

NEYVELI LIGNITE CORPORATION LIMITED

**2x500 MW NEYVELI NEW TPS
(FOR SG & TG PACKAGE)**

**TECHNICAL SPECIFICATION FOR
LT CONTROL CABLES**

DOC. NO. PE-TS-400-507-E003

REVISION 0

VOLUME II



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



2x500 MW NEYVELI NEW THERMAL
POWER STATION (NNTPS) At
NEYVELI, TAMIL NADU, INDIA

SPECIFICATION NO. PE-TS-400-507-E003

VOLUME II B

SECTION

TECHNICAL SPECIFICATION FOR
LT CONTROL CABLES

REVISION 0

DATE: 25.08.2014

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TOTAL NO. OF SHEETS		= 33

**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')



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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"), with bidder's signature and company stamp.
 - 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, data Sheets, write-up, drawing, 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, notes etc. from those given in Annexure-A to Section-C of specification [Bill Of Quantities] shall not be considered (i.e., technical description, quantities, notes etc. 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 vendor 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.



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VOLUME II-B

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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 site of **LT CONTROL CABLES** as mentioned in different sections of this specification for 2X500 MW NEYVELI NEW 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 bidders shall be responsible for and governed by all requirements stipulated hereinafter.
- 4.0 Requirements of the specification including the QP shall be agreed upon for total compliance by bidders without any deviations.
- 5.0 The documents shall be in English language and MKS system of units.



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VOLUME II-B

SECTION A

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SECTION-B

PROJECT INFORMATION



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 |





- 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 LT control cables conforming to this specification as detailed below.
- 1.2 General technical requirements of the cables are indicated in Section-D and Data sheet-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 Data sheet-A shall prevail in case of any conflict between the stipulations of Section-C, Data sheet-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 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) "The type tests are required to be conducted as indicated in Annexure to QAP (enclosed with quality plan) 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	Cl. no. may be read as 2.4.1 c
3	4.1	Two signed and stamped copies of the following shall be furnished by all bidders as technical offer: (i) Unpriced Price Schedule (Annexure-A of Section-C: BOQ, as enclosed with the specification) with bidder's signature and company stamp. (ii) A copy of "Instructions 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. <u>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.</u>



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3.1.2 Quality/ Inspection:

S. No.	Reference Clause No. of Section D (if any)	Specific Requirement/ Change
1	Nil	Nil

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 Standard Quality Plan no. PE-QP-999-507-E003, R0

3.1.5 The list and schedule of deliverables to be submitted by successful bidder shall be as Annexure- B.

3.1.6 Document distribution schedule for the project shall be as per Annexure-C.

3.17 A label shall be securely attached to each end of reel indicating the purchaser's order no, owner's identification mark " NNTPS", length, type,, conductor, voltage grade , conductor size, and number of cores of the and no. of cores. A tag containing the same information shall be attached to the leading end of the cable inside. An arrow and necessary instruction shall be marked on the drum indicating the direction in which it should be rolled. Drum number are to be indicated on the cable drum.

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS- 400-507-E003	
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ANNEXURE-A1
BOQ CUM PRICE SCHEDULE - SG PACKAGE


(A) MAIN SUPPLY

1.1 kV control cables with stranded plain annealed copper conductor, PVC Type-A insulation, core identification by colour coding (upto five cores)/ number marking (more than five cores), distinct extruded inner sheath of PVC type ST1 material with FRLS properties, GS round wire armour as per IS:3975 (where applicable), and extruded PVC Type ST1 outer sheath with FRLS properties, generally conforming to IS:1554 (Part-1) and BHEL specification.

S. NO.	ITEM CODE	Cable Size (No. of cores x Cross section Area (sq.mm))	Order Quantity (meters)	LOT-1 QUANTIT Y	Drum length (meters)	Unit price (Ex-works) Rs.	Total price (Ex-works) Rs.
A1.	507-30015-A	3C - 1.5- ARMoured	60000	42000	1000		
A2.	507-30017-A	3C - 2.5- ARMoured	43000	30000	1000		
A3.	507-30019-A	5C - 1.5- ARMoured	67000	47000	1000		
A4	507-30021-A	5C - 2.5- ARMoured	14000	10000	1000		
A5	507-30023-A	5C - 4- ARMoured	7000	5000	1000		
A6	507-30045-A	10C - 1.5- ARMoured	17000	12000	1000		
A7	507-30001-A	12C - 1.5- ARMoured	6000	4000	1000		

Notes :

- Quantities indicated above for S. No. (A) shall be known as Order Quantities. The variation in quantities of all sizes for Main item (A) put together shall be limited to (-) 30% to (+) 30% of the total contract value derived on the basis of the Ordered quantities of main item (A).
- The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ-Cum-Price Schedule enclosed with this specification. The unit prices shall apply for adjustment of variation in quantity as stipulated above.
- 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.
- Overall tolerance on total dispatched quantity of each size shall be (-) 2% and (+) 0% except where the total ordered quantity is one single drum length of 1000m, in which case it shall be -5% / +0%. Cables consumed for testing and inspection shall be to bidder's account.
- The standard drum length shall be 1000 meters. Tolerance on individual drum length shall be $\pm 5\%$.
- For each individual cable size, one short length of not less than 200m may be accepted only in the final drum length to complete the supply (except where the total ordered quantity is one single drum length of 1000m). The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).
- 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 without any price implication.
- Bidder shall indicate unit price of cables inclusive of type test charges. No separate Type Test charges are to be quoted by bidder.
- Bidder shall quote for all sizes/types of cables as per specification, failing which their offer shall be rejected.
- Delivery schedule of LOT-1 and subsequent lots shall be as per NIT

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ANNEXURE-A2
BOQ CUM PRICE SCHEDULE - TG PACKAGE


(A) MAIN SUPPLY

1.1 kV control cables with stranded plain annealed copper conductor, PVC Type-A insulation, core identification by colour coding (upto five cores)/ number marking (more than five cores), distinct extruded inner sheath of PVC type ST1 material with FRLS properties, GS round wire armour as per IS:3975 (where applicable), and extruded PVC Type ST1 outer sheath with FRLS properties, generally conforming to IS:1554 (Part-1) and BHEL specification.

S. NO.	ITEM CODE	Cable Size (No. of cores x Cross section Area (sq.mm))	Order Quantity (meters)	LOT-1 QUANTITY	Drum length (meters)	Unit price (Ex-works) Rs.	Total price (Ex-works) Rs.
A1.	507-30015-A	3C - 1.5- ARMoured	68000	48000	1000		
A2.	507-30017-A	3C - 2.5- ARMoured	34000	24000	1000		
A3.	507-30019-A	5C - 1.5- ARMoured	54000	39000	1000		
A4	507-30021-A	5C - 2.5- ARMoured	4000	3000	1000		
A5	507-30045-A	10C - 1.5- ARMoured	10000	7000	1000		
A6	507-30001-A	12C - 1.5- ARMoured	4000	3000	1000		

Notes :

- Quantities indicated above for S. No. (A) shall be known as Order Quantities. The variation in quantities of all sizes for Main item (A) put together shall be limited to (-) 30% to (+) 30% of the total contract value derived on the basis of the Ordered quantities of main item (A).
- The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ-Cum-Price Schedule enclosed with this specification. The unit prices shall apply for adjustment of variation in quantity as stipulated above.
- 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.
- Overall tolerance on total dispatched quantity of each size shall be (-) 2% and (+) 0% except where the total ordered quantity is one single drum length of 1000m, in which case it shall be -5% / +0%. Cables consumed for testing and inspection shall be to bidder's account.
- The standard drum length shall be 1000 meters. Tolerance on individual drum length shall be $\pm 5\%$.
- For each individual cable size, one short length of not less than 200m may be accepted only in the final drum length to complete the supply (except where the total ordered quantity is one single drum length of 1000m). The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).
- 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 without any price implication.
- Bidder shall indicate unit price of cables inclusive of type test charges. No separate Type Test charges are to be quoted by bidder.
- Bidder shall quote for all sizes/types of cables as per specification, failing which their offer shall be rejected.
- Delivery schedule of LOT-1 and subsequent lots shall be as per NIT

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ANNEXURE-B

LIST OF STANDARD DELIVERABLES

LIST OF STANDARD DELIVERABLES FOR LT CONTROL CABLES TO BE SUBMITTED BY SUCCESSFUL BIDDER

SL. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.	SUBMISSION SCHEDULE
1	Data Sheet for LT Control Cables	PE-V0-400-507-E131	Within Two weeks from the date of LOI
2	Cross-sectional Drawings for LT Control Cables	PE-V0-400-507-E133	--DO--
3	Type Test Procedure for LT Control Cables	PE-V0-400-507-E132	--DO--
4	Quality Plan LT PVC Power & Control Cables	PE-V0-400-507-E915	--DO--
5	Type Test Reports for Tests conducted under this contract	PE-V0-400-507-E134	--DO--



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ANNEXURE-C

DOCUMENTS / DRAWINGS DISTRIBUTION SCHEDULE

DRAWING/DOCUMENT DISTRIBUTION LIST

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

SI		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)	



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SECTION - 'D'

STANDARD TECHNICAL SPECIFICATION



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1.0 TECHNICAL REQUIREMENTS

1.1 Technical requirements for 1.1kV PVC control cables shall be as indicated in this section, in addition to those specified in Section- C and Data sheet-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. Minor changes in Quality Plan (which shall be to customer approval during contract stage) shall be without any commercial implication.

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 subject to BHEL/ customer approval.

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 Annexure to QAP (enclosed with quality plan) carried out in within last five years of the date of bid opening. These reports should be for the tests conducted either in government approved third party laboratory or witnessed by client (such as major utilities/ industries) on identical/ similar cables to those ordered under this contract.
- 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. BHEL reserves the right to witness the testing for which due notice shall be given by the vendor.
- d. Irrespective of the bidder furnishing type test report as indicated above, BHEL may get type tests as indicated in Annexure to QAP (enclosed with quality plan) on the lots offered for inspection (conduction of type tests shall be witnessed by BHEL). 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.
- b. Acceptance tests shall be conducted on every lot offered for inspection as per details indicated in Annexure to QAP (enclosed with quality plan).
- c. Cost of conduction of routine and acceptance testing shall be deemed to have been included in the quoted supply prices.

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



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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 signed and stamped copy of following:

- a. Section B (Project Information)
- b. Section C (Specific Technical Requirements)
- c. Annexure-A to Section-C, (Bill of Quantities)
- d. Data Sheet-A


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. Data sheet C and derating factors 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.


		QUALITY PLAN SHEET 1 OF 8			CUSTOMER : NEYVELI LIGNITE CORPORATION LTD.		PROJECT TITLE 2X500 MW NEYVELI NEW TPS		SPECIFICATION : NUMBER : PE-TS-400-507-E003			
					BIDDER/ VENDOR :		QUALITY PLAN NUMBER PE-QP-999-507-E003. R-0		SPECIFICATION TITLE			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY VOLUME III			
1	2	3	4	5	6	7	8	9	P	W	V	REMARKS
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 MATERIAL											
1.1	Copper Rods/ Aluminum Rod/ Wires (Al:- For Conductor & Armour) (Cu:- For Conductor)	GENERAL : 1. Physical properties 2. Elec.Properties SPECIFIC CHECKS : a) Make b) Grade c) Resistivity	MA	Physical Tests	Sample per Batch	IS 1554 Pt-1/ IS 613/ IS 5082 & Approved datasheet	IS 1554 Pt-1/ IS 613/ IS 5082 & Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
			MA	Electrical Tests	Sample per Batch	IS 1554 Pt-1/ IS 613/ IS 5082 & Approved datasheet	IS 1554 Pt-1/ IS 613/ IS 5082 & Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
			MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
			MA	-do-	-do-	IS 613/IS 5082 & Approved datasheet	IS 613/ IS 5082 & Approved datasheet	Log book/ Test Cert.	3/2	-	1	
			MA	Electrical Tests	Manufacturer std.	IS 613/ IS 5082	IS 613/ IS 5082	Log book/ Test Cert.	3/2	-	1	
1.2	PVC Compound (for insulation)	GENERAL : 1. Physical properties 2. Elec.Properties SPECIFIC CHECKS : a) Make b) Type/ Grade c) Shelf life/ Storage condition	MA	Physical Tests	Sample per batch	IS 1554 Pt-1/ IS 5831 & Approved datasheet	IS 1554 Pt-1/ IS 5831 & Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
			MA	Electrical Tests	Sample per batch	IS 1554 Pt-1/ IS 5831 & Approved datasheet	IS 1554 Pt-1/ IS 5831 & Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
			MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
			MA	Verify	100%	Mfrs std./ Approved datasheet	Mfrs std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1	
			MA	Verify	100%	Compound Manufacturer std.	Compound Manufacturer std.	Log book/ Test Cert.	3/2	-	1	
1.3	Fillers (as applicable)	1. Make 2. Flame retardant & moisture resistant. (as applicable)	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
			CR	Chemical/ Environ.	100%	Approved datasheet	Approved datasheet	Log book/ Test Cert.	3/2	-	2	(Fillers material chosen shall be compatible with the temperature rating of the cable and shall have no deleterious effect on any other component of cable)
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN			CUSTOMER : NEYVELI LIGNITE CORPORATION LTD.			PROJECT TITLE 2X500 MW NEYVELI NEW TPS			SPECIFICATION : NUMBER : PE-TS-400-507-E003		
SHEET 2 OF 8		BIDDER/ : VENDOR			QUALITY PLAN NUMBER PE-QP-999-507-E003, R-0			SPECIFICATION : TITLE					
SYSTEM		ITEM :HRPVC/ PVC POWER & CONTROL CABLE			SECTION			VOLUME III					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS 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	
1.4	Galvanised steel wire/strip for Armour (if applicable)	GENERAL : 1. Make 2. Dimension 3. Phy.and Elec. Properties 4.Galvanization Quality	MA	Verify	Manufacturer std.	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	* Sample from each size/ Batch/ Lot	
			MA	Measurement	Manufacturer std.	IS 1554 Pt-1/ IS 3975	IS 1554 Pt-1/ IS 3975	Log book/ Test Cert.	3/2	-	2		
			MA	Physical & Electrical Tests	Sample*	IS 1554 Pt-1/ IS 3975	IS 1554 Pt-1/ IS 3975	Log book/ Test Cert.	3/2	-	2		
			MA	Galv.Tests	Sample*	IS 1554 Pt-1/ IS 3975	IS 1554 Pt-1/ IS 3975	Log book/ Test Cert.	3/2	-	2		
1.5	PVC compound for Sheath	GENERAL : 1. Physical properties 2. Elec.Properties 3. FRLS Properties (as applicable) SPECIFIC CHECKS : a) Make b) Type/ Grade c) Shelf life/ Storage condition	MA	Physical Tests	Sample per batch	IS 1554 Pt-1/ IS 5831 & Approved datasheet	IS 1554 Pt-1/ IS 5831 & Approved datasheet	Log book/ Test Cert.	3/2	-	1/2		
			MA	Electrical Tests	Sample per batch	IS 1554 Pt-1/ IS 5831	IS 1554 Pt-1/ IS 5831	Log book/ Test Cert.	3/2	-	1/2		
			CR	Chemical/ Environ.	Sample per batch	IS 1554 Pt-1/ IS 5831 & Approved datasheet	IS 1554 Pt-1/ IS 5831 & Approved datasheet	Log book/ Test Cert.	3/2	-	1/2		
			MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1		
			MA	Verify	100%	IS 1554 Pt-1/ IS 5831 & Approved datasheet	IS 1554 Pt-1/ IS 5831 & Approved datasheet	Log book/ Test Cert.	3/2	-	1		
			MA	Verify	100%	Compound Manufacturer std.	Compound Manufacturer std.	Log book/ Test Cert.	3/2	-	1		
1.6	Wooden drums	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		
1.7	Steel drums #	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.	Mfr's Plant Std.	Mfr's Plant Std.	Mfr's Plant Std.	Log book/ Test Cert.	3/2	-	1		
2.0	IN PROCESS												
2.1	Wire Drawing & Annealing.	1. Size	MA	Dimensional	Plant Mfg. Std.	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	Log Book	2	-	1		
		2. Surface finish	MA	Visual	Plant Mfg. Std.	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	1		
		3. % of Elongation	MA	Mechanical	Plant Mfg. Std.	IS 1554 Pt-1./ IS 8130	IS 1554 Pt-1./ IS 8130	Log Book	2	-	1		
2.2	Tinning (For Conductor)	1. Size	MA	Dimensional	Plant Mfg. Std.	Approved datasheet	Approved datasheet	Log Book	2	-	1	(Applicable only for tin-coated copper conductor)	
		2. Chemical test for Tinning (if applicable)	CR	Chemical Test	Sample	IS 1554 Pt-1/ IS:8130 & Mfrs Std	IS 1554 Pt-1/ IS:8130 & Mfrs Std	Log Book	2	-	-		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN			CUSTOMER : NEVELI LIGNITE CORPORATION LTD.			PROJECT TITLE 2X500 MW NEVELI NEW TPS			SPECIFICATION : NUMBER : PE-TS-400-507-E003		
SHEET 3 OF 8		CHARACTERISTICS CHECK			BIDDER/ VENDOR SYSTEM			QUALITY PLAN NUMBER PE-QP-999-507-E003, R-0			SPECIFICATION : TITLE		
SL. NO.	COMPONENT/OPERATION	3	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION			VOLUME III REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
2.3	Stranding of wires	1. No.of wires	MA	Counting	Plant Mfg. Std.	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	Log Book	2	-	-		
		2. Resistance	CR	Electrical	Plant Mfg. Std.	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	Log Book	2	-	-		
		3. Sequence, lay length & Direction	MA	Visual, Measurement	Sample	IS 1554 Pt-1/ Mfrs standard	IS 1554 Pt-1/ Mfrs standard	Log Book	2	-	-		
		4. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-		
		5.Dimension	MA	Measurement	One Sample of each size/ lot	IS 1554 Pt-1/ IS 8130/Appd. Data Sheet	IS 1554 Pt-1/ IS 8130/Appd. Data Sheet	Log Book	2	-	-		
2.4	Core Insulation (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	# To be checked at starting & finish end of Extruded Length	
		2 Insulation thickness	CR	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Appd.data sheet	IS 1554 Pt-1 & Appd.data sheet	Log Book	2	-	-		
		3. Concentricity #	CR	Measurement	One Sample of each size/ lot	Mfrs Std/ IS 1554 Pt-1/ Approved Data Sheet	Mfrs Std/ IS 1554 Pt-1/ Approved Data Sheet	Log Book	2	-	1		
		4 Dia over insulation	MA	Measurement	One Sample of each size/ lot	IS 1554 Pt-1	IS 1554 Pt-1	Log Book	2	-	-		
		5. Core identification	MA	Visual	100%	IS 1554 Pt-1 & Appd. Data Sheet	IS 1554 Pt-1 & Appd. Data Sheet	Log Book	2	-	-		
		6. Tensile Strength & % Elongation	MA	Mechanical	100%	IS 1554 Pt-1/ IS 5831	IS 1554 Pt-1/ IS 5831	Log Book	2	-	-		
		7 Spark Test or Water Immersion test	CR	Electrical	100%	Mfr's Std.	Mfr's Std.	Log Book	2	-	1		
2.5	Core Laying	1. Dia over laidup core	MA	Measurement	One Sample of each size/ lot	IS 1554 Pt-1	IS 1554 Pt-1	Log Book	2	-	-		
		2. Sequence of lay, Lay length & direction for laid up core	MA	Visual & Meas.	One Sample of each size/ lot	Mfrs Std	Mfrs Std	Log Book	2	-	-		
		3. Core Identification	MA	Visual	One Sample of each size/ lot	IS 1554 Pt-1 & Appd. Data Sheet	IS 1554 Pt-1 & Appd. Data Sheet	Log Book	2	-	-		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN			CUSTOMER : NEYVELI LIGNITE CORPORATION LTD.			PROJECT TITLE 2X500 MW NEYVELI NEW TPS			SPECIFICATION : NUMBER : PE-TS-400-507-E003		
		BIDDER/ : VENDOR			QUALITY PLAN NUMBER PE-QP-999-507-E003, R-0			SPECIFICATION : TITLE					
SHEET 4 OF 8		SYSTEM			ITEM :HRPVC/ PVC POWER & CONTROL CABLE			SECTION		VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS 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	
2.6	InnerSheath Extrusion (If 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. Sheath thickness	CR	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Approved Data Sheet	IS 1554 Pt-1 & Approved Data Sheet	Log Book	2	-	-		
		3. Dia over inner sheath	MA	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Approved Data Sheet	IS 1554 Pt-1 & Approved Data Sheet	Log Book	2	-	-		
2.7	Armouring (If applicable)	1. No. of wires/Strips	MA	Counting	At the start of the process	IS 1554 Pt-1/ IS 3975	IS 1554 Pt-1/ IS 3975	Log Book	2	-	-		
		2. Lay Direction	MA	Visual	At the start of the process	IS 1554 Pt-1/ IS 3975	IS 1554 Pt-1/ IS 3975	Log Book	2	-	-		
		3. Lay Length	MA	Visual, Meas.	At the start of the process	IS 1554 Pt-1/ IS 3975	IS 1554 Pt-1/ IS 3975	Log Book	2	-	-		
		4. Coverage	MA	Measurement	At the start of the process	IS 1554 Pt-1/ IS 3975 & approved data sheet	IS 1554 Pt-1/ IS 3975 & approved data sheet	Log Book	2	-	-		
		5. Dia over armouring	MA	Measurement	At the start of the process	IS 1554 Pt-1 & Appd. Data Sheet	IS 1554 Pt-1 & Appd. Data Sheet	Log Book	2	-	-		
2.7	Outer Sheath Extrusion	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 1554 Pt-1 & Appd. Data Sheet	IS 1554 Pt-1 & Appd. Data Sheet	Log Book	2	-	-		
		3. Dia over outer sheath	MA	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Appd. Data Sheet	IS 1554 Pt-1 & Appd. Data Sheet	Log Book	2	-	-		
		4. Marking/ Color/ Embossing	MA	Visual	One Sample of each size/ lot	Appd. Data Sheet	Appd. Data Sheet	Log Book	2	-	-	Sequential marking shall be done by printing.	
2.8	Finished Cable (INTERNAL)	1. Routine Test (Refer Note-H)	CR	Electrical Tests & Measurement	100%	IS 1554-I & Appd. Datasheet	IS 1554-I & Appd. Datasheet	Test Report	2	-	1		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN SHEET 5 OF 8			CUSTOMER : NEYVELI LIGNITE CORPORATION LTD. BIDDER/ VENDOR :		PROJECT TITLE 2X500 MW NEYVELI NEW TPS QUALITY PLAN NUMBER PE-QP-999-507-E003, R-0 ITEM :HRPVC/ PVC POWER & CONTROL CABLE		SPECIFICATION : NUMBER : PE-TS-400-507-E003 SPECIFICATION : TITLE SECTION VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS 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
3.0	Final Inspection	1. Finish	MA	Visual	(See remark)	IS 1554 Pt-1/ Appd. Data Sheet	Free from Porosity, Bulging, Burnt particles, lumps, cuts & scratches	Test Report	2	1	-	One drum each for Power & Control cables in Lot.
		2. Length	MA	Measurement	(See remark)	IS 1554 Pt-1/ Appd. Data Sheet	BHEL Spec./ Data Sheet	Test Report	2	1	-	Length of each drum shall be as per tolerance given in the data sheet.
		3. Dimension	MA	Measurement	As per IS	IS 1554 Pt-1/ Appd. Data Sheet	Approved Data Sheet	Test Report	2	1	-	
		4. Armouring - Coverage No.of Wires/Strips	MA	Visual & Meas.	As per IS	IS 1554 Pt-1/ Appd. Data Sheet	Appd.Data Sheet	Test Report	2	1	-	
		4. Marking/Colour Coding	MA	Visual	As per IS	IS 1554 Pt-1/ Appd. Data Sheet	IS 1554 Pt-1/ Appd. Data Sheet	Test Report	2	1	-	
		5. Acceptance Tests (Refer Note-H)	CR	Phy & Elect. Tests FRLS tests	As per IS	IS 1554 Pt-1/ Appd. Data Sheet	IS 1554 Pt-1/ Appd. Data Sheet	Test Report	2	1	-	
		6. Type & FRLS Tests (Refer Note-H)	CR	Phy & Elect. Tests FRLS Tests	Sample#	BHEL Specn. Apprd.Data Sheet	BHEL Specn. Apprd.Data Sheet	Test Report	2	1	-	Refer Annexure to QAP for Type & Acceptance Tests
4.0	Packing	Sealing Identification	MA	Visual	100%	As per IS	As per IS	Test Report	2	1	-	
NOTES:- (A) JOINTS IN WIRE SHALL BE AS PERMITTED BY MFRS STANDARD. 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 'SAMPLE' & NOT DEFINED IN QP, THE SAME SHALL BE AS PER VENDORS SAMPLING PLAN. (G) VENDOR SHALL FURNISH COMPLIANCE CERTIFICATE TO THE INSPECTION AGENCY CONFIRMING THE PACKING AS PER IS/ BHEL SPECIFICATION. (H) FOR LISTS OF ROUTINE TESTS , ACCEPTANCE TESTS & TYPE TESTS REFER ANNEXURE TO QAP. LEGEND : P : PERFORMER W: WITNESSER V: VERIFIER 1- BHEL 2-VENDOR 3- SUB VENDOR CHP: CUSTOMER HOLD POINT WHICH WILL BE DECIDED AT CONTRACT STAGE.												
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

	ANNEXURE TO QAP	CUSTOMER: NEYVELI LIGNITE CORPORATION LTD.	PROJECT TITLE: 2X500 MW NEYVELI NEW TPS	SPECIFICATION NUMBER:PE-TS-400-507-E003
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R0	SPECIFICATION TITLE: DOC. NO.
SHEET OF 8	SYSTEM	ITEM: HRPVC/ PVC POWER & CONTROL CABLE		

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 shall be conducted & witnessed on one size (sample) of every lot of control cable.
 - Type test shall be conducted & witnessed on one size (sample) per type (Cu/ Al conductor) of every lot for power cable.
 - Flammability Test to be conducted only on one sample/ lot.

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-B of IS: 1554 Part-I.
 - Flammability Test to be conducted only on one sample/ lot.


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. Tests listed in S.No-7.0 & 8.0 shall be conducted only on one size (sample) of every lot.


S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
1.0	Tests for Conductor				
I.	Annealing test	For copper conductor	T, A	IS 10810 Pt 1	<i>In process records shall be furnished to inspector at the time of inspection.</i>
II.	Tensile Test	For aluminium conductor	T, A	IS 10810 Pt 2	
III.	Wrapping test	For aluminium conductor	T, A	IS 10810 Pt 3	
IV.	Resistance test	For copper/ aluminium conductor	T, A, R	IS 10810 Pt 5	
2.0	Tests for Round Steel Wires/Strips				
I.	Measurement of dimensions	For GS Round wire/Strip	T, A	IS 10810 Pt 36	
II.	Tensile test	For GS Round wire/Strip	T, A	IS 10810 Pt 37	
III.	Elongation test	For GS Round wire/Strip	T, A	IS 10810 Pt 37	
IV.	Torsion test	For GS Round wire	T, A	IS 10810 Pt 38	

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

	ANNEXURE TO QAP	CUSTOMER: NEYVELI LIGNITE CORPORATION LTD.	PROJECT TITLE: 2X500 MW NEYVELI NEW TPS	SPECIFICATION NUMBER:PE-TS-400-507-E003
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R0	SPECIFICATION TITLE:
	SHEET OF 8	SYSTEM	ITEM: HRPVC/ PVC POWER & CONTROL CABLE	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
V.	Winding test	For GS Formed wire	T, A	IS 10810 Pt 39	
VI.	Resistivity test	For GS wire/Strip	T, A	IS 10810 Pt 42	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip	T, A	IS 10810 Pt 40	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip	T, A	IS 10810 Pt 41	
3.0	<u>Physical Tests for PVC Insulation & PVC sheath</u>				
I.	Test for thickness	Applicable for PVC insulation, PVC inner sheath & PVC outer sheath	T, A	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for PVC insulation & PVC outer sheath	T, A	IS 10810 Pt 7	
III.	Ageing in air oven	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 10	
V.	Hot deformation test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 15	
VI.	Heat shock test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 14	
VII.	Shrinkage test	For PVC insulation & PVC outer sheath only	T	IS 10810 Pt 12	
VIII.	Thermal stability test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 60	
4.0	<u>Improved Fire performance (FR-LSH) Tests</u>				
I.	Oxygen index test	For PVC outer sheath only ^(S)	T, A	ASTMD 2863	
II.	Smoke density test	For PVC outer sheath only ^(S)	T, A	ASTM D2843	
III.	Acid gas generation test	For PVC outer sheath only ^(S)	T, A	IEC-754-1	
IV.	Temperature Index Test	For PVC outer sheath only ^(S)	T	ASTMD 2863	
5.0	<u>Flammability Tests</u>				
I.	Flammability test for single cable	For complete cable	T, A	IS: 1554 Part-I (As per category C2)/ IEC-60332 (Part-1)	Project Specific (As indicated in Datasheet-A)
II.	Flammability test for bunched cables	For complete cable	T	IS: 1554 Part-1 (As per category C2)/ IEC-60332 Part-3-23, Category-B / Category-A	
III.	Swedish chimney test	For complete cable	A	SEN SS 424 1475	

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

	ANNEXURE TO QAP	CUSTOMER: NEYVELI LIGNITE CORPORATION LTD.	PROJECT TITLE: 2X500 MW NEYVELI NEW TPS	SPECIFICATION NUMBER:PE-TS-400-507-E003
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R0	SPECIFICATION TITLE:
	SHEET OF 8	SYSTEM	ITEM: HRPVC/ PVC POWER & CONTROL CABLE	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
IV.	Flammability test	For complete cable	A	IEEE:383	
6.0	Electrical Tests				
I.	High Voltage Test (Water Immersion test)	On Cores	T	IS 10810 Pt 45	
II.	High Voltage Test at Room Temperature	For complete cable	T, A, R	IS 10810 Pt 45	
III.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T, A	IS 10810 Pt 43	
7.0	Anti-Rodent and Termite Repulsion test	For PVC outer sheath only	A	--	Project Specific (As indicated in Datasheet-A)
8.0	Anti Fungal Test	For PVC outer sheath only	A	--	Project Specific (As indicated in Datasheet-A)
9.0	Special Tests^(*)				
I.	Hydrolytic Stability	For complete cable	**	ASTM D 3137:81	Project Specific (As indicated in Datasheet-A)
II.	Ultraviolet Test	For complete cable	**	BS EN ISO 4892	

\$:- If inner sheath is also FRLS, then these tests will be applicable for inner sheath as well.

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

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



2x500 MW NEYVELI NEW THERMAL
POWER STATION (NNTPS) At
NEYVELI, TAMIL NADU, INDIA

SPECIFICATION NO. PE-TS- 400-507-E003

VOLUME II B

SECTION – C


TECHNICAL SPECIFICATION FOR
LT CONTROL CABLES

REVISION 0

DATE: 25.08.2014

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DATA SHEET - A

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DATA SHEET A

I. SPECIFIC TECHNICAL REQUIREMENTS

- 1.0 Type of cable : FRLS
- 2.0 Standard applicable : IS: 1554 Part-I (in general)
- 3.0 Voltage designation of cables : 1.1 kV
- 4.0 Number of cores and cross section area : As per BOQ, Annexure-A of Section-C
- 5.0 **CONDUCTOR**
- a) Material : Copper
- b) Grade, shape & class : Stranded, non-compacted circular, high conductivity annealed plain copper
- c) Strands : (Min.) 7
- d) Applicable standard : IS: 8130
- 6.0 **INSULATION**
- a) Material & Standard : PVC, Type A (IS: 5831)
- b) Continuous withstand temperature : 70° C
- c) Short circuit withstand temperature : 160° C
- d) Method of Application : By extrusion (Sleeve extrusion not permitted)
- 7.0 **IDENTIFICATION OF CORES**
- a) Control cables up to 5 core : Colour coded as per IS: 1554 (Part-I)
- b) Control cables above 5 cores : By numbering as per IS: 1554 (Part-I)
Insulation to have black colour.
- 8.0 **INNER SHEATH**
- a) Material & Standard : PVC Type ST 1 (IS: 5831)
- b) Colour : Black
- c) Whether FRLS : YES



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- d) Fillers : Acceptable
- e) Material of fillers : Same as innersheath.
- f) Method of application:
- i) With fillers : Pressure / Vacuum Extruded
- ii) Without fillers : Pressure Extruded.

9.0 **ARMOUR**

- a) Material : Galvanised steel round wire
Conforming to IS: 3975
- b) Minimum coverage : 90%
- c) Gap between armour wires : Shall not exceed one armour wire space
(No cross over/ overriding)
- d) Breaking load of joint : 95% of normal armour

10.0 **OUTER SHEATH**

- a) Material & Standard : PVC Type ST 1 (IS: 5831)
- b) Application : Extruded
- c) Colour : Black
- d) Whether FRLS : YES
- e) Marking : Manufacturer's name or trade mark, voltage
grade, Year of manufacture, Type of
insulation, Type of outer sheath e.g. "FRLS"
etc., ISI mark, Nominal cross sectional area of
conductor and number of cores @ 5 metre by
embossing.
However, progressive sequential marking @ 1
metre (by embossing). Customer name i.e.
'NNTPS/BHEL-PEM', size/core type and length
shall also be marked @1m.

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11.0 CHARACTERISTICS OF FRLS SHEATH

- a) Oxygen index (For both C1 & C2) : Min 29 (As per ASTM D 2863) at $27 \pm 2^\circ \text{C}$.
- b) Temperature Index (For both C1 & C2) : Min. 250°C (As per ASTM D 2863) at oxygen index of 21
- c) Acid gas generation (by weight) (For category C2) : Max. 20% (As per IEC-754-1)
- d) Smoke density rating (For category C2) : Max. 60% (As per ASTM D 2843-7)
- e) Flammability Test : Flammability - Cables shall pass test under fire conditions as per IS-10810- Part-53. The finished FRLS cable shall also pass the flammability test as per Swedish chimney test as per SS-4241475 class F3 and Ladder test for flammability as per IEEE-383.
- e) Flame Retardance Test : Flame retardance test on single cable and on bunched cables (for both C1 & C2) - After the test, there should be no visible damages on the test specimen within 300mm from its upper end. After burning has ceased, the cables should be wiped clean and the charred or affected portion should not have reached a height exceeding 2.5 meter above the bottom edge of the burner, measured at the front and rear of the cable assembly.

12.0 ANTI RODENT & TERMITE TEST TO BE PERFORMED: YES

13.0 TOLERANCE ON OUTER DIAMETER

- a) Upto 30 mm O.D. : (+/-) 1.5 mm
- b) Above 30 mm O.D. : (+/-) 5% or (+/-) 3 mm whichever is less.

14.0 MINIMUM BENDING RADIUS : 12 X OD

15.0 SAFE PULLING FORCE : 50N / sq. mm

16.0 CABLE DRUMS

- a) Type & construction : As per IS 10418
- b) Standard drum length : 1000 m (+/-) 5% (as specified in BOQ)



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DATA SHEET C

GUARANTEED TECHNICAL PARTICULARS (TO BE SUBMITTED BY SUCCESSFUL BIDDER)

1.1 Name of manufacturer :

1.2 Place of manufacture :

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

2.1 No. of cores x size :

2.2 Current rating of cable confirms to :

2.3 Short circuit rating of cable confirms to :

2.4 CONDUCTOR

a) Material type & grade :

b) No. & dia of wires in each core : no x mm
before stranding

2.5 PVC INSULATION

a) Type :

b) Minimum & Nominal thickness of insulation : mm

2.6 PVC ST1 INNERSHEATH

a) Thickness (min.) : mm

b) Method of application

1) Multi-core cables

i) with fillers

ii) without fillers : Pressure extruded



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- c) Type of fillers (if used) : PVC type ST1 as per IS 5831
Shape of fillers (if used) :

2.7 ARMOUR

- a) Material :
i) Multi-core cables
b) Size / dimensions :
c) Minimum no. of wires :
d) Maximum resistivity of GS wire :
e) Maximum resistivity of Aluminium round wire :

2.8 PVC ST1 FRLS OUTERSHEATH

- a) Minimum thickness of outer sheath : mm
b) Colour :

2.9 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

2.10 Weight of cable : kg./km

2.11 Dimension of drum : mm

2.12 Shipping weight : kg.