

NSPCL ROURKELA PP-II EXPANSION 1X250 MW

VOLUME-II

**TECHNICAL SPECIFICATION
FOR
*PVC INSULATED WIRES***

SPECIFICATION NO: *PE-TS-427-558-E003*

REVISION: 00



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP (INDIA) – 201301**



**TECHNICAL SPECIFICATION
FOR PVC INSULATED WIRES**

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VOLUME II

SECTION I

REVISION 00

DATE: 23.02.2023

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COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same
2. There is no technical deviation with respect to specification.
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
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 description/ quantities from those given in BOQ-Cum-Price schedule of the specification shall not be considered (i.e., technical description & quantities as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE



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1.0 SCOPE

- 1.1 Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of PVC Wires conforming to this specification.
- 1.2 Technical requirements of PVC insulated wires are indicated in Data Sheet-A & Section-II.
- 1.3 The stipulation of Data Sheet-A shall prevail in case of any conflict between the stipulations of Data Sheet-A & Section-II.

2.0 BILL OF QUANTITIES

The bidder to quote for items as per price schedule attached with NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENTS

S.No.	Reference Clause No. of Section- II	Specific Requirement/ Change
1	4.0	Clause 4.0 shall be read as: Wire should be sourced from BIS approved manufacturer of PVC insulated copper wire as per IS-694.

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

- 4.1 Documents shall be submitted after placement of order for BHEL & customer's approval as specified in NIT.
- 4.2 Documents shall be furnished through BHEL's document management system (WRENCH) portal.

Notes:

1. Vendor shall submit the dates for drawing/document submission/BHEL comments/resubmission after approval of all the documents.
2. In BOM each of the item to be uniquely identified with item code no. or item Sl. No. Supplier to ensure that all the items which will find separate mention in the packing list are covered in detailed BOM. Supplier to give following undertaking in BOM: " The BOM provided here completes the scope (in content and intent) of material supply under PO no. ---- dtd ----- Any additional material which may become necessary for the intended application of supplied item/package will be supplied free of cost in most reasonable time."



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DATA SHEET-A

1.0 APPLICABLE STANDARDS & CODES

- a) IS:694 PVC insulated unsheathed and sheathed cables/cords with rigid and flexible conductor.
- b) IS:5831 PVC insulation and sheath of electric cables.
- c) IS:8130 Conductors for insulated electric cables and flexible cords.
- d) IS:10810 Methods of tests for cables.

2.0 MAKE BIS approved As per enclosed sub-vendor list

3.0 TYPE OF WIRE :
 FIRE-RESISTANT (FR) FIRE-RESISTANT LOW SMOKE (FRLS)

4.0 CONDUCTOR

- a) NO. OF CORES : 1
- b) MATERIAL : High conductivity
untinned annealed copper
- c) Type : Stranded conductor
- d) CLASS : Class-2 as per IS: 8130
- e) MINIMUM NUMBER OF STRANDS : As per IS: 8130 (table-2)
- f) MAX. RESISTANCE OF CONDUCTOR : As per IS: 8130 (table-2)

5.0 INSULATION

- a) INSULATION MATERIAL : PVC, Type-A as per IS :5831
- b) NOMINAL INSULATION THICKNESS : As per IS: 694 (table-3)

6.0 MAX. OVERALL DIA. : As per IS: 694 (table-3)

7.0 STANDARD BUNDLE LENGTH : 90-100 meters (For all sizes)



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TECHNICAL PARTICULARS FOR PVC INSULATED WIRES – DATA SHEET-C

(to be submitted by successful bidder after award of contract)

S.No.	Particulars	Unit	Description
1	Manufacturer's name	-	
2	Reference design standards	-	IS 694, IS 8130, IS 5831, IS 10810
3	Type of wire		FIRE-RESISTANT (FR)
4	Rated Voltage	V	1100
5	No. of Cores	No.	1
6	Conductor cross section area (nominal)	sq. mm	As per BOQ
7	Conductor		
	a) Material	-	High conductivity untinned annealed copper
	b) Reference Standard	-	IS 8130
	C) Class		Class-2 as per IS: 8130
	d) No. of strands	No.	
	e) Diameter of strands (nom.)	mm	
	f) Approx. dia of conductor	mm	
	h) Maximum conductor resistance per Km at 20°C	ohm	12.1 for 1.5 sqmm 4.61 for 4 sqmm
8	Insulation		
	a) Reference Standard	-	IS 5831
	b) Material composition	-	PVC, Type-A as per IS :5831
	c) Minimum thickness	mm	0.53 mm for 1.5 sqmm 0.62 mm for 4 sqmm
	d) Nom. Thickness	mm	0.7 mm for 1.5 sqmm 0.8 mm for 4 sqmm
	e) Max. thickness	mm	
	f) Minimum volume resistivity as per IS 5831	Ohm cm	@ 27°C: 1×10^3 @ maximum rated temperature: 1×10^{10}
	g) Dielectric constant	-	
	h) Maximum conductor temperature withstand capacity	°C	70
	i) Minimum conductor temperature withstand capacity	°C	
	j) Maximum diameter including insulation	mm	3.3 mm for 1.5 sqmm 4.6 mm for 4 sqmm
9	Length of single bundle	M	
10	Details of Marking/ label provided as per specification	Yes/ No	



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CHECK LIST FOR SUBMITTING TECHNICAL PQR DOCUMENTS

Bidder to submit signed & stamped copy of checklist shall be submitted alongwith technical offer to ensure completeness of PQR documents.

Checklist		Remarks	Tick as applicable [√]	
1.	Valid BIS certificate enclosed	Specify date of validity	Yes []	No []
2.	Internal (in-house) type test report submitted	•Routine test	Yes []	No []
		•Type test	Yes []	No []
		• Acceptance test To be Included in internal test report	Yes []	No []
3.	Capacity of manufacturing 50Km of PVC wire per month	Proof of manufacturing such as •NSIC certificate •MSME certificate •Chartered engineer certificate •Any other document submitted <i>Note: chartered accountant certificate is not a valid proof for establishing manufacturing capacity</i>	Yes []	No []
4	Manufactured & supplied at least 1 Km of PVC FR copper wire	Proof of manufacturing & supplied FR copper wire such as •Purchase order submitted and	Yes []	No []
		•Dispatch documents (Performa invoice, dispatch details) submitted	Yes []	No []
5	Manufactured & supplied at least 50 Km of PVC copper wire in one or more orders	Proof of manufacturing & supplied copper wire such as •Single or multiple Purchase order copies submitted and	Yes []	No []
		•Single or multiple Dispatch documents (Performa invoice, dispatch documents) submitted	Yes []	No []
6	Copy of min two PO for PVC wires submitted	•Copy of Purchase order submitted	Yes []	No []



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SECTION-II

STANDARD TECHNICAL REQUIREMENTS



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1.0 INTENT OF SPECIFICATION

The intent of specification is not to specify all details of design & construction of material. The material shall, however, conform in all aspects to high standard of design, engineering and workmanship and be capable of performing in continuous operation up to & after bidder's guarantee period in manner acceptable to purchaser who will interpret the drawings & specification and shall have power to reject any work or material which in his judgement is not in full accordance with this specification.

2.0 CODES AND STANDARDS

- 2.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.
- 2.2 The material, construction, manufacture, inspection and testing of PVC wires shall conform to the latest revision of relevant standards as per Data Sheet-A.
- 2.3 In case of conflict between the applicable reference standard and this specification, stringent requirement shall govern.

3.0 TECHNICAL REQUIREMENTS

- 3.1 Lighting wires shall be single core, 1100 V grade, light duty PVC insulated, stranded copper wire for fixed wiring installation.
- 3.2 Wire shall be made with the Colour Codes specified below :

a) 3 phase AC Connections

- Phase 1 (R) Red
- Phase 2 (Y) Yellow
- Phase 3 (B) Blue
- Neutral Black

b) DC Connections

- Positive White
- Negative Grey

c) Earth Connection Green

The Colour wise quantity of PVC wires shall be as specified in 'BOQ cum Price schedule'.

- 3.3 Cross-sectional area of PVC wires shall be as specified in 'BOQ cum Price schedule'.
- 3.4 Technical particulars of PVC wires shall be as specified in Data Sheet – A.

4.0 QUALITY ASSURANCE, TESTING & INSPECTION

- 4.1 Bidder shall confirm compliance with the BHEL's Standard Quality Plan (QP.no. PE-QP-999-558-E003) as attached with the specification without any deviations. At contract stage, the



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successful bidder shall submit the Quality Plan for BHEL/ ultimate customer's approval. In case bidder has reference Quality Plan agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ ultimate customer's approval. There shall be no commercial implication to BHEL on account of Quality plan approval.

4.2 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved quality plan.

4.3 The supplier shall perform all tests necessary to ensure that the material and workmanship conform to the relevant standards and comply with the requirements of the specification. Charges for all these tests for all the equipments & components shall be deemed to be included in the bid price.

In case ordered quantities are manufactured and offered for inspection in more than one lot, BHEL reserves the right to witness testing on all lots without any commercial implications.

5.0 PACKING

5.1 The material shall be packed to ensure protection against damage during transit, storage for prolonged periods and handling.

5.2 The wire shall be clean and dry prior to packaging.

5.3 The wire shall be supplied in packed coils. The tapes used for packing shall not bleed, leave residue, or damage the item when removed.

5.4 The inside coil diameters shall not be smaller than the minimum safe allowable bending diameter for wires.

5.5 The coil shall be placed in a corrugated paperboard/ fibreboard container/ mono carton.

5.6 The mono cartons shall be wrapped or bagged or tied in place in master cartons. The master carton shall be taped and then wrapped with cushioning material.

5.7 The dimensions of cartons shall be as per manufacturer's recommendations.

6.0 MARKING:

6.1 The wire shall carry the following information either stencilled on the reel or contained in a label attached to it:

6.2 Reference of IS 694;

6.3 Manufacturer's name, brand name or trade-mark;

6.4 Type of wire (FR or FRLS, if applicable, to be used) and voltage grade;

6.5 Number of cores & Nominal cross-sectional area of conductor;

6.6 Colour of wire

6.7 Length of wire on the reel or coil;

6.8 Number of lengths on the reel or coil (if more than one);

Annexure-B to MOP: PVC WIRES for 1 x 250 MW NSPCL ROURKELA PP-II EXP

DEFAULT/ BREACH OF CONTRACT, INSOLVENCY AND RISK PURCHASE

In case of delays (beyond the maximum late delivery period as per LD clause) in supplies, or if there be defective supplies or non-fulfilment of any other terms and conditions of the Contract as enumerated subsequently in this clause, then, without prejudice to its right to recover any expenses, losses or damages to which the Buyer may be put to incur or sustain by reason of the Seller/Contractor's default or breach of Order/Contract or to suspend business dealings with the Seller/Contractor in terms of the Buyers' Guidelines for Suspension of Business Dealings as applicable from time to time, the Buyer shall also be entitled to cancel the Order/ Contract either in whole or portion thereof without compensation to Seller. On the occurrence of any of the acts/omissions mentioned below, the Buyer may if it so desires, procure upon such terms and in such manner as deemed appropriate, plant/ equipment/ stores not so delivered or others of similar description where plant/ equipment/ stores exactly complying with particulars are not, in the opinion of the Buyer (which shall be final), readily procurable, at the risk and cost of the Seller.

The Seller shall be liable to the Buyer for any excess costs incurred thereof and the Seller shall continue the performance of the Order/Contract to the extent not cancelled under the provisions of this clause. The Seller shall on no account be entitled to any gain on such repurchases. If the Bidder does not agree to this Risk Purchase clause, BHEL reserves the right to reject the bid/offer of the Bidder.

The order/contract may be cancelled in whole or part thereof and Risk & Cost Clause in line with terms and conditions of PO/Contract may be invoked by the Buyer in any of the following cases:

- i. If the Seller/Contractor fails to deliver the goods or materials or any installment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/services vis-à-vis delivery/execution timeline as stipulated in the contract, backlog attributable to the Seller including unexecuted portion of supply does not appear to be executable within balance period available;
- ii. delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications/execution methodology;
- iii. withdrawal from or repudiation/abandonment of the supply/services by the Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the order/Contract either in whole or in part or otherwise fails to perform the Order/Contract.
- iv. Non supply by the Seller within scheduled completion/delivery period as per contract or as extended from time to time for reasons attributable to the Seller;
- v. Termination of Contract on account of any other reason(s) attributable to the Seller.
- vi. Assignment, transfer, sub-letting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
- vii. If the Seller be an individual or a Sole Proprietorship, in the event of death or insanity of the Seller.
- viii. If the Seller/Contractor being an individual or if a partnership firm thereof, shall at any time be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
- ix. If the Seller/Contractor being a Company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager
- x. Non- Compliance to any contractual condition or any other default attributable to the Seller.

Such defaulting vendor/Seller shall not be eligible to participate in re-tendering conducted on account of risk purchase made due to fault of such vendor/Seller.

BHEL's right to go for Risk and Cost, Calculation of Risk and Cost amount & LD, recovery options to BHEL are given in detail in Annexure-V hereto.

ANNEXURE-V

(RISK AND COST CLAUSE)

1. BHEL reserves the right to terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor *after due notice of a period of 14 days' by BHEL* in any of the following cases:
 - i) If the Seller/Contractor fails to deliver the goods or materials or any instalment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/ services vis-a-vis delivery/execution timeline as stipulated in the Contract, backlog attributable to seller including unexecuted portion of supply does not appear to be executable within balance available period;
 - ii) Delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications;
 - iii) Withdrawal from or repudiation/ abandonment of the supply/ services by Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the Order/Contract either in whole or in part or otherwise fails to perform the Order/Contract;
 - iv) Non-supply by the Seller within scheduled completion/delivery period as per Contract or as extended from time to time, for the reasons attributable to the Seller;
 - v) Termination of Contract on account of any other reason (s) attributable to Seller.
 - vi) Assignment, transfer, subletting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
 - vii) If the Seller be an individual or a sole proprietorship Firm, in the event of the death or insanity of the Seller;
 - viii) If the Seller/Contractor being an individual or if a firm on a partnership thereof, shall at any time, be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the Order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
 - ix) If the Seller/Contractor being a company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances shall have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager;
 - x) Non-compliance to any contractual condition or any other default attributable to Seller.

1.1 Risk & Cost Amount against Balance Work:

Risk & Cost amount against balance work shall be calculated as follows:

Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,

A= Value of Balance scope of Work (*) as per rates of new contract

B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.

H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

1.2 * Balance scope of work (in case of termination of contract):

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount.

Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.

Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose.

Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: In case portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

1.3 LD against delay in executed work in case of Termination of Contract:

LD against delay in executed work shall be calculated in line with LD clause no. 16 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of LD against delay in executed work in case of termination of contract" is given below.


- i. Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
- ii. Let the value of executed work till the time of termination of contract = X
- iii. Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
- iv. Delay in executed work attributable to contractor i.e. T2 = $[1-(X/Y)] \times T1$
- v. LD shall be calculated in line with LD clause (clause 16) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2. Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor

Without prejudice to the other means of recovery of such dues from the Seller recoveries from the Seller on whom risk & cost has been invoked shall be made from the following:

- a) Dues available in the form of Bills payable to seller, SD, BGs against the same contract.
- b) Dues payable to seller against other contracts in the same Region/Unit/ Division of BHEL.
- c) Dues payable to seller against other contracts in the different Region/Unit/ division of BHEL.

In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

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		SHEET NO. 1 OF 1

ITEMS : PVC Wires	
SCOPE : Supply (Including design) : YES Erection & Commissioning : NO	
1.0	Vendor should be a BIS approved manufacturer of PVC insulated copper wire as per IS-694. or In case, vendor is not a BIS approved manufacturer of PVC insulated copper wire as per IS-694, then vendor can offer PVC insulated copper wire of any BIS approved make subject to submission of following documents: a) Undertaking from BIS approved manufacturer (along with its valid BIS certificate) of offered make to get the inspection & testing of aforesaid wires carried out at manufacturer's works. b) Credentials of the manufacturer of offered make to meet the PQR requirements of S. No. 2 to 5 below. c) Vendor's Credentials to meet S. No. 6 below.
2.0	Availability of test reports of PVC insulated copper wire to establish in-house capability at manufacturer's works to carry out all routine, type & acceptance tests as per relevant IS.
3.0	Capacity of manufacturing 50 km of PVC insulated copper wire per month.
4.0	Manufactured and supplied at least one (1) km of PVC insulated FR copper wire.
5.0	Manufactured and supplied at least 50 km of PVC insulated copper wire in one or more orders.
6.0	Minimum two (2) nos. purchase orders for PVC insulated copper wire shall be submitted which should not be more than five (5) years old from the date of techno- commercial bid opening for establishing continuity in business.

NOTES:

1. In place of PVC insulated copper wire, documents submitted for LT Power/control cables shall also be considered.
2. Consideration of offer shall be subject to customer's approval of bidders, if applicable.
3. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
4. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/ collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
5. After satisfactory fulfilment of all the above criterial requirement, offer shall be considered for further evaluation as per NIT and all other terms of the tender.

PREPARED BY	CHECKED BY	REVIEWED BY	APPROVED BY
NIDHI RAWAT (Dy. MANAGER)	MEGHA (MANAGER)	AYAN SAHA (DGM) SANDEEP LODH (Sr. DGM)	DEBASISA RATH AGM (DH-ELECT)

**NSPCL ROURKELA PP-II EXPANSION 1X250 MW
BOQ CUM PRICE SCHEDULE FOR PVC WIRES**

SL. NO.	ITEM CODE	ITEM DESCRIPTION	UNIT	QTY.
1	558-16001-A	WIRES 1X1.5 MM2 CU PVC	MTR	12600
2	558-16003-A	WIRES 1X4.0 MM2 CU PVC	MTR	5400

The Colour wise quantity of PVC wires shall be:

	1.5 SQMM	4.0SQMM
Black:	6300	2700
Red:	2100	2700
Yellow:	2100	
Blue:	2100	