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

TECHNICAL SPECIFICATION FOR 1.1 kV XLPE POWER CABLES

DOC. NO. PE-TS-400-507-E002

REVISION 0

VOLUME II

BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA, INDIA

CONTENTS:

TOTAL NO. OF SHEETS (INCLUDING COVER SHEETS) = 35

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

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

INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. 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

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.

SECTION – A

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 1.1kV XLPE POWER CABLES as mentioned in different sections of this specification for 2x500 MW NEYVELI NEW THERMAL POWER STATION (NNTPS) At NEYVELI, TAMIL NADU, INDIA.

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.

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

1.0 SCOPE OF ENQUIRY

1.1 This enquiry covers the supply of 1.1kV XLPE Power 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 Data Sheet-A 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	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. (iv) Signed-Stamped copy of data sheet A (v) Signed-Stamped copy of Quality plan along with Annexure-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.

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, 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-E002, R0

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

3.16 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 containg 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.

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

ANNEXURE-A1

BOQ CUM PRICE SCHEDULE - SG PACKAGE

(A) MAIN SUPPLY

(1.1) 1.1KV, Al conductor, XLPE insulated, Galvanised steel round wire/ strip armoured for twin and multicore cables (non – magnetic hard drawn aluminium single round wire armoured conforming to H4 grade for single core cables),INNER SHEATH: Extruded FRLS PVC compound conforming to type ST2 of IS: 5831 for multicore cable. Single core cables shall have no inner sheath. OVERALL SHEATH: extruded overall FRLS PVC compound conforming to type ST2 of IS: 5831, black in colour.

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.	507-28154-A	1C - 35	3500	2500	500		
A2.	507-28157-A	1C - 120	500	500	500		
A3	507-28005-A	1C - 400	7500	5000	500		
A4	507-28011-A	2C - 10	1500	1000	500		
A5	507-28017-A	2C - 25	4000	3000	500		
A6	507-28021-A	2C - 50	2000	1500	500		
A7	507-28027-A	2C - 95	500	500	500		
A8	507-28039-A	3C - 10	26000	18000	500		
A9	507-28047-A	3C - 25	11500	7500	500		
A10	507-28049-A	3C - 50	3500	2500	500		
A11	507-28051-A	3C - 95	2000	1500	500		
A12	507-28041-A	3C - 150	1000	1000	500		
A13	507-28045-A	3C - 240	6500	4500	500		
A14	507-28031-A	3.5C - 25	10000	7000	500		
A15	507-28035-A	3.5C - 50	35000	25000	500		
A16	507-28037-A	3.5C - 95	13000	9000	500		

ANNEXURE-A1

BOQ CUM PRICE SCHEDULE

(1.2) 1.1KV, Cu conductor, XLPE insulated, galvanised steel round wire / strip armoured for twin and multicore cables (non – magnetic hard drawn aluminium wire armoured conforming to H4 grade for single core cables). INNER SHEATH: Extruded FRLS PVC compound conforming to type ST2 of IS: 5831 for multicore cable. Single core cables shall have no inner sheath. OVERALL SHEATH: Extruded FRLS PVC compound conforming to type ST2 of IS: 5831, black in colour

S.NO.	ITEM CODE	Cable Size (No. of cores x Cross section Area (sq.mm)	Order Quantity (meters)	LOT-1 Quantity (meters)	Drum length (meters)	Unit price (Ex-works) Rs.	Total price (Ex-works) Rs.
A17.	507-28015-A	2C-2.5	29500	21000	1000		
A18.	507-28043-A	3C-2.5	44500	31000	1000		
A19.	507-28055-A	4C-2.5	8500	6000	1000		

Notes :

1. Quantities indicated above for S. No. (A) & (B) 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).

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

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

4. 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. Standard drum length shall be 500 / 1000metres.Tolerance on individual drum length shall be ±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. The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).

6. 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.

7. Bidder shall indicate unit price of cables inclusive of type test charges. No separate Type Test charges are to be quoted by bidder.

8. Bidder shall qoute for all sizes/types of cables as per specification, failing which their offer shall be rejected.

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

ANNEXURE-A2

BOQ CUM PRICE SCHEDULE - TG PACKAGE

(A) MAIN SUPPLY

(1.1) 1.1KV, Al conductor, XLPE insulated, Galvanised steel round wire/ strip armoured for twin and multicore cables (non – magnetic hard drawn aluminium single round wire armoured conforming to H4 grade for single core cables),INNER SHEATH: Extruded FRLS PVC compound conforming to type ST2 of IS: 5831 for multicore cable. Single core cables shall have no inner sheath. OVERALL SHEATH: extruded overall FRLS PVC compound conforming to type ST2 of IS: 5831, black in colour.

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.	507-28005-A	1C - 400	31500	22000	500		
A2.	507-28007-A	1C - 630	21000	15000	500		
A3	507-28011-A	2C - 10	4500	3000	500		
A4	507-28017-A	2C - 25	2500	1500	500		
A5	507-28021-A	2C - 50	4500	3000	500		
A6	507-28027-A	2C - 95	500	500	500		
A7	507-28013-A	2C - 185	1000	500	500		
A8	507-28039-A	3C - 10	21000	15000	500		
A9	507-28047-A	3C - 25	12500	9500	500		
A10	507-28049-A	3C - 50	9500	7000	500		
A11	507-28051-A	3C - 95	3000	2000	500		
A12	507-28041-A	3C - 150	5500	4000	500		
A13	507-28045-A	3C - 240	8500	6000	500		
A14	507-28031-A	3.5C - 25	8500	6000	500		
A15	507-28035-A	3.5C - 50	1000	500	500		
A16	507-28037-A	3.5C - 95	2500	1500	500		
A17	507-28029-A	3.5C - 185	1000	500	500		

ANNEXURE-A2

BOQ CUM PRICE SCHEDULE

(1.2) 1.1KV, Cu conductor, XLPE insulated, galvanised steel round wire / strip armoured for twin and multicore cables (non – magnetic hard drawn aluminium wire armoured conforming to H4 grade for single core cables). INNER SHEATH: Extruded FRLS PVC compound conforming to type ST2 of IS: 5831 for multicore cable. Single core cables shall have no inner sheath. OVERALL SHEATH: Extruded FRLS PVC compound conforming to type ST2 of IS: 5831, black in colour

S.NO.	ITEM CODE	Cable Size (No. of cores x Cross section Area (sq.mm)	Order Quantity (meters)	LOT-1 Quantity (meters)	Drum length (meters)	Unit price (Ex-works) Rs.	Total price (Ex-works) Rs.
A18.	507-28015-A	2C-2.5	43000	30000	1000		
A19	507-28065-A	2C-6.0	2000	1000	1000		
A20	507-28043-A	3C-2.5	74000	52000	1000		
A21	507-28055-A	4C-2.5	5500	4000	1000		
A22	507-28009-A	1C-630	1000	500	500		

Notes :

1. Quantities indicated above for S. No. (A) & (B) 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).

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

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

4. 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. Standard drum length shall be 500 / 1000metres.Tolerance on individual drum length shall be ±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. The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).

6. 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.

7. Bidder shall indicate unit price of cables inclusive of type test charges. No separate Type Test charges are to be quoted by bidder.

8. Bidder shall qoute for all sizes/types of cables as per specification, failing which their offer shall be rejected.

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

ANNEXURE-B : LIST OF STANDARD DELIVERABLES

LIST OF STANDARD DELIVERABLES FOR 1.1kV XLPE POWER CABLES TO BE SUBMITTED BY SUCCESSFUL BIDDER

SL. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.	SUBMISSION SCHEDULE
1	Data Sheet for 1.1kV XLPE Power Cables	PE-V0-400-507-E601	Within Two weeks from the date of LOI
2	Cross-sectional Drawings for 1.1kV XLPE Power Cables	PE-V0-400-507-E602	--DO--
3	Type Test Procedure for 1.1kV XLPE Power Cables	PE-V0-400-507-E603	--DO--
4	Quality Plan LT XLPE Power Cables	PE-V0-400-507-E604	--DO--
5	Type Test Reports for Tests conducted under this contract	PE-V0-400-507-E605	Within a week of conduction of type tests.

SECTION-D

STANDARD TECHNICAL SPECIFICATION

1.0 TECHNICAL REQUIREMENTS

1.1 Technical requirements for 1.1 kV XLPE 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. 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 the 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 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. 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 conducted as indicated in Datasheet-A and the same shall be 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 Datasheet A.

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

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

3.0 Packing

3.1 Cables shall be supplied in non-returnable heavy construction drums. All wooden parts shall be manufactured from seasoned wood treated with copper napthenates/ zinc napthenates (refer IS: 401). All ferrous parts shall be treated with suitable rust protective finish or coating to avoid rusting during transit and storage. BIS certification mark shall be stamped on each cable drum.

4.0 PROJECT 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) Datasheet- A
e) Quality plan along with Annexure-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. Datasheet 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.

	STANDARD QUALITY PLAN		CUSTOMER :			PROJECT: TITLE			SPECIFICATION NUMBER :				
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E002, **R0**			SPECIFICATION : TITLE				
	SHEET 1 OF 9		SYSTEM			ITEM : LT XLPE Power Cables			SECTION VOLUME III				
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS	
1	2	3	4	5	6	7	8	9	10			11	
Instructions: 1. Cable manufacturer to maintain records to show co-relation of raw materials to finished cables i.e. raw material batch/ lot no. should be traceable to the final cable drum number or batch no. 2. Cable manufacturer to maintain all quality records identified as per all QP stages enumerated below whether it is identified for BHEL verification or witness or not.													
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
1.1	**Aluminium Rods (Conductor/ Armour Wire)**	**GENERAL :** 1. Physical properties	MA	Physical Tests	Sample/ Batch	IS:7098-I,IS:5082, IS:5484, IS:8130 & Appd Datasheet	IS:7098-I,IS: 5082, IS:5484, IS:8130 & Appd Datasheet	Log book/ Test Cert.	3/2	-	1/2		
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2		
		SPECIFIC CHECKS : a) Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1		
		b) Grade	MA	-do-	-do-	IS 8130, IS 5082/ Approved datasheet	IS 8130, IS 5082/ Approved datasheet	-do-	3/2	-	1		
		c) Resistivity	MA	Electrical Tests	Manufacturer std.	IS 8130, IS 5082	IS 8130, IS 5082	-do-	3/2	-	1		
1.2	**XLPE Compound for insulation**	**GENERAL :** 1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-I & Mfs Std./ Approved datasheet	IS 7098-I & Mfs Std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1/2		
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2		
		SPECIFIC CHECKS : a) Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1		
		b) Type/ Grade	MA	-do-	-do-	Mfr. Std/ Approved datasheet	Mfr. Std/ Approved datasheet	-do-	3/2	-	1		
		c) Shelf life/ Storage condition	MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	3/2	-	1		

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

	STANDARD QUALITY PLAN		CUSTOMER :			PROJECT: TITLE			SPECIFICATION NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E002, **R0**			SPECIFICATION : TITLE			
	SHEET 2 OF 9		SYSTEM			ITEM : LT XLPE Power Cables			SECTION			VOLUME III
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
1.3	**PVC Compound (for sheath)**	**GENERAL :**										
		1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-I, IS 5831& Mfr. Std./ Approved datasheet	IS 7098-I, IS 5831& Mfr. Std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	
		3. FRLS Properties (as applicable)	CR	Chemical/ Environ.	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	
		SPECIFIC CHECKS :										
		a) Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		b) Type/ Grade	MA	-do-	-do-	Approved datasheet	Approved datasheet	-do-	3/2	-	1	
		c) Shelf life/ Storage condition	MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	3/2	-	1	
1.4	**Fillers (as applicable)**	1. Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		2. Type/ Grade	MA	-do-	-do-	Approved datasheet	Approved datasheet	-do-	3/2	-	1	(Fillers material chosen shall be compatible with the temerature rating of the cable and shall have no deleterious effect on any other componenet of the cable)

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

BHEL	**STANDARD QUALITY PLAN**		CUSTOMER :			PROJECT: TITLE			SPECIFICATION NUMBER :				
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E002, **R0**			SPECIFICATION : TITLE				
	SHEET 3 OF 9		SYSTEM			ITEM : LT XLPE Power Cables			SECTION			VOLUME III	
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS	
1	2	3	4	5	6	7	8	9	10			11	
1.5	**Galvanised steel wire/strip for Armour (as applicable)**	**GENERAL :**											
		1. Make	MA	Verify	Manufacturer std.	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1		
		2. Dimension	MA	Measurement	-do-	IS 7098-I, IS 3975 & Approved datasheet	IS 7098-I, IS 3975 & Approved datasheet	-do-	3/2	-	2		
		3. Phy.and Elec. Properties	MA	Physical & Electrical Tests	Sample*	-do-	-do-	-do-	3/2	-	2	* Sample from each armour size/ Batch / Lot	
		4.Galvanization Quality	MA	Galv.Tests	-do-	IS 3975 & Mfr. Std.	IS 3975 & Mfr. Std.	-do-	3/2	-	2		
1.6	**Wooden Drum**	1. Phy. & Constructional checks	MA	Visual	Mfr's Plant Std.	IS 10418	IS 10418	Log book/ Test Cert.	3/2	-	1		
		2. Anti termite treatment	MA	Chem.	Mfr's Plant Std.	Mfr's Plant Std.	Mfr's Plant Std.	COC	3/2		1		
1.7	**Steel Drum #**	1. Dimension	MA	Meas.	Mfr's Plant Std.	Mfr's Plant Std.	Mfr's Plant Std.	Log book/ Test Cert.	3/2	-	1	# (If Applicable)	
		2. Surface finish	MA	Meas.	-do-	Surface shall be smooth	Surface shall be smooth	-do-	3/2		1		

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	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	STANDARD QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :				
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E002, **R0**			SPECIFICATION : TITLE				
	SHEET 4 OF 9		SYSTEM			ITEM : LT 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	
2.0	**IN PROCESS**												
2.1	**Wire Drawing**	1. Size	MA	Dimensional	Plant Mfg. Std.	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	Log Book	2	-	1		
		2. Surface finish	MA	Visual	-do-	Surface shall be smooth	Surface shall be smooth	-do-	2	-	1		
		3. % of Elongation	MA	Mechanical	-do-	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	-do-	2	-	1		
2.2	**Stranding of wires**	1. No. of wires	MA	Counting	Plant Mfg. Std.	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	Log Book	2	-	-		
		2. Resistance	CR	Electrical	-do-	-do-	-do-	-do-	2	-	-		
		3. Sequence, lay length & Direction	MA	Visual, Meas.	One Sample of each size/ lot	Mfrs Std. / Appd. Datasheet	Mfrs Std. / Appd. Datasheet	-do-	2	-	-		
		4. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	-do-	2	-	-		
		5. Dimension	MA	Measurement	One Sample of each size/ lot	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	-do-	2	-	-		
2.3	**Core Insulation (XLPE)**												
	(No repair permitted)	1. Surface finish	MA	Visual	100%	Free from bulging, burnt particles, lumps, cuts & scratches	Free from bulging, burnt particles, lumps, cuts & scratches	Log Book	2	-	1		
		2. Eccentricity & Ovality #	CR	Measurement	One Sample of each size/ lot	IS 7098-I & Appd. Datasheet	IS 7098-I & Appd. Datasheet	-do-	2	-	1	*# To be checked at starting & finished end of extruded length.*	
		3. Insulation Thickness	CR	Measurement	-do-	-do-	-do-	-do-	2	-	-		
		4. Dia over insulation	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-		
		5. Tensile Strength & % Elongatio	MA	Mechanical	100%	-do-	-do-	-do-	2	-	-		
		6. Spark Test or Water immersion test	CR	Electrical	100%	Mnfr's Std	Mnfr's Std	-do-	2	-	1		

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

	STANDARD QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E002, **R0**			SPECIFICATION : TITLE			
	SHEET 5 OF 9		SYSTEM			ITEM : LT XLPE Power Cables			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.4	**Core Laying**	1. Dia over laid up core	MA	Measurement	One Sample of each size/ lot	IS 7098-I & Appd. Datasheet	IS 7098-I & Appd. Datasheet	Log Book	2	-	-	
		2. Sequence of lay & direction	MA	Visual & Meas.	-do-	IS 7098-I & Mfr. Std.	IS 7098-I & Mfr. Std.	-do-	2	-	-	
		3. Lay Length	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
2.5	**InnerSheath Extrusion (as applicable)**	1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-	*(Pimple, fish eye, porosity & burnt particles not permitted.)*
		2. Thickness	CR	Measurement	One Sample of each size/ lot	IS 7098-I & Appd. Datasheet	IS 7098-I & Appd. Datasheet	-do-	2	-	-	
		3. Dia over inner sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
2.6	**Armour(as applicable)**	1. No.of wires/Strips	MA	Counting	At the start of the process	IS 7098-I & Appd. Datasheet	IS 7098-I & Appd. Datasheet	Log Book	2	-	-	
		2. Lay length & Direction	MA	Visual & Meas.	-do-	IS 7098-I & Mfr. Std.	IS 7098-I & Mfr. Std.	-do-	2	-	-	
		3. Dia over armouring	MA	Measurement	-do-	IS 7098-I & Appd. Datasheet	IS 7098-I & Appd. Datasheet	-do-	2	-	-	
		4. Coverage	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
2.7	**Outer Sheath Extrusion (No repair permitted)**	1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-	*(Pimple, fish eye, porosity & burnt particles not permitted.)*
		2. Sheath Thickness	CR	Measurement	One Sample of each size/ lot	IS 7098-I & Appd. Datasheet	IS 7098-I & Appd. Datasheet	-do-	2	-	-	
		3. Dia over outer sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
		4. Embossing/ Sequencial Marking	MA	Visual	100%	Approved data sheet	Approved data sheet	-do-	2	-	-	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
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BHEL	**STANDARD QUALITY PLAN**		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E002, **R0**			SPECIFICATION : TITLE			
	SHEET 6 OF 9		SYSTEM			ITEM : LT XLPE Power Cables			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
3.0	**Finished Cable (INTERNAL)**	**1. Routine Test (Refer Note-F)**	CR	Electrical Tests & Measurement	100%	IS 7098-I & Appd. Datasheet	IS 7098-I & Appd. Datasheet	Test Report	2	-	1	
4.0	**Final Inspection (EXTERNAL)**	**1. Finish**	MA	Visual	One drum in each Lot	IS 7098-I & Appd. Datasheet	Free from Porosity, Bulging, Burnt particles,lumps, cuts &	Test Report	2	1	-	
		2. Length	MA	Measurement	-do-	-do-	Approved Data Sheet	-do-	2	1	-	
		3. Dimension	MA	-do-	As per IS	-do-	-do-	-do-	2	1	-	
		4. Armouring - Coverage & No.of Wires/Strips	MA	Visual & Meas.	-do-	-do-	-do-	-do-	2	1	-	
		5. Marking & Colour Coding	MA	Visual	As per IS	-do-	Approved Data Sheet	-do-	2	1	-	
		6. Acceptance Tests (Refer Note-F)	CR	Phy, Elect. Tests & FRLS Tests	-do-	-do-	-do-	-do-	2	1	-	
		7. Type Tests (Refer Note-F)	CR	Physical & Electrical Tests	Sample #	-do-	-do-	-do-	2	1	-	*# Refer Annexure-A to QAP enclsoed*
5.0	**Packing**	**Sealing Identification**	MA	Visual	100%	As per IS	As per IS	-do-	2	1	-	

NOTES:-

(A) JOINTS IN WIRE SHALL BE AS PERMITTED BY **IS** / MANUFACTURER'S STANDARD, VENDOR TO CERTIFY THE SAME.

(B) NO REPAIR OF CORE INSULATION PERMITTED

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

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

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

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

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

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

TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS

A. Type Test Conduction:

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

2. Sampling:
   a) Type test to be conducted on one size/ lot
   b) Flammability Test to be conducted only on one sample/ lot.

B. Acceptance Test Conduction:

1. Tests for which "A" is indicated in the 'Test Conduction Required As' column below shall be conducted as Acceptance tests.

2. Sampling:
   Sampling for acceptance tests shall be as per Appendix-B (Clause 15.2.2) of IS: 7098 Part-I.

3. Flammability Test to be conducted only on one sample/ lot.

C. Routine Test Conduction:

1. Tests for which "R" is indicated in the 'Test Conduction Required As' column below shall be conducted as Routine tests.

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

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
1.0	Tests for Conductor				
I.	Annealing test	For copper conductor only	T, A	IS 10810 Pt 1	*Internal in process Test Report to be furnished for acceptance test*
II.	Tensile test	For aluminium conductor only	T, A	IS 10810 Pt 2	
III.	Wrapping test	For aluminium conductor only	T, A	IS 10810 Pt 3	
IV.	Resistance test	For Al/Cu	T, A, R	IS 10810 Pt 5	
2.0	Tests for Armour Wires/Strips				
I.	Measurement of dimensions	Applicable for Aluminium wire & GS wire/Strip	T,A	IS 10810 Pt 36	
II.	Tensile test	Applicable for Aluminium wire & GS wire/Strip	T, A	IS 10810 Pt 37	
III.	Elongation at break test	Applicable for GS wire/Strip only	T, A	IS 10810 Pt 37	
IV.	Torsion test	For GS round wire only	T, A	IS 10810 Pt 38	
V.	Winding test	For GS strip only	T, A	IS 10810 Pt 39	

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
VI.	Resistivity test	Applicable for Aluminium wire & GS wire	A	IS 10810 Pt 42	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip only	A	IS 10810 Pt 40	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip only	A	IS 10810 Pt 41	
IX.	Wrapping Test	For Aluminium wires only	A	IS 10810 Pt 3	
3.0	Physical Tests for XLPE Insulation & PVC sheath				
I.	Test for thickness	Applicable for XLPE insulation, PVC inner sheath & PVC outer sheath	T, A	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for XLPE insulation & PVC outer sheath			
(a)	Before ageing		T, A	IS 10810 Pt 7	
(b)	After ageing		T, A	IS 10810 Pt 7	
III.	Ageing in air oven	Applicable for XLPE insulation & PVC outer sheath	T	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	For PVC outer sheath only	T	IS 10810 Pt 10	
V.	Hot deformation test	For PVC outer sheath only	T	IS 10810 Pt 15	
VI.	Heat shock test	For PVC outer sheath only	T	IS 10810 Pt 14	
VII.	Shrinkage test	For XLPE insulation & PVC outer sheath only	T	IS 10810 Pt 12	
VIII.	Thermal stability test	For PVC outer sheath only	T	IS 10810 Pt 60	
IX.	Hot set test	For XLPE insulation only	T, A	IS 10810 Pt 30	
X.	Water absorption (gravimetric) test	For XLPE insulation only	T	IS 10810 Pt 33	
4.0	Improved Fire performance (FR-LSH) Tests				
I.	Oxygen index test	For PVC outer sheath only	T, A	IS 10810 Pt 58 / ASTMD 2863	Applicable for Inner Sheath also, if the same is indicated in Datasheet-A
II.	Smoke density test	For PVC outer sheath only	T, A	IS 10810 Pt 63 / ASTMD 2843	
III.	Acid gas generation test	For PVC outer sheath only	T, A	IS 10810 Pt 59 / IEC-754-1	
IV.	Temperature Index Test	For PVC outer sheath only	T,A	IS 10810 Pt 64 / ASTMD 2863	
5.0	Flammability Tests				
I.	Flammability test for bunched cables	For complete cable	T,A	IS 10810 Pt 62/ IEC-60332 (Part-3-23-Cat-B/Cat-A,	Test & Category applicable as indicated in Datasheet-A
II.	Flammability test for single cable	For complete cable	T,A	IS: 10810 Pt 61 / IEC:60332 Part-1	
III.	Swedish chimney test	For complete cable	A	SEN SS 424 1475 (Class F3)	
IV.	Flammability test	For complete cable	A	IEEE: 60383	

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
6.0	Electrical Tests				
I.	High Voltage Test	For complete cable	T, A, R	IS 10810 Pt 45	
II.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T, A	IS 10810 Pt 43	
7.0	Anti-rodent and Termite Repulsion test	For PVC outer sheath only	A	--	Test applicable if indicated in Datasheet-A
8.0	Anti-Fungal Test	For PVC outer sheath only	A	--	
9.0	Special Tests				
I.	Hydrolytic Stability Test	For complete cable	**	ASTM D 3137:81	Test applicable if indicated in Datasheet-A
II.	Ultraviolet Radiation Test	For complete cable	**	BS EN ISO 4892-2	

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

DATA SHEET A

DATA SHEET-A

DS-AI. SPECIFIC TECHNICAL REQUIREMENTS

1.0	Type of Cable	Flame Retardant Low Smoke (FRLS)	
2.0	Standard applicable in general	IS: 7098 PART (I)	
3.0	Voltage Grade	1.1kV	
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ, Annexure-A to Section-C	
5.0	Formula for calculating short circuit current for different durations	Ish= k A/ $\sqrt{}$ (t) where, Ish = Short circuit current in kA t = Fault clearing time in sec. K = a constant = 0.094 for Aluminium conductor XLPE insulation = 0.141 for copper conductor XLPE insulation	
6.0	Installation Conditions for specified current rating		
(a)	Ambient air temperature	50 deg. C	
(b)	Ground temperature	30 deg. C	
(c)	Depth of laying of cables buried in ground	75 cm	
(d)	Thermal resistivity of soil	150 deg. C cm/W	
7.0	CONDUCTOR		
(a)	Material	Aluminium	Copper
	Grade and Class	STRANDED COMPACTED PLAIN Alumium OF H2 GRADE CLASS 2	STRANDED HIGH CONDUCTIVITY PLAIN ANNEALED COPPER
(b)	Standard Applicable	IS: 8130	
(c)	Shape	CIRCULAR UPTO 16 SQ. MM , SECTOR SHAPED 25 Sq. MM AND ABOVE	
(d)	Min. number of strands	As per Table-2 of IS: 8130	
8.0	INSULATION		
(a)	Material	XLPE	
(b)	Standard Applicable	IS: 7098 Part-I	
(c)	Continuous withstand temperature	90°C	
(d)	Short-circuit withstand temperature	250°C	
(e)	Method of application	By extrusion; sleeve extrusion not permitted.	
9.0	CORE IDENTIFICATION	Colour coding as per IS.	
10.0	INNER SHEATH (applicable for multi core cables only)		
(a)	Material	PVC Type ST2 as per IS: 5831	

(b)	Colour	*Black*
(c)	Whether FRLS	*YES*
(d)	Fillers	Acceptable
(e)	Material of fillers (if permitted)	Same as inner sheath (Material of filler to be compatible with that of inner sheath)
(f)	Method of application	
(1)	Multi-core cables:	
(i)	With fillers	*Pressure/Vacuum extruded*
(ii)	Without fillers	*Pressure extruded*
11.0	ARMOUR (where applicable)	
(a)	Material:	
(i)	Single core cables	Non Magnetic Hard drawn Aluminium Single Round Wire H4 grade to IS: 3975 & 7098 part-1
(ii)	Multi-core cables	Galvanised Steel *Round Wire / Strip* armour conforming to (i) Type *'a'/ 'b'* as per Table- 6 of IS 7098-I and (ii) IS 3975 as per project requirements.
(b)	Minimum Coverage	90%
(c)	Gap between armour wires	Shall not exceed one armour wire space (No cross-over/ over-riding)
(d)	Breaking load of joint	95 % of normal armour
12.0	OUTERSHEATH	
(a)	Material	PVC Type ST2 as per IS: 5831
(b)	Colour	*Black*
(c)	Whether FRLS	Yes
(d)	Method of application	Extruded
(e)	Marking 4.15 :	Manufacturer's name, Year of manufacture, Type of cable and the voltage class, Nominal cross sectional area of conductor and number of cores, Letter XLPE for XLPE insulated cables, Letter FRLS for FRLS cables, PEM, NEYVELI @ 5 metre by embossing. All LT power cable shall have progressive sequential embossing @ 1 metre for owner name, size/ core type and length.
13.0	FRLS CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per ASTMD 2863) at 27± 2° C.
(b)	Temperature index	Min. 250°C (As per NES -715/ ASTMD 2863) at oxygen index of 21
(c)	Acid gas generation (by weight)	Max. 20% (as per IEC-754-1)
(d)	Smoke density rating	Max. 60% (As per ASTM D 2843-7)
(e)	Flame retardance Test	Cable shall pass Flame retardance Test as per IS-10810- Part- 61 & 62 for single and bunched cable respectively.
(f)	Flammability test	(i) Cables shall pass test under fire conditions as per IS-10810- Part-53. (ii) Swedish chimney test as per SS-4241475 class F3. (iii) Ladder test for flammability as per IEEE-383.

14.0	ANTI RODENT/ TERMITE TEST TO BE PERFORMED	YES
15.0	TOLERANCE ON OUTER DIAMETER	Up to 30mm; ± 1.5mm Above 30mm; ±5% or ± 2mm, whichever is less.
16.0	MINIMUM BENDING RADIUS	
(a)	Single core cables	15 x O.D.
(b)	Multi core cables	12 x O.D.
17.0	SAFE PULLING FORCE	
(a)	Aluminium conductor cable	30 N/ sq. mm.
(b)	Copper conductor cable	50 N/ sq. mm.
18.0	CABLE DRUMS	
(a)	Type & construction	As per IS 10418
(b)	Standard drum length	*500m (±) 5% . (as specified in BOQ)*

DATAS SHEET- C

GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)

1.1	Name of manufacturer	:	
1.2	Place of Manufacture	:	
2.1	Current rating of cables conforms to	:	
2.2	Short circuit rating conforms to	:	
3.1	Formula for calculating short circuit current for different durations as per Clause-5 of Data Sheet-A	:	
	OR		
	Whether curve for short time current v/s time for different cables enclosed	:	

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

4.1	No. of cores x size	:	
4.2	Base current ratings (*) based on Clause 6.0 of Data Sheet-A		
	a) In air	:	Amp
	b) In ground	:	Amp
	c) ducts	:	Amp
4.3	Short circuit rating	:	kA, sec.
4.4	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

4.5 CONDUCTOR

a) Material type & grade :

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

4.6 XLPE INSULATION

a) Minimum & Nominal thickness of insulation : mm

4.7 PVC ST2 INNERSHEATH

a) Thickness (min.) : mm

b) Method of application

1) Multi-core cables
i) With fillers :

ii) With out fillers : Pressure Extruded

c) Type of fillers (if used) : PVC type ST2 as per IS 5831
Shape of fillers (if used) :

d) Colour :

4.8 ARMOUR

a) Material
i) Single core cables :
ii) Multi-core cables :

b) Size/ dimensions :

c) Minimum no. of wires :

d) Maximum resistivity of GS wire :

e) Maximum resistivity of Aluminium round wire :

4.9 PVC ST2 FRLS OUTERSHEATH

a) Minimum thickness of outer sheath : mm

b) Colour :

4.10 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
4.11	Weight of cable	:	kg./km
4.12	Dimension of drum	:	mm
4.13	Shipping weight	:	kg.

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