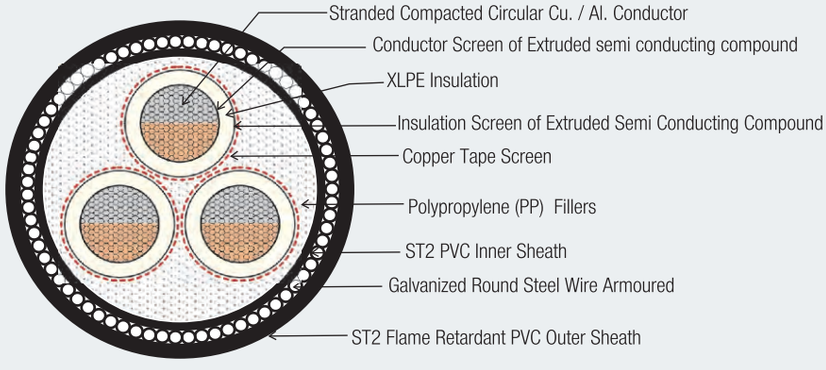
CONSTRUCTION OF MEDIUM VOLTAGE CABLES

- **CONDUCTOR**
  Electrical grade high conductivity Aluminium / Copper wires are formed to make stranded compacted circular conductors as per IEC 60502-2
- **SEMI-CONDUCTING LAYER OVER CONDUCTOR**
  Extruded semi-conducting compound is applied over the conductor, in tandem with insulation.
- **INSULATION**
  Insulation is of high quality super clean XLPE insulating compound. The thickness of insulation is as per the relevant tables. The insulation is free of foreign particles, air and water voids.
- **SEMI-CONDUCTING LAYER OVER INSULATION**
  Shield consisting of a layer of extruded semi-conducting compound applied in tandem over the insulation is provided if required.
- **COPPER TAPE**
  Copper tape with number / colour marking is applied over the cores. Where required water blocking tape can also be provided. Copper tape size can be chosen suitably as per system fault current requirement.
- **SEPARATION SHEATH (Optional for single core)**
  Separation sheath of ST-2 PVC along with polypropylene [PP] fillers, is provided.
- **ARMOUR**
  Armour of galvanized Wire / Strip / Tape as per relevant standard is provided over separation sheath to guard against mechanical damage. In case of single core cables used in A.C. Systems, armouring is of non magnetic hard drawn aluminium wire/strip. Also it is ensured that armour coverage is more than 95% to achieve better mechanical protection, low armour resistance and higher earth fault carrying capacity,
- **OUTERSHEATH**
  Outer sheath is of extruded ST-2 Flame Retardant PVC compound, having oxygen index of min. 30 and is resistant to termite and rodent attack. Outer sheath with FRLS / Zero halogen compound can be provided for better fire resistance,
- **MARKING OVER OUTER SHEATH**
  Progressive sequential marking, size marking, voltage grade, manufacturers name & any other desired marking are embossed on every meter of the outer sheath. Sheath can be of desired colour.
- **PACKING**
  Cables are supplied in non-returnable wooden or steel drums of heavy construction as per relevant standard. Wooden drums are properly seasoned and treated with anti rodent material and painted with good quality paint to increase the life of the drum. Each drum carries the manufacturers name, type, size and length of the cable, sequential marking detail, gross weight stenciled on sides of drum. An arrow and suitable accompanying wording is marked on one end of the reel indicating the direction in which it should be rolled. Packing is 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 are sealed with PVC / heat shrinkable end caps so as to eliminate ingress of water during transportation, storage and erection.

Drawing details



Voltage designations Uo/U (Um) and Catageories

1) 3.6/6.0 (7.2) kV 2) 6.0/10 (12) kV 3) 8.7/15 (17.5) kV 4) 12/20 (24) kV 5) 18/30 (36) kV

Uo is the rated power frequency voltage between conductor and earth or metallic screen for which the cable is designed.

U is the rated power frequency voltage between conductors for which the cable is designed.

Um is the maximum value of the "highest system voltage'' for which the equipment may be used.

The rated voltage of the cable for a given application shall be suitable for the operating conditions in the system in which the cable is used. To facilitate the selection of the cable, systems are divided into three categories:

- **category A:** this category comprises those systems in which any phase conductor that comes in contact with earth or an earth conductor is disconnected from the system within 1 min.

- **category B:** this category comprises those systems which, under fault conditions, are operated for a short time with one phase earthed. This period, according to IEC 60183, should not exceed 1 hr. For cables covered by this standard, a longer period, not exceeding 8 hr. on any occasion, can be tolerated. The total duration of earth faults in any year should not exceed 125 hr.

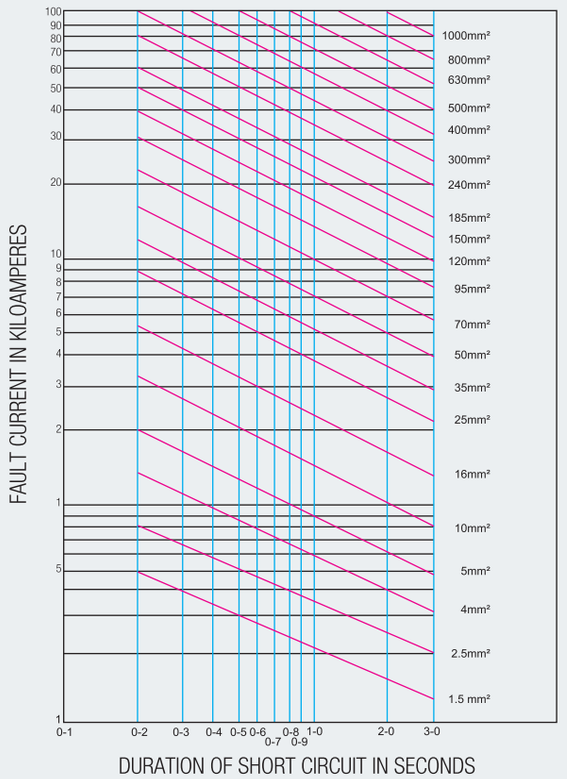
- **category C:** this category comprises all systems which do not fall into category A or B.

NOTE: It should be realized that in a system where an earth fault is not automatically and promptly isolated, the extra stresses on the insulation of cables during the earth fault reduce the life of the cables to a certain degree. If the system is expected to be operated fairly often with a permanent earth fault, it may be advisable to classify the system in category C.

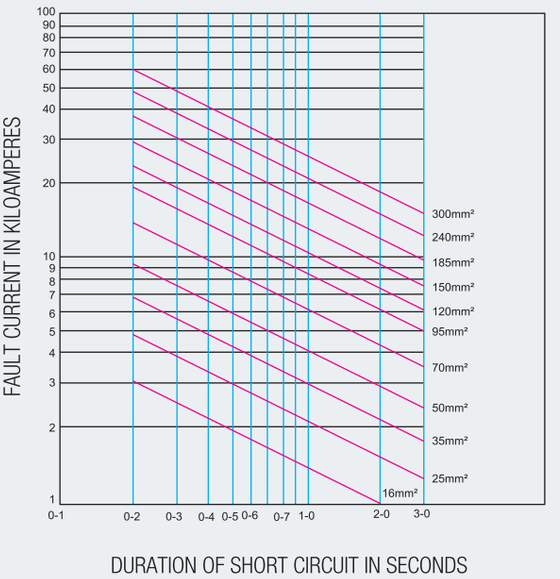
SHORT CIRCUIT RATINGS OF CONDUCTORS

The values of fault current given in the graph below are based on the cable being fully loaded at the start of the short circuit (conductor temperature 90°C) and a final conductor temperature of 250°C. It should be ensured that the accessories associated with the cables are also capable of operation at these values of fault current and temperature.

COPPER CONDUCTORS



ALUMINIUM CONDUCTORS



FOLLOWING TESTS ARE CARRIED OUT ON THE CABLES:

ROUTINE TESTS

a) Conductor resistance test
b) Partial discharge test [for screened cables only]
[To be carried out on full drum length]
c) High voltage test

SAMPLE TESTS

a) Conductor examination
b) Check of dimensions
c) Voltage test for 4 hr.
d) Hot set test

SPECIAL TESTS FOR FRLS CABLES

i) Oxygen Index Test as per ASTM-D-2863
ii) Temp. Index Test as per ASTM-D-2863
iii) Acid Gas Generation test (HCL) as per IEC-754(1)
iv) Smoke Density test as per ASTM-D-2843
v) Flammability tests
   a. As per IEC 332-I
   b. As per IEC 332-3
   c. Swedish Chimney as per SS-424-14-75 (Class F 3)
   d. IEEE - 383

TYPE TESTS

ELECTRICAL

1) Bending test followed by partial discharge test
2) Tan δ measurement
3) Heating cycle test followed by partial discharge test
4) Impulse test followed by voltage test
5) Voltage test of 4 hr.
6) Resistivity of semi-conducting screen
7) Insulation resistance measurement

NON-ELECTRICAL

1) Measurement of Insulation thickness
2) Measurement of thickness of non-metallic sheaths
3) Determination of mechanical properties of Insulation before & after ageing
4) Determination of mechanical properties of Non-metallic sheaths before & after ageing
5) Ageing test on pieces of completed cable
6) Loss of mass for PVC sheath
7) Pressure test at high temperature
8) Tests at low temperatures on PVC sheath
9) Heat shock test
10) Hot set test
11) Water absorption test on insulation
12) Flame sprade test for PVC sheathed cables
13) Shrinkage for XLPE insulaiton

PARTIAL DISCHARGE TEST

This test is conducted for detection and measurement of partial discharge in screened cables. Partial discharges in voids remain unnoticed in the normal HV test and could be harmful for the life of insulation.

Extruded di-electric tends to deteriorate very fast due to the discharges in small voids and cavities. It is therefore necessary that such voids should as far as possible be avoided in the extrusion process.

Still certain minute voids are unavoidable and these remain in the insulation. The magnitude of discharge in such voids is measured so as to determine whether these are within permissible limits.

This test is performed on such extruded di-electric in order to ensure that the insulation is free from partial discharges in excess of certain limits.

IMPULSE TEST

Insulating material used in M.V. cables is subjected to transient over voltages resulting from nearby lightening strokes. The ability of insulating material to withstand these transient voltages is important in establishing the reliability of the cable insulation and the design of cable.

MV CABLES

Table-1A: 3.6/6.0 (7.2) kV Single core XLPE Insulated Screened Armoured cable with Aluminium/Copper conductor Conf. to IEC:60502-2

Area	Thickness of XLPE Insulation	Thickness of Seperation Sheath	Dimension of Armour Wire	Thickness of Outer sheath		Approx. Overall diameter	Approx. Net Wt. of Cable	
mm^2	mm	mm	mm	mm	mm	mm	kg/km	kg/km
	Nom	Nom		Nom	Min		Al	Cu
25	2.5	1.2	1.6	1.80	1.24	23	670	820
35	2.5	1.2	1.6	1.80	1.24	24	735	950
50	2.5	1.2	1.6	1.80	1.24	25	815	1100
70	2.5	1.2	1.6	1.80	1.24	27	930	1355
95	2.5	1.2	1.6	1.90	1.32	29	1080	1650
120	2.5	1.2	1.6	1.90	1.32	30	1200	1930
150	2.5	1.2	1.6	2.00	1.40	32	1330	2235
185	2.5	1.2	2.0	2.00	1.40	34	1600	2725
240	2.5	1.2	2.0	2.10	1.48	38	1925	3350
300	2.5	1.2	2.0	2.20	1.56	40	2225	4065
400	2.5	1.2	2.0	2.30	1.64	44	2660	5030
500	2.5	1.3	2.5	2.50	1.80	49	3365	6350
630	2.5	1.4	2.5	2.60	1.88	53	3980	7890
800	2.5	1.4	2.5	2.70	1.96	58	4715	9665
1000	2.5	1.5	2.5	2.90	2.12	63	5600	11775

Area	Max D.C. resistance at 20°C		Approx. A.C. resistance at operating temp 90°C		Approx. reactance at 50 Hz	Approx. Capaci-tance	Current Rating as per IEC 60 502-2						Short circuit rating for 1 Sec.	
							Direct in Ground		In duct		In Air			
	Ohm/km	Ohm/km	Ohm/km	Ohm/km	Ohm/km	μf/km	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	
mm^2	Al	Cu	Al	Cu			Al	Cu	Al	Cu	Al	Cu	Al	Cu
25	1.20	0.727	1.54	0.927	0.148	0.263	108	140	102	132	127	163	2.35	3.58
35	0.868	0.524	1.113	0.668	0.141	0.292	129	166	122	157	154	198	3.29	5.01
50	0.641	0.387	0.822	0.494	0.134	0.326	152	196	144	186	184	238	4.70	7.15
70	0.443	0.268	0.568	0.342	0.124	0.371	186	239	176	227	230	296	6.58	10.01
95	0.320	0.193	0.411	0.247	0.118	0.418	221	285	210	271	280	361	8.93	13.6
120	0.253	0.153	0.325	0.196	0.114	0.460	252	323	240	308	324	417	11.28	17.2
150	0.206	0.124	0.265	0.159	0.111	0.494	281	361	267	343	368	473	14.1	21.5
185	0.164	0.0991	0.211	0.1276	0.107	0.550	317	406	303	387	424	543	17.4	26.5
240	0.125	0.0754	0.161	0.0979	0.105	0.601	367	469	351	447	502	641	22.6	34.3
300	0.100	0.0601	0.130	0.0789	0.102	0.617	414	526	397	504	577	735	28.2	42.9
400	0.0778	0.0470	0.1016	0.0629	0.098	0.655	470	590	451	564	673	845	37.6	572
500	0.0605	0.0366	0.0800	0.0504	0.098	0.686	533	669	511	639	763	958	47.0	71.5
630	0.0469	0.0283	0.0633	0.0409	0.095	0.766	605	760	581	727	867	1089	59.2	90.1
800	0.0367	0.0221	0.0512	0.0342	0.091	0.862	684	860	657	822	980	1232	75.2	111.4
1000	0.0291	0.0176	0.0425	0.0294	0.090	0.949	768	964	737	922	1100	1381	94.0	143.0

The above data is indicative & may be changed without prior information.
All conductors will be compacted circular shaped
Cables can be supplied in multiples of 500 mtrs or as per customer requirement.

Operating conditions - Amb. air temp. 30° C
Ground temp: 20° C
Depth of laying : 80 cm
Thermal resistivity of soil: 1.50 K-m/W
Thermal resistivity of duct: 1.20 K-m/W

MV CABLES

Table-1B: 3.6/6.0 (7.2) kV Three core XLPE Insulated Screened Armoured cable with Aluminium/Copper conductor Conf. to IEC:60502-2

Area	Thickness of XLPE Insulation	Thickness of Seperation Sheath	Dimension of Armour Wire	Thickness of Outer sheath		Approx. Overall diameter	Approx. Net Wt. of Cable	
mm^2	mm	mm	mm	mm	mm	mm	kg/km	kg/km
	Nom	Nom		Nom	Min		Al	Cu
25	2.5	1.2	2.00	2.30	1.64	39	2500	2955
35	2.5	1.2	2.00	2.30	1.64	42	3090	3745
50	2.5	1.3	2.50	2.50	1.80	46	3935	4800
70	2.5	1.4	2.50	2.60	1.88	50	4575	5865
95	2.5	1.4	2.50	2.70	1.96	54	5225	6985
120	2.5	1.5	2.50	2.80	2.04	57	5865	8075
150	2.5	1.5	2.50	2.90	2.12	60	6465	9210
185	2.5	1.6	2.50	3.00	2.20	65	7430	10810
240	2.6	1.7	2.50	3.20	2.36	72	8945	13265
300	2.8	1.8	3.15	3.50	2.60	79	11275	16840
400	3.0	2.0	3.15	3.80	2.84	88	13615	20795

Area	Max D.C. resistance at 20°C		Approx. A.C. resistance at operating temp 90°C		Approx. reactance at 50 Hz	Approx. Capaci-tance	Current Rating as per IEC 60 502-2						Short circuit rating for 1 Sec.	
							Direct in Ground		In duct		In Air			
	Ohm/km	Ohm/km	Ohm/km	Ohm/km	Ohm/km	µf/km	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	
mm^2	AI	Cu	AI	Cu			AI	Cu	AI	Cu	AI	Cu	AI	Cu
25	1.20	0.727	1.54	0.927	0.118	0.263	100	129	87	112	111	143	2.35	3.58
35	0.868	0.524	1.113	0.668	0.113	0.292	119	154	104	134	133	172	3.29	5.01
50	0.641	0.387	0.822	0.494	0.180	0.326	140	181	123	158	159	205	4.70	7.15
70	0.443	0.268	0.568	0.342	0.099	0.371	171	220	150	194	196	253	6.58	10.01
95	0.320	0.193	0.411	0.247	0.095	0.418	204	263	180	232	238	307	8.93	13.60
120	0.253	0.153	0.325	0.196	0.092	0.460	232	298	206	264	274	352	11.28	17.20
150	0.206	0.124	0.265	0.160	0.090	0.494	259	332	231	296	309	397	14.10	21.50
185	0.164	0.0991	0.211	0.1286	0.0863	0.550	293	374	262	335	354	453	17.40	26.50
240	0.125	0.0754	0.162	0.0987	0.0858	0.601	338	431	304	387	415	529	22.60	34.30
300	0.100	0.0601	0.130	0.0799	0.084	0.617	380	482	343	435	472	599	28.20	42.90
400	0.0778	0.0470	0.1024	0.0642	0.0821	0.655	432	541	393	492	545	683	37.60	57.20

The above data is indicative & may be changed without prior information.
All conductors will be compacted circular shaped
Cables can be supplied in multiples of 250/500 mtrs or as per customer requirement.

Operating conditions - Amb. air temp. 30° C
Ground temp: 20° C
Depth of laying : 80 cm
Thermal resistivity of soil: 1.50 K-m/W
Thermal resistivity of duct: 1.20 K-m/W

MV CABLES

Table-2A: 6/10 (12) kV Single core XLPE Insulated Screened Armoured cable with Aluminium/Copper conductor Conf. to IEC:60502-2

Area	Thickness of XLPE Insulation	Thickness of Seperation Sheath	Dimension of Armour Wire	Thickness of Outer sheath		Approx. Overall diameter	Approx. Net Wt. of Cable	
mm^2	mm	mm	mm	mm	mm	mm	kg/km	kg/km
	Nom	Nom		Nom	Min		Al	Cu
25	3.4	1.2	1.6	1.80	1.24	25	750	905
35	3.4	1.2	1.6	1.80	1.24	26	820	1040
50	3.4	1.2	1.6	1.80	1.24	27	900	1190
70	3.4	1.2	1.6	1.90	1.32	29	1040	1465
95	3.4	1.2	1.6	1.90	1.32	30	1180	1765
120	3.4	1.2	1.6	2.00	1.40	32	1320	2050
150	3.4	1.2	2.0	2.10	1.48	34	1550	2455
185	3.4	1.2	2.0	2.10	1.48	36	1740	2860
240	3.4	1.2	2.0	2.20	1.56	39	2060	3485
300	3.4	1.2	2.0	2.20	1.56	43	2320	4155
400	3.4	1.2	2.0	2.40	1.72	45	2745	5115
500	3.4	1.3	2.5	2.50	1.80	50	3395	6380
630	3.4	1.4	2.5	2.60	1.88	54	4030	7935
800	3.4	1.4	2.5	2.70	1.96	58	4765	9710
1000	3.4	1.5	2.5	2.90	2.12	63	5655	11800

Area	Max D.C. resistance at 20°C		Approx. A.C. resistance at operating temp 90°C		Approx. reactance at 50 Hz	Approx. Capacitance	Current Rating as per IEC 60 502-2						Short circuit rating for 1 Sec.	
							Direct in Ground		In duct		In Air			
	Ohm/km	Ohm/km	Ohm/km	Ohm/km	Ohm/km	μf/km	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	
mm^2	Al	Cu	Al	Cu			Al	Cu	Al	Cu	Al	Cu	Al	Cu
25	1.20	0.727	1.54	0.927	0.153	0.209	108	140	102	132	127	163	2.35	3.58
35	0.868	0.524	1.113	0.668	0.146	0.230	129	166	122	157	154	198	3.29	5.01
50	0.641	0.387	0.822	0.494	0.138	0.255	152	196	144	186	184	238	4.70	7.15
70	0.443	0.268	0.568	0.342	0.129	0.289	186	239	176	227	230	296	6.58	10.01
95	0.320	0.193	0.411	0.247	0.122	0.324	221	285	210	271	280	361	8.93	13.6
120	0.253	0.153	0.325	0.196	0.118	0.355	252	323	240	308	324	417	11.28	17.2
150	0.206	0.124	0.265	0.159	0.116	0.380	281	361	267	343	368	473	14.1	21.5
185	0.164	0.0991	0.211	0.1276	0.111	0.421	317	406	303	387	424	543	17.4	26.5
240	0.125	0.0754	0.161	0.0978	0.108	0.475	367	469	351	447	502	641	22.6	34.3
300	0.100	0.0601	0.130	0.0788	0.104	0.520	414	526	397	504	577	735	28.2	42.9
400	0.0778	0.0470	0.1016	0.0628	0.100	0.585	470	590	451	564	673	845	37.6	57.2
500	0.0605	0.0366	0.0799	0.0504	0.098	0.649	533	669	511	639	763	958	47.0	71.5
630	0.0469	0.0283	0.0633	0.0408	0.095	0.725	605	760	581	727	867	1089	59.2	90.1
800	0.0367	0.0221	0.0512	0.0341	0.092	0.815	684	860	657	822	980	1232	75.2	111.4
1000	0.0291	0.0176	0.0425	0.0294	0.090	0.897	768	964	737	922	1100	1381	94.0	143.0

The above data is indicative & may be changed without prior information.
All conductors will be compacted circular shaped
Cables can be supplied in multiples of 500 mtrs or as per customer requirement.

Operating conditions - Amb. air temp. 30° C
Ground temp: 20° C
Depth of laying : 80 cm
Thermal resistivity of soil: 1.50 K-m/W
Thermal resistivity of duct: 1.20 K-m/W

MV CABLES

Table-2B: 6/10 (12) kV Three core XLPE Insulated Screened Armoured cable with Aluminium/Copper conductor Conf. to IEC:60502-2

Area	Thickness of XLPE Insulation	Thickness of Seperation Sheath	Dimension of Armour Wire	Thickness of Outer sheath		Approx. Overall diameter	Approx. Net Wt. of Cable	
mm^2	mm	mm	mm	mm	mm	mm	kg/km	kg/km
	Nom	Nom		Nom	Min		Al	Cu
25	3.4	1.3	2.50	2.40	1.72	45	3335	3790
35	3.4	1.3	2.50	2.50	1.80	47	3600	4260
50	3.4	1.4	2.50	2.60	1.88	51	4080	4950
70	3.4	1.4	2.50	2.70	1.96	54	4530	5820
95	3.4	1.5	2.50	2.90	2.12	58	5215	6980
120	3.4	1.6	2.50	3.00	2.20	62	5845	8060
150	3.4	1.6	2.50	3.10	2.28	64	6335	9075
185	3.4	1.7	2.50	3.20	2.36	69	7155	10535
240	3.4	1.8	3.15	3.40	2.52	77	9340	13655
300	3.4	1.9	3.15	3.60	2.68	82	10430	16000
400	3.4	2.0	3.15	3.80	2.84	90	12185	19365

Area	Max D.C. resistance at 20°C		Approx. A.C. resistance at operating temp 90°C		Approx. reactance at 50 Hz	Approx. Capaci-tance	Current Rating as per IEC 60 502-2						Short circuit rating for 1 Sec.	
							Direct in Ground		In duct		In Air			
	Ohm/km	Ohm/km	Ohm/km	Ohm/km	Ohm/km	µf/km	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	
mm^2	AI	Cu	AI	Cu			AI	Cu	AI	Cu	AI	Cu	AI	Cu
25	1.20	0.727	1.54	0.927	0.126	0.209	100	129	87	112	111	143	2.35	3.58
35	0868	0.524	1.113	0.668	0.120	0.230	119	154	104	134	133	172	3.29	5.01
50	0.641	0.387	0.822	0.494	0.114	0.255	140	181	123	158	159	205	4.70	7.15
70	0.443	0.268	0.568	0.342	0.106	0.289	171	220	150	194	196	253	6.58	10.01
95	0.320	0.193	0.411	0.247	0.101	0.324	204	263	180	232	238	307	8.93	13.6
120	0.253	0.153	0.325	0.196	0.097	0.355	232	298	206	264	274	352	11.28	17.2
150	0.206	0.124	0.265	0.159	0.095	0.380	259	332	231	296	309	397	14.1	21.5
185	0.164	0.0991	0.211	0.1281	0.0910	0.421	293	374	262	335	354	453	17.4	26.5
240	0.125	0.0754	0.162	0.0985	0.0895	0.475	338	431	304	387	415	529	22.6	34.3
300	0.100	0.0601	0.130	0.0797	0.0870	0.520	380	482	343	435	472	599	28.2	42.9
400	0.0778	0.0470	0.1024	0.0641	0.0836	0.585	432	541	393	492	545	683	37.6	57.2

The above data is indicative & may be changed without prior information.
All conductors will be compacted circular shaped
Cables can be supplied in multiples of 250/500 mtrs or as per customer requirement.

Operating conditions - Amb. air temp. 30° C
Ground temp: 20° C
Depth of laying : 80 cm
Thermal resistivity of soil: 1.50 K-m/W
Thermal resistivity of duct: 1.20 K-m/W

MV CABLES

Table-3A: 8.7/15 (17.5) kV Single core XLPE Insulated Screened Armoured cable with Aluminium/Copper conductor Conf. to IEC:60502-2

Area	Thickness of XLPE Insulation	Thickness of Seperation Sheath	Dimension of Armour Wire	Thickness of Outer sheath		Approx. Overall diameter	Approx. Net Wt. of Cable	
mm^2	mm	mm	mm	mm	mm	mm	kg/km	kg/km
	Nom	Nom		Nom	Min		Al	Cu
25	4.5	1.2	1.60	1.80	1.24	27	865	1020
35	4.5	1.2	1.60	1.90	1.32	28	950	1170
50	4.5	1.2	1.60	1.90	1.32	29	1040	1325
70	4.5	1.2	1.60	1.90	1.32	31	1165	1595
95	4.5	1.2	2.00	2.00	1.40	34	1420	2000
120	4.5	1.2	2.00	2.10	1.48	35	1575	2305
150	4.5	1.2	2.00	2.10	1.48	37	1700	2605
185	4.5	1.2	2.00	2.20	1.56	39	1915	3030
240	4.5	1.2	2.00	2.30	1.64	42	2240	3665
300	4.5	1.2	2.00	2.30	1.64	44	2510	4250
400	4.5	1.3	2.50	2.50	1.80	49	3135	5500
500	4.5	1.3	2.50	2.60	1.88	52	3630	6615
630	4.5	1.4	2.50	2.70	1.96	56	4265	8175
800	4.5	1.5	2.50	2.80	2.04	61	5075	10020
1000	4.5	1.6	2.50	3.00	2.20	66	5970	12130

Area	Max D.C. resistance at 20°C		Approx. A.C. resistance at operating temp 90°C		Approx. reactance at 50 Hz	Approx. Capaci-tance	Current Rating as per IEC 60 502-2						Short circuit rating for 1 Sec.	
							Direct in Ground		In duct		In Air			
	Ohm/km	Ohm/km	Ohm/km	Ohm/km	Ohm/km	μf/km	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	
mm^2	Al	Cu	Al	Cu			Al	Cu	Al	Cu	Al	Cu	Al	Cu
25	1.20	0.727	1.54	0.927	0.158	0.171	108	140	102	132	127	163	2.35	3.58
35	0.868	0.524	1.113	0.668	0.151	0.187	129	166	122	157	154	198	3.29	5.01
50	0.641	0.387	0.822	0.494	0.144	0.207	152	196	144	186	184	238	4.70	7.15
70	0.443	0.268	0.568	0.342	0.133	0.232	186	239	176	227	230	296	6.58	10.01
95	0.320	0.193	0.411	0.247	0.128	0.259	221	285	210	271	280	361	8.93	13.6
120	0.253	0.153	0.325	0.196	0.124	0.283	252	323	240	308	324	417	11.28	17.2
150	0.206	0.124	0.265	0.159	0.120	0.302	281	361	267	343	368	473	14.1	21.5
185	0.164	0.0991	0.211	0.1275	0.115	0.333	317	406	303	387	424	543	17.4	26.5
240	0.125	0.0754	0.161	0.0977	0.112	0.374	367	469	351	447	502	641	22.6	34.3
300	0.100	0.0601	0.129	0.0787	0.108	0.408	414	526	397	504	577	735	28.2	42.9
400	0.0778	0.0470	0.1014	0.0626	0.105	0.458	470	590	451	564	673	845	37.6	572
500	0.0605	0.0366	0.0798	0.0502	0.101	0.506	533	669	511	639	763	958	47.0	71.5
630	0.0469	0.0283	0.0631	0.0406	0.098	0.564	605	760	581	727	867	1089	59.2	90.1
800	0.0367	0.0221	0.0510	0.0338	0.095	0.632	684	860	657	822	980	1232	75.2	111.4
1000	0.0291	0.0176	0.0422	0.0291	0.092	0.6941	768	964	737	922	1100	1381	94.0	143.0

The above data is indicative & may be changed without prior information.
All conductors will be compacted circular shaped
Cables can be supplied in multiples of 500 mtrs or as per customer requirement.

Operating conditions - Amb. air temp. 30° C
Ground temp: 20° C
Depth of laying : 80 cm
Thermal resistivity of soil: 1.50 K-m/W
Thermal resistivity of duct: 1.20 K-m/W

MV CABLES

Table-3B: 8.7/15 (17.5) kV Three core XLPE Insulated Screened Armoured cable with Aluminium/Copper conductor Conf. to IEC:60502-2

Area	Thickness of XLPE Insulation	Thickness Seperation Sheath	Dimension of Armour Wire	Thickness of Outer sheath		Approx. Overall diameter	Approx. Net Wt. of Cable	
mm^2	mm	mm	mm	mm	mm	mm	kg/km	kg/km
	Nom	Nom		Nom	Min		Al	Cu
25	4.5	1.4	2.50	2.60	1.88	50	3950	4405
35	4.5	1.4	2.50	2.70	1.96	52	4230	4890
50	4.5	1.5	2.50	2.80	2.04	55	4625	5490
70	4.5	1.5	2.50	2.90	2.12	59	5210	6505
95	4.5	1.6	2.50	3.00	2.20	63	5895	7655
120	4.5	1.7	2.50	3.10	2.28	67	6490	8705
150	4.5	1.7	2.50	3.20	2.36	70	7025	9765
185	4.5	1.8	3.15	3.40	2.52	76	8780	12160
240	4.5	1.9	3.15	3.60	2.68	82	10135	14455
300	4.5	2.0	3.15	3.70	2.76	87	11300	16860
400	4.5	2.1	3.15	4.00	3.00	95	13715	20355

Area	Max D.C. resistance at 20°C		Approx. A.C. resistance at operating temp 90°C		Approx. reactance at 50 Hz	Approx. Capaci-tance	Current Rating as per IEC 60 502-2						Short circuit rating for 1 Sec.	
							Direct in Ground		In duct		In Air			
	Ohm/km	Ohm/km	Ohm/km	Ohm/km	Ohm/km	µf/km	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	
mm^2	AI	Cu	AI	Cu			AI	Cu	AI	Cu	AI	Cu	AI	Cu
25	1.20	0.727	1.540	0.927	0.134	0.171	100	129	87	112	111	143	2.35	3.58
35	0.868	0.524	1.113	0.668	0.128	0.187	119	154	104	134	134	172	3.29	5.01
50	0.641	0.387	0.822	0.494	0.122	0.207	140	181	123	158	159	205	4.70	7.15
70	0.443	0.268	0.568	0.342	0.113	0.232	171	220	150	194	196	253	6.58	10.01
95	0.320	0.193	0.411	0.247	0.107	0.259	204	263	180	232	238	307	8.93	13.6
120	0.253	0.153	0.325	0.196	0.103	0.283	232	298	206	264	274	352	11.28	17.2
150	0.206	0.124	0.265	0.159	0.101	0.302	259	332	231	296	309	397	14.1	21.5
185	0.164	0.0991	0.211	0.128	0.0963	0.333	293	374	262	335	354	453	17.4	26.5
240	0.125	0.0754	0.162	0.0978	0.0942	0.374	338	431	304	387	415	529	22.6	34.3
300	0.100	0.0601	0.130	0.0795	0.0914	0.408	380	482	343	435	472	599	28.2	42.9
400	0.0778	0.0470	0.1021	0.0637	0.0876	0.458	432	541	393	492	545	683	37.6	57.2

The above data is indicative & may be changed without prior information.
All conductors will be compacted circular shaped
Cables can be supplied in multiples of 250/500 mtrs or as per customer requirement.

Operating conditions - Amb. air temp. 30° C
Ground temp: 20° C
Depth of laying : 80 cm
Thermal resistivity of soil: 1.50 K-m/W
Thermal resistivity of duct: 1.20 K-m/W

MV CABLES

Table-4A: 12/20 (24) kV Single core XLPE Insulated Screened Armoured cable with Aluminium/Copper conductor Conf. to IEC:60502-2

Area	Thickness of XLPE Insulation	Thickness of Seperation Sheath	Dimension of Armour Wire	Thickness of Outer sheath		Approx. Overall diameter	Approx. Net Wt. of Cable	
mm^2	mm	mm	mm	mm	mm	mm	kg/km	kg/km
	Nom	Nom		Nom	Min		Al	Cu
35	5.5	1.2	1.6	1.90	1.32	30	1060	1280
50	5.5	1.2	1.6	2.00	1.40	32	1165	1455
70	5.5	1.2	2.0	2.00	1.40	34	1390	1820
95	5.5	1.2	2.0	2.10	1.48	36	1560	2145
120	5.5	1.2	2.0	2.10	1.48	37	1715	2445
150	5.5	1.2	2.0	2.20	1.56	39	1860	2765
185	5.5	1.2	2.0	2.20	1.56	41	2065	3180
240	5.5	1.2	2.0	2.30	1.64	44	2400	3825
300	5.5	1.3	2.5	2.40	1.72	47	2885	4720
400	5.5	1.3	2.5	2.50	1.80	51	3315	5680
500	5.5	1.4	2.5	2.60	1.88	54	3840	6830
630	5.5	1.4	2.5	2.80	2.04	59	4525	8430
800	5.5	1.5	2.5	2.90	2.12	63	5335	10280
1000	5.5	1.6	2.5	3.00	2.20	68	6200	12365

Area	Max D.C. resistance at 20°C		Approx. A.C. resistance at operating temp 90°C		Approx. reactance at 50 Hz	Approx. Capacitance	Current Rating as per IEC 60 502-2						Short circuit rating for 1 Sec.	
							Direct in Ground		In duct		In Air			
	Ohm/km	Ohm/km	Ohm/km	Ohm/km	Ohm/km	μf/km	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	
mm^2	Al	Cu	Al	Cu			Al	Cu	Al	Cu	Al	Cu	Al	Cu
35	0868	0.524	1.113	0.668	0.155	0.150	129	166	122	157	154	198	3.29	5.01
50	0.641	0.387	0.822	0.494	0.148	0.163	152	196	144	186	184	238	4.70	7.15
70	0.443	0.268	0.568	0.342	0.142	0.179	186	239	176	227	230	296	6.58	10.01
95	0.320	0.193	0.411	0.247	0.132	0.200	221	285	210	271	280	361	8.93	13.6
120	0.253	0.153	0.325	0.196	0.127	0.223	252	323	240	308	324	417	11.28	17.2
150	0.206	0.124	0.265	0.159	0.124	0.242	281	361	267	343	368	473	14.1	21.5
185	0.164	0.0991	0.211	0.1275	0.119	0.258	317	406	303	387	424	543	17.4	26.5
240	0.125	0.0754	0.161	0.0976	0.115	0.283	367	469	351	447	502	641	22.6	34.3
300	0.100	0.0601	0.129	0.0785	0.112	0.317	414	526	397	504	577	735	28.2	42.9
400	0.0778	0.0470	0.1014	0.0625	0.108	0.345	470	590	451	564	673	845	37.6	572
500	0.0605	0.0366	0.0797	0.0500	0.104	0.386	533	667	511	638	763	956	47.0	71.5
630	0.0469	0.0286	0.0630	0.0404	0.100	0.426	604	756	580	723	865	1083	59.2	90.1
800	0.0367	0.0221	0.0508	0.0336	0.097	0.473	686	860	659	822	983	1231	75.2	111.4
1000	0.0291	0.0176	0.0420	0.0289	0.094	0.529	776	973	744	930	1111	1393	94.0	143.0

The above data is indicative & may be changed without prior information.
All conductors will be compacted circular shaped
Cables can be supplied in multiples of 500 mtrs or as per customer requirement.

Operating conditions - Amb. air temp. 30° C
Ground temp: 20° C
Depth of laying : 80 cm
Thermal resistivity of soil: 1.50 K-m/W
Thermal resistivity of duct: 1.20 K-m/W

MV CABLES

Table-4B: 12/20 (24) kV Three core XLPE Insulated Screened Armoured cable with Aluminium/Copper conductor Conf. to IEC:60502-2

Area	Thickness of XLPE Insulation	Thickness of Seperation Sheath	Dimension of Armour Wire	Thickness of Outer sheath		Approx. Overall diameter	Approx. Net Wt. of Cable	
mm^2	mm	mm	mm	mm	mm	mm	kg/km	kg/km
	Nom	Nom		Nom	Min		Al	Cu
35	5.5	1.5	2.50	2.80	2.04	57	4775	5435
50	5.5	1.6	2.50	2.90	2.12	60	5245	6110
70	5.5	1.6	2.50	3.10	2.28	64	5350	6645
95	5.5	1.7	2.50	3.20	2.36	68	6575	8340
120	5.5	1.7	3.15	3.30	2.44	73	7975	10190
150	5.5	1.8	3.15	3.40	2.52	76	8610	11350
185	5.5	1.9	3.15	3.60	2.68	80	9520	12900
240	5.5	2.0	3.15	3.70	2.76	87	10950	15265
300	5.5	2.0	3.15	3.90	2.92	92	12190	17755
400	5.5	2.2	3.15	4.10	3.08	100	14035	21215

Area	Max D.C. resistance at 20°C		Approx. A.C. resistance at operating temp 90°C		Approx. reactance at 50 Hz	Approx. Capaci-tance	Current Rating as per IEC 60 502-2						Short circuit rating for 1 Sec.	
							Direct in Ground		In duct		In Air			
	Ohm/km	Ohm/km	Ohm/km	Ohm/km	Ohm/km	µf/km	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	
mm^2	AI	Cu	AI	Cu			AI	Cu	AI	Cu	AI	Cu	AI	Cu
35	0868	0.524	1.113	0.668	0.135	0.150	119	154	104	134	133	172	3.29	5.01
50	0.641	0.387	0.822	0.494	0.128	0.163	140	181	123	158	159	205	4.70	7.15
70	0.443	0.268	0.568	0.342	0.121	0.179	171	220	150	194	196	253	6.58	10.01
95	0.320	0.193	0.411	0.247	0.113	0.200	204	263	180	232	238	307	8.93	13.6
120	0.253	0.153	0.325	0.196	0.108	0.223	232	298	206	264	274	352	11.28	17.2
150	0.206	0.124	0.265	0.159	0.106	0.242	259	332	231	296	309	397	14.1	21.5
185	0.164	0.0991	0.211	0.1278	0.1015	0.258	293	374	262	335	354	453	17.4	26.5
240	0.125	0.0754	0.162	0.0982	0.0983	0.283	338	431	304	387	415	529	22.6	34.3
300	0.100	0.0601	0.130	0.0793	0.0952	0.317	380	482	343	435	472	599	28.2	42.9
400	0.0778	0.0470	0.102	0.0635	0.0915	0.345	432	541	393	492	545	683	37.6	57.2

The above data is indicative & may be changed without prior information.
All conductors will be compacted circular shaped
Cables can be supplied in multiples of 250/500 mtrs or as per customer requirement.

Operating conditions - Amb. air temp. 30° C
Ground temp: 20° C
Depth of laying : 80 cm
Thermal resistivity of soil: 1.50 K-m/W
Thermal resistivity of duct: 1.20 K-m/W

MV CABLES

Table-5A: 18/30 (36) kV Single core XLPE Insulated Screened Armoured cable with Aluminium/Copper conductor Conf. to IEC:60502-2

Area	Thickness of XLPE Insulation	Thickness of Seperation Sheath	Dimension of Armour Wire	Thickness of Outer sheath		Approx. Overall diameter	Approx. Net Wt. of Cable	
mm^2	mm	mm	mm	mm	mm	mm	kg/km	kg/km
	Nom	Nom		Nom	Min		Al	Cu
50	8.0	1.2	2.0	2.20	1.56	38	1625	1910
70	8.0	1.2	2.0	2.20	1.56	39	1770	2200
95	8.0	1.2	2.0	2.30	1.64	41	1960	2540
120	8.0	1.2	2.0	2.30	1.64	43	2120	2850
150	8.0	1.3	2.5	2.40	1.72	45	2460	3365
185	8.0	1.3	2.5	2.50	1.80	48	2705	3825
240	8.0	1.3	2.5	2.50	1.80	50	3055	4480
300	8.0	1.4	2.5	2.60	1.88	53	3415	5250
400	8.0	1.4	2.5	2.70	1.96	56	3875	6240
500	8.0	1.5	2.5	2.80	2.04	60	4465	7450
630	8.0	1.5	2.5	2.90	2.12	64	5125	9035
800	8.0	1.6	2.5	2.10	2.28	69	6000	10945
1000	8.0	1.7	2.5	3.20	2.36	73	6920	13080

Area	Max D.C. resistance at 20°C		Approx. A.C. resistance at operating temp 90°C		Approx. reactance at 50 Hz	Approx. Capaci-tance	Current Rating as per IEC 60 502-2						Short circuit rating for 1 Sec.	
							Direct in Ground		In duct		In Air			
	Ohm/km	Ohm/km	Ohm/km	Ohm/km	Ohm/km	μf/km	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	
mm^2	Al	Cu	Al	Cu			Al	Cu	Al	Cu	Al	Cu	Al	Cu
50	0.641	0.387	0.822	0.494	0.160	0.150	152	196	144	186	184	238	4.70	7.15
70	0.443	0.268	0.568	0.342	0.151	0.163	186	239	176	227	230	296	6.58	10.01
95	0.320	0.193	0.411	0.247	0.144	0.179	221	285	210	271	280	361	8.93	13.6
120	0.253	0.153	0.325	0.196	0.136	0.200	252	232	240	308	324	417	11.28	17.2
150	0.206	0.124	0.265	0.159	0.134	0.223	281	361	267	343	368	473	14.10	21.5
185	0.164	0.0991	0.211	0.1273	0.129	0.242	317	406	303	387	424	543	17.40	26.5
240	0.125	0.0754	0.161	0.0975	0.124	0.258	367	469	351	447	502	641	22.60	34.3
300	0.100	0.0601	0.129	0.0784	0.119	0.283	414	526	397	504	577	735	28.20	42.9
400	0.0778	0.0470	0.1012	0.0623	0.114	0.317	470	590	451	564	673	845	37.60	572
500	0.0605	0.0366	0.0795	0.0497	0.111	0.345	533	667	511	638	763	956	47.00	71.5
630	0.0469	0.0283	0.0627	0.0401	0.106	0.386	604	756	580	723	865	1083	59.20	90.1
800	0.0367	0.0221	0.0505	0.0322	0.102	0.426	686	860	659	822	983	1231	75.20	111.4
1000	0.0291	0.0176	0.0416	0.0284	0.099	0.473	776	973	744	930	1111	1393	94.00	143.0

The above data is indicative & may be changed without prior information.
All conductors will be compacted circular shaped
Cables can be supplied in multiples of 500 mtrs or as per customer requirement.

Operating conditions - Amb. air temp. 30° C
Ground temp: 20° C
Depth of laying : 80 cm
Thermal resistivity of soil: 1.50 K-m/W
Thermal resistivity of duct: 1.20 K-m/W

MV CABLES

Table-5B: 18/30 (36) kV Three core XLPE Insulated Screened Armoured cable with Aluminium/Copper conductor Conf. to IEC:60502-2

Area	Thickness of XLPE Insulation	Thickness of Seperation Sheath	Dimension of Armour Wire	Thickness of Outer sheath		Approx. Overall diameter	Approx. Net Wt. of Cable	
mm^2	mm	mm	mm	mm	mm	mm	kg/km	kg/km
	Nom	Nom		Nom	Min		Al	Cu
50	8.0	1.8	3.15	3.4	2.52	74	7760	8625
70	8.0	1.8	3.15	3.5	2.60	77	8465	9760
95	8.0	1.9	3.15	3.6	2.68	81	9080	10840
120	8.0	2.0	3.15	3.7	2.76	85	9960	12175
150	8.0	2.0	3.15	3.8	2.84	88	10650	13395
185	8.0	2.1	3.15	4	3.00	93	11680	15060
240	8.0	2.2	3.15	4.1	3.08	99	13175	17495
300	8.0	2.3	3.15	4.3	3.24	104	14365	19930
400	8.0	2.4	3.15	4.5	3.40	111	16270	23450

Area	Max D.C. resistance at 20°C		Approx. A.C. resistance at operating temp 90°C		Approx. reactance at 50 Hz	Approx. Capaci-tance	Current Rating as per IEC 60 502-2						Short circuit rating for 1 Sec.	
							Direct in Ground		In duct		In Air			
	Ohm/km	Ohm/km	Ohm/km	Ohm/km	Ohm/km	μf/km	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	
mm^2	Al	Cu	Al	Cu			Al	Cu	Al	Cu	Al	Cu	Al	Cu
50	0.641	0.387	0.822	0.494	0.141	0.150	140	181	123	158	159	205	4.70	7.15
70	0.443	0.268	0.568	0.342	0.133	0.163	171	220	150	194	196	253	6.58	10.01
95	0.320	0.193	0.411	0.247	0.127	0.179	204	263	180	232	238	307	8.93	13.60
120	0.253	0.153	0.325	0.196	0.119	0.200	232	298	206	264	274	352	11.28	17.20
150	0.206	0.124	0.265	0.159	0.116	0.223	259	332	231	296	309	397	14.10	21.50
185	0.164	0.0991	0.211	0.1276	0.1114	0.242	293	374	262	335	354	453	17.40	26.50
240	0.125	0.0754	0.162	0.0979	0.1082	0.258	338	431	304	387	415	529	22.60	34.30
300	0.100	0.0601	0.130	0.0789	0.1038	0.283	380	482	342	435	472	599	28.20	42.90
400	0.0778	0.047	0.1017	0.0630	0.0994	0.317	432	541	393	492	545	683	37.60	57.20

The above data is indicative & may be changed without prior information.
All conductors will be compacted circular shaped
Cables can be supplied in multiples of 250/500 mtrs or as per customer requirement.

Operating conditions - Amb. air temp. 30° C
Ground temp: 20° C
Depth of laying : 80 cm
Thermal resistivity of soil: 1.50 K-m/W
Thermal resistivity of duct: 1.20 K-m/W

MV CABLES

Group Rating Factors for Circuits for Three Single Core Cables in Trefoil formation

Table 6A: Horizontal Formation laid Direct in Ground

No. of Circuits in group	Spacing between Trefoil group centres (cm)			
	Touching	20	40	60
2	0.85	0.88	0.92	0.94
3	0.75	0.8	0.85	0.88
4	0.69	0.75	0.82	0.86
5	0.65	0.72	0.79	0.84
6	0.62	0.69	0.77	0.83

Table 6B: Cables Laid in Air on Preforated trays with 2D apart from other Trefoil group.

No. of Trays	No. of 3 phase circuits		
	1	2	3
1	1	0.98	0.96
2	0.97	0.93	0.89
3	0.96	0.92	0.86

Group Rating Factors for Circuits for Multi-core Cables

Table 7A: Cables laid on perforated trays touching each other.

No. of Cable trays	Number of cables				
	2	3	4	6	9
1	0.88	0.82	0.79	0.76	0.73
2	0.87	0.8	0.77	0.73	0.68
3	0.86	0.79	0.76	0.71	0.66

Table 7B: Cables laid on perforated trays exposed to air, the cables paced by one cable diameter.

No. of Cable Trays	Number of cables per Rack			
	2	3	6	9
1	1	0.98	0.95	0.91
2	0.99	0.96	0.92	0.87
3	0.98	0.95	0.91	0.85

Table 7C: D) Cables laid Direct in Ground in horizontal formation

No. of circuits in group	Spacing of cables (cm)			
	Touching	20	40	60
2	0.8	0.86	0.9	0.92
3	0.69	0.77	0.82	0.86
4	0.62	0.72	0.79	0.83
5	0.57	0.68	0.76	0.81
6	0.54	0.65	0.74	0.8

Table 8: Recommended Minimum bending Radius.

Type of Cable	During Installation	During Termination
(A) SINGLE CORE		
Unarmoured	20 x D	15 X D
Armoured	15 X D	12 X D
(B) THREE CORE		
Unarmoured	15 x D	12 X D

Table 9: D.C. Test Voltage after Installation.*

Voltage Grade kV	D.C. Voltage kV
3.6/6	15
(06/10)	25
8.7/15	37
(12/20)	50
18/30	76

Table 10: Rating factor for variation in laying in Dept. Of laying in ground.

Dept. of laying (cm)	50	60	100	125	150	175	200	250	300
Single core <=185 mm^2	1.04	1.02	0.98	0.96	0.95	0.94	0.93	0.91	0.90
Single core >=185 mm^2	1.06	1.06	0.97	0.95	0.93	0.91	0.90	0.88	0.86
Three core cables	1.04	1.03	0.98	0.96	0.95	0.94	0.93	0.91	0.90

Table 11: Rating Factors for Variation in Ambient Air Temperature

Air Temp. ^{0} C	20	25	30	35	40	45	50	55	60
Rating Factor	1.08	1.04	1	0.96	0.91	0.9	0.82	0.76	0.71

Cable 12: Rating Factors for Variation in Ground Temperature

Group Temp.^{0}C	10	15	20	25	30	35	40	45	50
Rating Factor	1.07	1.04	1	1	0.93	0.89	0.85	0.8	0.76

Table 13: Rating factors for variation in thermal resistivity of soil (multicore cables laid direct in the ground)

Nominal area of conductor mm^2	For values of thermal resistivity of soil in K-m/W					
	0.8	0.9	1	2	2.5	3
25	1.2	1.16	1.13	0.91	0.84	0.78
35	1.21	1.17	1.13	0.91	0.83	0.78
50	1.21	1.17	1.14	0.91	0.83	0.77
70	1.21	1.18	1.14	0.9	0.83	0.77
95	1.22	1.18	1.14	0.9	0.83	0.77
120	1.22	1.18	1.14	0.9	0.83	0.77
150	1.22	1.18	1.15	0.9	0.83	0.77
185	1.23	1.18	1.15	0.9	0.83	0.77
240	1.23	1.19	1.15	0.9	0.83	0.77
300	1.23	1.19	1.15	0.9	0.82	0.77
400	1.23	1.19	1.15	0.9	0.82	0.76

Table 14: Rating factors for variation in thermal resistivity of soil three single core cables laid direct in the ground (three cables in trefoil touching)

Nominal area of conductor mm^2	For values of thermal resistivity of soil in K-m/W					
	0.8	0.9	1	2	2.5	3
25	1.25	1.2	1.16	0.89	0.81	0.75
35	1.25	1.21	1.16	0.89	0.81	0.75
50	1.26	1.21	1.16	0.89	0.81	0.74
70	1.27	1.22	1.17	0.89	0.81	0.74
95	1.28	1.22	1.18	0.89	0.8	0.74
120	1.28	1.22	1.18	0.88	0.8	0.74
150	1.28	1.23	1.18	0.88	0.8	0.74
185	1.29	1.23	1.18	0.88	0.8	0.74
240	1.29	1.23	1.18	0.88	0.8	0.73
300	1.3	1.24	1.19	0.88	0.8	0.73
400	1.3	1.24	1.19	0.88	0.79	0.73