

**NEYVELI LIGNITE CORPORATION LIMITED  
2x500 MW NEW NEYVELI THERMAL POWER STATION  
(NNTPS)**


**VOLUME : IIB**

**TECHNICAL SPECIFICATION  
FOR  
H T XLPE POWER CABLES**

**SPECIFICATION NO.: PE-TS-400/402-507-E001, Rev. 00**



**BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR, PROJECT ENGINEERING MANAGEMENT  
NOIDA 201301**


	<b>2x500 MW NEW NEYVELI THERMAL POWER STATION (NNTPS)</b>	Doc. No. PE-TS-400/402-507-E001	
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**IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION  
IN TOTO, & THAT THERE ARE NO TECHNICAL DEVIATIONS.**


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

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### INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. Two signed and stamped copies of the following shall be furnished by all bidders as technical offer:
  - a. Unpriced Price Schedule (Annexure-A of Section-C: BOQ, as enclosed with the specification) 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.
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 to Section-C of specification [Bill Of Quantities] shall not be considered (i.e., technical description & quantities as per specification shall prevail).

-----  
BIDDER'S STAMP & SIGNATURE

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## 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 “Project Information”.

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


**Section – D:** This section comprises of Tech. Spec. 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)


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**SECTION – A**  
**(SCOPE OF ENQUIRY)**


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### SCOPE OF ENQUIRY

- 1.0 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to **2x500 MW NEYVELI NEW THERMAL POWER STATION (NNTPS)** site of HT XLPE POWER CABLES as mentioned in different sections of this specification for the project as indicated in Section B (Project Information).
- 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 technical specification.
- 4.0 The bidders shall be responsible for and governed by all requirements stipulated hereinafter.
- 5.0 Requirements of the specification including the QP shall be agreed upon for total compliance by Bidders without any deviations.  
Price offers of only those bidders complying with the above requirement shall be acceptable.
- 6.0 The documents shall be in English language and MKS system of units.
- 7.0 For every shipment made to site, a shipping list, containing item reference (item number and description as per specification bill of quantities or packing drawing) and quantity of the same (in nos./weight) shall be provided by vendor at the time of dispatch of materials to site.

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**SECTION – B**  
**(PROJECT INFORMATION)**

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## SALIENT FEATURES OF THE SITE & GENERAL PROJECT INFORMATION

### 1.1 Introduction


The project site at Neyveli has distinct location advantages, being at pit-head distance from the source of lignite supply from Mines, making it convenient for transportation of lignite by belt conveyor. Water source is readily available from the nearby mines lake. Besides, other infrastructure such as access road, railway connection etc, already exist.

### 1.2 Power Plant Site


The power plant site is located at Neyveli, opposite to the now defunct Fertilizer and Briquetting & Carbonization Plant, near TPS-I Expansion and TPS-II.

### 1.3 Project & Site Information

- |                                    |   |  |
|------------------------------------|---|--|
| (i). Owner / Purchaser             | : | Neyveli Lignite Corporation Limited (NLC Ltd), Neyveli, Cuddalore District, Tamil Nadu State, India  |
| (ii). Consultant                   | : | Lahmeyer International (India) Pvt. Ltd (LII), Gurgaon, NCR, India.  |
| (iii). Project Title               | : | 2x500 MW Neyveli New Thermal Power Project (NNTPP)   |
| (iv). Location                     | : | 200 kms south of Chennai and 50 kms south-west of Cuddalore  |
| (v). Latitude                      | : | 11° 34' 00" N to 11° 35' 00" N   |
| (vi). Longitude                    | : | 79° 26' 00" E to 79° 27' 00" E   |
| (vii). Elevation above MSL         | : | (+) 67 m   |
| (viii). Nearest Railway Station    | : | Neyveli,   |
| (ix). Nearest Sea Port             | : | Chennai, at a distance of 200 km   |
| (x). Nearest Airport               | : | Chennai, at a distance of 200 km   |
| (xi). Road Access/Approach to Site | : | Connected by Chennai-Thanjavur NH 45C road and state highway connecting Cuddalore – Virudhachalam via Neyveli. Both NH and state high way roads are well connected to NLC township roads. The approach road is approximately 15 kms from Chennai–Thanjavur NH – 45C road |
| (xii). Site Meteorological Data    |   |  |
| • Max ambient temperature          | : | 42.8° C  |
| • Min Ambient Temperature          | : | 26.9° C  |


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- Wet bulb temp : 29° C
- Max. Relative Humidity : 92 % in the month of September
- Min. Relative Humidity : 23 % in the month of May
- Rainfall : About 1265.7 mm annually (average)
- Wind direction : South West to North East direction
- Wind Speed : 97.2 km/hr (maximum recorded)  
4.3 km/hr (average wind speed)
- Seismicity : As per IS: 1893 (part 4) (Zone-II)  
Importance factor: 1.75.

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## **SECTION – C**

### **(SPECIFIC TECHNICAL REQUIREMENTS)**

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## 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)) 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 Technical:

S. No.	Reference Clause No. of Section D(if any)	Specific Requirement/ Change
1	1.1	Data sheet –A to be fully complied without any deviations.

### 3.2 Quality/ Inspection:

S.NO	Reference Clause No. of Section D(if any)	Specific Requirement/ Change
1.	2.1	QP enclosed with technical specification shall be stamped and signed as token of acceptance. The QP shall be submitted at contract stage for customer approval without any commercial implication to BHEL.
2.	2.4.1.(d)	Conduction of testing requirements shall be as mentioned in Annexure to QP.

- 3.1.3 The successful bidder shall submit the standard list of raw material suppliers/ sub-vendors of each bidder for approval without any commercial implications. Changes to the same for specific projects, if proposed by any bidder, shall be to BHEL approval.
- 3.1.4 Quality Plan applicable for project: BHEL Quality Plan no. PE-QP-999-507-E001, R-0 (enclosed with specification).
- 3.1.5 Packing: Cables shall be supplied in non-returnable drums. Drum lengths shall be such so that cable joints are totally avoided. The drums shall be of heavy construction. All wooden parts shall be manufactured from seasoned wood. All ferrous parts used shall be treated with suitable rust preventive

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finish or coating to avoid rusting during transit or storage. Wooden cable drum shall be treated by immersing in copper-nitrate solution.

- 3.16 packing: The ends of each cable length shall be sealed before shipment. Heat shrinkable cable cap shall be used for this purpose.

#### **4.0 Nos. OF DRAWINGS/ DOCUMENTS REQUIRED FROM VENDOR:**

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


#### **DRAWING/DOCUMENT DISTRIBUTION LIST**

All documents & drawings shall be in English and in metric units

Sl		LII	NLC (HQ)	NLC-SITE	BHEL SITE	PMG BHEL	PEM/ UNITS/ PSSR	REMARKS
1	Master list of drawings / document (duly indicating schedule of submission)	Soft copy	Soft copy	Soft copy		Soft copy	Soft copy (S)	
2	Drawings / document for Approval/Information (First Submission)	Soft copy + 2 prints	Soft copy + 3 prints	Soft copy + 1 print		Soft copy	Soft copy (S)	
3	Return with comments/approval	Soft copy (S)	Soft copy	Soft copy		Soft copy	Soft copy	
4	Drawings / Documents for approval (second & subsequent submissions till approval)	Soft copy	Soft copy	Soft copy		Soft copy	Soft copy (S)	
5	Drawings / documents for distribution (Approved by NLC, in cat. 1 or Received for Information)	Soft copy + 2 print (HQ+ Site)	Soft copy + 3 prints	Soft copy + 3 prints	Soft copy + 5 prints	Soft copy	Soft copy (S)	
6	Erection Drawings / documents	-	Soft copy + 1 print	Soft copy + 3 prints	Soft copy + 5 prints	Soft copy	Soft copy (S)	
7	As built Drawings / documents	Soft copy + 1 print	Soft copy + 1 print	Soft copy + 3 prints	Soft copy + 5 prints	Soft copy	Soft copy (S)	
8	Operation & Maintenance Manual	-	Soft copy + 1 print	Soft copy + 10 prints	Soft copy + 5 prints	Soft copy	Soft copy (S)	
9	Type Test Certificate	Soft copy	Soft copy + 1 print	Soft copy + 3 prints	Soft copy + 5 prints	Soft copy	Soft copy (S)	


#### NOTES:

1. The above schedule of submission does not include Docs/Drgs. of quality assurance/inspection and delivery/dispatches. QAP documents to be submitted as per distribution schedule.
2. Date of submitting soft copy is to be taken as date of submission.
3. S – Source for generation of document.


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5.0 List of drawings / documents required to be furnished by successful bidder after award of contract shall be as below:

SL. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.	SUBMISSION SCHEDULE
1	Data Sheet for HT XLPE Power Cables	PE-V0-400/402-507-E101	Within one week of award of contract
2	Cross-sectional Drawings for HT XLPE Power Cables	PE-V0-400/402-507-E102	Within one week of award of contract
3	Quality Plan for XLPE Power Cables	PE-V0-400/402-507-E103	Within one week of award of contract
4.	Type Test Reports for Tests conducted under this contract	PE-V0-400/402-507-E104	Within one week of award of contract

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**ANNEXURE-A TO SECTION – C**  
**(BILL OF QUANTITIES)**

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**Bill of Quantity**  
**(MAIN ITEMS- SG PACKAGE (Annexure-I))**

11KV/11KV & 3.3KV/3.3KV (non-effectively earthed system) grade 90°C rating heavy duty XLPE power cable single or multicore, stranded compacted circular aluminium conductor H2 grade class 2, screened by triple extruded semi conducting compound, strippable, cross linked poly ethylene insulated, insulation screened by triple extruded semi conducting compound in combination with copper tape laid up FRLSH inner sheath with extruded PVC compound type ST 2, armoured (galvanized single core round steel wire armour for multicore cables and Non-magnetic hard drawn aluminium single round wire conforming to H4 grade for single core cables) and overall sheath with extruded FRLS PVC (type ST-2) cable complying with IS 7098 (part-2), IS-8130, IS-5831 & IS-3975.

**BILL OF QUANTITIES (MAIN ITEMS):**

**11 kV Armoured cables**


<u>Sl. No.</u>	<u>Cable Sizes</u>	<u>Total Quantity</u>	<u>LOT-1 Quantity</u>	<u>Drum Length</u>
1.1	3C – 240 Sq. mm	13200 Meters	13200 Meters	13 drums of 600 Meters, 10 drums of 500 Meters & 1 drum of 400 Meters
1.2	1C – 240 Sq. mm	4200 Meters	4200 Meters	3 drums of 600 Meters & 6 drums of 400 Meters

**3.3 kV Armoured cables**


<u>Sl. No.</u>	<u>Cable Sizes</u>	<u>Total Quantity</u>	<u>LOT-1 Quantity</u>	<u>Drum Length</u>
1.1	1C – 240 Sq. mm	1000 Meters	1000 Meters	2 drums of 500 Meters
1.2	3C – 240 Sq. mm	500 Meters	500 Meters	1 drum of 500 Meters

**Notes:**

- Quantities indicated above shall be known as Order Quantities. The variation in quantities of all sizes put together shall be limited to (+/- )30% of the total contract value till completion of supplies for 2x500 MW NEYVELI NEW THERMAL POWER STATION (NNTPS) Project.
- The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ in the Price Schedule enclosed with this specification. The unit prices shall apply for adjustment of variation in quantity as stipulated above.

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3. Lot-I quantities indicated above (in case the cable quantities are to be released for manufacture in more than one lot), or Order Quantity (in case the quantities are cleared for manufacture in one lot only) 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 and shall be completed within four months from the date of approval of documentation. Subsequent lots shall be cleared for manufacture based on progress of engineering and site requirements. A lead-time of three months shall be given for completion of supply for each subsequent lot from the date of clearance of the quantities.
4. 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.
5. Bidder shall indicate unit price of cables inclusive of type test charges. No separate charges shall be payable for type tests.
6. Standard drum length shall be 400m, 500m & 600m. Tolerance on individual drum length shall be ( $\pm$ ) 5%

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**Bill of Quantity**  
**(MAIN ITEMS – TG PACKAGE (Annexure-II))**

11KV/11KV & 3.3KV/3.3KV (non-effectively earthed system) grade 90°C rating heavy duty XLPE power cable single or multicore, stranded compacted circular aluminium conductor H2 grade, screened by triple extruded semi conducting compound, strippable cross linked poly ethylene insulated, insulation screened by triple extruded semi conducting compound in combination with copper tape laid up FRLSH inner sheath with extruded PVC compound type ST 2, armoured (galvanized single core round steel wire armour for multicore cables and Non-magnetic hard drawn aluminium single round wire conforming to H4 grade for single core cables) and overall sheath with extruded FRLS PVC (type ST-2) cable complying with IS 7098 (part-2), IS-8130, IS-5831 & IS-3975.

**BILL OF QUANTITIES (MAIN ITEMS):**

**11 kV armoured cables**


<u>Sl. No.</u>	<u>Cable Sizes</u>	<u>Total Quantity</u>	<u>LOT-1 Quantity</u>	<u>Drum Length</u>
1.1	3C – 240 Sq. mm	1500 Meters	1500 Meters	1 drum of 600 Meters, 1 drum of 500 Meters & 1 drum of 400 Meters
1.2	1C – 300 Sq. mm	2400 Meters	2400 Meters	4 drums of 600 Meters
1.3	1C – 630 Sq. mm	800 Meters	800 Meters	2 Drums of 400 Meters

**3.3 kV armoured cables**


<u>Sl. No.</u>	<u>Cable Sizes</u>	<u>Total Quantity</u>	<u>LOT-1 Quantity</u>	<u>Drum Length</u>
1.1	3C – 240 Sq. mm	2400 Meters	2400 Meters	4 drums of 500 Meters & 1 drum of 400 Meters

**Notes:**

- Quantities indicated above shall be known as Order Quantities. The variation in quantities of all sizes put together shall be limited to (+/- )30% of the total contract value till completion of supplies for 2x500 MW NEW NEYVELI THERMAL POWER STATION (NNTPS) Project.
- The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ in the Price Schedule enclosed with this specification. The unit prices shall apply for adjustment of variation in quantity as stipulated above.

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3. Lot-I quantities indicated above (in case the cable quantities are to be released for manufacture in more than one lot), or Order Quantity (in case the quantities are cleared for manufacture in one lot only) 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 and shall be completed within four months from the date of approval of documentation. Subsequent lots shall be cleared for manufacture based on progress of engineering and site requirements. A lead-time of three months shall be given for completion of supply for each subsequent lot from the date of clearance of the quantities.
4. 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.
5. Bidder shall indicate unit price of cables inclusive of type test charges. No separate charges shall be payable for type tests.
6. Standard drum length shall be 400m, 500m & 600m. Tolerance on individual drum length shall be ( $\pm$ ) 5%

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## **SECTION – D**

### **(STANDARD TECHNICAL SPECIFICATION)**

#### **1.0 TECHNICAL REQUIREMENTS**

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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.

2.2.1 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.

2.2.2 Bidders shall submit their list of proven sub-vendors for raw materials, which will be reviewed and made part of the MOU.


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 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.
- 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.
- d. Irrespective of the bidder furnishing type test report as indicated above, BHEL may get type tests as indicated in Datasheet-A 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.
- 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. Routine test shall be done on each drum of cables.
- b. Acceptance tests shall be conducted on every lot offered for inspection as per details indicated in Datasheet A.
- c. Cost of conduction of routine and acceptance testing shall be deemed to have been included in the quoted supply prices.

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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 naphthenates/ zinc naphthenates (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 SPECIFIC TECHNICAL AND QUALITY DOCUMENTATION TO BE SUBMITTED

4.1 By All Bidders

As technical offer:

- a. A copy of Section B (Project Information) as enclosed with enquiry with bidder's signature and company seal.
- b. A copy of Section C (Project Specific Technical Requirements) as enclosed with enquiry with bidder's signature and company seal.
- c. A copy of Annexure-A to Section-C, Bill of Quantities 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.


**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.

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## **DATA SHEET - A**

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## 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	3.3/3.3kV & 11/11 kV
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ, Annexure-A to Section-C
5.0	<b>CONDUCTOR</b>	
(a)	Material	<b>ALUMINIUM</b>
	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	<b>INSULATION</b>	
(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	<b>INSULATION SCREEN</b>	
(a)	Non-metallic	
(i)	Material	Semi-conducting compound extruded strippable
(ii)	Minimum thickness	0.3 mm
(b)	Metallic	
(i)	Material	Copper
(ii)	Type	Tape
(iii)	Size	Nominal thickness 0.1mm with tolerance ( $\pm$ ) 10%
(iv)	Minimum Overlap	10%
(c)	Earth fault current withstand capacity	300 Amp, 2 sec. (For multi core cables, screen of each core shall be rated individually for the above value. For single core armoured cables, the armouring shall constitute the metallic part of screening. The semi conducting tape shall be easily strippable).
8.0	<b>EXTRUSION (Insulation and Screens)</b>	
(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 in pressurized nitrogen atmosphere.
9.0	<b>CORE IDENTIFICATION</b>	
10.0	<b>INNER SHEATH</b>	
(a)	Material	PVC Type ST 2 as per IS: 5831
(b)	Colour	Black
(c)	Whether FRLS	YES

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(d)	Fillers	Acceptable
(e)	Material of fillers (if permitted)	Same as inner sheath.
(f)	Method of application	Pressure/Vacuum Extruded
11.0	<b>ARMOUR</b>	
(a)	Multicore cables	Galvanized single round steel wire armour conforming to IS:3975
(b)	Single core cables	Non-magnetic Hard drawn aluminium single round wire armour H4 grade as per IS:8130
(c)	Minimum coverage	90%
(d)	Gap between armour wires	Shall not exceed one armour wire space (No core-over/over-riding)
(e)	Breaking load of joint	95% of normal armour
12.0	<b>OUTERSHEATH</b>	
(a)	Material	PVC Type (ST2 as per IS: 5831 )
(b)	Colour	Black
(c)	Whether FRLS	Yes
(d)	Method of application	extruded
(e)	Marking	<p>Following markings @ 5m (by embossing)</p> <ul style="list-style-type: none"> <li>• Manufacturer's name and/ or trade name</li> <li>• Voltage grade of cable</li> <li>• Year of manufacture</li> <li>• Type of insulation</li> <li>• Letters FRLS (Type of outer sheath)</li> <li>• ISI marks</li> <li>• Cable size (Nominal cross sectional area and no. of cores)</li> <li>• Owner's identification mark "NNTPS"</li> <li>• BHEL-PEM</li> </ul> <p>And Progressive sequential marking @ 1m (by embossing).</p>
13.0	<b>FRLS CHARACTERISTICS</b>	
(a)	Oxygen index	Min 29 (As per ASTM D 2863)
(b)	Temperature index	Min. 250°C (As per ASTM D 2863) for normal atmospheric oxygen (21% by volume). Measured value of temperature index shall be 21 at a temperature of 250°C.
(c)	Acid gas generation	Max. 20% (as per IEC-754-1). Level of HCL evolved shall not exceed 20% by weight.
(d)	Smoke density rating	Max. 60% (As per ASTM D2843). Cables shall meet the requirements of light transmission of minimum 40% after the test.
(e)	Flammability Test	
	i) Under fire condition for single cable ii) Under fire condition for bunched cables iii) LADDER TEST FOR FLAMABILITY	(i) As per IEC – 332 – 1 (ii) As per IEC-332-3 Cat-B (iii) AS PER IEEE-383

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	ii) Swedish chimney test for class F3	as per SS : 424 1475, CLASS F3
	iii) Under fire conditions for bunched cables	AS PER IEEE 383/74
14.0	<b>TOLERANCE ON OUTER DIAMETER</b>	
	Tolerance on OD	(+/-) 2 mm.
15.0	<b>STANDARD DRUM LENGTH</b>	400m/500m/600m (±) 5%, and as specified in BOQ.
	<b>DRUM MARKINGS</b>	A label shall be securely attached to each end of the reel indicating the Purchaser's order number, Owner's identification mark i.e. "NNTPS", length, type, voltage grade, conductor size and number of cores of the cable. 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 numbers are to be indicated on the cable drums.
16.0	Anti-rodent and termite repulsion test	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.

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## **DATA SHEET - C**

### **DATASHEET C**

**GUARANTEED TECHNICAL PARTICULARS**

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**(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 **IS: 10810 part- 58** : YES

For oxygen index test

2.8 **SS:424-14-75 & IEC-332-III-Cat-B** : 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 :

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2.12 Short circuit rating conforms to :

2.13 Formula for calculating short circuit current for different durations :

OR

Whether curve for short time current v/s time for different cables enclosed : YES

3.0 Installation Conditions for specified current rating

- a) ambient air temperature : deg. C
- b) ground temperature : deg. C
- c) depth of laying of cables buried in ground : cm
- d) thermal resistivity of soil : deg. C cm/W

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

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- 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
- b) Nominal thickness of insulation : mm
- c) 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 (calculation to be furnished) : kA, sec.

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#### 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 :


#### 6.12 PVC ST2 FRLS OUTERSHEATH

- a) Nominal thickness of outer sheath : mm

#### 6.13 Diameters


- a) Diameter of insulated conductor : mm
- b) Cable diameter under armour : mm
- c) Cable diameter over armour : mm
- d) Overall diameter of cable : mm

- 6.14 Tolerance on overall diameter : (±) mm

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6.15 Minimum bending radius	:	x O.D.
6.16 Safe pulling force	:	kg.
6.17 Weight of cable	:	kg./km
6.18 Dimension of drum	:	mm
6.19 Shipping weight	:	kg.
6.20 Cable marking on outer sheath	:	

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

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## **QUALITY PLAN**



**STANDARD QUALITY PLAN**

CUSTOMER : NNTPS

PROJECT: 2x500 MW NEW NEYVELI THERMAL POWER STATION (NNTPS)

SPECIFICATION

TITLE

NUMBER : PE-TS-400/402-507-E001

BIDDER/ VENDOR

QUALITY PLAN NUMBER PED-507-00-Q-001, R5

SPECIFICATION: TECHNICAL SPECIFICATION FOR TITLE 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			REMARKS
									P	W	V	
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. Properties	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	
<b>BHEL</b>			<b>PARTICULARS</b>			<b>BIDDER/VENDOR</b>						
			<b>NAME</b>									
			<b>SIGNATURE</b>									
			<b>DATE</b>						<b>BIDDER'S/VENDORS COMPANY SEAL</b>			



**STANDARD QUALITY PLAN**

CUSTOMER : NNTPS

PROJECT: 2x500 MW NEW NEYVELI THERMAL POWER STATION (NNTPS)  
TITLE

SPECIFICATION :

NUMBER : PE-TS-400/402-507-E001

BIDDER/ VENDOR :

QUALITY PLAN NUMBER PED-507-00-Q-001, R5

SPECIFICATION: TECHNICAL SPECIFICATION FOR TITLE 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			REMARKS
									P	W	V	
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	-	-	
<b>BHEL</b>			<b>PARTICULARS</b>		<b>BIDDER/VENDOR</b>							
			<b>NAME</b>									
			<b>SIGNATURE</b>									
			<b>DATE</b>									
									<b>BIDDER'S/VENDORS COMPANY SEAL</b>			



**STANDARD QUALITY PLAN**

CUSTOMER : NNTPS

PROJECT: 2x500 MW NEW NEYVELI THERMAL POWER STATION (NNTPS)

SPECIFICATION :

NUMBER : PE-TS-400/402-507-E001

BIDDER/ VENDOR :

QUALITY PLAN NUMBER PED-507-00-Q-001, R5

SPECIFICATION: TECHNICAL SPECIFICATION FOR TITLE 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	11	
2.4	Core Insulation (XLPE) (No repair permitted)	1. Surface finish 2. Eccentricity # 3. Thickness of Insulation 4. Dia over insulation 5. Test on XLPE (Tensile & Elongation, Hot Set & Ageing Test) 6. Spark test or water immersion test (applicable for LT XLPE cables only)	MA CR CR MA MA CR	Visual Measurement Measurement Measurement Tests Electrical	100% Sample -do- -do- -do- 100%	- IS 7098 /Appd. Datasheet BHEL specn./Apprd. Data Sheet/ IS:7098 -do- -do- Mnfr's Std	-do- IS 7098 /Appd. Datasheet BHEL specn./Apprd. Data Sheet/ IS:7098 -do- -do- Mnfr's Std	Log Book Log Book Inspection Report -do- -do- Log Book	2 2 2 2 2 2	- - - - - -	1 1 - - 1 1	# To be checked at starting & finish end of Extruded Length
2.5	Insulation Screening, (Non Metallic & Metallic )	1. Surface finish 2. Thickness 3 Overlap of Tape Band 4 Tightness of Tape Band	MA MA MA MA	Visual -do- Measurement Visual	Sample -do- -do- -do-	- BHEL Spec./ data sheet BHEL Spec./ data sheet Plant Std.	Free from bulging burnt particles lumps, cuts & Scratches. BHEL Spec./ data sheet BHEL Spec./ data sheet Plant Std.	Log Book -do- -do- -do-	2 2 2 2	- - - -	- - - -	
<b>BHEL</b>			<b>PARTICULARS</b>			<b>BIDDER/VENDOR</b>						
			<b>NAME</b>									
			<b>SIGNATURE</b>									
			<b>DATE</b>						<b>BIDDER'S/VENDORS COMPANY SEAL</b>			



**STANDARD QUALITY PLAN**

CUSTOMER : NNTPS

PROJECT: 2x500 MW NEW NEYVELI THERMAL POWER STATION (NNTPS)

SPECIFICATION :

BIDDER/ VENDOR :

QUALITY PLAN NUMBER PED-507-00-Q-001, R5

NUMBER : PE-TS-400/402-507-E001

SHEET 4 OF 8

SYSTEM

ITEM XLPE Power Cables

SPECIFICATION: TECHNICAL SPECIFICATION FOR TITLE 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			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
<b>BHEL</b>			<b>PARTICULARS</b>			<b>BIDDER/VENDOR</b>						
			<b>NAME</b>									
			<b>SIGNATURE</b>									
			<b>DATE</b>									<b>BIDDER'S/VENDORS COMPANY SEAL</b>



**STANDARD QUALITY PLAN**

CUSTOMER : NNTPS

PROJECT: 2x500 MW NEW NEYVELI THERMAL POWER STATION (NNTPS)  
TITLE

SPECIFICATION :

NUMBER : PE-TS-400/402-507-E001

BIDDER/ VENDOR :

QUALITY PLAN NUMBER PED-507-00-Q-001, R5

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			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.10	Finished Cable <b>(INTERNAL)</b>	1. Routine Test #	CR	Elec. & Meas.	100%	IS:7098 & BHEL specn	IS:7098 & BHEL specn	Test Report	2	-	1	
3.0	Final Inspection <b>(EXTERNAL)</b>	1. Finish & Length	MA	Visual, Measurement	(See remark)	BHEL specn. & IS:7098	BHEL Specn./ Free from <b>Porosity</b> , 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 <b>FRLS Tests</b>	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		<b># REFER ANNEXURE TO QAP ENCLOSED</b>


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

		<b>BHEL</b>			<b>PARTICULARS</b>	<b>BIDDER/ VENDOR</b>						
					<b>NAME</b>							
					<b>SIGNATURE</b>							
					<b>DATE</b>							

BIDDER'S/VENDORS COMPANY SEAL

	ANNEXURE TO QAP	CUSTOMER: NNTPS	PROJECT TITLE: 2x500 MW NEW NEYVELI THERMAL POWER STATION (NNTPS)	SPECIFICATION NUMBER: PE-TS-400/402-507-E001
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PED-507-00-Q-001, R5	SPECIFICATION TITLE: TECHNICAL SPEC. FOR HT XLPE POWER CABLES
	Sheet  6 OF 8	SYSTEM	ITEM: XLPE POWER CABLES	DOC. NO.

## TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS

### A. Type Test Conduction:

- Tests for which "T" is indicated in the 'Test Conduction Required As' column below shall be conducted as Type Test.
- Sampling:  
Type test to be conducted on 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:

- Tests for which "A" is indicated in the 'Test Conduction Required As' column below shall be conducted as Acceptance tests.
- Sampling:  
Sampling for acceptance tests shall be as per Appendix-A (Clause 18.2.1) of IS: 7098 Part-II.


### C. Routine Test Conduction:

- 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	<b>Internal in process Test Report to be furnished for acceptance test</b>
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	

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

	<b>ANNEXURE TO QAP</b>	CUSTOMER: NNTPS	<b>PROJECT TITLE: 2x500 MW NEW NEYVELI THERMAL POWER STATION (NNTPS)</b>	SPECIFICATION NUMBER: PE-TS-400/402-507-E001
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PED-507-00-Q-001, R5	SPECIFICATION TITLE: TECHNICAL SPEC. FOR HT XLPE POWER CABLES
	Sheet  7 OF 8	SYSTEM	ITEM: XLPE POWER CABLES	DOC. NO.

<u>S. No.</u>	<u>TEST</u>	<u>APPLICABLE FOR</u>	<u>TEST CONDUCTION REQUIRED AS</u>	<u>REMARKS</u>
IX.	Wrapping Test	For Aluminium wires only	A	
<b>3.0</b>	<b><u>Physical Tests for XLPE Insulation &amp; PVC sheath</u></b>			
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	
<b>4.0</b>	<b><u>FRLS Tests</u></b>			
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	
<b>5.0</b>	<b><u>Flammability Tests</u></b>			
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

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

	<b>ANNEXURE TO QAP</b>	CUSTOMER: NNTPS	<b>PROJECT TITLE: 2x500 MW NEW NEYVELI THERMAL POWER STATION (NNTPS)</b>	SPECIFICATION NUMBER: PE-TS-400/402-507-E001
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PED-507-00-Q-001, R5	SPECIFICATION TITLE: TECHNICAL SPEC. FOR HT XLPE POWER CABLES
	Sheet   8 OF 8	SYSTEM	ITEM: XLPE POWER CABLES	DOC. NO.

<u>S. No.</u>	<u>TEST</u>	<u>APPLICABLE FOR</u>	<u>TEST CONDUCTION REQUIRED AS</u>	<u>REMARKS</u>
<b>6.0</b>	<b><u>Electrical Tests</u></b>			
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	
<b>7.0</b>	<b><u>Special Tests</u></b>			
a)	UV Radiation test as per BS EN ISO 4892-2	For PVC outer sheath	A**	Shall be conducted on one sample for entire contract. Duration of UV Radiation test shall be 14 Days
b)	<u>Anti-rodent and Termite Repulsion test</u>	For PVC outer and inner sheath only	A#	Shall be conducted on one sample only/ lot
c)	<u>Anti-Fungal Test</u>	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.

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