SCOPE OF WORK

JOB: SUPPLY OF 6.6KV (UE), 1CX630 SQMM, AL, XLPE, UNARMOURED, FRLS FOR BHEL R&M SINGRAULI STPP SITE.

Sl. no.	Description	Quantity	UoM
1.	**SUPPLY OF 6.6KV (UE), 1CX630 SQMM, AL, XLPE, UNARMOURED, FRLS FOR BHEL R&M SINGRAULI STPP SITE.** **Detail specification as per below.**	**5000**	**MTR.**

Note: 1) Vendor to quote Unit Rate inclusive of GST on FOR Destination basis to BHEL R&M Singrauli STPP site, U.P.

2) **GUARANTEE/WARRANTY:** 24 (Twenty-Four) Months from the date of supply of last consignment or 12 (Twelve) months from the date of last commissioning whichever is earlier.

BHEL- ISG, BANGALORE	TECHNICAL SPECIFICATIONS FOR 6.6KV(UE) HT POWER CABLES (XLPE)-1CX630 SQ.MM	SPECIFICATION NO.
	CUSTOMER : M/s NTPC	IS-1-19-2001/013

SINGRAULI STPP STAGE-I & II (5X200MW+2X500MW) RENOVATION & RETROFITTING OF ESP PACKAGE

ENQUIRY TECHNICAL SPECIFICATION
FOR
6.6KV HT POWER CABLE (XLPE)-1CX630SQ.MM

Prepared By	Checked By	Approved by
DASARATHA RAMUDU VEENA	Puli Satyanarayana Digitally signed by Puli Satyanarayana DN: cn=Puli Satyanarayana, o=BHEL-ISG, ou=PE (Electrical), email=psa@bhel.in, c=IN Date: 2026.02.13 17:27:49 +05'30' PULI SATYANARAYANA	Digitally signed by Chiranjeevi DN: cn=Chiranjeevi, o=BHEL, ou=BHEL ISG, email=tkc@bhel.in, c=IN Date: 2026.02.14 09:49:54 +05'30' T K CHIRANJEEVI

CONTENTS

Important Notes to the Bidder:

1. *M/s BHEL shall not entertain any technical clarification after submitting the offer. Technical clarification (if any) pertaining to the Technical Specification must be obtained from M/s BHEL by the vendor before submitting the offer. Once the offer is received from the vendor it is deemed as offer is in line with the technical requirement.*
2. *Vendor must follow the Approved Data Sheet for the cable mentioned in scope of supply as attached in* ***Annexure-3.***
3. *Vendor must follow the Approved Quality Assurance Plan (QAP) as attached in* ***Annexure-4.***
4. *During tender stage, Technical submittals such as copies of type test certificates, technical literature, datasheets etc. are not required. Any such submission, even if made, shall stand null & void and shall not be*

considered as part of offer and successful bidder after award of order shall have no right to take any technical and commercial advantage out of the technical submittals furnished during tender stage.

SECTION-I
COMPLIANCE CERTIFICATE

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

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

2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'

3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.

4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ-Cum-Price schedule' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

6. In case of any ambiguity, conflict in the standard & specification and/or interpretation of clauses in this enquiry spec. and its enclosures the decision of BHEL shall be final and binding and any change due to this shall have no price implication on BHEL and shall have to be absorbed by the successful bidder.

BIDDER'S STAMP & SIGNATURE

SECTION-II
PROJECT INFORMATION

PROJECT : SINGRAULI SUPER THERMAL POWER PROJECT

Singrauli Super Thermal Power Project (SSTPP) has operating capacity of Stage – I (5X200MW) and Stage – II (2X500MW)

Environmental Conditions: All equipment's & accessories shall be suitable for conductive dusty laden corrosive atmosphere normally experienced in Power Plants and all equipment's & accessories shall be designed to resist vermin , fungus, dew etc.

SECTION-III
APPLICABLE STANDARDS

01.00.00 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. The cables shall conform to the requirements of the following standards and Codes:

Nothing in this specification shall be constructed to relieve the contractor of the required statutory responsibility.

For Applicable Standards, please refer Annexure-5 (CUSTOMER NIT SPEC) *(i.e., Clause No.1.00.00 Codes & Standards)*

Note:

i. The list mentioned in above Annexure-5 is not exhaustive. Standards not listed above but are applicable also to be followed to meet requirement.

ii. The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.

iii. In case of conflict between the applicable reference standard and this specification, this specification shall govern.

SECTION – IV
SCOPE OF SUPPLY

04.01 The Scope of Supply includes Design, manufacture, Inspection and testing at manufacturer's works, proper packaging and delivery to site of 6.6KV HT POWER CABLES as per BOQ conforming to the specification.

4.02 HT Power cables of Multi stranded and Compacted Circular Aluminium conductor, extruded semi conducting compound screen, extruded XLPE Insulated, dry cured, extruded semi-conducting compound with a layer of non-magnetic metallic tape for insulation screen, extruded FRLS PVC(Type-ST2) inner sheath, **un armored**, extruded FRLS PVC (Type-ST2) outer sheathed, Single core cable confirming to confirming to the relevant standards. Copper metallic screen provided around each core shall be capable of carrying earth fault current of 300A for 2 secs

Refer Annexure-1 for BILL OF QTY (BOQ)

Note:

1. Quantities indicated above shall be known as Order Quantities.
2. For PVC formula & Indices refer Annexure-6

Operational Requirements:

All the cables shall be suitable for high ambient, high humid tropical Indian climatic conditions. All the cables shall be designed to withstand the mechanical, electrical and thermal stresses under the foreseen steady state and transient / fault conditions, and shall be suitable for the proposed method of installation.

SECTION – V
TECHNICAL SPECIFICATION

5.0 For the technical particulars of the 6.6kV (UE) HT POWER Cables, Bidder must refer the NTPC Specification as per **Annexure –5 (**CUSTOMER NIT SPEC) **and Annexure-3** (Approved Data sheet to be followed)

5.01 Additional points

Bidder shall indicate FOR site Price. No separate Charges shall be payable for type test conducted if applicable.

SECTION-VI

INSPECTION & TESTING

6.0 GENERAL INSTRUCTIONS**:**

6.01.1 The bidder shall submit the valid type test reports for 6.6kV (UE) HT Power cables as listed in this specification on the equipment to be supplied under this contract.

6.01.2 In case the bidder has conducted such specified type test(s) within period of 10 years as on the date of bid opening, he may submit during detailed engineering the type test reports to the Employer for waiver of conductance of such 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 BHEL and NTPC reserves the right to waive conducting of any or all the specified type test(s) under this contract. Charges for conduction of these type tests shall be deemed to be included in the quoted price.

6.01.3 The successful bidder shall obtain the BHEL and NTPC'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.

6.01.4 The type tests shall be carried out in presence of representatives of Customer and BHEL, for which minimum 15 days' notice shall be given by the bidder.

6.01.5 Cable/material consumption during inspection and testing shall be in bidder's account. No additional cost shall be applicable for Inspection and testing. Purchaser shall not accept any short length of cable drum.

6.01.6 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. Bidder to endorse and submit the standard quality plan of NTPC for HT Power cable. Refer **annexure-4**

6.01.7 All routine and acceptance tests shall be performed in presence of representatives of Customer and BHEL. The Bidder shall give at least fifteen (15) days' advance notice of the date when the tests are to be carried out.

6.01.8 Type & routine test report/certificates shall include details of standard to which the tests are performed, test parameters, acceptance criteria, test set up etc. used during the testing along with the test piece details/rating and the detailed test record and final test result.

6.01.9 Bidder shall also furnish copies of reference documents/plant standards/acceptance norms test and inspection, procedure, etc. as referred in quality plans.

6.01.10 All inspection, measuring and test equipment used by the bidder shall be calibrated periodically. Bidder shall maintain all relevant records of periodic calibration, instrument identification.

6.01.11 In case the quantities cleared by BHEL for manufacturing (in a lot) are manufactured and offered for inspection by successful bidder in more than one batch, BHEL reserves the right to witness type/acceptance testing on all batches.

6.02 TESTS DURING MANUFACTURE: -

During the manufacture of cables, manufacturer's standard tests shall be performed and record / test report shall be made available to purchaser's representative during inspection / testing.

6.02.1 TYPE, ROUTINE & ACCEPTANCE TESTS: -

After completion of manufacture of cables, type, routine and acceptance tests shall be performed strictly as per relevant IS & other applicable standards amended upto date.

Routine tests shall be carried out on 100% drums.

6.02.2 Type Tests

The reports for the type tests shall be submitted for **all types and sizes of HT XLPE Power cables**

6.03 TEST WITNESS

Tests shall be performed in presence of NTPC and BHEL representative. The Contractor shall give at least fifteen (15) days advance notice of the date on which the tests are to be carried out.

6.04 TEST CERTIFICATES

6.04.1 Certified reports of all the tests carried out at the works shall be furnished for approval of the Owner/Purchaser.

6.04.2 Test reports shall be completed with all details and shall also contain IS/IEC specified limit values, wherever applicable, to facilitate review.

6.04.3 The cables shall be dispatched from works only after receipt of Owner/ Purchaser's written approval of the test reports.

SECTION-VII

DOCUMENTATION

7.01 DOCUMENTS REQUIRED AFTER AWARD OF ORDER:

The following documents shall be submitted after award of offer

Sl. No	Type of document	Document category	Time of submission
1.	Datasheet of 6.6kV(UE) HT POWER Cable	Approval	R-0 within 7 days from LOI & subsequent revisions within 10 days of comments received from BHEL.
2.	QAP of 6.6kV(UE) HT POWER Cable Endorse NTPC Standard QAP	Approval	BHEL shall furnish comments / approval on each submission within 18 days from receipt.
3.	Type Test Report of 6.6kV(UE) HT POWER Cable, if available	Approval	Within 1 week From LOA
4.	Type Pest Procedure for 6.6kV(UE) HT POWER Cable (If type test conduction is planned)	Approval	Within 1 week after conduction of type test.
5.	Internal Test certificates in A4 size.	Information	Along with inspection call
6.	Routine, Acceptance and Type Test certificates in A4 size.	Information	After completion of Final Inspection
7.	O & M manual, Installation manual, Erection instructions, Storage instructions for long period storage	Information	After completion of Final Inspection
8.	Packing / drum details	Information	After completion of Final Inspection
9.	Final approved documents for Sl. No 1 and 2	For distribution	

7.01.1 All the Drawing/Documents shall be submitted in BHEL Title Block issued during detailed engineering.

7.01.2 All documents shall be submitted through BHEL's Document Management System "WRENCH" for which BHEL shall provide single login id and password to the successful bidder. Successful bidder shall receive all commented/ approved documents through "WRENCH" only.

SECTION-VII
INFORMATION TO BE FURNISHED ALONG WITH OFFER

Bidder must ensure the below mentioned documents are to be furnished along with the offer

S.NO	DESCRIPTION
1	Signed and stamped copy of complete enquiry specifications (From Sheet No. 01 to 11).
2	Duly signed and stamped copy of Unpriced format mentioning the prices are " **Quoted**"
3	Duly Signed and stamped copy of "Deviation Sheet " by mentioning " **NO DEVIATION** " in the Technical Column
4	A copy of the sheet **"Compliance certificate (Section-I)"** with bidder's signature and company stamp.
5	Duly signed and stamped copy of documents required in line with Pre-Qualification Criteria (PQC) attached herewith and it should be s properly indexed and submitted for technical scrutiny. Quotations received from bidders who do not fulfill the PQR shall be summarily rejected without any further evaluation and information to bidders.

ANNEXURE-1

BILL OF QUANTITY (BOQ) of 6.6KV HT POWER CABLES(XLPE)-1CX630 SQ.MM

BHEL tender/ enquiry ref. no.:

Item Work Description: Supply of 6.6kV(UE) HT POWER CABLES (1CX630 SQ.MM)

Project: NTPC R&M Singrauli STPP Stage-I (5X200MW) & Stage-II (2X500)

Name of the bidder:

Item Number	Item Description	Unit of Measure	Item Quantity	Unit price ex-works (Rs.)	Unit Price incl. GST (Rs.)	FOR Site price incl. GST (Rs.)
	Supply :					
1	6.6kV (UE) , 1CX630 sqmm, Al, XLPE, Unarmoured, FRLS	Mtr	5000			

ANNEXURE-2

UNPRICE FORMAT

BHEL tender/ enquiry ref. no.:

Item Work Description: Supply of 6.6kV(UE) HT POWER CABLES (1CX630 SQ.MM)

Project: NTPC R&M Singrauli STPP Stage-I (5X200MW) & Stage-II (2X500)

Name of the bidder:						
Item Number	Item Description	Unit of Measure	Item Quantity	Unit price ex-works (Rs.)	Unit Price Incl. GST (Rs.)	FOR Site price incl. GST (Rs.)
	Supply :					
1	6.6kV (UE) , 1CX630 sqmm, Al, XLPE, Unarmoured, FRLS	Mtr	5000			

ANNEXURE-3
DATA SHEET TO BE FOLLOWED BY BIDDER

Item Description: 6.6KV(UE) HT POWER CABLES(XLPE)-1CX630 SQ.MM

TECHNICAL PARTICULARS

S.No.		Description	1C x 630 Sqmm
1		Make	
2		Country manufacturer	India
3		Type designation	A2XY
4		Applicable standard	IS-7098/II
5		Cable Size (No.of cores x mm 2) (Nom.)	**1C x 630 Sqmm**
6		Rated Voltage	6.35/11 KV (E) , suitable for 6.6 KV (UE) grade system
7		Continuous current rating for maximum conductor temp. when laid in air ambient of 50 deg.C.	
	a)	When metallic screen/armour is earthed at one end (Amps)	Not Applicable
	b)	When metallic screen/armour is earthed at both the ends (Amps)	Not Applicable
	c)	For unscreened,unamoured cables (Amps)	713 Amps (for screened ,unarmoured cable)
8		Continuous current rating for max.conductor temp. when buried in soil having thermal resistivity of 150 deg.C Cm/N at a depth of 1 mtr and at ground ambient temp.of 40 deg.C.	
	a)	When metallic screen/armour is earthed at one end (Amps)	Not Applicable
	b)	When metallic screen/armour is earthed at both the ends (Amps)	Not Applicable
	c)	For unscreened,unamoured cables (Amps)	730 Amps (for screened ,unarmoured cable)
9		Short circuit withstand capacity and duration for :	
	a)	Conductor	59.4 KA for 1 sec
	b)	Metallic screen	300 A for 2 sec (for Copper screen)
	c)	Armour	Not Applicable
10		**Conductor**	
	a)	Material (Copper or Aluminium)	Aluminium to IS-8130
	b)	Grade	H4 garde
	c)	Nominal cross sectional area (Sq.mm)	630
	d)	Number and diameter of wire before compacting of conductor strands	
		i) No.of wires	**59**
		ii) Dia of wires in mm (before stranding)	**3.86 (Nom.)**
	e)	Shape of conductor	Stranded compacted circular
	f)	Diameter Over conductor (mm)	
		i) Fictitious (as per IS 10462 (Part-1)-1993)	28.3 mm
		ii) Approximate	29.3 mm
	g)	Direction of lay of stranded layers	
	h)	Conductor resistance (DC) at 20 deg C in Ohm/Km (max.)	0.0469
	i)	Conductor resistance (AC)	
		a) at 20 deg. C ohm/Km (Approx)	0.051
		b) at 90 deg. C in ohm/Km (Approx) (for XLPE cables)	0.065
	j)	Reactance per phase at 50 Hz in ohm/km (Approx.)	0.085
	k)	Capacitance at 50 hz in micro farads /Km (Approx.)	0.62
	l)	**Conductor screening (Wherever applicable)**	
		a) Material and type	Extruded semi-conducting compound
		b) Thickness of extruded layer (mm)	0.3 (Min.)

TECHNICAL PARTICULARS

S.No.		Description	1C x 630 Sqmm
12		**Insulation**	
	a)	Composition of insulation	XLPE to IS-7098/II/2011
	b)	Nominal thickness of insulation (mm)	3.6
	c)	Tolerance on thickness of Insulation (mm)	0.46
	d)	Filled or unfilled (for XLPE only)	Unfilled
	e)	Type of curing (for XLPE only)	Dry cured
	f)	Min. insulation resistance at 20 deg. C (Mega Ohm/Km)	Min. V.R. 1 x 10^{14} ohm-cm at 27°C
	g)	Identification of cores	Not Applicable
13		**Insulation screening (wherever applicable)**	
	a)	Material & Type	Extruded semi-conducting compound
	b)	Thickness of extruded layer (mm)	0.3 (Min.)
14		**Metallic screen**	
	a)	Material	**Plain Copper tape (with 20% overlap)**
	b)	Size of type/wire (mm)	**One tape of nom dimension 55 x 0.06 mm**
	c)	No. of wires / tapes	
	d)	Short circuit capacity of metallic screen	300 A for 2 sec
	e)	Cross sectional area of screen (sq.mm)	3.3 (Approx.)
	f)	Dia below metallic screen i.e. below copper tape/wire (mm)	38.5 (Approx.)
15		**Inner sheath**	
	a)	Material	Not Applicable
	b)	Diameter over the laid up cores (mm)	Not Applicable
		i) Calculated (By fictitius calculation as per IS 10462 (part -1) -1983)	Not Applicable
		ii) Approximate	Not Applicable
	c)	Thickness of sheath (Min) (mm)	Not Applicable
	d)	Colour of sheath	Not Applicable
	e)	Tolerance in thickness of inner sheath (mm)	Not Applicable
16		Type of filler material	Not Applicable
17		**Armour (in case of armoured cables)**	Not Applicable
	a)	Type of material of armour	Not Applicable
	b)	Formed wire / wire	Not Applicable
	c)	Diameter of cable over inner sheath (under armour) mm	Not Applicable
		i) Calculated (By fictitius calculation as per IS 10462 (part -1) -1983)	Not Applicable
		ii) Approximate	Not Applicable
	d)	Dimension of formed wire / wire in mm	Not Applicable
	e)	No. of armour formed wires/wires	Not Applicable
	f)	Approx. cross sectional area of armour (Sq.mm)	Not Applicable
	g)	Resistivity of armour wire at 2- deg.C (ohm-em.)	Not Applicable
	h)	Direction of lay of armour	Not Applicable
18		**Outer Sheath**	
	a)	Material and type	**FRLS** PVC Type-ST-2
	b)	Diameter under the sheath (mm)	38.6 (Approx.)
		i) Calculated (By fictitius calculation as per IS 10462 (part -1) -1983)	Not Applicable
		ii) Approximate (overall dia)	43.5
	c)	Thickness of sheath (mm) (Nom.)	2.4
	d)	Tolerance on nominal thickness of sheath (mm)	0.68
	e)	Colour of sheath	Black
19	a)	Overall diameter of cable (mm)	43.5
	b)	Tolerance on overall diameter (mm)	± 2.0
	c)	Eccentricity of insulation	10 % (Max.)
	d)	Ovality of core	2 % (Max.)

TECHNICAL PARTICULARS

S.No.		Description	1C x 630 Sqmm
20		Weight of cable per 1000 mtrs (kg) (Approx.- for guidence purpose)	2785
21		Recommended min installation radius (mm)	15 x OD
22		Safe pulling force when pulled by pulling on the conductor (kg)	30 N/Sqmm (Max.)
23		**Cable Drum**	
	a)	Type (wooden/steel)	Wooden drum
	b)	dimensions (Approx)	
		i) Flange diameter (mm)	Gen. to IS-10418
		ii) barrel diameter (mm)	
		iii) Traverse (mm)	
	c)	Weight of cable drum with cables (Kgs) (approx.- for guidence only)	3200
24		Max. / standard length per drum for each size of cable (mtr.) and tolerance (%)	1000 ± 5%
25		Guaranteed value of min.oxygen index of outer sheath	Minimum Oxygen Index shall be 29 at room temp when tested as per IS-10810 part-58.
26		Max.acid gas generation by weight (%)	Maximum Acid Gas Generation shall be 20% by weight when tested as per IEC : 60754/1-
27		Maximum smoke density rating(%)	Maximum Smoke Density Rating shall be 60% when tested as per ASTM-D : 2843
28		Voltage developed in the screen/armour per 100 mt run with screen/armour earthed at one end when cables is carrying (for single core cable only)	
	a)	rates current (volts)	Not Applicable
	b)	Short circuit current (Volts)	Not Applicable
		i) in the screen	Not Applicable
		ii) in the armour	Not Applicable
29		Circulating current developed in the screen/armour for 100 mt. run,with screen/armour earthed at both ends when cables is carrying (for single core cables only)	
	a)	Rates current (Amps)	Not Applicable
	b)	Short circuit current (amps)	Not Applicable
		i) in the screen	Not Applicable
		ii) in the armour	Not Applicable
30		Embossing on outer sheath	Cable size & Voltage grade, word 'FRLS', 'Screen fault current 300A for 2 sec' shall be embossed on outer sheath at interval not more than 5-meter interval and sequential length marking shall be provided at every meter.

Note:- Plain glass fibre tape may be provided in the cable under outer sheath.

FRLS CHARACTERISTICS

Offered cables shall meet the following special type tests in order to ascertain FRLS characteristics.

a). Oxygen Index Test on FRLS Sheath as per IS-10810 part-58 and Minimum Oxygen Index shall be 29 at room temp.

b). Temperature Index Test on FRLS Sheath as per ASTM-D : 2863 (By Extrapolation Method) and Minimum Temperature Index shall be 250 °C at Oxygen Index of 21.

c). Acid Gas Generation Test on FRLS Sheath as per IEC : 60754/1 and Maximum Acid Gas Generation shall be 20% by weight.

d). Smoke Generation Test on FRLS Sheath as per ASTM-D : 2843 and Maximum Smoke Density Rating shall be 60%.

e). Flammability Test on finished cables as per
a) IEC-60332-3 Cat-B.
b) IEEE-383

Comment on specification : Clause 10.05.00 (e):-

Please note that FRLS tests are based on the quality of FRLS PVC compound used for outer sheath which remains same for all cables unless changes are made in the formulation and also note that flammablity tests consume redundant material during testing, which is only wastage of material. Therefore please note that flammability test (as per IEC-60332-3 cat-B) shall be conducted on one sample of any size of entire offered lot.

CALCULATION OF SHORT CIRCUIT RATING OF METALLIC SCREEN OF HT XLPE CABLES

Short circuit current carrying capacity can be calculated by the formula :

$$I_t = \frac{A}{K_1 K_2 \sqrt{t}} \quad \text{.....(1)}$$

Where,

I_t = Short circuit current for 't' second in K.A.

A = Area of screen / armour in sqmm

t = Duration of short circuit in seconds

K_1 = Constant depending upon screen/armour material (**4.41 for CU**)

K_2 = Constant depending on initial and final temperature of short circuit and screen/armour material and same can be calculated as under :

$$K_2 = [\text{Log}_e \{ (\theta + \alpha_e) / (\theta + \alpha_a) \}]^{-1/2} \quad \text{----------(2)}$$

Where ,

θ = Temp. coefficient of electrical resistance at '0' °C **(234.5 for CU)**

α_a = Initial temperature of short circuit (80°C)

α_e = Final temperature of short circuit (200°C)

On substituting the values of θ , α_a and α_e in equation (2) ,

K_2 works out to **1.759 for CU**

Now , on substituting the values of K_1 and K_2 in equation (1) we get :

$$I_t = \frac{0.129\ A}{\sqrt{t}} \text{ KA, for CU screen} \quad \text{---------- (3)}$$

For CU screen 11KV(E) 1C x 630,

We have offered Nom. copper screen area **3.3 sqmm** . Now from eqn. (3) the short circuit rating of copper screen works out to **300A for 2 second duration**.

ANNEXURE-4
QAP TO BE FOLLOWED BY BIDDER

Item Description: 6.6KV(UE) HT POWER CABLES(XLPE)-1CX630 SQ.MM

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-00 DATE : 12-04-12 Page 1 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY अनुमोदित A.K. Garg Approved 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

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

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"
FORMAT NO:QS-01-QA1-P-10/F3-R1

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-00 DATE : 12-04-12 Page 2 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY A.K. Garg Approved DGM	2

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
1.05	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	--	
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	--	--	

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QA1-P-10/F3-R1

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-00 DATE : 12-04-12 Page 3 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY A.K. Garg Approved	3

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
1.09	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	
		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 manufacturer 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/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	--	--	

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QA1-P-10/F3-R1

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-00 DATE : 12-04-12 Page 4 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY A.K. Garg Approved	4

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. Tensile test	CR	Mech	One sample/Setting of each size	One sample / Setting of each size	IS 8130	IS 8130	QCR		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 ADS	--do--		P	--	--	
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

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"
FORMAT NO:QS-01-QA1-P-10/F3-R1

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-00 DATE : 12-04-12 Page 5 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY A.K. Garg Approved	5

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
2.04	Copper Taping	1. Thickness	CR	Mech	One sample/Setting of each size	--	NTPC ADS	NTPCADS	QCR		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	--	--	
		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		--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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

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-00 DATE : 12-04-12 Page 6 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY अनुमोदित A.K. Garg	6

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
							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--	--	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: (1).Batch number or Drum number (2) IS 7098-II (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		--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
		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	

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"
FORMAT NO:QS-01-QA1-P-10/F3-R1

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-00 DATE : 12-04-12 Page 7 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY अनुमोदित A.K. Garg Approved

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
		4. Colour of outer sheath	MA	Visual	Each type & size of cables as per sampling plan of IS 7098- Part II		NTPC ADS	NTPC ADS	QCR	✓	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	
		7. 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	W	W	
		4. Elongation test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	W	W	
		5.Torsion test (for round wires only)	CR	Mech	--do--		--do--	--do--	--do--	✓	P	W	W	
		6. Wrapping test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	W	W	
		7. Resistance test	CR	Mech	--do--		--do--	--do-	--do-	✓	P	W	W	
		8.Mass of Zinc coating	CR	Meas	--do--		--do--	--do--	--do--	✓	P	W	W	
		9. Uniformity of Zinc Coating	CR	Chem.	--do--		--do--	--do--	--do--	✓	P	W	W	
		10.Adhesion test	CR	Mech	--do--		--do--	--do-	--do--	✓	P	W	W	
		11.Freedom from defects	CR	Visual	--do--		--do--	--do--	--do--	✓	P	W	W	
3.03 (iii)	Conductor	1.Resistance Test	CR	Elect	--do--		--do--	--do--	--do--	✓	P	W	W	
		2.Tensile test	CR	Mech	Each type & size of cables as per sampling plan of IS 7098-Part-II		IS 8130	IS 8130	Test Certific ate	✓	P	W	W	Test report of manufactur er to be reviewed as per Sl. No. 2.01 for Tensile test & wrapping test

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"
FORMAT NO:QS-01-QA1-P-10/F3-R1

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-00 DATE : 12-04-12 Page 8 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY Approved A.K. Garg Dt.	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
		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 ageing)	CR	Mech	--do--		IS 7098-Part II	IS 7098-Part II		✓	P	W	W	Refer Note 3 Also
		3.Tensile strength & elongation at break of insulation & outer sheath (after Ageing)	CR	Mech	Refer Note 3		IS 7098-Part II	IS 7098-Part II	Test Certificate	✓	P	W	W	Refer Note 3
		4. 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	
		5. Partial Discharge test	CR	Elect.	--do--		--do--	--do--	--do--	√	P	W	W	For Screened cable only
		6.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	
		7.Thermal stability on outer sheath	CR	Chem	One sample of each offered lot of all offered sizes		-do--	--do--	--do--	✓	P	W	W	

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"
FORMAT NO:QS-01-QA1-P-10/F3-R1

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-00 DATE : 12-04-12 Page 9 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY अनुमोदित A.K. Garg Date	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
		8. Hot Set Test for inculation	CR	Mech	Each type & size of cables as per sampling plan of IS 7098-Part II		IS 7098-Part II	IS 7098-Part II	QCR	✓	P	W	W	For XLPE insulation only
		9.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	
		10.Acid gas generation test on outer sheath	CR	Chem	--do--		NTPC ADS & IEC 60754-1	'NTPC ADS	--do--	✓	P	W	W	
		11. Oxygen Index	CR	Chem	--do--		NTPC ADS/ IS 10810 Part 58	--do--	--do--	√	P	W	W	
		12.Flammability test on completed cable	CR	Chem	One sample irrespective of size per voltage grade		NTPC ADS & IEC 60332 Part-3 (Category-B)	--do--	--do--	✓	P	W	W	
		13.Surface finish & length measurement.	CR	Visual & Meas	One length of each size	One length of each size	A) Following shall be embossed or printed on outer sheath at every 5 meter length of cable: (1).Batch number or Drum number (2) IS 7098-II (3) Cable size (4) Voltage grade (5) word "FRLS" (marking shall be legible & indelible). B) 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		Test Certific ate	✓	P	W	W	Pimple, Fish Eye, Burnt particles, Blow Hole etc. not permitted. Repairing on outer sheath not permitted.
		14. 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	
		15. 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	

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QA1-P-10/F3-R1

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-00 DATE : 12-04-12 Page 10 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY AVKdGarg Dt.	10

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
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	

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/ Regional Offices** :- Routine Test of manufacturer internal test report are to be verified by NTPC at the time of final inspection. NTPC will also witness routine tests on cables on 10% sample basis on 1.9 KV/ 3.3 KV and 3.3KV/ 3.3 KV cables , other HT cables will be witnessed on 100% basis.
2(b) **In case of manufacturers / supplier WHO HAVE NOT SUPPLIED cables in the past through Corporate Centre/ Regional Offices**,:- Routine Test of manufacturer internal test report are to be verified by NTPC at the time of final inspection. NTPC will also witness routine tests on cables for the first order on 100% basis.

3) **Refer table on page 11& 12 of 12 for Sampling & Acceptance criteria.**

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"
FORMAT NO:QS-01-QA1-P-10/F3-R1

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-00 DATE : 12-04-12 Page 11 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY A.K. Garg Approved Dt....	11

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

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

Sampling & Acceptance Criteria

Criteria	Manufacturer experience prerequisite	Condition	Testing procedure	Remarks
Samples as per relevant IS from every size/ type of cable in the offered lot shall be tested for Tensile Strength & Elongation (before ageing). The values will be compared with corresponding values mentioned in the Type Test report accepted by NTPC. These values of Tensile Strength & Elongation (before ageing) should be within +/ - 15% tolerance (final values should be more than the minimum values indicated in relevant standard) of the Type Test report	In case of Manufacturers/ Supplier who have supplied cables in the past through Corporate Centre / Regional offices	In case of sizes/ type which meet the criteria	1 Sample per size/ type out of sizes which have met the criteria, will be put on accelerated ageing test (refer IRS specification no. IRS: S-63/2007 Rev 3.0). The samples shall be aged in air oven at temperature of 130°c+/- 2°c for 5 hours. 1 Sample of XLPE insulation per type of cables offered which have met the criteria, will be put on ageing test as per IS 7098 –II . After wards the samples shall be tested for Tensile Strength & Elongation. Acceptance norms shall be as per relevant IS. **This test shall be witnessed by NTPC.**	In case the samples do not meet the requirement in accelerated ageing test **then 1 sample of that size/ type will be put on ageing test as per IS.**
		In case of size /type which do not meet the criteria	Particular size/ type will be put on ageing test as per IS. **This test shall be witnessed by NTPC.**	----

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"
FORMAT NO:QS-01-QA1-P-10/F3-R1

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-00 DATE : 12-04-12 Page 12 of 12 VALID UP TO: 11-04-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY A.K. Garg	12

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
				In case of Manufacturers/ Supplier WHO HAVE NOT SUPPLIED cables in the past through Corporate Centre / Regional offices	In case of size /type which meet the criteria		1 Sample per sizes/ type out of all sizes which have met the criteria, will be put on aging test and **witnessed by NTPC as per relevant IS**							----
					In case of size/ type which do not meet the criteria		Particular size / type will be put on ageing test as per IS. **This test shall be witnessed by NTPC**							----

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QA1-P-10/F3-R1

REVISED STANDARD QUALITY PLAN

	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान	TO BE FILLED IN BY NTPC
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं..: 0000-999-क्यूओई -एस-042 REV/ संशोधित सं..:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ1 OF/ से 14 VALID UPTO:26.08.2024

REVIEWED BY: AMAN PANDEY, AMAN DUBEY, S K LAL, SUNIL KUMAR LAL, NISHITH AGARWAL, NISHITH AGRAWAL

APPROVED BY: Quality Assurance, अनुमोदित Approved, N.T.P.C., Noida, B C Roy

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check		Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी				Remarks/ /टिप्पणियां
					M/ एम	C/ N सी/एन					M/ एम	C/ सी	N/ एन	
1	2	3	4	5	6		7	8	9	D*	**	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%	---	NTPC Accepted Sources	NTPC Accepted Sources	QCR		V	V	V	
		2. Grade	MA	--do--	--do--	--	NTPCADS	NTPC ADS	--do--		V	--	---	
		3. Resistivity	MA	Elect	As per cable mnfr std.	--	IS5082 / As per Rel. Std.	IS 5082	-do--		P	--	--	
1.02	Aluminum rod for Armouring (as applicable)	1. Make	MA	Verify	100%	--	NTPC Accepted Sources	NTPC Accepted 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%	--	NTPC Accepted Sources	NTPC Accepted Sources	QCR		V	--	--	
		2. Resistivity	MA	Verify	As per cable mnfr std.	--	IS 613	IS 613	--do--		P			
1.04	XLPE compound	1. Make	MA	Verify	--do--	100%	NTPC Accepted Sources	NTPC Accepted Sources	--do--		V	V	V	

LEGEND:/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION./ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER / SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

NTPC	**STANDARD QUALITY PLAN** स्टैण्डर्ड क्वालिटी प्लान	**TO BE FILLED IN BY NTPC**
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं..: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं..:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ2 OF/ से 14 VALID UPTO:26.08.2024
REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL	APPROVED BY Quality Assurance अनुमोदित Approved N.T.P.C., Noida B C Roy	

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check		Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी				Remarks/ /टिप्पणियां
					M/ एम	C/ N सी/एन					M/ एम	C/ सी	N/ एन	
1	2	3	4	5	6		7	8	9	D*	**	10		11
	for insulation	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	--	NTPC Accepted Sources	NTPC Accepted Sources	Supplier TC		V	V	--	
		2. Type/ Grade	MA	Verify	--do--	--	NTPC ADS	NTPC ADS	--do--		V	V	--	
1.06	Semi Conducting Compound	1.Make	MA	Verify	100%	100%	NTPC Accepted Sources	NTPC Accepted 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 Accepted Sources	NTPC Accepted Sources	--do--	√	P	V	V	
		2. Dimension	MA	Measu	As per cable mnfr std.	--	NTPC ADS	NTPC ADS	--do--		P	--	--	

LEGEND:/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION./ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER/ SUB-SUPPLIER/निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR/ मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में 'W' के रूप में करेगा ।

NTPC	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान		TO BE FILLED IN BY NTPC	
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं..: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं..:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ3 OF/ से 14 VALID UPTO:26.08.2024	REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL	APPROVED BY Quality Assurance N.T.P.C. Noida अनुमोदित Approved B C Roy

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check M/ एम	Quantum of check C/ N सी/एन	Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी	M/ एम	C/ सी	N/ एन	Remarks/ /टिप्पणियां
1	2	3	4	5	6		7	8	9	D*	**	10		11
		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%	NTPC Accepted Sources	NTPC Accepted Sources	--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%	NTPC Accepted Sources	NTPC Accepted 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%	NTPC Accepted Sources	NTPC Accepted Sources	QCR		V	V	V	

LEGEND:/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION./ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।
** M: MANUFACTURER / SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W' के रूप में करेगा ।

NTPC	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान	TO BE FILLED IN BY NTPC		
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं..: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं..:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ4 OF/ से 14 VALID UPTO:26.08.2024	REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL	APPROVED BY Quality Assurance अनुमोदित Approved N.T.P.C. Noida B.C. Roy

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check M/ एम	Quantum of check C/ N सी/एन	Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	D*	Agency / एजेंसी M/ एम	C/ सी	N/ एन	Remarks/ /टिप्पणियां
1	2	3	4	5	6		7	8	9	D*	**	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 manufacturer 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/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. Tensile test	CR	Mech	--do--	One	IS 8130	IS 8130	--do--		P	V	V	Refer Sl.

LEGEND:/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION./ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER / SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

Format No.: QS-01-QAI-P-07A/F3-R0
प्रारूप सं..

Engg. Div./QA&I
अभि. प्रभाग./क्यूए व आई

NTPC		**STANDARD QUALITY PLAN** **स्टैण्डर्ड क्वालिटी प्लान**	**TO BE FILLED IN BY NTPC**	
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**		CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं..: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं..:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ5 OF/ से 14 VALID UPTO:26.08.2024	REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL

APPROVED BY
Quality Assurance
अनुमोदित
Approved
N.T.P.C. Noida
B.C. Roy

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check		Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी				Remarks/ /टिप्पणियां
					M/ एम	C/ N सी/एन					M/ ए म	C/ सी	N/ एन	
1	2	3	4	5	6		7	8	9	D*	**	10		11
						sample / Setting of each size								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 ADS	--do--		P	--	--	
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	--	--	

LEGEND/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION/ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER/ SUB-SUPPLIER/निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR/ मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

NTPC	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान	TO BE FILLED IN BY NTPC
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं..: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं..:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ6 OF/ से 14 VALID UPTO:26.08.2024
		REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL
		APPROVED BY Quality Assurance अनुमोदित Approved N.T.P.C. Noida B.C. Roy

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check		Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी				Remarks/ /टिप्पणियां
					M/ एम	C/ N सी/एन					M/ एम	C/ सी	N/ एन	
1	2	3	4	5	6		7	8	9	D*	**	10		11
		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	--	--	

LEGEND:/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION./ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER / SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

NTPC	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान	TO BE FILLED IN BY NTPC
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं.: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं.:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ 7 OF/ से 14 VALID UPTO:26.08.2024
		REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL
		APPROVED BY Quality Assurance अनुमोदित Approved N.T.P.C., Noida

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check		Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी				Remarks/ /टिप्पणियां
					M/ एम	C/ N सी/एन					M/ ए म	C/ सी	N/ एन	
1	2	3	4	5	6		7	8	9	D*	**	10		11
		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	--	--	
		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	--	--	

LEGEND/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION/ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER / SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

NTPC	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान	TO BE FILLED IN BY NTPC		
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं.: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं..:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ8 OF/ से 14 VALID UPTO:26.08.2024	REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL	APPROVED BY Quality Assurance अनुमोदित Approved N.T.P.C. Noida

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check M/ एम	Quantum of check C/N सी/एन	Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारुप		Agency / एजेंसी M/ एम	C/ सी	N/ एन	Remarks/ /टिप्पणियां
1	2	3	4	5	6		7	8	9	D*	**	10		11
		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
		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

LEGEND:/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION./ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।
** M: MANUFACTURER / SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

Format No.: QS-01-QAI-P-07A/F3-R0
प्रारूप सं..

Engg. Div./QA&I
अभि. प्रभाग./क्यूए व आई

	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान	TO BE FILLED IN BY NTPC		
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं.: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं.:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ9 OF/ से 14 VALID UPTO:26.08.2024	REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL	APPROVED BY Quality Assurance अनुमोदित Approved B C Roy N.T.P.C., Noida

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check		Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency/ एजेंसी				Remarks/ /टिप्पणियां
					M/ एम	C/ N सी/एन					M/ ए म	C/ सी	N/ एन	
1	2	3	4	5	6		7	8	9	D*	**	10		11
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 /
		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	

LEGEND:/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION/ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER / SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

एनटीपीसी NTPC	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान	TO BE FILLED IN BY NTPC
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं..: 0000-999-क्यूओई -एस-042 REV/ संशोधित सं..:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ10 OF/ से 14 VALID UPTO:26.08.2024
		REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL
		APPROVED BY Quality Assurance अनुमोदित Approved N.T.P.C. Noida DE

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check		Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी				Remarks/ /टिप्पणियां
					M/ एम	C/ N. सी/एन					M/ ए म	C/ सी	N/ एन	
1	2	3	4	5	6		7	8	9	D*	**	10		11
		5.Torsion test (for round wires only)	CR	Mech	--do--		--do--	--do--	--do--	✓	P	V	V	Al wires
		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.Resistance Test	CR	Elect	--do--		--do--	--do--	--do--	✓	P	W	W	
		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	

LEGEND/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION/ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER / SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान	TO BE FILLED IN BY NTPC
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं.: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं.:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ11 OF/ से 14 VALID UPTO:26.08.2024
		REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL
		APPROVED BY Quality Assurance अनुमोदित Approved B C Roy N.T.P.C., Korba

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check M/ एम	Quantum of check C/N सी/एन	Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी D*	M/ए म **	C/सी 10	N/एन	Remarks/ /टिप्पणियां 11
1	2	3	4	5	6		7	8	9					
		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(Finished Cables) 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-1I)		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

LEGEND/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION/ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER / SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान	TO BE FILLED IN BY NTPC
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं.: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं..:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ12 OF/ से 14 VALID UPTO:26.08.2024
		REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL
		APPROVED BY Quality Assurance ★ N.T.P.C ★ Noida अनुमोदित Approved B.C.Roy

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check		Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी				Remarks/ /टिप्पणियां
					M/ एम	C/ N सी/एन					M/ ए म	C/ सी	N/ एन	
1	2	3	4	5	6		7	8	9	D*	**	10		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. 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 Certific ate	✓	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	

LEGEND:/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION./ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER/ SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

NTPC	STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान	TO BE FILLED IN BY NTPC		
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): **HT Power FRLS Cable (3.3 kV to 33 kV)**	CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE-S-042 क्यूपी सं..: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं..:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ13 OF/ से 14 VALID UPTO:26.08.2024	REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL	APPROVED BY Quality Assurance अनुमोदित Approved N.T.P.C. Noida

SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check		Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी				Remarks/ /टिप्पणियां
					M/ एम	C/ N सी/एन					M/ ए म	C/ सी	N/ एन	
1	2	3	4	5	6		7	8	9	D*	**	10		11
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	

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.

LEGEND:/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION./ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।
** M: MANUFACTURER / SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR / मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में "W" के रूप में करेगा ।

एनटीपीसी NTPC			STANDARD QUALITY PLAN स्टैण्डर्ड क्वालिटी प्लान			TO BE FILLED IN BY NTPC										
Item (material, class, grade, rating, range, size etc.) / मद (सामग्री, वर्ग, ग्रेड, रैटिंग, रेंज, आकार आदि): HT Power FRLS Cable (3.3 kV to 33 kV)			CONFORMING TO CODE/ कोड के अनुरूप: IS 7098 Part-II AND NTPC TECHNICAL SPECIFICATION)			QP. NO. 0000-999- QOE-S-042 क्यूपी सं.: 0000-999-क्यूओई-एस-042 REV/ संशोधित सं.:02 DATE :/तिथि: 27.08.2021 Page/ पृष्ठ14 OF/ से 14 VALID UPTO:26.08.2024	REVIEWED BY AMAN PANDEY AMAN DUBEY S K LAL SUNIL KUMAR LAL NISHITH AGARWAL NISHITH AGRAWAL	APPROVED BY Quality Assurance अनुमोदित Approved N.T.P.C., Noida					
SL. NO क्र.सं	COMPONENT & OPERATIONS अवयव व संचालन	Characteristics/ विशेषताएं	Class /वर्ग	Type of check/जांच के प्रकार	Quantum of check		Reference Document/ संदर्भ दस्तावेज#	Acceptance Norms/ स्वीकृत मानदंड	Record Format/ रिकॉर्ड का प्रारूप	Agency / एजेंसी				Remarks/ /टिप्पणियां		
					M/ एम	C/ N सी/एन					M/ ए म	C/ सी	N/ एन			
1	2	3	4	5	6		7	8	9	D*	**	10		11		

	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**

LEGEND:/ संकेतिका: * RECORDS, INDENTIFIED WITH "TICK" (Ö) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION./ * "टिक" (..) के साथ प्रमाणित रिकॉर्ड, क्यूए दस्तावेजीकरण में आपूर्तिकर्ता द्वारा अनिवार्य रूप से शामिल किया जाएगा।

** M: MANUFACTURER/ SUB-SUPPLIER /निर्माता / उप-आपूर्तिकर्ता C: MAIN CONTRACTOR/ मुख्य संविदाकार, N: NTPC/ एनटीपीसी P: PERFORM/ निष्पादन W: WITNESS/ गवाह AND V: VERIFICATION. AS APPROPRIATE/ सत्यापन (जैसा उपयुक्त हो), CHP/ सीएचपी: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.: एनटीपीसी खंड "N" में 'W' के रूप में करेगा ।

ANNEXURE-5
CUSTOMER NIT SPECIFICATIONS

Item Description: 6.6KV(UE) HT POWER CABLES(XLPE)-1CX630 SQ.MM

SUB-SECTION-III-E-7

HT CABLES

HT CABLES

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

2.02.00 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.

CLAUSE NO.	HT CABLES
2.06.00	
2.06.01	
2.06.02	
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)

CLAUSE NO.	HT CABLES
	(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 as per BOQ) (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.
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% .
3.00.00	**CONSTRUCTIONAL FEATURES (AS APPLICABLE)**
3.01.00	**11/11KV, 6.35/11KV & 3.8/6.6KV Grade Power Cables:**

000435

CLAUSE NO.	HT 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 for 11/11KV, 6.35/11KV and 3.8/6.6KV Cables shall be " dry curing / gas curing / steam curing " . The metallic screen for each core shall be capable of carrying the system earth fault current of 300 A for 2 second, shall consist of copper wore or tape with minimum overlap of 20%. However, for single core armoured cables , the armouring shall constitute the metallic part of the screening .
4.00.00	**CABLE DRUMS**
4.01.01	Cables shall be supplied in non returnable wooden or steel drums of heavy construction. 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. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply with IS: 10418.
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 power cables shall not be less than 500 meters. The length per drum shall be subjected to a maximum tolerance of +/- 5% of the standard drum length. The Employer shall have the option of rejecting cable drum with shorter lengths. For each size, the variance of total quantity, adding all the supplied drum lengths, from the ordered quantity, shall not exceed +/-2%.
5.00.00	**TESTS**
	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.
5.01.01	The following type tests shall be carried out on one size each of 11/11KV, 6.35/11KV and 3.8/6.6 KV (As applicable)
	S. No **Type Test** **Remarks**

000436

CLAUSE NO.	HT CABLES		
		Conductor	
	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	
	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
5.01.02	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 6.35/11KV & 3.8/6.6 KV Grade only.		

000437

CLAUSE NO.	HT CABLES
	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
5.02.00	Indicative list of tests/ checks, Routine and Acceptance tests shall be as per Quality Assurance & Inspection table of H.T. Cables enclosed with this chapter.

000433

ANNEXURE-6
IEEMA CIRCULAR FOR PVC

Item Description: 6.6KV(UE) HT POWER CABLES(XLPE)-1CX630 SQ.MM

CIN No. U99999MH1970GAPO14629

ieema
your link to electricity

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

Cir. No. 22/DIV/CAB/05 07 June 2023

To Cable Division and Utilities/SEBS, listed of purchasing organisations

Sub: Correction in amendment to Price Variation Clause for MV and EHV Cables wef Apr 2023

IEEMA recently published amended Price Variation Clause for MV and EHV Cables wef Apr 2023 vide Cir. No. 07/DIV/CAB/05 and 06/DIV/CAB/05 dated 08 May 2023. After publishing IEEMA found some corrections to be done in the below factor tables:

For EHV Cables -
Table: 3d (SMIF): Variation factor for Copper in Lead + Cu wire construction (CuFpb)

For MV Cables -
Table: H4 (c) 3.3 KV (E) Unscreened arm
And note added for Table: H5 (a) & Table: H5 (b) as "Fillers added in above factors"

The corrected factor tables are attached and request to all stakeholders to replace these tables with earlier published factor tables.

All other factor tables and guidelines remains unchanged as per Cir No. 07/DIV/CAB/05 and 06/DIV/CAB/05 dated 08 May 2023.

Director
Encl.: corrected factor tables for amended PV clause for MV Cables wef Apr 23.

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

ieema
your link to electricity

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

TABLE : H4 (c)
VARIATION FACTOR FOR STEEL WIRE ARMOUR (FeW)
THREE CORE ARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area in Sq. mm	3.3 KV (E) Unscreened arm	3.3 KV (E) screened arm	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	1.258	1.358	1.457	1.612	2.509	1.503	-	-
35	1.361	1.465	1.569	1.853	2.644	2.797	2.517	-
50	1.682	1.685	1.687	2.321	2.800	2.921	4.569	4.603
70	2.033	1.959	1.979	2.503	3.219	3.347	4.809	4.935
95	2.202	2.355	2.507	2.718	4.019	4.200	5.437	6.553
120	2.371	2.523	2.675	2.882	4.241	4.416	6.713	6.820
150	2.870	2.812	2.847	3.265	4.447	4.621	6.976	7.088
185	3.121	3.215	3.309	4.148	4.726	5.289	7.356	7.489
240	3.758	3.993	4.227	4.442	5.442	6.651	7.718	7.890
300	4.099	4.562	5.024	5.182	6.894	7.084	8.187	8.359
400	5.750	6.161	6.572	6.658	7.433	7.657	8.760	8.960
500	6.716	6.747	6.777	6.861	7.588	7.797	8.830	9.629
630	7.492	7.116	7.465	7.477	8.209	8.386	9.413	10.365

TABLE : H5 (a)
VARIATION FACTOR FOR Polymer (CCFAL/CCFCu)
SINGLE CORE ARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV(E) screened ARM	6.6 KV (E) ARM	6.6 KV (UE) / 11 KV (E) ARM	11 KV (UE) ARM	22 KV (E) ARM	33 KV (E) ARM	33 KV (UE) ARM
35	0.123	0.197	0.259	0.278	0.330	0.376	0.468	0.493
50	0.152	0.209	0.272	0.294	0.379	0.394	0.483	0.530
70	0.170	0.227	0.295	0.317	0.404	0.419	0.508	0.583
95	0.184	0.244	0.317	0.338	0.435	0.449	0.554	0.609
120	0.197	0.261	0.337	0.392	0.457	0.472	0.576	0.634
150	0.194	0.303	0.389	0.413	0.477	0.492	0.597	0.656
185	0.224	0.322	0.414	0.445	0.502	0.539	0.674	0.767
240	0.276	0.354	0.456	0.479	0.558	0.573	0.711	0.806
300	0.294	0.377	0.489	0.506	0.587	0.602	0.811	0.915
400	0.333	0.450	0.569	0.578	0.687	0.703	0.866	0.974
500	0.367	0.493	0.675	0.679	0.809	0.826	1.056	1.139
630	0.438	0.611	0.735	0.739	0.873	0.928	1.168	1.290
800	0.529	0.734	0.863	0.866	1.027	1.05	1.189	1.380
1000	0.648	0.880	1.031	1.035	1.138	1.158	1.402	1.619

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor, the above factor will be multiplied by 0.63
Fillers added in above factors

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

TABLE : H5 (a)
VARIATION FACTOR FOR Polymer (CCFAL/CCFCu)

SINGLE CORE UNARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV(E) screened ARM	6.6 KV (E) ARM	6.6 KV (UE) / 11 KV (E) ARM	11 KV (UE) ARM	22 KV (E) ARM	33 KV (E) ARM	33 KV (UE) ARM
35	0.158	0.191	0.224	0.252	0.323	0.342	0.361	0.380
50	0.177	0.209	0.240	0.269	0.342	0.361	0.520	0.539
70	0.198	0.232	0.265	0.296	0.370	0.391	0.551	0.572
95	0.233	0.261	0.288	0.318	0.396	0.450	0.582	0.636
120	0.253	0.282	0.310	0.342	0.454	0.477	0.613	0.636
150	0.269	0.299	0.328	0.361	0.476	0.500	0.638	0.662
185	0.292	0.323	0.354	0.420	0.508	0.532	0.719	0.743
240	0.322	0.371	0.419	0.455	0.547	0.572	0.766	0.791
300	0.355	0.408	0.461	0.490	0.585	0.610	0.863	0.888
400	0.423	0.474	0.524	0.539	0.683	0.711	0.932	0.960
500	0.477	0.553	0.629	0.635	0.743	0.825	1.059	1.141
630	0.548	0.620	0.691	0.697	0.866	0.898	1.144	1.176
800	0.672	0.749	0.826	0.833	1.016	1.051	1.320	1.355
1000	0.789	0.877	0.964	0.964	1.099	1.200	1.488	1.589

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63
Fillers added in above factors

TABLE : H5 (b)
VARIATION FACTOR FOR POLYMER (CCFAI / CCFCu)

THREE CORE ARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm	3.3 KV (E) Unscreened ARM	3.3 KV (E) screened ARM	6.6 KV (E) ARM	6.6 KV (UE) / 11 KV (E) ARM	11 KV (UE) ARM	22 KV (E) ARM	33 KV (E) ARM	33 KV (UE) ARM
35	0.374	0.634	0.990	1.142	1.604	1.782	-	
50	0.445	0.702	1.119	1.260	1.834	2.046	2.864	3.070
70	0.547	0.863	1.290	1.396	2.011	2.284	3.219	3.380
95	0.594	0.990	1.440	1.647	2.269	2.428	3.367	3.721
120	0.732	1.214	1.692	1.877	2.498	2.715	3.646	4.020
150	0.812	1.355	1.906	2.061	2.767	2.931	3.927	4.216
185	0.960	1.589	2.086	2.406	3.028	3.180	4.166	4.529
240	1.130	1.832	2.484	2.744	3.398	3.580	4.589	4.917
300	1.219	2.201	2.912	3.161	3.840	4.016	5.029	5.325
400	1.313	2.561	3.530	3.664	4.353	4.666	5.736	5.911
500	1.652	3.138	3.925	3.971	4.621	4.878	5.913	6.625
630	1.949	3.774	4.487	4.982	5.225	5.477	6.696	7.445

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63
Fillers added in above factors

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

Cir. No. 07/DIV/CAB/05 08 May 2023

To Cable Division and Utilities/SEBS, listed of purchasing organisations

Sub: Amendment to Price Variation Clause for MV Cables

IEEMA MV Cable PV formula is applicable from Sep 2019. With the coming demand for cables; Cable manufacturers' requested IEEMA to publish following missing factors from formula document of MV Cable effective from Sep 2019; since some of the users were procuring such cables and demanding these factors and also for the correction in the SMIF factor for Copper Wire Metallic Screen for MV and EHV cables.

IEEMA Cable Technical committee discussed the subject in depth and IEEMA collected the variation factors and finalised in consensus. The average factors are tabled in annexure which are effective from 01 Apr 2023 and accordingly modified the formulae, attached with circular.

New evolved variation factors and corrections in formulae are as below:

1. Variation factors for Polymer (CCFAL/CCFCu), Table: H5 (a) are added for
   Single core unarmored XLPE insulated 3.3 to 33 KV Power cables with Al / Cu conductor

2. Variation factors for 33 KV (UE) and 3.3 KV (screened) are added

3. The formula for copper screen factor given in IEEMA MV Cable PV clause for all formulae wef Sep 19 is for copper wires only and copper tape binder if provided, its area would be additional.

   The SMIF, weight factor for Copper Wire Metallic Screen has been modified as under:

   SMIF = (A x D x LF)/1000, where D = Density (= 8.89 for Cu), LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

4. Considering the fluctuations in the prices; and as suggested by members, IEEMA will be publishing a separate price for XLPE for EHV Cables (Above 66 KV) in IEEMA Cable price variation circular from 01 Apr 2023 onwards. This price will applicable for XLPE in all EHV Cable (Above 66 KV) formulae from 01 Apr 2023 onwards. And correction/change in existing "XLPE - HV Cable" being mentioned in IEEMA Price circulars with "XLPE - MV Cable" applicable for MV cables.

5. For the better clarity and application of prices, it is also agreed upon to change/replace the existing PVC grades "CW 22" & "HR-11" being mentioned in IEEMA Price circulars with generic PVC names as under;

   CW 22 to be changed to " PVC" &
   HR 11 to be changed to " HR PVC"

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

ieema
your link to electricity

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

As discussed and agreed in consensus, the understanding for above generic PVC grades is that" PVC" will be considered for PVC insulation and PVC sheath of General Purpose PVC insulated LV cables as per IS 1554 (I) suitable max conductor temperature of 70 ^{0}C, whereas " HRPVC" will be considered for Heat Resisting PVC insulation and Heat Resisting PVC sheath of HRPVC insulated LV Cables as per IS 1554 (I) and also for Heat Resisting PVC sheath of XLPE insulated LV cables as per IS 7098 (I) & Heat Resisting PVC sheath of XLPE insulated HT Cables as per IS 7098 (Part-2).

6. There is regular requirement of 3.3 kV DC cables for Metro Projects, with Galvanized Steel (GS) wire/strip armouring, in view of this, Variation Factors for GS wire/ Strip armouring for Single core 3.3 kV cables are collected and the table of average variation factor is evolved.

7. As suggested by stake holders and in consensus with IEEMA Cable Tech committee, prices of Steel for armouring for following thickness are published in IEEMA Cable PVC from 01 Jan 2023 and are effective/applicable from 01 Jan 2023.
Round wire 2.0 mm dia, Round wire 2.5 mm dia, Round wire 3.15 mm dia, Round wire 4.0 mm dia

We are enclosing amended price variation clause for MV Cables along with applicable table of variation factors and additional table of variation factors which are effective from 01 Mar 2023. We recommend all stakeholders to incorporate these changes in all the contracts/tenders henceforth for settlement of price variation from 01 Apr 2023 onwards.

Director
Encl.: Amended PV clause for MV Cables along with table of variation Factors

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

Material Price Variation Clause for 3.3-33 KV XLPE Insulated Armoured Single & Three core Screen Cables

The Price quoted/confirmed is based on the input cost of raw materials/components as on the date of quotation, and the same is deemed to be related to the prices of raw materials as specified in the price variation clause given below. In case of any variation in these prices, the price payable shall be subject to adjustment up or down in accordance with the formulae provided in this document.

Terms used in price variation formulae:

P Price payable as adjusted in accordance with above appropriate formula **(in Rs/Km)**
Po Ex-Works Price quoted/confirmed **(in Rs/Km)**

ALUMINIUM

AlF Variation factor for Aluminium

Al Price of Aluminum. This price is as applicable **one** month prior to the date of delivery.
Alo Price of Aluminium. This price is as applicable **one** month prior to the date of tendering.

COPPER

CuF Variation factor for copper

Cu Price of CC copper rods. This price is as applicable **one** month prior to the date of delivery.
Cuo Price of CC copper rods. This price is as applicable **one** month prior to the date of tendering.

POLYMER COMPOUND (PVC/PE/Zero Halogen low smoke)

PVC Price of PVC Compound / PE / Zero Halogen low smoke. This price is as applicable on **one** month prior to the date of delivery.
PVCo Price of PVC Compound / PE / Zero Halogen low smoke. This price is as applicable on **one** month prior to the date of tendering.

(the relevant price of Polymer Compound is to be selected depending upon the type of compound used for the cable)

CCFAl Variation factor for PVC compound / PE / Zero Halogen low smoke for aluminum conductor cable.
CCFCu Variation factor for PVC compound / PE / Zero Halogen low smoke for copper conductor cable.

XLPE COMPOUND

Cc price of XLPE compound. This price is as applicable on first working day of the month, **one** month prior to the date of delivery.

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

Cco Price of XLPE compound. This price is as applicable on first working day of the month, **one** month prior to the date of tendering.

XLFAL Variation factor for XLPE compound for aluminum conductor cable.
XLFCU Variation factor for XLPE compound for Copper conductor cable.

STEEL

FeF Variation factor for steel
FeW Variation factor for round wire steel armouring

Fe Price of Steel Strips/steel wire. This price is as applicable on the first working day of the month, **one** month prior to the date of delivery.
Feo Price of steel strips/steel wire. This price is as applicable on first working day of the month, **one** month prior to the date of tendering

COPPER TAPE

SMIFS Variation factor for Copper tape
SMIF1 Price of CC copper rods. This price is as applicable **one** month prior to the date of delivery.

SMIF0 Price of CC copper rods. This price is as applicable **one** month prior to the date of tendering.

The above prices and indices are as published by IEEMA vide Circular reference IEEMA (PVC)/CABLE (R-1)/--/-- for the month i.e. **one** month prior to the date of tendering.

The date of delivery is the date on which the cable is notified as being ready for inspection/dispatch (in the absence of such notification, date of manufacturer's dispatch note is to be considered as the date of delivery) or contracted delivery date (including any agreed extension thereto) whichever is earlier.

Notes: All prices of raw materials are exclusive of GST amount. The details of prices are as under:

1. Price of Aluminium is LME average Cash SELLER Settlement price of Primary Aluminium in US$ per MT as published by London Metal Bulletin (LME) including Premium for Aluminium Ingot in US$ per MT is converted in Indian Rs./MT.
2. Price of PVC Compound (in Rs/MT) is the ex-works price, as quoted by the manufacturer/s
3. Price of XLPE Compound (in Rs/MT) is the ex-works price, as quoted by the manufacturer/s
4. Price of Polymer Compound (in Rs/MT) is the ex-work price, as quoted by the manufacturer/s
5. Price of Zero halogen low smoke (LSZH) (in Rs/MT) is the ex-work price, as quoted by the manufacturer/s
6. Price of CC copper rods (in Rs/MT) is ex-works price as quoted by the primary producer
7. Price of galvanized steel strip / steel wire (in Rs/MT) is ex-works price as quoted by the manufacturer for Round steel Wire and Flat steel strip (the relevant price of steel strip or steel wire is to be selected depending upon the type of armouring of the cable)

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

Price variation formulae

G. For Aluminium conductor XLPE insulated 3.3 to 33 kV Single Core Armoured power cables

P = Po + AlF (Al – Alo) + XLFAL(CC-Cco)+ SMIFS (SMIF1-SMIF0) + CCFAl (PVCc – PVCco)
For Single Core unarmoured cables Aluminium factor (AlF) shall be referred from Table ALP

Table References:

ALP	Aluminium conductor Factor in single core (for unarmoured cable) ; AlF
H1	Aluminium Armour Factor for Armour with Al Cond.
H2(a)	XLPE Compound Factor ; XLFAl
H3(a)	Copper Tape Factor ; SMIFS
H5(a)	Polymer factor for Single core cable ; CCFAl

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below:

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet
D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

SMIF = (A x D x LF)/1000

H. For Copper conductor XLPE insulated 3.3 to 33 kV Single Core Armoured power cables

P = Po + CuF (Cu – Cu0) + XLFCu(CC-Cco)+ SMIFS (SMIF1-SMIF0) + AlF(Al-Alo) + CCFAl (PVCc – PVCco)

For Single Core unarmoured cables Aluminium factor (AlF) shall be 0

Table References:

CuP	Copper conductor Factor in single core ; CuF
H2(a)	XLPE Compound Factor ; XLFCu
H3(a)	Copper Tape Factor ; SMIFS
H4(a)	Aluminium Armour factor ; AlF
H5(a)	Polymer factor for Single core cable ; CCFCu

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below
If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet
D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

SMIF = (A x D x LF)/1000

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

I. For Aluminium conductor XLPE insulated 3.3 to 33 kV Three Core Armoured power cables

P = Po + AlF (Al – Alo) + XLFAL(CC-Cco)+ SMIF (SMIF1-SMIF0) + FeF(FeF1-FeF0) + CCFAl (PVCc – PVCco)

For unarmoured Three Core cables, Steel Armour factor (FeF for Strip & FeW for Wire) shall be 0

Table References:

ALP	Aluminium conductor Factor in three core; AlF
H2(b)	XLPE Compound Factor ; XLFAl
H3(b)	Copper Tape Factor ; SMIF
H4(b)	Steel Strip Armour Factor ; FeF
H4(c)	Steel Wire Armour ; FeW
H5(b)	Polymer factor for Three Core cable ; CCFAl

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet
D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)
SMIF = (A x D x LF)/1000

J. For Copper conductor XLPE insulated 3.3 to 33 kV Three Core Armoured power cables

P = Po + CuF (Cu – Cuo) + XLFCu(CC-Cco)+ SMIF(SMIF1-SMIF0) + FeF(FeF1-FeF0) + CCFCu (PVCc - PVCco)

For Three Core unarmoured cables, Steel Armour factor (FeF for Strip & FeW for Wire) shall be 0

Table References:

CuP	Copper conductor Factor in three core; CuF
H2(b)	XLPE Compound Factor; XLFCu
H3(b)	Copper Tape Factor; SMIF
H4(b)	Steel Strip Armour Factor; FeF
H4(c)	Steel Wire Armour Factor; FeW
H5(b)	Polymer factor for Three Core cable; CCFCu

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below
If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet
D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)
SMIF = (A x D x LF)/1000

CIN No. U99999MH1970GAPO14629

ieema
your link to electricity

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

K. For Aluminium conductor XLPE insulated 3.3 kV Single Core Armoured power cables

P = Po + AlF (Al – Alo) + XLFAL(CC-Cco) + CCFAl (PVCc – PVCco) + FeF(FeF1-FeF0)

For Single Core unarmoured cables Aluminium factor (AlF) shall be referred from Table ALP

Table References:

ALP	Aluminium conductor Factor in single core (for unarmoured cable) ; AlF
H1	Aluminium Armour Factor for Armour with Al Cond.
H2(a)	XLPE Compound Factor ; XLFAl
H4(d)	Steel Strip Armour Factor ; FeF / Steel Wire Armour Factor ; FeW for 3.3KV cables
H5(a)	Polymer factor for Single core cable ; CCFAl

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet
D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape) **SMIF = (A x D x LF)/1000**

L. For Copper conductor XLPE insulated 3.3 kV Single Core Armoured power cables

P = Po + CuF (Cu – Cu0) + XLFCu(CC-Cco) + AlF(Al-Alo) + CCFAl (PVCc – PVCco) + FeF(FeF1-FeF0)

For Single Core unarmoured cables Aluminium factor (AlF) shall be 0

Table References:

CuP	Copper conductor Factor in single core ; CuF
H2(a)	XLPE Compound Factor ; XLFCu
H4(a)	Aluminium Armour factor ; AlF
H4(d)	Steel Strip Armour Factor ; FeF / Steel Wire Armour Factor ; FeW for 3.3KV cables
H5(a)	Polymer factor for Single core cable ; CCFCu

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet
D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape) **SMIF = (A x D x LF)/1000**

The PV factor for metallic screen will be computed based on approved screen area in case of cables having a specific short circuit capacity

Authorized Signatory

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

TABLE ALP

VARIATION FACTOR FOR ALUMINIUM (AIF)

POWER CABLES WITH ALUMINIUM CONDUCTOR
(EXCLUDING SINGLE CORE ARMOURED CABLES)

Nominal Cross Sectional Area (in Sq. mm.)	1 core	3 core
25	0.073	0.219
35	0.101	0.302
50	0.137	0.410
70	0.197	0.593
95	0.274	0.821
120	0.346	1.036
150	0.425	1.279
185	0.533	1.605
240	0.703	2.099
300	0.879	2.635
400	1.126	3.374
500	1.418	4.256
630	1.828	5.494
800	2.340	7.018
1000	2.951	8.834

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

TABLE CUP

VARIATION FACTOR FOR COPPER CONDUCTOR (CUF)
POWER CABLES WITH COPPER CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	1 core	3 core
25	0.240	0.720
35	0.332	0.993
50	0.451	1.348
70	0.648	1.950
95	0.901	2.700
120	1.138	3.407
150	1.398	4.207
185	1.753	5.279
240	2.312	6.904
300	2.891	8.667
400	3.703	11.097
500	4.664	13.998
630	6.012	18.070
800	7.696	23.082
1000	9.706	29.055

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

Table : H1
VARIATION FACTOR FOR ALUMINIUM (AIF)
ALUMINIUM ARMOURED SINGLE CORE XLPE INSULATED 3.3 TO 33 KV CABLES

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Aluminium Conductor							
	3.3 KV(E) unscreened Arm	3.3 KV(E) screened Arm	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
35	0.251	0.268	0.284	0.301	0.344	0.358	0.473	0.528
50	0.312	0.324	0.336	0.352	0.397	0.408	0.672	0.695
70	0.385	0.397	0.409	0.423	0.469	0.501	0.723	0.775
95	0.476	0.488	0.500	0.518	0.637	0.656	0.856	0.883
120	0.561	0.574	0.586	0.601	0.726	0.744	0.949	0.985
150	0.653	0.666	0.678	0.696	0.823	0.842	1.050	1.094
185	0.773	0.785	0.797	0.893	0.949	0.965	1.183	1.247
240	0.997	1.030	1.063	1.083	1.139	1.154	1.387	1.463
300	1.209	1.240	1.271	1.283	1.333	1.307	1.753	1.877
400	1.438	1.497	1.556	1.565	1.620	1.636	2.046	2.217
500	1.873	1.887	1.901	1.910	2.110	2.128	2.484	2.613
630	2.337	2.349	2.361	2.369	2.580	2.595	2.978	3.147
800	3.007	3.039	3.071	3.080	3.145	3.163	3.588	3.789
1000	3.737	3.739	3.741	3.749	3.804	3.822	4.565	4.891

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

TABLE : H2 (a)
VARIATION FACTOR FOR XLPE(XLFAl/XLFCu)
SINGLE CORE ARMOURED /UNARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross-Sectional Area (in Sq. mm.)	XLPE Factor for Armoured/ Unarmoured Cable with AL /CU Conductor							
	3.3 KV(E) unscreened Arm	3.3 KV(E) screened Arm	6.6 KV (E)	6.6 KV (UE) / 11 KV (E)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	0.110	0.117	0.131	0.170	0.279	-	-	-
35	0.122	0.129	0.137	0.175	0.284	0.317	0.522	0.575
50	0.135	0.144	0.151	0.191	0.307	0.341	0.563	0.620
70	0.155	0.165	0.172	0.215	0.342	0.379	0.615	0.678
95	0.174	0.185	0.193	0.241	0.377	0.417	0.670	0.732
120	0.192	0.205	0.212	0.262	0.407	0.449	0.713	0.785
150	0.209	0.223	0.229	0.283	0.437	0.481	0.757	0.832
185	0.228	0.244	0.250	0.308	0.471	0.518	0.809	0.888
240	0.255	0.271	0.279	0.343	0.519	0.569	0.883	0.961
300	0.280	0.296	0.322	0.372	0.560	0.613	0.943	1.030
400	0.326	0.345	0.392	0.420	0.625	0.683	1.041	1.133
500	0.388	0.407	0.461	0.469	0.694	0.757	1.142	1.236
630	0.467	0.490	0.520	0.529	0.777	0.845	1.265	1.356
800	0.567	0.595	0.593	0.602	0.874	0.949	1.407	1.494
1000	0.656	0.688	0.665	0.660	0.955	1.036	1.525	1.624

Note : XLPE factors include Semicons for Conductor & Insulation screen

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

TABLE – H2 (b)
VARIATION FACTOR FOR XLPE (XLFAl/XLFCu)
THREE CORE ARMOURED /UNARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross-Sectional Area (in Sq. mm)	3.3 KV unscreened Arm	3.3 KV screened Arm	6.6 KV (E) ARM	6.6 KV (UE)/ 11 KV (E) ARM	11 KV (UE) ARM	22 KV (E) ARM	33 KV (E) ARM	33 KV (UE) ARM
25	0.315	0.315	0.394	0.511	0.838	-	-	-
35	0.339	0.350	0.427	0.545	0.880	0.982	1.638	-
50	0.378	0.387	0.474	0.600	0.957	1.065	1.751	1.858
70	0.435	0.445	0.541	0.679	1.067	1.183	1.916	2.034
95	0.489	0.499	0.604	0.755	1.171	1.295	2.071	2.194
120	0.537	0.554	0.661	0.822	1.265	1.396	2.210	2.355
150	0.585	0.601	0.719	0.890	1.359	1.497	2.350	2.494
185	0.642	0.660	0.784	0.968	1.468	1.614	2.513	2.665
240	0.717	0.734	0.873	1.074	1.615	1.773	2.732	2.882
300	0.781	0.804	1.006	1.167	1.744	1.928	2.919	3.089
400	0.886	0.910	1.227	1.314	1.948	2.130	3.229	3.399
500	0.956	1.085	1.421	1.446	2.148	2.381	3.588	3.689
630	1.129	1.285	1.582	1.609	2.382	2.630	3.940	4.068

Note : XLPE factors include Semicons for Conductor & Insulation screen

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

TABLE – H3 (a)

VARIATION FACTOR FOR COPPER TAPE (SMIFS)

SINGLE CORE ARMOURED /UNARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross-Sectional Area in sq.mm.	3.3 KV Screened	6.6 KV (E)	6.6 KV (UE) / 11 KV (E)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
	ARM	ARM	ARM	ARM	ARM	ARM	ARM
35	0.016	0.018	0.020	0.025	0.026	0.016	0.035
50	0.016	0.019	0.022	0.026	0.028	0.035	0.038
70	0.020	0.022	0.024	0.029	0.030	0.037	0.040
95	0.022	0.024	0.026	0.031	0.032	0.039	0.043
120	0.022	0.025	0.028	0.032	0.034	0.041	0.045
150	0.025	0.027	0.029	0.034	0.035	0.042	0.046
185	0.027	0.029	0.031	0.036	0.038	0.045	0.049
240	0.030	0.032	0.034	0.039	0.040	0.047	0.052
300	0.034	0.035	0.036	0.043	0.043	0.050	0.054
400	0.039	0.040	0.041	0.046	0.047	0.054	0.062
500	0.045	0.045	0.045	0.050	0.051	0.058	0.066
630	0.048	0.049	0.050	0.054	0.056	0.063	0.071
800	0.055	0.055	0.055	0.060	0.061	0.068	0.077
1000	0.056	0.060	0.058	0.065	0.066	0.073	0.082

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

TABLE – H3 (b)
VARIATION FACTOR FOR COPPER TAPE (SMIF)
THREE CORE ARMOURED /UNARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross-Sectional Area in sq.mm.	3.3 KV Screened	6.6 KV (E)	6.6 KV (UE) / 11 KV (E)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
	ARM	ARM	ARM	ARM	ARM	ARM	
35	0.049	0.055	0.061	0.072	0.079	-	-
50	0.053	0.059	0.065	0.076	0.083	0.104	0.123
70	0.059	0.065	0.071	0.082	0.090	0.111	0.130
95	0.065	0.071	0.077	0.088	0.096	0.117	0.137
120	0.071	0.077	0.083	0.094	0.101	0.123	0.144
150	0.076	0.082	0.088	0.099	0.106	0.128	0.149
185	0.082	0.088	0.094	0.105	0.113	0.134	0.157
240	0.091	0.097	0.103	0.114	0.121	0.143	0.166
300	0.102	0.106	0.110	0.122	0.129	0.150	0.174
400	0.120	0.122	0.124	0.135	0.142	0.164	0.198
500	0.134	0.135	0.136	0.147	0.155	0.176	0.211
630	0.149	0.149	0.149	0.160	0.168	0.190	0.228

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

TABLE : H4 (a)
VARIATION FACTOR FOR ALUMINIUM (AIF)
SINGLE CORE ARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Copper Conductor							
	3.3 KV(E) unscreened Arm	3.3 KV(E) screened Arm	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
35	0.153	0.170	0.187	0.204	0.247	0.258	0.372	0.426
50	0.179	0.191	0.203	0.220	0.262	0.275	0.425	0.456
70	0.196	0.208	0.219	0.233	0.278	0.311	0.444	0.501
95	0.213	0.225	0.237	0.254	0.373	0.392	0.470	0.523
120	0.228	0.241	0.253	0.268	0.393	0.410	0.488	0.545
150	0.243	0.256	0.269	0.287	0.414	0.432	0.504	0.567
185	0.261	0.273	0.285	0.381	0.437	0.455	0.526	0.600
240	0.324	0.357	0.389	0.410	0.465	0.480	0.556	0.633
300	0.365	0.397	0.428	0.440	0.490	0.510	0.737	0.834
400	0.432	0.452	0.471	0.480	0.536	0.552	0.783	0.895
500	0.489	0.503	0.517	0.526	0.726	0.744	0.844	0.955
630	0.544	0.556	0.568	0.572	0.787	0.801	0.902	1.034
800	0.706	0.747	0.787	0.797	0.862	0.880	0.982	1.111
1000	0.824	0.845	0.865	0.867	0.923	0.940	1.324	1.504

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

TABLE : H4 (b)

VARIATION FACTOR FOR STEEL STRIP ARMOUR (FeF)

THREE CORE ARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area Sq. mm.	3.3 KV (E) unscreened arm	3.3 KV (E) screened arm	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	0.551	0.553	0.604	0.656	0.814	-	-	-
35	0.645	0.645	0.645	0.731	0.879	0.937	-	-
50	0.675	0.684	0.703	0.761	0.937	0.966	1.181	1.301
70	0.761	0.764	0.761	0.849	0.996	1.055	1.289	1.393
95	0.820	0.828	0.849	0.907	1.083	1.113	1.348	1.454
120	0.879	0.924	0.907	0.966	1.142	1.172	1.406	1.531
150	0.966	0.988	0.966	1.055	1.201	1.259	1.494	1.592
185	1.025	1.051	1.055	1.113	1.259	1.318	1.553	1.668
240	1.142	1.147	1.142	1.231	1.377	1.406	1.641	1.760
300	1.231	1.258	1.259	1.318	1.465	1.524	1.758	1.852
400	1.348	1.402	1.406	1.435	1.582	1.641	1.876	1.990
500	1.454	1.500	1.573	1.642	1.714	1.758	2.095	2.100
630	1.632	1.680	1.745	1.943	1.889	1.918	2.150	2.280

TABLE : H4 (c)

VARIATION FACTOR FOR STEEL WIRE ARMOUR (FeW)

THREE CORE ARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area in Sq. mm	3.3 KV (E) Unscreened arm	3.3 KV (E) screened arm	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	1.258	1.358	1.457	1.612	2.509	1.503	-	-
35	1.361	1.465	1.569	1.853	2.644	2.797	2.517	-
50	1.682	1.685	1.687	2.321	2.800	2.921	4.569	4.603
70	1.938	1.959	1.979	2.503	3.219	3.347	4.809	4.935
95	2.202	2.355	2.507	2.718	4.019	4.200	5.437	6.553
120	2.371	2.523	2.675	2.882	4.241	4.416	6.713	6.820
150	2.776	2.812	2.847	3.265	4.447	4.621	6.976	7.088
185	3.121	3.215	3.309	4.148	4.726	5.289	7.356	7.489
240	3.758	3.993	4.227	4.442	5.442	6.651	7.718	7.890
300	4.099	4.562	5.024	5.182	6.894	7.084	8.187	8.359
400	5.750	6.161	6.572	6.658	7.433	7.657	8.760	8.960
500	6.716	6.747	6.777	6.861	7.588	7.797	8.830	9.629
630	6.767	7.116	7.465	7.477	8.209	8.386	9.413	10.365

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

TABLE : H4 (d)

VARIATION FACTOR FOR STEEL WIRE ARMOUR (FeW/FeF)

SINGLE CORE ARMOURED XLPE INSULATED 3.3 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross section area in sq. mm	Single Core 3.3 kV	
	FeF	FeW
25	0.276	0.385
35	0.303	0.409
50	0.314	0.442
70	0.331	0.528
95	0.341	0.584
120	0.369	0.629
150	0.395	0.676
185	0.423	0.731
240	0.464	0.92
300	0.504	0.982
400	0.573	1.215
500	0.613	1.359
630	0.696	1.518

TABLE : H5 (a)

VARIATION FACTOR FOR Polymer (CCFAL/CCFCu)

SINGLE CORE ARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV(E) screened ARM	6.6 KV (E) ARM	6.6 KV (UE) / 11 KV (E) ARM	11 KV (UE) ARM	22 KV (E) ARM	33 KV (E) ARM	33 KV (UE) ARM
35	0.123	0.197	0.259	0.278	0.330	0.376	0.468	0.493
50	0.152	0.209	0.272	0.294	0.379	0.394	0.483	0.530
70	0.170	0.227	0.295	0.317	0.404	0.419	0.508	0.583
95	0.184	0.244	0.317	0.338	0.435	0.449	0.554	0.609
120	0.197	0.261	0.337	0.392	0.457	0.472	0.576	0.634
150	0.194	0.303	0.389	0.413	0.477	0.492	0.597	0.656
185	0.224	0.322	0.414	0.445	0.502	0.539	0.674	0.767
240	0.276	0.354	0.456	0.479	0.558	0.573	0.711	0.806
300	0.294	0.377	0.489	0.506	0.587	0.602	0.811	0.915
400	0.333	0.450	0.569	0.578	0.687	0.703	0.866	0.974
500	0.367	0.493	0.675	0.679	0.809	0.826	1.056	1.139
630	0.438	0.611	0.735	0.739	0.873	0.928	1.168	1.290
800	0.529	0.734	0.863	0.866	1.027	1.05	1.189	1.380
1000	0.648	0.880	1.031	1.035	1.138	1.158	1.402	1.619

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor, the above factor will be multiplied by 0.63

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

CIN No. U99999MH1970GAPO14629

Indian Electrical & Electronics Manufacturer's Association
501, Kakad Chambers
132, Dr. A. B. Road, Worli,
Mumba i 400 018
India
P +91 22 2493 0532
F +91 22 2493 2705
E mumbai@ieema.org
W www.ieema.org

IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1) **Effective from: 01 April 2023**

TABLE : H5 (a)

VARIATION FACTOR FOR Polymer (CCFAL/CCFCu)

SINGLE CORE UNARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV(E) screened ARM	6.6 KV (E) ARM	6.6 KV (UE) / 11 KV (E) ARM	11 KV (UE) ARM	22 KV (E) ARM	33 KV (E) ARM	33 KV (UE) ARM
35	0.158	0.191	0.224	0.252	0.323	0.342	0.361	0.380
50	0.177	0.209	0.240	0.269	0.342	0.361	0.520	0.539
70	0.198	0.232	0.265	0.296	0.370	0.391	0.551	0.572
95	0.233	0.261	0.288	0.318	0.396	0.450	0.582	0.636
120	0.253	0.282	0.310	0.342	0.454	0.477	0.613	0.636
150	0.269	0.299	0.328	0.361	0.476	0.500	0.638	0.662
185	0.292	0.323	0.354	0.420	0.508	0.532	0.719	0.743
240	0.322	0.371	0.419	0.455	0.547	0.572	0.766	0.791
300	0.355	0.408	0.461	0.490	0.585	0.610	0.863	0.888
400	0.423	0.474	0.524	0.539	0.683	0.711	0.932	0.960
500	0.477	0.553	0.629	0.635	0.743	0.825	1.059	1.141
630	0.548	0.620	0.691	0.697	0.866	0.898	1.144	1.176
800	0.672	0.749	0.826	0.833	1.016	1.051	1.320	1.355
1000	0.789	0.877	0.964	0.964	1.099	1.200	1.488	1.589

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63

TABLE : H5 (b)

VARIATION FACTOR FOR POLYMER (CCFAI / CCFCu)

THREE CORE ARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm	3.3 KV (E) Unscreened ARM	3.3 KV (E) screened ARM	6.6 KV (E) ARM	6.6 KV (UE) / 11 KV (E) ARM	11 KV (UE) ARM	22 KV (E) ARM	33 KV (E) ARM	33 KV (UE) ARM
35	0.374	0.634	0.990	1.142	1.604	1.782	-	
50	0.445	0.702	1.119	1.260	1.834	2.046	2.864	3.070
70	0.547	0.863	1.290	1.396	2.011	2.284	3.219	3.380
95	0.594	0.990	1.440	1.647	2.269	2.428	3.367	3.721
120	0.732	1.214	1.692	1.877	2.498	2.715	3.646	4.020
150	0.812	1.355	1.906	2.061	2.767	2.931	3.927	4.216
185	0.960	1.589	2.086	2.406	3.028	3.180	4.166	4.529
240	1.130	1.832	2.484	2.744	3.398	3.580	4.589	4.917
300	1.219	2.201	2.912	3.161	3.840	4.016	5.029	5.325
400	1.313	2.561	3.530	3.664	4.353	4.666	5.736	5.911
500	1.652	3.138	3.925	3.971	4.621	4.878	5.913	6.625
630	1.949	3.774	4.487	4.982	5.225	5.477	6.696	7.445

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63

HEAD OFFICE - DELHI
Rishyamook Building, First Floor, 85 A, Panchkuian Road, New Delhi 110001
P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

ANNEXURE-7
PRE-QUALIFICATION REQUIREMENTS (PQR)

Item Description: 6.6KV(UE) HT POWER CABLES(XLPE)-1CX630 SQ.MM

1. Tender offers from NTPC approved following vendors will only be accepted:

Vendor list of H.T. CABLE - Inspection Category CAT-I				
S.No.	**Vendor Name**	**Location**	**Status**	**Remarks**
1	Apar Industries	Umbergaon	A	Upto 33kV
2	Gemscab	Bhiwadi	A	Upto 33kV
3	Gupta Power	Kashipur	A	Upto 33kV
4	Havells India Ltd.	Alwar	A	Upto 11kV
5	KEC Asian	Vadodara	A	Upto 33kV
6	KEI Industries	Bhiwadi	A	Upto 33kV
7	Krishna Electrical Industries Ltd	Gwalior	A	Upto 11kV
8	Polycab India Limited (Formerly Known as Polycab Wires Limited),	Daman	A	Upto 33kV
9	Tirupati Plastomatics	Jaipur	A	Upto 11kV
10	Torrent Cable Ltd	Nadaid	A	Upto 33kV
11	CMI	Baddi	A	Upto 11kV
12	Universal Cable Ltd.	Satna	A	Upto 33kV
13	Dynamic Cables	Reengus	A	Upto 33kV
14	Paramount Communications	Khushkhera	A	Upto 33kV
15	Suyog Electricals Limited	Halol	A	Upto 11 KV
16	V-Marc	Roorkee	A	Upto 11 KV

AND

2. Vendor should have supplied following type/quantity of HT Power Cables in the last five years from the latest date of bid submission:
   a) At least 5 KM of XLPE insulated power cables of 6.6kV or higher voltage grade, and sizes of minimum 1CX630sqmm in single or multiple (upto 4nos.) purchase orders.

   AND

   b) At least one KM Flame retardant low smoke (FRLS) armoured cables

   Bidder shall submit copy of purchase order(s) and proof of supply at site such as tax invoice and copy of LR/ SRV/ MRC/ Completion Certificate (any one) for evaluation of 2(a) & 2(b).

Note to bidder:

1. Offers received from bidders who do not fulfil the PQR shall be rejected.
2. After satisfactory fulfilment of all the above criterial requirement, offer shall be considered for further evaluation as per NIT and all other terms of the tender.