

UNISTAR[®]

LOW VOLTAGE CABLES

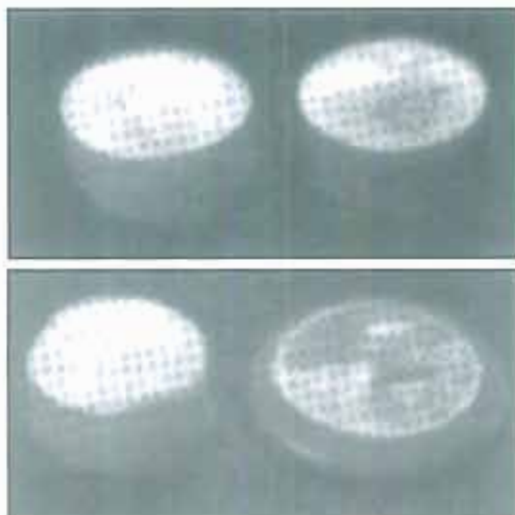


UNIVERSAL CABLES LIMITED

WHY XLPE CABLE ?

Thermoplastic power cable (i.e. PVC Power Cable) ever since its introduction in low tension distribution network in mid-sixties failed to satisfy utilities and industrial users because of its many inherent limitations such as low power rating, poor emergency overload capacity, poor resistance to surge currents, thermoplastic nature, comparatively poor insulation resistance, shorter life with susceptibility to thermal degradation, and though claimed to be moisture resistant absorbed considerable amount of moisture on long time exposure to lower the dielectric properties alarmingly. Utilities voiced their grievances in many forums against thermoplastic cable which they were forced to use because of ban imposed by the Government on use of PILC cable in distribution network due to high import content of this cable.

M/s Universal Cables Ltd. decided to introduce XLPE Cable for Medium and Low voltage distribution network to provide utilities and industrial users a cable which combines the advantages of PILC and PVC Cables totally eliminating their demerits. Total installed cost of this cable is also much lower than that of PILC or PVC Power Cable. This cable is totally indigenous as 'XLPE' compound is now being manufactured by UNIVERSAL CABLES LTD. in their newly installed modern microprocessor controlled compounding plant.



In fact 1.1 kv XLPE cable is the most economic solution for low tension power distribution with high efficiency and total reliability. Utilities and Industrial users will find in this cable a realisation of their long elusive dream of an ideal cable for low tension power distribution system.

ADVANTAGES

Advantages of XLPE cable as compared to

thermoplastic cable are listed below:

- * Higher Power rating.
- * Higher emergency overload rating.
- * Higher short circuit rating.
- * Higher insulation resistance (1000 times more than that of PVC).
- * Higher resistance to moisture (100 times more than that of PVC).
- * Capacity to withstand localised hot spot temperature (very important for industrial wiring in steel plant, power stations etc.)
- * Resistant to chemicals and corrosive gases etc. - hence suitable for installation in polluted atmosphere..
- * Resistant to vibration, impact, etc. - no hazard of hot deformation.
- * Quick method of jointing and termination with simple, non-expensive accessories.
- * Better resistance to surge currents.
- * Longer cable life.

SPECIFICATIONS

These cables are manufactured and tested as per national/international standards and also as per specific requirement of customer. Dimension of cables conforming to IS:7098/ (Part-1)/1988 are given in table 4 to 12.

CONSTRUCTIONAL DETAILS

Conductor: Copper or Aluminium conductor conforming to IS: 8130/1984 - solid circular, stranded circular, compacted circular, stranded shaped

Insulation: Crosslinked polyethylene (XLPE).

Inner sheath: Unvulcanised rubber or Thermo-Plastic Material compatible with thermal rating of insulation.

Armour: Galvanized steel wires/Flat strips

Outer sheath: PVC.

NOTE :- For cables with improved Fire performance the sheath shall be specially formulated to meet the requirement of Flame Retardance (FR) or Flame Retardance with reduced halogen evolution and smoke categories (FRLS).

CURRENT RATINGS

Comparative data for current ratings and voltage drop/amp/m for 1.1 kv XLPE and PVC power cables are given in Table - 13 under standard conditions. From this it will be observed that for equivalent power rating one size lower 1.1 kv XLPE cable may be used as substitute for PVC cable provided slightly higher voltage drop can be tolerated. Current ratings, short circuit rating and

rating factors for 1.1 kv XLPE cable are given in Table 14 to 22.

	XLPE CABLE	PVC CABLE	PVC CABLE
High continuous loading			
High ambient temperature			
High peak loads			
High short circuit currents			
Low dielectric losses			
Low weight, quick installation			
Compact terminations			
Particularly well suited for submarine use			
Unaffected by vibration and subsidence			
Suitable for great differences in heights			

JOINTING AND TERMINATION

No special skill is required for jointing and termination of 1.1 kv XLPE cable. For jointing and termination any of the following standard methods may be employed:

- (I) Cast resin jointing and termination with cast polyurethane compound.
- (II) Heat shrinkable joints and termination.

Method (I) and (II) are the preferred techniques. Accessories needed for Jointing and Termination are simple and readily available from standard manufacturers.

EMERGENCY OVERLOADING

Cables can be overloaded up to max conductor temperature for 130 degree C for a duration of max 100 hours in any Twelve consecutive months, and max. 500 hours during the life time of cable.

APPLICATIONS

Besides being ideal for general purpose distribution 1.1 kv XLPE cable will be specially advantageous for use in steel plants, power station wiring, chemical plant wiring, under water wiring, wiring for mines, etc.

NOTE OF CAUTION

Do not use PVC sheathed cables where it is likely to come in contact with sulphuric acid, highly chlorinated hydro carbon cresylic acids, pyridine, ketones & caprolactum.

TECHNICAL ADVICE

We welcome enquiries on cable engineering problems and get them solved for you through our design and development staff and assist you in providing even design for cables to suit your particular requirement

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TABLE 1

CONDUCTOR DATA

Copper & Aluminium conductor for single core & multicore cables conforming to IS-8130-1984

Nominal cross section area	Minimum number of wires in the conductor				Maximum d.c. resistance of conductor at 20° C	
	Stranded Conductor (class 2)				Plain copper conductor	Aluminium Conductor
	Circular conductor (non-compacted)		Circular Compacted or Shaped Conductor			
mm ²	Cu	Al	Cu	Al	ohm/km	ohm/km
1.5	3	-	-	-	12.1	-
2.5	3	-	-	-	7.41	-
4	7	3	-	-	4.61	7.41
6	7	3	-	-	3.08	4.61
10	7	7	5	-	1.83	3.08
16	7	7	5	6	1.15	1.91
25	7	7	5	6	0.727	1.20
35	7	7	5	6	0.524	0.868
50	19	19	5	6	0.387	0.641
70	19	19	12	12	0.268	0.443
95	19	19	15	15	0.193	0.320
120	37	37	18	15	0.153	0.253
150	37	37	18	15	0.124	0.206
185	37	37	30	30	0.0991	0.164
240	61	37	34	30	0.0754	0.125
300	61	61	34	30	0.0601	0.100
400	61	61	53	53	0.0470	0.0778
500	61	61	53	53	0.0366	0.0605
630	91	91	53	53	0.0283	0.0469
800	91	91	53	53	0.0221	0.0367
1000	91	91	53	53	0.0176	0.0291

TABLE 2
REACTANCE

Approximate reactance at 50 Hz (ohms/km) 1.1 kv XLPE cables

Nominal Area of Conductor (sq. mm)	Single Core		Multicore
	Unarmoured	Armoured	
1.5	0.155	-	0.107
2.5	0.142	-	0.0985
4	0.132	-	0.0927
6	0.123	-	0.0884
10	0.114	0.134	0.0837
16	0.108	0.125	0.0808
25	0.103	0.120	0.0805
35	0.0986	0.114	0.0783
50	0.0937	0.108	0.0750
70	0.0900	0.102	0.0740
95	0.0865	0.100	0.0724
120	0.0841	0.0968	0.0712
150	0.0839	0.0941	0.0716
185	0.0836	0.0932	0.0718
240	0.0813	0.0900	0.0710
300	0.0795	0.0881	0.0705
400	0.0787	0.0873	0.0704
500	0.0779	0.0859	0.0702
630	0.0765	0.0843	0.0698
800	0.0755	0.0826	-
1000	0.0752	0.0829	-

TABLE 3
CAPACITANCE

Approximate capacitance (Microfarads/km) 1.1 kv XLPE cables

Nominal area of conductor (sq. mm)	Single core		Two core	Three, Three & half and four core
	Unarmoured	Armoured		
1.5	0.19	-	0.051	0.15
2.5	0.24	-	0.058	0.18
4	0.29	-	0.065	0.22
6	0.34	-	0.071	0.25
10	0.43	0.32	0.081	0.31
16	0.51	0.38	0.088	0.36
25	0.49	0.38	0.089	0.41
35	0.57	0.44	0.096	0.47
50	0.58	0.46	0.098	0.50
70	0.63	0.51	0.10	0.53
95	0.73	0.59	0.11	0.61
120	0.74	0.61	0.11	0.63
150	0.73	0.61	0.11	0.60
185	0.69	0.59	0.11	0.60
240	0.74	0.64	0.11	0.63
300	0.80	0.69	0.12	0.67
400	0.83	0.70	0.12	0.67
500	0.83	0.71	0.12	0.69
630	0.87	0.75	0.11	0.73
800	0.92	0.78	-	-
1000	0.94	0.81	-	-

DIMENSIONS & WEIGHTS

*Unistar 1.1 Kv Single Core XLPE insulated unarmoured & armoured cable with Aluminium Conductor conforming to IS:7098/Part-1/88.

Nominal area of conductor	Form of Conductor	UNARMOURED				Nominal thickness of XLPE insulation of armoured Cable	ROUND WIRE ARMoured				FLAT STRIP ARMoured				Normal delivery length (m)
		Nominal thickness of insulation	Nominal thickness of Outer sheath	Approx overall diameter of cable	Approx. weight of cable		Nominal diameter of round wire	Minimum thickness of outersheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal dimension of flat strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	
(mm ²)		(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)		
4	Solid circular	0.7	1.8	8.0	62	-	-	-	-	-	-	-	-	500	
4	Stranded circular	0.7	1.8	8.5	67	-	-	-	-	-	-	-	-	..	
6	Solid circular	0.7	1.8	8.5	74	-	-	-	-	-	-	-	-	..	
6	Stranded circular	0.7	1.8	9.0	79	-	-	-	-	-	-	-	-	..	
10	Solid circular	0.7	1.8	9.0	90	1.0	1.4	1.24	12.0	158	-	-	-	..	
10	Stranded circular	0.7	1.8	9.5	96	1.0	1.4	1.24	12.0	168	-	-	-	..	
16	Compacted circular	0.7	1.8	10.5	119	1.0	1.4	1.24	13.0	195	-	-	-	..	
25	..	0.9	1.8	12.0	162	1.2	1.4	..	14.5	255	-	-	-	..	
35	..	0.9	1.8	13.0	198	1.2	1.4	..	15.5	298	-	-	-	..	
50	..	1.0	1.8	14.5	247	1.3	1.4	..	17.0	354	-	-	-	..	
70	..	1.1	1.8	16.0	325	1.4	1.4	..	19.0	448	-	-	-	..	
95	..	1.1	1.8	18.5	417	1.4	1.6	1.4	21.5	594	4.0 x 0.8	1.4	20.0	518	
120	..	1.2	1.8	19.5	499	1.5	1.6	..	23.0	694	..	..	21.5	611
150	..	1.4	2.0	22.0	620	1.7	1.6	..	25.0	812	..	..	23.0	720
185	..	1.6	2.0	24.0	755	1.9	1.6	..	27.0	962	..	..	25.5	863
240	..	1.7	2.0	26.5	942	2.0	1.6	..	29.5	1175	..	..	27.5	1065
300	..	1.8	2.0	28.5	1136	2.1	1.6	1.56	32.0	1409	..	1.56	30.5	1299	
400	..	2.0	2.2	32.5	1451	2.4	2.0	..	36.5	1826	..	..	34.0	1612
500	..	2.2	2.2	36.0	1809	2.6	2.0	..	40.0	2227	..	..	37.5	1987
630	..	2.6	2.2	40.0	2273	2.8	2.0	1.72	44.0	2767	..	1.72	42.0	2498	
800	..	2.6	2.4	45.0	2869	3.1	2.0	1.88	49.5	3431	..	..	46.5	3096
1000	..	2.8	2.6	50.0	3572	3.3	2.5	2.04	55.0	4344	..	1.88	51.0	3819	

DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv Two Core XLPE insulated unarmoured & armoured cable with Aluminium Conductor conforming to IS-7098/Part-1/88.

Nominal area of conductor	Form of Conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMoured			ROUND WIRE ARMoured				FLAT STRIP ARMoured				Normal delivery length (m)
				Nominal thickness of Outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of round wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal dimension of flat strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	
(mm ²)		(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
4	Solid circular	0.7	0.3	1.8	13.0	171	1.4	1.24	14.5	409	-	-	-	-	500
4	Stranded circular	..	..	..	14.0	195	..	..	16.0	456	-	-	-	-	..
6	Solid circular	..	..	..	14.0	210	..	..	16.0	470	-	-	-	-	..
6	Stranded circular	..	..	..	15.0	227	..	..	17.0	512	-	-	-	-	..
10	Solid circular	..	..	..	15.5	260	..	..	17.5	556	-	-	-	-	..
10	Stranded circular	..	..	..	16.5	284	..	..	18.5	605	-	-	-	-	..
16	Compacted circular	..	..	..	18.5	353	..	1.40	20.5	724	-	-	-	-	..
25	Stranded shaped	0.9	..	2.0	19.5	366	1.6	..	21.5	803	4.0 x 0.8	1.4	19.5	608	..
35	..	0.9	..	..	20.5	432	..	..	22.5	900	..	..	20.5	672	..
50	..	1.0	..	..	23.0	548	..	..	25.0	1077	..	..	23.5	836	..
70	..	1.1	..	..	25.5	708	..	1.56	28.0	1338	..	..	26.5	1063	..
95	..	1.1	0.4	2.2	29.0	991	2.0	..	32.0	1901	..	1.56	29.5	1370	..
120	..	1.2	..	..	31.0	1172	..	..	33.5	2130	..	..	31.5	1600	..
150	..	1.4	..	..	34.5	1416	..	1.72	38.0	2527	..	1.72	35.5	1919	..
185	..	1.6	0.5	2.4	39.0	1789	..	1.88	42.0	3024	..	..	39.0	2305	..
240	..	1.7	..	2.6	43.0	2254	2.5	2.04	47.0	3990	..	1.88	43.0	2813	..
300	..	1.8	0.6	2.8	46.5	2731	..	2.20	50.5	4584	..	2.04	46.5	3330	..
400	..	2.0	..	3.0	54.0	3459	..	2.36	57.5	5624	..	2.36	54.0	4213	..
500	..	2.2	0.7	3.4	60.5	4384	3.15	2.68	65.5	7449	..	2.52	60.5	5176	..
630	..	2.4	..	3.6	67.5	5479	..	2.84	72.5	8909	..	2.68	67.5	6347	..

TABLE 5

DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv Three Core XLPE insulated unarmoured & armoured cable with Aluminum Conductor conforming to IS:7098/Part-1/88.

Nominal area of conductor	Form of Conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMOURED			ROUND WIRE ARMoured				FLAT STRIP ARMoured				Normal delivery length (m)
				Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of round wire	Minimum thickness of outersheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal dimension of flat strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	
(mm ²)		(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
4	Solid circular	0.7	0.3	..	13.5	190	1.4	1.24	15.5	439	-	-	-	-	500
4	Stranded circular	..	..	..	15.0	215	..	..	16.5	500	-	-	-	-	..
6	Solid circular	..	..	..	15.0	235	..	..	16.5	521	-	-	-	-	..
6	Stranded circular	..	..	..	16.0	253	..	..	17.5	549	-	-	-	-	..
10	Solid circular	..	..	..	16.5	294	..	..	18.0	615	-	-	-	-	..
10	Stranded circular	..	..	..	17.5	319	..	..	19.0	662	-	-	-	-	..
16	Stranded shaped	..	..	..	17.5	320	1.6	1.4	20.0	742	4.0 x 0.8	1.24	18.0	538	..
25	..	0.9	..	2.0	20.5	463	..	..	22.5	947	..	1.4	21.0	727	..
35	..	..	..	..	22.5	570	..	..	24.5	1099	..	..	23.0	858	..
50	..	1.0	..	..	25.5	716	..	1.56	27.5	1330	..	..	25.5	1052	..
70	..	1.1	0.4	2.2	29.0	986	2.0	..	31.5	1871	..	1.56	29.5	1366	..
95	..	..	..	..	32.5	1261	..	..	35.0	2267	..	..	32.5	1713	..
120	..	1.2	..	..	35.0	1515	..	1.72	38.0	2625	..	..	35.0	1988	..
150	..	1.4	0.5	2.4	39.0	1881	..	1.88	42.0	3141	..	1.72	39.5	2396	..
185	..	1.6	..	2.6	43.5	2335	2.5	2.04	47.5	4111	..	1.88	43.5	2919	..
240	..	1.7	0.6	2.8	48.5	2973	..	2.20	52.5	4944	..	2.04	48.5	3620	..
300	..	1.8	..	3.0	53.0	3627	..	2.36	57.0	5793	..	2.2	53.5	4339	..
400	..	2.0	0.7	3.2	60.0	4607	3.15	2.68	65.5	7790	..	2.52	60.5	5452	..
500	..	2.2	..	3.6	68.0	5860	..	2.84	73.0	9354	..	2.68	68.0	6754	..
630	..	2.4	..	3.8	76.5	7399	4.0	3.0	83.0	12440	..	2.84	76.0	8390	250

DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv Three and half Core XLPE insulated unarmoured & armoured cable with Aluminum Conductor conforming to IS:7098/Part-1/88.

Nominal area of conductor		Nominal thickness of insulation		Minimum thickness of inner sheath	UNARMOURED			ROUND WIRE ARMoured				FLAT STRIP ARMoured				Normal delivery length (m)
Power core	Neutral core	Power core	Neutral core		Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of round wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal dimension of flat strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	
(mm ²)	(mm ²)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
25	16	0.9	0.7	0.3	2.0	22.5	537	1.6	1.4	24.5	1067	4.0x0.8	1.40	23.0	826	500
35	16	0.9	0.7	0.3	..	24.5	647	..	..	26.5	1223	..	..	25.0	957	..
50	25	1.0	0.9	0.3	..	27.5	831	..	1.56	29.5	1508	..	..	27.5	1189	..
70	35	1.1	0.9	0.4	2.2	32.0	1142	2.0	1.56	35.0	2123	..	1.56	32.5	1568	..
95	50	1.1	1.0	0.4	..	34.5	1452	..	1.56	37.5	2532	..	..	35.0	1926	..
120	70	1.2	1.1	0.4	..	38.0	1785	..	1.72	41.0	3021	..	1.72	38.5	2336	..
150	70	1.4	1.1	0.5	2.4	43.0	2167	..	1.88	46.0	3553	..	..	43.5	2755	..
185	95	1.6	1.1	0.5	2.6	46.5	2683	2.5	2.04	50.5	4575	..	1.88	47.0	3312	..
240	120	1.7	1.2	0.6	2.8	53.0	3430	..	2.20	57.0	5597	..	2.04	53.0	4146	..
300	150	1.8	1.4	0.6	3.0	58.5	4199	..	2.36	62.5	6600	..	2.20	58.5	4977	..
400	185	2.0	1.6	0.7	3.4	65.5	5348	3.15	2.68	70.5	8725	..	2.52	65.5	6205	..
500	240	2.2	1.7	0.7	3.6	74.5	6772	..	2.84	79.5	10639	..	2.68	74.5	7753	250
630	300	2.4	1.8	0.7	4.0	84.5	8585	4.0	3.0	90.5	14052	..	3.0	84.0	9670	..

TABLE 7

DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv Four Core XLPE insulated unarmoured & armoured cable with Aluminum Conductor conforming to IS:7098/Part-1/88.

Nominal area of conductor	Form of Conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMOURED			ROUND WIRE ARMoured				FLAT STRIP ARMoured				Normal delivery length (m)
				Nominal thickness of outersheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of round wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal dimension of flat strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	
(mm ²)		(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
4	Solid circular	0.7	0.3	1.8	14.5	221	1.4	1.24	16.5	494	-	-	-	-	500
4	Stranded circular	..	..	..	16.0	248	..	..	17.5	557	-	-	-	-	..
6	Solid circular	..	..	..	16.0	277	..	..	18.0	585	-	-	-	-	..
6	Stranded circular	..	..	..	17.0	296	..	..	19.0	628	-	-	-	-	..
10	Solid circular	..	..	..	18.5	348	..	1.4	20.0	707	-	-	-	-	..
10	Stranded circular	..	..	..	19.0	376	..	..	21.0	772	-	-	-	-	..
16	Stranded shaped	..	..	..	20.0	401	1.6	..	22.0	886	4.0 x 0.8	1.40	20.5	658	..
25	..	0.9	..	2.0	23.5	581	..	..	25.5	1126	..	..	23.5	893	..
35	..	..	..	..	25.5	712	..	..	27.0	1304	..	..	25.5	1047	..
50	..	1.0	..	..	28.5	911	..	1.56	31.0	1620	..	1.56	29.0	1316	..
70	..	1.1	0.4	2.2	33.0	1260	2.0	..	36.0	2291	..	..	33.5	1711	..
95	..	..	..	..	36.0	1612	..	1.72	39.5	2772	..	..	36.5	2082	..
120	..	1.2	0.5	2.4	40.5	2017	..	1.88	43.5	3328	..	1.72	41.0	2557	..
150	..	1.4	..	2.6	45.0	2472	2.5	2.04	49.0	4326	..	1.88	45.5	3078	..
185	..	1.6	..	2.8	50.5	3071	..	2.20	54.0	5121	..	2.04	50.5	3739	..
240	..	1.7	0.6	3.0	56.0	3902	..	2.36	60.0	6185	..	2.20	56.0	4659	..
300	..	1.8	0.7	3.2	62.5	4811	3.15	2.52	67.5	8071	..	2.36	62.5	5655	..
400	..	2.0	..	3.6	70.0	6096	..	2.84	75.0	9650	..	2.68	70.0	7011	..
500	..	2.2	..	3.8	78.5	7684	4.0	3.00	85.0	12926	..	2.84	78.5	8721	250
630	..	2.4	..	4.0	89.0	9710	..	..	97.0	15579	..	3.00	88.5	10861	..

DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv 1.5 sq. mm. (Solid) XLPE insulated unarmoured & armoured Multicore Control cable with Copper Conductor conforming to IS:7098/Part-1'88.

Number of Cores	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMOURED			ROUND WIRE ARMoured				FLAT STRIP ARMoured				Normal delivery length (m)
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of round wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal dimension of flat strip	Minimum thickness of outersheath	Approx. overall diameter of cable	Approx. weight of cable	
(no.)	(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
2	0.7	0.3	1.8	11.0	140	1.4	1.24	13.0	331	-	-	-	-	500
3	"	"	"	11.5	160	"	"	13.5	362	-	-	-	-	"
4	"	"	"	12.5	186	"	"	14.0	412	-	-	-	-	"
5	"	"	"	13.0	215	"	"	15.0	453	-	-	-	-	"
6	"	"	"	14.0	232	"	"	16.0	493	-	-	-	-	"
7	"	"	"	14.0	240	"	"	16.0	501	-	-	-	-	"
8	"	"	"	15.0	273	"	"	17.0	558	-	-	-	-	"
9	"	"	"	16.0	306	"	"	18.0	615	-	-	-	-	"
10	"	"	"	17.0	324	"	"	19.0	656	-	-	-	-	"
12	"	"	"	17.5	364	"	"	19.0	708	-	-	-	-	"
14	"	"	"	18.5	407	"	1.4	20.5	778	-	-	-	-	"
16	"	"	"	19.0	454	1.6	"	21.5	908	4.0 x 0.8	1.4	20.0	712	"
19	"	"	"	20.0	513	"	"	22.5	982	"	"	21.0	770	"
21	"	"	2.0	21.5	581	"	"	23.5	1064	"	"	22.0	845	"
24	"	"	"	23.5	650	"	"	25.5	1178	"	"	23.5	937	"
27	"	"	"	24.0	709	"	"	26.0	1254	"	"	24.0	1021	"
30	"	"	"	24.5	770	"	"	26.5	1331	"	"	25.0	1081	"
33	"	"	"	25.5	836	"	"	27.5	1428	"	"	26.0	1172	"
37	"	"	"	26.0	912	"	"	28.0	1519	"	"	26.5	1246	"
44	"	"	"	29.0	1068	"	1.56	31.5	1778	"	"	29.5	1450	"
52	"	"	"	30.5	1222	"	"	33.0	1963	"	1.56	31.0	1652	"
61	"	0.4	2.2	32.5	1440	2.0	"	35.5	2422	"	"	33.0	1867	"

DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv 1.5 sq. mm. (Stranded) XLPE insulated unarmoured & armoured Multicore Control cable with Copper Conductor conforming to IS:7098/Part-1/88.

Number of Cores	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMOURED			ROUND WIRE ARMOURED				FLAT STRIP ARMOURED				Normal delivery length (m)
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of round wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal dimension of flat strip	Minimum thickness of outersheath	Approx. overall diameter of cable	Approx. weight of cable	
(no.)	(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
2	0.7	0.3	1.8	11.5	149	1.4	1.24	13.5	351	-	-	-	-	500
3	"	"	"	12.0	170	"	"	14.0	383	-	-	-	-	"
4	"	"	"	13.0	199	"	"	14.5	437	-	-	-	-	"
5	"	"	"	14.0	232	"	"	15.5	494	-	-	-	-	"
6	"	"	"	15.0	247	"	"	16.5	520	-	-	-	-	"
7	"	"	"	15.0	256	"	"	16.5	529	-	-	-	-	"
8	"	"	"	16.0	292	"	"	17.5	588	-	-	-	-	"
9	"	"	"	17.0	327	"	"	18.5	647	-	-	-	-	"
10	"	"	"	18.0	345	"	"	19.5	688	-	-	-	-	"
12	"	"	"	18.5	388	"	"	20.0	743	-	-	-	-	"
14	"	"	"	19.0	435	"	1.4	21.0	831	-	-	-	-	"
16	"	"	"	20.0	485	1.6	"	22.5	971	4.0 x 0.8	1.4	21.0	742	"
19	"	"	"	21.0	548	"	"	23.5	1049	"	"	22.0	830	"
21	"	"	2.0	22.5	620	"	"	24.5	1135	"	"	23.0	909	"
24	"	"	"	24.5	696	"	"	26.5	1272	"	"	25.0	1007	"
27	"	"	"	25.0	757	"	"	27.0	1333	"	"	25.5	1067	"
30	"	"	"	26.0	823	"	"	28.0	1430	"	"	26.5	1157	"
33	"	"	"	27.0	894	"	"	29.0	1517	"	"	27.0	1254	"
37	"	"	"	27.5	975	"	"	29.5	1629	"	"	28.0	1333	"
44	"	"	"	31.0	1143	"	1.56	33.0	1900	"	1.56	31.0	1548	"
52	"	"	"	32.0	1308	"	"	34.5	2097	"	1.56	33.0	1763	"
61	"	0.4	2.2	34.5	1543	2.0	"	37.5	2598	"	"	35.0	2018	"

DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv 2.5 sq. mm. (Solid) XLPE insulated unarmoured & armoured Multicore Control cable with Copper Conductor conforming to IS:7098/Part-1/88.

Number of Cores	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMOURED			ROUND WIRE ARMOURED				FLAT STRIP ARMOURED				Normal delivery length (m)
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of round wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	
(no.)	(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
2	0.7	0.3	1.8	12.0	173	1.4	1.24	13.5	387	-	-	-	-	500
3	"	"	"	12.5	203	"	"	14.5	429	-	-	-	-	"
4	"	"	"	13.5	241	"	"	15.0	490	-	-	-	-	"
5	"	"	"	14.5	283	"	"	16.0	557	-	-	-	-	"
6	"	"	"	15.5	307	"	"	17.0	592	-	-	-	-	"
7	"	"	"	15.5	322	"	"	17.0	607	-	-	-	-	"
8	"	"	"	16.5	368	"	"	18.0	689	-	-	-	-	"
9	"	"	"	17.5	413	"	1.4	19.5	772	-	-	-	-	"
10	"	"	"	18.5	438	1.6	"	21.0	891	4.0 x 0.8	1.24	19.0	654	"
12	"	"	"	19.0	498	"	"	21.5	952	"	1.4	20.0	756	"
14	"	"	"	20.0	562	"	"	22.5	1048	"	"	21.0	819	"
16	"	"	2.0	21.5	650	"	"	23.5	1133	"	"	22.0	914	"
19	"	"	"	22.5	738	"	"	24.5	1253	"	"	23.0	1027	"
21	"	"	"	23.5	812	"	"	25.5	1357	"	"	24.0	1098	"
24	"	"	"	25.5	913	"	"	27.5	1521	"	"	26.0	1247	"
27	"	"	"	26.5	999	"	"	28.5	1606	"	"	26.5	1333	"
30	"	"	"	27.0	1093	"	"	29.0	1731	"	"	27.5	1452	"
33	"	"	"	28.0	1189	"	1.56	30.5	1883	"	"	28.5	1572	"
37	"	"	2.0	29.0	1305	"	"	31.5	2014	"	"	29.5	1686	"
44	"	0.4	2.2	33.0	1576	2.0	"	36.0	2583	"	1.56	33.5	2028	"
52	"	"	"	34.5	1811	"	"	37.0	2867	"	1.56	35.0	2287	"
61	"	"	"	36.5	2081	"	"	39.0	3185	"	"	36.5	2580	"

TABLE 11

DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv 2.5 sq. mm. (Stranded) XLPE insulated unarmoured & armoured Multicore Control cable with Copper Conductor conforming to IS:7098/Part-1/88.

Number of Cores	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMOURED			ROUND WIRE ARMOURED				FLAT STRIP ARMOURED				Normal delivery length (m)
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of round wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal dimension of flat strip	Minimum thickness of outersheath	Approx. overall diameter of cable	Approx. weight of cable	
(no.)	(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
2	0.7	0.3	1.8	12.5	182	1.4	1.24	14.0	408	-	-	-	-	500
3	"	"	"	13.0	213	"	"	15.0	451	-	-	-	-	"
4	"	"	"	14.0	253	"	"	15.5	514	-	-	-	-	"
5	"	"	"	15.0	298	"	"	16.5	583	-	-	-	-	"
6	"	"	"	16.0	319	"	"	18.0	628	-	-	-	-	"
7	"	"	"	16.0	334	"	"	18.0	643	-	-	-	-	"
8	"	"	"	17.0	383	"	"	19.0	714	-	-	-	-	"
9	"	"	"	18.5	431	"	1.4	20.5	803	-	-	-	-	"
10	"	"	"	19.5	456	1.6	"	22.0	925	4.0 x 0.8	1.24	20.0	697	"
12	"	"	"	20.0	518	"	"	22.5	1004	"	1.4	21.0	775	"
14	"	"	"	21.0	585	"	"	23.5	1086	"	"	22.0	867	"
16	"	"	2.0	22.5	675	"	"	24.5	1190	"	"	23.0	964	"
19	"	"	"	23.5	767	"	"	25.5	1312	"	"	24.0	1054	"
21	"	"	"	25.0	843	"	"	27.0	1420	"	"	25.0	1154	"
24	"	"	"	27.0	947	"	"	29.0	1585	"	"	27.5	1306	"
27	"	"	"	27.5	1038	"	"	29.5	1692	"	"	28.0	1397	"
30	"	"	"	28.5	1133	"	"	30.5	1802	"	"	29.0	1515	"
33	"	"	"	29.5	1235	"	1.56	32.0	1960	"	"	30.0	1616	"
37	"	"	"	30.0	1352	"	"	33.0	2110	"	"	31.0	1758	"
44	"	0.4	2.2	35.0	1635	2.0	"	37.5	2690	"	1.56	35.0	2110	"
52	"	"	"	36.5	1878	"	"	39.0	2983	"	"	36.5	2378	"
61	"	"	"	38.5	2158	"	"	41.0	3336	"	"	39.0	2653	"

Note: Normal delivery length given in various table are for general guidance only. Cables can be however supplied in longer lengths on specific request.

COMPARATIVE CURRENT RATINGS OF 1.1 KV PVC AND XLPE CABLES

continuous current rating of 3 & 4 core cables
armoured & unarmoured laid direct in the ground or
in air 650/1100v Aluminium conductor.

**TABLE
13**

Nominal Area of Conductor (mm ²)	3 or 4 core cables is IS 1554/I/1988 (PVC)			3 or 4 core cables to IS 7098/I/1988 (XLPE)		
	In Ground (Amps)	In Air (Amps)	Approx. Voltage Drop (mv/Amp/m)	In Ground (Amps)	In Air (Amps)	Approx. Voltage Drop (mv/Amp/m)
16	60	51	4	73	70	4.2
25	76	70	2.5	94	96	2.7
35	92	86	1.8	113	117	1.9
50	110	105	1.3	133	142	1.4
70	135	130	0.93	164	179	0.99
95	165	155	0.68	196	221	0.72
120	185	180	0.54	223	257	0.58
150	210	205	0.45	249	292	0.48
185	235	240	0.37	282	337	0.39
240	275	280	0.29	326	399	0.31
300	305	315	0.25	367	455	0.26

The Current ratings given above are based on the following assumptions

	<u>PVC</u>	<u>XLPE</u>
(a) Maximum conductor temperature for continuous operation (°C)	: 70	90
(b) Ambient Air Temperature (°C)	: 40	40
(c) Ground temperature (°C)	: 30	30
(d) Thermal resistivity of soil (°C Cm/watt)	: 150	150
(e) Thermal resistivity of insulation (°C Cm/watt)	: 650	350
(f) Depth of laying (to the highest point of cable laid direct in the ground or to the top surface of ducts)	: 75 cm	75 cm

CURRENT RATINGS

XLPE insulated Aluminium Conductor 1.1 Kv grade power cable.

Nominal area of conductor	Cables in ground					Cables in air				
	Single core cables			Two core cables	Three, Three and half and four core cables	Single core cables			Two core cables	Three, Three and half and four core cables
	Two cables		Three cables			Two cables		Three cables		
	AC	DC		AC	DC					
(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)
4	42	42	36	43	34	34	34	31	39	31
6	52	52	44	55	43	43	43	39	50	40
10	69	69	59	71	57	60	60	53	67	53
16	90	90	76	91	73	82	82	73	88	70
25	116	116	96	120	94	108	108	98	117	96
35	139	139	114	143	113	136	136	121	145	117
50	162	162	135	167	133	163	163	150	176	142
70	199	199	166	204	164	208	208	187	221	179
95	241	241	198	245	196	258	258	230	271	221
120	273	273	225	278	223	303	303	268	316	257
150	305	305	253	315	249	348	348	309	362	292
185	347	347	286	356	282	407	407	360	420	337
240	407	407	332	407	326	488	488	433	497	399
300	458	463	376	463	367	569	569	501	578	455
400	518	528	431	523	418	669	678	596	678	530
500	592	602	490	592	470	786	805	693	786	612
630	666	694	557	676	529	922	958	814	913	707
800	750	796	632	-	-	1067	1130	968	-	-
1000	833	907	701	-	-	1220	1329	1102	-	-

TABLE 17

RATING FACTORS
For air and ground temperatures

c) Rating factors for variation in ambient air temperature -						
Ambient temp (°C)	25	30	35	40	45	50
Rating factors	1.16	1.11	1.06	1.00	0.94	0.88
b) Rating factors for variation in ground temperature -						
Ambient temp (°C)	15	20	25	30	35	40
Rating factors	1.12	1.08	1.04	1.00	0.96	0.91

TABLE 18

RATING FACTORS
for the depth of laying (cables laid direct in the ground)

Depth of laying cm	Size		
	up to 25 mm ²	Above 25 mm ² up to 300 mm ²	Above 300 mm ²
75	1.00	1.00	1.00
90	0.99	0.98	0.97
105	0.98	0.97	0.96
120	0.97	0.96	0.95
150	0.96	0.94	0.92
180 or more	0.95	0.93	0.91

TABLE 19

RATING FACTORS
or variation in thermal resistivity of soil
for single and multi-core cables laid direct in the ground).

Nominal area of conductor t mm ²	For value for Thermal Resistivity of soil in °C cm/W					
	100	120	150	200	250	300
1.5	1.10	1.05	1.0	0.92	0.86	0.81
2.5	1.10	1.05	1.0	0.92	0.86	0.81
4	1.10	1.05	1.0	0.92	0.86	0.81
6	1.10	1.05	1.0	0.92	0.86	0.81
10	1.10	1.06	1.0	0.92	0.85	0.80
16	1.12	1.06	1.0	0.91	0.84	0.79
25	1.14	1.08	1.0	0.91	0.84	0.78
35	1.15	1.08	1.0	0.91	0.84	0.77
50	1.15	1.08	1.0	0.91	0.84	0.77
70	1.15	1.08	1.0	0.90	0.83	0.76
95	1.15	1.08	1.0	0.90	0.83	0.76
120	1.17	1.09	1.0	0.90	0.82	0.76
150	1.17	1.09	1.0	0.90	0.82	0.76
185	1.18	1.09	1.0	0.89	0.81	0.75
240	1.18	1.09	1.0	0.89	0.81	0.75
300	1.18	1.09	1.0	0.89	0.81	0.75
400	1.19	1.10	1.0	0.89	0.81	0.75

RATING FACTORS

For variation in thermal resistivity of soil (two and three single-core cables laid direct in the ground)

Nominal area of conductor mm ²	Two cables touching, for values for Thermal Resistivity of soil in °C cm/W						Three cables in Trefoil touching, for values for Thermal Resistivity of soil in °C cm/W					
	100	120	150	200	250	300	100	120	150	200	250	300
1.5	1.15	1.08	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.90	0.82	0.76
2.5	1.15	1.08	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.90	0.82	0.76
4	1.15	1.08	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.90	0.82	0.76
6	1.15	1.08	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.90	0.82	0.76
10	1.15	1.08	1.00	0.90	0.83	0.77	1.18	1.09	1.00	0.89	0.81	0.75
16	1.17	1.09	1.00	0.90	0.83	0.77	1.19	1.09	1.00	0.89	0.81	0.74
25	1.18	1.09	1.00	0.90	0.82	0.76	1.19	1.09	1.00	0.88	0.80	0.74
35	1.18	1.09	1.00	0.90	0.82	0.75	1.20	1.09	1.00	0.88	0.80	0.74
50	1.18	1.09	1.00	0.90	0.82	0.75	1.20	1.09	1.00	0.88	0.80	0.74
70	1.19	1.09	1.00	0.89	0.81	0.74	1.21	1.10	1.00	0.88	0.80	0.74
95	1.19	1.09	1.00	0.89	0.81	0.74	1.22	1.10	1.00	0.88	0.80	0.74
120	1.21	1.10	1.00	0.89	0.80	0.74	1.22	1.10	1.00	0.88	0.79	0.74
150	1.21	1.10	1.00	0.89	0.80	0.74	1.22	1.10	1.00	0.88	0.79	0.73
185	1.21	1.10	1.00	0.89	0.80	0.74	1.22	1.10	1.00	0.88	0.79	0.73
240	1.21	1.10	1.00	0.89	0.80	0.74	1.22	1.10	1.00	0.88	0.79	0.73
300	1.21	1.10	1.00	0.89	0.80	0.74	1.22	1.10	1.00	0.88	0.79	0.72
400	1.21	1.10	1.00	0.88	0.80	0.74	1.24	1.11	1.00	0.88	0.79	0.72
500	1.21	1.10	1.00	0.88	0.80	0.74	1.24	1.11	1.00	0.88	0.79	0.72
630	1.22	1.10	1.00	0.88	0.80	0.74	1.24	1.11	1.00	0.88	0.79	0.72

TABLE 20

TABLE 21

GROUP RATING FACTORS
for single core cables laid in Trefoil formation

A) Cables laid in ground in horizontal formation.

No of Trefoils in group	Spacing between trefoils			
	Touching	15 cm.	30 cm.	45 cm.
2	0.78	0.81	0.85	0.88
3	0.68	0.71	0.77	0.81
4	0.61	0.65	0.72	0.76
5	0.56	0.61	0.68	0.73

B) Cables laid in Trefoil Ducts in horizontal formation.

No of Trefoils in group	Spacing between trefoils		
	Touching	45 cm.	60 cm.
2	0.87	0.90	0.91
3	0.79	0.83	0.86
4	0.74	0.79	0.82
5	0.71	0.76	0.80

C) Cables laid on Racks/Trays in covered trench with removable covers where air circulation is restricted, Trefoils are separated by two cable dia horizontally and the trays are in tiers with 30 cm. gap between them.

No of racks/Trays in tiers	No. of trefoils in Horizontal formation		
	1	2	3
1	0.95	0.90	0.88
2	0.90	0.85	0.83
3	0.88	0.83	0.81
6	0.86	0.81	0.79

D) Cables laid as in 'C' but in open air.

1	1.0	0.98	0.96
2	1.0	0.95	0.93
3	1.0	0.94	0.92
6	1.0	0.93	0.90

GROUP RATING FACTORS
for multi-core cables

TABLE 22

A) Cables laid inside concrete trench with removable covers, on cables trays where air circulation is restricted. The cables spaced by one cable diameter and trays in tiers by 300 mm. The clearance of the cable from the wall is 25 mm.

No. of cable Trays in tier	No. of cables				
	1	2	3	6	9
1	0.95	0.90	0.88	0.85	0.84
2	0.90	0.85	0.83	0.81	0.80
3	0.88	0.83	0.81	0.79	0.78
6	0.86	0.81	0.79	0.77	0.76

B) Cables laid on cable trays exposed to air, the cables spaced by one cable diameter and trays in tiers by 300 mm. The clearance between the wall and the cable is 25 mm.

No. of cable Trays in tier	No. of cables				
	1	2	3	6	9
1	1	0.98	0.96	0.93	0.92
2	1	0.95	0.93	0.90	0.89
3	1	0.94	0.92	0.89	0.88
6	1	0.93	0.90	0.87	0.86

C) Cables laid on cable trays exposed to air, the cables touching and trays in tiers by 300 mm. The clearance between the wall and the cable 25 mm.

No. of Trays	No. of cables per tray				
	1	2	3	6	9
1	1.0	0.84	0.80	0.75	0.73
2	1.0	0.80	0.76	0.71	0.69
3	1.0	0.78	0.74	0.70	0.68
6	1.0	0.76	0.72	0.68	0.66

D) Cables laid direct in ground in horizontal formation.

No. of cables in group	Spacing of cables			
	Touching	15 cm.	30 cm.	45 cm.
2	0.79	0.82	0.87	0.9
3	0.69	0.75	0.79	0.83
4	0.62	0.69	0.74	0.79
5	0.58	0.65	0.72	0.76
6	0.54	0.61	0.69	0.75

E) Cables laid in single way ducts/pipes in horizontal formation.

No. of cables in group	Spacing of cables			
	Touching	30 cm.	45 cm.	60 cm.
2	0.88	0.90	0.92	0.94
3	0.82	0.84	0.87	0.89
4	0.77	0.80	0.84	0.87
5	0.74	0.78	0.82	0.85
6	0.71	0.76	0.81	0.84

HANDLING & STORAGE OF CABLE DRUMS

- a) The cable drums or coils must not be dropped or thrown from railway wagons or trucks during unloading operations. A ramp or crane may be used for unloading cable drums. If neither of these is available, a temporary ramp with inclination 1 : 3 to 1 : 4 approximately should be constructed. The cable drum should then be rolled over the ramp by means of ropes and winches. Additionally a sand bed at the foot of the ramp may be made to brake the rolling of cable drum.
- b) The arrows painted on the flange of the drum indicate the direction in which the drum should be rolled. The cable will unwind and become loose if the drum is rolled in the opposite direction.
- c) The site chosen for storage of cable drums should be well-drained and should preferably have a concrete surface/firm surface which will not cause the drums to sink and thus lead to flange rot and extreme difficulty in moving the drums.
- d) All drums should be stored in such a manner as to leave sufficient space between them for air circulation. It is desirable for the drums to stand on battens placed directly under the flanges. During storage, the drum should be rolled to an angle of 90° once every three months.
- e) In no case should the drums be stored 'on the flat', that is, with flange horizontal.
- f) Overhead covering is not essential unless the storage is for a very long period. The cable should, however, be protected from direct rays of the sun by leaving the battens on or by providing some form of sun shielding.
- g) When for any reason, it is necessary to rewind a cable on to another drum, the barrel of the drum should have a diameter not less than that of the original drum.