Data Sheets–B, which are to be duly filled by bidder and the same shall be furnished with the technical bid.

2.0 This requirements mentioned in Section – C / Data Sheet – A of Section – D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section – D.

SECTION – 'A'

SCOPE OF ENQUIRY

SCOPE OF ENQUIRY

1.0 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to site of HT XLPE POWER CABLES as mentioned in different sections of this specification for 2 X 660 MW SURATGARH STPS, STAGE-V, UNIT#7 & 8.

2.0 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee.

3.0 The general terms and conditions, instructions to bidders and other attachment referred to elsewhere are hereby made part of the Technical Specification.

4.0 The bidders shall be responsible for and governed by all requirements stipulated hereinafter.

5.0 Bidders shall confirm total compliance to the specification without any deviations from the technical/ quality assurance requirements stipulated.

6.0 The documents shall be in English language and MKS system of units.

SECTION – 'B'

PROJECT INFORMATION

1.0	Owner	Rajasthan Rajya Vidyut Utpadan Nigam Ltd., Jaipur
2.0	Consulting Engineer	TATA Consulting Engineers Ltd. 73/1, St. Marks Road, Bangalore – 560 001 Tel : 080 – 6622 6000 Fax : 080 – 22274874
3.0	Location of the plant	Prabat Nagar, Suratgarh Sriganganagar district, Rajasthan.
4.0	Latitude and longitude	Latitude : 29 deg. 10 min. N Longitude : 74 deg.01 min. E
5.0	Elevation above mean sea level	186 m (approximate)
6.0	**Climatic conditions**	
6.1	Temperatures : Monthly basis	
	Mean of daily max.	32.8 deg.C (in the month of May)
	Mean of daily min.	17.6 deg.C (in the month of Jan)
6.2	Temperatures : Annual basis	
	Mean of daily max.	32.3 deg.C
	Mean of daily min.	19.6 deg.C
	Highest temperature recorded	50 deg.C
	Lowest temperature recorded	(-) 2.8 deg.C
	Design Ambient Temperature for Electrical Equipment design	50 deg C
6.3	Relative humidity	Varies between 21% and 81%
6.4	Annual average rain fall	312 mm
6.5	Annual mean wind speed :	4 km / hr.
7.0	Wind load	

	Calculations for wind effect shall be in accordance with IS:875-1987(Part-3) taking into account the following:	
	a) Basic wind speed = 47 m/sec	
	b) Factor K1 = 1.07	
	c) Category of terrain = Category 2	
	d) K3 – as per IS 875	
8.0	Seismic data (As per IS: 1893 latest issue)	
	a) Zone	Zone II
	Designs & design coefficients shall be based on IS 1893:2002	
	Design condenser cooling water inlet temperature	33 Deg C
9.0	Auxiliary power supply:	
	Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following system:	
a)	For motors rated 160 kW and below.	415V AC, 3-phase, 3-wire effectively earthed.
b)	For motors rated above 160 kW and up to 1500 kW	6600V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
c)	For motors rated above 1500kW	11000V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
d)	For motor control centres	415V AC, 3-phase, 3/4-wire effectively earthed.
e)	DC motor starters, DC solenoids, DC alarm control and protection	220 V DC, 2-wire unearthed
f)	AC control & protective devices	110 V 1 phase, 50Hz, 2 wire AC supply. The single phase 110V AC supply shall be derived by VENDOR by providing 415V / 110 V Control transformers of adequate rating with MCCB / MCB on both the primary and secondary sides.
g)	Uninterrupted power supply	230 V, 1-phase, 50 Hz, 2-wire, AC

		supply (For all instrumentation and control system equipment and solenoid valves)

g) Lighting fixtures and space heaters — 240 V, 1 phase, 2 wire, 50Hz,solidly earthed system

h) Construction supply — 415 V, 3 phase, 4 wire, 50Hz AC supply with neutral lead solidly earthed.

i) The above voltages may vary as follows :

All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance.

AC supply	Voltage variation ± 10% Frequency variation ± 5% Combined voltage & frequency variation 10%
DC supply	Voltage variation +10% ,-15%

j) For instrument and control system of steam generator and steam turbine generator. — 230 V ± 5% AC UPS, 1-phase, 50 Hz, 2-wire. The 24 V DC required for control system shall be generated from this UPS.

10.0 All the electrical equipment shall be designed for 50° C reference ambient temperature.

SECTION – 'C'

SPECIFIC TECHNICAL REQUIREMENTS

1.0 SCOPE OF ENQUIRY

1.1 This enquiry covers the supply of HT cables conforming to this specification as detailed below.

1.2 General technical requirements of the cables are indicated in Section-D and Datasheet-A. Project specific technical/ quality requirements/ changes are listed below.

1.3 Cables shall conform in all respects to the requirements stipulated in all the above parts of the specification.

1.4 The stipulations of Section-C, followed by those of Datasheet-A shall prevail in case of any conflict between the stipulations of Section-C, Datasheet-A and Section-D.

2.0 BILL OF QUANTITIES:

2.1 Quantity requirements shall be as per Annexure-A (Bill of Quantities (BOQ)) & Annexure-I (mandatory spares) enclosed.

2.2 Delivery schedule (i.e. contractual calendar dates) for the package shall be given separately to the bidders for compliance. Supplies shall be completed conforming to the lot requirements stipulated in the BOQ within the overall delivery schedule.

3.0 SPECIFIC TECHNICAL REQUIREMENTS

3.1 Specific technical requirements shall be as listed below *:*

3.1.1 Technical:

S. No.	*Reference Clause No. of Section D (if any)*	*Specific Requirement/ Change*
1	2.4.1 b, c & d	May be read as 2.4.1 (b). Additionally "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). Bidder to indicate unit price of cables inclusive of type test charges. No separate charges shall be payable for type tests.
2	2.4.1 e	Refer S. No. 1 above.
3	4.1	Two signed and stamped copies of the following shall be furnished by all bidders as technical offer : (i) Un-priced Price Schedule (Annexure-A including Annexure-I of mandatory spares, as enclosed with the specification) with bidder's signature and company stamp. (ii) A copy of "Instruction to Bidders for Preparing Technical Offer" sheet, with bidder's signature and company stamp. (iii) A copy of "List Of Contents" sheet, with bidder's signature and company stamp. (iv) A copy of "Datasheet-A" sheet, with bidder's signature and company stamp. (v) A copy of "Quality Plan including Annexure to QAP" sheet, with bidder's signature and company stamp.

		No other documentation is required to be submitted as technical offer. Any information contained in other parts of the offer (e.g. covering letter, annexure, etc.) which is deviating from specification requirements in any way shall not be considered by BHEL as part of offer.

3.1.2 Quality/ Inspection:

S. No.	*Reference Clause No. of Section D (if any)*	*Specific Requirement/ Change*
1	2.2	QP (Including Annexure to QAP) enclosed with spec. shall be stamped and signed by bidders as token of acceptance. The QP shall be submitted during contract stage for customer/BHEL approval without any commercial implications to BHEL.
2	2.4.1(d)	All Tests shall be conducted as per contract. Conduction of Testing requirements mentioned in datasheet-A & Annexure to QAP.

3.1.3 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.

3.1.4 Quality Plan applicable for project*:*
BHEL Standard Quality Plan no. PED-507-00-Q-001, R05 (Enclosed with specification)

3.1.5 Document distribution schedule for the project shall be as below:

No. of prints to be submitted by vendor after award of contract shall be as under:

S. NO.	DESCRIPTION	No. hard /soft copies	No. of CD-ROMs	REMARKS
1	Drawings / docs. for approval (First submission)	PDF File + 2 Hard copies	NIL	
2	Drawings /docs. for approval (Second & subsequent submission till approval)	PDF File + 2 Hard copies	NIL	
3	Final approval Drawings / docs. for Distribution after CAT-1.	PDF File + 5 Hard Copies	NIL	
4	As Built Drawings/ docs.	6 Hard Copies	4 CD-ROMS	
5	Type Test Certificates/ Reports for approval	PDF+ 2 hard Copies	NIL	
6	Type Test Certificates/ Reports for distribution	6 hard Copies	6 CD-ROMS	

3.1.6 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.

2X660 MW SURATGARH STPP, UNIT# 7 & 8
ANNEXURE - A
BOQ-CUM-PRICE SCHEDULE FOR HT XLPE POWER CABLES

Sr. No.	Item code	Item description	Unit	Order Quantity (metres)	Lot-1 Quantity (metres)	Drum Length (Meters)	UNIT PRICE (EX-WORKS) Rs	REMARKS
1.0		**11/11 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMOURED/ UNEARTHED GRADE POWER CABLE**						
1.1	507-27025-A	1C-630	MTR	18000	12500	500		
1.2	507-27037-A	3C-240	MTR	34500	24000	500		
2.0		**6.6/6.6 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMOURED/ UNEARTHED GRADE POWER CABLE.**						
2.1	507-27093-A	1C-185	MTR	1500	1000	500		
2.2	507-27113-A	1C-630	MTR	79000	55500	500		
2.3	507-27121-A	3C-185	MTR	15000	10500	500		
3.0	507-27000-B	**MANDATORY SPARES**	SET	----	----	500		**REFER ANNEXURE-I FOR DETAIL LIST**

Notes:

1 Quantities indicated above for S. No. 1.0, 2.0 & 3.0 shall be known as Order Quantities. The variation in quantities of all sizes for Main items (S. No. 1.0 & 2.0) put together shall be limited to (-) 30% to (+) 30% of the total contract value derived on the basis of the Ordered quantities for this very project.

2 The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ-Cum-Price Schedule enclosed with this specification. The unit prices shall apply for adjustment of variation in quantity as stipulated above.

3 Lot-1 Quantity indicated above shall be cleared for manufacturing along with LOI. However, manufacturing of the cables shall be taken up by the successful bidder only after approval of technical and quality documentation. Subsequent lots shall be cleared for manufacture based on progress of engineering and site requirements.

4 Delivery schedule of LOT-1 and subsequent lots shall be as per NIT.

5 Standard drum length shall be 500 metres.Tolerance on individual drum length shall be ±5%.

6 Overall tolerance on total dispatched quantity of each size shall be (-) 2% and (+) 0%. Cables consumed for testing and inspection shall be to bidder’s account.

7 For each individual cable size, one short length of not less than 200m may be accepted only in the final drum length to complete the supply. The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).

8 Bidder shall indicate unit price of cables inclusive of type test charges and UV radiation test. No separate Type & UV radiationTest charges are to be quoted by bidder.

9 The charges of Hydrolytic Stability test, if asked to perform shall be reimbursed extra at actual against original money receipt of Govt. lab (CPRI/ERDA).

10 In case the quantities cleared by BHEL for manufacturing (in a lot) are manufactured and offered for inspection by successful bidder in more than one batch, BHEL reserves the right to witness type testing on all batches.

2X660 MW SURATGARH STPP, UNIT# 7 & 8

HT XLPE POWER CABLES- MANDATORY SPARES (ANNEXURE-I)

Sr. No.	Item code	Item description	Unit	Order Quantity (metres)	Drum Length (Meters)	UNIT PRICE (EX-WORKS) Rs	REMARKS
3.0	**507-27000-B**	**MANDATORY SPARES**					
3.1		**11/11 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMOURED/ UNEARTHED GRADE POWER CABLE**					
3.1.1		1C-630	MTR	500	500		
3.1.2		3C-240	MTR	500	500		
3.2		**6.6/6.6 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMOURED/ UNEARTHED GRADE POWER CABLE.**					
3.2.1		1C-185	MTR	500	500		
3.2.2		1C-630	MTR	500	500		
3.2.3		3C-185	MTR	500	500		

Notes: (Applicable for Mandatory Spares only)

1 Quantities indicated above shall be known as Order Quantities. The quantities are firm & there is no variation in the ordered quantities.

2 The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ-Cum-Price Schedule enclosed with this specification.

3 Standard drum length shall be 500 metres.No negative tolerance on drum for mandatory spare (as indicated above) is allowed.

4 Quantity of mandatory spares indicated above shall be released alongwith Lot-1 (indicated in Annexure-A) after approval of technical and quality documentation. Thus, one drum (minimum 500m) of each size of the total quantities released (Lot-1 of Annexure-A & Mandatory spares of Annexure-I) will be declared as mandatory spares and shall be clearly identified.

5 Delivery schedule of quantities indicated above shall be as per NIT.

SECTION-D

STANDARD TECHNICAL SPECIFICATION

1.0 TECHNICAL REQUIREMENTS

1.1 Technical requirements for HT cables shall be as indicated in this section, in addition to those specified in Section-C and Datasheet-A as attached for project specific requirements.

2.0 QUALITY ASSURANCE REQUIREMENTS

2.1 Bidder shall confirm compliance with the BHEL Quality Plan as attached with the specification without any deviations.

2.2 In the event of BHEL Quality Plan not being applicable for a project (as indicated in section-C of the project specification), the successful bidder shall submit the Manufacturing Quality Plan (MQP) for approval by BHEL/ Owner (as applicable) during detailed engineering stage without any commercial implications.

2.3 Bidders shall submit their list of proven sub-vendors for raw materials, which will be reviewed by BHEL/Customer.

2.4 Type testing requirements and routine/ acceptance testing requirements shall be as detailed below.

2.4.1 Type Tests on Cables

a. All cables to be supplied shall conform to type tests as per relevant standards and proven type.

b. The bidder shall furnish the reports of all the type tests listed in ~~Table-1 in Datasheet-A~~ 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-C, Cl. No. 3.1.1, S. No.1).

c. 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-C, Cl. No. 3.1.1, S. No.1).

d. Irrespective of the bidder furnishing type test report as indicated above, BHEL may get type tests as indicated in ~~Datasheet-A~~ 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-C, Cl. No. 3.1.1, S. No.1).

e. Minor changes in the final Type Test Procedures (which shall be to approval during contract stage) shall be without any commercial implication.

2.4.2 Routine and Acceptance Tests

a. 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.

b. Acceptance tests shall be conducted on every lot offered for inspection as per details indicated in Annexure to QAP, enclosed with quality plan.

c. Cost of conduction of routine and acceptance testing shall be deemed to have been included in the quoted supply prices.

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

3.0 Packing

3.1 Cables shall be supplied in non-returnable heavy construction drums. All wooden parts shall be manufactured from seasoned wood treated with copper napthenates/ zinc napthenates (refer IS: 401). 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.

4.0 PROJECT SPEIFIC TECHNICAL AND QUALITY DOCUMENTATION TO BE SUBMITTED

4.1 By All Bidders

As technical offer:

a. A copy of "Instruction to bidder's for preparing technical offer" as enclosed with enquiry with bidder's signature and company seal.

b. A copy of "List of contents" as enclosed with enquiry with bidder's signature and company seal.

c. A copy of Annexure-A (BOQ-Cum-Price schedule) as enclosed with enquiry with bidder's signature and company seal.

d. A copy of Datasheet-A as enclosed with enquiry with bidder's signature and company seal.

e. A copy of Quality Plan(including Annexure to QAP) as enclosed with enquiry with bidder's signature and company seal.

No other documentation is required to be submitted as technical offer. Any information contained in other parts of the offer (e.g. covering letter, annexures, etc.) which is deviating from specification requirements in any way shall not be considered by BHEL as part of offer.

4.2 By Successful Bidder (for approval during contract stage)

a. Datasheet C in the format provided to the successful bidder along with LOI.
b. Cross-section drawings of the cables
c. Manufacturing Quality Plan in case BHEL SQP is not applicable.
d. List of sub-vendors/ suppliers of raw materials
e. Type Test Procedure
f. Field Quality Plan
g. Technical catalogues/ literature for the cables.

4.3 Two copies of the above documentation shall be submitted for first review. Number of copies to be submitted for second and subsequent submissions (till Cat-I approval is accorded), and those for final distribution prints of approved documentation and test certificates shall be as indicated separately in section C.

4.4 Wherever required, soft copy of all approved technical/ quality documentation shall be submitted as specified without any additional commercial implication. Soft copies may be required both in native file format (e.g. MS Word/ MS Excel) as well as PDF files.

	STANDARD QUALITY PLAN		CUSTOMER : RRVUNL			PROJECT: 2 X 660MW STPP, STAGE-V, Units 7 & 8 TITLE			SPECIFICATION NUMBER : PE-TS-392-507-E001			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-507-00-Q-001, **R5**			SPECIFICATION TITLE : TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES			
		SHEET 1 OF 8	SYSTEM			ITEM : XLPE Power Cables			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	RAW MATERIALS											
1.1	XLPE Compound	1. Physical properties	MA	Physical Tests	Sample/ Lot	IS:7098 & Mfrs Std./ Appd Data Sheet	IS:7098 & Mfrs Std, Appd Data Sheet	Test Report Log Book	3/2	-	1,2	Raw material verification as per approved sub-vendor list
		2. Elec.Properties	MA	Electrical Tests	-do-	-do-	-do-	-do-	3/2	-	1,2	
1.2	Semi Conducting Compound	1. Phy.and Elec. Properties	MA	Phy.and Elec. Tests	-do-	Manufacturer's standard	Manufacturer's standard	-do-	3/2	-	1,2	
1.3	Copper Foil	1. Dimensions	MA	Measurement	-do-	Manufacturer's std./ Appd. Data sheet	Manufacturer's std./ Appd. Data sheet	Log Book	2	-	1,2	
		2. Physical, Chemical & Elect. Properities	MA	Phy., Chem. & Elect. Tests	-do-	IS:1897	IS:1897	Supplier's test report & log book	3/2	-	1,2	
1.4	PVC Compound (for sheath)	1. Physical properties	MA	Physical Tests	Sample/ lot	IS:5831/BHEL Specification	IS:5831/BHEL Specification	Log Book/ Test Report	3/2	-	1,2	
		2. FRLS Properties	MA	Envir/ Chemical	Sample/ lot	ASTMD-2863, ASTMD-2843, IEC-754-1	Appd. Data sheet	Log Book/ Test Report	3/2	-	1,2	
1.5	Galvanised steel wire/strip	1. Phy. and Elec. Properties	MA	Physical & Electrical Tests	Sample from each batch/ lot	IS:3975/ BHEL Specification/ Appd Data Sheet	IS:3975/ BHEL Specification/ Appd Data Sheet	Log Book/ Test Cert.	3/2	-	1,2	
		2. Dimension	MA	Measurement	-do-	-do-	-do-	-do-	3/2	-	1,2	
		3. Galvanization	MA	Galv. requirement	-do-	-do-	-do-	-do-	3/2	-	1,2	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	STANDARD QUALITY PLAN		CUSTOMER : RRVUNL			PROJECT: 2 X 660MW SCTPS, STAGE-V, Units 7 & 8 TITLE			SPECIFICATION : NUMBER : PE-TS-392-507-E001			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-507-00-Q-001, R5			SPECIFICATION TITLE : TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES			
		SHEET 2 OF 8	SYSTEM			ITEM XLPE Power Cables			SECTION			VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.6	Copper/Aluminium Rods/ Wires	1. Physical Properties	MA	Physical Tests	-do-	IS:613, IS-5484, IS:8130 & BHEL Specification	IS:613, IS-5484, IS:8130 & BHEL Specification	-do-	3/2	-	1,2	
		2. Chemical Composition & purity	MA	Chemical analysis	-do-	-do-	-do-	-do-	3/2	-	1,2	
		3.Electrical properties	MA	Electrical Tests	-do-	-do-	-do-	-do-	3/2	-	1,2	
		4. Dimensions	MA	Measurement	-do-	-do-	-do-	-do-	3/2	-	1,2	
2.0	IN PROCESS											
2.1	Wire Drawing	1. Physical, Electrical, Finish & dimension	CR	Phy. & Elect. Tests Visual / Meas.	Sample	IS:8130 & BHEL Specn.	IS:8130 & BHEL Specn.	Log Book	2	-	1	
2.2	Stranding of wires	1. No. of wires	MA	Counting	-do-	BHEL Specn, Apprd. Data Sheet & Relevant IS	BHEL Specn, Apprd. Data Sheet & Relevant IS	-do-	2	-	-	
		2. Sequence, lay length & Direction	MA	Visual, Meas.	-do-	-do-	-do-	-do-	2	-	-	
		3 Surface Finish	MA	Visual	-do-	-do-	-do-	-do-	2	-	-	
		4. Dimension	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
2.3	Conductor Screening	1. Radial thickness	MA	-do-	Sample	BHEL Specn & Apprd. Data Sheet	BHEL Specn & Apprd. Data Sheet	Log Book	2	-	-	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	STANDARD QUALITY PLAN		CUSTOMER : RRVUNL			PROJECT: 2 X 660MW SCTPS, STAGE-V, Units 7 & 8 TITLE			SPECIFICATION : NUMBER : PE-TS-392-507-E001			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-507-00-Q-001, R5			SPECIFICATION TITLE			: TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES
		SHEET 3 OF 8	SYSTEM			ITEM XLPE Power Cables			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.4	Core Insulation (XLPE) (No repair permitted)	1. Surface finish	MA	Visual	100%	-	-do-	Log Book	2	-	1	
		2. Eccentricity #	CR	Measurement	Sample	IS 7098 /Appd. Datasheet	IS 7098 /Appd. Datasheet	Log Book	2	-	1	# To be checked at starting & finish end of Extruded Length
		3. Thickness of Insulation	CR	Measurement	-do-	BHEL specn./Apprd. Data Sheet/ IS:7098	BHEL specn./Apprd. Data Sheet/ IS:7098	Inspection Report	2		-	
		4 Dia over insulation	MA	Measurement	-do-	-do-	-do-	-do-	2		-	
		5. Test on XLPE (Tensile & Elongation, Hot Set & Ageing Test)	MA	Tests	-do-	-do-	-do-	-do-	2		1	
		6. Spark test or water immersion test (applicable for LT XLPE cables only)	CR	Electrical	100%	Mnfr's Std	Mnfr's Std	Log Book	2	-	1	
2.5	Insulation Screening, (Non Metallic & Metallic)	1. Surface finish	MA	Visual	Sample	-	Free from bulging burnt particles lumps, cuts & Scratches.	Log Book	2	-	-	
		2. Thickness	MA	-do-	-do-	BHEL Spec./ data sheet	BHEL Spec./ data sheet	-do-	2	-	-	
		3 Overlap of Tape Band	MA	Measurement	-do-	BHEL Spec./ data sheet	BHEL Spec./ data sheet	-do-	2	-	-	
		4 Tightness of Tape Band	MA	Visual	-do-	Plant Std.	Plant Std.	-do-	2	-	-	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	STANDARD QUALITY PLAN		CUSTOMER : RRVUNL			PROJECT: 2 X 660MW SCTPS, STAGE-V, Units 7 & 8			SPECIFICATION :			
			BIDDER/ VENDOR :			TITLE			NUMBER : PE-TS-392-507-E001			
						QUALITY PLAN NUMBER PED-507-00-Q-001, R5			SPECIFICATION TITLE : TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES			
		SHEET 4 OF 8	SYSTEM			ITEM XLPE Power Cables			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.6	Core Laying	1. Dia over laid up core	MA	Measurement	Sample	Apprd. Data Sheet	Apprd. Data Sheet	Log Book	2	-	-	
		2.Sequence of lay, & direction	MA	Visual & Meas.	Sample	IS 7098/ Mfrs.Std.	IS 7098/ Mfrs.Std.	-do-	2	-	-	
		3. Lay Length	MA	Meas.	-do-	Mnfrs. Std.	Mnfrs. Std.	-do-	2	-	-	
2.7	InnerSheath Extrusion	1. Surface finish	MA	Visual	100%	--	Free from bulging, burnt particles, lumps cuts & scratches.	-do-	2	-	-	
		2. Sheath thickness	MA	Measurement	Sample	Appd. Data Sheet, IS:7098	Appd. Data Sheet, IS:7098	-do-	2	-	-	
		3. Dia over inner sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
2.8	Armour	1. No.of wires/Strips	MA	Counting	At the start of the process	IS 7098 / Apprd.Data sheet	IS 7098 / Apprd.Data sheet	-do-	2	-	-	
		2. Lay Direction	MA	Visual	-do-	IS:7098	IS:7098	-do-	2	-	-	
		3. Lay Length	MA	Meas.	-do-	Plant Standard	Plant Standard	Log Book	2	-	-	
		4. Coverage	MA	Measurement	-do-	BHEL Specn./ Appd. Data Sheet	BHEL Specn./ Appd. Data Sheet	-do-	2	-	-	
		5. Dia over armouring	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
2.9	Outer Sheath Extrusion	1. Surface Finish	MA	Visual	100%	-	Free from Porosity, Bulging, burnt particles, lumps, cuts &	Log Book	2	-	-	
		2.Sheath thickness	MA	Measurement	Sample	Appd. Data Sheet	Appd. Data Sheet	Log Book	2	-	-	
		3. Dia over outer sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
		4. Marking	MA	Visual	100%	IS:7098, BHEL Specn & Appd. Data Sheet	IS:7098, BHEL Specn. & Appd. Data Sheet	Test Report	2	-	-	Sequential marking shall be done by printing

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	STANDARD QUALITY PLAN	CUSTOMER : RRVUNL	PROJECT: 2 X 660MW SCTPS, STAGE-V, Units 7 & 8	SPECIFICATION :
		BIDDER/ VENDOR :	TITLE QUALITY PLAN NUMBER PED-507-00-Q-001, R5	NUMBER : PE-TS-392-507-E001 SPECIFICATION TITLE : TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES
	SHEET 5 OF 8	SYSTEM	ITEM XLPE Power Cables	SECTION VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.10	Finished Cable (INTERNAL)	1. Routine Test #	CR	Elec. & Meas.	100%	IS:7098 & BHEL specn	IS:7098 & BHEL specn.	Test Report	2	-	1	
3.0	Final Inspection (EXTERNAL)	1. Finish & Length	MA	Visual, Measurement	(See remark)	BHEL specn. & IS:7098	BHEL Specn./ Free from Porosity, Bulging Burnt particles, lumps, cuts & scratches	-do-	2	1	-	One drum in each Lot
		2. Dimension	MA	Measurement	As per IS	Appd.Data Sheet/ IS:7098, IS:10810	Specn./ Appd. Data Sheet/ IS:7098, IS:10810	-do-	2	1	-	
		3. Armouring - Coverage No.of Wires/Strips	MA	Visual & Meas.	-do-	-do-	-do-	-do-	2	1	-	
		4. Marking & Colour Coding	MA	Visual	-do-	-do-	-do-	-do-	2	1	-	
		5. Acceptance Tests #	CR	Phy, Elect. Tests FRLS Tests	AS PER IS:7098	IS:7098	IS:7098	-do-	2	1		
		6. Type Tests #	CR	Physical & Electrical Tests	Sample #	IS:7098	IS:7098	-do-	2	1		*# REFER ANNEXURE TO QAP ENCLOSED*

NOTES:-

(A) JOINTS IN WIRE SHALL BE AS PERMITTED BY IS / BHEL SPECIFICATION, VENDOR TO CERTIFY THE SAME.

(B) NO REPAIR OF CORE INSULATION PERMITTED

(C) CABLE ENDS SHALL BE SEALED AS PER VENDOR'S SPECIFICATION

(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 APPROVED DATA SHEET

(F) WHEREVER EXTENT OF CHECK FOR STAGE IS MENTIONED AS SAMPLES AND NOT DEFINED IN QP, THE SAME SHALL BE AS PER SAMPLING PLAN AGREED BY PURCHASER.

(G) VENDOR SHALL FURNISH COMPLIANCE CERTIFICATE TO THE INSPECTION AGENCY CONFIRMING THE PACKING AS PER IS 7098.

LEGEND : P : PERFORMER W: WITNESSER V: VERIFIER 1- BHEL 2-VENDOR 3- SUB VENDOR CHP:CUSTOMER HOLD POINT WHICH WILL BE DECIDED AT CONTRACT STAGE

BHEL	PARTICULARS	BIDDER/ VENDOR
	NAME	
	SIGNATURE	
	DATE	

BIDDER'S/VENDORS COMPANY SEAL

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:
   Type test to be conducted on one size of each voltage grade/ lot except FRLS test & Electrical tests which shall be conducted on every size & voltage grade of cables.

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:
   Sampling for acceptance tests shall be as per Appendix-A (Clause 19.2.1) of IS: 7098 Part-II.

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.

D. Sampling for Flammability (S.No-5.0) & Special Tests (S.No-7.0) shall be as per remarks column.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REMARKS
1.0	Tests for Conductor			
I.	Annealing test	For copper conductor only	T, A	***Internal in process Test Report to be furnished for acceptance test***
II.	Tensile test	For aluminium conductor only	T, A	
III.	Wrapping test	For aluminium conductor only	T, A	
IV.	Resistance test	For Al/Cu	T, A, R	
2.0	Tests for Armour Wires/Strips			
I.	Measurement of dimensions	Applicable for Aluminium wire & GS wire/Strip	T	
II.	Tensile test	Applicable for Aluminium wire & GS wire/Strip	T, A	
III.	Elongation at break test	Applicable for GS wire/Strip only	A	
IV.	Torsion test	For GS round wire only	A	
V.	Winding test	For GS strip only	A	
VI.	Resistivity test	Applicable for Aluminium wire & GS wire	A	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip only	A	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip only	A	

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REMARKS
IX.	Wrapping Test	For Aluminium wires only	A	
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	
II.	Tensile strength and elongation test at break	Applicable for XLPE insulation & PVC outer sheath		
(a)	Before ageing		T, A	
(b)	After ageing		T, A	
III.	Ageing in air oven	Applicable for XLPE insulation & PVC outer sheath	T	
IV.	Loss of mass in air oven test	For PVC outer sheath only	T	
V.	Hot deformation test	For PVC outer sheath only	T	
VI.	Heat shock test	For PVC outer sheath only	T	
VII.	Shrinkage test	For XLPE insulation & PVC outer sheath only	T	
VIII.	Thermal stability test	For PVC outer sheath only	T	
IX.	Hot set test	For XLPE insulation only	T, A	
X.	Water absorption (gravimetric) test	For XLPE insulation only	T	
4.0	FRLS Tests			
I.	Oxygen index test	For PVC outer sheath only	T, A	
II.	Smoke density test	For PVC outer sheath only	T, A	
III.	Acid gas generation test	For PVC outer sheath only	T, A	
5.0	Flammability Tests			
I.	Flammability test to IEC-60332 Part-3-23, Cat-A for bunched cables (Flammability test to IS: 7098-II Category C2)	For complete cable	A#	Shall be conducted on one sample only/ lot
II.	Flammability test to IEC:60332 Part-1 for Single cable (Flammability test to IS: 7098-II Category C2)	For complete cable	T#	Shall be conducted on one sample only/ lot
III.	Swedish chimney test to SEN SS 424 1475	For complete cable	A#	Shall be conducted on one sample only/ lot
IV.	Flammability test to IEEE: 383	For complete cable	A#	Shall be conducted on one sample only/ lot

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REMARKS
6.0	Electrical Tests			
I.	High Voltage Test	For complete cable	T, A, R	
II.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T, A	
III.	Partial discharge test (shall be carried out on full drum length)		T,A,R	
IV.	Bending Test followed by Partial Discharge test		T	
V.	Dielectric Power Factor Test (i) As a function of voltage (ii) As a function of temperature	Applicable for 6.35/11kV & above only	T	
VI.	Heating Cycle Test		T	
VII.	Impulse Withstand Test	Applicable for 6.35/11kV & above only	T	
7.0	Special Tests			Shall be conducted on one sample for entire contract. Duration of UV Radiation test shall be 14 Days
a)	UV Radiation test as per BS EN ISO 4892-2	For PVC outer sheath	A**	
b)	Anti-rodent and Termite Repulsion test	For PVC outer and inner sheath only	A#	Shall be conducted on one sample only/ lot
c)	Anti-Fungal Test	For PVC outer and inner sheath only	A#	-do-

Note-

1) Hydrolytic test if asked to perform shall be conducted as per ASTM D 3137.
2) Test requirements as per latest standard (i.e 7098-II-2011) shall be considered, even if the same are not indicated above.

DATASHEET A

DATA SHEET-A

I. SPECIFIC TECHNICAL REQUIREMENTS

1.0	Type of Cable	Flame Retardant Low Smoke (FRLS)
2.0	Standard applicable in general	IS: 7098 PART (II)
3.0	Voltage Grade	*11/11kV (UE) & 6.6/6.6kV (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)* *1Cx185 sq.mm (6.6/6.6kV, Armoured)* *1Cx630 sq.mm (6.6/6.6kV, Armoured)* *3Cx185 sq.mm (6.6/6.6kV, Armoured)* *Quantities As per BOQ, Annexure-A*
5.0	CONDUCTOR	
(a)	Material	Aluminium
	Grade and Class	H2, Class 2
(b)	Standard Applicable	IS: 8130
(c)	Shape	Circular, Stranded & Compacted
(d)	Min. number of strands	As per Table-2 of IS: 8130
(e)	Conductor screen	
(i)	Material	Cross-linked Semi-conducting compound
(ii)	Minimum thickness	*0.3 mm*
6.0	INSULATION	
(a)	Material	XLPE
(b)	Standard Applicable	IS: 7098 Part-II
(c)	Continuous withstand temperature	90°C
(d)	Short-circuit withstand temperature	250°C
7.0	INSULATION SCREEN	
(a)	Non-metallic	
(i)	Material	Cross-linked Semi-conducting compound
(ii)	Minimum thickness	*0.3 mm*
(b)	Metallic	
(i)	Material	Copper
(ii)	Type	Tape
(iii)	Size	*Nominal thickness 0.1mm with tolerance (±) 10%*
(iv)	Minimum Overlap	*10%*
(c)	Earth fault current withstand capacity	*400 A, 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 insulation screen shall be applied along with XLPE insulation in a single operation by triple extrusion process).

(b)	Method of Curing	*Dry curing/ Gas curing/ Steam curing/ Sioplas.*
9.0	CORE IDENTIFICATION	Colour coding as per IS.
10.0	INNER SHEATH (applicable for all cables)	
(a)	Material	PVC Type ST2 as per IS: 5831
(b)	Colour	Black
(c)	Whether FRLS	*No*
(d)	Fillers	*Acceptable*
(e)	Material of fillers (if permitted)	Same as inner sheath (Material of filler to be compatible with that of inner sheath)
(f)	Method of application	
(1)	Multi-core cables:	
(i)	With fillers	*Pressure/Vacuum extruded*
(ii)	Without fillers	*Pressure extruded*
(2)	Single-core cables:	*Pressure/ Vacuum extruded*
12.0	*ARMOUR*	
(a)	Material:	
(i)	Single core cables	Aluminium Round Wire H4 grade to IS: 8130
(ii)	Multi-core cables	Galvanised Steel Formed Wire/Strip armour conforming to IS 7098 part-II and IS 3975
(b)	Minimum Coverage	90%
(c)	Gap between armour wires/ formed wires	Shall not exceed one armour wire/ formed wire space (No cross-over/ over-riding)
(d)	Breaking load of joint	95 % of normal armour
13.0	OUTERSHEATH	
(a)	Material	PVC Type ST2 as per IS: 5831
(b)	Colour	Black
(c)	Whether FRLS	Yes
(d)	Method of application	Extruded
(e)	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 e.g. "FRLS" etc, @ 5m (by embossing)* *'BHEL-PEM' and 'RRVUNL' @5m (by embossing)* *Progressive sequential marking @ 1m (by printing)*
(f)	Other properties	*The sheath shall be resistant to water, UV radiation, fungus, termite and rodent attack*
14.0	FRLS CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per ASTMD 2863-77)
(b)	Temperature index	Min. 250°C at oxygen index 21
(c)	Acid gas generation	Max. 20% (as per IEC-754-1)
(d)	Smoke density rating	Max.60% (As per ASTM D2843)
(e)	Flammability Test	As per IEC: 60332-III CAT-A, IEC: 60332-I, IEEE: 383 & SS: 424:1475 (Class-F3), IS:10810
15.0	Anti-fungal, Anti-rodent and Termite repulsion Test	*YES*

16.0	UV Radiation Test (As per BS EN ISO 4892-2)	*YES*
17.0	Water Absorption Test (As per IS:10810)	*YES*
18.0	TOLERANCE ON OUTER DIAMETER	(±)2 mm. over the declared value in filled-up Data Sheet-C
19.0	STANDARD DRUM LENGTH	*500m (±) 5%, and as specified in BOQ.*

DATASHEET C

DATASHEET C

GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)

1.0	General		
1.1	Name of manufacturer	:	
1.2	Place of Manufacture	:	
2.0	Standards applicable		
2.1	IS: 7098 Part-II	:	YES
	For general specification of XLPE Cables		
2.2	IS: 8130	:	YES
	For conductor material		
2.3	IS: 5831	:	YES
	For material of innersheath & outersheath.		
2.4	IS: 3975 / IS: 8130	:	YES
	For armour of 3 core/ single core cables		
2.5	IS: 10810	:	YES
	For method of tests		
2.6	IS:10418	:	YES
	For cable drums		
2.7	ASTMD-2863	:	YES
	For oxygen index test		
2.8	SS:424-1475 & IEC-332-III-Cat-A, IEC-332-I/ IEEE: 383	:	YES
	For flammability test		
2.9	IEC-754-1	:	YES
	For acid gas generation test		

2.10	ASTMD-2843	:	YES	
	For smoke generation test			
2.11	Current rating of cables conforms to	:		
2.12	Short circuit rating conforms to	:		
2.13	Formula for calculating short circuit current for different durations	:		
3.0	(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
	iv) thermal resistivity of soil	:		deg. C cm/W
	(b) Installation conditions for current rating specified at clause 6.3	:		
4.0	CHARACTERISTICS OF FRLS SHEATH			
	a) Oxygen index	:		
	b) Temperature index	:		
	c) Acid gas generation	:		
	d) Smoke density rating	:		
5.0	CABLE DRUMS			
	a) Type & construction	:		
	b) Standard drum length	:		
	c) Tolerance on drum length	:		

6.0 INFORMATION TO BE FILLED IN FOR EACH SIZE CABLE IN THE FORM OF TABLE

6.1	No. of cores x size		:	
6.2	Voltage grade (U_o/U)		:	kV
6.3	Base current ratings (*) based on Clause 3.0			
	a)	In air	:	Amp
	b)	In ground	:	Amp
	c)	ducts	:	Amp
6.4	Short circuit rating		:	kA, sec.
6.5	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
6.6	CONDUCTOR			
	a)	Material type & grade	:	
	b)	No & dia of wires in each core before stranding	:	no x mm
	c)	Shape	:	
6.7	CONDUCTOR SCREEN			
	a)	Material	:	
	b)	Minimum thickness	:	
6.8	XLPE INSULATION			
	a)	Nominal thickness of insulation	:	mm
	b)	Method of curing	:	

6.9 INSULATION SCREEN

a) Material and thickness (minimum and nominal)

i) Metallic :
No. of tapes and minimum overlapping :

ii) Non-metallic :

b) Earth fault current withstand capacity : kA, sec.
(Calculation to be furnished)

6.10 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

6.11 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 :

g) Minimum coverage :

6.12 PVC ST2 FRLS OUTERSHEATH

a) Nominal thickness of outer sheath : mm

6.13	Diameters			
	a) Diameter of insulated conductor	:		mm
	b) Diameter of laid up core	:		mm
	c) Cable diameter under armour	:		mm
	d) Cable diameter over armour	:		mm
	e) Overall diameter of cable	:		mm
6.14	Tolerance on overall diameter	:	(±)	mm
6.15	Minimum bending radius	:		x O.D.
6.16	Safe pulling force	:		kg.
6.17	Weight of cable	:		kg./km
(a)	Weight of conductor	:		MT./km
(b)	Weight of XLPE insulation	:		MT./km
(c)	Weight of PVC (Inner Sheath, Outer Sheath & Fillers)	:		kg./km
(d)	Weight of Armour (As applicable)	:		kg./km
6.18	Reel indicating the length, type, voltage grade, Conductor size and number of core of the cable	:		
6.19	Dimension of drum	:		mm
6.20	Shipping weight	:		kg.
6.21	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.

(*) Eccentricity and Ovality also to be indicated.

LIST OF STANDARD DELIVERABLES FOR HT POWER CABLES
TO BE SUBMITTED BY SUCCESSFUL BIDDER

	HT XLPE CABLES		
SL. No.	**DOCUMENT TITLE**	**DWG. / DOCUMENT No.**	**SUBMISSION SCHEDULE**
1	Data Sheet for XLPE HT Power Cables	PE-V0-392-507-E111	Within Two weeks from the date of LOI
2	Cross-sectional Drawings for XLPE HT Power Cables	PE-V0-392-507-E112	Within Two weeks from the date of LOI
4	Quality Plan for XLPE Power Cables (Alongwith routine/ type/ acceptance test requirements)	PE-V0-392-507-E113	Within Two weeks from the date of LOI
3	Type Test Reports for Tests conducted under this contract (Ref. Cl. 2.4.1.c & 2.4.1.d of section-D)	PE-V0-392-507-E114	Within a week from the date of conduction of Type Test