

**TELANGANA STATE POWER GENERATION
CORPORATION LIMITED
5 X 800 MW YADADRI TPS**

VOLUME – II

**TECHNICAL SPECIFICATION OF
LT HRPVC CONTROL CABLE**

**SPECIFICATION NO: PE-TS-417-507-E004,
REVISION: 00**



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UTTAR PRADESH, INDIA – 201301**

466390/2021/PS-PEM-EL


**TECHNICAL SPECIFICATION OF
LT HRPVC CONTROL CABLE**
5X800 MW YADADRI TPS
SPECIFICATION NO. PE-TS-417-507-E004
VOLUME II
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REV. 0
DATE: 01.09.2021
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NO. OF SHEETS
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TOTAL NUMBER OF SHEETS=
36
(INCLUDING COVER & SEPARATOR SHEETS)

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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/ technical deviation with regard to same.
2. There is no deviation with respect to specification other than those furnished in the 'schedule of deviations'.
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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SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS

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1.0 SCOPE OF ENQUIRY

- 1.1 Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of LT HRPVC Control Cable conforming to this specification.
- 1.2 It is not the intent to specify herein all the details of design & manufacture of material. However, the material shall conform in all respects to high standard of design, engineering & workmanship and shall be capable of performing in continuous commercial operation at site condition.
- 1.3 Technical requirements of LT HRPVC Control Cable are indicated in Data Sheet-A & Section-II. Project specific technical/ quality requirements / changes are listed in Section-I
- 1.4 The stipulations of Section-I, followed by those of Data Sheet-A shall prevail in case of any conflict between the stipulations of Section-I, Data Sheet - A & Section-II.
- 1.5 The documents shall be in English Language and MKS system of units.

2.0 BILL OF QUANTITIES

Quantity requirements shall be as per price schedule attached with NIT. Bidder to take care of 'Notes' mentioned in price schedule.

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

- 4.1 Documents required along with the technical offer: -
 - a) Signed & Stamped copy of Compliance certificate.
 - b) Signed & stamped copy of unpriced price schedule with "quoted" word indicated against all items.
 - c) Deviation Sheet (Cost of withdrawal) with bidder's signature and company stamp.
 - d) Annexure-A: PQR Assessment Sheet
- 4.2 Documents/drawings shall be submitted after placement of order for BHEL & customer's approval as specified in NIT.

Notes:

1. Vendor shall submit the dates for drawing/document submission/BHEL comments/resubmission after approval of 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."
- 4.3 Documents/drawings shall be submitted through BHEL's Document Management System (DMS).

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5.0 SPECIFIC TECHNICAL REQUIREMENTS

5.1 TECHNICAL

S. No.	Reference Clause No. of Section- II	Specific Requirement/ Change/ Additional
1	3.3	<i>Referred clause shall be read as:</i> Type testing, routine / acceptance testing and special testing requirements shall be as per Annexure –I to QP & clause 5.2 of Section-I, Volume-II. The type tests are required to be conducted as indicated in Annexure to QAP and the same shall be offered for inspection (conduction of type tests shall be witnessed by BHEL/Customer). Charges for all these tests for all the equipments & components shall be deemed to be included in the bid price. No separate charges shall be payable for type tests.

5.2 QUALITY/INSPECTION

S. No.	Reference Clause No. of Section- II	Specific Requirement/ Change/ Additional
1	Annexure –I to QP Type Test Conduction Clause A 2)	<i>Referred clause shall be read as:</i> Type test on each type and size of cable on one drum out of every 10 drums of cable.
2	Annexure –I to QP Acceptance Test Conduction Clause A 2)	<i>Referred clause shall be read as:</i> Acceptance Tests on 1 drum out of every 10 drums chosen at random for acceptance of the lot for every size.
3	Annexure –I to QP Additional Clause	<i>Additional clause is added in Annexure-I to QP:</i> In addition to tests mentioned in QP “Test for specific optical density of smoke” shall be performed on cable. The cables shall meet the requirements of IS/IEC.
4	Annexure –I to QP Additional Clause	<i>Additional clause is added in Annexure-I to QP:</i> Flame Retardance test on single cable and on bunched cables (both C1 & C2). After the test, there should be no visible damages on the test specimen within 300mm from its upper end. After burning has ceased, the cables should be wiped clean and the charred or affected portion should not have reached a height exceeding 2.5 meter above the bottom edge of the burner, measured at the front and rear of the cable assembly.

Notes:

1) Standard Quality Plan as enclosed in the technical specification is to be appended with cover sheet bearing document number and description as stated above. The signed and stamped copy of the same shall be submitted to BHEL without making any changes in the contents of the document.

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

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DATA SHEET-A (ARMOURED CABLE)

1.0	Type of Cable	Flame Retardant Low Smoke Halogen (FR-LSH)
2.0	Standard applicable in general (Latest amendment to be referred if any)	IS:1554 (Part-1), IS:8130, IS:5831, IS:10810, IS:3975, ASTMD:2843, ASTMD:2863, ASTM D 3137:81, IEC-60754-1, IEC:60332 Part-1, IEC:60332 Part-3-23
3.0	Voltage Grade	1.1kV
4.0	Number of cores, cross sectional area of conductors and quantities	As per Price Schedule
5.0	CONDUCTOR	
(a)	Material	Copper
	Grade and Class	Stranded, annealed high conductivity, Class 2
		<i>Non-Compacted</i>
		<i>Plain Copper</i>
(b)	Standard Applicable	IS: 8130
(c)	Shape	Circular
(d)	Min. number of strands	As per IS
6.0	INSULATION	
(a)	Material	HRPVC Type-C
(b)	Standard Applicable	IS: 5831
(c)	Continuous withstand temperature	85°C
(d)	Short-circuit withstand temperature	160°C
(e)	Method of application	By extrusion; sleeve extrusion not permitted.
(f)	Nominal Thickness of insulation	As per Table-2 of IS: 1554 (Part-1)
(g)	Volume Resistivity	3.5×10^{14} Ohm-cm at 27 deg C and 3.5×10^{11} Ohm-cm at 85 deg C
7.0	CORE IDENTIFICATION	
(a)	Control Cables	Colour coding as per IS 1554 (Part-1)
(b)	Numbering interval	100mm or less.
8.0	INNER SHEATH	
(a)	Material	Extruded HRPVC compound confirming to Type ST-2
(b)	Standard Applicable	IS: 5831
(c)	Colour	<i>Black</i>
(d)	Whether FR-LS Applicable	Yes.
(e)	Thickness of inner sheath	As per Table-4 of IS: 1554 (Part-1)
(f)	Fillers	Acceptable
(g)	Material of fillers (if permitted)	Same as inner sheath
(h)	Method of application for multi-core cables:	
(i)	With fillers	<i>Pressure/Vacuum extruded</i>
(ii)	Without fillers	<i>Pressure extruded</i>

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9.0	ARMOUR	
(a)	Applicable	YES
(b)	Material:	Galvanised single round steel wire for twin and multicore cables.
(c)	Standard Applicable	IS: 1554 (Part-1) Table-5 and IS:3975
(d)	Minimum Coverage	90%
(e)	Gap between armour wires	Shall not exceed one armour wire space (No cross-over/ over-riding)
(f)	Breaking load of joint	95 % of normal armour
10.0	OUTERSHEATH	
(a)	Material	Extruded HRPVC compound confirming to Type ST-2
(b)	Standard Applicable	IS: 1554 (Part-1) & IS: 5831
(c)	Colour	Black
(d)	Whether FR-LSH	Yes
(e)	Method of application	Extruded
(f)	Thickness of outer sheath	As per Table-7 of IS: 1554 (Part-1)
(g)	Marking	<i>Cable size (cross section area and no. of cores), voltage grade, HRPVC, Ref. IS, FRLS/FR-LSH, Manufacturer's name and/ or trade name, ISI mark and year of manufacture @ 5m (by embossing) 'TSGENCO' and 'BHEL-PEM' Name @5m (by embossing) Progressive sequential marking @ 1m. (by printing/ embossing) Further customer specific marking requirement (if any) shall be informed later.</i>
11.0	FR-LSH CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per IS 1554-I /ASTMD 2863)
(b)	Temperature index	Min. 250°C(As per IS 1554-I /ASTMD 2863)
(c)	Acid gas generation	Max. 20% by weight (As per IS 1554-I /IEC-60754-1)
(d)	Smoke density rating	Max. 60% (As per IS 1554-I /ASTM D 2843)
(e)	Flammability Test	
(i)	Flammability test for single cable	YES, As per: IEC-60332 Part-1
(ii)	Flammability test for bunched cables	YES, As per: IEC-60332 Part-3-23, CAT-B
(iii)	Flammability test as per IEEE: 60383	YES
(iv)	Swedish Chimney test SEN-SS-424-1475-F3	YES
12.0	Anti-rodent and Termite repulsion Test	YES
13.0	Special Tests	
(a)	Hydrolytic Stability Test	No (Refer Clause no 3.4 of Section-II).
(b)	Ultraviolet Radiation Test	No (Refer Clause no 3.4 of Section-II).
14.0	TOLERANCE ON OUTER DIAMETER	± 2mm

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15.0	MINIMUM BENDING RADIUS	
(a)	Multi core cables	12 x O.D.
16.0	SAFE PULLING FORCE	
(a)	Copper conductor cable	50 N/ sq. mm.
17.0	CABLE DRUMS	
(a)	Type of Drum	Wooden as per IS 10418
(b)	Standard drum length	1000m (±) 5%.
(c)	Painting	Entire surface to be painted. All ferrous parts used shall be treated with suitable rust preventive finish or coating to avoid rusting during transit or storage. Wooden cable drums shall be treated by immersing in copper-nitrate solution. Drum number shall be indicated on each drum.
(d)	Construction Details	Clause no 4.2 of Section-II of this technical specification
(e)	Particular details on Drum	Clause no 4.3 of Section-II of this technical specification. Further customer specific marking requirement (if any) shall be informed later.

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DATA SHEET C
GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)

S NO.	PARTICULARS	
1	Name of manufacturer	
2	Place of manufacture	
3	No of cores X Nominal area of conductor (mm ²)	
4	Cable Type	
5	CONDUCTOR	
	a) Material type & grade	
	b) Shape	
	c) No. of Strands/Diameter of each strand (No. / mm)	
6	HRPVC INSULATION	
	a) Material	
	b) Dielectric strength kv/mm	
	c) Nominal thickness (mm)	
	d) Volume resistivity at 27° C (ohm-cm)	
	e) Volume resistivity at 70° C (ohm-cm)	
	f) Insulation resistance constant at 27° C (M ohm km)	
	g) Insulation resistance constant at 70° C (M ohm km)	
	h) Min. Tensile strength (N/mm ²)	
	i) Min. Elongation at break (%)	
	j) Negative tolerance on thickness (mm)	
	k) Fictitious dia over insulation (mm)	
7	FILLERS	
	a) Material	
8	INNERSHEATH	
	a) Material	
	b) Whether FRLS	
	c) Minimum thickness (mm)	
	d) Colour of inner sheath	
	e) Fictitious dia over inner sheath (mm)	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

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9	ARMOUR	
	a) Material	
	b) Type of armouring	
	c) Nominal size of armour (mm)	
	d) Minimum coverage	
	e) Method of jointing	
	f) Breaking load of joint	
	g) Minimum no. of wires (No.)	
	h) Armour resistance at 20 deg.C (Ohm/km) max	
	i) Max. Resistivity of GS wire (Ohm-cm) max.	
	j) Fictitious dia over Armouring (mm)	
10	OUTERSHEATH	
	a) Material	
	b) Whether FRLS	
	c) Thickness (mm) (Nominal)	
	d) Min. Tensile strength (N/mm ²)	
	e) Min. Elongation at break (%)	
	f) Colour of Outer sheath	
	g) Tolerance on thickness in mm	
11	Permissible Voltage Variation	
12	Permissible Frequency Variation	
13	Combined Voltage & Frequency Variation	
14	Max. rated Conductor temperature	
15	Max. allowable conductor temperature during short circuit	
16	a. Continuous current carrying capacities	
	b. In Ground 30 deg.C (A)	
	c. In Duct 30 deg.C (A)	
	d. In Air 50 deg.C (A)	
	e. Depth of laying	
	f. Thermal resistivity of soil	
17	FRLS PROPERTIES	
	a. Oxygen Index (ASTMD 2863)	
	b. Temperature Index (ASTMD 2863-77)	
	c. Smoke density rating (ASTMD 2843)	
	d. HCL (ACID) Gas Generation (IEC 754-1)	
	e. Flammability tests	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

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18	CABLE DRUMS	
	a. Type & construction	
	b. Stranded drum length with tolerance on drum length	
19	Max. D.C. resistance of conductor at 20° C-Main (ohm/km)	
20	Max. A.C. resistance of conductor at 70° C-Main (ohm/km)	
21	Calculated star reactance (ohm/km)	
22	Approx. Cable Capacitance (micro F/km)	
23	Charging current at 415 V (A/km)	
24	Loss tangent (for reference only)	
25	DIAMETERS	
	a. Approx. dia over insulation (mm)	
	b. Approx. dia over inner sheath (mm)	
	c. Fictitious. dia under outer sheath (mm)	
	d. Approx. overall dia of cable (mm)	
	e. Tolerance on overall dia in mm	
26	Minimum bending radius	
27	safe pulling force when pulled by pulling eye N	
28	Approximate weight of cable (kg/km)	
29	Marking at every 5 meter on Outer Sheath by Embossing	
30	Marking at every 1 meter on Outer Sheath by Printing	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

Annexure-A
PQR Assessment Sheet
5x800 MW YADADRI TPS : LT HRPVC CONTROL CABLE

Sl. No.	PQR Requirement	Suggestive list of doc to be furnished by vendor (the list does not exlude any other document, which can be specified & submitted by bidder against respective PQR clause)	Remarks
Project Specific PQR			1. Vendor to mentioned Document Reference No. & Date against each PQR requirement. 2. In Case Vendor has already furnished the required documents & the list of relevant documents to BHEL PEM in same package enquiry in last one year, Vendor to mention the reference enquiry number & date and may not require to furnish the document again under subject enquiry. (However in case feel necessary, Bidder may be asked to furnish the same during technical bid clarification stage of the subject enquiry).
1	At least 300 km of PVC insulated, PVC sheathed stranded copper conductor 1.1 kV grade cables in one single contract upto 17.10.2017.	(i) Customer PO & corresponding dispatch docs like invoice/ MDCC etc. ii) Customer declaration on their letter head.	
2	At least one (1) km of Flame retardant low smoke cables upto 17.10.2017.	(i) Customer PO & corresponding dispatch docs like invoice/ MDCC etc. ii) Customer declaration on their letter head.	
General PQR			
1	Vendor should be manufacturer of LT Control cables.	Factory Registraion/BIS Licence/any other Govt. approved/authorized document.	
2	Availability of test reports of tests of LT PVC/HRPVC FRLS control cables to establish in-house capability to carry out all routine, type & acceptance tests as per relevant IS/ International Standards (except UV radiation & hydrolystic stability test which can be conducted at Govt. Lab/ Govt. approved independent lab).	In House Test Report.	
3	Capacity of manufacturing 200 km of LT control cables per month.	MSME certificate / NSIC CERTIFICATE/ ISO certificate/any other Govt. approved/authorized document.	
4	Manufactured and supplied at least one (1) km of FRLS cable.	(i) Customer PO & corresponding dispatch docs like invoice/ MDCC etc. ii) Customer declaration on their letter head.	
5	Manufactured and supplied LT control cables upto 12 cores.	(i) Customer PO & corresponding dispatch docs like invoice/ MDCC etc. ii) Customer declaration on their letter head.	
6	Manufactured and supplied at least 500 km of LT control cable of min. 1.5 sq mm in one or more orders and atleast 100 km of LT control cable of min. 1.5 sq mm in one single order.	(i) Customer POs & corresponding dispatch docs like invoice/ MDCC etc. ii) Customer declaration on their letter head.	
7	Minimum two (2) nos. purchase order for LT PVC/HRPVC control cables shall be submitted which should not be more than five (5) years old from the date of techno-commercial bid opening (as applicable) for establishing continuity in business.	(i) Customer POs.	

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SECTION-II

STANDARD TECHNICAL REQUIREMENTS

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1.0 CODES AND STANDARDS

- 1.1 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.
- 1.2 The design, material, construction, manufacture, inspection and testing of LT HRPVC Control Cable shall conform to the latest revision of relevant standards as per Data Sheet-A.
- 1.3 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

2.0 TECHNICAL REQUIREMENTS

- 2.1 LT HRPVC Control Cable shall be supplied as per technical particulars specified in Data Sheet – A.

3.0 QUALITY ASSURANCE, TESTING & INSPECTION

- 3.1 Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-507-E010, Rev-0) as attached with the specification without any deviations. At contract stage, the successful bidder shall submit the same QP for BHEL/ ultimate customer's approval. In case bidder has reference QP 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 minor changes in QP during contract stage.
- 3.2 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved Quality Plan.
- 3.3 Type testing, routine / acceptance testing and special testing requirements shall be as per Annexure –A to QAP. Charges for all these tests for all the equipments & components shall be deemed to be included in the bid price (except UV Radiation & Hydraulic Stability test).
- 3.4 The charges of UV Radiation test & Hydrolytic Stability test (if applicable) shall be reimbursed extra at actual against original money receipt of Govt. Lab. (CPRI/ ERDA etc).
- 3.5 Cost of cables consumed for testing shall be to bidder's account.

4.0 PACKING

- 4.1 Cables shall be supplied in non-returnable drums. Material of cable drums shall be wooden.
- 4.2 For wooden drums, all wooden parts shall be manufactured from seasoned wood treated with copper naphthenates / zinc naphthenates (refer IS: 401) and anti-termite. 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. Dimensions of wooden drums shall be as per IS 10418. All ferrous parts shall be treated with suitable rust protective

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finish or coating to avoid rusting during transit and storage. BIS certification mark shall be stamped on each cable drum.

- 4.3 Each drum shall carry manufacturer's name, purchaser's name, address and contract no., item no. & type, size, code & length of cable, year of manufacture, ISI mark and net gross weight stencilled on both sides of drum. A tag containing same information shall be attached to the leading end of the cable. An arrow & suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 1 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	*	**
					M C/N				D	M C N

RAW MATERIAL

Copper Rods	GENERAL:										
	1. Physical properties	MA	Physical Tests	Sample/Batch	Sample/Batch	IS 613	IS 613	Test Certificate	√	P/V	V -
	2. Elec. Properties	MA	Electrical Tests	Sample/Batch	Sample/Batch	-do-	-do-	-do-	√	P/V	V -
	SPECIFIC CHECKS:										
	a) Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC	√	P	V -
	b) Grade	MA	-do-	-do-	-do-	IS 613	IS 613	Test Certificate	√	P	V -

BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:	Manish	MANISH SHUKLA	Reviewed by:	R.K. JAISWAL	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
Reviewed by:	Sign & Date	Name	Seal
Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 2 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		c) Resistivity	MA	Electrical Tests	Manufacturer std.	Manufacturer std.	IS 613	IS 613	Test Certificate	√	P	V	-	
	PVC Compound (for insulation)	GENERAL :												
		1. Physical properties	MA	Physical Tests	Sample/Batch	Sample/Batch	IS 5831	IS 5831	Test Certificate	√	P/V	V	-	
		2. Elec.Properties	MA	Electrical Tests	Sample/Batch	Sample/Batch	-do-	-do-	-do-	√	P/V	V	-	
		SPECIFIC CHECKS:												

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	<i>Devendra Singh</i>	DEVENDRA SINGH	Checked by:	<i>Kunal Gandhi</i>	KUNAL GANDHI
Reviewed by:	<i>Manish Shukla</i>	MANISH SHUKLA	Reviewed by:	<i>R.K. Jaishwal</i>	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 3 OF 10

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* D	** M C N
					M C/N					

		a) Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC	√	P	V	-	
		b) Type/ Grade	MA	-do-	-do-	-do-	Approved datasheet	Approved datasheet	-do-	√	P	V	-	
		c) Shelf life/ Storage condition	MA	-do-	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	√	P	V	-	
	Fillers (as applicable)	1. Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC	√	P	V	-	Fillers material chosen shall be compatible with the temperature rating of the cable and shall have no deleterious effect on any other component of cable)
		2. Flame retardant & moisture resistant. (as applicable)	CR	Chemical/ Environ.	-do-	-	Appd. Data Sheet	Appd. Data Sheet	-do-	√	P/V	-	-	

BHEL				
ENGINEERING		QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Name
	<i>Devendra Singh</i>	DEVENDRA SINGH	<i>Kunal Gandhi</i>	KUNAL GANDHI
Reviewed by:	Sign & Date	Name	Reviewed by:	Name
	<i>Manish Shukla</i>	MANISH SHUKLA	<i>R.K. Jaishwal</i>	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

28/02/2020

27/4/2020

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE: 466
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 4 OF 17

SI. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	

	Galvanised steel wire/strip for Armour (if applicable)	GENERAL :												
		1. Make	MA	Verify	Manufacturer std.	Manufacturer std.	Manufacturer approved source	Manufacturer approved source	Inspection report/ Test Certificate	√	P	V	-	
		2. Dimension	MA	Measurement	-do-	-	Approved datasheet	Approved datasheet	-do-	√	P/V	-	-	
		3. Phy.and Elec. Properties	MA	Physical & Electrical Tests	Sample*	-	-do-	-do-	-do-	√	P/V	-	-	* Sample from each armour size/Batch/ Lot
		4.Galvanization Quality	MA	Galv.Tests	-do-	-	IS 3975	IS 3975	-do-	√	P/V	-	-	

BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
	<i>Devendra Singh</i>	DEVENDRA SINGH		<i>Kunal Gandhi</i>	KUNAL GANDHI
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
	<i>Manish Shukla</i>	MANISH SHUKLA		<i>R.K. Jaishwal</i>	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 5 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* D	** M C N
					M C/N					

	PVC compound for Sheath	GENERAL :												
		1. Physical properties	MA	Physical Tests	Sample/Batch	Sample/Batch	IS 5831	IS 5831	Inspection report/ Test Certificate	√	P/V	V	-	
		2. Elec.Properties	MA	Electrical Tests	Sample/Batch	Sample/Batch	-do-	-do-	-do-	√	P/V	V	-	
		3. FRLS Properties (as applicable)	CR	Chemical/ Environ.	Sample/Batch	Sample/Batch	Approved datasheet	Approved datasheet	-do-	√	P/V	V	-	
		SPECIFIC CHECKS :												

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	<i>Devedra Singh</i>	DEVENDRA SINGH	Checked by:	<i>Kunal Gandhi</i>	KUNAL GANDHI
Reviewed by:	<i>Manish Shukla</i>	MANISH SHUKLA	Reviewed by:	<i>R.K. Jaishwal</i>	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 6 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		a) Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC	√	P	V	-	
		b) Type/ Grade	MA	-do-	-do-	-do-	Approved datasheet	Approved datasheet	-do-	√	P	V	-	
		c) Shelf life/ Storage condition	MA	-do-	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	√	P	V	-	
	Wooden drums	1. Phy. & Constructional checks	MA	Visual	Mfr's Plant Std.	Mfr's Plant Std.	IS 10418	IS 10418	Inspection report/ Test Certificate	√	P	V	-	
		2. Anti-termite treatment	MA	Chem.	-do-	-do-	Mfr's Plant Std.	Mfr's Plant Std.	COC	√	P	V	-	

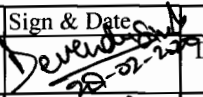
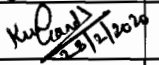
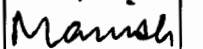
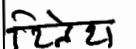
BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
	<i>Devendra Singh</i>	DEVENDRA SINGH		<i>Kunal Gandhi</i>	KUNAL GANDHI
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
	<i>Manish Shukla</i>	MANISH SHUKLA		<i>R.K. Jaishwal</i>	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE: 466
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 7 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
	Steel drums (If applicable)	1. Dimension	MA	Meas.	Mfr's Plant Std.	Mfr's Plant Std.	Approved drawing of steel drum	Approved drawing of steel drum	Inspection report	√	P	V	-	
		2. Surface finish	MA	Visual	-do-	-do-	Surface shall be smooth	Surface shall be smooth	Inspection report	√	P	V	-	
	IN PROCESS													
	Wire Drawing & Annealing	1. Size	MA	Dimensional	Mfr's Plant Std.	Mfr's Plant Std.	Approved Data Sheet	Approved Data Sheet	Inspection report	√	P	V	-	
		2. Surface finish	MA	Visual	-do-	-do-	Surface shall be smooth	Surface shall be smooth	-do-	√	P	V	-	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		DEVENDRA SINGH	Checked by:		KUNAL GANDHI
Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

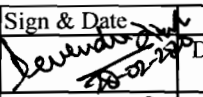
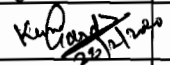
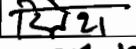
FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

28/02/2020

28/2/2020

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 8 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					M	C	N	
		3. % of Elongation	MA	Mechanical	-do-	-do-	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	-do-	√	P	V	-	
	Tinning (Conductor)	1. Size	MA	Dimensional	Plant Mfg. Std.	Plant Mfg. Std.	Mfrs Std	Mfrs Std	-do-	√	P	V	-	(Applicable only for tin-coated copper conductor)
		2. Chemical test for tinning	CR	Chemical	-do-	-do-	IS 10810 Pt-4	IS:8130	-do-	√	P	V	-	
	Stranding of wires	1. No.of wires	MA	Counting	Mfr's Plant Std.	Mfr's Plant Std.	Approved Data Sheet	Approved Data Sheet	-do-	√	P	V	-	
		2. Resistance	CR	Electrical	-do-	-	-do-	-do-	-do-	√	P	-	-	

BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
		DEVENDRA SINGH			KUNAL GANDHI
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
		MANISH SHUKLA			R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
Reviewed by:	Sign & Date	Name	Seal
Approved by:			

28/02/2020

28/02/2020

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE: 466
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 9 OF 17

SI. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* D	** M C N
					M C/N					

		3. Sequence, lay length & Direction	MA	Visual, Meas	one Sample of each size/lot	-	Mfrs Std	Mfrs Std.	-do-	√	P	-	-	
		4. Surface Finish	MA	Visual	100%	-	Surface shall be smooth	Surface shall be smooth	-do-	√	P	-	-	
		5.Dimension	MA	Measurement	one Sample of each size/lot	-	Appd. Data Sheet	Appd. Data Sheet	-do-	√	P	-	-	
	Core Insulation (No repair permitted)	1. Surface finish	MA	Visual	100%	100%	Free from bulging	Free from bulging	Inspection report	√	P	V	-	
		2 Insulation thickness	CR	Measurement	one Sample of each	-	Appd.data sheet	Appd.data sheet	-do-	√	P	-	-	

BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
	<i>Devendra Singh</i>	DEVENDRA SINGH		<i>Kunal Gandhi</i>	KUNAL GANDHI
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
	<i>Manish Shukla</i>	MANISH SHUKLA		<i>R.K. Jaishwal</i>	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
Reviewed by:	Sign & Date	Name	Seal
Approved by:			

28/01/2020

28/1/2020

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 10 OF 17

SI. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
					size/lot									
		3. Concentricity #	CR	Measurement	-do-	-do-	Mfrs Std	Mfrs Std	Inspection Report	√	P	V	-	# To be checked at starting & finish end of Extruded Length
		4 Dia over insulation	MA	Measurement	-do-	-	Approved Data Sheet	Approved Data Sheet	-do-	√	P	-	-	
		5. Core identification	MA	Visual	100%	-	Appd. Data Sheet	Appd. Data Sheet	-do-	√	P	-	-	
		6. TS & % Elongation	MA	Mechanical	100%	-	IS 1554 Pt-1/ IS 5831	IS 1554 Pt-1/ IS 5831	-do-	√	P	-	-	

BHEL				BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Doc No:			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name		Sign & Date	Name	Seal
	<i>Devendra Singh</i>	DEVENDRA SINGH		<i>Kunal Gandhi</i>	KUNAL GANDHI				
Reviewed by:	<i>Manish Shukla</i>	MANISH SHUKLA	Reviewed by:	<i>R.K. Jaishwal</i>	R.K. JAISWAL				

28/04/2020

28/04/2020

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 11 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* D	** M C N
		7. Spark Test or Water immersion test	CR	Electrical	100%	-	Mfr's Std.	Mfr's Std.	-do-	√ P - -
	Core laying	1. Dia over laid up core	MA	Measurement	one Sample of each size/lot	-	Approved Data Sheet	Approved Data Sheet	-do-	√ P - -
		2. Sequence of lay and lay length & direction for laid up core	MA	Visual meas	one Sample of each size/lot	-	IS 1554 Pt-1	IS 1554 Pt-	-do-	√ P - -
		3. Core identification	CR	Visual	one Sample of each size/lot	-	Appd. Data Sheet	Appd. Data Sheet	-do-	√ P - -

BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
	<i>Devendra Singh</i>	DEVENDRA SINGH		<i>Kunal Gandhi</i>	KUNAL GANDHI
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
	<i>Manish Shukla</i>	MANISH SHUKLA		<i>R.K. JAISWAL</i>	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
Reviewed by:	Sign & Date	Name	Seal
Approved by:			

28/02/2020

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE: 466
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 12 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					M	C	N	

Inner Sheath Extrusion (if applicable)	1. Surface finish	MA	Visual	100%	-	Surface shall be smooth	Surface shall be smooth	-do-	√	P	-	-	
	2. Sheath thickness	CR	Measurement	One sample of each size/lot	-	Approved Data Sheet	Approved Data Sheet	-do-	√	P	-	-	
	3. Dia over inner sheath	MA	Measurement	-do-	-	Approved Data Sheet	Approved Data Sheet	-do-	√	P	-	-	
Armouring (if applicable)	1. No. of wires/Strips	MA	Counting	At the start of the process	-	Mfr's Std	Mfr's Std	-do-	√	P	-	-	
	2. Lay Direction	MA	Visual	-do-	-	IS 1554 Pt-1	IS 1554 Pt-1	-do-	√	P	-	-	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	<i>Devendra Singh</i>	DEVENDRA SINGH	Checked by:	<i>Kunal Gandhi</i>	KUNAL GANDHI
Reviewed by:	<i>Manish Shukla</i>	MANISH SHUKLA	Reviewed by:	<i>R.K. Jaiswal</i>	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

28/02/2020

28/02/2020

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 13 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					M	C	N	
		3. Lay Length	MA	Visual, Meas.	At the start of the processes	-	IS 1554 Pt-1	IS 1554 Pt-1	-do-	√	P	-	-	
		4. Coverage	MA	Measurement	-do-	-	Approved data sheet	Approved data sheet	-do-	√	P	-	-	
		5. Dia over armouring	MA	Measurement	-do-	-	Appd. Data Sheet	Appd. Data Sheet	-do-	√	P	-	-	
	Outer Sheath Extrusion	1. Surface Finish	MA	Visual	100%	-	Surface shall be smooth	Surface shall be smooth	-do-	√	P	-	-	
		2. Sheath thickness	CR	Measurement	One sample of each size/lot	-	Appd. Data Sheet	Appd. Data Sheet	-do-	√	P	-	-	

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ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	<i>Devendra Singh</i>	DEVENDRA SINGH	Checked by:	<i>Kunal Gandhi</i>	KUNAL GANDHI
Reviewed by:	<i>Manish Shukla</i>	MANISH SHUKLA	Reviewed by:	<i>R.K. Jaishwal</i>	R.K. JAISWAL

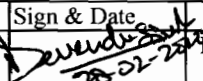
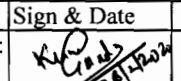
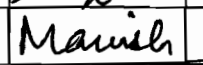
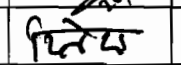
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Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 14 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	* D	**			
					M	C/N					M	C	N	
		3. Dia over outer sheath	MA	Measurement	One sample of each size/lot	-	Appd. Data Sheet	Appd. Data Sheet	-do-	√	P	-	-	
		4. Marking/ Colour / Embossing	MA	Visual	One sample of each size/lot	-	Appd. Data Sheet	Appd. Data Sheet	-do-	√	P	-	-	
	Final Inspection (Internal)	1.Routine Test (Refer Note-H)	CR	Electrical Test & measurement	100%	100%	IS 1554-I & Appd. Datasheet	IS 1554-I & Appd. Datasheet	Test Report	√	P	V	✓	#: Refer Annexure-A to QP
	Final Inspection	1. Finish	MA	Visual, Measurement	See Remark	See Remark	IS 1554 Pt-1/ Appd. Data Sheet	Free from Bulging, Burnt particles, lumps, cuts & scratches/ Approved data sheet	Test Report	√	P	W	W	

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Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
		DEVENDRA SINGH			KUNAL GANDHI
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
		MANISH SHUKLA			R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE: 466
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 15 OF 17

SI. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* D	** M C N
					M C/N					

	2. Length	MA	Visual, Measurement	See Remark	See Remark	IS 1554 Pt-1/ Appd. Data Sheet	BHEL Spec./ Data Sheet	Test Report	√	P	W	W	
	2. Dimensions	MA	Measurement	As per IS	As per IS	IS 1554 Pt-1/ Appd. Data Sheet	Appd. Data sheet	Test Report	√	P	W	W	
	3. Armouring - Coverage No. of Wires/Strips	MA	Visual & Meas.	-do-	-do-	IS 1554 Pt-1/ Appd. Data Sheet	IS 1554 Pt-1/ Appd. Data Sheet	Test Report	√	P	W	W	'Refer Annexure-I to QP for sampling plan.
	4. Marking/Colour Coding	MA	Visual	-do-	-do-	IS 1554 Pt-1/ Appd. Data Sheet	IS 1554 Pt-1/ Appd. Data Sheet	Test Report	√	P	W	W	
	6. Acceptance Tests (Refer Note-H)	CR	Phy & Elect. Tests FRLS Test	Sample #	Sample #	#:	#:	Test Report	√	P	W	W	

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ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	<i>Devendra Singh</i>	DEVENDRA SINGH	Checked by:	<i>Kunal Gandhi</i>	KUNAL GANDHI
Reviewed by:	<i>Manish Shukla</i>	MANISH SHUKLA	Reviewed by:	<i>R.K. Jaiswal</i>	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

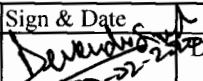
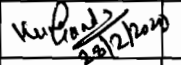
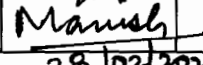
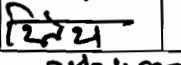
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	Sign & Date	Name	Seal
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Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 16 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		7. Type & FRLS Tests (Refer Note-H)	CR	Measurement	sample	sample	#:	#:	Test Report	√	P	W	W	
	Packing	Sealing Identification	MA	Visual	100%	100%	As per IS	As per IS	Test Report	√	P	W	-	

NOTES: -

- | | |
|-----|--|
| (A) | JOINTS IN WIRE SHALL BE AS PERMITTED BY MFRS STANDARD. VENDOR TO CERTIFY THE SAME. |
| (B) | NO REPAIR OF CORE INSULATION PERMITTED |
| (C) | CABLE ENDS SHALL BE SEALED AS PER VENDOR'S SPECIFICATION. |
| (D) | RECORD OF RAW MATERIAL, PROCESS & ALL STAGES SHALL BE CERTIFIED BY VENDORS QC. AND ARE LIABLE TO AUDIT CHECK BY PURCHASER. |
| (E) | FILLERS/DUMMY CORES ETC. SHALL BE AS PER APPROVED DATA SHEET |
| (F) | WHEREVER EXTENT OF CHECK FOR STAGE IS MENTIONED AS 'SAMPLE' & NOT DEFINED IN QP, THE SAME SHALL BE AS PER VENDORS SAMPLING PLAN. |
| (G) | VENDOR SHALL FURNISH COMPLIANCE CERTIFICATE TO THE INSPECTION AGENCY CONFIRMING THE PACKING AS PER IS/ BHEL SPECIFICATION. |
| (H) | FOR LISTS OF ROUTINE TESTS, ACCEPTANCE TESTS & TYPE TESTS REFER ANNEXURE TO QAP. |

BHEL				BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Doc No:			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name	Seal
		DEVENDRA SINGH			KUNAL GANDHI				
Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL	Approved by:			
28/02/2020		24/2/2020							

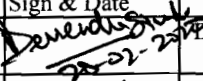
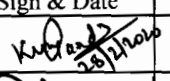
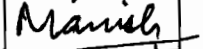
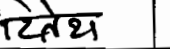
	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004	DATE: 466
		CUSTOMER :		QP NO.: PE-QP-999-507-E003, R-1	DATE:
		PROJECT:		PO NO.:	DATE:
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	SYSTEM:	SECTION: II	SHEET 17 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* D	** M C N
					M C/N					

- (I) BHEL RESERVES THE RIGHT FOR CONDUCTING REPEAT TEST, IF REQUIRED.
- (J) AFTER PACKING AND PRIOR TO ISSUE OF MDCC, PHOTOGRAPHS OF COMPLETE CABLE (TO BE DISPATCHED) SHALL BE SENT TO BHEL-PURCHASE GROUP FOR REVIEW.
- (K) PROJECT SPECIFIC QP SHALL BE DEVELOPED BASED ON CUSTOMER REQUIREMENT.

LEGENDS:

*RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
 ** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, C: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, N: CUSTOMER,
 P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE
 MA: MAJOR, MI: MINOR, CR: CRITICAL, D: DOCUMENTATION

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ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
		DEVENDRA SINGH			KUNAL GANDHI
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
		MANISH SHUKLA			R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Approved by:			

28/02/2020

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	ANNEXURE-I TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-RC-999-507-E004
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R1	SPECIFICATION TITLE:
		SYSTEM	ITEM: 1. LT PVC CONTROL CABLE 2. LT HRPVC CONTROL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	DOC. NO.

TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS**A. Type Test Conduction:**

- Tests for which "T" is indicated in the 'Test Conduction Required As' column below shall be conducted as Type Test.
- Sampling:
 - Type test to be conducted on one size of cable for every lot of cable.
 - FRLS & Flammability Test to be conducted only on one sample/ lot.

B. Acceptance Test Conduction:

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

Sampling for acceptance tests shall be as per Appendix-B of IS: 1554 Part-I (control cable).
- Flammability Test to be conducted only on one sample/ lot.

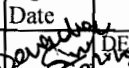
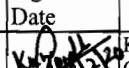
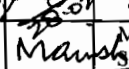
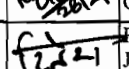
C. Routine Test Conduction:

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

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

LOT shall be defined as per IS: 1554 Part-I (control cable).

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
1.0	Tests for Conductor				
I.	Annealing test	For copper conductor	T, A	IS 10810 Pt 1	In process records shall be furnished to inspector at the time of inspection.
II.	Resistance test	For copper conductor	T, A, R	IS 10810 Pt 5	
2.0	Tests for Armour Wires/Strips				
I.	Measurement of dimensions	Applicable for GS wire/Strip	T,A	IS 10810 Pt 36	
II.	Tensile test	Applicable for GS wire/Strip	T, A	IS 10810 Pt 37	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		DEVENDRA SINGH	Checked by:		KUNAL GANDHI
Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
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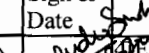
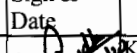
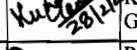
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	ANNEXURE-I TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-RC-999-507-E004
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R1	SPECIFICATION TITLE:
		SYSTEM	ITEM: 1. LT PVC CONTROL CABLE 2. LT HRPVC CONTROL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
5.0	Flammability Tests				
I.	Flammability test for bunched cables	For complete cable	T	IS 10810 Pt 62/ IEC-60332 (Part-3-23-Cat-B)	Test & Category applicable as indicated in Datasheet-A
II.	Flammability test for single cable	For complete cable	T, A	IS: 10810 Pt 61 / IEC:60332 Part-1	
III.	Swedish chimney test	For complete cable	A	SEN SS 424 1475 (Class F3)	
IV.	Flammability test	For complete cable	A	IEEE: 60383	
6.0	Electrical Tests				
I.	High Voltage Test (Water immersion test)	On cores	T	IS 10810 Pt 45	
II.	High Voltage Test at room temperature	For complete cable	T, A, R	IS 10810 Pt 45	
III.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T, A	IS 10810 Pt 43	
7.0	Anti-rodent and Termite Repulsion test	For PVC outer sheath only	A	Refer Note	Test applicable if indicated in Datasheet-A
8.0	Anti-Fungal Test	For PVC outer sheath only	A	--	
9.0	Special Tests				
I.	Hydrolytic Stability Test	For complete cable	**	ASTM D 3137:81	Test applicable if indicated in Datasheet-A
II.	Ultraviolet Radiation Test	For complete cable	**	BS EN ISO 4892-2	

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

Note: A few chipping of the PVC compound is slowly ignited on a porcelain dish or cubicle in a muffle furnace at about 60-degree C. The resulting ignited ash is boiled with a little ammonium acetate solution (10%). Place a drop of aqueous sodium sulphide solution on a thick filter paper and allow soaking. Touch the spot with a drop of above extract. A black spot indicates the presence of lead, the anti-termite and rodent compound.

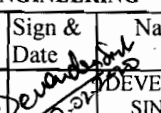
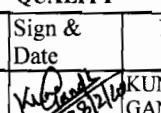
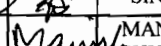
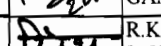
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ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		DEVENDRA SINGH	Checked by:		KUNAL GANDHI
Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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	ANNEXURE-I TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-RC-999-507-E004
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R1	SPECIFICATION TITLE:
		SYSTEM	ITEM: 1. LT PVC CONTROL CABLE 2. LT HRPVC CONTROL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
III.	Elongation at break test	Applicable for GS wire/Strip only	T, A	IS 10810 Pt 37	
IV.	Torsion test	For GS round wire only	T, A	IS 10810 Pt 38	
V.	Winding / Adhesion Test	For GS strip only	T, A	IS 10810 Pt 39	
VI.	Resistivity test	Applicable for GS wire/Strip	T, A	IS 10810 Pt 42	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 40	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 41	
IX.	Wrapping Test	For G. S. wires/Strip only	A	IS 10810 Pt 3	
3.0	Physical Tests for PVC Insulation & PVC sheath				
I.	Test for thickness	Applicable for PVC insulation, PVC inner sheath & PVC outer sheath	T, A	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for PVC insulation & PVC outer sheath			
(a)	Before ageing		T, A	IS 10810 Pt 7	
(b)	After ageing		T, A	IS 10810 Pt 7	
III.	Ageing in air oven	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 10	
V.	Hot deformation test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 15	
VI.	Heat shock test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 14	
VII.	Shrinkage test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 12	
VIII.	Thermal stability test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 60	
4.0	Improved Fire performance (FR-LSH) Tests				
I.	Oxygen index test	For PVC outer sheath only	T, A	IS 10810 Pt 58 / ASTM D 2863	Applicable for Inner Sheath also, if the same is indicated in Datasheet-A
II.	Smoke density test	For PVC outer sheath only	T, A	IS 10810 Pt 63 / ASTM D 2843	
III.	Acid gas generation test	For PVC outer sheath only	T, A	IS 10810 Pt 59 / IEC-754-1	
IV.	Temperature Index Test	For PVC outer sheath only	T	IS 10810 Pt 64 / ASTM D 2863	

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BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved			

5X800 MW YADADRI TPS**BOQ-CUM-PRICE SCHEDULE FOR LT HRPVC CONTROL CABLE**

Sr. No.	Item code	Item description	Unit	Order Quantity	Standard drum length	Lot-1 Quantity	UNIT PRICE (EX-WORKS) in Rs	TOTAL PRICE (EX-WORKS) in Rs
1.0		1.1 KV CU. CONDUCTOR, HRPVC INSULATED, INNER & OUTER SHEATH FRLS (HRPVC-ST2) AND ARMoured CONTROL CABLE.						
(i)	507-37021-A	5C-2.5 ARMoured	MTR	2,00,000	1000 mtr	2,00,000	0.5374*X/200000	0.5374*X
(ii)	507-37023-A	5C-4 ARMoured	MTR	15,000	1000 mtr	15,000	0.1762*X/15000	0.1762*X
(iii)	507-37031-A	7C-2.5 ARMoured	MTR	50,000	1000 mtr	50,000	0.2271*X/50000	0.2271*X
(iv)	507-37003-A	12C-2.5 ARMoured	MTR	40,000	1000 mtr	40,000	0.0593*X/40000	0.0593*X
							TOTAL PRICE (EX-WORKS)	X

NOTES:-

1	Bidder has to quote only Total Value 'X'. Based on this price, unit price shall be derived for all items as per formulae indicated above.
2	The standard drum length shall be 1000 metres as indicated above. Tolerance on individual drum shall be $\pm 5\%$.
3	Overall tolerance on total dispatched quantity of each size shall be (-) 2% and (+) 0% except where the total ordered quantity is one single drum length of 1000m, in which case it shall be -5% to 0%. Cables consumed for testing and inspection shall be to bidder's account.
4	For each individual cable size, one short length of not less than 200m may be accepted only in final drum length to complete the supply (except where the total ordered quantity is one single drum length of 1000m). The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).
5	In case of the quantities cleared by BHEL for manufacturing are manufactured and offered for inspection by successful bidder in more than one batch, BHEL reserves the right to witness type testing on all batches without any price implications.
6	Unit price of cables quoted by bidder shall be inclusive of all tests including type test/additional test charges. No separate charges shall be payable for any tests.