

VOLUME-II

TECHNICAL SPECIFICATION FOR *SCREENED CONTROL CABLE*

SPECIFICATION NO: *PE-RC-999-507-E006*

REVISION: 00



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



TECHNICAL SPECIFICATION FOR SCREENED CONTROL CABLES

SPECIFICATION NO. PE-RC-999-507-E006

VOLUME II

SECTION

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DATE: 15.02.2020

SHEET 1 OF 1

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COMPLIANCE CERTIFICATE

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

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.
2. There are 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 PURPOSE

This specification is intended for finalization of rate contract between BHEL PEM and Bidder. Standard technical detail as indicated in the specification shall be agreed upon between BHEL PEM and bidder. Project specific technical detail shall be made available to the bidder along with project enquiry.

2.0 SCOPE OF ENQUIRY

- 2.1 Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of Screened Control Cable conforming to this specification.
- 2.2 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.
- 2.3 Technical requirements of Screened Control Cable are indicated in Data Sheet-A & Section-II.
- 2.4 The stipulation of Data Sheet-A shall prevail in case of any conflict between the stipulations of Data Sheet-A & Section-II.

2.0 TECHNICAL:

S.No.	Reference clause No. of Section II (if any)	Specific Requirement/ Change
1.	3.1	Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-507-E004, Rev-2) 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.

3.0 BILL OF QUANTITIES

The bidder to quote for items as per price schedule attached with NIT. **The quantity as mentioned in the BOQ is only for evaluation purpose.** However actual ordered quantity may vary from project to project throughout the contract.

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED



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- 4.1 After rate contract; against specific project requirement following information shall be furnished by BHEL: -
- a) BOQ (Bill of Quantities)
- 4.2 Following documents shall be submitted for specific project requirement after placement of order for BHEL & customer's approval: -

Sl. No.	Drawing / Document Description	Drawing / Document no	Document Type
1	Technical Data sheet – Screened Control cables	PE-V0-XXX-507-E141	Primary
2	Cross-sectional Drgs.- Screened Control Cables	PE-V0-XXX-507-E143	Primary
3	Quality Plan - Screened Control Cables	PE-V0-XXX-507-E916 (*)	Primary
4	Type test certificates – Screened Control Cables	PE-V0-XXX-507-E144	Secondary

NOTE: (*)

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

- 4.3 Drawings/documents shall be submitted through Document Management System (DMS).
- 4.4 Supplier to submit the drawing/documents submission/resubmission schedule as & when required by BHEL.



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DATA SHEET-A

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:3975, IS:694, SEN-SS-424-1475, Class F3, IEEE-383, IS:10810 Part 62, Cat-B, ASTMD:2843, ASTMD:2863, ASTM D 3137:81, IEC-60754-1, IEC:60332 Part-1, IEC:60332 Part-3-23, Cat-B.
3.0	Voltage Grade	1.1kV
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ-Cum-Price Schedule
5.0	CONDUCTOR	
(a)	Material	Copper
	Grade and Class	Stranded, annealed high conductivity, Class 2
		<i>Non-Compacted, Electrolytic</i>
		<i>Tinned</i>
(b)	Standard Applicable	IS: 8130
(c)	Shape	Circular
(d)	Min. number of strands, Dia and cross sectional area.	7, 0.3 mm (nom.) dia,of each, 0.5 sq.mm (0.8 mm conductor dia)
6.0	INSULATION	
(a)	Material	Extruded HR PVC 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	0.6 mm nominal (for 0.5 sq.mm) as per IS-694
(g)	Volume resistivity (Min.)	1x10 ¹⁴ ohm-cm at 20 deg. C & 1x10 ¹¹ ohm-cm at 70 deg. C. or 1x10 ¹³ ohm-cm at 27 deg. C & 1x10 ¹⁰ ohm-cm at 85 deg. C. <i>Project specific requirement shall be informed later.</i>
7.0	LAYING OF CORES	
(a)	Min. number of twist per metre for paired cables.	16 (For 0.5 Sq.mm) / 20 (For 0.5 Sq.mm). <i>Project specific requirement shall be informed later.</i>
(b)	Maximum lay of individual twisted pair	60 (For 0.5 Sq.mm) / 50 mm (For 0.5 Sq.mm). <i>Project specific requirement shall be informed later.</i>
(c)	Diameter of core	In accordance with clause 6 (f)
8.0	IDENTIFICATION OF CORES	As per Annexure: B-I Core Identification / Pair Identification. <i>Project specific requirement or any other requirement shall be informed later.</i>



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9.0	INDIVIDUALLY SCREENED	
(a)	Material	Aluminium-Mylar tape
(b)	Coverage	100%
(c)	Overlap	Minimum 25% or 30%. <i>Project specific requirement shall be informed later.</i>
(d)	Min. thickness (Micron)	28 micron
10.0	OVERALL SCREENED	
(a)	Material	Aluminium-Mylar tape
(b)	Coverage	100%
(c)	Overlap	Minimum 25% or 30%. <i>Project specific requirement shall be informed later.</i>
(d)	Min. thickness (Micron)	55 micron / 60 micron <i>Project specific requirement shall be informed later.</i>
Note: Over the individual pair screening tape two laps of 0.05 mm thick (min.) polyester tape shall be applied within minimum overlap of 25%/30%. Metallic side of the screen shall be in touch with drain wire.		
11.0	DRAIN WIRE	
	To be provided separately for individual pair shield and overall shield.	
(a)	Material	Multi stranded Annealed tinned copper drain wire.
(b)	Size (No. of strands/ Dia. of each strand)	0.5 sqmm (7/ 0.3 mm) .0.8 mm is the dia. of conductor.
12.0	BEDDING / BINDER/ TAPE	
(a)	Material	Mylar tape.
13.0	INNER SHEATH	
(a)	Material	Extruded HR PVC Type ST-2
(b)	Standard Applicable	IS: 5831
(c)	Colour	<i>Project specific requirement shall be informed later.</i>
(d)	Whether FR-LSH 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 (with moisture resistant / non-hygroscopic properties)
(h)	Method of application for multi-core cables:	
(i)	With fillers	<i>Pressure/Vacuum extruded</i>
(ii)	Without fillers	<i>Pressure extruded</i>
14.0	RIP CORD	A non-hygroscopic and non-wicking non-metallic cord
15.0	ARMOUR	
(a)	Applicable	YES
(b)	Material:	<i>Galvanised Steel Round Wire, as per BOQ-Cum price schedule.</i> <i>Galvanised Steel Formed Wire/Strip, as per BOQ-Cum price schedule.</i> conforming to (i) Type 'a' / 'b' as per Table-5 of IS 1554-I and (ii) IS 3975 as per project requirements.
(c)	Standard Applicable	IS: 1554 (Part-1) Table-5 and IS:3975
(d)	Minimum Coverage	90%



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(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
(g)	Method of jointing	Welding
16.0	OUTERSHEATH	
(a)	Material	Extruded HR PVC Type ST2
(b)	Standard Applicable	IS: 1554 (Part-1) & IS: 5831
(c)	Colour	<i>Black/ Grey for Overall screened cable (G type) & Light blue/ Black/ Grey' for Individual & overall screened cable (F type)</i> <i>Project specific requirement shall be informed later.</i>
(d)	Whether FR-LSH	Yes
(e)	Method of application	Extruded
(f)	Thickness of outer sheath	As per IS: 1554 Part-1 (i.e. Min thickness shall be 1.24 mm)
(g)	Other properties	Resistant to water, oil, acid, alkali, termite & rodent attack
(h)	Marking	<i>Cable size (cross section area and no. of pairs), voltage grade, Type of Insulation e.g. HRPVC, FRLS, Manufacturer's name and/ or trade name, and year of manufacture @ 5m (by embossing) 'BHEL-PEM' and 'CUSTOMER' Name @5m (by embossing)</i> <i>Progressive sequential length marking @ 1m. (by Printing / embossing)</i> <i>Further customer specific marking requirement (if any) shall be informed later.</i>
17.0	FR-LSH CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per ASTM D 2863)
(b)	Temperature index	Min. 250°C at oxygen index value of 21 (As per ASTM D 2863)
(c)	Acid gas generation	Max. 20% by weight (As per IEC-60754-1)
(d)	Smoke density rating	Not more than 60% (As per ASTM D 2843). Area under coverage
(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)	Flammability test as per IS-10810 Part 62, Cat B	YES
iv)	Swedish Chimney test SEN-SS-424-1475-F3	YES
18.0	Anti-rodent and Termite repulsion Test	YES
19.0	Special Tests	
(a)	Hydrolytic Stability Test	No (Refer Clause no 3.4 of Section-II). <i>Project specific requirement shall be informed later</i>
(b)	Ultraviolet Radiation Test	No (Refer Clause no 3.4 of Section-II). <i>Project specific requirement shall be informed later</i>
20.0	TOLERANCE ON OVERALL DIAMETER	+ 2mm max. over the declared value in Technical datasheet.



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21.0	VARIATION IN DIA & OVALITY AT ANY CROSS SECTION	Maximum 1 mm
22.0	CABLE DRUM DETAILS	
(a)	Material Type	Non-returnable wooden drums, as per IS 10418
(b)	Standard drum length	1000 metres: upto and including 12 Pairs. 500 metres: above 12 pairs.
(c)	Tolerance on drum length	±5%
(d)	Painting	Entire surface to be painted
(e)	Construction Details	Clause no 4.2 of Section-II of this technical specification
(f)	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.
(g)	Outermost layer	To be covered with waterproof polyethylene.

23.0 TECHNICAL PARAMETERS (C & I) As per Tables below:		
Parameter	0.5 mm ² (IS & OS) type-F	0.5 mm ² (OS) type-G
Mutual Capacitance (max.) at 0.8 kHz, nF/Km	120	100
Conductor Loop Resistance (max.), Ohm/Km	78 (tinned)	78 (tinned)
Insulation Resistance (min), M Ohm/ Km	100	100
Cross Talk attenuation (min) at 0.8kHz, dB	60	60
Characteristic impedance (max.) at 1/0.8 * kHz	320	340
Attenuation (max.) at 1 kHz db/Km	1.2	1.2
Capacitance unbalance (max), pF/500m *	400	400

Note:

1. Cable parameters indicated above are at 20 degC (+/- 3 degC)
2. *Project specific requirement shall be informed later

24.0	TEST VOLTAGE & DURATION	
(a)	High Voltage Test, AC Tests	
(i)	Core to core	2 kV (max.) for 1 minute (max.)
(ii)	Core to shield	2 kV (max.) for 1 minute (max.)



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ANNEXURE: B-I

CORE IDENTIFICATION / PAIR IDENTIFICATION



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ANNEXURE: B-I (A)

The cable cores shall be colour coded as mentioned below:

PAIR	CORE	COLOUR
1st	1st	Blue
1st	2nd	Red
2nd	1st	Grey
2nd	2nd	Yellow
3rd	1st	Green
3rd	2nd	Brown
4th	1st	White
4th	2nd	Black

Each four pair is laid to form one unit and wound with Mylar tape. The cores of each unit shall then be identified by colour bands for cables of more than 4-pair. Eg. All eight cores of the first unit shall have a single band of pink color (preferably rose pink).

Unit No No.	COLOUR OF BANDS	BAND MARKS
1.	PINK	= === ==
2.		= ===== ==
3.		= ===== ==
4.		= ===== ==
5.	ORANGE	= === ==
6.		= ===== ==
7.		= ===== ==
8.		= ===== ==
9.	VIOLET	= === ==
10.		= ===== ==
11.		= ===== ==
12.		= ===== ==

The dimension L (distance between the markings) shall be limited to 50 mm. The bands shall be neat and cover at least 2/3 of the periphery of the core.

Eg: A grey wire having 3 orange bands is the first core of the second pair of the Seventh unit.

Band markings shall not be easily erasable and shall also meet Bleeding and Blooming Test and colour fastness to water test requirement as per relevant standard.



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OR**Annexure-BI (B)****BS 5308-2:2009****Table C.1 Identification of cable pairs other than two-pair cables without individual pair screens (quads)**

Pair no.	a-wire	b-wire	Pair no.	a-wire	b-wire
1	White	Blue	26	Red-Blue	Blue
2	White	Orange	27	Red-Blue	Orange
3	White	Green	28	Red-Blue	Green
4	White	Brown	29	Red-Blue	Brown
5	White	Grey	30	Red-Blue	Grey
6	Red	Blue	31	Blue-Black	Blue
7	Red	Orange	32	Blue-Black	Orange
8	Red	Green	33	Blue-Black	Green
9	Red	Brown	34	Blue-Black	Brown
10	Red	Grey	35	Blue-Black	Grey
11	Black	Blue	36	Yellow-Blue	Blue
12	Black	Orange	37	Yellow-Blue	Orange
13	Black	Green	38	Yellow-Blue	Green
14	Black	Brown	39	Yellow-Blue	Brown
15	Black	Grey	40	Yellow-Blue	Grey
16	Yellow	Blue	41	White-Orange	Blue
17	Yellow	Orange	42	White-Orange	Orange
18	Yellow	Green	43	White-Orange	Green
19	Yellow	Brown	44	White-Orange	Brown
20	Yellow	Grey	45	White-Orange	Grey
21	White-Blue	Blue	46	Orange-Red	Blue
22	White-Blue	Orange	47	Orange-Red	Orange
23	White-Blue	Green	48	Orange-Red	Green
24	White-Blue	Brown	49	Orange-Red	Brown
25	White-Blue	Grey	50	Orange-Red	Grey

NOTE Except in the case of bi-colour extrusion, the colour indicated first is known as the base colour, and is:

a) the extruded colour; and

b) the colour with the greater area of exposure on the finished wire.

Pair identification shall be provided with numbers at interval of not more than 250mm.



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OR

Annexure-BI (C)

The cable cores shall be colour coded as mentioned below:

Pair	Core	Colour
1 st	1 st	Blue
1 st	2 nd	Red
2 nd	1 st	Grey
2 nd	2 nd	yellow
3 rd	1 st	Green
3 rd	2 nd	Brown
4 th	1 st	White
4 th	2 nd	Black

Each four pair is laid up to from one unit and wound with Mylar Tape. The cores of each unit shall then be identified by numbering for cables of more than 4-pair.

Eg. All eight cores of the first unit shall have " 1/one" printed on each core in Black/ White colour

Unit no.	Colour of Number Printing	Number printed on core
1	BLACK on WHITE core. WHITE on all other cores	1/One
2		2/Two
3		3/Three
4		4/Four
5		5/Five
6	BLACK on WHITE core. WHITE on all other cores	6/Six
7		7/Seven
8		8/Eight
9	BLACK on WHITE core. WHITE on all other cores	9/Nine
10		10/Ten
11		11/Eleven
12		12/Twelve

The dimension L (distance between the markings) shall be limited to 50 mm. The number marking shall be neat. eg. A grey wire having " 7/Seven" number printed on the core is the first (1st) core of the second (2nd) pair of the Seventh unit.

For Black & White cores Printing:-

Black on White Core

White on all Other Cores



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DATA SHEET-C

S.No.	Particulars	Unit	Description
1	Manufacturer's name	-	
2	Reference design standards	-	
3	Conductor size	sq. mm	
4	Rated Voltage	V	
5	Number of pairs	No.	
6	Cable suitable for both earthed & unearthed system	-	
7	Conductor		
	a) Material	-	
	b) Reference Standard	-	
	c) Grade	-	
	d) No. of strands	No.	
	e) Diameter of strands (nom.)	mm	
	f) Approx. dia of conductor	mm	
	g) Cross Section area	sq. mm	
	h) Maximum conductor resistance per Km at 20°C	ohm	
8	Insulation		
	a) Reference Standard	-	
	b) Material composition	-	
	c) Application	-	
	d) Minimum thickness	mm	
	e) Nom.Thickness	mm	
	f) Max. thickness	mm	
	g) Minimum volume resistivity as per IS 5831	Ohm cm	
	h) Dielectric constant	-	
	i) Maximum conductor temperature withstand capacity	°C	
	j) Core diameter including insulation	mm	
9	Core laying		
	a) Whether cores/pairs are twisted.	-	
	b) Minimum no. of twists per meter.		
	c) Maximum lay of twist	mm	
	d) Identification of cores/pairs	-	
10	Individual Shield		



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	a) Material	-	
	b) Thickness of tape	micron	
	c) Coverage/ Overlap	%	
	d) Noise interference better than	dB	
11	Drain wire for individual shield		
	a) Reference standard	-	
	b) Size (No. of strands x dia. of each strand)	sq. mm (no. x mm)	
	c) Material	-	
	d) Resistance of drain wire per km at 20 deg.C	ohm	
12	Overall shield		
	a) Material	-	
	b) Thickness of tape	mm	
	c) Coverage/Overlap	%	
	d) Noise interference better than	dB	
13	Drain wire for overall shield		
	a) Reference standard	-	
	b) Size (No. of strands x dia. of each strand)	sq. mm (no. x mm)	
	c) Material	-	
	d) Resistance per Km (with shield) at 20°C	Ohm/ km	
14	a) Fillers: Material (if applicable)		
	b) Bedding Material		
15	Inner sheath		
	a) Material, type and standard	-	
	b) Whether FRLS	-	
	c) Colour	-	
	d) Method of application	-	
	e) Thickness (min)	mm	
16	Armour		
	a) Material,	-	
	b) Formed wire / round wire		
	c) Minimum Coverage	%	
	d) Method of jointing	-	
	e) Breaking load of joint	-	
	f) Size (approx.) of strip	mm	
	g) Dia of armour	mm	
	h) No. of wires/ strip.	No.	
17	Outer sheath		
	a) Reference standard	-	
	b) Material	-	
	c) Minimum thickness of sheath	mm	



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	d) Calculated dia under outersheath	mm	
	e) Oxygen index (as per ASTM D 2863)	-	
	f) Temperature index (in deg. C as per ASTM D 2863)	deg. C	
	g) Maximum acid gas generation as per IEC754-1	%	
	h) Maximum smoke density rating as per ASTM D 2843	%	
	i) Colour of outer sheath	-	
18	Dia over laid-up core	mm	
19	Dia under armour	mm	
20	Dia above armour	mm	
21	Overall diameter of cable	mm	
22	Tolerance on overall diameter	mm	
23	Weight of		
	Copper (conductor & drain wire)	Kg/ km	
	PVC (insulation, sheath & fillers)	Kg/ km	
	Armour	Kg/ km	
	Cable (approx.)	Kg/ km	
24	Cable parameters at 20°C(+/-3 deg. C)		
	a) Conductor resistance (max)	Ohm/ km	
	b) Insulation resistance (min)	M-Ohm/ km	
	c) Mutual capacitance at 0.8KHz (max)	nF/ km	
	d) Cross talk at 0.8KHz (min)	dB	
	e) Attenuation at 1 KHz (max)	dB/ km	
	f) Characteristic impedance at 1 KHz (max)	Ohm	
25	Continuous operating temp. (deg.C)	deg. C	
26	(a) Relevant IS standard including Part & category for Flame retardance of complete cable	-	
	(b) Relevant IEC standard including Part & category for Flammability of complete cable		
27	Whether complete cable passes Swedish Chimney test as per SEN 4241475 (F3)	-	
28	Identification		
	a) Length of cable marked at every mtr.	-	
	b) FRLS marked at every 5 mtrs	-	
	c) Each core of the pair numbered	-	
	d) Conductor identification details for pairs	-	
	e) Details of cable markings	-	
29	Test voltage		
	a) High voltage test/ Dielectric Strength		
	i) Voltage (KV), Core - Core	kV	
	ii) Duration	min	
	b) High Voltage test		



TECHNICAL SPECIFICATION FOR SCREENED CONTROL CABLES

SPECIFICATION NO. PE-RC-999-507-E006

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	i) Voltage (KV), Core - Screen	V	
	ii) Duration	min	
	c) Resistance to direct current test (applicable for 225 V cable as per VDE)	-	
	Voltage	V	
	Duration	hrs/days	
30	Min bending radius	No. x OD	
31	Ovality at any cross section	mm	
32	Variation of dia through out cable length	mm	
33	Cable cross-sectional drawings for each type of cable furnished		
34	i) Length of single coil in a drum	M	
	ii) Marking on drum	-	
	iii) Seasoned wood drum provided	-	
	iv) Both ends of cable to be sealed with PVC/ Rubber caps to prevent water/ moisture ingress	-	
	v) Gross weight (approx.)	kg.	
	vi) Net weight (approx.)	kg	
35	Type test procedures as per BHEL Technical Spec. and other relevant standards enclosed.	-	
36	Anti termite & rodent test	-	



TECHNICAL SPECIFICATION FOR SCREENED CONTROL CABLES

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SECTION-II

STANDARD TECHNICAL REQUIREMENTS



TECHNICAL SPECIFICATION FOR SCREENED CONTROL CABLES

SPECIFICATION NO. PE-RC-999-507-E005

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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 Screened 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 Screened 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-E004, Rev-1) 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 –I to QP. Charges for all these tests for all the equipment & 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 finish or coating to avoid rusting during transit and storage. BIS certification mark shall be stamped on each cable drum.



TECHNICAL SPECIFICATION FOR SCREENED CONTROL CABLES

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- 4.3 Each drum shall carry manufacturer's name or trade make, purchaser's name, address and contract no., Type of cable & voltage grade, Year of manufacture, Type of insulation e.g. HRPVC item no., No. of pairs and size of cables & Type, Cable code e.g. FRLS, No. of length on drum, if more than one, length of cable 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.



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SL NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE CRITERIA	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	D M C N	

INSTRUCTIONS:

- Cable manufacturer to maintain records to show co-relation of raw materials to finished cables i.e. raw material batch/ lot no. should be traceable to the final cable drum number or batch no.
- Cable manufacturer to maintain all quality records identified as per all QP stages enumerated below whether it is identified for BHEL verification or witness or not.

1.0	RAW MATERIAL													
1.1	Copper Rods/ Wires (For Conductor & drain wire)	<u>GENERAL:</u>												
		1. Physical properties	MA	Physical Tests	Sample/Batch	Sample/Batch	IS 613	IS 613	Inspection Report/ Test Cert.	P/ V	V	-		
		2. Elec. Properties	MA	Electrical Tests	Sample/Batch	Sample/Batch	-do-	-do-	-do-	P/ V	V	-		
		<u>SPECIFIC CHECKS:</u>												
		a) Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.	P	V	-		
	b) Grade	MA	-do-	-do-	-do-	IS 613	IS 613	-do-	P	V	-			

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CUSTOMER : PROJECT: ITEM: SCREENED CONTROL CABLES		SYSTEM:			QP NO.: PE-QP-999-507-E004, REV 02.	DATE:
					PO NO.:	DATE:
					SECTION: II	SHEET 2 OF 11

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1	2	3	4	5	6		7	8	9	**				
					M	C/N				D	M	C	N	
		c) Resistivity	MA	Electrical Tests	Manufacturer std.		IS 613	IS 613	-do-		P	V	-	
1.2	PVC Compound (for insulation)	<u>GENERAL :</u> 1. Physical properties 2. Elec. Properties <u>SPECIFIC CHECKS :</u> a) Make b) Type/ Grade c) Shelf life/ Storage condition	MA	Physical Tests	Sample/Batch	Sample/Batch	IS 5831	IS 5831	Inspection Report/ Test Cert.		P/ V	V	-	
			MA	Electrical Tests	Sample/Batch	Sample/Batch	-do-	-do-	-do-		P/ V	V	-	
			MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.		P	V	-	
			MA	-do-	100%	100%	Approved datasheet	Approved datasheet	-do-		P	V	-	
			MA	-do-	100%	100%	Compound Manufacturer std.	Compound Manufacturer std.	-do-		P	V	-	
1.3	Screen / Tapes/ Binders	1. Make 2. Dimension 3. T.S. & Elongation	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	TC & IR		P/ V	V	-	
			MA	Measure ment	Manufacturer std.	Manufacturer std.	Manufacturer datasheet/ Approved datasheet	Manufacturer datasheet/ Approved datasheet	TC & IR		P/ V	V	-	
			MA	Physical Tests	-do-	-do-	Manufacturer datasheet	Manufacturer datasheet	-do-		P/ V	V	-	

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SL NO.	COMPONENT & OPERATION	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		
		4. Chem. & Phys. Properties	MA	Chemical & Physical Tests	-do-	-do-	Manufacturer std.	Manufacturer std.	-do-	P/ V	V	-		
1.4	Fillers (as applicable)	1. Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC/Test certificate	P/ V	V	-		Filler material chosen shall be compatible with the temperature rating of the cable and shall have no deleterious effect on any other component of the cable
		2. Flame retardant & moisture resistant. (as applicable)	MA	Chemical/ Environ.	-do-	-do-	Appd. Data Sheet	Appd. Data Sheet	-do-	P/ V	-	-		
1.5	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 Cert.	P/ V	V	-		
		2. Dimension	MA	Measurement	-do-	-do-	Appd. Data Sheet	Appd. Data Sheet	-do-	P/ V	-	-		
		3. Phy and Elec. Properties	MA	Physical & Electrical Tests	Sample*	Sample*	-do-	-do-	-do-	P/ V	-	-		* Sample from each armour size/Batch/ Lot
		4. Galvanization Quality	MA	Galv. Tests	-do-	-do-	IS 3975	IS 3975	-do-	P/ V	-	-		

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					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9	*	**			
		2. Surface finish	MA	Visual	-do-	-do-	Surface shall be smooth	Surface shall be smooth	Inspection Report		P	V	-	
2.0	IN PROCESS													
2.1	Wire Drawing & Annealing.	1. Size 2. Surface finish	MA MA	Dimensional Visual	Mfr's Plant Std. -do-	Mfr's Plant Std. -do-	Approved datasheet Surface shall be smooth	Approved datasheet Surface shall be smooth	Inspection Report		P	V	-	
2.2	Tinning (Conductor or drain wire)	1. Size 2. Chemical test for tinning	MA CR	Dimensional Chemical	Plant Mfg. Std. -do-	Plant Mfg. Std. -do-	Mfr's Plant Std. IS 10810 - 4	Mfr's Plant Std. IS 8130	-do-		P	V	-	(Applicable only for tin-coated copper conductor and drain wire)
2.3	Stranding of wires	1. No. of wires 2. Resistance 3. Sequence, lay length & Direction 4. Surface Finish	MA CR MA MA	Counting Electrical Visual, Meas Visual	Mfr's Plant Std. -do- one Sample each size/lot 100%	Mfr's Plant Std. -do- one Sample each size/lot 100%	Approved datasheet Mfr. Std Surface shall be smooth	Approved datasheet Mfr. Std. Surface shall be smooth	-do- -do- -do-		P P P	V - -	- - -	

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Seal	Sign & Date
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					M	C/N			*	D	M	C	N	
1	2	3	4	5	6		7	8	9		10			
		5. Dimension	MA	Measurement	one Sample of each size/lot	one Sample of each size/lot	Appd. Data Sheet	Appd. Data Sheet	-do-		P	-	-	
2.4	Core Insulation (No repair permitted)	1. Surface finish	MA	Visual	100%	100%	Free from bulging burnt particles lumps, cuts & Scratches.	Free from bulging burnt particles lumps, cuts & Scratches.	Inspection Report		P	V	-	
		2. Insulation thickness (Min./Max.)	CR	Measurement	one Sample of each size/lot	one Sample of each size/lot	Appd. data sheet	Appd. data sheet	-do-		P	-	-	
		3. Concentricity #	CR	Measurement	-do-	-do-	Mfr's Std.	Mfr's Std.	Inspection Report		P	V	-	# To be checked at starting & finish end of Extruded Length
		4. Dia over insulation	MA	Measurement	-do-	-do-	Appd. data sheet	Appd. data sheet	-do-		P	-	-	
		5. Core identification	MA	Visual	100%	100%	Appd. data sheet	Appd. data sheet	-do-		P	-	-	
		6. TS & % Elongation	MA	Mechanical	100%	100%	IS 1554/ IS 5831	IS 1554/ IS 5831	-do-		P	-	-	

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					6					**				
					M	C/N				D	M	C	N	
1	2	3	4	5			7	8	9	*				
2.5	Core pairing, screening (provision of drain wire & laying)	1. Pair identification	MA	Visual	100%	100%	Appd. Data Sheet	Appd. Data Sheet	Insp ectio n Rep ort		P	-	-	
		2. Wire size & tape size	MA	Measure ment	100%	100%	-do-	-do-	-do-		P	-	-	
		3. Test for capacitance	CR	Elect. Test	100%	100%	-do-	-do-	-do-		P	-	-	
		4. Sequence of lay and lay length	MA	Visual meas	one Sample of each size/lot	one Sample of each size/lot	Appd. Data Sheet	Appd. Data Sheet	-do-		P	-	-	
		5. Screen overlap & coverage	MA	Measure ment	-do-	-do-	-do-	-do-	-do-		P	-	-	
		6. Dia over laid up core	MA	Measure ment	-do-	-do-	-do-	-do-	-do-		P	-	-	
		7. Continuity of drain & drain wire with Screen	MA	Elect. Test	100%	100%	<-----No Discontinuity ----->		-do-		P		-	-
2.6	Inner Sheath Extrusion (if applicable)	1. Surface finish	MA	Visual	100%	100%	Free from bulging, burnt particles, lumps, cuts & Scratch.	Free from bulging, burnt particles, lumps, cuts & Scratch	-do-		P	-	-	
		2. Sheath thickness	CR	Measure ment	One sample of each size/lot	One sample of each size/lot	Approved Data sheet	Approved Data sheet	-do-		P	-	-	
		3. Dia over inner sheath	MA	Measure ment	-do-	-do-	Appd. Data Sheet	Appd. Data Sheet	-do-		P	-	-	

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SL NO.	COMPONENT & OPERATION	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	10	11			
					M	C/N					M	C	N	
		4. Colour					Appd. Data Sheet	ppd. Data Sheet						
2.7	Armouring (if applicable)	1. No. of wires/Strips	MA	Counting	At the start of the process	At the start of the process	Mfr's Std Sheet	Mfr's Std Sheet	-do-		P	-	-	
		2. Size of wire/ Strip	MA	Measurement	-do-	-do-	Appd. Data Sheet	Appd. Data Sheet	-do-		P	-	-	
		3. Lay Direction	MA	Visual	-do-	-do-	Mfr's Std Sheet	Mfr's Std Sheet	-do-		P	-	-	
		4. Lay Length	MA	Visual, Meas.	At the start of the process	At the start of the process	-do-	-do-	-do-		P	-	-	
		5. Coverage	MA	Measurement	-do-	-do-	Appd. Data Sheet	Appd. Data Sheet	-do-		P	-	-	
		6. Dia over armour	MA	Measurement	-do-	-do-	-do-	-do-	-do-		P	-	-	
2.8	Outer Sheath Extrusion	1. Surface Finish	MA	Visual	100%	100%	-	Free from Bulging, Burnt particles, lumps, cuts & scratches	-do-		P	-	-	
		2. Sheath thickness	CR	Measurement	One sample of each size/lot	One sample of each size/lot	Approved Data sheet	Approved Data sheet	-do-		P	-	-	

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SL NO.	COMPONENT & OPERATION	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					M	C	N	
		3. Dia over outer sheath	MA	Measurement	-do-	-do-	Appd. Data Sheet	Appd. Data Sheet	-do-		P	-	-	
		4. Marking/ Colour / Embossing	MA	Visual	100%	100%	Appd. Data Sheet	Appd. Data Sheet	-do-		P	-	-	Sequential be done by printing marking shall
		5. TS & % Elongation	MA	Mechanical	100%	100%	IS 5831/IS 10810 part 7	IS 5831	-do-		P	-	-	
3.0	Final Inspection (Internal)	Routine Test (Refer Note-H)	CR	Electrical test & Measurement	100%	100%	#	#	-do-		P	V	V	# Refer Annexure-A to QP.
4.0	Final Inspection (External)	1. Finish & Length (Cable & cable drum)	MA	Visual, Measurement	One drum in each lot	One drum in each lot	Appd. Data Sheet	Free from Bulging, Burnt particles, lumps, cuts & scratches/ Approved data sheet	Inspection Report		P	W	W	

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Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name		Approved by:	Sign & Date	Name	

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1	2	3	4	5	6	7	8	9	*	M	C	N	
		2. Dimensions	MA	Measurement	As per std.	As per std.	Appd. Data sheet	Inspecti on Report		P	W	W	
		3. Armouring - Coverage	MA	Measurement	-do-	-do-	-do-	-do-		P	W	W	# Refer Annexure-A to QP.
		4. Marking/Colour/ pair identification (Cable & cable drum)	MA	Visual	-do-	-do-	-do-	-do-		P	W	W	
		5. Acceptance Tests (Refer Note-H)	CR	Phy & Elect. Tests	#	#	-do-	-do-		P	W	W	
		6. Type & FRLS Tests (Refer Note-H)	CR	Measurement	#	#	Appd. Data sheet	-do-		P	W	W	

NOTES: -

(A) JOINTS IN CONDUCTOR AND ARMOUR SHALL BE AS PERMITTED BY IS 8130 & IS 1554-1 RESPECTIVELY.

(B) NO REPAIR OF CORE INSULATION PERMITTED.

(C) CABLE ENDS SHALL BE SEALED

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

BHEL			
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SPEC. NO.:

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E004, REV 02.

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: SCREENED CONTROL
CABLES

SYSTEM:

SECTION: II

SHEET 11 OF 11

- (E) FILTERS/DUMMY CORES ETC. SHALL BE AS PER BHEL SPECIFICATION
- (F) WHEREVER EXTENT OF CHECK FOR STAGE IS MENTIONED AS SAMPLES AND NOT DEFINED IN QP, THE SAME SHALL BE AS PER VENDORS SAMPLING PLAN AGREED BY PURCHASER.
- (G) VENDOR SHALL FURNISH COMPLIANCE CERTIFICATE TO THE INSPECTION AGENCY CONFIRMING THE PACKING AS PER BHEL SPECIFICATION.
- (H) FOR LIST OF TYPE TESTS, ROUTINE TESTS & ACCEPTANCE TESTS; REFER ANNEXURE A TO QP.

LEGENDS:

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

BHEL

ENGINEERING

QUALITY

Sign & Date

Name

Prepared by:

Checked by:

Reviewed by:

Sign & Date

Name

Checked by:

Reviewed by:

Sign & Date

Seal

BIDDER/SUPPLIER

FOR CUSTOMER REVIEW & APPROVAL

Doc No:

Sign & Date

Name

Reviewed by:

Approved by:

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	ANNEXURE - I TO QP	CUSTOMER:	PROJECT TITLE: RATE CONTRACT	SPECIFICATION NUMBER: PE-RC-999-507-E005
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E004, R1	SPECIFICATION TITLE:
	Page 1 of 5	SYSTEM	ITEM: SCREENED CONTROL CABLES	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 tests (except for Sl. no. b & c below) to be conducted on one size (2P, 4P etc.) of each type (F or G type)/ lot.
 - Electrical & C&I tests to be conducted on each size of each type of cables /lot.
 - FRLS & Flammability tests to be conducted only on one sample/ lot, irrespective of size/type.

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:
 - Acceptance tests (except for Sl. no. b & c below) for every lot shall be as per Appendix-B (Clause 15.2.2) of IS: 1554 Part-I.
 - Electrical & C&I tests to be conducted on each size of each type of cables /lot.
 - FRLS & Flammability tests to be conducted only on one sample/ lot, irrespective of size/type.

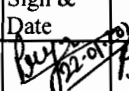
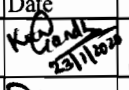
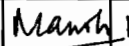
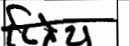
C. Routine Test Conduction:

- Tests for which "R" is indicated in the 'Test Conduction Required As' column below shall be conducted as Routine tests.
- Sampling:
Routine testing shall be conducted in line with the applicable standards and as per the Manufacturing Quality Plan approved for the project for every lot offered for inspection.

D. ADS: Approved datasheet.

NOTE: LOT shall be defined as per IS: 1554 Part-1.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
1.0	Tests for Conductor				
I.	Annealing test	For copper conductor only	T, A	IS 10810 Pt 1	<u>In process records shall be furnished to inspector at the time of inspection.</u>

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

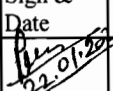
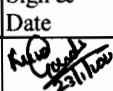
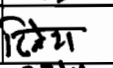
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Approved by:			

23/1/2020

	ANNEXURE - I TO QP	CUSTOMER:	PROJECT TITLE: RATE CONTRACT	SPECIFICATION NUMBER: PE-RC-999-507-E005
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E004, R1	SPECIFICATION TITLE:
	Page 2 of 5	SYSTEM	ITEM: SCREENED CONTROL CABLES	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
II.	Tin coating test (for tinned copper)	For copper conductor only	T, A	IS 10810 Pt 4	
III.	Resistance test	For Al/Cu	T, A, R	IS 10810 Pt 5	
IV.	Diameter test	For conductor	T, A	ADS	
2.0	Tests for Armour Wires/Strips				
I.	Measurement of dimensions	Applicable for Aluminium wire & GS wire/Strip	T, A	IS 10810 Pt 36	
II.	Tensile test	Applicable for Aluminium wire & GS wire/Strip	T, A	IS 10810 Pt 37	
III.	Elongation at break test	Applicable for GS wire/Strip only	T, A	IS 10810 Pt 37	
IV.	Torsion test	For GS round wire only	T, A	IS 10810 Pt 38	
V.	Winding test	For GS strip only	T, A	IS 10810 Pt 39	
VI.	Resistivity test	Applicable for Aluminium wire & GS wire	T, A	IS 10810 Pt 42	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 40 , IS: 2633	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 41	
3.0	Physical Tests for PVC Insulation, PVC sheath.				
I.	Test for thickness & Eccentricity	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	T, A	IS 10810 Pt 7	
(a)	Before ageing		T, A	IS 10810 Pt 7	
(b)	After ageing		T, A	IS 10810 Pt 7	
III.	Ageing in air oven	For PVC insulation & PVC outer sheath	T	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	For PVC insulation & PVC outer & Inner sheath	T	IS 10810 Pt 10	

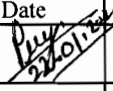
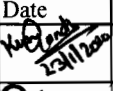
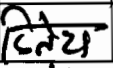
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Prepared by:		Bejanku	Checked by:		KUNAL GANDHI
Reviewed by:	Mamsh	MANISH	Reviewed by:		RUTAJA

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	ANNEXURE - I TO QP	CUSTOMER:	PROJECT TITLE: RATE CONTRACT	SPECIFICATION NUMBER: PE-RC-999-507-E005
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E004, R1	SPECIFICATION TITLE:
	Page 3 of 5	SYSTEM	ITEM: SCREENED CONTROL CABLES	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
V.	Hot deformation test	For PVC insulation & PVC outer & Inner sheath	T	IS 10810 Pt 15	
VI.	Heat shock test	For PVC insulation & PVC outer & Inner sheath	T	IS 10810 Pt 14	
VII.	Shrinkage test	For PVC insulation & PVC outer & Inner sheath	T	IS 10810 Pt 12	
VIII.	Thermal stability test	For PVC insulation & PVC outer sheath	T	IS 1554-1	
IX.	Bleeding & Blooming test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 19	
X.	Cold bend test	For PVC insulation & PVC outer & Inner sheath	T	IS 10810 Pt 20	
XI.	Cold impact test	For PVC insulation & PVC outer & Inner sheath	T	IS 10810 Pt 21	
XII.	Colour fastness to water	For PVC insulation & PVC outer sheath	T	IS 10810 Pt 18, Appendix-A of IS: 5831	
4.0	Tests for Al-Mylar Shield				
I.	Continuity test	For Al-Mylar shield	T, A	Plant Standard	
II.	Shield thickness	For Al-Mylar shield	A	ADS	
III	Overlap test	For Al-Mylar shield	A	ADS	
IV	Constructional details, dimensions	For Al-Mylar shield	A	ADS	
V	Visual, surface finish+	For Al-Mylar shield	A	Plant Standard	
VI	Overall coverage	For Al-Mylar shield	A	Plant Standard	
VII	Noise interference test.	For Al-Mylar shield	A	ADS	
5.0	Tests for Drain Wire				
I.	Annealing test	For copper conductor only	T, A	IS 10810 Pt 1	<u>In process records shall be furnished to inspector at the time of inspection.</u>

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ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		Beiyanda	Checked by:		KUNAL GANDHI
Reviewed by:	Mainsi MANDH		Reviewed by:		R K JAIN

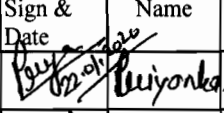
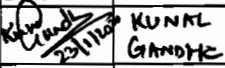
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Approved by:			

23/11/2020

	ANNEXURE - I TO QP	CUSTOMER:	PROJECT TITLE: RATE CONTRACT	SPECIFICATION NUMBER: PE-RC-999-507-E005
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E004, R1	SPECIFICATION TITLE:
	Page 4 of 5	SYSTEM	ITEM: SCREENED CONTROL CABLES	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
II.	Tin coating test (for tinned copper)	For copper conductor only	T, A	IS 10810 Pt 4	
III.	Resistance test	For Cu Conductor	T, A, R	IS 10810 Pt 5	
IV.	Diameter test	For conductor	T, A	ADS	
6.0	FRLS Tests				
I.	Oxygen index test	For PVC outer sheath & Fillers only	T, A	IS 10810 Pt 58 / ASTM D 2863	Applicable for Inner Sheath if the same is indicated in Datasheet-A
II.	Smoke density test	For PVC outer sheath & Fillers only	T, A	ASTM D 2843	
III.	Acid gas generation test	For PVC outer sheath & Fillers 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	
7.0	Flammability Tests				
I.	Flammability test for bunched cables	For complete cable	T, A	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	
8.0	Electrical Tests				
I.	High Voltage Test	For complete cable	T, A, R	IS: 10810 Pt 45	
II.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T, A, R	IS: 10810 Pt 43	
III.	L/R Ratio	For complete cable	A, R	BS:5308 Part II	
IV.	Spark Test	Online Process during Extrusion of Insulation	Online	BS:5308 Part II	

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

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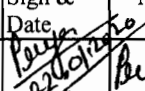
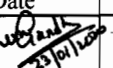
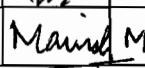
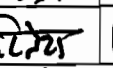
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	ANNEXURE - I TO QP	CUSTOMER:	PROJECT TITLE: RATE CONTRACT	SPECIFICATION NUMBER: PE-RC-999-507-E005
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E004, R1	SPECIFICATION TITLE:
	Page 5 of 5	SYSTEM	ITEM: SCREENED CONTROL CABLES	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
V.	Thermal ageing test	For complete cable	T	IS-1554 Pt-I	
9.0	C&I Tests				
I.	Cross talk	For complete cable	T, A	ADS	
II.	Attenuation	For complete cable	T, A	ADS	
III.	Characteristic Impedance	For complete cable	T, A	ADS	
IV.	Mutual capacitance	For complete cable	T, A, R	ADS	
V.	Noise interference	For complete cable	T, A	ADS	
10.0	Anti-rodent and Termite Repulsion test	For PVC outer sheath only	A	Refer Note	Test applicable as indicated in Datasheet-A
11.0	Anti-Fungal Test	For PVC outer sheath only	A	Self-certification by vendor for anti-fungal property.	Same shall be applicable as per the project requirement to be furnished later.
12.0	Special Tests				
I.	Hydrolytic Stability	For complete cable	A ^(*)	ASTM D 3137	Test applicable as indicated in Datasheet-A
II.	Ultraviolet Test	For complete cable	A ^(*)	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: Few chippings of PVC compound are slowly ignited in a porcelain dish in a muffle furnace at about 600 deg. C. The resulting ignited ash is boiled with a little ammonium acetate solution (10%). A drop of aqueous sodium sulphide solution is placed on a thick filter paper and it is allowed to soak. The spot is touched with a drop of above extract. A black spot indicates the presence of anti-termite & rodent compound (lead).

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		Pooja	Checked by:		KUNAL GANDHI
Reviewed by:		MANISH	Reviewed by:		R K JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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