2X660 MW ENNORE TPS

TECHNICAL SPECIFICATION

FOR

HT XLPE POWER CABLES

SPECIFICATION NO: *PE-TS-412-507-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 ENNORE TPS.

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. INTRODUCTION

Tamilnadu Generation and Distribution Corporation owns the proposed green-field 1320 MW (2 units of 660 MW each) Coal Based Thermal Power Station at Katupalli. This is an expansion of North Chennai Thermal Power Station (NCTPS) and located on some portion of the ashdyke of NCTPS.

2. OWNER

Tamilnadu Generation and Distribution Corporation

3. CONTRACT SPECICATIONS

TNEB specification No. SE/E/T&H(P)/OT.No.175/2007-08

4. LOCATION

The proposed site for main power plant is located near Ennore port (approx 5 kms).
The nearest Railway station is at Athipattu Pudunagar (approx 5 kms)
All weather road from Pattamandri on the Thiruvottiyur-Ponneri district highway is the nearest road access.
The nearest airport is at Chennai at a distance of 60 km.

5. SITE CONDITION

The site is located near Vayalur Village, Ennore
Latitude : 13°17' N to 13°18' N
Longitude : 80°18' E to 80°19' E
Distance from Chennai City : 35 km
Nearest Airport is at Chennai at a
Distance of : 60 km

6. AVAILABILITY OF LAND

About 500 acres of land has been earmarked to locate all the facilities of the proposed plant and the land is in possession of TANGEDCO.

7. SITE DEVELOPMENT

Generally, level and rough graded land will be made available by the owner.

8. SOIL CONDITION

As indicated by soil consultants, the present site is located in a coastal region with sub-surface consisting of sedimentary deposits. Soil investigation has been carried out at the proposed site. From bore logs it is observed that sub soil in this strata is generally comprising of medium coarse sand up to 5 m followed by silty clay, and compacted clay layers below.

9. PLANT FOUNDATIONS

All major buildings like Turbine Building, Mill Building, Chimney, Boiler, etc. will be on piles. Major equipment foundations like TG foundations, Boiler Feed Pumps, ID Fan, FD Fan, PA Fan, Coal Mills will be on pile foundations. Other buildings can be supported on spread or raft foundations.

10. MAJOR DISTANCES TO PROJECT SITE

Plant located in Athipattu, Ponneri Taluk of Thiruvallur district, Tamil Nadu.

Distance from Chennai	-	35 km North of Chennai
Distance from Manali	-	20 km
Nearest road	-	All weather road from Pattamandiri, 5 km from Site on Chennai – Ponneri district highway
Nearest Railway Station	-	Athipattu Pudunagar on Chennai Howrah mainline, 3 km from Site
Nearest Sea Port	-	Ennore Port – 3 km and Chennai Port – 20 km from Site
Nearest Air Port	-	Chennai

11. ACTUAL DESTINATION FOR MATERIALS

ENNORE Thermal Power Station

12. MODE OF DESPATCH

Road / Rail / Sea / Air (as per project requirement)

Ambient temperature for Design of electrical equipment in non-air conditioned area	:	50^0C
Relative humidity for design of electrical equipment	:	85%
AC Voltage Level For Aux Power Distribution :		11 KV, 3 phase, 3 wire 3.3 KV, 3 phase, 3 wire 415 V, 3 phase, 4 wire
Rated frequency	:	50 Hz.
Voltage & Frequency variation	:	All equipment shall be suitable for Voltage variation of ± 10 %, frequency variation of (+) 3% to (-) 5% and 10% combined variation (sum of absolute values) of voltage and frequency.

The voltage level for motor shall be as follows:

• Above 1500 KW	:	11 KV
• Above 160 KW & upto 1500 KW	:	3.3 KV
• Upto 160 KW	:	415 V
AC control voltage	:	240 V, 1ph, 50 HZ
UPS Voltage	:	240 V, 1ph, 50 Hz

DC Voltage for motor, protection, control and emergency lighting	:	220 V
DC Voltage for control & instrumentation	:	24 V
AC Voltage for lighting, Space heating	:	240 V, 1ph, 50 Hz
AC emergency supply	:	415V; 3 Ph; 3 wire
DC Voltage variation	:	187 V - 242 V for 220 V DC

Fault levels:

400KV System	:	63 kA for 1 sec
33kV System	:	25 kA for 3 sec
11KV System	:	50 kA for 3 sec
3.3KV System	:	40 kA for 3 sec
415V System	:	50 kA for 1 sec
220V DC System	:	25 kA

Grounding:

a).	400KV System	:	Solidly grounded
b).	Generator	:	High resistance grounded through distribution Transformer, transformer secondary loaded with resistor.
c).	11KV System	:	Low Resistance Grounded with Earth-Fault Current limited to 300A
d).	3.3KV System	:	Low Resistance Grounded with Earth-Fault Current limited to 300A
e).	415V System	:	Solidly grounded
f).	220V DC System	:	Ungrounded
g).	Diesel Generator	:	Ungrounded

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. PE-QP-999-507-E001, R0 (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.N.	Drawings and documents	Soft and Hard Prints
1.0	DRAWING FOR APPROVAL	
1.1	For approval	Soft+2 Hard Print
1.2	For customer approval	Soft+4 Hard Print
1.3	For final distribution	Soft+2 CD +5 Hard Print

3.1.6 Each drum shall carry manufacturer's name, owner's name, address, contact no., Type & Voltage grade of cable, Year of manufacture, Type of Insulation, No. & Size of cable, Cable code, length of cable on drum, ISI mark, appx. Gross mass stencilled on both sides of the drum. 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. Drum shall be wooden or steel of heavy construction.

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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**						
		1C-630	MTR	19600	700x20	700M x 28		
1.1		1C-300	MTR	65000	700M X 7 500M X 3	700M X 90 500M X 4		
1.2		3C-150	MTR	38700	700M X 19 500M X 29	700M X 26 500M X 41		
2.0		**3.3/3.3 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMOURED/ UNEARTHED GRADE POWER CABLE.**						
2.1		1C-120	MTR	5000	1000M x 4	1000M x 5		
2.2		3C-120	MTR	25900	700M X 12 500M X 20	700M X 17 500M X 28		
3.0	507-27000-B	**MANDATORY SPARES**	SET	----	----			**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 0 to (+) 30% of the total contract value derived on the basis of the Ordered quantities for this project.

2 The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ-Cum-Price Schedule. 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 1000 , 700 & 500 metres.Tolerance on individual drum length shall be +5%. There shall be no negative tolerance.

6 Overall tolerance on total dispatched quantity of each size shall be (-) 0% and (+) 2%. 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. No separate Type Test charges are to be quoted by bidder. Type test to be conducted on one drum for every 10 drums or less of each type and size of cable/ lot

9 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.

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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	1400	700x2		
3.1.2		1C-300	MTR	6400	700x7 500x3		
3.1.3		3C-150	MTR	2800	700x4		
3.2		**3.3/3.3 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMOURED/ UNEARTHED GRADE POWER CABLE.**					
3.2.1		1C-120	MTR	500	500 x 1		
3.2.2		3C-120	MTR	2000	500 x 4		

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 above BOQ-Cum-Price Schedule.

3 Standard drum length shall be 500 & 700 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.

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

c. Pls refer to QAP & annexure to QAP for type test requirements.

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.

d. Pls refer to QAP & annexure to QAP for routine / acceptance test requirements.

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 (if applicable) 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 : TANGEDCO			PROJECT: 2 X 660MW ENNORE TITLE			SPECIFICATION NUMBER : PE-TS-412-507-E001				
		BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E001, **R0**			SPECIFICATION : TITLE				
	SHEET 1 OF 10	SYSTEM			ITEM : HT 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	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
	Instructions: 1. 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. 2. 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.											
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**											
1.1	**Aluminium Rods (Conductor/ Armour Wire)**	**GENERAL :**										
		1. Physical properties	MA	Physical Tests	Sample/ Batch	IS:7098-II,IS: 5082, IS:5484, IS:8130 & Appd Datasheet	IS:7098-II,IS: 5082, IS:5484, IS:8130 & Appd Datasheet	Log book/ Test Cert.	3/2	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	
		SPECIFIC CHECKS :										
		a) Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		b) Grade	MA	-do-	-do-	IS 8130, IS 5082/ Approved datasheet	IS 8130, IS 5082/ Approved datasheet	-do-	3/2	-	1	
		c) Resistivity	MA	Electrical Tests	Manufacturer	IS 8130, IS 5082	IS 8130, IS 5082	-do-	3/2	-	1	
1.2	**XLPE Compound for insulation**	**GENERAL :**										
		1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-II & Mfs Std./ Approved datasheet	IS 7098-II & Mfs Std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	
		SPECIFIC CHECKS :										
		a) Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		b) Type/ Grade	MA	-do-	-do-	Mfr. Std/ Approved datasheet	Mfr. Std/ Approved datasheet	-do-	3/2	-	1	
		c) Shelf life/ Storage condition	MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	3/2	-	1	

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

	STANDARD QUALITY PLAN	CUSTOMER : TANGEDCO	PROJECT: 2 X 660MW ENNORE TITLE	SPECIFICATION NUMBER : PE-TS-412-507-E001
		BIDDER/ VENDOR :	QUALITY PLAN NUMBER: PE-QP-999-507-E001, **R0**	SPECIFICATION : TITLE
	SHEET 2 OF 10	SYSTEM	ITEM : HT 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
1.3	**Semi Conducting Compound**	**GENERAL :**										
		1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-II & Mfs Std./ Approved datasheet	IS 7098-II & Mfs Std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
		SPECIFIC CHECKS :										
		1. Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		2. Type/ Grade	MA	-do-	-do-	Mfr. Std/ Approved datasheet	Mfr. Std/ Approved datasheet	-do-	3/2	-	1	
		3. Shelf life/ Storage condition	MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	3/2	-	1	
1.4	**Copper Tape**	**GENERAL :**										
		1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-II, IS 1897, IS 613 & Mfr. Std./ Approved datasheet	IS 7098-II, IS 1897, IS 613 & Mfr. Std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	
		3. Dimension	MA	Measurement	-do-	-do-	-do-	-do-	3/2	-	2	
		SPECIFIC CHECKS :										
		1. Resistivity	MA	Electrical Tests	Manufacturer std.	IS 613	IS 613	-do-	3/2	-	1	
1.5	**Fillers (as applicable)**	1. Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		2. Type/ Grade	MA	-do-	-do-	Approved datasheet	Approved datasheet	-do-	3/2	-	1	(Fillers material chosen shall be compatible with the temerature rating of the cable and shall have no deleterious effect on any other componenet of the cable)
1.6	**PVC Compound (for sheath)**	**GENERAL :**										
		1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-II, IS 5831& Mfr. Std./ Approved datasheet	IS 7098-II, IS 5831& Mfr. Std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	
		3. FRLS Properties (as applicable)	CR	Chemical/ Environ.	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	

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

	STANDARD QUALITY PLAN		CUSTOMER : TANGEDCO			PROJECT: 2 X 660MW ENNORE TITLE			SPECIFICATION NUMBER : PE-TS-412-507-E001			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E001, **R0**			SPECIFICATION : TITLE			
	SHEET 3 OF 10		SYSTEM			ITEM : HT 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	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
		SPECIFIC CHECKS :										
		a) Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		b) Type/ Grade	MA	-do-	-do-	Approved datasheet	Approved datasheet	-do-	3/2	-	1	
		c) Shelf life/ Storage condition	MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	3/2	-	1	
1.7	**Galvanised steel wire/strip for Armour (as applicable)**	**GENERAL :**										
		1. Make	MA	Verify	Manufacturer std.	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		2. Dimension	MA	Measurement	-do-	IS 7098-II, IS 3975 & Approved datasheet	IS 7098-II, IS 3975 & Approved datasheet	-do-	3/2	-	2	
		3. Phy.and Elec. Properties	MA	Physical & Electrical Tests	Sample*	-do-	-do-	-do-	3/2	-	2	* Sample from each armour size/ Batch / Lot
		4.Galvanization Quality	MA	Galv.Tests	-do-	IS 3975 & Mfr. Std.	IS 3975 & Mfr. Std.	-do-	3/2	-	2	
1.8	**Wooden Drum**	1. Phy. & Constructional checks	MA	Visual	Mfr's Plant Std.	IS 10418	IS 10418	Log book/ Test Cert.	3/2	-	1	
		2. Anti termite treatment	MA	Chem.	Mfr's Plant Std.	Mfr's Plant Std.	Mfr's Plant Std.	COC	3/2		1	
1.9	**Steel Drum #**	1. Dimension	MA	Meas.	Mfr's Plant Std.	Mfr's Plant Std.	Mfr's Plant Std.	Log book/ Test Cert.	3/2	-	1	# (If Applicable)
		2. Surface finish	MA	Meas.	-do-	Surface shall be smooth	Surface shall be smooth	-do-	3/2		1	

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

	STANDARD QUALITY PLAN		CUSTOMER : TANGEDCO			PROJECT: 2 X 660MW ENNORE			SPECIFICATION			
						TITLE			NUMBER : PE-TS-412-507-E001			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E001, **R0**			SPECIFICATION : TITLE			
	SHEET 4 OF 10		SYSTEM			ITEM : HT 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	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.0	**IN PROCESS**											
2.1	**Wire Drawing**	1. Size	MA	Dimensional	Plant Mfg. Std.	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	Log Book	2	-	1	
		2. Surface finish	MA	Visual	-do-	Surface shall be smooth	Surface shall be smooth	-do-	2	-	1	
		3. % of Elongation	MA	Mechanical	-do-	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	-do-	2	-	1	
2.2	**Stranding of wires**	1. No. of wires	MA	Counting	Plant Mfg. Std.	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	Log Book	2	-	-	
		2. Resistance	CR	Electrical	-do-	-do-	-do-	-do-	2	-	-	
		3. Sequence, lay length & Direction	MA	Visual, Meas.	One Sample of each size/ lot	Mfrs Std. / Appd. Datasheet	Mfrs Std. / Appd. Datasheet	-do-	2	-	-	
		4. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	-do-	2	-	-	
		5. Dimension	MA	Measurement	One Sample of each size/ lot	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	-do-	2	-	-	
2.3	**Conductor Screening**	1. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-	
		2. Radial Thickness	CR	Mechanical	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
2.4	**Core Insulation (XLPE) (No repair permitted)**	1. Surface finish	MA	Visual	100%	Free from bulging, burnt particles, lumps, cuts & scratches	Free from bulging, burnt particles, lumps, cuts & scratches	Log Book	2	-	1	
		2. Eccentricity & Ovality #	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	1	*# To be checked at starting & finished end of extruded length.*
		3. Insulation Thickness	CR	Measurement	-do-	-do-	-do-	-do-	2	-	-	
		4. Dia over insulation	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
		5. Tensile Strength & % Elongatio	MA	Mechanical	100%	-do-	-do-	-do-	2	-	-	

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

	STANDARD QUALITY PLAN	CUSTOMER : TANGEDCO	PROJECT: 2 X 660MW ENNORE	SPECIFICATION
			TITLE	NUMBER : PE-TS-412-507-E001
		BIDDER/ VENDOR :	QUALITY PLAN NUMBER: PE-QP-999-507-E001, **R0**	SPECIFICATION : TITLE
	SHEET 5 OF 10	SYSTEM	ITEM : HT 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
2.5	**Insulation Screening**	**NON METTALIC**										
		1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-	
		2. Thickness	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		METALLIC										
		1. Dimension of tape	CR	Measurement	One Sample of each size/ lot	Mfrs Std. / Appd. datasheet	Mfrs Std. / Appd. datasheet	Log Book	2	-	-	
		2. Overlap of Tape Band	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
		3. Tightness of Tape	MA	Visual	-do-	Mfs Std.	Mfs Std.	-do-	2	-	-	
2.6	**Core Laying**	1. Dia over laid up core	MA	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Log Book	2	-	-	
		2. Sequence of lay & direction	MA	Visual & Meas.	-do-	IS 7098-II & Mfr. Std.	IS 7098-II & Mfr. Std.	-do-	2	-	-	
		3. Lay Length	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
2.7	**InnerSheath Extrusion (as applicable)**	1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-	*(Pimple, fish eye, porosity & burnt particles not permitted.)*
		2. Thickness	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		3. Dia over inner sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
2.8	**Armour(as applicable)**	1. No.of wires/Strips	MA	Counting	At the start of the process	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Log Book	2	-	-	
		2. Lay length & Direction	MA	Visual & Meas.	-do-	IS 7098-II & Mfr. Std.	IS 7098-II & Mfr. Std.	-do-	2	-	-	
		3. Dia over armouring	MA	Measurement	-do-	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		4. Coverage	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	

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BHEL	STANDARD QUALITY PLAN	CUSTOMER : TANGEDCO	PROJECT: 2 X 660MW ENNORE TITLE		SPECIFICATION NUMBER : PE-TS-412-507-E001	
		BIDDER/ VENDOR :	QUALITY PLAN NUMBER: PE-QP-999-507-E001, R0		SPECIFICATION : TITLE	
	SHEET 6 OF 10	SYSTEM	ITEM : HT 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	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.9	**Outer Sheath Extrusion (No repair permitted)**	1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-	*(Pimple, fish eye, porosity & burnt particles not permitted.)*
		2. Sheath Thickness	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		3. Dia over outer sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
		4. Embossing/ Sequencial Marking	MA	Visual	100%	Approved data sheet	Approved data sheet	-do-	2	-	-	
3.0	**Finished Cable (INTERNAL)**	**1. Routine Test (Refer Note-F)**	CR	Electrical Tests & Measurement	100%	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Test Report	2	-	1	
4.0	**Final Inspection (EXTERNAL)**	**1. Finish**	MA	Visual	One drum in each Lot	IS 7098-II & Appd. Datasheet	Free from Porosity, Bulging, Burnt particles,lumps, cuts &	Test Report	2	1	-	
		2. Length	MA	Measurement	-do-	-do-	Approved Data Sheet	-do-	2	1	-	
		3. Dimension	MA	-do-	As per IS	-do-	-do-	-do-	2	1	-	
		4. Armouring - Coverage No.of Wires/Strips	MA	Visual & Meas.	-do-	-do-	-do-	-do-	2	1	-	

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

	STANDARD QUALITY PLAN		CUSTOMER : TANGEDCO			PROJECT: 2 X 660MW ENNORE TITLE			SPECIFICATION NUMBER : PE-TS-412-507-E001			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E001, **R0**			SPECIFICATION : TITLE			
		SHEET 7 OF 10	SYSTEM			ITEM : HT 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	W	V	REMARKS
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
		5. Marking & Colour Coding	MA	Visual	As per IS	-do-	Approved Data Sheet	-do-	2	1	-	
		6. Acceptance Tests (Refer Note-F)	CR	Phy, Elect. Tests FRLS Tests	-do-	-do-	-do-	-do-	2	1	-	
		7. Type Tests (Refer Note-F)	CR	Physical & Electrical Tests	Sample #	-do-	-do-	-do-	2	1	-	*# Refer Annexure to QAP enclsoed*
5.0	**Packing**	**Sealing Identification**	MA	Visual	100%	As per IS	As per IS	-do-	2	1	-	

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) RECORD OF RAW MATERIAL, PROCESS & ALL STAGES SHALL BE CERTIFIED BY VENDORS QC. AND ARE LIABLE TO AUDIT CHECK BY PURCHASER.

(D) FILLERS/DUMMY CORES ETC. SHALL BE AS PER APPROVED DATA SHEET

(E) VENDOR SHALL FURNISH COMPLIANCE CERTIFICATE TO THE INSPECTION AGENCY CONFIRMING THE PACKING AS PER BHEL SPECIFICATION.

(F) ***FOR LIST OF ROUTINE, TYPE & ACCEPTANCE TESTS, REFER ANNEXURE TO QAP ENCLOSED.***

LEGEND : P : PERFORMER W: WITNESSER V: VERIFIER 1- BHEL/BHEL'S CUSTOMER 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:
   a) Type test to be conducted on 1 drum for every 10 drums or less of each type and size of cable/ lot.
   b) Flammability Test, FRLS test & Electrical tests to be conducted on every size & voltage grade of cables.
   c) Each type of cable shall be subjected to the following additional Type test/ acceptance test per lot to prove Fire resistant characteristics: (i) Oxygen Index test.
   (ii) Flammability test.

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 1 drum for every 10 drums or less of each type and size of cable/ lot.

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. Tests listed in S.No-8.0 & 9.0 shall be conducted only on one sample / lot. SAMPLING FOR FLAMMABILITY TESTS (Sl. No. 5) SHALL BE AS PER REMARKS COLUMN.

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	T, A	IS 10810 Pt 2	IS8130
III.	Wrapping test (before compacting/ shaping)	For aluminium conductor only	T, A	IS 10810 Pt 3	IS8130
IV.	Resistance test	For Al/Cu	T, A, R	IS 10810 Pt 5	
2.0	Tests for Armour Wires/Strips				
I.	Measurement of dimensions	Applicable for Aluminium wire & GS wire/Strip	T,A	IS 10810 Pt 36	

BHEL	PARTICULARS	BIDDER/ VENDOR	
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S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
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 test	For GS strip only	T, A	IS 10810 Pt 39	
VI.	Resistivity test	Applicable for Aluminium wire & GS wire	A	IS 10810 Pt 42	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip only	T,A	IS 10810 Pt 40	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip only	T,A	IS 10810 Pt 41	
IX.	Wrapping Test	For Aluminium wires only	T,A	IS 10810 Pt 3	
X.	Adhesion Test	For Aluminium wires only	T,A	IS 3975	
3.0	Physical Tests for XLPE Insulation & PVC sheath				
I.	Test for thickness & Eccentricity	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.	Hot set test	For XLPE insulation only	T, A	IS 10810 Pt 30	
X.	Water absorption (gravimetric) test	For XLPE insulation only	T	IS 10810 Pt 33	
XI.	Bleeding booming test	For HRPVC inner & outer sheath only	T,A	IS 5831	
~~XII.~~	Cold Impact test	For HRPVC inner & outer sheath only	T,A	IS 5831	
4.0	FRLS Tests				
I.	Oxygen index test	For PVC outer sheath only	T, A	IS 10810 Pt 58 / ASTMD 2863	Applicable for Inner Sheath if the same is
II.	Smoke density test	For PVC outer sheath only	T, A	ASTMD 2843	

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
III.	Acid gas generation test	For PVC outer sheath only	T, A	IS 10810 Pt 59 / IEC-754-1	indicated in Datasheet-A
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,A	IS 10810 Pt 62/ IEC-60332 (Part-3-23,	Test & Category applicable as indicated in Datasheet-A & Flammability Tests to be conducted only on one sample/ lot.
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)	
I.	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	
III.	Partial discharge test (shall be carried out on full drum length)		T,A,R	IS 10810 Pt 46	
IV.	Bending Test followed by Partial Discharge test		T	IS 10810 Pt 50	
V.	Dielectric Power Factor Test (i) As a function of voltage (ii) As a function of temperature		T	IS 10810 Pt 48	
VI.	Heat Cycle Test		T	IS 10810 Pt 49	
VII.	Impulse Withstand Test		T	IS 10810 Pt 47	
~~VIII.~~	~~Thermal ageing test~~	~~For complete cable~~	~~T~~	~~IS 7098-II~~	
7.0	Anti-rodent and Termite Repulsion test	For PVC outer sheath only	T,A	--	Test applicable as indicated in Datasheet-A
8.0	Anti-Fungal Test	For PVC outer sheath only	T,A	--	

DATASHEET A

DATA SHEET-A

I. SPECIFIC TECHNICAL REQUIREMENTS

1.0	Type of Cable	HT XLPE FRLSH POWER CABLE
2.0	Standard applicable in general	IS: 7098 PART (II)
3.0	Voltage Grade	*11/11kV (UE) & 3.3/3.3kV (UE)*
4.0	Number of cores, cross sectional area of conductors and quantities	*3Cx150 sq.mm (11/11kV, Armoured)* *1Cx300 sq.mm (11/11kV, Armoured)* *1Cx630 sq.mm (11/11kV, Armoured)* *3Cx120 sq.mm (3.3/3.3kV, Armoured)* *1Cx120 sq.mm (3.3/3.3kV, 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	Extruded Semi-conducting compound
(ii)	Minimum thickness	*0.3 mm*
6.0	INSULATION	
(a)	Material	Extruded 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	Extruded Semi-conducting compound
(ii)	Minimum thickness	*0.1 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	*300 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 FOR 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*
9.0	CORE IDENTIFICATION	BY COLOURED STRIPS OR NUMERALS APPLIED ON CORE.
10.0	INNER SHEATH	(applicable ONLY for multicore cables)
(a)	Material	EXTRUDED HRPVC, FR-LSH CONFORMING TO TYPE ST2 AS PER IS 5831
(b)	Colour	Black
(c)	Whether FRLS	*YES FRLSH*
(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 extruded*
(ii)	Without fillers	*Pressure extruded*
(2)	Single-core cables:	*Pressure extruded*
12.0	*ARMOUR*	
(a)	Material:	
(i)	Single core cables	Aluminium Round Wire H4 grade to IS: 8130
(ii)	Multi-core cables	Galvanised Steel STRIP AS PER IS 7098 PARTII
(b)	Minimum Coverage	90%
(c)	Gap between armour wires/ formed wires	Shall not exceed one armour wire space (No cross-over/ over-riding)
(d)	Breaking load of joint	95 % of normal armour
13.0	OUTERSHEATH	
(a)	Material	EXTRUDED HRPVC, FR-LSH CONFORMING TO TYPE ST2 AS PER IS 5831
(b)	Colour	Black
(c)	Whether FRLS	Yes, FRLSH
(d)	Method of application	Extruded
(e)	Marking	*Owner's name* *Manufacturer's name and /or trade mark* *voltage grade,* *year of manufacture,* *Type of insulation,* *Cable size (cross section area of conductor and no. of cores)* *IS Number(s)* *Type of inner & outer sheath e.g. "FRLSH" etc, Sequential Length, 'BHEL-PEM'* ***@ 1m (by embossing)***
14.0	FRLS CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per ASTM D2863)
(b)	Temperature index	Min. 250°C at oxygen index 21 (ASTM D2863)
(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-B, IEC: 60332-I, IEEE: 383

		& SS: 424:1475 (Class-F3), IS:10810
15.0	Anti-rodent and Termite repulsion Test	*YES* The test shall be carried out to also note the presence of rodent and termite repelling chemical in PVC compound. Normal procedure is that a few chippings of the PVC compound are slowly ignited in a porcelain dish or crucible in a muffle furnace at about 600°C. The resulting ignited ash is boiled with a little ammonium acetate solution (10%). A drop of aqueous sodium-sulphide solution is placed on a thick filter paper and it is allowed to soak. The spot is touched with a drop of above extract. A black spot indicates the presence of anti-termite & rodent compound.
16.0	TOLERANCE ON OUTER DIAMETER	(±)2 mm. over the declared value in filled-up Data Sheet-C
17.0	STANDARD DRUM LENGTH	500/700m/1000m (+) 5%, and as specified in BOQ. NO NEGATIVE TOLERANCE ALLOWED.
18.0	MATERIAL OF CABLE DRUM	The cables shall be supplied in non-returnable packing wooden/**steel drum.**

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_0/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-V0-412-507-E111	Within Two weeks from the date of LOI
2	Cross-sectional Drawings for XLPE HT Power Cables	PE-V0-412-507-E112	Within Two weeks from the date of LOI
4	Quality Plan for XLPE Power Cables (Alongwith routine/ type/ acceptance test requirements)	PE-V0-412-507-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-V0-412-507-E114	Within a week from the date of conduction of Type Test