



**NTPC LTD**  
**CPG-1/VDC Raipur**


**1. Sub: Qualifying Requirement (QR) for Vendor Enlistment for Supply of LT PVC Insulated Control Cables**


A)	MEG DETAILS		
	1.0	MEG DESCRIPTION	LT CONTROL CABLES ( 1.1 Kv)
	2.0	MEG RESPONSEBILITY	VDC
B)	<p><b>Technical Criteria of QR:</b></p> <p>The bidder should have manufactured and supplied during last five years from the date of application:</p> <p>a) Atleast 1 km of PVC insulated, PVC sheathed, copper conductor, 1.1 KV grade cables. b) Atleast one (1) km of Flame retardant low smoke cables.</p>		
C)	<p><b>Documents required in support of meeting QR :</b></p> <p>1. Latest annual report OR NSIC / SSI / MSME registration certificate / BIS license / ISO certificate / Certificate of registration from the concerned excise department / any other statutory document as a proof of being manufacturer of the LT Control cables. Brief details of manufacturing facilities or Standard published catalogue for LT Control cables also to be given.</p> <p>2. The PO in support of award and completion certificate/copies of invoice to establish successful execution of the supply of LT Control cables as per QR.</p>		
D)	<p><b>Documents to be submitted to find executed value of orders :</b></p> <p>In addition to the documents required in support of meeting technical requirements as stated above, following documents are required to be submitted by the Applicants applying for enlistment:-</p> <p>1. Three (3) POs of the highest executed values of similar work (see definition at point E:Note- 1 below) during previous five (5) years from the date of application. Copy of Invoice / Completion certificate from the concerned buyer/s in support of successful execution of supply against the POs to be submitted. These will be required for calculation of execution capability.</p> <p>2. Audited balance sheet including Profit &amp; Loss statement for the previous three (3) completed financial year's reckoned from the date of application. In case where the audited results for the last financial years as on the date of application are not available, the financial result certified by a practicing Chartered accountant shall be considered acceptable.</p> <p>3.GSTIN certificate ,PAN ,Power of attorney, Letter of undertaking ,works information etc. as mentioned in enlistment application pages of website <a href="http://www.vendor.ntpc.co.in">www.vendor.ntpc.co.in</a></p> <p>4. NTPC can request for other documents as necessary during the course of evaluation.</p>		
E)	NOTE-1	Similar works means: "Supply of 1.1 KV LT PVC Control cables.	

	NOTE-2	The executed value means Basic value of quantity of similar works executed/supplied against thereference PO (also applicable to partly executed POs as on date of application).Where PO value is composite(i.e. including Taxes etc.),the applicant to give item-wise break-up of Composite PO value mentioning Basic Value, Taxes etc.


CLAUSE NO.	<p style="text-align: center;"><b>TECHNICAL REQUIREMENTS</b></p> 		
<b>1.00.00</b>	<b>CODES &amp; STANDARDS</b>		
1.01.00	<p>All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS : codes, standards, etc.) referred to herein, the former shall prevail. All the cables shall conform to the requirements of the following standards and codes:</p> <p style="margin-left: 40px;">IS :1554 - I      PVC insulated (heavy duty) electric cables for working voltages up to and including 1100V.</p> <p style="margin-left: 40px;">IS : 3961      Recommended current ratings for cables</p> <p style="margin-left: 40px;">IS : 3975      Low carbon galvanized steel wires, formed wires and tapes for armouring of cables.</p> <p style="margin-left: 40px;">IS : 5831      PVC insulation and sheath of electrical cables.</p> <p style="margin-left: 40px;">IS : 8130      Conductors for insulated electrical cables and flexible cords.</p> <p style="margin-left: 40px;">IS : 10418      Specification for drums for electric cables.</p> <p style="margin-left: 40px;">IS : 10810      Methods of tests for cables.</p> <p style="margin-left: 40px;">ASTM-D –2843      Standard test method for density of smoke from the burning or decomposition of plastics.</p> <p style="margin-left: 40px;">IEC-754 (Part-I)      Tests on gases evolved during combustion of electric cables.</p> <p style="margin-left: 40px;">IEC-332      Tests on electric cables under fire conditions. Part-3: Tests on bunched wires or cables (Category-B).</p>		
<b>2.00.00</b>	<b>TECHNICAL REQUIREMENTS</b>		
2.01.00	The cables shall be suitable for laying on racks, in ducts, trenches, conduits and under ground buried installation with chances of flooding by water.		
2.02.00	All cables including EPR cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses develop under steady state and transient operating conditions as specified elsewhere in this specification.		
2.03.00	Conductor of control cables shall be made of stranded, plain annealed copper.		
2.04.00	PVC insulation shall be suitable for continuous conductor temperature of 70 deg C and short circuit conductor temperature of 160 deg. C.		
2.05.00	The cable cores shall be laid up with fillers between the cores wherever necessary. It shall not stick to insulation and inner sheath. All the cables, other than single core unarmoured cables, shall have distinct extruded PVC inner sheath of black colour as per IS: 5831.		
	<b>TECHNICAL SPECIFICATION</b> <b>LT CONTROL CABLES</b>		<b>PAGE</b> <b>1 OF 6</b>

CLAUSE NO.	TECHNICAL REQUIREMENTS															
2.06.00	<p>For multicore armoured cables, the armouring shall be of galvanized steel as follows:</p> <table border="0"> <tr> <td>Calculated nominal dia of cable under armour</td> <td>Size and Type of armour</td> </tr> <tr> <td>Up to 13 mm</td> <td>1.4mm dia GS wire</td> </tr> <tr> <td>Above 13 upto 25 mm</td> <td>0.8 mm thick GS formed wire / 1.6 mm dia GS wire</td> </tr> <tr> <td>Above 25 upto 40 mm</td> <td>0.8mm thick GS formed wire / 2.0mm dia GS wire</td> </tr> <tr> <td>Above 40 upto 55mm</td> <td>1.4 mm thick GS formed wire/2.5mm dia GS wire</td> </tr> <tr> <td>Above 55 upto 70 mm</td> <td>1.4mm thick GS formed wire / 3.15mm dia GS wire</td> </tr> <tr> <td>Above 70mm</td> <td>1.4 mm thick GS formed wire / 4.0 mm dia GS wire</td> </tr> </table> <p>The gap between armour wires / formed wires shall not exceed one armour wire / formed wire space and there shall be no cross over / over-riding of armour wire / formed wire. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire / formed wire. Zinc rich paint shall be applied on armour joint surface.</p>	Calculated nominal dia of cable under armour	Size and Type of armour	Up to 13 mm	1.4mm dia GS wire	Above 13 upto 25 mm	0.8 mm thick GS formed wire / 1.6 mm dia GS wire	Above 25 upto 40 mm	0.8mm thick GS formed wire / 2.0mm dia GS wire	Above 40 upto 55mm	1.4 mm thick GS formed wire/2.5mm dia GS wire	Above 55 upto 70 mm	1.4mm thick GS formed wire / 3.15mm dia GS wire	Above 70mm	1.4 mm thick GS formed wire / 4.0 mm dia GS wire	
Calculated nominal dia of cable under armour	Size and Type of armour															
Up to 13 mm	1.4mm dia GS wire															
Above 13 upto 25 mm	0.8 mm thick GS formed wire / 1.6 mm dia GS wire															
Above 25 upto 40 mm	0.8mm thick GS formed wire / 2.0mm dia GS wire															
Above 40 upto 55mm	1.4 mm thick GS formed wire/2.5mm dia GS wire															
Above 55 upto 70 mm	1.4mm thick GS formed wire / 3.15mm dia GS wire															
Above 70mm	1.4 mm thick GS formed wire / 4.0 mm dia GS wire															
2.07.00	<p>Outer sheath shall be of PVC as per IS: 5831 and grey in colour. In addition to meeting all the requirements of Indian Standards referred to, outer sheath of all the cables shall have the following FRLS properties.</p> <p>(a.) Oxygen index of min. 29. (As per IS 10810 Part-58)</p> <p>(b.) Acid gas emission of max. 20% (As per IEC-754-I)</p> <p>(c.) Smoke density rating shall not be more than 60% during Smoke Density Test as per ASTM D-2843.</p>															
2.08.00	<p>Cores of the cables of upto 5 cores shall be identified by colouring of insulation. Following colour scheme shall be adopted.</p> <table border="0"> <tr> <td>1 core -</td> <td>Red, Black, Yellow or Blue</td> </tr> <tr> <td>2 core -</td> <td>Red &amp; Black</td> </tr> <tr> <td>3 core -</td> <td>Red, Yellow &amp; Blue</td> </tr> <tr> <td>4 core -</td> <td>Red, Yellow, Blue and Black</td> </tr> <tr> <td>5 core -</td> <td>Red, Yellow, Blue, Black and Grey</td> </tr> </table>	1 core -	Red, Black, Yellow or Blue	2 core -	Red & Black	3 core -	Red, Yellow & Blue	4 core -	Red, Yellow, Blue and Black	5 core -	Red, Yellow, Blue, Black and Grey					
1 core -	Red, Black, Yellow or Blue															
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4 core -	Red, Yellow, Blue and Black															
5 core -	Red, Yellow, Blue, Black and Grey															
2.09.00	<p>For cables having more than 5 cores, core identification shall be done by numbering the insulation of cores sequentially, starting by number 1 in the inner layer (e.g. say for 10 core cable, core numbering shall be from 1 to 10). The number shall be printed in Hindu-Arabic numerals on the outer surfaces of the cores. All the numbers shall be of the same colour, which shall contrast with the colour of insulation. The colour of insulation for all the cores shall be grey only. The numerals shall be legible and indelible. The numbers shall be repeated at regular intervals along the core, consecutive numbers being inverted in relation to each other. When the number is a single numeral, a dash shall be placed underneath it. If the number consists of two numerals, these shall be disposed one below</p>															
	<p align="center"><b>TECHNICAL SPECIFICATION LT CONTROL CABLES</b></p>	<p align="right"><b>PAGE 2 OF 6</b></p>														

CLAUSE NO.	TECHNICAL REQUIREMENTS											
<p>2.10.00</p> <p>2.11.00</p> <p>2.12.00</p> <p>2.13.00</p> <p>2.14.00</p> <p>2.14.01</p> <p>2.14.02</p> <p>3.00.00</p> <p>3.01.00</p> <p>3.02.00</p>	<p>the other and a dash placed below the lower numeral. The spacing between consecutive numbers shall not exceed 50 mm.</p> <p>In addition to manufacturer's identification on cables as per IS, following marking shall also be provided over outer sheath:</p> <p>(a.) Cable size and voltage grade - To be embossed</p> <p>(b.) Word 'FRLS' at every 5 metre - To be embossed</p> <p>(c.) Sequential marking of length of the cable in metres at every one metre - To be embossed / printed.</p> <p>The embossing / printing shall be progressive, automatic, in line and marking shall be legible and indelible. For EPR cables identification shall be printed on outer sheath.</p> <p>All cables shall meet the fire resistance requirement as per Category-B of IEC-332 Part-3.</p> <p>Allowable tolerances on the overall diameter of the cables shall be <math>\pm 2</math> mm maximum over the declared value in the technical data sheets.</p> <p>In plant repairs to the cables shall not be accepted. Pimples, fish eye, blow holes etc. are not acceptable.</p> <p>Cable selection &amp; sizing</p> <p>Control cables shall be sized based on the following considerations:</p> <p>(a) The minimum conductor cross-section shall be 1.5 sq.mm.</p> <p>(b) The minimum number of spare cores in control cables shall be as follows:</p> <table border="1" data-bbox="375 1066 1284 1333"> <thead> <tr> <th>No. of cores in cable</th> <th>Min. No. of spare cores</th> </tr> </thead> <tbody> <tr> <td>2C, 3C</td> <td>NIL</td> </tr> <tr> <td>5C</td> <td>1</td> </tr> <tr> <td>7C-12C</td> <td>2</td> </tr> <tr> <td>14C &amp; above</td> <td>3</td> </tr> </tbody> </table> <p>Cable lengths shall be considered in such a way that straight through cable joints are avoided.</p> <p>All Cables shall be of armoured type.</p> <p><b>CONSTRUCTIONAL FEATURES</b></p> <p>1.1 KV Grade Control Cables shall have stranded copper conductor and shall be multicore PVC insulated, PVC inner sheathed, armoured, FRLS PVC outer sheathed conforming to IS: 1554. (Part-I).</p> <p>1.1 KV grade Trailing cables shall have tinned copper(class 5)conductor, insulated with heat resistant elastomeric compound based on Ethylene Propylene Rubber(EPR) suitable for withstanding 90 deg.C continuous conductor temperature and 250deg C during short circuit, inner-sheathed with heat resistant elastomeric compound, nylon cord reinforced, outer-sheathed with heat resistant, oil resistant and flame retardant heavy duty elastomeric compound conforming to IS 9968. Minimum conductor size shall be 2.5 sqmm.</p>		No. of cores in cable	Min. No. of spare cores	2C, 3C	NIL	5C	1	7C-12C	2	14C & above	3
No. of cores in cable	Min. No. of spare cores											
2C, 3C	NIL											
5C	1											
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	<p align="center"><b>TECHNICAL SPECIFICATION</b> <b>LT CONTROL CABLES</b></p>	<p align="right"><b>PAGE</b> <b>3 OF 6</b></p>										

CLAUSE NO.	TECHNICAL REQUIREMENTS		
4.00.00	<p><b>CABLE DRUMS</b></p> <p>(a.) Cables shall be supplied in non returnable steel drums of heavy construction. The drum shall be designed on the basis of weight, diameter, bending radius and length of cable. 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.</p> <p>(b.) Each drum shall carry manufacturer's name, purchaser's name, address and contract number, item number and type, size and length of cable and net gross weight stenciled on both the sides of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.</p> <p>(c.) The standard drum length for control cables with a maximum tolerance of +/- 5% may be decided by the bidder subject to condition that there shall not be any joint in cable, where application length of cable is up to &amp; including 1000 meter. One drum length of each cable size can be of non-standard length (not less than 250 meter) so as to match the ordered quantity Subject to condition that there shall not be any joint in cable</p>		
5.00.00	<p><b>TESTS</b></p> <p>All equipments to be supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Owner's 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. 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 client.</p> <p>However if the contractor 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 contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client /owners representative and submit the reports for approval.</p> <p>All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price</p> <p>The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, 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.</p>		
5.01.00	<p><b>TYPE TESTS</b></p>		
5.01.01	<p>The reports for the following type tests shall be submitted for one size of control cables. Size shall be decided by the employer during detailed engineering</p>		
	<p>TECHNICAL SPECIFICATION LT CONTROL CABLES</p>		<p>PAGE 4 OF 6</p>

	Type Test	Remarks
<b>S. No.</b>		
	<b>For Conductor</b>	
1.	Resistance test	
	<b>For Armour Wires / Formed Wires (If applicable)</b>	
2.	Measurement of Dimensions	
3.	Tensile Test	
4.	Elongation test	
5.	Torsion test	For round wire only
6.	Wrapping test	For aluminium wires / formed wires only.
7.	Resistance test	
8(a).	Mass of zinc Coating test	For GS wires/formed wires only
8(b).	Uniformity of zinc coating	For GS wires/formed wires only
9.	Adhesion test	For GS wires/formed wires only
	<b>For PVC insulation &amp; PVC Sheath</b>	
10.	Test for thickness	
11.	Tensile strength and elongation test	before ageing and after ageing
12.	Ageing in air oven	
13.	Loss of mass test	For PVC insulation and sheath only
14.	Hot deformation test	For PVC insulation and sheath only
15.	Heat shock test	For PVC insulation and sheath only
16.	Shrinkage test	
17.	Thermal stability test	For PVC insulation and sheath only
18.	Oxygen index test	For outer sheath only

CLAUSE NO.	TECHNICAL REQUIREMENTS		
5.02.00	<b>Type Test</b>	<b>Remarks</b>	
	<p data-bbox="412 289 483 317"><b>S. No.</b></p> <p data-bbox="428 348 467 375">19.</p> <p data-bbox="561 348 776 375">Smoke density test</p> <p data-bbox="428 407 467 434">20.</p> <p data-bbox="561 407 831 434">Acid gas generation test</p> <p data-bbox="561 466 821 493"><b>For completed cables</b></p> <p data-bbox="428 525 467 552">21.</p> <p data-bbox="561 525 1138 552">Insulation resistance test(Volume resistivity method)</p> <p data-bbox="428 583 467 611">22.</p> <p data-bbox="561 583 751 611">High voltage test</p> <p data-bbox="428 642 467 669">23.</p> <p data-bbox="561 642 1149 669">Flammability test as per IEC-332 Part-3 (Category-B)</p> <p data-bbox="388 714 1422 772">Indicative list of tests/checks, Routine and Acceptance tests shall be as per Quality Assurance &amp; Inspection table of Control Cables enclosed.</p>	<p data-bbox="992 348 1230 375">For outer sheath only</p> <p data-bbox="992 407 1230 434">For outer sheath only</p>	
	<b>TECHNICAL SPECIFICATION LT CONTROL CABLES</b>		<b>PAGE 6 OF 6</b>





Item: 1.1 KV PVC Insulated FRLS Control cables		<b>STANDARD QUALITY PLAN</b> (CONFORMING TO CODE: IS 1554 PART 1 AND NTPC TECHNICAL SPECIFICATION)					QP. NO. 0000-999- QOE- S-040 REV-01 DATE: 29/11/2018 Page 1 of 8		REVIEWED BY AMAN PANDEY RAJESH SHARMA S K LAL DINESH KUMAR		APPROVED BY Approved K K OJHA Dt. ....			
Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
					M	C/N				D*	M	C	N	
1	2	3	4	5	6		7	8	9	10				11
<b>Instructions:</b> 1) 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 cable drum. 2) Cable manufacturer to maintain all quality control records identified as per all QP stages enumerated below whether it is identified for NTPC verification or witness or not.														
<b>A Raw material/ Bought out Items</b>														
1.01	Copper	1.Make	MA	Verify	100%	--	MANUFACTURER APPROVED SOURCES	MANUFACTURE R APPROVED SOURCES	QCR		V	--	--	
		2. Resistivity	MA	Elect	As per cable mnfr std.	--	IS 613	IS 613	--do--		P	--	--	
1.02	PVC compound for insulation	1. Make	MA	Verify	--do--	100%	MANUFACTURER APPROVED SOURCES	MANUFACTURE R APPROVED SOURCES	--do--		V	V	--	
		2. Type/ Grade	MA	Verify	100%	100%	NTPC ADS	NTPC ADS	--do--		V	V	V	
		3. All acceptance test as per manufacturer norms	MA	Verify	As per manufacturer norms	As per manufacturer norms	--do--	--do--	--do--		V	V	V	Refer note 1
1.03	PVC Compound for Inner sheath	1. Make	MA	Verify	--do--	--do--	MANUFACTURER APPROVED sources	MANUFACTURE R APPROVED sources	--do--		V	V	V	
		2. Type/ Grade	MA	Verify	--do--	--do--	NTPC ADS	NTPC ADS	--do--		V	V	V	
1.04	Steel wire / Formed Wire ( As applicable )	1. Make	MA	Verify	--do--	--do--	MANUFACTURER APPROVED sources	MANUFACTURE R APPROVED sources	--do--		V	V	V	
		2. Dimension	MA	Meas	1 sample from each size / lot	--	NTPC APPROVED DATA SHEET & IS 3975	NTPC APPROVED DATA SHEET & IS 3975	--do--		P	--	--	
		3. All acceptance tests as per IS 3975	MA	Verify	As per IS 3975	--	IS 3975	IS 3975	Supplier TC		V	V	--	
1.05	PVC compound for Sheath	1. Make	MA	Verify	As per manufacturer norms	100%	MANUFACTURER APPROVED sources	MANUFACTURE R APPROVED sources	QCR		V	V	--	
		2. Type / Grade	MA	Verify	100%	100%	NTPC ADS	NTPC ADS	--do--		V	V	V	
		3. All acceptance test as per manufacturer norms	MA	Verify	As per manufacturer norms	As per manufacturer norms	--do--	--do--	--do--		V	V	V	Refer note 1
		4. Thermal Stability	MA	Chem	One sample / Batch	--	NTPC ADS	NTPC ADS	QCR		P	--	--	
		5. Oxygen Index	MA	Chem	--do--	--	NTPC ADS/ IS 10810 Part 58	NTPC ADS/ IS 10810 Part 58	--do--		P	--	--	

LEGEND:- \*RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

NTPC		Item: 1.1 KV PVC Insulated FRLS Control cables		<b>STANDARD QUALITY PLAN</b> (CONFORMING TO CODE: IS 1554 PART 1 AND NTPC TECHNICAL SPECIFICATION)			QP. NO. 0000-999- QOE- S-040 REV-01 DATE : Page 2 of 8		REVIEWED BY AMAN PANDEY RAJESH SHARMA S K LAL DINESH KUMAR			APPROVED BY K K OJHA		
Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
					M	C/N				D*	M	C	N	
1	2	3	4	5	6		7	8	9	10				11
		6. Acid Gas Emission	MA	Chem	--do--	--	NTPC ADS / IEC60754	NTPC ADS / IEC60754	--do--		P	--	--	
1.06	Wooden Drum	1. Dimension	MI	Meas	Manuf. Std.	--	IS 10418	IS10418	QCR		P	--	--	
		2. Anti termite treatment	MI	Chem	Cable manuf. std	--	CABLE MANUF. STD.	CABLE MANUF. STD.	COC		V	V	V	COC from drum manuf.
1.07	Steel Drum	1. Dimension	MI	Meas	--do--	--	--do--	--do--	QCR		P	--	--	
		2. Surface finish	MI	Meas	--do--	--	--do--	--do--	--do--		P	--	--	
<b>B</b>	<b>Process &amp; Stage Inspection</b>													
2.01	Wire Drawing	1. Surface finish	MA	Visual	One sample/Setting of each size	--	SHOULD BE SMOOTH & FREE FROM SCRATCHES	SHOULD BE SMOOTH & FREE FROM SCRATCHES	QCR		P	--	--	
		2. Wire Diameter	MA	Meas	--do--	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
		3. Annealing Test	CR	Mech	--do--	Same as 6M	IS8130/NTPC ADS	IS8130/NTPC ADS	--do--		P	V	V	Refer Sl. No. 3.03(iii).
2.02	Bunching / stranding	1. No. of wires	MA	Meas	--do--	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
		2. Dia of wire	MA	Meas	--do--	--	--do--	--do--	--do--		P	--	--	
		3. Dimension of Conductor	MA	Meas	--do--	--	--do--	--do--	--do--		P	--	--	
		4. Direction of lay	MA	Visual	--do--	---	--do--	--do--	--do--		P	--	--	
		5. Records of strand breakage / welding during conductor stranding	MA	Verify	--do--	--	IS 8130	IS8130	--do--		P	--	--	
		6. Surface finish	MA	Visual	--do--	-	--do--	--do--	--do--		P	--	--	
		7. DC Resistance	CR	Meas	--do--	-	IS8130/NTPC ADS	IS8130/NTPC ADS	--do--		P	--	--	
2.03	Insulation extrusion	1. Surface finish	MA	Visual	--do--	-	NTPC spec	SHOULD BE SMOOTH. NO POROSITY IS PERMITTED.	--do--		P	--	--	PVC compound shall be preferably loaded in to extruder by suction method.
		2. Colour of cores	MA	Visual	--do--	-	NTPC ADS	NTPC ADS	--do--		P	--	--	

LEGEND:- \*RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QAI-P-10/F3-R1

Sl. No		Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
1		2	3	4	5	M	C/N	7	8	9	D*	M	C	N	11
			3.Core identification	MA	Visual	One sample/Setting of each size	--	NTPC ADS	NTPC ADS	QCR		P	--	--	Core printing shall be legible & indelible
			4.Thickness	CR	Meas	--do--	--	--do--	-do-	--do--		P	--	--	
			5.Spark Test	CR	Elect	100%	100%	CABLE MANUF. STD.	No FAILURE	QCR		P	V	V	1.Spark test failure record is to be verified. 2.Core repairing not permitted
2.04	Laying up	1. Core sequence	MA	Visual	One sample/Setting of each size	--	--	IS 1554 (Part I)	IS 1554 (Part I)	--do--		P	--	--	
		2. Direction of lay	MA	Visual	--do--	--	--	-do-	--do--	--do--		P	--	--	
		3. Dia over laid up core	MA	Meas	--do--	--	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
2.05	Inner Sheath	1.Colour	MA	Visual	-do-	-	-	--do--	--do--	--do--		P	--	--	
		2. Surface Finish	MA	Visual	100%	-	-	NTPC SPECIFICATION	FISH EYE, BLOW HOLE NOT PERMITTED	--do--		P	--	-	
		3.Thickness	MA	Meas	One sample/Setting of each size	-	-	NTPC ADS	NTPC ADS	--do--		P	--	--	
		4.Dia over inner sheath	MI	Meas	--do--	-	-	--do--	--do--	--do--		P	--	--	
2.06	Armouring ( As Applicable)	1.Dimension	MA	Meas	--do--	-	-	--do--	--do--	--do--		P	--	--	
		2.No. of wires / strip	MA	Meas.	--do--	-	-	--do--	--do--	--do--		P	--	--	

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FORMAT NO:QS-01-QAI-P-10/F3-RI



Item: 1.1 KV PVC Insulated FRLS Control cables		STANDARD QUALITY PLAN (CONFORMING TO CODE: IS 1554 PART 1 AND NTPC TECHNICAL SPECIFICATION)				QP. NO. 0000-999- QOE- S-040 REV-01 DATE: Page 4 of 8		REVIEWED BY AMAN PANDEY RAJESH SHARMA S K LAL DINESH KUMAR		APPROVED BY K K OJHA				
Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
					M	C/N				D*	M	C	N	
1	2	3	4	5	6		7	8	9	10				11
		3. Direction of lay	MA	Visual	One sample/Setting of each size	--	IS 1554 (Part 1)	IS 1554 (Part 1)	QCR		P	--	--	
		4. Coverage & Quality of armouring	MA	Meas.	100%	--	Min. area of coverage of armouring shall be 90%. The gap between amour wires / formed wires shall not exceed one amour wire/ formed wire space & there shall be no cross over/ over riding of amour wire / formed wire. Zn rich paint shall be applied on amour joint surface of G.S. Wire /formed wire. The breaking load of amour wire joint shall not be less than 95% of that amour wire / formed wire. (As per NTPC specification)	--do--		P	--	--		
		5 Dia over armouring	MA	Meas.	One sample/Setting of each size	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
2.07	Outer Sheath	1. Surface finish	MA	Visual	100%	--	Pimple, Fish Eye, Burnt particles, Blow Hole not permitted. Repairing on outer sheath not permitted. (As per NTPC specification)	QCR		P	--	--	PVC FRLS compound shall be preferably loaded in to extruder by suction method.	
		2. Colour of sheath	MA	Visual	One sample/Setting of each size	--	NTPC ADS	NTPC ADS	QCR		P	--	--	
		3. Dia over outer sheath	MA	Meas	--do--	--	--do--	--do--	--do--		P	--	--	
		4. Thickness of outer sheath	CR	Meas	--do--	-	--do--	--do--	--do--		P	--	--	
		5. Embossing quality	MA	Visual	100%	-	Drum No.,IS 1554( Part 1) Cable size, Voltage grade & Words "FRLS" at every 5 meter is to be embossed. Embossing shall be automatic, in line & marking shall be legible & indelible. (As per NTPC specification)	--do--		P	--	--	Drum No. on Cable may be embossed/ printed	

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 FORMAT NO:QS-01-QAI-P-10/F3-R1



<b>एनटीपीसी</b> <b>NTPC</b>	Item: 1.1 KV PVC Insulated FRLS Control cables	<b>STANDARD QUALITY PLAN</b> (CONFORMING TO CODE: IS 1554 PART 1 AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE- S-040 REV-01 DATE : Page 5 of 8	REVIEWED BY AMAN PANDEY RAJESH SHARMA S K LAL DINESH KUMAR	APPROVED BY Approved <b>K K OJHA</b>
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Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
					M	C/N				D*	M	C	N	
1	2	3	4	5	6		7	8	9	10				11
		6. Sequential marking	MA	Visual	Full length	--	Sequential marking of length of cable in meter at every one meter is to be embossed / printed. Embossing / printing shall be progressive, automatic in line & marking shall be legible & indelible. ( A s per NTPC specification ) In addition, Drum No. is also to be embossed/printed on full cable length	--do--		P	--	--		
<b>C Finished Cables</b>														
3.01	Type test reports clearance from NTPC Engineering	All type tests as per NTPC specification	CR	Doc.	100%	100%	NTPC SPECIFICATION / NTPC ADS / IS 1554 (Part I)	NTPC SPECIFICATION / NTPC ADS / IS 1554 (Part I)	QCR	✓	P	V	V	
3.02	Routine Tests	1.High Voltage test at room temperature	CR	Elect	100%	100%	NTPC ADS / IS 1554 (Part I)	NTPC ADS / IS 1554 (Part I)	Test certificate	✓	P	W	V	Refer note 2
		2.Conductor Resistance	CR	Elect	100%	100%	NTPC ADS / IS 1554 (Part I)	NTPC ADS / IS 1554 (Part I)	--do--	✓	P	W	V	
<b>3.03 Acceptance Tests</b>														
3.03(i)	Construction of finished Cable	1. OD of Cable	MA	Meas.	Each type & size of cables as per sampling plan of IS 1554 ( Part I)		NTPC ADS	NTPC ADS	--do--	✓	P	W	W	
		2. Laying of core	CR	Visual	--do--		NTPC ADS / IS 1554 (Part I)	NTPC ADS / IS 1554 (Part I)	Test certificate	✓	P	W	W	
		3. Core Identification	CR	Visual	--do--		--do--	--do--	--do--	✓	P	W	W	Core printing shall be legible & indelible
		4. Colour of outer sheath	MA	Visual	--do--		NTPC ADS	NTPC ADS	--do--	✓	P	W	W	
		5. Inner sheath thickness	CR	Meas	- do -		--do--	--do--	--do--	✓	P	W	W	
		6. Inner sheath colour	MA	Visual	- do -		- do -	- do -	--do--	✓	P	W	W	
3.03 (ii)	Armour wires/ Formed wires ( if applicable)	1.Dimensions	CR	Meas	Each type & size of cables as per sampling plan of IS 1554 ( Part I)		NTPC ADS /IS1554(PartI)/IS3975	NTPC ADS /IS1554(PartI)/IS3975	--do--	✓	P	V	V	
		2. No. of wires/ formed wire	CR	Mech	-- do --		--do--	--do--	--do--	✓	P	V	V	
		3. Tensile test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	V	V	

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 FORMAT NO:QS-01-QAI-P-10/F3-R1

Sl. No		Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
1		2	3	4	5	M	C/N	7	8	9	D*	M	C	N	11
			4. Elongation test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	V	V	
			5. Torsion test ( for round wires only)	CR	Mech	--do--		--do--	--do--	--do--	✓	P	V	V	
			6. Wrapping test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	V	V	
			7. Resistance test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	V	V	
			8. Mass of Zinc coating	CR	Meas	--do--		--do--	--do--	--do--	✓	P	V	V	
			9. Uniformity of Zinc Coating	CR	Chem.	--do--		--do--	--do--	--do--	✓	P	V	V	
			10. Adhesion test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	V	V	
			11. Freedom from defects	CR	Visual	--do--		--do--	--do--	--do--	✓	P	V	V	
3.03 (iii)	Conductor	1. Annealing Test	CR	Mech	--do--			NTPC ADS/ IS 8130	NTPC ADS/ IS 8130	--do--	✓	P	V	V	Refer Sl. No. 2.01
		2. Resistance Test	CR	Elect	--do--			--do--	--do--	--do--	✓	P	W	W	
3.03 (iv)	PVC Insulation & PVC Sheath	1. Thickness of insulation & sheath	CR	Meas.	--do--			NTPC ADS/ IS 1554(Part1)	NTPC ADS/ IS 1554(Part1)	--do--	✓	P	W	W	
		2. Tensile strength & elongation at break of insulation & outer sheath	CR	Mech	--do--			--do--	NTPC ADS/ IS 1554(Part1)	--do--	✓	P	W	W	
		3. Tensile strength & elongation of PVC at break of insulation & outer sheath (Ageing Test )	CR	Mech	One sample per batch of offered lot irrespective of sizes			NTPC ADS/ IS 1554(Part1)	NTPC ADS/ IS 1554(Part1)	Test certificate	✓	P	V	V	MTR of the offered lot shall be verified
		4. Insulation resistance (Volume resistivity method)	CR	Elect	Each type & size of cables as per sampling plan of IS 1554 ( Part 1)			--do--	NTPC ADS/ IS 1554(Part1)	--do--	✓	P	W	W	
		5. High voltage test at room temperature	CR	Elect	--do--			--do--	--do--	--do--	✓	P	W	W	
		6. Thermal stability on PVC Insulation and outer sheath	CR	Chem	One sample of each offered lot of all offered sizes			--do--	--do--	--do--	✓	P	W	W	
		7. Oxygen index Test on outer sheath	CR	Chem	--do--			NTPC ADS / IS10810 Part 58	NTPC A.D.S	Test certificate	✓	P	W	W	Refer Note 3
		8. Smoke density rating test on outer sheath	CR	Chem	--do--			NTPC ADS & ASTM D2843	NTPC ADS	--do--	✓	P	W	W	Refer Note 3



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Sl. No		Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
1		2	3	4	5	M	C/N	7	8	9	D*	M	C	N	11
			9. Acid gas generation test on outer sheath	CR	Chem	--do--		NTPC ADS & IEC 60754-1	'NTPC ADS	--do--	✓	P	W	W	Refer Note 3
			10. Flammability test on completed cable	CR	Chem	Refer Note 4	Refer Note 4	NTPC ADS & IEC 60332 Part-3 (Category-B)	NTPC ADS	--do--	✓	P	W	W	
			11. Surface finish & length measurement.	CR	Visual & Meas	100% (COC from Manufacturer to be submitted for surface finish as per specification's requirement)	one length of each offered lot of 50 drums of all sizes	(1)IS1554Part-I (2)Cable size, Voltage grade & Words "FRLS" at every 5 meter is to be embossed. Embossing shall be automatic, in line & marking shall be legible & indelible. (3) Sequential marking of length of cable in meter at every one meter is to be embossed / printed. Embossing / printing shall be progressive, automatic, in line & marking shall be legible & indelible (4) drum / Batch number marking on outer sheath	--do--	✓	P	W	W	Pimple, Fish Eye, Burnt particles, Blow Hole etc. not permitted. Repairing on outer sheath not permitted.	
			12. Sequence of cores armour coverage, gap between two consecutive armour/ formed wire	CR	Visual & Meas	One length of each size	One length of each size	Min. area of coverage of armouring shall be 90%. The gap between armour wires / formed wires shall not exceed one armour wire/ formed wire space & there shall be no cross over/ over riding of armour wire / formed wire. Zn rich paint shall be applied on armour joint surface of G.S. Wire /formed wire	--do--	✓	P	W	W		
4	Packing	1. Sealing		MA	Visual	100%	100%	(1)IS 1554(Part-I) (2) The surface of the drum and the outer most cable layer shall be covered with water proof cover. (3) Both the ends of cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by "U" nails.	QCR	✓	P	--	--		
4.01	Identification	NTPC Sealing		MA	Visual	100%	100%	Sealing shall be visible	Sealing shall be visible	--do--	✓	P	V	V	

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FORMAT NO:QS-01-QAI-P-10/F3-R1

		Item: 1.1 KV PVC Insulated FRLS Control cables		<b>STANDARD QUALITY PLAN</b> (CONFORMING TO CODE: IS 1554 PART 1 AND NTPC TECHNICAL SPECIFICATION)		QP. NO. 0000-999- QOE- S-040 REV-01 DATE :  Page 8 of 8		REVIEWED BY AMAN PANDEY RAJESH SHARMA S K LAL DINESH KUMAR		APPROVED BY  K K OJHA Approved	
Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check	Reference Document	Acceptance Norms	Record Format	Agency	Remarks	
<b>Notes:</b>											
1)		If the compound manufacturer is carrying out Ageing test, test report of compound manufacturer is to be reviewed. If the compound manufacturer is not carrying out ageing test, then cable manufacturer is to carry out ageing test & test report is to be reviewed ( quantum of ageing test sample shall be one sample /batch )									
2)		2(a) <b>In case of manufacturers / supplier who have supplied cables in the past through Corporate Centre:-</b> Routine Test of manufacturer internal test report are to be verified by NTPC at the time of final inspection. 2(b) <b>In case of manufacturers / supplier WHO HAVE NOT SUPPLIED cables in the past through Corporate Centre:-</b> Routine Test are to be witnessed by Main Contractor on 100% basis. This is in addition to manufacturer internal test report to be verified by NTPC at the time of final inspection. Same is to be verified by NTPC									
3)		1. <b>For Smoke Density rating test:</b> if the test result without conditioning is within (-)10% of the maximum specified value, then, retesting is to be carried out with conditioning of samples as per standard and the test results after conditioning shall be final for acceptance/rejection. 2. <b>For Acid Gas Generation test:</b> if the test result without conditioning is within (-)10% of the maximum specified value, then, retesting is to be carried out with conditioning of samples as per standard and the test results after conditioning shall be final for acceptance/rejection. 3. <b>For Oxygen Index test:</b> if the test result without conditioning is within (+)7% of the minimum specified value, then, retesting is to be carried out with conditioning of samples as per standard and the test results after conditioning shall be final for acceptance/rejection. 4. In case the test results without conditioning do not meet the maximum/minimum specified value, the manufacturer may exercise the option of retesting the samples after conditioning as per standard.									
4)		This test will be carried out using composite sampling i.e. irrespective of size; cables of one particular type (i.e. armoured, unarmoured) will be bunched together, as per calculations in line with the IEC. All sizes of armoured & unarmoured cables shall be covered.									
<b>LEGEND:</b>	<b>NTPC ADS: NTPC approved data sheet, QCR: quality control records of cable manufacturer, CABLE MANUF STD- cable manufacturer's internal plant standard, MI: minor, MA: major, CR: critical, COC- certificate of conformance</b>										

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