

**2x250MW BARAUNI TPS , UNIT # 8 & 9**


**VOLUME: IIB & III**

**TECHNICAL SPECIFICATION  
FOR  
LT XLPE FIRE SURVIVAL CABLES**

**SPECIFICATION NO.: PE-TS-374-507-E005, Rev. 00**



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

	<b>TECHNICAL SPECIFICATION FOR LT XLPE FIRE SURVIVAL CABLES</b>	<b>Doc. No. PE-TS-374-507-E005</b>	
		<b>Volume --</b>	<b>Section --</b>
		<b>Rev. : 0</b>	<b>Date : 08.12.2011</b>

### PREAMBLE

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

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

This consists of four parts as below:-

**Volume – IA**                      This part contains Instructions to bidders for making bids to BHEL.

**Volume – IB**                      This part contains General Commercial Conditions of the Tender & includes provision that vender shall be responsible for the quality of item supplied by their sub-vendors.

**Volume – IC**                      This part contains Special Conditions of Contract.

**Volume – ID**                      This part contains Commercial conditions for Erection & Commissioning site work, as applicable.

1.2 **VOLUME – II**    **TECHNICAL SPECIFICATIONS**

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

**Volume – IIA**                      General Technical Conditions.

**Volume – IIB**                      Technical Specification including Drawings, if any.

1.3 **VOLUME – IIB**

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

**Section – A**    This section outlines the Intent of Specification

**Section – B**    This section provides "Projection Information".

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

**Section – D**    This section comprises of Technical Specifications of Equipments Complete with Datasheets A, B, C.

**Data sheet - A:-**                      Specific data and other requirements pertaining to the equipments.


**Data sheet - B:-**                      Specific Data to be filled by bidder (Data Sheet - B is contained in Volume - III).

**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**


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 requirements mentioned in Section – C / Data Sheet – A of Section – D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section – D.

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**VOLUME IIB**


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	<b>TOTAL NO. OF SHEETS=</b>	<b>25</b>
	(INCLUDING COVER/ SEPARATOR SHEETS)	

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## SECTION – A

### SCOPE OF ENQUIRY

- 1.0 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery of **LT XLPE FIRE SURVIVAL CABLES** to **2x250MW BARAUNI TPS** site 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/ product 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 be 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 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 2x250 MW Barauni Unit# 8 &9

#### 1.0.0 PROJECT INFORMATION

1.	Owner	Bihar Electricity Board (BSEB).
2.	Project	2 X 250 MW Unit # 8 & 9, Barauni-TPS, Begusarai
3.	Owner's consultant	M/s Evonik, Sec-16, Noida
4.	Location	Town: Barauni, District: Begusarai, State: Bihar
5.	Site	Existing ash dyke are of about 340 acres
6.	FFL/FGL	FFL EL+/- 0.0 corresponds to RL 45.50 M above MSL FGL corresponds to RL 45.00 M above MSL
7.	Nearest Airport	Patna-115 Kms.
8.	Nearest Rail Head	Simaria Railway Station on North Eastern railways
9.	Access to site	The site is at Barauni-Mokama section of National Highway (NH-31)
10.	Metrological data	(Refer as under)

#### Site Meteorological Data:

S.NO.	DESCRIPTION	DATA
A	Latitude	N 25°23'13.5" to N 25°23'54"
B	Longitude	E 86°01'05.1" to E 86°01'46.3"
1.	Maximum Ambient Air Temperature	35.2° C
2.	Minimum Ambient Air Temperature	11.4° C
	Dry Bulb Temperatures	
	Highest recorded :	35.3° C
	Lowest recorded :	12.1° C
	Wet Bulb Temperatures	
1.	Design AMB WBT	Minimum – 12.0° C Maximum- 29.0° C
C	RELATIVE HUMIDITY	
	Design AMB WBT	Minimum- 26% Maximum- 98%
	Annual Mean	52 %
D	RAINFALL	
1.	Annual Total	1003.4 mm
E	WIND DATA	
1.	Wind Speed	47 m/sec
2.	Prevailing Wind Direction	East (blowing from)
3.	Wind Pressure	Minimum 990 hPa. Maximum 1011.5 hPa.
F	SEISMIC COEFFICIENT	Zone IV as per IS-1893 Part-I (2002)

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## TECHNICAL SPECIFICATION FOR LT XLPE FIRE SURVIVAL CABLES

### SECTION – C

#### (SPECIFIC TECHNICAL REQUIREMENTS)

#### 1.0 SCOPE OF ENQUIRY

- 1.1 This enquiry covers the supply of LT XLPE Fire Survival Cables conforming to this specification as detailed below.
- 1.2 General technical requirements of the cables are indicated in Section-D. Project specific technical/ quality requirements/ changes are listed in Datasheet-A and below.
- 1.3 Cables shall conform in all respects to the requirements stipulated in all the above parts of the specification.
- 1.4 The stipulations of Section-C, followed by those of Datasheet-A shall prevail in case of any conflict between the stipulations of Section-C, Datasheet-A and Section-D.

#### 2.0 BILL OF QUANTITIES:

- 2.1 Quantity requirements shall be as per Annexure-A (Bill of Quantities (BOQ)) enclosed.
- 2.2 Delivery schedule (i.e. contractual calendar dates) for the package shall be given separately to the bidders for compliance. Supplies shall be completed conforming to the lot requirements stipulated in the BOQ within the overall delivery schedule.

#### 3.0 SPECIFIC TECHNICAL REQUIREMENTS

##### 3.1 Technical:

- (a) Latest revisions of all relevant Standards in this specification shall be referred.
- (b) Data Sheet-B for power cables (enclosed with Vol. III of this specification) shall be duly filled in and furnished along with the offer. Data Sheet-B in the enclosed format only shall be accepted. Data furnished in any other format will make the offer incomplete and shall not be considered for analysis.

##### 3.2 Quality/ Inspection:


The successful bidder shall submit their Manufacturing Quality Plan. The same shall be subject to customer/ BHEL approval **(This clause shall prevail over clause 2.1 and 4.2- c of Section-D).**

- 3.3 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.

##### 3.4 Technical & Quality documentation to be submitted by all bidders is as under:

- (i) Data Sheet-B [Refer 3.1 (b)]
- (ii) Technical Deviations, if any in the format enclosed with Vol-III of TS.
- (iii) Technical Catalogue
- (iv) Type Test Reports of similar type of cables supplied by bidder in various other contracts. [Refer 2.4.1 (b), Section-D].
- (v) List of orders/ customers to whom bidder has supplied Fire Survival Cables.

#### 4.0 Document distribution schedule for the project shall be as per ANNEXURE-B attached.

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

SL. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.
1	Data Sheet for LT Fire Survival Power Cables	PE-V0-374-507-E001
2	Cross-sectional Drawings for LT Fire Survival Power Cables	PE-V0-374-507-E002
3	Quality Plan for LT XLPE Fire Survival Power Cables	PE-V0-374-507-E003
4.	Type Test Reports for Tests conducted under this contract	PE-V0-374-507-E004
5	Type Test Procedures/ Schedule	PE-V0-374-507-E005
6	Acceptance test procedures/ Schedule	PE-V0-374-507-E006
7	Standard list of raw material suppliers/ sub-vendors	PE-V0-374-507-E007




**ANNEXURE - A OF SECTION - C**  
**BILL OF QUANTITY / PRICE SCHEDULE FOR LT XLPE FIRE SURVIVAL CABLES**

<b>COPPER CONDUCTOR, XLPE INSULATED, ARMOURED FIRE SURVIVAL CABLE</b>					
<b>APPLICABLE TO TECHNICAL SPECIFICATION No. PE-TS-374-507-E005.</b>					
<b>S. No.</b>	<b>ITEM CODE</b>	<b>ITEM DESCRIPTION</b>	<b>UOM</b>	<b>ORDERED QUANTITY</b>	<b>UNIT PRICE (Rs./m)</b>
1.	507-38018	2C-95-Cu-Armoured	METRE	1000	
3	507-38008	1C-630-Cu-Armoured	METRE	2500	

**Notes:**


- Quantities indicated above shall be known as ordered quantities. However, the total quantity variation shall be limited to +30% of the total contract value derived on the basis of the order quantities.
- The bidder shall indicate the unit price of each type and size of cables listed above. The unit prices shall apply for adjustment of variation in quantity as stipulated above.
- Order Quantity shall be cleared for manufacturing along with LOI. However, manufacturing of the cables shall be taken up by the successful bidder only after approval of technical and quality documentation, and supply shall be completed within four months from the date of approval of documentation. Subsequent lots shall be cleared for manufacture based on progress of engineering and site requirements. A lead-time of three months shall be given for completion of supply for each subsequent lot from the date of clearance of the quantities.
- The standard drum length shall be 500meters as indicated above. Tolerance on individual drum length shall be  $\pm 5\%$ .
- 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
- For each individual cable size, one short length of not less than 200m may be accepted only in the final drum length to complete the supply (except where the total ordered quantity is one single drum length of 500m). The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).
- Bidder shall indicate unit price of cables inclusive of type test charges. No separate charges shall be payable for these tests.

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### ANNEXURE - B

S.NO.	DESCRIPTION	NOS.(HARD COPY)	SOFT COPY IN AUTOCAD & PDF	CD ROM
1.	All Drgs./docs.- First submission/resubmission	2	YES	-
2.	Final Drgs./docs. after approval for distribution purpose	20	YES	4
3.	As built drgs./docs.	20	YES	4
4.	Quality plan –submission/	2	YES	-
5	Quality plan- after approval for distribution purpose	20	YES	4
6.	Instruction Manual (Erection,/O&M), commissioning procedure, Data Books/Plant hands book/ CATALOGUES etc.			
6(a)	Draft copy	2	-	-
6(b)	Final submission	20	YES	4
7.	Performance & Guarantee Test Report	10	YES	4

\* Applicable for vendor drawings

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### SECTION – D (STANDARD TECHNICAL SPECIFICATION)

#### 1.0 TECHNICAL REQUIREMENTS


- 1.1 Technical requirements for LT XLPE cables shall be as indicated in this section.
- 1.2 Project specific technical requirements shall be indicated in Datasheet-A and Section-C.

#### 2.0 QUALITY ASSURANCE REQUIREMENTS

- 2.1 Bidder shall confirm compliance with BHEL Quality Plan as attached with the specification without any deviations.
- 2.2 The successful bidder shall submit the Manufacturing Quality Plan (MQP) for approval by BHEL/ Owner 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 to approval/acceptance.
- 2.4 Testing requirements shall be as detailed below.
  - 2.4.1 Type Tests
    - 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-C of S. No. II of 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. Irrespective of the bidder furnishing type test report as indicated above, BHEL will get type tests conducted (indicated in Datasheet-A) on the lots offered for inspection.
    - d. Minor changes in the final Type Test Procedure (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.
  - 2.4.3 Cost of conduction of routine, type and acceptance testing shall be deemed to have been included in the quoted supply prices.
  - 2.4.4 Cost of cables consumed for testing shall be to bidder's account.

#### 3.0 PACKING

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

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**4.0 PROJECT SPECIFIC TECHNICAL AND QUALITY DOCUMENTATION TO BE SUBMITTED**


4.1 During tender stage (Before award of contract): Refer clause 3.1, 3.4 Section-C

4.2 The following documents shall be submitted by Successful Bidder (for approval during contract stage)

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

4.3 Two hard copies along with soft copy in PDF of the above documentation shall be submitted for first review. Number of copies to be submitted for second and subsequent submissions (till Cat-I approval is accorded), and those for final distribution prints of approved documentation and test certificates shall be as indicated separately in section C.


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

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## DATASHEET A

### I. TECHNICAL DATA;

1.0	Type of Cable	Fire Survival cables (FS type)
2.0	Standard applicable in general	BS 7846/ BS 6724 & Technical specification
3.0	Voltage Grade (U <sub>0</sub> / U)	600V/ 1000V
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ, Annexure-A to Section-C
5.0	<b>CONDUCTOR</b>	
(a)	Material	Annealed, Un-Tinned Copper
	Grade and Class	Stranded plain Class 2
(b)	Standard Applicable	BS 6360
(c)	Shape	Circular/Circular Compacted/ shaped
(d)	Min. number of strands	As per Table-2 of BS-6360
6.0	<b>FIRE BARRIER TAPE</b>	Glass Mica tape in two layers with minimum 50% overlap, suitable to meet performance requirements as per Clause 13.0 below
7.0	<b>INSULATION</b>	
(a)	Material	GP8 (XLPE)
(b)	Standard Applicable	BS 7655, Section-1.2 OR BS 7655, Section-1.3
(c)	Continuous withstand temperature	90°C
(d)	Short-circuit withstand temperature	250°C
(e)	Method of application	Pressure extruded (sleeve extrusion is not acceptable).
8.0	<b>CORE IDENTIFICATION</b>	Colour coding as per BS 6724
9.0	<b>INNER SHEATH</b>	
(a)	Material	Polymeric material
(b)	Colour	Black
(c)	Type	<b>LSZH, suitable to meet performance reqmt. mentioned at clause 12.0 below</b>
(d)	Fillers	Not Acceptable
(e)	Method of application	Pressure Extruded
10.0	<b>ARMOUR</b>	
(a)	Material	Single Layer of GS round wire/ Aluminium round wire as per BS 6724
(b)	Size	As per BS 6724


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(c)	Coverage	90%
(d)	Breaking load of joint	95% of normal armour
(e)	Method of jointing	Welding
11.0	<b>OUTERSHEATH</b>	
(a)	Material	Polymeric material
(b)	Colour	Black
(c)	Type	<b>LSZH, suitable to meet performance reqmt. as defined at clause 12.0 below</b>
(d)	Method of application	Pressure Extruded
(e)	Marking	A. By Embossing @ 5m interval 1. Cable size (Nominal cross sectional area and no. of cores) and voltage grade. 2. Letters "FS" 3. Manufacturer's Name/Trade Name 4. Year of manufacture 5. 2 x 250 MW BARAUNI TPS B. By Embossing/ Printing @ 1m interval:- Progressive sequential marking
12.0	<b>FRLS CHARACTERISTICS FOR OUTER SHEATH</b>	
(a)	Oxygen index at room temperature of 50 deg C	Min 30 (As per ASTM D 2863)
(b)	Temperature index	Min. 350°C (As per ASTM D 2863)
(c)	Acid gas generation	Less than 0.5% (as per IEC-60754-1)
(d)	Smoke density rating	Max. 20% as per ASTM D 2843
(e)	Flammability Test	As per IEC: 60332-I, Swedish chimney test & flammability test on multiple cables as per BS EN 50266, CAT-B
13.0	<b>FIRE RESISTANCE CHARACTERISTICS</b>	Meet the requirement of Circuit Integrity test for Min. 3HR. AT 750 DEG. C AS PER IEC 60331
14.0	<b>TEST FOR RODENT &amp; TERMITE TEST</b>	Applicable as per manufacturer standard
15.0	<b>TOLERANCE ON OUTER DIAMETER</b>	±2mm
16.0	<b>STANDARD DRUM LENGTH</b>	As specified in BOQ.

## II. TESTING REQUIREMENTS

### A. Type Test Conduction:

- Type tests are listed at Annexure-C in the last column as either 'T' or 'S' and the same shall be conducted as type tests on one size/lot of finished cable except the Fire Survival Test, Flammability tests & Electrical tests listed at clause no. 7, 8 & 10 for which the sampling plan shall be 'all sizes/ lot'.  
The Type tests may be witnessed by BHEL/ Owner, for which due notice shall be given by the vendor.

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**B Acceptance Test Conduction:**

1. Acceptance tests are listed at Annexure-C in the last column as 'A' and the same shall be conducted as acceptance tests.

**C. Routine Test Conduction:**

1. Routine tests are listed at Annexure-C in the last column as 'R' and the same shall be conducted on 100% of cables.

**ANNEXURE-C**

**TYPE TEST REQUIREMENTS FOR FIRE SURVIVAL CABLES**

S. No.	TEST	APPLICABLE FOR	REF. STD	CLASSIFICATION OF TEST
1.0	<b>Tests for Conductor</b>			
a)	Persulphate test	For copper conductor only	BS-7846/BS-6360	S,A
b)	Annealing test	For copper conductor only	"	T, A
c)	Resistance test	For Cu	"	T, A,R
d)	Tensile, Wrapping & Elongation test	For Cu	"	T,A
2.0	<b>Test for armour</b>			
a)	Measurement of dimensions/ Armour diameter	For armour wire	BS-7846	S,A
b)	Mass of Zinc coating test	For G.S. armour wire	"	T
c)	Wrapping test	Galvanized armour wire	"	T
d)	Armour resistance test	For armour wire	BS-7846	S,R
3.0	<b>Test for Fire Barrier Tape</b>		-	
a)	Test for minimum thickness	Fire barrier tape	-	S,A
4.0	<b>Tests for Insulation (XLPE/GP-8)</b>			
a)	Material	Applicable for insulation	BS-7846	T
b)	Test for thickness	"	"	S,A
c)	Spark Test	"	"	R
d)	Tensile strength and elongation test	Applicable for insulation	BS-7655,1.3	T,A
e)	Ageing in air oven	Applicable for insulation	BS 7846	T
f)	Insulation resistance	Applicable for insulation	"	T,A
g)	Hot set test	Applicable for insulation	"	T,A
h)	Water absorption test	Applicable for insulation	"	T
i)	Shrinkage of insulation	Applicable for insulation	BS-7846	T
j)	Abrasion	On complete cable	"	T

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S. No.	TEST	APPLICABLE FOR	REF. STD	CLASSIFICATION OF TEST
k)	Power factor & permittivity test	Applicable for insulation	"	A
5.0	<b>Test for Inner Sheath (Bedding)</b>		"	
	Physical Properties	Applicable for inner sheath	"	T
	Test for thickness	Applicable for inner sheath	"	S,A
	Corrosive and acid gas emission	Applicable for Inner sheath	IEC-60754-I	S
6.0	<b>Test for Over Sheath</b>		"	
	Physical Properties	Applicable for Over sheath	"	T
	Test for thickness	Applicable for Over sheath	"	S,A
	Spark test	Applicable for Over sheath	"	R
	Corrosive and acid gas emission	Applicable for Over sheath	IEC-60754-I	S
	Shrinkage of over sheath	For complete cable	"	T
	IR constant of oversheath	For complete cable	"	T
7.0	<b>Flammability Tests</b>		"	
a)	Oxygen Index test	For PVC outer sheath only	ASTMD-2863	T,A
b)	Temperature index test	For PVC outer sheath only	ASTMD-2863	T,A
c)	Smoke density test	For PVC outer sheath only	ASTMD 2843	T,A
d)	Smoke emission	For complete cable	BS-7846	S,A
e)	Swedish chimney test	For complete cable	SEN-SS-424-1475	T
8.0	<b>Electrical Tests</b>			
a)	High Voltage Test	On complete cable	BS-7846	T,R
b)	Insulation Resistance Test (Volume resistivity method)	Over sheath	BS-7846	T
9.0	Compatibility	Over Complete cable	BS-7846	T
10.0	<b>Fire Survival Tests</b>			
a)	Flame propagation on single cable	For complete cable	IEC 60331	S,A
b)	Flame propagation on multiple cables	For complete cable	BS-50266, CAT-B	T

T & S: SHALL BE CONDUCTED AS TYPE TEST

R: ROUTINE TEST

A: ACCEPTANCE TEST

#### **SAMPLING PLAN :**


##### **A. TYPE TESTS :**

1. All physical tests & flammability tests shall be conducted on one sample/ lot.
2. Conductor resistance, HV test, LSZH properties on sheath, fire survival tests shall be conducted on one sample/ size/lot.

B. Routine tests shall be conducted on 100% drums.

C. Acceptance tests shall be conducted on 2 drums/ lot.



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#### DATASHEET C

### GUARANTEED TECHNICAL PARTICULARS (TO BE SUBMITTED BY SUCCESSFUL BIDDER)

The above shall be submitted by the successful bidder during contract stage in the format provided by BHEL.

#### 1.0 General

1.1 Name of manufacturer :

1.2 Place of Manufacture :

#### 2.0 Standards applicable

2.1 For general specification of XLPE Fire Survival Cables

2.2 For conductor material

2.3 For material of innersheath & outersheath.

2.4 For method of tests in general

2.5 For cable drums

2.6 For oxygen index test

2.7 For flammability test

For Fire Survival Test

2.8 For acid gas generation test on outer sheath

2.9 For smoke generation test on outer sheath

2.10 Current rating of cables conforms to :

2.11 Short circuit rating conforms to :

#### 3.0 CABLE CONSTRUCTION

BIDDER TO SPECIFY SIZE WISE (WHEREVER APPLICABLE)

##### 3.1 VOLTAGE GRADE

##### 3.2 No. of Cores X Size

##### 3.3 BASE CURRENT RATING AS PER STANDARD


(a) INSTALLATION CONDITIONS

(i) In air

(ii) In ground

(iii) In ducts

##### 3.4 SHORT CIRCUIT RATING & STANDARD REF.

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### 3.5 CONDUCTOR

- |    |  |   |         |
|----|--|---|---------|
| a) | Conductor material, grade & standard                   | : |         |
| b) | Shape of conductor                                     | : |         |
| c) | No & dia of wires in each core before stranding        | : | no x mm |
| d) | Applicable standard                                    | : |         |
| e) | D.C. resistance of conductor at 20 deg. C              | : | ohm/km  |
| f) | A.C. resistance of conductor at 90 deg. C              | : | ohm/km  |
| g) | Reactance of cable at normal frequency                 | : | ohm/km  |
| h) | Electrostatic capacitance of cable at normal frequency | : | mF/km   |
| i) | Maximum conductor temperature                          | : |         |
| j) | Maximum Short Circuit Temperature                      | : |         |

### 3.6 HEAT BARRIER TAPE

- |    |                        |
|----|------------------------|
| a) | Material               |
| b) | Thickness of tape      |
| c) | No. of layers, overlap |
| d) | Standard ref.          |

### 3.7 INSULATION

- |    |   |
|----|---|
| a) | Material & standard                                       |
| b) | Method of cross –linking                                  |
| c) | Method of curing  |
| d) | Extrusion process   |
| e) | Thickness of insulation & Minimum thickness of insulation |
| f) | Dielectric strength of insulation.                        |
| g) | Resistivity of insulation                                 |
| h) | Acid gas generation of insulation & tape in %             |

### 3.8 CORE IDENTIFICATION


Specify standard

### 3.9 INNER SHEATH

- |    |                                   |
|----|-----------------------------------|
| a) | Material & type                   |
| b) | Extrusion process                 |
| c) | Nominal & minimum Thickness       |
| d) | Type & Shape of fillers (if used) |
| e) | Colour                            |

### 3.10 ARMOUR

- |    |                                 |
|----|---------------------------------|
| a) | Material, type & standard       |
| b) | Dimensions                      |
| c) | No. of wires                    |
| d) | Maximum DC resistance of armour |
| e) | Maximum AC resistance of armour |

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## TECHNICAL SPECIFICATION FOR LT XLPE FIRE SURVIVAL CABLES

- f) Minimum coverage

### 3.11 OUTER SHEATH

- a) Material & type
- b) Extrusion process
- c) Nominal & minimum Thickness
- d) Colour

### 4.0 Permissible voltage & frequency variation

- a) Voltage : (+/-)10%
- b) Frequency : (+/-) 5 %
- c) Voltage-frequency combined : |ABS| 10%

### 5.0 CHARACTERISTICS OF LSLH INNER & OUTER SHEATH (SPECIFY ALONG WITH STANDARD)

- a) Oxygen index at room temp. of 50 deg. C :
- b) Temperature index :
- c) Acid gas generation :
- d) Smoke density rating :

### 6.0 Applicable Tests under Fire conditions For single cable & multiple cables

#### 7.0 Applicable Standard for Circuit Integrity Test

- a) Temperature
- b) Duration

### 8.0 CABLE DRUMS

- a) Type & construction :
- b) Standard drum length : as per BoQ
- c) Tolerance on drum length : (+/-) 5%


### 9.0 DOCUMENTATION

Whether following enclosed

- a) X-sectional drawing with constructional details :
- b) Manufacturer Quality Plan :
- c) Type test, Acceptance test & routine test reports
- d) Technical Catalog
- e) List of orders/ customers to whom bidder has supplied Fire Survival cables

### 10.0 Diameters in mm.

- a) Overall Dia of Conductor
- b) Overall dia over taped conductor

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- c) Approximate cable diameter of insulated conductor
- d) Approximate Cable diameter over inner sheath
- e) Approximate overall diameter of cable

11.0 Tolerance on overall diameter : (±)mm

12.0 Minimum bending radius : x O.D.

13.0 Safe pulling force : kg.

14.0 Weight of cable components/ cable in Kg/ m

- (i) Weight of conductor
- (ii) Weight of Fire Barrier Tape
- (iii) Weight of XLPE
- (iv) Weight of PVC/ Polymeric material
- (v) Total weight of cable

15.0 Shipping weight : kg.

16.0 Identification mark on outer sheath :

A) By embossing @5m interval

1) Cable size (Nominal cross sectional area and no. of cores) and voltage grade


2) Letters "FS"

3) Manufacturer's Name/Trade mark

4) Year of manufacture


5) 2 x 250 MW BARAUNI TPS

B) By embossing /printing @ 1m interval progressive sequential marking

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FIRE SURVIVAL CABLES**

**VOLUME III**

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## DATASHEET B

### (TO BE SUBMITTED ALONG WITH THE BID)

#### 1.0 General

1.1 Name of manufacturer :

1.2 Place of Manufacture :

#### 2.0 Standards applicable

2.1 For general specification of XLPE Fire Survival Cables

2.2 For conductor material

2.3 For material of innersheath & outersheath.

2.4 For method of tests in general

2.5 For cable drums

2.6 For oxygen index test

2.7 For flammability test

For Fire Survival Test

2.8 For acid gas generation test on outer sheath

2.9 For smoke generation test on outer sheath

2.10 Current rating of cables conforms to :

2.11 Short circuit rating conforms to :

#### 3.0 CABLE CONSTRUCTION

BIDDER TO SPECIFY SIZE WISE (WHEREVER APPLICABLE)

##### 3.1 VOLTAGE GRADE

3.2 No. of Cores X Size

##### 3.3 BASE CURRENT RATING AS PER STANDARD


(a) INSTALLATION CONDITIONS

(vi) In air

(vii) In ground

(viii) In ducts

##### 3.4 SHORT CIRCUIT RATING & STANDARD REF.

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### 3.5 CONDUCTOR

- e) Conductor material, grade & standard :
- f) Shape of conductor
- g) No & dia of wires in each core : no x mm  
before stranding
- h) Applicable standard
- e) D.C. resistance of conductor at : ohm/km  
20 deg. C
- f) A.C. resistance of conductor at : ohm/km  
deg. C
- e) Maximum conductor temperature :
- f) Maximum Short Circuit Temperature :

### 3.6 HEAT BARRIER TAPE

- g) Material
- h) Thickness of tape
- i) No. of layers, overlap
- j) Standard ref.

### 3.7 INSULATION

- i) Material & standard
- j) Method of cross-linking
- k) Method of curing
- l) Extrusion process
- m) Thickness of insulation &  
Minimum thickness of insulation
- n) Dielectric strength of insulation.
- o) Resistivity of insulation
- p) Acid gas generation of insulation & tape in %

### 3.8 CORE IDENTIFICATION

Specify standard

### 3.9 INNER SHEATH


- a) Material & type
- b) Extrusion process
- c) Nominal & minimum Thickness
- d) Type & Shape of fillers (if used)
- e) Colour

### 3.10 ARMOUR

- a) Material, type & standard
- b) Dimensions
- c) No. of wires
- d) Maximum DC resistance of armour
- e) Maximum AC resistance of armour
- f) Minimum coverage

### 3.11 OUTER SHEATH

- a) Material & type
- b) Extrusion process
- c) Nominal & minimum Thickness

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d) Colour

#### 4.0 Permissible voltage & frequency variation

- |    |                            |   |           |
|----|----------------------------|---|-----------|
| a) | Voltage                    | : | (+/-)10%  |
| b) | Frequency                  | : | (+/-) 5 % |
| c) | Voltage-frequency combined | : | ABS  10%  |

#### 5.0 CHARACTERISTICS OF LSLH INNER & OUTER SHEATH (SPECIFY ALONG WITH STANDARD)

- |    |   |   |  |
|----|---|---|--|
| a) | Oxygen index at room temp. of 50 deg. C | : |  |
| b) | Temperature index                       | : |  |
| c) | Acid gas generation                     | : |  |
| d) | Smoke density rating                    | : |  |

#### 6.0 Applicable Tests under Fire conditions For single cable & multiple cables

#### 7.0 Applicable Standard for Circuit Integrity Test

- |    |             |
|----|-------------|
| c) | Temperature |
| d) | Duration    |

#### 8.0 CABLE DRUMS

- |    |                          |   |            |
|----|--------------------------|---|------------|
| a) | Type & construction      | : |            |
| b) | Standard drum length     | : | as per BoQ |
| c) | Tolerance on drum length | : | (+/-) 5%   |

#### 9.0 DIAMETERS in mm.

- |    |   |
|----|---|
| a) | Overall Dia of Conductor                          |
| b) | Overall dia over taped conductor                  |
| c) | Approximate cable diameter of insulated conductor |
| d) | Approximate Cable diameter over inner sheath      |
| e) | Approximate overall diameter of cable             |

10.0 Tolerance on overall diameter : (±)mm


11.0 Minimum bending radius : x O.D.

12.0 Safe pulling force : kg.

#### 13.0 Weight of cable components/ cable in Kg/ m

- |       |  |
|-------|--|
| (i)   | Weight of conductor                            |
| (ii)  | Weight of Fire Barrier Tape                    |
| (iii) | Weight of XLPE                                 |
| (ix)  | Weight of PVC/ Polymeric material              |
| (x)   | Weight of armour (Galvanised steel/ Aluminium) |
| (xi)  | Total weight of cable                          |



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**TECHNICAL DEVIATION/ CLARIFICATION SHEET**

S. NO.	REF. CLAUSE NO. OF TECHNICAL SPECIFICATION	TECHNICAL CLARIFICATION/ DEVIATION SOUGHT BY BIDDER