NTPC LTD

CPG-1/VDC Raipur

Sub: Qualifying Requirement (QR) for Vendor Enlistment for Supply of HT Power(3.3 kV & above & up to 11 kV) (Al) XLPE Insulated FRLS Cables

A)	MEG DETAILS		
	1.0	MEG DESCRIPTION	HT POWER CABLES (3.3 kV & Above Power cables & upto 11 kV)
	2.0	MEG RESPONSEBILITY	VDC
B)	**Technical Criteria of QR:** The bidder should have manufactured and supplied during last five years from the date of application. a) Atleast one (1) km of 11/11 kV or above XLPE Insulated Power cables. b) Atleast one (1) km of Flame retardant low smoke (FRLS) cables of any voltage grade.		
C)	**Documents required in support of meeting QR :** 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 HT power cables. Brief details of manufacturing facilities or Standard published catalogue for HT power cables also to be given. 2. The PO in support of award and completion certificate/copies of invoice to establish successful execution of the supply of HT power cables as per QR.		
D)	**Documents to be submitted to find executed value of orders** : 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:- 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. 2. Audited balance sheet including Profit & 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. 3.GSTIN certificate ,PAN ,Power of attorney, Letter of undertaking ,works information etc. as mentioned in enlistment application pages of website www.vendor.ntpc.co.in 4. NTPC can request for other documents as necessary during the course of evaluation.		
E)	NOTE-1	Similar works means: "Supply of 3.3 kV or above Power 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.

1.00.00 CODES & STANDARDS

1.01.00 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 :

IS:7098 (Part -II)	Specification for Cross linked polyethylene insulated PVC sheathed cables. Part-II: For working voltages from 3.3 KV upto and including 33 KV.
IS : 3975	Low Carbon Galvanized steel wires, formed wires and tapes for armouring of cables.
IS : 4905	Methods for random sampling.
IS : 5831	PVC insulation and sheath of electrical cables.
IS : 8130	Conductors for insulated electrical cables and flexible cords.
IS : 10418	Specification for drums for electric cables.
IS : 10810	Methods of tests for cables.
ASTM-D -2843	Standard test method for density of smoke from the burning or decomposition of plastics.
IEC-754 (Part-I)	Tests on gases evolved during combustion of electric cables.
IEC-332	Tests on electric cables under fire conditions. Part-3: Tests on bunched wires or cables (Category-B).

2.00.00 TECHNICAL REQUIREMENTS

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 developed under steady state and transient operating conditions as specified elsewhere in this specification.

2.03.00 Aluminium conductor used in power cables shall have tensile strength of more than 100 N/ sq.mm. Conductors shall be multi stranded.

2.04.00 XLPE insulation shall be suitable for continuous conductor temperature of 90 deg. C and short circuit conductor temperature of 250 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.

2.06.00 For single core armoured cables, armouring shall be of aluminium wires. For multicore armoured cables armouring shall be of galvanized steel as follows : -

	Calculated nominal dia of cable under armour	Size and Type of armour
i)	Upto 13 mm	1.4mm dia GS wire
ii)	Above 13 & upto 25mm	0.8 mm thick GS formed wire / 1.6 mm dia GS wire
iii)	Above 25 & upto 40 mm	0.8mm thick GS formed wire / 2.0mm dia GS wire
iv)	Above 40 & upto 55mm	1.4 mm thick GS formed wire/2.5mm dia GS wire
v)	Above 55 & upto 70mm	1.4 mm thick GS formed wire/3.15mm dia GS wire
vi)	Above 70mm	1.4 mm thick GS formed wire / 4.0 mm dia GS wire

2.06.01 The aluminium used for armouring shall be of H4 grade as per IS: 8130 with maximum resistivity of 0.028264 ohm-sq.mm/mtr at 20 deg.C. The types and sizes of aluminium armouring shall be same as mentioned for galvanized steel at 2.06.00 above.

2.06.02 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 wires / formed wires. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire / formed wire. Zinc rich paint shall be applied on armour joint surface of GS wires/formed wires.

2.07.00 Distinct extruded PVC inner sheath of black colour as per IS:5831 shall be provided for the cables as follows:

a). For all multicore cables.

b). For single core armoured cables, where armouring is not being used as metallic screen.

2.08.00 Outer sheath shall be of PVC black 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.

(a.) Oxygen index of min. 29 (Test method as per IS 10810 Part-58)

(b.) Acid gas emission of max. 20% as per IEC-754 (Part-I)

	(c.) Smoke density rating shall not be more than 60% during Smoke Density Test as per ASTMD-2843.
2.09.00	Cores of three core cables shall be identified by colouring of insulation or by providing coloured tapes helically over the cores, with Red, Yellow & Blue colours.
2.10.00	In addition to manufacturer's identification on cables as per IS, following marking shall also be provided over outer sheath : (a.) Cable size and voltage grade - To be embossed (b.) Word 'FRLS' at every 5 metre - To be embossed (c.) Screen Fault current _ _ _KA for _ _ _ Sec. (Value of current & time shall be indicated) (d.) Sequential marking of length of the cable in metres at every one metre - To be embossed / printed 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.
2.11.00	All cables shall meet the fire resistance requirement as per Category-B of IEC-332 Part-3.
2.12.00	Allowable tolerances on the overall diameter of the cables shall be +\-2 mm maximum over the declared value in the technical data sheets.
2.13.00	In plant repairs to the cables shall not be accepted. Pimples, fish eye, blow holes etc. are not acceptable.
2.14.00	The cross-sectional area of the metallic screen strip/tape/wires shall be considered in sizing calculations.
2.15.00	The eccentricity shall be calculated as tmax -tmin ---------- x 100 t max and the ovality shall be calculated as dmax -dmin ---------- x 100 d max Where t-max/t-min is the maximum/minimum thickness of insulation and d-max/d-min is the maximum / minimum diameter of the core. The eccentricity of the core shall not exceed 10% and ovality not to exceed 2% .

2.16.00	**Cable selection & sizing**
2.16.01	HT cables shall be sized based on the following considerations: a) Rated current of the equipment b) The voltage drop in the cable, during motor starting condition, shall be limited to 10% and during full load running condition, shall be limited to 3% of the rated voltage c) Short circuit withstand capability
2.16.02	Derating Factors Derating factors for various conditions of installations including the following shall be considered while selecting the cable sizes: a) Variation in ambient temperature for cables laid in air b) Grouping of cables c) Variation in ground temperature and soil resistivity for buried cables.
2.16.03	Cable lengths shall be considered in such a way that straight through cable joints is avoided.
2.16.04	All Cables shall be of armoured type.
3.00.00	**CONSTRUCTIONAL FEATURES**
3.01.00	**19/33 KV Grade Power Cables:**
3.02.00	Cables shall conform to IS 7098 Part-II. These cables shall be multi-stranded, compacted circular aluminium conductor, XLPE-insulated, metallic screened PVC outer sheathed. The conductor screen and insulation screen shall both be of extruded semiconducting compound and shall be applied along with the XLPE insulation in a single operation of triple extrusion process so as to obtain continuously smooth interfaces. Method of curing for 19/33 KV Cables shall be “dry curing / gas curing “. The metallic screen for each core shall be capable of carrying the system earth fault current and shall consist of copper wires or tape with minimum overlap of 20%. However, for single core armoured cables, the armouring shall constitute the metallic part of the screening.
3.03.00	**11/11KV, 6.6/6.6KV Grade Power Cables:** Cables shall conform to IS-7098 Part-II. These cables shall be multi-stranded, compacted circular aluminium conductor, XLPE-insulated, metallic screened, PVC outer sheathed. The conductor screen and insulation screen shall both be of extruded semiconducting compound and shall be applied along with the XLPE insulation in a single operation of triple extrusion process so as to obtain continuously smooth interfaces. Method of curing shall be “dry curing / gas curing / steam curing “. The metallic screen for each core shall be capable of carrying the system earth fault current and shall consist of copper wires or tape with minimum overlap of 20%. However, for single core armoured cables, the armouring shall constitute the metallic part of the screening .
3.02.00	**3.3/3.3kV Grade Power Cables:** Cables shall conform to IS: 7098 Part - II. These cables shall be multi- stranded, compacted

	circular aluminium conductor, XLPE insulated, metallic screened, PVC outer sheathed. The metallic screen of each core shall consist of copper wires or tape with minimum overlap of 20%. However, for single core armoured cables, the armouring shall constitute the metallic part of the screening. The metallic screen of each core shall be capable of carrying the system earth fault current Method of curing for cables shall be "dry curing / gas curing / steam curing".
3.03.00	Trailing cables shall have tinned copper (class 5) conductor, insulated with heat resistant elastomeric compound based on Ethylene Propyline 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.
4.00.00	**CABLE DRUMS**
4.01.01	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.
4.01.02	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 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.
4.01.03	The standard drum length for HT power 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 & including 1000 meter for single core cable, and 750 meter for multicore cable. 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
5.00.00	**TYPE, ROUTINE AND ACCEPTANCE TESTS**
	a) The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII-(Forms & Procedures) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer. b) The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set–up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out. c) In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type

test reports to the owner for waiver of conductance of such type test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The owner reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.

d) 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

e) 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.

All types and sizes of cables being supplied shall be subjected to type tests, routine tests and acceptance tests as specified below and according to relevant standards.

5.01.00 The following type tests shall be carried out on one size each of 19/33kV, 11/11KV, 6.6/6.6KV and 3.3/3.3KV cables. Size shall be decided by the employer during detailed engineering

S. No	Type Test Conductor	Remarks
1.	Resistance test	
	For Armour Wires / Formed Wires	
2.	Measurement of Dimensions	
3.	Tensile Test	
4.	Elongation test	
5.	Torsion test	For round wires only
6.	Wrapping test	
7.	Resistance test	
8(a)	Mass & uniformity of Zinc Coating tests	For GS wires/formed wires only.
8(b)	Adhesion test	For GS wires/formed wires only
	For XLPE insulation & PVC Sheath	
9.	Test for thickness	
10.	Tensile strength and elongation test before ageing and after ageing	
11.	Ageing in air oven	

S. No	Type Test	Remarks
12.	Loss of mass test	For PVC outer sheath only.
13.	Hot deformation test	For PVC outer sheath only.
14.	Heat shock test	For PVC outer sheath only
15.	Shrinkage test	
16.	Thermal stability test	For PVC outer sheath only
17.	Hot set test	For XLPE insulation only
18.	Water absorption test	For XLPE insulation only
19.	Oxygen index test	For PVC outer sheath only
20.	Smoke density test	For PVC outer sheath only
21.	Acid gas generation test	For PVC outer sheath only
22	Flammability test as per IEC-332 Part-3 (Category -B)	For completed cable only

5.02.00 The following type tests shall be carried out on each type (voltage grade) & size of the cable:

S. No.	Type Test For all cables
1.	Insulation resistance test (Volume Resistivity method)
2.	High voltage test

For cables of 19/33kV, 11/11KV & 6.6/6.6KV Grade only.

3. Partial discharge test
4. Bending test
5. Dielectric power factor test
   a) As a function of voltage
   b) As a function of temperature
6. Heating cycle test
7. Impulse withstand test

Indicative list of tests/ checks, Routine and Acceptance tests shall be as per Quality Assurance & Inspection table of H.T. Cables enclosed.

एनटीपीसी NTPC	Item:- HT POWER FRLS CABLE (3.3 KV TO 33 KV)	**STANDARD QUALITY PLAN** (CONFORMING TO CODE:IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE- S-042 REV-02 DATE : 03/12/2018 Page 1 of 9	REVIEWED BY AMAN PANDEY RAJESH SHARMA S K LAL DINESH KUMAR	APPROVED BY K K OJHA	1

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
	Instructions: 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 final cable drum number or batch number. 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. 3) Sources of raw material shall be submitted at the time of submission of endorsement sheet for approval by NTPC.													
A	**Raw material/ Brought out Items**													
1.01	Aluminum rod for conductor	1.Make	MA	Verify	100%	---	MANUFACTURER APPROVED SOURCES	MANUFACTURER APPROVED SOURCES	QCR		V	--	--	
		2. Grade	MA	--do--	--do--	--	NTPCADS	NTPC ADS	--do--		V	--	---	
		3. Resistivity	MA	Elect	As per cable mnfr std.	--	IS 5082	IS 5082	-do--		P	--	--	
1.02	Aluminum rod for Armouring (as applicable)	1. Make	MA	Verify	100%	--	MANUFACTURER APPROVED SOURCES	MANUFACTURER APPROVED SOURCES	Q.C.R		V	--	--	
		2. Grade	MA	Verify	As per mnfr std.	--	NTPC ADS	NTPC ADS	Manuf. TC		V	--	--	
		3. Resistivity	MA	Verify	-do-	-	IS 5082	IS 5082	-do--		P	--	--	
1.03	Copper rod (If applicable)	1. Make	MA	Verify	100%	--	Manufacturer approved vender	Manufacturer approved vender	QCR		V	--	--	
		2. Resistivity	MA	Verify	As per cable mnfr std.	--	IS 613	IS 613	--do--		P			
1.04	XLPE compound for insulation	1. Make	MA	Verify	--do--	100%	MANUFACTURER APPROVED SOURCES	MANUFACTURER APPROVED SOURCES	--do--		V	V	V	
		2. Type/ Grade	MA	Verify	100%	100%	NTPC ADS	NTPC ADS	--do--		V	V	V	
		3. Shelf life/ Storage condition	MA	Verify	100%	100%-	Compound manuf. Std	Compound manuf. Std	QCR		V	V	V	
		4. All acceptance test as per manufacturer norms	MA	Verify	As per manufacturer norms	As per manufacturer norms	NTPC ADS	NTPC ADS	Supplier TC		V	V	V	Refer note 1
1.05	PVC Compound for Inner sheath	1. Make	MA	Verify	As per manufacturer norms	--	MANUFACTURER APPROVED sources	MANUFACTURER APPROVED sources	Supplier TC		V	V	--	
		2. Type/ Grade	MA	Verify	--do--	--	NTPC ADS	NTPC ADS	--do--		V	V	--	

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

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
1.06	Semi Conducting Compound	1.Make	MA	Verify	100%	100%	NTPC Approved sources	NTPC Approved sources	--do--	√	P	V	V	
		2. Resistivity	MA	--do--	100%	100%	NTPCADS	NTPCADS	--do--		P	V	V	
		3. Shelf Life / Storage condition	MA	Verify	100%	100%	Compound manuf. recommendation	Compound manuf. recommendations	--do--		P	V	V	
1.07	Copper tape (Electrolytic High Conductivity Copper Foils)	1. Make	MA	Verify	100%	100%	NTPC Approved sources	NTPC Approved sources	--do--	√	P	V	V	
		2. Dimension	MA	Measu	As per cable mnfr std.	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
		3. Resistivity	MA	Verify	100%	----	IS 613	IS 613	Supplier TC		V	V	V	
		4. Chem.& Phy. properties	MA	Elec & Mech.	As per cable mnfr std.	--	As per cable mnfr std.	As per cable mnfr std.	--do--		V	V	-	
1.08	Polyester Tape (As applicable)	1.Make	MA	Verify	100%	100%	Manufacturer approved vendor	Manufacturer approved vendor	--do--		P	V	V	
		2. Dimension	Phy.	Meas	As per cable mnfr std.	--	Manuf. Data sheet	Manuf. Data sheet	--do--		P	-	-	
		3. T.S & Elongation	Phy.	Phy.	-do--	--	--do--	--do--	--do--		V	--	--	
1.09	Steel wire / Formed Wire (As applicable)	1. Make	MA	Verify	As per cable mnfr std.	100%	MANUFACTURER APPROVED sources	MANUFACTURER APPROVED sources	QCR		V	V	V	BIS licensees only
		2. Dimension	MA	Meas	1 sample from each size / lot	--	NTPC APPROVED DATA SHEET & IS 3975	NTPC APPROVED DATA SHEET & IS 3975	QCR		P	--	--	
		3. All acceptance tests as per IS 3975	MA	Verify	As per IS 3975	--	IS 3975	IS 3975	Supplier TC		V	V	--	
1.10	PVC compound for Sheath	1. Make	MA	Verify	As per manufacturer norms	100%	MANUFACTURER APPROVED sources	MANUFACTURER APPROVED sources	QCR		V	V	V	

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					M	C/ N				D*	M	C	N	
1	2	3	4	5	6		7	8	9	10				11
		2. Type / Grade	MA	Verify	100%	100%	NTPC ADS	NTPC ADS	QCR		V	V	V	
		3. All acceptance test as per manufacturer norms	MA	Verify	As per manufacturer norms	As per manufactu rer norms	Compound Mnfr standard	IS 5831	QCR		V	V	V	Refer note 1
		4. Thermal Stability	MA	Chem	One sample / Batch	--	IS 5831	IS 5831	QCR		P	--	--	
		5. Oxygen Index	MA	Chem	--do--	--	NTPC ADS/ IS 10810 Part 58	NTPC ADS	--do--		P	---	--	
1.11	Filler Material (As applicable	1.Type	MA	Verfy	As per manuf. Std.	----	NTPC ADS	NTPC ADS	QCR	-	P	--	--	
1.12	Wooden Drum	1. Dimension	MI	Meas	Manuf. Std.	--	IS 10418	IS10418	--do--		P	--	--	
		2. Anti termite treatment	MI	Chem	Cable manuf. std	--	CABLE MANUF. STD.	CABLE MANUF. STD.	COC		V	V	V	COC from drum manuf.
1.13	Steel Drum	1. Dimension	MI	Meas	--do--	--	--do--	--do--	QCR		P	--	--	
		2. Surface finish	MI	Meas	--do--	--	--do--	--do--	--do-		P	--	--	
B	**Process & Stage Inspection**													
2.01	Wire Drawing	1.Surface finish	MA	Visual	One sample/Settin g 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. Tensile test	CR	Mech	--do--	One sample / Setting of each size	IS 8130	IS 8130	--do--		P	V	V	Refer Sl. No.3.03(iii)
		4. Wrapping test	CR	Mech	--do--	--do--	--do--	--do--	--do--		P	V	V	--do--
		5. Annealing Test	CR	Mech	--do--	--do--	--do--	--do--	-do--		P	V	V	--do--
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	--do--		P	--	--	

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					M	C/ N				D*	M	C.	N	
1	2	3	4	5	6		7	8	9	10				11
								ADS						
2.03	Insulation extrusion (Conductor screen, XLPE Insulation & Insulation screen)	1. Surface finish	MA	Visual	One sample / Setting of each size	--	Extrusion should be by triple extrusion technique Method of curing for cables shall be "dry curing / gas curing/ steam curing" up to 11KV & " dry curing/ gas curing " for 19/33 KV Insulation extrusion area should be preferably clean & dust free. Extrusion Should be smooth. No porosity is permitted	QCR-		P	-	--	
		2.Thickness	CR	Meas	--do--	--	NTPC ADS	NTPC ADS	QCR	P	--	--	
		3. Eccentricity & Ovality	CR	Meas	--do--	--	Eccentricity of core shall not exceed 10% and Ovality not to exceed 2%	Eccentricity of core shall not exceed 10% and Ovality not to exceed 2%	--do--	P	-- -	--	
		3.Hot Set	CR	Mech	One sample/Setting of each size	--	IS 7098- Part II	IS 7098- Part II	--do--	P	--	--	Sample is to be taken from both top & bottom end
2.04	Copper Taping	1. Thickness	CR	Mech	--do--	--	NTPC ADS	NTPCADS	--do-	P	--	--	
		2. No. of tape	CR	Meas	--do--	--	--do--	--do-	--do--	P	--	--	
		3. Tape application overlap	CR	Meas	--do--	--	--do--	---do--	--do--	P	--	--	
		4. Core identification tape	CR	Visual	--do--	--	--do--	---do--	--do--	P	--	--	
2.05	Laying up	1. Core sequence	MA	Visual	--do--	--	IS 7098- Part II	IS 7098- Part II	--do--	P	--	--	
		2. Direction of lay	MA	Visual	--do--	--	-do-	--do--	--do--	P	--	--	
		3. Lay Length	MA	Meas	--do--	--	Manuf. Std.	Manuf. Std	--do-				
		4. Dia over laid up core	MA	Meas	--do--	--	NTPC ADS	NTPC ADS	--do--	P	--	--	
2.06	Inner Sheath	1.Colour	MA	Visual	-do--	-	--do--	--do--	--do--	P	--	--	
		2.Thickness	MA	Meas	One sample/Setting of each size	-	NTPC ADS	NTPC ADS	--do--	P	--	--	
		3.Dia over inner sheath	MI	Meas	--do--.	-	--do--	---do--	--do--	P	--	--	
2.07	Armouring (As Applicable)	1.Dimension	MA	Meas	--do--	-	--do--	--do--	--do--	P	--	--	
		2.No. of wires / strip	MA	Meas.	--do--	-	--do--	--do--	--do--	P	--	--	

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

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	--do--	--	IS 7098- Part II	IS 7098- Part II	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)		QCR		P	--	--		
		5 Dia over armouring	MA	Meas.	One sample/Setting of each size	--	NTPC ADS		--do--		P	--	--		--
2.08	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) PVC FRLS compound shall be preferably loaded in to extruder by suction method.		--do--		P	--	--		
		2.Colour of sheath	MA	Visual	One sample/Setting of each size	--	NTPC ADS	NTPC ADS	--do--		P	--	--		
		3. Dia over outer sheath	MA	Meas	--do--	--	NTPC ADS	NTPC ADS	--do--		P	--	--		
		4.Thickness of outer sheath	CR	Meas	--do--	-	--do--	--do--	--do--		P	--	--		
		5. Embossing quality	MA	Visual	100%	-	Following shall be embossed or printed on outer sheath at every 5 meter length of cable in addition to identification as per IS:(1).Batch number or Drum number (2) IS 1554 –Part-I (3) Cable size, (4) Voltage grade (5) word "FRLS" (marking shall be legible & indelible).		--do--		P	--	--		
		6. Sequencial marking	MA	Visual	Full length	--	Sequential marking of length of cable in meters at every one meter is to be embossed or printed. Embossing or printing shall be progressive, automatic, in line & marking shall be legible & indelible. In addition, Drum No. is also to be embossed/printed on full cable length		--do--		P	--	--		
C	**Finished Cables**														
3.01	Type Test clearance from NTPC Engineering to be verified at the time of final inspection.														
3.02	Routine Tests	1.High Voltage test at room temperature	CR	Elect	100%	100%	NTPC ADS / IS 7098- Part II	NTPC ADS	Test certificate	✓	P	W	W		Refer note 2

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Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C/ N	Reference Document	Acceptance Norms	Record Format	Agency D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	10				11
		2.Conductor Resistance	CR	Elect	100%	100%	NTPC ADS / IS 7098- Part II	NTPC ADS	--do--	✓	P	W	W	Refer note 2
		3. Partial Discharge Test	CR	Elect.	100%	100%	NTPC ADS / IS 7098- Part II	NTPC ADS	-do--	√	P	W	W	For Screened cable only/ Refer note 2
3.03	**Acceptance Tests**													
3.03 (i)	Construction of finished Cable	1. OD of Cable	MA	Meas.	Each type & size of cables as per sampling plan of IS 7098- Part II		NTPC ADS	NTPC ADS	--do--	✓	P	W	W	
		2. Laying of core	CR	Visual	--do--		NTPC ADS / IS 7098- Part II	NTPC ADS / IS 7098- Part II	--do--	✓	P	W	W	
		3. Core Identification	CR	Visual	--do--		--do--	--do--	--do--	✓	P	W	W	
		4. Colour of outer sheath & Inner sheath	MA	Visual	Each type & size of cables as per sampling plan of IS 7098- Part II		NTPC ADS	NTPC ADS	--do--	✓	P	W	W	
		5. Inner sheath thickness	CR	Meas	- do -		--do--	--do--	--do--	✓	P	W	W	
		6. Copper tape / Wire dimension with overlap (As applicable)	CR	Phy	--do--		NTPC ADS/ Min overlap 20%	NTPC ADS/ Min. overlap 20%	--do--	√	P	W	W	
3.03 (ii)	Armour wires/ Formed wires.	1.Dimensions	CR	Meas	Each type & size of cables as per sampling plan of IS 7098- Part II		NTPC ADS/ IS7098-II	NTPC ADS	Test Certific	✓	P	W	W	Test as applicable for Galvanized wires/ strips / Al wires
		2. No. of wires/ formed wire	CR	Mech	-- do --		--do--	--do--	--do--	✓	P	W	W	
		3. Tensile test	CR	Mech	--do--		IS 3975	IS 3975	--do--	✓	P	V	V	
		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	Conductor	1.Resistance Test	CR	Elect	--do--		--do--	--do--	--do--	✓	P	W	W	

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Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C/N	Reference Document	Acceptance Norms	Record Format	Agency D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	10				11
(iii)		2.Tensile test	CR	Mech	Each type & size of cables as per sampling plan of IS 7098(Part-11		IS 8130	IS 8130	Test Certific ate	✓	P	W	W	Test report of manufacturer to be reviewed as per Sl. No. 2.01 for Tensile test & wrapping test
		3.Wrapping test	CR	Mech	--do--		--do--	--do--	-do--	√	P	P	W	--do—
3.03 (iv)	XLPE Insulation & PVC Sheath	1.Thickness of insulation & sheath	CR	Meas.	--do-		NTPC ADS & IS 7098-Part II	NTPC ADS	--do--	✓	P	W	W	
		2.Tensile strength & elongation at break of insulation & outer sheath (before & after ageing)	CR	Mech	One sample per batch of offered lot irrespective of sizes		IS 7098-Part II	IS 7098-Part II		✓	P	V	V	MTR for Ageing Test of the offered lot shall be verified
		2(A).Tensile strength & elongation at break of insulation & outer sheath	CR	Mech	Each type & size of cables as per sampling plan of IS 7098(Part-11)		IS 7098-Part II	IS 7098-Part II		✓	P	W	W	
		3. Insulation resistance (Volume resistivity method)	CR	Elect	Each type & size of cables as per sampling plan of IS 7098-Part II		--do--	--do--	--do--	✓	P	W	W	
		4. Partial Discharge test	CR	Elect.	--do--		--do--	--do--	--do--	√	P	W	W	For Screened cable only
		5.High voltage test at room temperature	CR	Elect	Each type & size of cables as per sampling plan of IS 7098-Part II		--do--	--do--	--do--	✓	P	W	W	
		6.Thermal stability on outer sheath	CR	Chem	One sample of each offered lot of all offered sizes		-do--	--do--	--do--	✓	P	W	W	
		7. Hot Set Test for insulation	CR	Mech	Each type & size of cables as per sampling plan of IS 7098-Part II		IS 7098-Part I	IS 7098-Part II	--do--	✓	P	W	W	For XLPE insulation only
		8.Smoke density test on outer sheath	CR	Chem	One sample of each offered lot of all offered sizes		NTPC ADS & ASTMD2843	NTPC ADS	-do--	✓	P	W	W	Refer Note 3
		9.Acid gas generation test on	CR	Chem	--do--		NTPC ADS & IEC 60754-1	'NTPC ADS	--do--	✓	P	W	W	Refer Note 3

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एनटीपीसी NTPC	Item:- HT POWER FRLS CABLE (3.3 KV TO 33 KV)	**STANDARD QUALITY PLAN** (CONFORMING TO CODE:IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE- S-042 REV-02 DATE : Page 8 of 9	REVIEWED BY AMAN PANDEY RAJESH SHARMA S K LAL DINESH KUMAR	APPROVED BY K.K.OJHA	8

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
		outer sheath												
		10. Oxygen Index	CR	Chem	--do--		NTPC ADS/ IS 10810 Part 58	--do--	--do--	√	P	W	W	Refer Note 3
		11.Flammability test on finished cable	CR	Chem	One sample irrespective of sizes		NTPC ADS & IEC 60332 Part-3 (Category-B)	--do--	--do--	✓	P	W	W	
		12.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 25 drums of all sizes	(1) Drum number / Outer sheath extrusion batch number (2) IS 7098-Part II (3)Cable size, Voltage grade , Words " FRLS" & Screen Fault Current & duration 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 at every meter length is to be embossed / printed. .(4) Manufacturer's identification as per IS . Embossing / printing shall be progressive, automatic, in line & marking shall be legible & indelible.	Test Certificate	✓	P	W	W	Pimple, Fish Eye, Burnt particles, Blow Hole etc. not permitted. Repairing on outer sheath not permitted.
		13. 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.	--do-	√	P	W	W	Zn rich paint shall be applied on armour joint surface of G.S. Wire /formed wire
		14. Measurement of Eccentricity & Ovality	CR	Meas.	--do--	--do--	Eccentricity of core shall not exceed 10% and Ovality not to exceed 2%	-do--	√	P	W	W	
4	Packing	1. Sealing	MA	Visual	100%	100%	(1) IS 7098-Part II (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	QCR	√	P	V	V	

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एनटीपीसी NTPC	Item:- HT POWER FRLS CABLE (3.3 KV TO 33 KV)	STANDARD QUALITY PLAN (CONFORMING TO CODE:IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE- S-042 REV-02 DATE : Page 9 of 9	REVIEWED BY AMAN PANDEY RAJESH SHARMA S K LAL DINESH KUMAR	APPROVED BY K K OJHA	9

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

Notes:	
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 will carry out ageing test & the test report will be reviewed by NTPC (quantum of ageing test sample shall be one sample /batch)
2)	(a) In case of manufacturers / supplier who have supplied cables in the past through Corporate Centre:- Routine Test of manufacturer internal test report are to be verified by NTPC and Main Contractor at the time of final inspection. NTPC and Main Contractor will also witness routine tests on cables on 10% sample basis. (b) In case of manufacturers / supplier WHO HAVE NOT SUPPLIED cables in the past through Corporate Centre:- Routine Test of manufacturer internal test report are to be verified by NTPC at the time of final inspection. NTPC will witness routine tests on cables for the first order on 10% sample basis and Main Contractor will witness routine tests on cables for the first order on 100% basis.
3)	1. For Smoke Density rating test: 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. For Acid Gas Generation test: 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. For Oxygen Index test: 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.
LEGEND:	**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**

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