NTPC LIMITED
3X660 MW NORTH KARANPURA STPP

VOLUME IIB

TECHNICAL SPECIFICATION

FOR

HT XLPE CABLES

SPECIFICATION NO.: PE-TS-405-507-E001 (REV. 00)

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA-201301
INDIA

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS- 405-507-E001	
	TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES 3 x 660 MW North Karanpura STPP	VOLUME II B	
		SECTION	
		REVISION 0	DATE: 15.01.15
		SHEET 1 OF 1	

CONTENTS:

TOTAL NO. OF SHEETS= 49
(INCLUDING COVER SHEET, CONTENT SHEET & SEPARATOR SHEETS)

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

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

INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. In line with clause no. 4.1 of Section-D, Volume-II-B of the specification, Two signed and stamped copies of the following shall be furnished by all bidders as technical offer:
    a. Unpriced BOQ-Cum-Price Schedule ("Quoted" words against items") with bidder's signature and company stamp.
    b. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer")
    c. A copy of previous sheet ("List Of Contents"), with bidder's signature and company stamp.
    d. A copy of "Quality Plan including Annexure to QAP" sheet, with bidder's signature and company stamp.

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

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

4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

5. Any changes made by the bidder in the price schedule with respect to the cable description/ quantities from those given in Annexure-A to Section-C of specification [Bill Of Quantities] shall not be considered (i.e., technical description & quantities as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE
(REFER INSTRUCTION NO. 1 ABOVE)

PREAMBLE

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

1.1 **VOLUME - I : CONDITIONS OF CONTRACT**

This consists of four parts as below:
Volume – IA: This part contains Instructions to bidders for making bids to BHEL.
Volume – IB: This part contains General Commercial Conditions of the Tender & includes provision that vender shall be responsible for the quality of item supplied by their sub-vendors.
Volume – IC: This part contains Special Conditions of Contract.
Volume – ID: This part contains Commercial Conditions for Erection & Commissioning site work, as applicable.

1.2 **VOLUME – II TECHNICAL SPECIFICATIONS**

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

Volume – IIA General Technical Conditions.
Volume – IIB Technical Specification including Drawings, if any.

1.3 VOLUME – IIB

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

Section – A: This section outlines the Intent of Specification.
Section – B : This section provides "Project Information".
Section – C: This section indicates Technical Requirements specific to Contract, not covered in Sec- D.
Section – D: This section comprises of Technical Specification 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 The stipulations of Section-C, followed by those of Datasheet-A shall prevail in case of any conflict between the stipulations of Section-C, Datasheet-A and Section-D.

SECTION – 'A'

SCOPE OF ENQUIRY

SCOPE OF ENQUIRY

1.0 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to 3X660 MW N. KARANPURA STPP SITE of **HT XLPE POWER CABLES** as mentioned in different sections of this specification for the project as indicated in Section B (Project Information).

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

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

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

5.0 Requirements of the specification including the QP shall be agreed upon for total compliance by Bidders without any deviations.
Price offers of only those bidders complying with the above requirement shall be acceptable.

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

SECTION – 'B'

PROJECT INFORMATION

1.00.00 **BACKGROUND**

North Karanpura Super Thermal Power Project (3x660 MW), a pit head coal based thermal power project, is located in Hazaribagh and Chatra districts of Jharkhand State. Basic inputs i.e. coal, water and land have already been tied up. The project is proposed for the States & Union Territories of Northern, Western and Eastern Regions and the State of Jharkhand.

The capacity of the project is 1980 MW comprising of three (3) units of 660 MW each.

1.01.00 **Location and Approach**

The power project is proposed to be located near Tandwa town in Chatra districts in the state of Jharkhand on Hazaribagh-Chatra State highway at a distance of about 50 kms from Hazaribagh city. The nearest commercial airport is Ranchi at a distance of 150 kms from project site. The nearest railhead Khalari Railway Station on Ranchi-Garhwa section of Eastern Railways is about 40 kms from project site.
Major rail/road distances from the project site are as under:

City		**Distance Approx. (kms)**
Ranchi	:	150
Khalari	:	40

The site is located near Tandwa town having latitude and longitude of about 23^0 50' N to 23º 52' N and 84^0 59' E to 85º 2' E respectively. The Vicinity Plan of the project is placed at **Annexure-I.**

Further to the information given in this sub-section, Bidders are also advised to visit the project site and collect data on local site conditions.

1.02.00 **Land**

About 2245 acres of land is being acquired for the project. About 1500 acres of land is under possession/legal possession and out of 1500 acres, about 890 acres of land is to be used for plant, ash dyke and initial enabling township. No additional land is envisaged to be acquired in plant area. About 15 acres of land is envisaged to be acquired in Hazaribagh city for Township.
Commissioner, Chatra vide dated 25.05.1999 and 14.06.2000 has given in-principle clearance for NKSTPP.

1.03.00 **Water**

Make up water available for this project would be about 22 cusec and will be arranged by constructing a dam/reservoir across river Garhi.

1.04.00 **Fuel (Coal)**

1.04.01 **Coal Requirement, Availability and Linkage**

Coal requirement for the project is estimated as 10.6 Million Tonne/Annum (MTPA), considering a GCV of 3800 kcal/kg. Ministry of Coal vide letter dated 21.10.99 accorded in-principle coal linkage of 10.00 MTPA subject to ratification by Standing Linkage Committee-Long Term (SLC (LT)), of MOC. SLC (LT) in its meeting held on 15.12.2000 firmed up the coal linkage of 10.24 MTPA for the project. Subsequently, the coal linkage was withdrawn by SLC (LT) in its meeting held on 22/23.10.08.

Cabinet Committee on Investment (GOI) in its meeting on 20.02.13 decided in-principle to restore the original coal linkage granted to NKSTPP (i.e. from Magadh Coal Block) with the stipulation that the coal supply will commence during the 13th Five Year Plan. MOC vide letter dated 09.05.2013 restored the coal linkage with the stipulation that the coal supply will commence during the 13th five year plan.

1.04.02 **Coal Transportation**

Coal from Magadh block of North Karanpura Coalfields is proposed to be transported to the project site through conveyor belt system. One external coal handling plant and one internal coal handling plant are envisaged.

1.05.00 **Meteorological Data**

Important meteorological data from nearest observatory at Hazaribag is placed at Annexure-II**.**

1.06.00 **Plant Water Scheme**

The Plant water scheme is described below.

1.06.01 **Condenser Cooling System**

It is proposed to adopt Air Cooled Condenser for the project.

1.06.02 **Equipment Cooling Water (ECW) System (Unit Auxiliaries)**

All plant auxiliaries shall be cooled by De-mineralized water (DM) in a closed circuit. The primary circuit DM water shall be cooled through heat exchangers by auxiliary cooling water system. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system.

1.06.03 **Ash Water System**

It is proposed to have HCSD (High concentration Slurry Disposal) system for combined fly ash and bottom ash. No recirculation of ash water from ash disposal area is envisaged.

1.06.04 **Other Miscellaneous Water Systems**

(a) Raw water shall be used for meeting the Fly ash and bottom ash system requirement etc.

(b) The service water shall be taken from clarified water tank of Pretreatment plant. Service water (wash water) collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc. as per requirement and treated water from liquid effluent treatment plant shall be recycled back to the service water system for re-use.

(c) The drinking water requirement of the plant shall be provided from water treatment plant.

(d) Steam Cycle make-up water, makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water and makeup to the hydrogen generation plant shall be provided from Demineralising plant.

(e) The quality of Raw water is enclosed with this sub-section as Annexure-III.

1.07.00 **Criteria for Earthquake Resistant Design of Structures and Equipment**

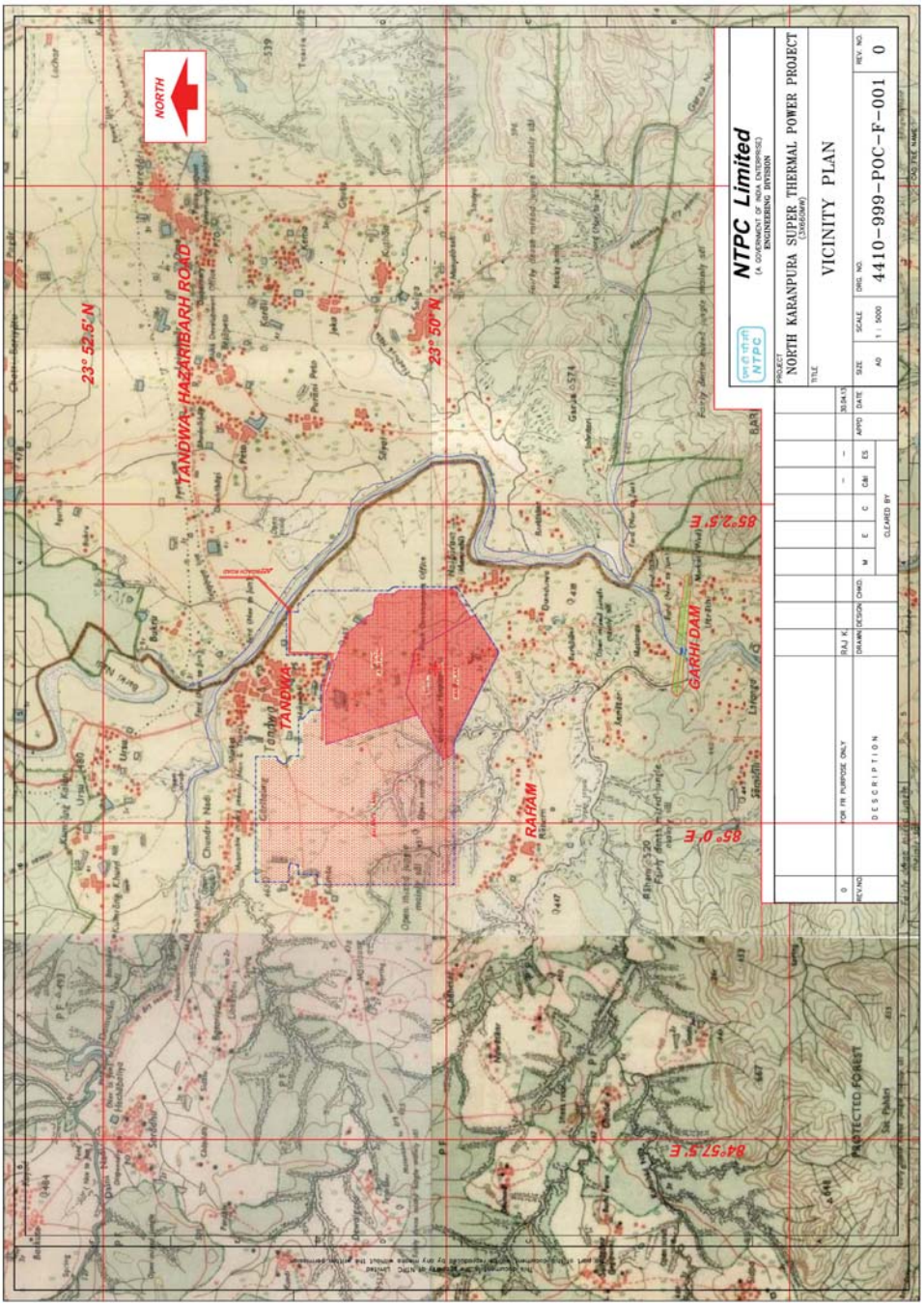
All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in the Part - B of this section.

1.08.00 **Criteria for Wind Resistant Design of Structures and Equipment**

All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in Part B of this section.

Annexure-I

VICINITY PLAN



Annexure-II

CLIMATOLOGICAL TABLE

CLIMATOLOGICAL TABLE

स्टेशन : हजारीबाग STATION : Hazaribagh — अक्षांश LAT 23°59′ N — देशांतर LONG 85°22′ E — समुद्री तल माध्य से ऊँचाई HEIGHT ABOVE M. S. L. 611 मीटर METRES — 1951 से 1980 तक के प्रेक्षणों पर आधारित BASED ON OBSERVATIONS FROM 1951 TO 1980

AIR TEMPERATURE (वायु तापमान)

MONTH		STATION LEVEL PRESSURE (hPa)	MEAN DRY BULB (°C)	MEAN WET BULB (°C)	MEAN DAILY MAX (°C)	MEAN DAILY MIN (°C)	MEAN HIGHEST IN THE MONTH (°C)	MEAN LOWEST IN THE MONTH (°C)	EXTREMES HIGHEST (°C)	DATE AND YEAR	EXTREMES LOWEST (°C)	DATE AND YEAR
जनवरी JAN	I	947.6	14.7	10.9	22.6	9.3	26.7	4.6	30.6	31 1881	0.9	07 1980
	II	944.5	18.9	12.8								
फरवरी FEB	I	945.7	17.9	12.3	25.7	12.0	30.5	6.9	33.6	22 1967	1.7	08 1974
	II	942.6	22.6	14.4								
मार्च MAR	I	944.0	23.4	15.0	30.8	16.6	35.6	11.4	38.9	27 1892	6.7	04 1898
	II	940.6	27.8	16.3								
अप्रैल APR	I	941.0	28.6	18.2	35.7	21.3	39.3	16.4	41.7	22 1956	10.6	01 1968
	II	937.1	32.4	18.8								
मई MAY	I	937.0	30.7	21.1	37.8	24.0	41.5	19.3	43.9	18 1897	15.6	22 1977
	II	933.4	34.3	21.2								
जून JUN	I	933.4	28.4	23.3	34.1	24.1	40.1	21.0	46.6	14 1975	18.3	02 1975
	II	930.4	30.4	23.5								
जुलाई JUL	I	933.1	25.6	23.8	29.5	23.0	33.2	21.4	39.6	08 1975	19.3	18 1975
	II	930.5	26.8	24.1								
अगस्त AUG	I	934.5	25.2	23.7	29.1	22.7	31.5	21.3	34.2	03 1972	20.0	29 1967
	II	931.6	26.4	24.3								
सितम्बर SEP	I	938.2	25.1	23.1	29.0	22.2	31.5	20.4	33.3	24 1960	17.8	29 1950
	II	935.1	26.0	23.5								
अक्तूबर OCT	I	943.6	23.9	20.4	28.5	18.9	31.3	14.3	34.0	04 1966	9.7	12 1972
	II	940.6	24.9	20.7								
नवम्बर NOV	I	947.0	20.2	15.5	25.8	13.3	28.3	9.0	31.7	01 1896	4.4	25 1879
	II	943.9	21.4	16.0								
दिसम्बर DEC	I	946.2	15.7	11.8	23.1	9.3	26.2	5.1	29.4	20 1950	0.5	24 1961
	II	945.1	18.7	13.1								
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	941.1	23.3	18.3	29.3	18.1	41.9	3.8	46.6		0.5	
	II	938.0	25.9	19.1								
वर्षों की सं NUMBER OF YEARS	I	28	27	27	27	28	27	28	83		83	
	II	28	28	28								

HUMIDITY, CLOUD AMOUNT, RAINFALL (वर्षा)

MONTH		RELATIVE HUMIDITY (%)	VAPOUR PRESSURE (hPa)	ALL CLOUDS (Oktas of sky)	LOW CLOUDS (Oktas of sky)	MONTHLY TOTAL (mm)	NO. OF RAINY DAYS	TOTAL IN WETTEST MONTH WITH YEAR (mm)	TOTAL IN DRIEST MONTH WITH YEAR (mm)	HEAVIEST FALL IN 24 HOURS (mm)	DATE AND YEAR	MEAN WIND SPEED (Kmph)
जनवरी JAN	I	62	10.4	1.4	0.5	23.5	1.7	113.0 1919	0.0	68.1	06 1945	6.2
	II	49	10.4	1.6	0.5							
फरवरी FEB	I	52	10.3	1.3	0.4	16.2	1.4	117.3 1907	0.0	63.5	23 1927	7.3
	II	39	10.4	1.4	0.6							
मार्च MAR	I	39	10.8	1.5	0.3	18.4	1.7	164.3 1905	0.0	44.2	20 1946	7.9
	II	29	10.2	1.9	0.5							
अप्रैल APR	I	36	13.3	1.8	0.3	17.0	1.4	81.6 1952	0.0	60.5	22 1925	8.6
	II	26	11.8	2.2	0.7							
मई MAY	I	43	18.1	2.5	0.3	43.4	2.9	187.2 1936	0.0	84.1	27 1887	9.1
	II	32	15.7	2.9	0.7							
जून JUN	I	67	25.0	5.3	1.8	177.1	9.2	774.5 1911	0.5 1905	249.2	24 1911	8.7
	II	60	23.8	5.8	2.5							
जुलाई JUL	I	86	28.2	6.5	3.8	310.0	16.2	693.2 1930	99.6 1911	221.7	06 1953	7.9
	II	80	28.1	6.4	3.7							
अगस्त AUG	I	88	28.3	6.4	3.8	320.1	16.2	708.1 1943	83.8 1928	180.1	17 1888	7.6
	II	84	28.7	6.4	3.5							
सितम्बर SEP	I	85	26.8	5.1	2.9	260.9	11.6	530.9 1893	40.7 1966	167.4	28 1963	7.3
	II	81	27.2	5.6	2.9							
अक्तूबर OCT	I	73	21.4	2.4	1.2	80.6	4.1	378.6 1963	0.0	149.4	24 1963	5.2
	II	68	21.3	2.9	1.3							
नवम्बर NOV	I	60	14.3	1.2	0.4	5.5	0.4	160.0 1924	0.0	95.0	08 1924	4.8
	II	56	14.2	1.6	0.5							
दिसम्बर DEC	I	62	11.1	1.1	0.2	5.2	0.4	81.3 1885	0.0	39.4	13 1885	5.3
	II	52	11.1	1.2	0.2							
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	63	18.2	3.0	1.3	1277.9	67.2	2146.0	739.6	249.2		7.2
	II	55	17.7	3.3	1.5			1893	1966			
वर्षों की सं NUMBER OF YEARS	I	27	27	29	23	29	29	99	99	99		23
	II	28	27	30	22							

1.00.00 **General Requirements**

1.01.00 For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% shall be considered. The equipment shall operate in a highly polluted environment. However, for equipment in air conditioned areas, design ambient temperature shall be 35 deg.C, if 2x100% air conditioning system is provided.

1.02.00 All equipments shall be suitable for rated frequency of 50Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification. The step-up voltage level for the project shall be 400 KV. The turbo generator unit will be connected to its own step-up transformers for feeding power into the EHV grid. The overall system shall be designed considering voltage variation of +/- 5% and fault level of 50kA for 400KV and 40kA for 220 KV system. Under black start condition the minimum fault level of 1000 MVA shall be considered at 400KV voltage level and voltage variation at 400kV may be considered as +/-10% till system stabilization.

1.03.00 Contractor shall provide fully compatible electrical system, equipments, accessories and services for the entire station/plant in his scope as well as those specifically required by the Employer.

1.04.00 All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and International Codes & Standards, especially the Indian Statutory Regulations.

1.05.00 The auxiliary AC voltage supply arrangement shall have 33 kV, 11 kV, 3.3KV and 415V systems. It shall be designed to limit voltage variations as given below under worst operating condition:

a)	33KV/11KV/3.3KV (MV)	+/- 6%
b)	415 V/240 V	+/- 10%
c)	220V DC	-15% to +10% However the nominal continuous DC power supply shall be 240V.

1.06.00 The voltage level for motors shall be as follows:

a) Upto 0.2 KW	:	Single phase 240V AC / 3 phase 415V AC
b) Above 0.2 KW and upto 200 KW	:	3 phase, 415V AC
c) Above 200 KW and upto 1500 KW	:	3 phase, 3.3 kV AC
d) Above 1500 KW	:	11 kV

The bidder may adopt 415V/3.3 KV for the drives rated in the range of 160-210 KW.

For CHP conveyor motor's rating above 160 kW, 3.3 KV, three phase AC supply is to be used.

The voltage rating of the drives indicated above is for basic guideline. Minor variations in above can be accepted on case to case basis based on techno-economic considerations of the various sub-systems.

Voltage rating for special purpose motors viz, VFD and screw compressors, shall be as per manufacturer's standard. All the motors ratings on Stacker/ reclaimer shall be 415V ac supply only.

1.07.00	The preferred AC control supply voltage shall be 110V for all 415 V non breaker controlled feeders. Control supply voltages other than above may be offered by bidder based on the bidder's standard proven practice.
1.08.00	The designed fault levels for 11 KV & 3.3 KV systems shall be restricted to 40 kA rms for 1 second and 50 kA rms for 1 second for 415 V systems. The 33 KV system equipments shall have a minimum short circuit fault withstand rating of 12.5 kA for 1 second.
1.09.00	The nominal voltage of main DC system shall be 220V. DC batteries shall be designed for continuous float operation with trickle charge, hence all the associated components like batteries, battery chargers, DC motors, relays, contactors, timers etc shall be suitable for continuous operation at the maximum continuous battery float voltage including suitable temperature correction factors. The operational limits of variation of DC voltage is (+)10 % to (-)15%. In addition, the bidder may propose 110V, 48V or 24V systems as per requirements of control and instrumentation of his equipment and design.
1.10.00	The Contractor shall furnish calculations of maximum loading and fault levels under the most onerous conditions for the various equipment/systems as defined else where in the specification to prove adequacy of their parameters. In case any equipment or system is found to be inadequate, it shall be changed/ modified without any additional liability to the Employer.

SECTION – 'C'

SPECIFIC TECHNICAL REQUIREMENTS

1.0 SCOPE OF ENQUIRY

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

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

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

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

2.0 BILL OF QUANTITIES:

2.1 Quantity requirements shall be as per Annexure-A (BOQ cum price schedule) to section-C enclosed.

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

3.0 SPECIFIC TECHNICAL REQUIREMENTS

3.1 Technical:

S. No.	Reference Clause No. of Section D(if any)	Specific Requirement/ Change
1	2.4.1 b, c & d	May be read as 2.4.1 (b). Additionally "The type tests are required to be conducted as indicated in Annexure to QAP and the same shall be offered for inspection (conduction of type tests shall be witnessed by BHEL). Bidder to indicate unit price of cables inclusive of type test charges. No separate charges shall be payable for type tests.
2	2.4.1 e	Refer S. No. 1 above.
3	4.1	Two signed and stamped copies of the following shall be furnished by all bidders as technical offer : (i) Un-priced Price Schedule (Annexure-A to section C, as enclosed with the specification) with bidder's signature and company stamp. (ii) A copy of "Instruction to Bidders for Preparing Technical Offer" sheet, with bidder's signature and company stamp. (iii) A copy of "List Of Contents" sheet, with bidder's signature and company stamp. (iv) A copy of "Quality Plan including Annexure to QAP" sheet, with bidder's signature and company stamp. **No other documentation is required to be submitted as technical offer. Any information contained in other parts of the offer (e.g. covering letter, annexure, etc.) which is deviating from specification requirements in any way shall not be considered by BHEL as part of offer.**

3.2 Quality/ Inspection:

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

3.1.3 The successful bidder shall submit the standard list of raw material suppliers/ sub-vendors for approval without any commercial implications. Changes to the same for specific projects, if proposed by any bidder, shall be to BHEL approval.

3.1.4 Quality Plan applicable for project: BHEL Quality Plan no. PE-QP-999-507-E001, R-0 (enclosed with specification).

3.1.5 Bidder should have manufactured and supplied following cables, as on 28.11.2013 :

a) Atleast 50kms of XLPE insulated power cables of 6.35/11KV or higher voltage grade, executed in one or more orders.

b) Atleast one (1) km of flame retardant low smoke cables of any voltage level.

Bidders to submit relevant documents in support of cl. No. 3.1.5 in their offer. This information shall be considered in bid evaluation.

4.0 Nos. OF DRAWINGS/ DOCUMENTS REQUIRED FROM VENDOR:

No. of prints to be submitted by vendor after award of contract for project shall be as per Annexure-VI

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

SL. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.	SUBMISSION SCHEDULE
1	Data Sheet for HT XLPE Power Cables	PE-V0-405-507-E101	Within Two weeks from the date of LOI
2	Cross-sectional Drawings for HT XLPE Power Cables	PE-V0-405-507-E103	Within Two weeks from the date of LOI
3	Quality Plan for XLPE Power Cables	PE-V0-405-507-E912	Within Two weeks from the date of LOI
4.	Type Test Reports for Tests conducted under this contract	PE-V0-405-507-E104	Within a week from the date of conduction of Type Test

S.No	Description of Drgs/Docs	No of Prints	No of CD ROMs/DVDs/Portable Hard Disk .
1	Drawings, Data sheets, Design calculations, Purchase specifications and other documents		
	First submission and submission with major changes		
	▪ Layout (A0&A1 sizes)	4	-
	▪ Other Drawings/Documents (A0&A1 sizes)	2	-
	▪ P&ID (All sizes)	4	-
	a) Final drawings/documents (Directly to site)	6	2
	b) "As Built" Drawing/Documents (Directly to site)	6	2
	c) Analysis reports of Equipments / piping /structures components/system employing software packages as detailed in the specifications.	2	2
2	Erection Manual (Directly to site)	4 sets	2
3	Operation & Maintenance manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2
4	Plant Hand Book i) First Submission	1	1
5	Commissioning and Performance Test Procedure manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2

ANNEXURE-A TO SECTION – C

(BOQ-CUM-PRICE SCHEDULE)

BILL OF QUANTITIES

a) 11/11 kV Al XLPE FRLS unarmoured cables

Sl. No.	Cable Sizes	Total Quantity	LOT-1 Quantity	Drum Length	Supply		Remarks
					Unit Price (Ex-works)	Total Price (Ex-works)	
1.1	3C – 185 Sq. mm	32250 Meters (43 drums)	22500 Meters (30 drums)	750 Meters			
1.2	1C – 630 Sq. mm	25000 Meters (25 drums)	18000 Meters (18 drums)	1000 Meters			

b) 11/11 kV Al XLPE FRLS armoured cables

Sl. No.	Cable Sizes	Total Quantity	LOT-1 Quantity	Drum Length	Supply		Remarks
					Unit Price (Ex-works)	Total Price (Ex-works)	
1.1	3C – 185 Sq. mm	1500 Meters (2 drums)	1500 Meters (2 drums)	750 Meters			
1.2	1C – 630 Sq. mm	15000 Meters (15 drums)	11000 Meters (11 drums)	1000 Meters			

c) 3.3/3.3 kV Al XLPE FRLS unarmoured cables

Sl. No.	Cable Sizes	Total Quantity	LOT-1 Quantity	Drum Length	Supply		Remarks
					Unit Price (Ex-works)	Total Price (Ex-works)	
1.1	1C – 185 Sq. mm	3000 Meters (3 drums)	3000 Meters (3 drums)	1000 Meters			
1.2	3C –185 Sq. mm	24750 Meters (33 drums)	17250 Meters (23 drums)	750 Meters			

d) 3.3/3.3 kV Al XLPE FRLS armoured cables

Sl. No.	Cable Sizes	Total Quantity	LOT-1 Quantity	Drum Length	Supply		Remarks
					Unit Price (Ex-works)	Total Price (Ex-works)	
1.1	1C – 630 Sq. mm	2000 Meters (2 drums)	2000 Meters (2 drums)	1000 Meters			

e) 33/19 kV Al XLPE FRLS armoured cables

Sl. No.	Cable Sizes	Total Quantity	LOT-1 Quantity	Drum Length	Supply		Remarks
					Unit Price (Ex-works)	Total Price (Ex-works)	
1.1	1C –185 Sq. mm	2000 Meters (2 drums)	2000 Meters (2 drums)	1000 Meters			

Notes:

1. Quantities indicated above shall be known as Order Quantities. The variation in quantities of all sizes put together shall be limited to (+/-)30% of the total contract value till completion of supplies for 3X660 MW N. KARANPURA STPP.

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

3. Lot-I quantities indicated above (in case the cable quantities are to be released for manufacture in more than one lot), or Order Quantity (in case the quantities are cleared for manufacture in one lot only) shall be cleared for manufacturing along with LOI. However, manufacturing of the cables shall be taken up by the successful bidder only after approval of technical and quality documentation. Subsequent lots shall be cleared for manufacture based on progress of engineering and site requirements.

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

5. The standard drum length for power cables shall not be less than mentioned against each cable size above. The length per drum shall be subjected to a maximum tolerance of +/- 5% of the standard drum length.

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

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

8. Bidder shall indicate unit price of cables inclusive of type test charges. No separate charges shall be payable for type tests.

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

SECTION-D

STANDARD TECHNICAL SPECIFICATION

1.0 TECHNICAL REQUIREMENTS

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

2.0 QUALITY ASSURANCE REQUIREMENTS

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

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

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

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

2.4.1 Type Tests on Cables

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

b. The bidder shall furnish the reports of all the type tests listed in Annexure to QAP (enclosed with quality plan) carried out in within last five years of the date of bid opening. These reports should be for the tests conducted either in government approved third party laboratory or witnessed by client (such as major utilities/ industries) on identical/ similar cables to those ordered under this contract.(Refer Section-C, Cl. No. 3.1.1, S. No.1)

c. In case bidder is not able to submit report of type test(s) conducted in last five years, or in case type tests report(s) are not found to be meeting the specification/ relevant standard requirements, then all such tests shall be conducted under this contract by the bidder free of cost to BHEL, and reports shall be submitted for approval. No charges shall be paid for testing under such circumstances. (Refer Section-C, Cl. No. 3.1.1, S. No.1).

d. Irrespective of the bidder furnishing type test report as indicated above, BHEL may get type tests as indicated in Annexure to QAP (enclosed with quality plan) on the lots offered for inspection. Separate price shall be quoted for the conduction of type testing per lot, which shall be used for cost comparison. A maximum of three lots shall be considered for price comparison purposes on account of type testing. However, type-testing charges shall be paid as per type test conducted. (Refer Section-C, Cl. No. 3.1.1, S. No.1).

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

2.4.2 Routine and Acceptance Tests

a. Routine testing shall be conducted in line with the applicable standards and as per the Manufacturing Quality Plan approved for the project for every lot offered for inspection.

b. Acceptance tests shall be conducted on every lot offered for inspection as per details indicated in 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:

a. A copy of "Instruction to bidder's for preparing technical offer" as enclosed with enquiry with bidder's signature and company seal.
b. A copy of "List of contents" as enclosed with enquiry with bidder's signature and company seal.
c. A copy of Annexure-A to section C (BOQ-Cum-Price schedule) as enclosed with enquiry with bidder's signature and company seal.
d. A copy of Quality Plan (including Annexure to QAP) as enclosed with enquiry with bidder's signature and company seal.

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

4.2 By Successful Bidder (for approval during contract stage)

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

4.3 Two copies of the above documentation shall be submitted for first review. Number of copies to be submitted for second and subsequent submissions (till Cat-I approval is accorded), and those for final

distribution prints of approved documentation and test certificates shall be as indicated separately in section C.

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

QUALITY PLAN

	STANDARD QUALITY PLAN		CUSTOMER : **NTPC**			PROJECT: **3 X 660 MW NORTH KARANPURA** TITLE			SPECIFICATIOI NUMBER :	**PE-TS-405-507-E001**		
			BIDDER/ VENDOR :			QUALITY PLAN **NUMBER: PE-QP-999-507-E001, R0**			SPECIFICATION : TITLE			
	SHEET 2 OF 15		SYSTEM			ITEM : HT XLPE Power Cables			SECTION			VOLUME III
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
Instructions: 1. Cable manufacturer to maintain records to show co-relation of raw materials to finished cables i.e. raw material batch/ lot no. should be traceable to the final cable drum number or batch no. 2. Cable manufacturer to maintain all quality records identified as per all QP stages enumerated below whether it is identified for BHEL verification or witness or not.												
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**											
1.1	**Aluminium Rods (Conductor/ Armour Wire)**	**GENERAL :**										
		1. Physical properties	MA	Physical Tests	Sample/ Batch	IS:7098-II,IS: 5082, IS:5484, IS:8130 & Appd Datasheet	IS:7098-II,IS: 5082, IS:5484, IS:8130 & Appd Datasheet	Log book/ Test Cert.	3/2	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	
		SPECIFIC CHECKS :										
		a) Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		b) Grade	MA	-do-	-do-	IS 8130, IS 5082/ Approved datasheet	IS 8130, IS 5082/ Approved datasheet	-do-	3/2	-	1	
		c) Resistivity	MA	Electrical Tests	Manufacturer 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-II & Mfs Std./ Approved datasheet	IS 7098-II & Mfs Std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	
		SPECIFIC CHECKS :										
		a) Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		b) Type/ Grade	MA	-do-	-do-	Mfr. Std/ Approved datasheet	Mfr. Std/ Approved datasheet	-do-	3/2	-	1	
		c) Shelf life/ Storage condition	MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	3/2	-	1	

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

BHEL	**STANDARD QUALITY PLAN**		CUSTOMER : **NTPC**			PROJECT: **3 X 660 MW NORTH KARANPURA** TITLE			SPECIFICATIOI **PE-TS-405-507-E001** NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN **NUMBER: PE-QP-999-507-E001, R0**			SPECIFICATION : TITLE			
	SHEET 3 OF 15		SYSTEM			ITEM : HT XLPE Power Cables			SECTION			VOLUME III
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.3	**Semi Conducting Compound**	**GENERAL :**										
		1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-II & Mfs Std./ Approved datasheet	IS 7098-II & Mfs Std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
		SPECIFIC CHECKS :										
		1. Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		2. Type/ Grade	MA	-do-	-do-	Mfr. Std/ Approved datasheet	Mfr. Std/ Approved datasheet	-do-	3/2	-	1	
		3. Shelf life/ Storage condition	MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	3/2	-	1	
1.4	**Copper Tape**	**GENERAL :**										
		1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-II, IS 1897, IS 613 & Mfr. Std./ Approved datasheet	IS 7098-II, IS 1897, IS 613 & Mfr. Std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	
		3. Dimension	MA	Measurement	-do-	-do-	-do-	-do-	3/2	-	2	
		SPECIFIC CHECKS :										
		1. Resistivity	MA	Electrical Tests	Manufacturer std.	IS 613	IS 613	-do-	3/2	-	1	
1.5	**Fillers (as applicable)**	1. Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		2. Type/ Grade	MA	-do-	-do-	Approved datasheet	Approved datasheet	-do-	3/2	-	1	(Fillers material chosen shall be compatible with the temerature rating of the cable and shall have no deleterious effect on any other componenet of the cable)
1.6	**PVC Compound (for sheath)**	**GENERAL :**										
		1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-II, IS 5831& Mfr. Std./ Approved datasheet	IS 7098-II, IS 5831& Mfr. Std./ Approved datasheet	Log book/ Test Cert.	3/2	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	
		3. FRLS Properties (as applicable)	CR	Chemical/ Environ.	Sample/ Batch	-do-	-do-	-do-	3/2	-	1/2	

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

भेल HHL	**STANDARD QUALITY PLAN**		CUSTOMER : **NTPC**			PROJECT: TITLE	**3 X 660 MW NORTH KARANPURA**		SPECIFICATIOI NUMBER :	**PE-TS-405-507-E001**		
			BIDDER/ VENDOR :			QUALITY PLAN **NUMBER: PE-QP-999-507-E001, R0**			SPECIFICATION : TITLE			
	SHEET 4 OF 15		SYSTEM			ITEM : HT XLPE Power Cables			SECTION	VOLUME III		
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
		SPECIFIC CHECKS :										
		a) Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		b) Type/ Grade	MA	-do-	-do-	Approved datasheet	Approved datasheet	-do-	3/2	-	1	
		c) Shelf life/ Storage condition	MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	3/2	-	1	
1.7	**Galvanised steel wire/strip for Armour (as applicable)**	**GENERAL :**										
		1. Make	MA	Verify	Manufacturer std.	Manufacturer approved source	Manufacturer approved source	Log book/ Test Cert.	3/2	-	1	
		2. Dimension	MA	Measurement	-do-	IS 7098-II, IS 3975 & Approved datasheet	IS 7098-II, IS 3975 & Approved datasheet	-do-	3/2	-	2	
		3. Phy.and Elec. Properties	MA	Physical & Electrical Tests	Sample*	-do-	-do-	-do-	3/2	-	2	* Sample from each armour size/ Batch / Lot
		4.Galvanization Quality	MA	Galv.Tests	-do-	IS 3975 & Mfr. Std.	IS 3975 & Mfr. Std.	-do-	3/2	-	2	
1.8	**Wooden Drum**	1. Phy. & Constructional checks	MA	Visual	Mfr's Plant Std.	IS 10418	IS 10418	Log book/ Test Cert.	3/2	-	1	
		2. Anti termite treatment	MA	Chem.	Mfr's Plant Std.	Mfr's Plant Std.	Mfr's Plant Std.	COC	3/2		1	
1.9	**Steel Drum #**	1. Dimension	MA	Meas.	Mfr's Plant Std.	Mfr's Plant Std.	Mfr's Plant Std.	Log book/ Test Cert.	3/2	-	1	# (If Applicable)
		2. Surface finish	MA	Meas.	-do-	Surface shall be smooth	Surface shall be smooth	-do-	3/2		1	

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

BHEL	**STANDARD QUALITY PLAN**		CUSTOMER : **NTPC**			PROJECT TITLE	**3 X 660 MW NORTH KARANPURA**		SPECIFICATIOI NUMBER :	**PE-TS-405-507-E001**		
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E001, R0			SPECIFICATION : TITLE			
	SHEET 5 OF 15		SYSTEM			ITEM : HT XLPE Power Cables			SECTION	VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.0	**IN PROCESS**											
2.1	**Wire Drawing**	1. Size	MA	Dimensional	Plant Mfg. Std.	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	Log Book	2	-	1	
		2. Surface finish	MA	Visual	-do-	Surface shall be smooth	Surface shall be smooth	-do-	2	-	1	
		3. % of Elongation	MA	Mechanical	-do-	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	-do-	2	-	1	
2.2	**Stranding of wires**	1. No. of wires	MA	Counting	Plant Mfg. Std.	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	Log Book	2	-	-	
		2. Resistance	CR	Electrical	-do-	-do-	-do-	-do-	2	-	-	
		3. Sequence, lay length & Direction	MA	Visual, Meas.	One Sample of each size/ lot	Mfrs Std. / Appd. Datasheet	Mfrs Std. / Appd. Datasheet	-do-	2	-	-	
		4. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	-do-	2	-	-	
		5. Dimension	MA	Measurement	One Sample of each size/	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	-do-	2	-	-	
2.3	**Conductor Screening**	1. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-	
		2. Radial Thickness	CR	Mechanical	One Sample of each size/	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
2.4	**Core Insulation (XLPE) (No repair permitted)**	1. Surface finish	MA	Visual	100%	Free from bulging, burnt particles, lumps, cuts & scratches	Free from bulging, burnt particles, lumps, cuts & scratches	Log Book	2	-	1	
		2. Eccentricity & Ovality #	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	1	*# To be checked at starting & finished end of extruded length.*
		3. Insulation Thickness	CR	Measurement	-do-	-do-	-do-	-do-	2	-	-	
		4. Dia over insulation	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
		5. Tensile Strength & % Elongatio	MA	Mechanical	100%	-do-	-do-	-do-	2	-	-	

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

	STANDARD QUALITY PLAN	CUSTOMER : **NTPC**	PROJECT TITLE **3 X 660 MW NORTH KARANPURA**	SPECIFICATIOI NUMBER : **PE-TS-405-507-E001**
	SHEET 6 OF 15	BIDDER/ VENDOR :	QUALITY PLAN **NUMBER: PE-QP-999-507-E001, R0**	SPECIFICATION : TITLE
		SYSTEM	ITEM : HT XLPE Power Cables	SECTION VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.5	**Insulation Screening**	**NON METTALIC**										
		1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-	
		2. Thickness	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		METALLIC										
		1. Dimension of tape	CR	Measurement	One Sample of each size/ lot	Mfrs Std. / Appd. datasheet	Mfrs Std. / Appd. datasheet	Log Book	2	-	-	
		2. Overlap of Tape Band	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
		3. Tightness of Tape	MA	Visual	-do-	Mfs Std.	Mfs Std.	-do-	2	-	-	
2.6	**Core Laying**	1. Dia over laid up core	MA	Measurement	One Sample of each size/	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Log Book	2	-	-	
		2. Sequence of lay & direction	MA	Visual & Meas.	-do-	IS 7098-II & Mfr. Std.	IS 7098-II & Mfr. Std.	-do-	2	-	-	
		3. Lay Length	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
2.7	**InnerSheath Extrusion (as applicable)**	1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-	*(Pimple, fish eye, porosity & burnt particles not permitted.)*
		2. Thickness	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		3. Dia over inner sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
2.8	**Armour(as applicable)**	1. No.of wires/Strips	MA	Counting	At the start of the process	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Log Book	2	-	-	
		2. Lay length & Direction	MA	Visual & Meas.	-do-	IS 7098-II & Mfr. Std.	IS 7098-II & Mfr. Std.	-do-	2	-	-	
		3. Dia over armouring	MA	Measurement	-do-	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		4. Coverage	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	

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

	STANDARD QUALITY PLAN		CUSTOMER : **NTPC**			PROJECT TITLE **3 X 660 MW NORTH KARANPURA**			SPECIFICATIOI NUMBER : **PE-TS-405-507-E001**			
			BIDDER/ VENDOR :			QUALITY PLAN **NUMBER: PE-QP-999-507-E001, R0**			SPECIFICATION : TITLE			
	SHEET 7 OF 15		SYSTEM			ITEM : HT XLPE Power Cables			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.9	**Outer Sheath Extrusion (No repair permitted)**	1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Log Book	2	-	-	*(Pimple, fish eye, porosity & burnt particles not permitted.)*
		2. Sheath Thickness	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		3. Dia over outer sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
		4. Embossing/ Sequencial Marking	MA	Visual	100%	Approved data sheet	Approved data sheet	-do-	2	-	-	
3.0	**Finished Cable (INTERNAL)**	**1. Routine Test (Refer Note-F)**	CR	Electrical Tests & Measurement	100%	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Test Report	2	-	1	
4.0	**Final Inspection (EXTERNAL)**	**1. Finish**	MA	Visual	One drum in each Lot	IS 7098-II & Appd. Datasheet	Free from Porosity, Bulging, Burnt particles,lumps, cuts &	Test Report	2	1	-	
		2. Length	MA	Measurement	-do-	-do-	Approved Data Sheet	-do-	2	1	-	
		3. Dimension	MA	-do-	As per IS	-do-	-do-	-do-	2	1	-	
		4. Armouring - Coverage No.of Wires/Strips	MA	Visual & Meas.	-do-	-do-	-do-	-do-	2	1	-	

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

	STANDARD QUALITY PLAN	CUSTOMER : **NTPC**			PROJECT TITLE **3 X 660 MW NORTH KARANPURA**			SPECIFICATIOI NUMBER : **PE-TS-405-507-E001**			
		BIDDER/ VENDOR :			QUALITY PLAN **NUMBER: PE-QP-999-507-E001, R0**			SPECIFICATION : TITLE			
	SHEET 8 OF 15	SYSTEM			ITEM : HT XLPE Power Cables			SECTION			VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
		5. Marking & Colour Coding	MA	Visual	As per IS	-do-	Approved Data Sheet	-do-	2	1	-	
		6. Acceptance Tests (Refer Note-F)	CR	Phy, Elect. Tests FRLS Tests	-do-	-do-	-do-	-do-	2	1	-	
		7. Type Tests (Refer Note-F)	CR	Physical & Electrical Tests	Sample #	-do-	-do-	-do-	2	1	-	*# Refer Annexure to QAP enclsoed*
5.0	**Packing**	**Sealing Identification**	MA	Visual	100%	As per IS	As per IS	-do-	2	1	-	

NOTES:-

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

(B) NO REPAIR OF CORE INSULATION PERMITTED

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

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

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

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

LEGEND : P : PERFORMER W: WITNESSER V: VERIFIER 1- BHEL 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

TYPE/ ACCEPTANCE TEST REQUIREMENTS

A. Type Test Conduction:

1. Tests for which "T" is indicated in the 'Conduction Required as' column below shall be conducted as type tests.
2. Sampling:
   a. Type test shall be conducted on one size of cable of each voltage grade/lot.
   b. FRLS test & Electrical tests shall be conducted on every size and voltage grade of cables.
   c. Flammability Test to be conducted only on one sample/ lot.

B. Acceptance Test Conduction:

1. Tests for which a hash sign (A) is indicated in the 'Conduction Required as ' column below shall be conducted as acceptance tests.

2. Sampling:
   Sampling for acceptance tests shall be as per Appendix-A (Clause 18.2.1) of IS: 7098 Part-II.

C. Routine Test Conduction:

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

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQD. 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 REQD. 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 GS wires/strip only	A	IS 10810 PT 40	
viii.	Mass of Zinc coating test	For GS round wire 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 & eccentricity	Applicable for XLPE insulation, PVC inner sheath & PVC outer sheath	T,A	IS 10810 PT 6	
ii.	Tensile strength and elongation test at break	Applicable for XLPE insulation & PVC outer sheath			
a	Before ageing		T,A	IS 10810 PT 7	
b	After ageing		T,A	IS 10810 PT 7	
iii	Ageing in air oven	Applicable for XLPE insulation & PVC outer sheath	T	IS 10810 PT 11	
iv	Loss of mass in air oven test	For PVC outer sheath only	T	IS 10810 PT 10	
v	Hot deformation test	For PVC outer sheath only	T	IS 10810 PT 15	
vi	Heat shock test	For PVC outer sheath only	T	IS 10810 PT 14	
vii	Shrinkage test	For XLPE insulation & PVC outer sheath only	T	IS 10810 PT 12	
vii	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	**FRLS tests**				
i.	Temperature index test	For PVC outer sheath only	T,A	IS 10810 PT 64/ ASTMD 2863	
ii.	Oxygen index test	For PVC outer sheath only	T,A	IS 10810 PT 58/ ASTM D2863	Applicable for inner sheath if the same is indicated in datasheet A
iii.	Smoke density test	For PVC outer sheath only	T,A	ASTM D2843	
iv.	Acid gas generation test	For PVC outer sheath only	T,A	IS 10810 PT 59/ IEC 754-1	
5.0	**Flammability Tests**				

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQD. AS	REFERENCE STANDARD	REMARKS
i.	Flammability test for bunched cables	For complete cable	T,A	IS 10810 Pt 62/ IEC-60332 (Part-3-23 category B)	Test & Category applicable as indicated in Datasheet-A & Flammability Tests to be conducted only on one sample/ lot.
ii.	Flammability test for single cable	For complete cable	T,A	IS: 10810 Pt 61 / IEC:60332 Part-1	
iii.	Swedish chimney test	For complete cable	A	SEN SS424 1475 (Class F3)	
iv.	Flammability test	For complete cable	A	IEEE: 60383	
6.0	**Electrical Tests**				
i.	High Voltage Test	For complete cable	T,A, R	IS 10810 PT 45	
ii.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T,A	IS 10810 PT 43	
iii.	Partial discharge test (shall be carried out on full drum length)		T,A,R	IS 10810 PT 46	
iv.	Bending test followed by Partial discharge test		T	IS 10810 PT 50	
v.	Dielectric Power Factor Test: (i) As a function of voltage. (ii) As a function of temperature.		T	IS 10810 PT 48	
vi.	Heat Cycle test		T	IS 10810 PT 49	
vii.	Impulse Withstand Test		T	IS 10810 PT 47	

SUB-SECTION–E-41

H.T. CABLE

CLAUSE NO.

QUALITY ASSURANCE & INSPECTION

MODULE NO. SQE 13

H.T CABLES

Item / Components / Sub System Assembly \ Attributes / Characteristics	Make, Type, Rating & T.C	Dimension/surface finish	Mechanial properties	Chemical Composition	Spark Test(as applicable)	Curing Properties	Electrical properties	Hot Set Test/ Eccentricity & Ovality	Lay length & Sequence	Armour coverage, cross over, looseness, gap between two wire	Sequential marking/surface finish/ cable length	T.S & elongation before & after ageing on outer sheath & insulation	Thermal seability on outer sheath	Metallic (Cu) Screening (If applicable)	Anti termite coating on wooden drums	Constructional requirements feature as per NTPC specification	Routine & Acceptance Test as per relevant standard & NTPC specification	FRLS Test
Aluminium (IS-8130)	Y	Y	Y	Y			Y											
Semiconducting Compound	Y		Y			Y	Y											
XLPE Compound (IS-7098 Part-II)	Y		Y			Y	Y					Y						
FRLS PVC Compound (IS-5831, ASTM-D2843, IS10810(Part 58) ,IEC-60754 Part-1)	Y		Y									Y	Y					Y
Triple Extrusion & curing /Manufacturing of Core		Y			Y			Y	Y									
Copper Tape	Y	Y	Y				Y											
Polyster tape	Y	Y																
Armour wire/strip	Y	Y	Y															
Copper tapping	Y	Y					Y											
Inner sheath	Y	Y																
Armouring										Y				Y				
Outer Sheathing		Y									Y	Y	Y			Y		Y
Power Cable (Finished) (IS : 7098 Part II, IEC : 60332 (Part 3 Cat. B), IS-5831, ASTM-D2843, IS10810(Part 58) , IEC-60754 Part-1)	Y								Y	Y	Y	Y	Y			Y	Y	Y
Wooden drum(IS-10418) /Steel Drum		Y													Y			

Notes:

1. This is an indicative list of tests / checks. The manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.
2. Make of all major Bought Out Items will be subject to NTPC approval.

CLAUSE NO.	QUALITY ASSURANCE & INSPECTION

ROUTINE TESTS

Routine tests shall be carried out on each drum of finished cables for all types & sizes.
Following shall constitute routine tests:

1) Conductor Resistance test

2) High voltage test

3) Partial discharge test **(for Screened cables only)**

ACCEPTANCE TESTS

Following Acceptance tests shall be carried out for each type and size of the cables on the cable drums selected at random as per sampling plan mentioned in IS: 7098 Part 1I

A) For Conductor
1) Tensile Test
2) Wrapping Test
3) Resistance test

B) For Armour Wires / Formed Wires (If applicable)
1) Measurement of Dimensions
2) Tensile Tests
3) Elongation Test
4) Torsion Test — For Round wires only
5) Wrapping Test
6) Resistance Test
7) Mass of Zinc coating test — For G S wires / Formed wires only
8) Uniformity of Zinc coating — For G S wires / Formed wires only
9) Adhesion test — For G S wires / Formed wires only
10) Freedom from defects

C) For XLPE insulation & PVC Sheath
1) Test for thickness
2) Tensile strength & Elongation before ageing
3) **Hot set test (For XLPE insulation)**

D) For completed cables
1) Insulation resistance test (Volume resistivity method)
2) High voltage test
3 Partial discharge test **(for Screened cables only**)

CLAUSE NO.	QUALITY ASSURANCE & INSPECTION

E) **Following tests shall be carried out and only one sample shall be taken from each offered lot of all sizes for these tests:-**

1) Thermal stability test **on PVC insulation and outer sheath**

2) Oxygen index test **on outer sheath**

3) Smoke density rating test **on outer sheath as per ASTM –D 2843**

4) Acid gas generation test **on outer sheath as per IEC –60 754 (Part 1)**

5) Flammability test **as per IEC 60332 - Part- 3 (Category- B) on completed cable**

F) **Ageing test on XLPE insulation and PVC outer sheath as per following:**

In case of regular manufacturers:-
Samples as per relevant IS from every size & type of cable in the offered lot shall be tested for tensile strength & elongation (before ageing). The values will be compared with corresponding values mentioned in the type test report accepted by NTPC.
In case values of tensile strength & elongation (before ageing) of PVC insulation & outer sheath are within + /- 15% of the type test reports then 1 sample from sizes which meet the criteria will be put on accelerated ageing test. The accelerated ageing test procedure for PVC insulation & outer sheath: sample to be put in air oven at temperature of 130^c +/- 2^c for 5 hours, tensile strength & elongation acceptance norms as per relevant IS.

However in case the tensile strength and elongation values are not within +/- 15% of type test values then 1 sample of that particular size of cable will be tested for tensile strength & elongation after ageing test as per relevant IS.

For XLPE insulation: 1 sample of every size will be put on ageing test as per relevant IS.

In case of new manufacturers / suppliers (supplying first time to NTPC through corporate contract):-

Samples as per relevant IS from every size & type of cable in the offered lot shall be tested for tensile strength & elongation (before ageing). 1 Samples from every size & type of cable in the offered lot shall be tested for tensile strength & elongation after ageing test as per IS.

G) **Following tests shall be carried on one length of each size of offered lot:**

1) Surface finish, length measurement, sequence of cores, armour coverage, Gap between two consecutive armour wires / formed wires

2) Measurement of Eccentricity & Ovality

DATASHEET- A

DATASHEET-A

I. SPECIFIC TECHNICAL REQUIREMENTS

1.0	Type of Cable	Flame Retardant Low Smoke (FRLS)
2.0	Standard applicable in general	IS: 7098 PART (II)
3.0	Voltage Grade	19/33KV(E), 11/11kV(UE) & 3.3/3.3kV(UE)
4.0	Number of cores, cross sectional area of conductors and quantities	3.3 kV – unarmoured - 01C X 185 SQ. MM 3.3 kV – unarmoured - 01C X 400 SQ. MM 3.3 kV – unarmoured - 03C X 185 SQ. MM 3.3 kV – armoured - 01C X 630 SQ. MM 11 kV – armoured - 01C X 630 SQ. MM 11 kV – unarmoured - 01C X 630 SQ. MM 11 kV – armoured - 03C X 185 SQ. MM 11 kV – unarmoured - 03C X 185 SQ. MM 33 kV - armoured - 1C –185 SQ. MM As per BOQ cum price schedule (Annexure-A to Section-C)
5.0	**CONDUCTOR**	
(a)	Material	Aluminium
	Grade & Class	H2, Class 2
(b)	Standard Applicable	IS: 8130
(c)	Shape	Compacted circular and stranded
(d)	Min. number of strands	As per Table-2 of IS: 8130
(e)	Conductor screen	
(i)	Material	Cross-linked extruded Semi-conducting compound
(ii)	Minimum thickness	0.3 mm
(f)	Eccentricity of core	Shall not exceed 10%
(g)	Ovality of core	Shall not exceed 2%
6.0	**INSULATION**	
(a)	Material	XLPE
(b)	Standard Applicable	IS:7098 Part-II
(c)	Continuous withstand temperature	90°C
(d)	Short-circuit withstand temperature	250°C
7.0	**INSULATION SCREEN**	
(a)	Non-Metallic	
(i)	Material	Cross-linked Semi-conducting compound extruded
(ii)	Minimum Thickness	0.3 mm
(b)	Metallic	
(i)	Material	Copper
(ii)	Type	Wires or Tape
(iii)	Size	Nominal thickness 0.1mm with tolerance (±) 10%
(iv)	Minimum Overlap	20%
(c)	Earth fault current withstand capacity	600 A, 2 sec. (except for single core armoured cable). For single core armoured cable, armouring shall

		constitute the metallic part of screening
8.0	**EXTRUSION (Insulation and Screens)**	
(a)	Process	Triple Extrusion (Extruded semi-conducting compound conductor screen and insulation screen shall be applied along with XLPE insulation in a single operation by triple extrusion process).
(b)	Method of Curing	a) For 11 kV & 3.3 kV - Dry curing/gas curing/steam curing b) For 33 kV - Dry curing/gas curing
9.0	**CORE IDENTIFICATION**	Colour coding as per IS
10.0	**INNER SHEATH (applicable for all cables except single core unarmoured cable)**	
(a)	Material	PVC Type ST2 as per IS: 5831
(b)	Colour	Black
(c)	Whether FRLS	No
(d)	Fillers	Acceptable
(e)	Material of fillers (if permitted)	Same as inner sheath (Material of filler to be compatible with that of inner sheath. It shall not stick to insulation and inner sheath.)
(f)	Method of application	
(1)	Multi-core Cables	
(i)	With fillers	Pressure/Vacuum extruded
(ii)	Without fillers	Pressure extruded
(2)	Single core cables:	Pressure/ Vacuum extruded
11.0	**ARMOUR**	
a)	Material	Galvanised Steel Single Round Wire / formed wire armour conforming to (i) as per IS 7098 part-II (2011) and (ii) IS 3975
(i)	Multicore cables	Galvanised steel round wire /formed wire armour conforming to IS:3975.
(ii)	Single core cables	Hard drawn aluminium round wire armour H4 grade as per IS:8130.
b)	Minimum coverage	90%
c)	Gap between armour wires	Shall not exceed one armour wire space (No core-over/over-riding)
d)	Breaking load of joint	95% of normal armour
e)	Armour joint surface	To be applied with Zinc rich paint
12.0	**OUTERSHEATH**	
	Material	FRLS PVC Type ST2 as per IS: 5831
	Colour	Black
	Whether FRLS	Yes
	Method of application	Extruded
	Marking	1. Cable size (cross section area and no. of cores) (by embossing), 2. Voltage grade (by embossing), 3. Letters FRLS@ 5m (by embossing) 4. Screen fault current 0.6 kA for 2 .sec.

		5. Progressive sequential marking of length @ 1m (by embossing/printing). 6. Manufacturer's name and /or trade name, year of manufacture, 7. 'BHEL-PEM' & 'NTPC' @5m (by embossing)
13.0	**FRLS CHARACTERISTICS**	
(a)	Oxygen index	Min 29 (As per ASTM-D- 2863. Test method as per IS 10810 Part-58)
(b)	Temperature index	Min. 250^{O}C (As per ASTM-D- 2863)
(c)	Acid gas generation	Max. 20% (as per IEC-754-1)
(d)	Smoke density rating	Max 60% (As per ASTM –D- 2843)
(e)	Flame retardance properties	AS PER of IEC: 60332-I (for Single core) & IEC: 60332-3 category B (for Multi core), IEEE: 383 & SS: 424:1475 (class-F3)
14.0	**TOLERANCE ON OUTER DIAMETER**	(±) 2mm. Over the declared value in filled-up Data sheet-C
15.0	**CABLE DRUM**	
(a)	Material of drum	Non-returnable Steel or Wooden (The surface of the of the drum and the outer most cable layer shall be covered with water proof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply with IS 10418).
(b)	Marking on drum (on both sides of drum)	Manufacturer's name or trade mark, purchaser's name, address and contract number, item number & type of cable & voltage grade, year of manufacture, type of insulation/sheath, no. of core and size of cables, cable code, length of cable on drum, direction of rotation (by arrow), approx. net gross weight. A tag containing same information shall be attached to the leading end of the cable.
(c)	Standard drum length	1000m(±) 5% for single core cables and 750m(±) 5% for 3 core cables

DATASHEET C

GUARANTEED TECHNICAL PARTICULARS (TO BE SUBMITTED BY SUCCESSFUL BIDDER)

1.0	**General**		
1.1	Name of manufacturer	:	
1.2	Place of Manufacture	:	
2.0	**Standards applicable**		
2.1	**IS: 7098 Part-II**	:	YES
	For general specification of XLPE Cables		
2.2	**IS: 8130**	:	YES
	For conductor material		
2.3	**IS: 5831**	:	YES
	For material of innersheath & outersheath.		
2.4	**IS: 3975 / IS: 8130**	:	YES
	For armour of 3 core/ single core cables		
2.5	**IS: 10810**	:	YES
	For method of tests		
2.6	**IS:10418**	:	YES
	For cable drums		
2.7	**IS: 10810 part- 58**	:	YES
	For oxygen index test		
2.8	**SS:424-14-75 & IEC-332-III-Cat-B**	:	YES
	For flammability test		
2.9	**IEC-754-1**	:	YES

For acid gas generation test

2.10 **ASTMD-2843** : YES

For smoke generation test

2.11 Current rating of cables conforms to :

2.12 Short circuit rating conforms to :

2.13 Formula for calculating short circuit current for different durations :

OR

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

3.0 Installation Conditions for specified current rating

a) ambient air temperature : deg. C

b) ground temperature : deg. C

c) depth of laying of cables buried in ground : cm

d) thermal resistivity of soil : deg. C cm/W

4.0 **CHARACTERISTICS OF FRLS SHEATH**

a) Oxygen index :

b) Temperature index :

c) Acid gas generation :

d) Smoke density rating :

5.0 **CABLE DRUMS**

a) Type & construction :

b) Standard drum length :

c) Tolerance on drum length :

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

6.1 No. of cores x size :

6.2 Voltage grade (U_o/U) : kV

6.3 Base current ratings (*) based on Clause 3.0

a) In air : Amp

b) In ground : Amp

c) ducts : Amp

6.4 Short circuit rating : kA, sec.

6.5 a) D.C. resistance of conductor at 20 deg. C : ohm/km

b) A.C. resistance of conductor at 90 deg. C : ohm/km

c) Reactance of cable at normal frequency : ohm/km

d) Electrostatic capacitance of cable at normal frequency : mF/km

6.6 CONDUCTOR

a) Material type & grade :

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

c) Shape :

6.7 CONDUCTOR SCREEN

a) Material :

b) Minimum thickness :

6.8 XLPE INSULATION

b) Nominal thickness of insulation : mm

c) Method of curing :

6.9 INSULATION SCREEN

a) Material and thickness (minimum and nominal)

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

ii) Non-metallic
:

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

6.10 PVC ST2 INNERSHEATH

a) Material :

b) Thickness (min.) : mm

c) Method of application

1) Multi-core cables
i) With fillers :

ii) With out fillers : Pressure Extruded

2) Single core cables :

d) Type & Shape of fillers (if used):

e) Colour

6.11 ARMOUR

(a) Material :

b) Size/ dimensions :

c) Minimum no. of wires/ formed wires :

d) Tolerance on formed wire dimension :

e) Maximum resistivity of GS formed wire :

f) Maximum resistivity of Al round wire :

6.12 PVC ST2 FRLS OUTERSHEATH

a) Nominal thickness of outer sheath : mm

6.13 Diameters

a) Diameter of insulated conductor : mm

b) Cable diameter under armour : mm

c) Cable diameter over armour : mm

d) Overall diameter of cable : mm

6.14 Tolerance on overall diameter : (±) mm

6.15 Minimum bending radius : x O.D.

6.16 Safe pulling force : kg.

6.17 Weight of cable : kg./km

6.18 Dimension of drum : mm

6.19 Shipping weight : kg.

6.20 Cable marking on outer sheath :

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