

 BHEL - ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
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BHARAT HEAVY ELECTRICALS LIMITED

INDUSTRIAL SYSTEMS GROUP, BANGALORE

ENQUIRY TECHNICAL SPECIFICATION FOR
6.6 kV (UE) HT POWER CABLE

PROJECT: 1 X 250 MW NSPCL ROURKELA PP-II EXPANSION PROJECT

Raj Kishore Majhi		K Balsamy	
Name	Sign	Name	Sign
Prepared & Checked by		Approved by	



BHEL -ISG BANGALORE

**1 X 250 MW NSPCL Rourkela PP-II Expansion Project
Enquiry Technical Specification for
6.6 kV (UE) HT POWER CABLE**

Specification No.
IS-1-16-2003/031

CONTENTS

SECTIONS	TITLE	PAGE NOS
COVER SHEET	COVERSHEET	PAGE 01 OF 20
CONTENTS	CONTENTS	PAGE 02 OF 20
SECTION – I	GENERAL PROJECT INFORMATION	PAGE 03 OF 20
SECTION - II	CODES AND STANDARDS	PAGE 05 OF 20
SECTION – III	SCOPE OF SUPPLY	PAGE 06 OF 20
SECTION – IV	TECHNICAL SPECIFICATION	PAGE 07 OF 20
SECTION – V	INSPECTION & TESTING	PAGE 10 OF 20
SECTION – VI	DOCUMENTATION	PAGE 16 OF 20
ANNEXURE - 1	PRE-QUALIFICATION REQUIREMENT	3 PAGES
ANNEXURE - 2	UNPRICED PRICE BID	1 PAGE

 BHEL -ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
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SECTION I

GENERAL PROJECT INFORMATION

1.0 PROJECT INFORMATION

- | | | |
|---|---|--|
| 1. Owner | : | NTPC SAIL POWER COMPANY LTD (NSPCL) |
| 2. Consultant | : | MECON LTD |
| 3. Project Title | : | 1 X 250 MW NSPCL Rourkela PP-II Expansion Project |
| 4. Package | : | Coal Handling Plant and Ash Handling Plant |
| 5. Location | : | Rourkela Steel Plant in Sundergarh district of Orissa on the western side of existing 2x60 MW units. |
| 6. Road connectivity | : | The site is connected by road of NH-23 through a link road from a road junction at Panposh located approx. 10 KM from proposed site. |
| 7. Nearest Railway station | : | Rourkela station which is situated about one km from the proposed plant site. A new railway siding will be developed for receiving coal from the source. |
| 8. Nearest Airport | : | Ranchi airport which is about 170 KM by rail and 225 KM by road from the proposed site |
| 9. Nearest seaport | : | Paradip (Orissa) which is around 400 Kms from the proposed site. |
| 10. Latitude | : | 22°13'19" N |
| 11. Longitude | : | 84°53'51" E |
| 12. Coal source | : | Ramnagar coal mines (owned by SAIL) |
| 13. Water source | : | Brahmani which is about 8 km from the proposed site. |
| 14. Average elevation above MSL | : | 194m |
| 15. Barometric pressure : | : | 983 mb |
| 16. Ambient temperature | : | |
| a. Absolute maximum | : | 48 °C |
| b. Absolute minimum | : | 6 °C |
| c. Temperature to be considered for design of electrical equipment/ devices | : | 50 °C |
| 17. Relative humidity (Maximum) | : | 65 % |
| 18. a. Annual Average Rainfall | : | 2656.6 mm |
| b. Heaviest in 24 Hrs | : | 257.8 mm |
| 19. Seismic Zone | : | Zone-II (As per latest Revision of IS 1893 /2002) Part-I |

 BHEL -ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
---	---	--

2.0 POWER SUPPLY SYSTEM

2.1 H.T. Supply

- a. Motors above 160 KW for CHP and 200KW for AHP and also LT Transformers (6.6KV/415V) for AHP & CHP.

Voltage & Frequency	6600 V AC, 3ph, 3W, 50 Hz
Voltage variation	±10%
Frequency variation	±5%
Combined Voltage & frequency variation	10% (absolute sum)
Fault level	40 KA symm. for 1 sec.
Earthing	non-effectively earthed

2.2 L.T. Supply

- a. Motors and loads up to 160 KW for CHP and 200KW for AHP and lighting transformers (1:1)

Voltage & Frequency	415V AC, 3 phase , 4W, 50 Hz
Voltage variation	±10%
Frequency variation	±5%
Combined Voltage & frequency variation	10% (absolute sum)
Fault level	50 KA symm. for 1 sec.
Earthing	effectively earthed

- b. Control, Protection & Metering for LT Switchgear/MCC/Control Panel

Voltage & Frequency	110V AC, 1 phase, 50 Hz
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- c. Motors upto 200W, Lighting, space heaters and A.C. control & protective devices (other than mentioned in point b above)

Voltage & Frequency	240V AC, 1 phase, 2W, 50 Hz
Voltage variation	±10%
Frequency variation	±5%
Combined Voltage & frequency variation	10% (absolute sum)
Earthing	effectively earthed

- d. UPS power supply for DCS/PLC, control & instrumentation

Voltage & Frequency	240V AC, 1 phase, 2W, 50 Hz stabilized supply through UPS system
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- e. Maintenance Lighting

Voltage	24V AC
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2.3 DC Supply

- a. D.C. alarm, control & protective devices, DC motors, Emergency lighting

Voltage	220V DC, 2W
Fault level	25 KA
Earthing	unearthed

- b. Control & Instrumentation

Voltage	24V DC
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For the purpose of design an ambient temperature of 50 deg. C and relative humidity of 95% shall be considered.

 BHEL Maharatna Company BHEL -ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
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SECTION II
CODES AND STANDARDS

All Cables shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

1.	IS: 3975-2004	Low carbon galvanised steel wires, formed wires (Flat strips) and tapes for armouring of cable
2.	IS: 4905-2006	Methods for random sampling
3.	IS: 5831 /84 - 2006	PVC Insulation and Sheath of Electric cables
4.	IS: 7098- Part -2 -2005	Cross-linked Polyethylene Insulated, PVC Sheathed cable for working voltage from 3.3KV up to and including 33KV.
5.	IS: 8130: 2006	Conductors for Insulated Electric cables and flexible cords.
6.	IS: 10418-2006	Drums for electric cables
7.	IS: 10810-2006	Methods of tests for cables
9.	ASTM 2843	Standard test method for density of smoke from the burning or decomposition of plastics
10.	IEC 754-I	Test on gasses evolved during combustion of electric cables
12.	SS: 424:1475, IEC332-1, IEEE-384/74	Flammability test
13.	IEC-332	Tests on electric cables under fire conditions. Part-3: Tests on bunched wires or cables (Category-B).

 BHEL -ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
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SECTION-III
SCOPE OF SUPPLY

- 1.1 The following Cables shall be supplied as per Specification.

Table-1		
Sl. No.	Type & Size of Cable	Quantity (Mtrs.)
1.	3C X 150 SQ.MM., 6.6kV (UE) HT XLPE ARMoured POWER CABLE	15500
2.	3C X 240 SQ.MM., 6.6kV (UE) HT XLPE ARMoured POWER CABLE	1500

- 1.2 The scope of bidder for this tender includes design, detailed engineering, submission of engineering drawings/ docs./ datasheets/ QAPs/ and obtaining the approval from NSPCL/MECON/BHEL, Manufacturing/ fabrication, inspection / shop floor testing, supply of equipment, customs clearance / port clearance, packing & transportation to site.
- 1.3 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 this Project.
- 1.4 Bidder to furnish unit price for each size of cable. The unit prices shall be operated in case of addition/deletion in cable quantity during detail engineering.
- 1.5 Overall tolerance on total dispatched quantity of each size shall be (+) 0% to (+) 2%.
- 1.6 All the enclosures furnished along with this specification shall form part of the tender. Bidder shall submit a signed copy of BHEL's this Tender Enquiry Specification along with all enclosures as Technical Offer with the Bid without any Deviation.
- 1.7 In case of any ambiguity, conflict in the standard & specification and/or interpretation of clauses in this enquiry spec. and its enclosures the decision of BHEL shall be final and binding and any change due to this shall have no price implication on BHEL and shall have to be absorbed by the successful bidder.
- 1.8 Bidder shall include the responsibility of getting the drawings approved from Customer / Customer's Consultant (MECON) & BHEL. Bidder shall be solely responsible for submission and getting the Drawings / Data Sheets / QAP approved from BHEL / Customer / Customer's consultant in time and shall plan the activities accordingly.
- 1.9 Bidder shall submit company's credentials along with the technical offer. The technical bids will be accepted only if Bidder qualifies the Pre-Qualification criteria (Annexure-1) for the tender. All the

 BHEL Bharat Heavy Electricals Limited BHEL - ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
---	---	---------------------------------------

technically qualified bidders shall be subject to approval of Customer. In case offer is rejected on these grounds then offer will be treated as technically rejected and no further correspondence shall be made with the Bidder.

- 1.10 During tender stage, Technical submittals for 1 x 250 MW Rourkela project such as copies of type test certificates, technical literature, datasheets etc. are not required. Any such submission, even if made, shall stand null & void and shall not be considered as part of offer and successful bidder after award of order shall have no right to take any technical and commercial advantage out of the technical submittals furnished during tender stage.
- 1.11 Technical deviation from the tender specification is not acceptable. Bidder shall submit the "DEVIATION FORMAT" indicating "NIL DEVIATION". Clarifications, if any shall be sorted out, before submission of the bid. Bidder's shall raise all ambiguities, conflict in the standard & specification and/or interpretation of clauses, if any, in this enquiry spec. and its enclosures before bid submission, failing which it shall be understood that bidder has no issue and at later date successful bidder shall have no right to take any technical and commercial advantage out of any ambiguity, conflict in the standard & specification and/or interpretation of clauses and the decision of BHEL shall be final and binding and any change due to this shall have no price implication on BHEL and shall have to be absorbed by successful bidder.

SECTION-IV

TECHNICAL SPECIFICATIONS

1.0 CABLE SPECIFICATION

Sl.No	Particulars	HT Power cable Details
1.	Voltage Grade	6.6 kV (Unearthed)
2.	No. of cores and Size	As mentioned in Section-III –Table-1
3.	Conductor type	Compact circular multi stranded aluminium conductor of grade H2 as per IS 8130
4.	Conductor screen	Extruded conductor shielding of semi conducting material with minimum thickness of 0.3mm
5.	Insulation type	XLPE insulated with continuous withstand temperature of 90°C and short circuit withstand temperature of 250°C as per IS 7098.



BHEL -ISG BANGALORE

**1 X 250 MW NSPCL Rourkela PP-II Expansion Project
Enquiry Technical Specification for
6.6 kV (UE) HT POWER CABLE**

Specification No.
IS-1-16-2003/031

Sl.No	Particulars	HT Power cable Details
6.	Insulation screen	Insulation shielding shall be provided over individual cores, consisting of extruded bonded semi conducting compound with minimum thickness of 0.3mm. Over the semi conductor screen, copper tape (non magnetic) metallic screen with a minimum overlap of 20% and with a thickness capable of carrying the system earth fault current of 400A for 2sec for each core, shall be provided.
7.	Extrusion process	Triple Extrusion. The conductor screen and insulation screen shall both be applied along with the XLPE insulation in a single operation of triple extrusion process so as to obtain continuously smooth interfaces. Cables with fillers may be pressure extruded or vacuum extruded. Cables without fillers shall be pressure extruded.
8.	Curing	Method of curing for cables shall be dry curing / gas curing/ steam curing
9.	Fillers	The cable cores shall be laid up with fillers between the cores wherever necessary.
10.	Inner sheath	Extruded PVC inner sheath Type ST2 of Black colour as per IS: 5831 and IS 7098
11.	Armour	Galvanized steel Flat strip armour shall be provided for cables with under armour diameter greater than 13 mm and Galvanized steel Round wire armour shall be provided for cables with under armour diameter not greater than 13 mm as per IS 7098.
12.	Outer sheath	Extruded PVC outer sheath Type ST2 of Black colour as per IS: 5831 and IS 7098. Outer sheath should have FRLS properties.
13.	FRLS properties of outer sheath	a. Oxygen index of min. 29 (Test method as per IS 10810 Part-58)
		b. Temperature index of min 250°C as per IS 7098
		c. Acid gas emission of max. 20% as per IEC-754 (Part-I)
		d. Smoke density rating shall not be more than 60% during Smoke Density Test as per ASTM D-2843
		e. Flammability test as per Category-B of IEC-332 Part-3

 BHEL Maharatna Company BHEL -ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
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Sl.No	Particulars	HT Power cable Details
14.	Marking	(A) Following shall be marked at every 5m by embossing: 1. Cable size (cross section and no. of cores) and voltage grade 2. Word "XLPE" "FRLS" 3. Screen fault current (value of current and time) 4. Manufacturer's name and/or trade name and year of manufacture 5. BHEL-ISG and NSPCL name (B) Sequential marking of length of cable at every 1m by printing
15.	Core identification	By colouring of insulation or by providing coloured tapes helically over the cores, with Red, Yellow & Blue colours as per IS-7098
16.	Tolerance on Outer Diameter	+/- 2 mm over the declared value on technical datasheet

2.0 DESIGN CRITERIA

- 2.1 The cables shall be suitable for laying on racks, in ducts, trenches, conduits and underground (buried) installation with chances of flooding by water.
- 2.2 The cable cores shall be laid up with fillers between the cores wherever necessary. It shall not stick to insulation and inner sheath.
- 2.3 Thickness of galvanised steel flat strip armour and diameter of galvanised steel round wire armour shall be as per IS 7098. The gap between armour wires/strips shall not exceed one armour wire/strip space and there shall be no cross over / over-riding of armour wires. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire/strip. Zinc rich paint shall be applied on armour joint surface of GS wires/formed wires (Flat strips).
- 2.4 The cables shall meet the FRLS characteristics as specified elsewhere in the specification.
- 2.5 In plant repairs to the cables shall not be accepted. Pimples, fish eye, blow holes etc. are not acceptable.
- 2.6 The cross-sectional area of the metallic screen strip/tape/wires shall be considered in sizing calculations.
- 2.7 The eccentricity shall be calculated as

$$\frac{t_{max} - t_{min}}{t_{max}} \times 100$$

and the ovality shall be calculated as

$$\frac{d_{max} - d_{min}}{d_{max}} \times 100$$

 BHEL - ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
--	---	---

Where t_{max}/t_{min} is the maximum/minimum thickness of insulation and d_{max}/d_{min} is the maximum / minimum diameter of the core.

The eccentricity of the core shall not exceed 10% and ovality not to exceed 2%.

3.0 CABLE DRUMS

- 3.1 Cables shall be supplied in non-returnable steel drums of heavy construction. The surface 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.
- 3.2 Each drum shall carry manufacturer's name, owner's name, address, contract number, item number, cable type (voltage grade, insulation, FRLS), cable size, cable length, net gross weight stencilled on both sides of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.
- 3.3 The drum length shall be 750 meters. The length per drum shall be subjected to a maximum tolerance of $\pm 5\%$ of the standard drum length. The purchaser shall have the option of rejecting cable drums with shorter lengths. However, overall tolerance on total dispatched quantity of each size shall be $(+) 0\%$ to $(+) 2\%$
- 3.4 For each individual cable size, one short length of not less than 500m 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).

SECTION-V INSPECTION & TESTING

1.0 GENERAL INSTRUCTIONS:

- 1.1 The bidder shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. Charges for conduction of these type tests shall be deemed to be included in the equipment price.
- 1.2 The type tests shall be carried out in presence of the purchaser's representative, for which minimum 15 days' notice shall be given by the bidder. The bidder shall obtain the purchaser's

 BHEL -ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
---	---	--

approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, test parameters, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.

- 1.3 Purchaser may waive off conducting type test in case the bidder furnishes valid type test (Refer Cl.2.0 Type Test) report conducted within last ten years as on **2nd April 2015**. The type test should have been conducted on equipment similar to those proposed to be supplied under this contract. Type Test should have been conducted either at an independent laboratory or witnessed by a client. However, acceptance of type test report and waiver of conducting type test is subject to acceptance of NSPCL/MECON.

In case of non-acceptance of the above type test report, the same shall be conducted by the Bidder without any additional price implication to purchaser.

- 1.4 Cable/material consumption during inspection and testing shall be in bidder's account. No additional cost shall be applicable for Inspection and testing. Purchaser shall not accept any short length of cable drum.
- 1.5 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.
- 1.6 All acceptance Tests shall be performed in presence of BHEL/NSPCL's representatives. The Bidder shall give at least fifteen (15) days' advance notice of the date when the tests are to be carried out.
- 1.7 After completion of inspection, the material will be treated as ready for dispatch if inspection is OK as observed by Inspection Engineers. However, formal clearance will be issued by BHEL-ISG Bangalore.
- 1.8 Type & routine test report/certificates shall include details of standard to which the tests are performed, test parameters, acceptance criteria, test set up etc. used during the testing along with the test piece details/rating and the detailed test record and final test result.
- 1.9 Bidder shall also furnish copies of reference documents/plant standards/acceptance norms test and inspection, procedure, etc. as referred in quality plans.
- 1.10 All inspection, measuring and test equipment used by the contractor shall be calibrated periodically. Bidder shall maintain all relevant records of periodic calibration, instrument identification, and shall provide for inspection by bidder wherever asked specifically; bidder shall calibrate measuring/testing equipment in the presence of employer
- 1.11 In case the quantities cleared by BHEL for manufacturing (in a lot) are manufactured and

 BHEL - ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
--	---	--

offered for inspection by successful bidder in more than one batch, BHEL reserves the right to witness type/acceptance testing on all batches.

2.0 TYPE TESTS

2.1 The following type tests shall be carried out (if applicable as per cl 1.3 above) on each type and size of cables.

Sl.No	Tests	Remarks
A.	Conductor	
1.	Resistance test For Armour Wires / Formed wires (Flat strips)	
2.	Measurement of Dimensions	
3.	Tensile Test	
4.	Elongation test	
5.	Torsion test	For round wires only
6.	Wrapping test	
7.	Resistance test	
8.	a. Mass & uniformity of Zinc Coating tests	For GS wires/formed wires (Flat strips) only.
	b. Adhesion test	For GS wires/formed wires (Flat strips) only
B.	For XLPE insulation & PVC Sheath	
9.	Test for thickness	
10.	Tensile strength and elongation test before ageing and after ageing	
11.	Ageing in air oven	
12.	Loss of mass test	For PVC outer sheath only
13.	Hot deformation test	For PVC outer sheath only
14.	Heat shock test	For PVC outer sheath only
15.	Shrinkage test	
16.	Thermal stability test	For PVC outer sheath only
17.	Hot set test	For XLPE insulation only
18.	Water absorption test	For XLPE insulation only
19.	Oxygen index test	For PVC outer sheath only
20.	Smoke density test	For PVC outer sheath only
21.	Acid gas generation test	For PVC outer sheath only
22.	Flammability test as per IEC-332 Part-3 (Category -B)	For completed cable only
C.		
1.	Insulation resistance test (Volume Resistivity method)	

 BHEL -ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
---	---	---

Sl.No	Tests	Remarks
2.	High voltage test	
3.	Partial discharge test	
4.	Bending test	
5.	Dielectric power factor test a) As a function of voltage b) As a function of temperature	
6.	Heating cycle test.	
7.	Impulse withstand test	

3.0 ROUTINE TESTS

3.1 Routine tests shall be carried out on each drum of finished cables for all types & sizes.

3.2 Following shall constitute routine tests:

- i. Conductor Resistance test
- ii. High voltage test
- iii. Partial discharge test

4.0 ACCEPTANCE TESTS

4.1 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 1

Sl.No	Tests
A.	For Conductor
1.	Tensile Test
2.	Wrapping Test
3.	Resistance test
B.	For Armour Wires / Formed wires (Flat strips)
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 (Flat strips) only
8.	Uniformity of Zinc coating For G S wires / Formed wires (Flat strips) only
9.	Adhesion test For G S wires / Formed wires (Flat strips) only



BHEL -ISG BANGALORE

**1 X 250 MW NSPCL Rourkela PP-II Expansion Project
Enquiry Technical Specification for
6.6 kV (UE) HT POWER CABLE**

Specification No.
IS-1-16-2003/031

Sl.No	Tests
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)
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 BHEL/NSPCL. 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 deg.c +/- 2 deg.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 NSPCL 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

 BHEL - ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
--	---	---------------------------------------

Sl.No	Tests
	between two consecutive armour wires / formed wires (Flat strips)
2.	Measurement of Eccentricity & Ovality

5.0 INDICATIVE LIST OF TESTS/ CHECKS

5.1 Bidder to refer the below table for the Indicative list of tests/ checks, Routine and Acceptance tests to be conducted. However, this list is only indicative. The manufacturer shall furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents for approval of Customer.

Attributes /Characteristics Item /Components / Sub System	Make, Type, Rating & T.C	Dimension/surface finish	Mechanical 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 stability on outer sheath	Metallic (Cu) Screening (If applicable)	Anti-termite coating on wooden drums	Constructional requirements feature as per NSPCL specification	Routine & Acceptance Test as per relevant standard & NSPCL	FRLS TESTS
Aluminum (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								Y				Y				

 BHEL -ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
---	---	---------------------------------------

Attributes /Characteristics Item /Components / Sub System	Make, Type, Rating & T.C	Dimension/surface finish	Mechanical 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 stability on outer sheath	Metallic (Cu) Screening (If applicable)	Anti-termite coating on wooden drums	Constructional requirements feature as per NSPCL specification	Routine & Acceptance Test as per relevant standard & NSPCL	FRLS TESTS
Armouring																		
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
Steel Drum		Y													Y			

SECTION-VI

DOCUMENTATION

1.0 DOCUMENTS REQUIRED ALONG WITH OFFER:

1.1 The following documents shall be submitted along with the offer

- i. Signed and stamped copy of complete enquiry technical specification including all annexures
- ii. Unpriced Price Bid enclosed in Annexure-2 shall be duly filled as “QUOTED” against each item with signature and stamp by the bidder. The unpriced bid shall be submitted along with the offer without which the offer is liable for rejection.
- iii. “DEVIATION FORMAT” indicating “NIL DEVIATION” shall be submitted along with the offer
- iv. Documents to establish Pre-Qualification Requirement as per Annexure-1

 BHEL Bharat Heavy Electricals Limited BHEL - ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
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2.0 DOCUMENTS REQUIRED AFTER AWARD OF ORDER:

2.1 The following documents shall be submitted after award of offer

Sl.No	Type of document	Hard copies	Soft copies	Document category	Time of submission	Drawing no.
1.	Technical Data Sheet of Cables	6	2	Approval	Within 1 week From LOA	IS-4-DS-708-101-E001
2.	Manufacturer Quality Assurance Plan (Refer Section-V Inspection & Testing)	4	2	Approval	Within 1 week From LOA	IS-4-QP-708-101-E007
3.	Type test certificates, if available	4	2	Approval	Within 1 week From LOA	
4.	Type test procedure (If type test conduction is planned)	4	2	Approval	One month before conduction of type test	
5.	Internal Test certificates in A4 size.	4	2	Information	Along with inspection call	
6.	Routine, Acceptance and Type Test certificates in A4 size.	4	2	Information	After completion of Final Inspection	
7.	O & M manual, Installation manual, Erection instructions, Storage instructions for long period storage	4	2	Information	After completion of Final Inspection	
8.	Packing / drum details			Information	After completion of Final Inspection	

2.2 The drawing numbers furnished in the specification shall be followed for the respective drawings. All the Drawing/Documents shall be submitted in BHEL Title Block issued during detailed engineering.

2.3 Soft copies of documents shall be furnished in CDs.

2.4 The technical datasheet of cables submitted by bidder during detailed engineering, as a

 BHEL -ISG BANGALORE	1 X 250 MW NSPCL Rourkela PP-II Expansion Project Enquiry Technical Specification for 6.6 kV (UE) HT POWER CABLE	Specification No. IS-1-16-2003/031
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minimum shall consist of the details specified in the technical datasheet format and the cable specification.

3.0 TECHNICAL DATASHEET FORMAT

Sl.No	Particulars	Details
1.1	Make	
1.2	Type	
1.3	Specifications and Standards	
1.4	Design ambient temperature	
1.5	System Particulars	
2	CABLES(Fill separate columns for the following particulars for each type and size of cables)	
2.1	Name of the Manufacturer	
2.2	Cable size	
2.3	No. of cores	
2.4	Whether cable will carry ISI mark	Yes /No
2.5	Voltage grade	
2.6	Suitable for earthed/unearthed system	
2.7	Permissible voltage and frequency variation for satisfactory operation	
2.8	Conductor	
2.8.1	Material	
2.8.2	Applicable standard	
2.8.3	Grade	
2.8.4	Size	
2.8.5	No.& dia.of wire in each conductor No./mm	
2.9	Shielding on conductor	
2.9.1	Material	
2.9.2	Type	
2.9.3	Thickness	
2.10	Insulation	
2.10.1	Material	
2.10.2	Type/Applicable standard	
2.10.3	ThicknOess	
2.11	Inner sheath	
2.11.1	Material	
2.11.2	Type/applicable std.	
2.11.3	Thickness	mm
2.11.4	Whether triple extrusion technique for HT adopted?	Yes /No



BHEL -ISG BANGALORE

**1 X 250 MW NSPCL Rourkela PP-II Expansion Project
Enquiry Technical Specification for
6.6 kV (UE) HT POWER CABLE**

Specification No.
IS-1-16-2003/031

Sl.No	Particulars	Details
2.12	Maximum acid-gas generation by weight (%) of outer sheath to IEC 754-1.	
2.13	Approx. weight of finished cable	(kg/km)
2.14	Overall diameter of cable (D)	mm
2.15	Inner sheath	
2.15.1	Material, confirming standard / type	
2.15.2	Extruded	Yes /No
2.15.3	Whether inner sheath will be of FRLS material and meet special Tests as per specification for FRLS cables	Yes /No
2.16	Filler Material details	
2.16.1	Armouring	
2.16.2	Material	
2.16.3	Type of armouring	
2.16.4	Whether galvanised	Yes /No
2.16.5	Outer sheath	
2.16.5.1	Material confirming standard/ type	
2.16.5.2	Extruded	
2.16.6	Whether outer sheath will be of FRLS material and will meet the special tests as per specification	Yes /No
2.17	Short circuit withstand capacity	
2.17.1	Short circuit current	kA
2.17.2	Duration of short circuit	Sec
2.18	Allowable/attainable maximum conductor temperature when carrying continuously currents	
2.19	Allowable/attainable maximum conductor temperature at the termination of short circuit current	
2.20	Conductor resistance	
2.20.1	a) Thickness of insulation	
	b) Thickness of sheath	
	i. inner	
	ii. outer	
2.20.2	Insulation resistance	
2.20.3	Tensile strength of conductor	
2.20.4	a) Tensile strength at break of	
	i. Insulation	
	ii. Inner sheath	
	iii. Outer sheath	
	b) Elongation at break of	
	i) Insulation	



BHEL -ISG BANGALORE

**1 X 250 MW NSPCL Rourkela PP-II Expansion Project
Enquiry Technical Specification for
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Specification No.
IS-1-16-2003/031

Sl.No	Particulars	Details
	ii) Inner sheath	
	iii) Outer sheath	
2.20.5	Oxygen index value	
2.20.6	Smoke density	
2.20.7	Acid gas generation	
2.20.8	Flame propagation as tested by flammability test.	
2.21	Factory tests (Enumerate in detail for each type of cable)	
2.21.1	Type tests	
2.21.2	Acceptance tests	
2.21.3	Routine tests	
2.21.4	Special tests to prove FRLS/FS properties	
2.22	Is the offered cable guaranteed to safely withstand continuous conductor temperature of 90°C for XLPE,FS/ 85°C for HRPVC	Yes /No

NOTE: OFFER OF BIDDERS NOT MEETING THE REQUIRED SPECIFICATION SHALL BE TECHNICALLY REJECTED.