ANNEXURE-1

1.0 SCOPE

1.1 Design, Manufacture, Inspection and testing at manufacture's works, proper packing and delivery to site of **Screened Control cables** conforming to this specification.

1.2 General technical requirements of the Screened Control cables are indicated in Section-II. Project specific technical/ quality requirements / changes are listed in Section-I.

1.3 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.

1.4 The documents shall be in English Language and MKS system of units.

2.0 BILL OF QUANTITIES:

2.1 Quantity requirements shall be as per BOQ-cum-price schedule enclosed in NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENTS

S.No.	***Reference Clause No. of Section- II***	***Specific Requirement/ Change***
1	3.1	The standard quality plan no. shall be read as 0000-999-QOI-S-035 in place of PE-QP-999-507-E004.
1	3.3	Follow clause 3.3 of section-D.
2	3.4	Follow clause 3.4 of section-D.
~~3~~	~~3.7 (clause is added)~~	~~All equipment to be supplied shall be of type tested design. During detailed engineering, the successful bidder shall submit for BHEL/NTPC approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening (17.07.2017). These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a process plant/refinery/power plant/nuclear plant client or client representatives.~~
~~4~~	~~3.8 (clause is added)~~	~~However, if the successful bidder is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the successful bidder shall conduct all such tests under this contract at no additional cost to the BHEL either at third party lab or in presence of BHEL/NTPC and submit the reports for approval.~~

~~5~~	~~3.9 (clause is added)~~	~~The type test reports (for type tests carried out within last ten years from the date of bid opening (17.07.2017) once approved for any project of NTPC shall be treated as reference. For PATRATU TPS, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.~~
5	3.10 (clause is added)	If a cable drum fails in site testing then that drum shall be supplied again by vendor free of cost to BHEL.

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

Following documents/drawings shall be submitted after placement of order for BHEL customer's approval: -

Sl. No.	Drawings/Document Description	Drawings / Document Number
1.	Technical Data Sheet – Screened control cables	PE-V0-434-507-E141
2.	Cross-sectional Drawings – Screened control cables	PE-V0-434-507-E143
3.	Type Test Reports – Screened control cable	PE-V0-434-507-E144
4.	Steel drum drawing (if applicable)	PE-V0-434-507-E145
5.	Standard Quality Plan - Screened control cables	PE-V0-434-507-E916 (*)

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.

ANNEXURE-2

एनटीपीसी NTPC	ITEM : Instrumentation Cables. SUB SYSTEM : Shielded Instrument/ TC extension/ Compensating PVC FRLS Cable	STANDARD QUALITY PLAN	To be filled by NTPC QP No.: 0000-999-QOI-S-035 Revision:00 Date:05/09/2012 Page:1 OF 5 Valid up to : 04/09/2015	Reviewed By: Archana Nath Rajeev Garg S.samanta	Approved By A.K.GARG Approved Dt.....

Sl No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C,N	Reference Document	Acceptance Norms	Format of record	D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9		10			11
I.	RAW MATERIAL													
A	CONDUCTOR													
A1	COPPER ROD For Conductor/ Drain wire	a) Dimension	Maj.	Measu.	1 sample/lot	–	IS:613/IS:12444	IS:613/IS:12444	IMR/ TC		V	-	-	Make - As per Annexure enclosed
		b) Conductivity/ Resistivity	Cri.	Elec.	1 sample/lot	1 sample/lot	IS:613/IS:12444	IS:613/IS:12444	IMR/ TC		V	V	-	
A2	Conductor for compensating cable	a) Size	Min	Dimen	1 Sample / lot	–	APPROVED DATASHEET	APPROVED DATA SHEET	IMR/ TC		P	-	-	Make - As per Annexure enclosed
		b) Resistance check	Maj	Elec	1 Sample / lot	–	APPROVED DATASHEET	APPROVED DATA SHEET	IMR/ TC		P	-	-	
		c) Thermo emf	Cri	Elec	1 Sample / lot	–	ANSI MC 96.1	ANSI MC 96.1	IMR/ TC		P	-	-	
		d) Specific resistance, Temp. cofficient.	Maj	Elec/Mech	1 Sample / lot	1 Sample / lot	Mfr. catalog	Mfr. catalog	IMR/ TC		V	V	V	
		e) Chemical composition.	Maj	Chem.	1 Sample / lot	1 Sample / lot	Mfr. catalog	Mfr. catalog	IMR/ TC		V	V	V	
B	PVC COMPOUND													
B1	PVC Compound (Insulation & Sheath) Type of compound as per NTPC Spec.	a) Thermal stability (for Insulation)	Maj.	Therm.	1 sample/lot	1 sample/lot	VDE 207 Part -4/5	VDE 207 Part -4/5	IMR/ TC		P	V	-	
		b) TS & % Elongation Before and After aging and variation.	Maj.	Mech.	1 sample/lot	1 sample/lot	VDE 207 Part -4/5	VDE 207 Part -4/5	IMR/ TC		P	V	-	
		c) Loss of Mass (Sheath)	Maj.	Therm.	1 sample/lot	1 sample/lot	VDE 207 Part -4/5	VDE 207 Part -4/5	IMR/ TC		P	V	-	
B2	FR Properties for Filler Compound	a) Oxygen index	Cri.	Chem	1 sample/lot	1 sample/lot	29 %(min)ASTMD2863	29%(min)ASTMD2863	IMR/ TC		P	V	-	
		b) Temperature index deg. C	Cri.	Chem	1 sample/lot	1 sample/lot	250 deg. C(min) ASTMD2863	250 deg. C(min) ASTMD2863	IMR/ TC		P	V	-	
B3	FRLS Properties for Sheath	a) Oxygen index	Cri.	Chem	1 sample/lot	1 sample/lot	ASTMD2863/ APPROVED DATASHEET	ASTMD2863/ APPROVED DATASHEET	IMR/ TC		P	V	-	
		b) Temperature index	Cri.	Chem	1 sample/lot	1 sample/lot	ASTMD2863/ APPROVED DATASHEET	ASTMD2863/ APPROVED DATASHEET	IMR/ TC		P	V	-	
		c) Smoke density rating	Cri.	Chem	1 sample/lot	1 sample/lot	ASTMD2843/ APPROVED DATASHEET	ASTMD2843/ APPROVED DATASHEET	IMR/ TC		P	V	-	
		d) HCL Emission	Cri.	Chem	1 sample/lot	1 sample/lot	IEC754-1/ APPROVED DATASHEET	IEC754-1/ APPROVED DATASHEET	IMR/ TC		P	V	-	
C	Tapes / Binders (Aluminium Mylar,Melinex & Binders)	a) Thickness	Maj.	Mesu.	1 Sample/ Lot	1 Sample/ Lot	APPROVED DATASHEET	APPROVED DATASHEET	IMR/ TC		P	V	-	
		b) Size	Maj.	Mesu.	1 Sample/ Lot	1 Sample/ Lot	APPROVED DATASHEET	APPROVED DATASHEET	IMR/ TC		P	V	-	
D	Armour (If applicable)	a) Dimension	Maj.	Mesu.	1 Sample/ Lot	1 Sample/ Lot	APPROVED DATASHEET	APPROVED DATASHEET	IMR/ TC		P	V	-	
		b) TS & %Elongation	Maj.	Mech	1 Sample/ Lot	1 Sample/ Lot	IS 3975	IS 3975	IMR/ TC		P	V	-	
		c) Zn Coating	Maj.	Chem	1 Sample/ Lot	1 Sample/ Lot	IS 3975	IS 3975	IMR/ TC		P	V	-	
		d) Resistivity	Maj.	Elect	1 Sample/ Lot	1 Sample/ Lot	IS 3975	IS 3975	IMR/ TC		P	V	-	

LEGEND : * RECORDS, IDENTIFIED WITH " TICK" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION .M:MANUFACTURER/ SUB SUPPLIER C:MAIN SUPPLIER,N:NTPC, P:PERFORM ,'W: WITNESS and V: VERIFICATION AS APPROPRIATE, "CHP" NTPC SHALL INDICATED IN COLOUM "N" AS "W"

Format No. :QS-01-QAI-P-09/F1-R1

एनटीपीसी NTPC	ITEM : Instrumentation Cables. SUB SYSTEM : Shielded Instrument/ TC extension/ Compensating PVC FRLS Cable	STANDARD QUALITY PLAN	To be filled by NTPC QP No.: 0000-999-QOI-S-035 Revision:00 Date:05/09/2012 Page:2 OF 5 Valid up to : 04/09/2015	Reviewed By: Archana Nath Rajeev Garg S.samanta	Approved By A.K.GARG

Sl No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C,N	Reference Document	Acceptance Norms	Format of record	D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9		10			11
E	Wooden Drums	a) Constructional checks	Maj.	Visu.	100%	_	IS 10418	IS 10418	IMR/ TC		P	-	-	
		b) Dimensions	Maj.	Mesu.	1 Sample/ Lot	_	IS 10418	IS 10418	IMR/ TC		P	-	-	
II	INPROCESS INSPECTION													
A	Wire Drawing & Anealing	a)Size	Maj.	Dimn.	1 Sample at Start and 1 Sample at End	_	Approved Datasheet	Approved Datasheet	IMR/ TC		P	-	-	
		b) Surface finish	Maj.	Visu.	100%	_	Surface shall be smooth	Surface shall be smooth	IMR/ TC		P	-	-	
		c) % of Elongation	Maj.	Mech.	1 Sample/ Lot	_	IS:8130	IS:8130	IMR/ TC		P	-	-	
B	Tinning (Only for Drain wire)	a) Size	Maj.	Dimn.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		b) Percentage of Elongation	Maj.	Mech.	1 Sample/ Lot	1 Sample/ Lot	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	V	V	
C	Bunching	a) Dimension and No. of strand.	Maj.	Measu.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P			
		b)Resistance	Cri	Elec.	1 Sample/ Lot	1 Sample/ Lot	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	V	V	
D	Insulation	a) Surface finish	Maj.	Visu.	100%	_	Surface shall be smooth & free from scratches	Surface shall be smooth & free from scratches	IMR/ TC		P	-	-	
		b) Core Diameter	Maj.	Measu.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		c) Radial Thickness(Min & Max.)	Maj.	Measu.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	No Repairs are allowed on the Insulated core
		d) Spark Test	Maj.	Elec.	100%	100%	IS 10810(With 3KV ac)	No Spark failure is allowed	IMR/ TC		P	V	V	
		e) Volume Resistivity/ Insulation Resistance	Maj.	Elec.	1 Sample/ Lot	1 Sample/ Lot	VDE -0207/ Approved Datasheet	VDE -0207/ Approved Datasheet	IMR/ TC		P	V	V	
		f) Colour, Marking/ Identification	Maj.	Visual	100%	100%	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	V	-	
		g) TS & %Elongation	Maj.	Mech.	1 Sample/ Lot	_	VDE -0207/ Approved Datasheet	VDE -0207/ Approved Datasheet	IMR/ TC		P	-	-	
E	Twisting	a) Lay length and Direction	Maj.	Measu. &	1 Sample at Start and 1 Sample at End	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		b) Size/ Dimension	Maj.	Measu.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		c) Pair Colour	Maj.	Visual	100%	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	

LEGEND : * RECORDS, IDENTIFIED WITH " TICK" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION .M:MANUFACTURER/ SUB SUPPLIER C:MAIN SUPPLIER,N:NTPC, P:PERFORM ,'W: WITNESS and V: VERIFICATION AS APPROPRIATE, "CHP" NTPC SHALL INDICATED IN COLOUM "N" AS "W"

एनटीपीसी NTPC	ITEM : Instrumentation Cables. SUB SYSTEM : Shielded Instrument/ TC extension/ Compensating PVC FRLS Cable	STANDARD QUALITY PLAN	To be filled by NTPC QP No.: 0000-999-QOI-S-035 Revision:00 Date:05/09/2012 Page:3 OF 5 Valid up to : 04/09/2015	Reviewed By: Archana Nath Rajeev Garg S.samanta	Approved By A.K.GARG अनुमोदित Approved Dt.

Sl No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C,N	Reference Document	Acceptance Norms	Format of record	D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9		10			11
F	Laying of Pairs/ Taping/ Shielding (Wherever Applicable)	a) Construction	Maj.	Visu.	100%	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		b) Dimension	Maj.	Measu.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		c) Coverage/ Overlap	Maj.	Measu.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		d) Continuity	Maj.	Dimn.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
G	Sheathing (Inner - If applicable)	a) Surface Finish	Maj.	Visual	100%	_	Smooth, free from visual defects #	Smooth, free from visual defects#	IMR/ TC			-	-	# Porosity, Burnt particles, Pimples (Repairs are not allowed)
		b) Colour	Maj.	Visual	100%	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		c) Diameter / Thickness	Maj.	Measu.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
H	Armouring (If applicable)	a) Surface finish	Maj.	Visual	100%	_	Smooth, free from visual defects like rusting etc.	Smooth, free from visual defects like rusting etc.	IMR/ TC		P	-	-	
		b) Direction of Lay & Coverage	Maj.	Visual	100%	_	Smooth, free from visual defects like rusting etc.	Smooth, free from visual defects like rusting etc.	IMR/ TC		P	-	-	Min coverage shall be 90 %. Gap should not be more than 1 wire/ Strip dimension.
		c) Size of Wire/ Strip	Maj.	Measu.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		d) Diameter over Armouring	Maj.	Measu.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
I	Sheathing (Outer)	a) Surface Finish	Maj.	Visual	100%	_	Smooth, free from visual defects#	Smooth, free from visual defects#	IMR/ TC		P	-	-	# Porosity, Burnt particles, Pimples (No Repairs are allowed)
		b) Colour/ Marking/ Embossing	Maj.	Visual	100%	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		c) Overall Diameter, Thickness	Maj.	Measu.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
		d) TS & %Elongation	Maj.	Mech.	1 Sample/ Lot	_	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	IMR/ TC		P	-	-	
III. FINAL INSPECTION														
A.	TYPE TEST	Type test as per agreement with NTPC Engg. Review of type test clearence from NTPC Engg. before final Inspection - **CHP**												
B.	ROUTINE TEST	a) Cond.resistance (Cable & Drain wire)	Cri.	Elec.	100%	100%	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	V	V	
		b) HV Test	Cri.	Elec.	100%	100%	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	V	V	

LEGEND : * RECORDS, IDENTIFIED WITH " TICK" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION .M:MANUFACTURER/ SUB SUPPLIER C:MAIN SUPPLIER,N:NTPC, P:PERFORM ,'W: WITNESS and V: VERIFICATION AS APPROPRIATE, "CHP" NTPC SHALL INDICATED IN COLOUM "N" AS "W"

एनटीपीसी NTPC	ITEM : Instrumentation Cables. SUB SYSTEM : Shielded Instrument/ TC extension/ Compensating PVC FRLS Cable	STANDARD QUALITY PLAN	To be filled by NTPC QP No.: 0000-999-QOI-S-035 Revision:00 Date:05/09/2012 Page:4 OF 5 Valid up to : 04/09/2015	Reviewed By: Archana Nath Rajeev Garg S.samanta	Approved By A.K.GARG अनुमोदित Approved

Sl No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C,N	Reference Document	Acceptance Norms	Format of record		Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	D*	10			11
		c) IR Test (on drum length)	Cri.	Elec.	100%	100%	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	V	V	
		d) Drain wire contunity	Cri.	Elec.	100%	100%	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	V	V	
C.	ACCEPTANCE TEST	a) Cond.resistance (Cable & Drain wire)	Cri.	Elec.	Samples as per IS 1554/8784	Samples as per IS 1554/8784	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		b) HV Test	Cri.	Elec.	Samples as per IS 1554/8784	Samples as per IS 1554/8784	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		c) IR Test	Cri.	Elec.	Samples as per IS 1554/8784	Samples as per IS 1554/8784	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		d) Constructional Details & Dimensions												
		i) Constructional Details	Maj.	Visual	Samples as per IS 1554/8784	Samples as per IS 1554/8784	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		ii) Shield Al-mylar thickness	Maj.	Measu.	Samples as per IS 1554/8784	Samples as per IS 1554/8784	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		iii) Insulation thickness	Maj.	Measu.	Samples as per IS 1554/8784	Samples as per IS 1554/8784	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		iv) Inner/ Outer sheath thickness (as applicable)	Maj.	Measu.	Samples as per IS 1554/8784	Samples as per IS 1554/8784	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	before and after ageing for insulation.
		v) Diameter over outer sheath	Maj.	Measu.	Samples as per IS 1554/8784	Samples as per IS 1554/8784	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		e) Outer sheath - Colour, Marking/ Embossing & End sealing.	Maj.	Visual	Samples as per IS 1554/8784	Samples as per IS 1554/8784	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		f) Length checking.	Maj.	Measu.	1 No. of each size & type per Lot	1 No. of each size & type per Lot	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		g) Core - Band marking/ Numbering, Colour.	Maj.	Visual	1 No. of each size & type per Lot	1 No. of each size & type per Lot	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		h) Overall Coverage/overlap of shield & Continuity of drain wire.	Maj.	Visual	1 No. of each size & type per Lot	1 No. of each size & type per Lot	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	Continuity shall be checked as per Manufacturer practice.

LEGEND : * RECORDS, IDENTIFIED WITH " TICK" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION .M:MANUFACTURER/ SUB SUPPLIER C:MAIN SUPPLIER, N:NTPC, P:PERFORM ,'W: WITNESS and V: VERIFICATION AS APPROPRIATE, "CHP" NTPC SHALL INDICATED IN COLOUM "N" AS "W"

एनटीपीसी NTPC	ITEM : Instrumentation Cables. SUB SYSTEM : Shielded Instrument/ TC extension/ Compensating PVC FRLS Cable	STANDARD QUALITY PLAN	To be filled by NTPC QP No.: 0000-999-QOI-S-035 Revision:00 Date:05/09/2012 Page:5 OF 5 Valid up to : 04/09/2015	Reviewed By: Archana Nath Rajeev Garg S.samanta	Approved By A.K.GARG Approved Dt.....

Sl No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C,N	Reference Document	Acceptance Norms	Format of record		Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	D*	10			11
		i) Thermal EMF test (For compensating cable only)	Maj.	Elec.	Sample as per IS 8784	Sample as per IS 8784	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		j) Thermal Stability (Insulation & Sheath)	Maj.	Chem.	1 No. of each size & type per Lot	1 No. of each size & type per Lot	Spec./ADS/IS:5831	Spec./ADS/IS:5831	FIR	√	P	W	W	
		k) Visual & Surface Finish	Maj.	Visual	1 No. of each size & type per Lot	1 No. of each size & type per Lot	Smooth, free from visual defects #	Smooth, free from visual defects #	FIR	√	P	W	W	# Like Porosity, Burnt particles, Pimples
		l) Electrical Parameters (Mutual capacitance, Cross talk, Attenuation, Charactristic Impedence as applicable)	Maj.	Elec.	1 No. of each size & type per Lot	1 No. of each size & type per Lot	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		m) Persulphate Test (For Drain wire)	Maj.	Chem.	1 No. of each size & type per Lot	1 No. of each size & type per Lot	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		n) Swidesh chimney test (overall cable)	Maj.	Chem	1 No./ Complete lot offered $	1 No./ Complete lot offered $	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	$ Irrespective of size & type.
		o) FRLS Test for outer sheath for OI(Oxygen Index), TI(Temperature Index), SDR(Smoke Density Rating) & HCL Emission.	Maj.	Chem	1 No./ Complete lot offered $	1 No./ Complete lot offered $	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		p) TS & %Elongation test of Insualtion & Sheath (Before & After aging)	Maj.	Mech	1 No./ Complete lot offered $	1 No./ Complete lot offered $	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		q) Volume Resistivity (At room and Elevated Temperature)	Maj.	Elec.	1 No./ Complete lot offered $	1 No./ Complete lot offered $	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
		r) Armouring Dimension & Zn coating. (If applicable)	Maj.	Measu.	1 No./ Complete lot offered $	1 No./ Complete lot offered $	NTPC Tech.Specfication /Approved Datasheet	NTPC Tech.Specfication /Approved Datasheet	FIR	√	P	W	W	
D.	Packaing and Dispatch	Stencileing, completeness & Verification with packing list	Maj.	Visual.	100%	-	Mfg. Practice	Mfg. Practice			P	-	-	

NOTE 1 : Where witnessing and verification of records is done only by main contractor (Coloum "C"), NTPC inspection Engineer may do a survilience Verification/ Witnessing as per his discretion.

NOTE 2 : IMR : Inword Material Register, TC : Test Certificates, Mfg. : Manufacturer, FIR : Final Inspection Report.

NOTE 3: NTPC Inspection Enginner to check,approval date,revision no of reference documents at the time of Inspection.

LEGEND : * RECORDS, IDENTIFIED WITH " TICK" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION .M:MANUFACTURER/ SUB SUPPLIER C:MAIN SUPPLIER,N:NTPC, P:PERFORM ,'W: WITNESS and V: VERIFICATION AS APPROPRIATE, "CHP" NTPC SHALL INDICATED IN COLOUM "N" AS "W"

Format No. :QS-01-QAI-P-09/F1-R1

BHEL QP APPLICABLE FOR TYPE TEST

	QUALITY PLAN		CUSTOMER :			PROJECT : 3 X 800 MW PATRATU TPS TITLE			SPECIFICATION : PE-TS-434-507-E004 NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER: PE-QP-999-507-E004, REV 0.			SPECIFICATION : TITLE			
	SHEET 5 OF 5		SYSTEM			ITEM :INSTRUMENTATION CABLES			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	**W**	**V**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
3.0	Final Inspection	Type Tests (Refer Note-A)	CR	Measurement	Sample	Appd. Data sheet	Appd. Data sheet	-do-	2	1	-	Refer Annexure-C to QP enclosed

NOTES:-

(A) FOR LIST OF TYPE TESTS, ROUTINE TESTS & ACCEPTANCE TESTS; REFER ANNEXURE-C TO QAP.

LEGEND : P : PERFORMER W: WITNESSER V: VERIFIER 1- BHEL/CUSTOMER 2-VENDOR 3 SUB VENDOR CHP: CUSTOMER HOLD POINT

TC : Test Certificates, Spec. : Specification Mfg. : Manufacturer.

	PARTICULARS	**BIDDER/VENDOR**	
BHEL	**NAME**		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS (AS PER VDE)

A. Type Test Conduction:

1. Tests for which "T" is indicated in the 'Test Conduction Required As' column below shall be conducted as Type Test.

2. Sampling:
   a) 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.
   b) Electrical & C&I tests to be conducted on each size of each type of cables /lot.
   c) FRLS & Flammability tests to be conducted only on one sample/ lot, irrespective of size/type.

B. Acceptance Test Conduction:

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

2. Sampling:
   a) 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.
   b) Electrical & C&I tests to be conducted on each size of each type of cables /lot.
   c) FRLS & Flammability tests to be conducted only on one sample/ lot, irrespective of size/type.

C. Routine Test Conduction:

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

2. 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.

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	***Internal in process Test Report to be furnished for both type & acceptance tests***
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**	VDE 0815	

BHEL	PARTICULARS	BIDDER/ VENDOR	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S / VENDORS COMPANY SEAL

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
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	**A**	IS 10810 Pt 42	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip only	**A**	IS 10810 Pt 40	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip only	**A**	IS 10810 Pt 41	
IX.	Wrapping Test	For Aluminium wires only	**A**	IS 10810 Pt 3	
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**	VDE 0472	
II.	Tensile strength and elongation test at break	Applicable for PVC insulation, PVC inner sheath & PVC outer sheath		VDE 0472	
(a)	Before ageing		**T, A**		
(b)	After ageing		**T, A**		
III.	Ageing in air oven	Applicable for PVC insulation & PVC outer sheath	**T**	VDE 0472	
IV.	Loss of mass in air oven test	For PVC insulation, PVC inner & PVC outer sheath	**T**	VDE 0472	
V.	Hot deformation test	For PVC insulation, PVC inner & PVC outer sheath	**T**	VDE 0472	
VI.	Heat shock test	For PVC insulation, PVC inner & PVC outer sheath	**T**	VDE 0472	
VII.	Shrinkage test	For PVC insulation, PVC inner & PVC outer sheath.	**T**	VDE 0472	
VIII.	Thermal stability test	For PVC insulation, PVC inner & PVC outer sheath	**A**	VDE 207	
IX.	Bleeding & Blooming Test	For PVC insulation & outer sheath.	**T**	IS 10810 Pt 19	

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
X.	Cold Bend & Cold Impact test	For PVC inner & outer sheath.	**T**	VDE 0472	
XI.	Core marking, end sealing	For PVC insulation, PVC inner & PVC outer sheath	**A**	VDE-207	
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	**T,A**	ADS	
5.0	**Tests for Drain Wire**				
I.	Annealing test	For copper conductor only	**T, A**	IS 10810 Pt 1	***Internal in process Test Report to be furnished for both type & acceptance tests***
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**	VDE 0815	
IV.	Diameter test	For conductor	**T, A**	ADS	
V.	Continuity test	For Al-Mylar shield	**T, A**	Plant Standard	
6.0	**FRLS Tests**				
I.	Oxygen index test	For PVC outer sheath & Filler	**T, A**	IS 10810 Pt 58 / ASTMD 2863	**Applicable for Inner Sheath if the same is indicated in Datasheet-A**
II.	Smoke density test	For PVC outer sheath only	**T, A**	ASTMD 2843	
III.	Acid gas generation test	For PVC outer sheath only & Filler	**T, A**	IS 10810 Pt 59 / IEC-754-1	
IV.	Temperature Index Test	For PVC outer sheath only	**T**	IS 10810 Pt 64 / ASTMD 2863	
7.0	**Flammability Tests**				

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
I.	Flammability test for bunched cables	For complete cable	**T,A**	IS 10810 Pt 62/ IEC-60332 (Part-3-23, CAT A/ 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	**T,A**	SEN SS 424 1475 (Class F3)	
IV.	Flammability test	For complete cable	**T,A**	IEEE: 383	
8.0	**Electrical Tests**				
I.	High Voltage Test	For complete cable	**T, A, R**	VDE 0815	
II.	Insulation Resistance Test (Volume resistivity method)	For complete cable	**T, A, R**	IS 10810 Pt 43	
III.	Conductor resistance	For complete cable	**A,R**	VDE 0815	
IV.	Spark test	Insulation	**R**	VDE 0207	
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**	ADS	
V.	Noise interference	For complete cable	**T, A**	ADS	
10	**Complete Cable**				
I.	Visual , surface Finish	Overall Cable	**A**	Plant Standard	
II.	Volume resistivity at room and elevated temperature	Overall Cable	**A**	IS 10810 Pt43/ ADS	
III.	Construction details, dimensions	Overall Cable	**T, A**	ADS	

INSTRUMENTATION CABLE

TESTS / ITEMS	Conductor Resistance ® & (A)	High Voltage ® & (A)	Insulation Resistance ® & (A)	Constructional detail, dimensions (A)	Outer-Sheathe/core marking, end sealing (A)	Thermal Stability (A) +	Visual, Surface finish (A) +	Electrical Parameters ** (A) +	Persulphate Test (A) +	Overall/Coverage/Continuity (A)	Swidesh chimney Test (SS-4241475) (A) ++	FRLS Test * (A) ++	Tensile & Elongation before & after aging (A) ++	Vol. Resistivity. at room & Elevated Temp. (A) ++	Spark test report review ®
1. Instrument cable twisted and shielded															
Conductor(IS-8130)	Y			Y			Y								
Insulation(VDE-207)				Y	Y	Y	Y						Y		Y
Pairing/Twisting				Y	Y		Y								
Shielding				Y			Y			Y					
Drain wire	Y			Y			Y		Y	Y					
Inner Sheath				Y	Y	Y	Y					Y	Y		
Outer Sheath				Y	Y	Y	Y					Y	Y		
Over all cable	Y	Y	Y	Y	Y		Y	Y			Y			Y	
Cable Drums(IS-10418)				Y			Y								

Note : High Temp. cables shall be subjected to tests as per VDE-207(Part-6) Compensating cables shall be checked for Thermal EMF/Endurance test as per IS 8784.

Note : This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating his practice & Procedure along with relevant supporting documents during QP finalization for all items.

Note : ® - Routine Test A - Acceptance Test Y - Test Applicable

Note : Sampling Plan for Acceptance test shall be as per IS 8784 (As applicable)

- * FRLS Tests: Oxygen / Temp Index (ASTM D-2863), Smoke Density Rating (ASTM – D 2843), HCL Emission (IEC-754-1)
- ** Characterisitic Impedence, Attenuation, Mutual Capacitance, Cross Talk (As applicable)

\+ Sample size will be One No. of each size/type per lot.

++ Sample size will be One No. sample for complete lot offered irrespective of size/type.