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TECHNICAL SPECIFICATIONS

FOR

SINGLE AND THREE CORE ALUMINIUM CONDUCTOR,

XLPE INSULATED, ARMOURED, POWER CABLES OF

VOLTAGE GRADES 11kV AND 33kV

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This is a Tender Specification for procurement of “SINGLE AND THREE CORE ALUMINIUM CONDUCTOR, CROSS LINKED POLYETHYLENE (XLPE) INSULATED, FRLS, PVC SHEATHED, ARMoured, SCREENED POWER CABLES OF VOLTAGE GRADE 33kV AND 11kV OF VARIOUS SIZES”, subject to the modification by the Purchaser as per actual field requirement. Supplier to submit the Guaranteed Technical Particulars (GTP) and Drawings, after the award of the Contract, for approval of the Purchaser

SECTION A
TECHNICAL SPECIFICATIONS OF SINGLE AND THREE CORE ALUMINIUM CONDUCTOR, CROSS LINKED POLYETHYLENE (XLPE) INSULATED, FRLS, PVC SHEATHED, ARMoured, SCREENED POWER CABLES OF VOLTAGE GRADE 33kV OF SIZES (95/120/185/240/300 and 400 SQ-MM) AND 11kV OF SIZES (35/50/70/95/120/185/240/300 and 400 SQ-MM)

1. SCOPE:-

- 1.1** This specification covers the design, manufacture, testing at manufacturer’s work and supply of 1 or 3- core, aluminium conductor, cross linked polyethylene (XLPE) insulated, PVC sheathed, armoured, screened, FRLS type specification ISI marked and conforming to IS: 7098 Part-II of 2011 with up to date amendments suitable for earthed system for 11 kV (of sizes 35/50/70/95/120/185/240/300 and 400sqmm) and 33 kV (of sizes 95 sq mm, 120 sq mm, 185sq mm, 240sq mm, 300sq mm and 400sq mm).
- 1.2** It is not the intent to specify completely herein all details of the design and construction of the equipment. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation up to the bidder’s guarantee in a manner acceptable to the purchaser, will interpret the meanings of drawings and specifications and shall have the discretion to reject any work or material which, in his judgment, is not in accordance there with.

2. LOCATION:

- 2.1** The cables may be laid buried directly in ground at a depth of one meter in average with sand cushioning and brick covering anywhere in Kashmir Valley and terminate for outdoor connection to a power transformer or for indoor connection for indoor switchgear
- 2.2** The cables may also be laid within covered cable trenches, in cable racks or open-air ladder trays etc. for certain portion of lengths.

3. SYSTEM DETAILS:

S.NO	PARTICULARS	DATA	DATA
a.	Line Voltage (kV)	11kV	33kV
b.	Highest System Voltage (kV)	12kV	36kV
c.	Number of Circuits	1	1
d.	Frequency	50Hz	50Hz
e.	Neutral	Effectively earthed	Effectively earthed

4. Applicable standards for manufacturing:

4.1 The materials shall conform to the latest editions of the following Indian/International Standards:

S.NO	Indian Standards	Title	International
1	IS 7098 Part 2-1984	Specification for XLPE insulated PVC sheathed cables For working voltages from 3.3 kV up to and including 33 kV	
2	IS 5831 : 1984	Specification for PVC Insulation and sheath of electric cables	
3	IS 8130:1984	Specification for Conductors for insulated electric cables and flexible cords	
4	IS 613:1984	Specifications for copper rods and bars for electrical purposes	
5	IS 3975:1999	Specification for Mild steel wires, formed and tapes for armouring of cable.	
6	IS: 10810 –1984	Method of tests for cables	
7		Standard test method for density of smoke from burning or decomposition of plastics.	ASTM-D 2843-1993
8		Standard test method for measuring minimum oxygen concentration to support candle-like combustion of plastics(Oxygen index)	ASTM-D 2863-1991
9	IS: 3961	Recommended current rating for cables	
10	IS: 3961 Part-11 1967	PVC insulated and PVC sheathed heavy duty cables	
11	IS: 10418 – 1982	Drums for electric cables	
12	IS:10462-1991	Fictitious calculation method for determination of dimensions of protective covering of cables	
13	IEC-332	Test on electrical cables under fire conditions.	
	Part-1-1993	Test on a single vertical insulated wire or cable.	
14	IEC-754	Test on gases evolved during combustion of electric cables	
	Part-I :1994	Determination of the amount of halogen acid gas evolved during combustion of polymeric material taken from the cables.	
15	NEMA_WCS-1992	Thermoplastic insulated wire and cable for the transmission and distribution of electrical energy	

- 4.2** The cable joints, outdoor and indoor termination and their accessories and fittings may conform to IS -1255(1983) and/or equivalent standards or important publications to improve upon their performance, but shall not fall short of the requirement of this specification. The tenderer shall clearly indicate such standards in their offers.

5. GENERAL REQUIREMENTS

- 5.1** All cables shall be suitable for Climatic conditions as listed in **Section -B**. Cables shall be designed to withstand the mechanical, electrical and thermal stresses under the unforeseen steady state and transient conditions and shall be suitable for proposed method of installation.
- 5.2** Conductor shall be of uniform, of good quality, free from defects.
- 5.3** Insulation shall be Cross Linked Polyethylene (XLPE).
- 5.4** For 33 kV and 11 kV cables, conductor screen and insulation screen shall both be Extruded, semi- conducting compound and shall be applied along-with XLPE insulation in a single operation by triple extrusion process.
- 5.5** Method of curing for 11kV and 33 kV cable shall be "Dry curing/ gas curing" only.
- 5.6** Extruded Semi-conducting screening and metallic screening of copper tape shall be generally as per IS 7098 (Part-II) with latest amendments. The semi conducting compound shall be suitable for the operating temperature of the cable and compatible with the insulating material.
- 5.7** The insulation screen shall be an extruded layer of black semi-conducting compound and continuously covers the whole area of insulation. The semi-conducting screens should be effectively cross linked to achieve 90 ° C cable rating. The contact surface between insulation and insulation screen shall be smooth and free from protrusion and irregularities.
- 5.8** The interface between insulation and insulation screen shall be free of any voids. Insulation screen shall be strippable type.
- 5.9** The metallic screen shall consist of a layer of copper wire applied in helical form.
- 5.10 Inner sheath** - All armoured and multi-core cables shall have distinct extruded inner PVC sheath of black colour.

5.11 Armouring - Material for armour shall be GS wire / flat. Armouring shall be as per relevant IS and it shall have minimum 90% coverage.

5.12 Breaking Load of the joints shall be minimum 95% of the normal armour.

5.13 Outer Sheath – The quality of PVC over sheath (jacket) shall be ensured for service reliability against moisture intrusion and shall conform to type ST-2 of IS : 5831. It shall be of black colour PVC with Cable size and Voltage grade embossed on it. Sequential marking shall be at every 1 (one) Meter distance. Word "FRLS" shall also be embossed on it at every 5 (Five) meter distance.

The sheaths shall be protected against white ants, vermin and termites by suitable, durable and reliable measures. The suppliers shall suggest suitable materials for use, in the event of damage to the over sheath to prevent the passage of moisture along the cable.

5.14 FRLS Properties - All cable shall be Flame Retardant, Low Smoke (FRLS) type. Outer sheath shall have the following properties –

- Acid Gas Generation – Max 20%(as per IEC 754-1)
- Smoke density rating: 60% (As per ASTM D 2843)
- Flammability test - As per Swedish chimney test F3 as per SEN 4241475 As per IEC 332 part-3 (Category B)

5.15 Repaired cables shall not be acceptable.

6 CURRENT RATING OF CABLES

Normal current rating shall not be less than that covered by IS 3961. Vendor shall submit data in respect of all cables in the prescribed format.

Tables given de-rating factors for various conditions of cable installation including the following, for all types of cables shall be furnished.

- Variation in ambient air temperature. - Variation in ground temperature.
 - Depth of laying.
 - Cables laid in the ground - Cables laid in trench
 - Cables laid in ducts - Soil resistivity.
- Grouping of cables.

The value of short circuit withstand current ratings of all cables shall be indicated for a short circuit for 1 second duration as per the table given below and should also specify the maximum temperature during short circuit.

Short Circuit Current:

S.no	Cable Size (in Sq.mm)	Short Circuit Current in KA(in 1 Sec)
1.	35	3.29
2	50	4.70
3	70	6.58
4	95	8.93
5	120	11.28
6	185	17.39
7	240	22.56
8	300	28.20
9	400	37.60

The following factors shall also be accounted for, while specifying the maximum short circuit withstand of the cables:-

- i) Deformation of the insulation, due to thermo-mechanical forces produced by the short circuit conditions, can reduce the effective thickness of insulation.
- ii) Conductor and core screens can be adversely affected with loss of screening effect. Likewise the thermal properties of the outer sheath material can be the limitation.
- iii) It is essential that the accessories which are used in the cable system with mechanical and/or soldered connections are suitable for the temperature adopted for the cables.
- iv) Formula for calculating short circuit current for different duration or curve showing short time current v/s time for different sizes of cables shall be furnished by vendor.

7 TECHNICAL REQUIREMENTS

Technical parameters of the cable shall be as follows:

Sl No	Particulars	Unit	11 kV	33kV
1	Rated Voltage	kV	6.35/11	19.0/33
2	Type of Insulation	-	XLPE	XLPE
3	Single/Three core	-	Both Single and three core	Both Single and three core
4	Armoured/Unarmoured	-	Armoured	Armoured
5	Material of Conductor	-	Material to IS :8130 H4 Grade Aluminium Conductor, stranded compact Circular	Material to IS : 8130 H4 Grade Aluminium Conductor, stranded compact Circular
6	System	-	11 kV Earthed	33 kV Earthed
7	Highest System Voltage	kV	12	36
8	Material	-	Stranded Aluminium	Stranded Aluminium
9	Voltage Grade		6.35/11 kV	19/0.33 kV
10	Conductor Size	Sq. mm	35,50,70,95,120,185,240,300 and 400	95,120,185,240,300 and 400
11	Shape of Conductor		Circular	Circular
12	Minimum Number of wires in conductor for:		11 kV	33 kV
	35 sq mm		6	-
	50 sq mm		6	-
	70 sq mm		12	-
	95 sq mm		15	15
	120 sq mm		15	15
	185 sq mm		30	30
	240 sq mm		30	30
	300 sq mm		30	30
	400 sq mm		53	53
13	Max. Conductor Temp	°C	90 °C at max. Continuous current	90 °C at max. Continuous current
14	Short Circuit Current for 1 second duration		11 kV	33 kV
	35 sq mm		3.29	-

	50 sq mm		4.70	-
	70 sq mm		6.58	-
	95 sq mm		8.93	8.93
	120 sq mm		11.28	11.28
	185 sq mm		17.39	17.39
	240 sq mm		22.56	22.56
	300 sq mm		28.20	28.20
	400 sq mm		37.60	37.60
15	Power Frequency Withstand Voltage	kV rms	28	70
16	Lightning Impulse Withstand Voltage	kV rms	75	170
17	Max. DC resistance of conductor at 20 Deg Celsius		11 kV (For both Single and three Core)	33 kV (For both Single and three Core)
	35 sq mm		0.868	-
	50 sq mm		0.641	-
	70 sq mm		0.443	-
	95 sq mm		0.320	0.320
	120 sq mm		0.253	0.253
	185 sq mm		0.164	0.164
	240 sq mm		0.125	0.125
	300 sq mm		0.110	0.110
400 sq mm		0.0778	0.0778	
18	Continuous Withstand Temperature	°C	90°C	90°C
19	Short Circuit withstand Temperature	°C	250°C for one hour	250°C for one hour
20	Conductor Screening	:	Extruded, cross linked, semi-conducting compound. The thickness shall be as per IS -7098. (As per IS -7098; cl 11).	
21	Insulation	:	11kV	33kV
a	Material	:	XLPE as per IS: 7098 (Part-II) of 2011(Reaffirmed 2016)	XLPE as per IS: 7098(Part-II) of 2011(Reaffirmed 2016)
b	Nominal thickness	mm	3.6	8.8
c	Insulation screening			
	I) Non-Metallic			

	<ul style="list-style-type: none"> Type and material 		Extruded semi conducting compound(As per cl. 13.3 IS: 7098Part-2 2011 (Reaffirmed 2016))	
	<ul style="list-style-type: none"> Applicable thickness 	mm	As per IS: 7098 Part-2 2011(Reaffirmed 2016)	
	II) Metallic <ul style="list-style-type: none"> Material: 	:	Copper tape shall be applied with 100% coverage.(As per cl. 13.4 of IS:7098 Part-2 2011)	
	<ul style="list-style-type: none"> Applicable thickness 	mm	As per IS: 7098 Part-2 2011(Reaffirmed 2016)	
22	Inner Sheath		11 kV	33 kV
a	Type and Material	:	PVC tape as per IS 7098/Part-II/2011(Reaffirmed 2016)	PVC tape as per IS 7098/Part-II/2011(Reaffirmed 2016)
			For single core there will be no inner sheath as per IS 7098 Part-2 2011(Reaffirmed 2016)	
b	Whether extruded/wrapped:-		Extruded	Extruded
c	Min. thickness	mm	As per IS: 7098 Part-2 2011(Reaffirmed 2016) Table 5	
29	Armouring	---	The Type of Armour shall be as per IS 7098 (Part-2) :2011 (Where the calculated diameter below armouring does not exceed 13 mm ,the armour shall consist of galvanized round steel wires .The armour of cables having calculated diameter below armouring greater than 13 mm shall consists of either galvanized round steel wires or galvanized formed wires.	
30	Thickness of Armour	mm	As per IS: 7098 Part-2 2011(Reaffirmed 2016) Table 6	
31	Outer Sheath		Voltage grade should be embossed on it. Sequential marking shall be at every 1 (one) meter distance. Word FRLS shall be embossed on it at every 5 (five) meter distance.	
a	Type and Material		PVC type ST2 of IS 5831/84	

b	Min Thickness	mm	As per IS: 7098 Part-2 2011(Reaffirmed 2016) Table 7	
c	Colour		Black	Black
32	Approx. length of cable In a Drum/standard drum Length with tolerance $\pm 5\%$	m	1000	
33	H.V Tests between Conductors & Screen / Armour		21kV (rms) as per IS 7098-2	63kV (rms) as per IS 7098-2
34	FRLS Properties		Flame Retardant, Low smoke(FRLS Type)	
A	Acid Gas generation		Max 20 % (as per IEC 754-1)	
B	Smoke density rating		60% (as per ASTM D 2843)	
C	Flammability test		As per IEC 332 PART -3 (Category B)	
35	The relevant IS specification to which the material and construction of cable conform		IS7098 (Part-II/2011) Reaffirmed 2016	
36	Curing process:		Dry (Chemical curing)/Gas curing	Dry (Chemical curing)/Gas curing

* NB the above parameters are applicable for three core and single core cable, if not otherwise specified.

8 PACKING AND MARKING:-

- 8.1** The cable shall be wound on the drums as per IS: 10418 – 1982 (amended up to date) and packed. The dimensional drawings of wooden drums shall be furnished after Purchase order both as hard copy and soft copy(PDF format and AutoCAD format). The ends of the cable shall be sealed by means of non-hygroscopic material.
- 8.2** Cables shall be supplied in non-returnable wooden or steel drums of heavy construction and drum shall be properly seasoned, sound and free from defects. Wood preservative shall be applied to the entire drum.
- 8.3** All Power Cables shall be supplied in drum length of 1000 m. Each drum shall contain one continuous length of cable. Owner shall have the option of rejecting cable drums with shorter lengths. The cable length per drum is allowed a tolerance of $\pm 5\%$.

Where the ordered quantity is not multiple of 1000 m and the incremental quantity is very small, the same may be included in one of the drums. Otherwise, an additional length for the incremental quantity will be supplied.

8.4 A layer of water proof paper shall be applied to the surface of the drums and over the outer most cable layer.

8.5 A clear space of at least 40 mm shall be left between the cables and the logging.

8.6 Packing shall be sturdy and adequate to protect the cables from any injury due to mishandling or other conditions encountered during transportation, handling and storage. Both cable ends shall be sealed with PVC /Rubber caps so as to eliminate ingress of water during transportation and erection.

8.7 The cable shall carry the following information either stenciled on the drum or contained in the label attached to it:

- Reference to the Indian Standard i.e reference IS-7098(Part-II)2011(Reaffirmed 2016)
- Manufacturer's name or trademark.
- Number of cores.
- Nominal cross-sectional area of conductor.
- Cable code.
- Length of cable on the drum.
- Number of length on the drum (if more than one).
- Direction of rotation of drum (by means of an arrow)
- Gross mass.
- Country of manufacture
- Year of manufacture.

8.8 The cable (drum or label) shall bear **ISI certification mark**.

8.9 The manufacturer shall be identified throughout the length of cable by manufacturer name or trade mark, voltage grade & year of manufacture indented, printed or embossed or by way of a tape bearing this information. The identification printing or embossing shall be done on the outer sheath.

8.10 The identification of core for 3-cores cable 11 kV and 33 kV grade shall be follows:

- i) Colour strips applied on the cores and /or.
- ii)By numerals (1, 2 &3) either by applying number strips or by printing on the cores.

9 TESTS

The Type, Acceptance, Routine and Optional tests shall be in accordance with clause 19.1, 19.2, 19.3 and 19.4 of IS: 7098 (PART-II) of 2011 respectively.

Tenderer shall have to submit type test report along with the Bid. The Type test reports shall not be older than TEN years from the date of submission of Bid. Bidder will be disqualified for non-submission of type test reports.

9.1 Type Tests

The following shall constitute type tests:

- i) Tests on conductor
 - a. Tensile tests (for aluminium)
 - b. Wrapping tests (for aluminium)
 - c. Resistance test
- ii) Tests for armouring wires/formed wire
- iii) Test for thickness of insulation and sheath
- iv) Test on extruded semi-conducting screens
 - a. Test for strippability of semiconducting strippable insulation screen(when applicable)
 - b. Volume resistivity
- v) Physical tests for insulation
 - a. Tensile strength and elongation at break
 - b. Ageing in air oven
 - c. Degree of cross linking
 - d. Hot set test
 - e. Shrinkage test
 - f. Water absorption (gravimetric)
- vi) Physical tests for outer sheath
 - a. Tensile strength and elongation at break
 - b. Ageing in air oven

- c. Hot deformation
 - d. Shrinkage test
 - e. Loss of mass in air oven
 - f. Heat shock
 - g. Thermal stability
 - h. Carbon black content of polythene sheath
- vii) Thermal ageing for complete cable
 - viii) Partial discharge test
 - ix) Bending test
 - x) Dielectric power factor test
 - a. As a function of voltage
 - b. As a function of temperature
 - xi) Insulation resistance (volume resistivity) tests
 - xii) Heating cycle test
 - xiii) Impulse withstand test
 - xiv) High voltage test
 - xv) Flammability test

9.2 Acceptance tests

The following shall constitute acceptance tests:

- a. Tensile test (for aluminium)
- b. Wrapping tests (for aluminium)
- c. Conductor resistance test,
- d. Test for thickness of insulation
- e. Hot set test for insulation,
- f. Tensile strength and elongation at break test for insulation and sheath
- g. Partial discharge test (for screened cables only)

- h. High voltage test and
- i. Insulation resistance (volume resistivity) test
- j. Test for cross –linking for extruded semi conducted screen

All the acceptance tests shall be carried out by the firm, in the presence of Purchaser's representative at their works. The firm shall give at least 30 days advance notice to the Purchaser to enable him to depute the Engineer for witnessing the tests. The test certificates for Acceptance Tests witnessed by Inspecting Officer /Engineer shall be submitted for approval before dispatch of material.

9.3 Routine test

The following shall constitute routine tests:

- i) Conductor resistance test
- ii) Partial discharge test (for screened cables only) and
- iii) High voltage tests.
- iv) Resistance test for armour (for mining cables)in accordance with IS 10810 (part -42)and 17.5

9.4 Optional tests

Cold impact tests for outer sheath (IS: 5831-1984) shall constitute the optional tests.

9.4 CHALLENGE CLAUSE:

Purchase reserves the right to have the material, received after the inspection by the authorized inspecting officer, again tested for any parameter(s) from approved/NABL Accredited testing house/in house technique of the Purchaser. The results if found deviating/unacceptable or in non-compliance with the approved GTP's , the lot shall be rejected and bidder shall arrange to replace the rejected LOT within **thirty (30) days** of such detection at his cost including to and fro transportation.

10. DETAILS OF TESTS

The tests shall be governed by section 19 (classifications of tests) and clause -20 (details of tests) as per IS: 7098 (part –II) of 2011 (Reaffirmed 2016)

SECTION -B
CLIMATIC AND ISOCERAUNIC CONDITIONS (CIC)

1. The climatic and isoceraunic conditions at the site of work are approximately given as under:

S.No.	Description	Values
i.	Max. temp of air in shade	30.6 ⁰ C
ii.	Min. temp of air in shade	-20 ⁰ C
iii.	Max. temp of air in sun	45 ⁰ C
iv.	Height above sea level (Approx.)	1600 m
v.	Max. relative humidity	90%
vi.	Min. relative humidity	15%
vii.	Average no. of thunder storm days per year	54
viii.	Average rainfall	80 cm
ix.	Wind Zone	WZ – 3
x.	Average number of rainy days per year	106
xi.	Seismic Zone	SZ – 5
xii.	Area of installation	HSZ

HSZ = Heavy Snow Zone, LSZ = Light Snow Zone

2. Communication and Transport

The nearest railway station is Jammu/Udhampur on the broad gauge line and is connected to the Divisional Stores by a metal road. The equipment is required to pass en-route through various Tunnels on NH-44. The weights and maximum dimension of the packages suitable for transportation through tunnel route are as follows:

i.	Length	7.0m
ii.	Width	3.0m
iii.	Height	4.55m
iv.	Weight	40 Ton (Metric)

The supplier shall get the permissible weight and dimensions confirmed from the Highway Authorities before proceeding with the manufacture of the equipment. It will be the responsibility of the supplier to ensure timely and proper delivery of the equipment on door delivery at Srinagar, through road transport. The supplier shall also ensure that the weights and dimensions of the packages which are suitable to be carried by road transport up to Srinagar.

SECTION –C

GUARANTEED TECHNICAL PARTICULARS

Technical parameters of the cable shall be as follows:

Sl No	Particulars	Unit	11 kV	33kV
1	Rated Voltage	kV		
2	Type of Insulation	-		
3	Single/Three core	-		
4	Armoured/Unarmoured	-		
5	Material of Conductor	-		
6	System	-		
7	Highest System Voltage	kV		
8	Material	-		
9	Voltage Grade			
10	Conductor Size	Sq. mm		
11	Shape of Conductor			
12	Minimum Number of wires in conductor for:		11 kV	33 kV
	35 sq mm			
	50 sq mm			
	70 sq mm			
	95 sq mm			
	120 sq mm			
	185 sq mm			
	240 sq mm			
	300 sq mm			
	400 sq mm			
13	Approx overall cable diameter	---		
14	Current carrying capacity of the cable when laid in			
a	In Ground at 30 degree Celsius		11 kV	33 kV
	35 sq mm	Amps		
	50 sq mm			
	70 sq mm			
	95 sq mm			
	120 sq mm			
	185 sq mm			
	240 sq mm			
	300 sq mm			

	400 sq mm			
b	In Air at 40 Degree Celsius	Amps	11 kV	33 kV
	35 sq mm			
	50 sq mm			
	70 sq mm			
	95 sq mm			
	120 sq mm			
	185 sq mm			
	240 sq mm			
	300 sq mm			
	400 sq mm			
15	Max. Conductor Temp	°C		
16	Short Ckt.Current for 1 second duration	KA	11 kV	33 kV
	35 sq mm			
	50 sq mm			
	70 sq mm			
	95 sq mm			
	120 sq mm			
	185 sq mm			
	240 sq mm			
	300 sq mm			
400 sq mm				
17	Power Frequency Withstand Voltage	kV rms		
18	Lightning Impulse Withstand Voltage	kV rms		
19	Max. DC resistance of conductor at 20 Deg Celsius	ohm/k m	11 kV (For both Single and three Core)	33 kV (For both Single and three Core)
	35 sq mm			
	50 sq mm			
	70 sq mm			
	95 sq mm			
	120 sq mm			
	185 sq mm			
	240 sq mm			
	300 sq mm			
400 sq mm				
	Max. AC resistance of conductor at 90 Deg.		11 kV (For both Single and three Core)	33 kV (For both Single and three Core)

20	Celsius					
	35 sq mm	ohm/k m				
	50 sq mm					
	70 sq mm					
	95 sq mm					
	120 sq mm					
	185 sq mm					
	240 sq mm					
	300 sq mm					
	400 sq mm					
21	Reactance of cable at normal frequency (Approx)			11 kV		33 kV
		ohm/k m	SINGLE CORE	THREE CORE	SINGLE CORE	THREE CORE
	35 sq mm					
	50 sq mm					
	70 sq mm					
	95 sq mm					
	120 sq mm					
	185 sq mm					
	240 sq mm					
	300 sq mm					
400 sq mm						
22	Electrostatic capacitance at normal frequency		11 kV		33 kV	
		Micro farads per km	SINGLE CORE	THREE CORE	SINGLE CORE	THREE CORE
	35 sq mm					
	50 sq mm					
	70 sq mm					
	95 sq mm					
	120 sq mm					
	185 sq mm					
	240 sq mm					
	300 sq mm					
400 sq mm						
23	Continuous Withstand Temperature	oC				
24	Short Circuit withstand Temperature	oC				
25	Conductor Screening	:				
26	Insulation	:	11kV		33 kV	
a	Material	:				
b	Nominal thickness	mm				

c	Insulation screening					
	I) Non-Metallic					
	• Type and material					
	• Applicable thickness		mm			
	II) Metallic					
	• Material:		:			
	• Applicable thickness		mm			
27	Inner Sheath		11 kV	33 kV		
a	Type and Material					
b	Whether extruded/wrapped:-					
c	Min. thickness for sizes:		mm	11 kV(3 core)	33 kV(3 core)	
	35 sq mm					
	50 sq mm					
	70 sq mm					
	95 sq mm					
	120 sq mm					
	185 sq mm					
	240 sq mm					
	300 sq mm					
	400 sq mm					
28	Armouring		---			
a	Nominal dimension of Al (Armour) round wire		11kV		33 kV	
			SINGLE CORE	THREE CORE	SINGLE CORE	THREE CORE
	35 sq mm					
	50 sq mm					
	70 sq mm					
	95 sq mm					
	120 sq mm					
	185 sq mm					
	240 sq mm					
	300 sq mm					
400 sq mm						
29	Outer Sheath					
a	Type and Material					

	Min Thickness	mm	11 kV		33 kV	
			SINGLE CORE	THREE CORE	SINGLE CORE	THREE CORE
b	35 sq mm					
	50 sq mm					
	70 sq mm					
	95 sq mm					
	120 sq mm					
	185 sq mm					
	240 sq mm					
	300 sq mm					
	400 sq mm					
	c	Colour				
30	Approx. length of cable In a Drum/standard drum Length					
31	Max.'Tan -delta' at room temp.At normal phase to neutral voltage (Uo)	-				
32	H.V Tests between Conductors & Screen / Armour					
33	FRLS Properties					
A	Acid Gas generation					
B	Smoke density rating					
C	Flammability test					
34	Minimum Bending radius					
35	The relevant IS specification to which the material and construction of cable conform					
36	Curing process:					