

**UNIVERSAL<sup>®</sup>**

# PVC INSULATED POWER AND CONTROL CABLES



**UNIVERSAL CABLES LIMITED**

**SPECIFICATIONS**

These cables are manufactured and tested as per national / international standards and also as per specific requirement of customers. Dimension of cables conforming to IS: 1554 (Part -I) / 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:** PVC/HR PVC

**Inner Sheath:** Unvulcanised rubber or Thermo-Plastic Material compatible with thermal rating of insulation



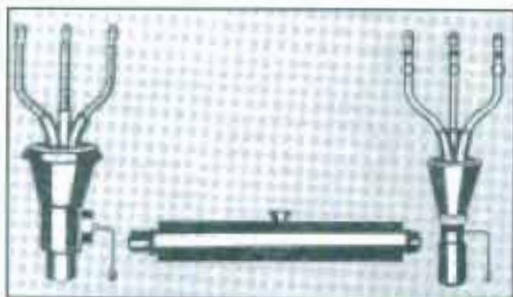
**Armour:** Galvanized Steel Wires/Flat strips

**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**

Current ratings, short circuit ratings and rating factors for 1.1 kv PVC/HR PVC cables are given in Tables 13 to 22.



**JOINTING AND TERMINATION**

No special skill is required for jointing and termination of 1.1 kv PVC cables. 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. Methods (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 of 95 degree C. in case of PVC and 105 degree C. in case of HR PVC cables for a duration of max 100 hours in any twelve consecutive months and max 500 hours during the life time of cable.

**APPLICATIONS**

Power transmission and distribution, control system, utility network, railway signalling installation, switching station, textile mills, chemical plants, machine shops, etc.



**NOTE OF CAUTION**

Do not use PVC sheathed cables where it is likely to come in contact with sulphuric acid, highly chlorinated hydro-carbons, ceresylic acids, pyridine, Ketones & caproactum.

**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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**CONDUCTOR DATA**

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

**TABLE 1**

Nominal cross section area mm <sup>2</sup>	Minimum number of wires in the conductor Stranded Conductor (class 2)				Maximum d.c. resistance of conductor at 20° C	
	Circular conductor (non-compacted)		Circular Compacted or Shaped Conductor		Plain copper conductor	Aluminium Conductor
	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	6	-	1.83	3.08
16	7	7	6	6	1.15	1.91
25	7	7	6	6	0.727	1.20
35	7	7	6	6	0.524	0.868
50	19	19	6	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 PVC and HR PVC cables

Nominal Area of Conductor (sq. mm)	PVC and HR PVC Cables		
	Single Core		Multicore
	Unarmoured	d*	
1.5	0.157	-	0.110
2.5	0.145	-	0.106
4	0.136	-	0.102
6	0.128	-	0.0962
10	0.118	0.137	0.0908
16	0.110	0.128	0.0859
25	0.107	0.122	0.0849
35	0.106	0.116	0.0823
50	0.0973	0.110	0.0765
70	0.0924	0.107	0.0769
95	0.090	0.103	0.0766
120	0.088	0.0989	0.0741
150	0.0862	0.0960	0.0743
185	0.0857	0.0950	0.0742
240	0.0837	0.0929	0.0737
300	0.0828	0.0922	0.0733
400	0.0810	0.0893	0.0729
500	0.0807	0.0890	0.0732
630	0.0803	0.0876	0.0731
800	0.0782	0.0862	-
1000	0.0772	0.0849	-

\*Wire armoured

**CAPACITANCE**

Approximate capacitance (Microfarads/km) 1.1 kv PVC and HR PVC cables

Nominal area of conductor (sq. mm)	PVC and HR PVC Cables			
	Single core		Two core	Three, Three & half and four core
	Unarmoured	Armoured		
1.5	0.43	-	0.12	0.35
2.5	0.52	-	0.13	0.41
4	0.57	-	0.14	0.46
6	0.67	-	0.16	0.52
10	0.83	0.67	0.18	0.63
16	0.97	0.80	0.19	0.82
25	1.00	0.83	0.22	0.86
35	1.15	0.95	0.24	0.98
50	1.26	0.95	0.24	1.00
70	1.32	1.12	0.26	1.16
95	1.36	1.17	0.26	1.18
120	1.49	1.28	0.28	1.31
150	1.52	1.32	0.28	1.28
185	1.47	1.30	0.28	1.30
240	1.54	1.37	0.28	1.34
300	1.60	1.40	0.29	1.37
400	1.70	1.50	0.29	1.43
500	1.63	1.46	0.29	1.41
630	1.64	1.45	0.29	1.42
800	1.87	1.65	-	-
1000	2.05	1.76	-	-

## DIMENSIONS &amp; WEIGHTS

'Unistar' 1.1 k.v Single Core PVC insulated unarmoured &amp; armoured cable with Aluminium Conductor conforming to 15-1554 (Part-1)-1988.

Nominal area of conductor	Form of Conductor	UNARMOURED				Nominal thickness of 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 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	
(mm <sup>2</sup> )	(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
4	Solid circular	1.0	1.8	8.5	75	-	-	-	-	-	-	-	-	-	500
4	Stranded circular	1.0	1.8	9.0	82	-	-	-	-	-	-	-	-	-	"
6	Solid circular	1.0	1.8	9.0	89	-	-	-	-	-	-	-	-	-	"
6	Stranded circular	1.0	1.8	9.5	94	-	-	-	-	-	-	-	-	-	"
10	Solid circular	1.0	1.8	10.0	106	1.3	1.4	1.24	13.0	182	-	-	-	-	"
10	Stranded circular	1.0	1.8	10.5	113	1.3	1.4	1.24	13.0	192	-	-	-	-	"
16	Compacted circular	1.0	1.8	11.0	137	1.3	1.4	1.24	13.5	225	-	-	-	-	"
25	"	1.2	1.8	13.0	186	1.5	1.4	1.24	15.0	286	-	-	-	-	"
35	"	1.2	1.8	13.5	226	1.5	1.4	1.24	16.5	333	-	-	-	-	"
50	"	1.4	1.8	15.5	286	1.7	1.4	1.24	18.0	406	-	-	-	-	"
70	"	1.4	1.8	17.0	364	1.7	1.4	1.4	19.5	512	-	-	-	-	"
95	"	1.6	1.8	19.5	477	1.9	1.6	"	22.5	672	4.0 x 0.8	1.4	21.0	595	"
120	"	1.6	2.0	21.0	577	1.9	1.6	"	24.0	766	"	"	22.0	676	"
150	"	1.8	2.0	23.0	691	2.1	1.6	"	25.5	897	"	"	24.0	808	"
185	"	2.0	2.0	25.0	839	2.3	1.6	"	28.0	1065	"	"	26.0	962	"
240	"	2.2	2.0	27.5	1050	2.5	1.6	1.56	31.0	1321	"	"	29.0	1190	"
300	"	2.4	2.0	30.0	1269	2.7	1.6	"	33.0	1570	"	1.56	31.5	1452	"
400	"	2.6	2.2	34.0	1610	3.0	2.0	"	37.5	2020	"	"	35.5	1797	"
500	"	3.0	2.2	37.5	2027	3.4	2.0	1.72	42.0	2513	"	"	39.0	2230	"
630	"	3.4	2.4	42.5	2598	3.9	2.0	1.88	47.0	3160	"	1.72	44.0	2844	"
800	"	3.4	2.4	47.0	3164	3.9	2.0	"	51.0	3781	"	1.88	48.5	3466	"
1000	"	3.4	2.6	51.0	3865	3.9	2.5	2.04	56.0	4685	"	2.04	53.0	4193	"

## DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv Two Core PVC insulated unarmoured & armoured cable with Aluminium Conductor conforming to 15-1554 (Part-1)-1988.

Nominal area of conductor	Form of Conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMOURED			ROUND WIRE ARMOURD				FLAT STRIP ARMOURD				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	
(mm <sup>2</sup> )		(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
4	Solid circular	1.0	0.3	1.8	14.5	213	1.4	1.24	16.0	474	-	-	-	-	500
4	Stranded circular	1.0	0.3	1.8	15.5	241	1.4	1.24	17.0	537	-	-	-	-	"
6	Solid circular	1.0	0.3	1.8	15.5	256	1.4	1.24	17.5	552	-	-	-	-	"
6	Stranded circular	1.0	0.3	1.8	16.5	274	1.4	1.24	18.0	583	-	-	-	-	"
10	Solid circular	1.0	0.3	1.8	17.0	311	1.4	1.24	18.5	643	-	-	-	-	"
10	Stranded circular	1.0	0.3	1.8	18.0	338	1.4	1.24	19.5	681	-	-	-	-	"
16	Compacted circular	1.0	0.3	1.8	19.5	413	1.6	1.4	22.0	882	4.0 x 0.8	1.4	20.5	670	"
25	Stranded shaped	1.2	0.3	2.0	20.5	435	1.6	1.4	22.5	903	"	"	21.0	700	"
35	"	1.2	0.3	2.0	21.5	506	1.6	1.4	23.5	1005	"	-	22.0	769	"
50	"	1.4	0.3	2.0	24.5	654	1.6	1.56	27.0	1251	"	-	25.0	964	"
70	"	1.4	0.3	2.0	27.0	811	1.6	"	29.5	1473	"	1.56	27.5	1192	"
95	"	1.6	0.4	2.2	31.5	1156	2.0	"	34.0	2113	"	"	32.0	1584	"
120	"	1.6	0.4	2.2	32.5	1329	2.0	1.72	36.0	2364	"	"	33.0	1781	"
150	"	1.8	0.4	2.4	37.0	1638	2.0	"	39.5	2766	"	1.72	37.0	2106	"
185	"	2.0	0.5	2.4	40.5	2016	2.0	1.88	43.5	3326	"	1.88	41.5	2588	"
240	"	2.2	0.5	2.6	45.0	2546	2.5	2.04	49.0	4360	"	2.04	46.0	3188	"
300	"	2.4	0.6	2.8	49.0	3090	2.5	2.2	53.0	5060	"	2.2	49.5	3776	"
400	"	2.6	0.7	3.2	57.0	3973	3.15	2.52	62.0	6921	"	2.36	57.0	4725	"
500	"	3.0	0.7	3.4	64.0	4989	3.15	2.84	69.0	8291	"	2.68	64.0	5872	"
630	"	3.4	0.7	3.8	72.5	6355	4.0	3.0	79.0	11093	"	2.84	72.5	7278	"

## DIMENSIONS &amp; WEIGHTS

'Unistar' 1.1 kv Three Core PVC insulated unarmoured & armoured cable with Aluminium Conductor conforming to IS-1554 (Part-1) -1988.

Nominal area of conductor (mm <sup>2</sup> )	Form of Conductor	Nominal thickness of insulation (mm)	Minimum thickness of inner sheath (mm)	UNARMOURED			ROUND WIRE ARMOURD				FLAT STRIP ARMOURD				Normal delivery length (m)
				Nominal thickness of outer sheath (mm)	Approx. overall diameter of cable (mm)	Approx. weight of cable (kg/km)	Nominal diameter of round wire (mm)	Minimum thickness of outer sheath (mm)	Approx. overall diameter of cable (mm)	Approx. weight of cable (kg/km)	Nominal dimensions of flat strip (mm)	Minimum thickness of outer sheath (mm)	Approx. overall diameter of cable (mm)	Approx. weight of cable (kg/km)	
4	Solid circular	1.0	0.3	1.8	15.0	240	1.4	1.24	17.0	525	-	-	-	-	500
4	Stranded circular	1.0	0.3	1.8	16.5	268	1.4	..	18.0	576	-	-	-	-	"
6	Solid circular	1.0	0.3	1.8	16.5	289	1.4	..	18.0	597	-	-	-	-	"
6	Stranded circular	1.0	0.3	1.8	17.5	310	1.4	..	19.0	642	-	-	-	-	"
10	Solid circular	1.0	0.3	1.8	18.0	355	1.4	1.4	20.0	714	-	-	-	-	"
10	Stranded circular	1.0	0.3	1.8	19.0	383	1.4	..	21.0	767	-	-	-	-	"
16	Stranded shaped	1.0	0.3	1.8	19.0	385	1.6	..	21.0	838	4.0 x 0.8	1.4	19.5	643	"
25	..	1.2	0.3	2.0	22.0	548	1.6	..	24.0	1063	"	"	22.5	837	"
35	..	1.2	0.3	2.0	24.0	665	1.6	..	26.0	1226	"	"	24.5	976	"
50	..	1.4	0.3	2.0	27.0	850	1.6	1.56	29	1511	"	1.56	27.5	1231	"
70	..	1.4	0.4	2.2	30.5	1122	2.0	..	33.0	2056	"	"	30.5	1526	"
95	..	1.6	0.4	2.2	34.5	1473	2.0	1.72	38.0	2583	"	"	35.0	1947	"
120	..	1.6	0.4	2.2	36.5	1721	2.0	..	40.0	2907	"	1.72	37.5	2248	"
150	..	1.8	0.5	2.4	41.0	2128	2.0	1.88	44.0	3439	"	1.88	41.5	2700	"
185	..	2.0	0.5	2.6	45.5	2628	2.5	2.04	49.5	4441	"	"	45.5	3234	"
240	..	2.2	0.6	2.8	51.0	3353	2.5	2.2	54.5	5403	"	2.2	51.5	4063	"
300	..	2.4	0.6	3.0	56.0	4106	2.5	2.36	60.0	6348	"	2.36	56.5	4883	"
400	..	2.6	0.7	3.4	63.5	5233	3.15	2.68	68.5	8485	"	2.52	63.5	6071	"
500	..	3.0	0.7	3.6	71.5	6653	3.15	3.0	77.0	10388	"	2.84	72.0	7641	"
630	..	3.4	0.7	4.0	81.5	8537	4.0	..	87.5	13806	"	3.0	81.0	9580	250

## DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv Three & Half Core PVC insulated unarmoured & armoured cable with Aluminium Conductor conforming to IS-1554 (Part-1) -1988.

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 <sup>2</sup> )	(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
25	16	1.2	1.0	0.3	2.0	24.0	639	1.6	1.4	26.0	1200	4.0 x 0.8	1.4	24.0	950	500
35	16	1.2	1.0	0.3	2.0	26.0	757	1.6	"	28.0	1364	"	"	26.0	1091	"
50	25	1.4	1.2	0.3	2.0	29.5	986	1.6	1.56	31.5	1711	"	1.56	30.0	1417	"
70	35	1.4	1.2	0.4	2.2	34.0	1305	2.0	"	36.0	2335	"	"	34.0	1755	"
95	50	1.6	1.4	0.4	2.2	37.0	1695	2.0	1.72	40.0	2881	"	"	37.5	2192	"
120	70	1.6	1.4	0.5	2.4	40.5	2079	2.0	1.88	43.5	3364	"	1.72	41.0	2619	"
150	70	1.8	1.4	0.5	2.4	45.0	2455	2.0	"	48.0	3890	"	1.88	45.5	3100	"
185	95	2.0	1.6	0.5	2.6	48.5	3026	2.5	2.04	52.5	4997	"	2.04	49.0	3745	"
240	120	2.2	1.6	0.6	3.0	55.5	3916	2.5	2.36	59.5	6159	"	2.2	56.0	4649	"
300	150	2.4	1.8	0.6	3.2	62.0	4805	3.15	2.52	67.0	8003	"	2.36	62.0	5625	"
400	185	2.6	2.0	0.7	3.4	68.5	5998	3.15	2.68	73.5	9562	"	2.68	69.0	6950	"
500	240	3.0	2.2	0.7	3.8	79.0	7748	4.0	3.0	88.5	12990	"	2.84	79.0	8785	250
630	300	3.4	2.4	0.7	4.0	89.0	9797	4.0	3.0	95.5	15665	"	3.0	89.0	10948	250

TABLE 7



## DIMENSIONS &amp; WEIGHTS

'Unistar' 1.1 kv Four Core PVC insulated unarmoured & armoured cable with Aluminium Conductor conforming to 15-1554 (Part-1) - 1988.

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 dimensions of flat strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	
(mm <sup>2</sup> )		(mm)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm)	(mm)	(kg/km)	
4	Solid circular	1.0	0.3	1.8	16.0	281	1.4	1.24	18.0	589	-	-	-	-	500
4	Stranded circular	1.0	0.3	1.8	17.5	316	1.4	"	19.5	659	-	-	-	-	"
6	Solid circular	1.0	0.3	1.8	17.5	343	1.4	"	19.5	686	-	-	-	-	"
6	Stranded circular	1.0	0.3	1.8	18.5	367	1.4	"	20.5	735	-	-	-	-	"
10	Solid circular	1.0	0.3	1.8	19.5	423	1.6	1.4	22.0	892	4.0 x 0.8	1.4	20.5	680	"
10	Stranded circular	1.0	0.3	1.8	20.5	456	1.6	"	23.0	958	"	"	21.5	738	"
16	Stranded shaped	1.0	0.3	2.0	21.5	504	1.6	"	23.5	1002	"	"	22.0	767	"
25	"	1.2	0.3	2.0	25.0	688	1.6	"	27.0	1280	"	"	25.0	1024	"
35	"	1.2	0.3	2.0	26.5	831	1.6	1.56	29.0	1493	"	"	27.0	1190	"
50	"	1.4	0.4	2.2	31.0	1121	2.0	"	34.0	2079	"	1.56	31.5	1550	"
70	"	1.4	0.4	2.2	34.5	1437	2.0	"	37.5	2517	"	"	35.0	1911	"
95	"	1.6	0.4	2.4	39.0	1912	2.0	1.72	42.0	3139	"	1.72	39.5	2428	"
120	"	1.6	0.5	2.4	42.5	2285	2.0	1.88	45.5	3645	"	1.88	43.0	2881	"
150	"	1.8	0.5	2.6	47.5	2793	2.5	2.04	51.5	4725	"	"	47.5	3421	"
185	"	2.0	0.6	2.8	53.5	3475	2.5	2.2	57.5	5603	"	2.04	53.5	4166	"
240	"	2.2	0.6	3.0	58.5	4397	2.5	2.36	62.5	6758	"	2.36	59.0	5224	"
300	"	2.4	0.7	3.4	66.0	5498	3.15	2.68	71.0	8874	"	2.52	66.0	6355	"
400	"	2.6	0.7	3.6	73.0	6834	3.15	2.84	78.0	10576	"	2.84	73.0	7847	"
500	"	3.0	0.7	4.0	83.0	8784	4.0	3.0	89	14152	"	3.0	83.0	9849	250
630	"	3.4	0.7	4.0	94.0	11092	4.0	"	100.0	17258	"	"	93.5	12308	250

## DIMENSIONS & WEIGHTS

'Unistar' 1.1 kv 1.5 sq. mm (Solid) PVC insulated unarmoured & armoured Multicore Control cable with copper conductor conforming to IS-1554/1/1988.

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	0.8	0.3	1.8	11.5	155	1.4	1.24	13.5	357	-	-	-	-	500
3	"	"	"	12.0	177	"	"	14.0	390	-	-	-	-	"
4	"	"	"	13.0	208	"	"	14.5	446	-	-	-	-	"
5	"	"	"	14.0	243	"	"	15.5	491	-	-	-	-	"
6	"	"	"	15.0	261	"	"	16.5	534	-	-	-	-	"
7	"	"	"	15.0	271	"	"	16.5	544	-	-	-	-	"
8	"	"	"	16.0	312	"	"	17.5	608	-	-	-	-	"
9	"	"	"	17.0	353	"	"	18.5	674	-	-	-	-	"
10	"	"	"	18.0	368	"	1.4	20.0	726	-	-	-	-	"
12	"	"	"	18.5	416	1.6	"	21.0	853	4.0 x 0.8	1.24	19.0	632	"
14	"	"	"	19.0	466	"	"	21.5	919	"	1.4	20	724	"
16	"	"	"	20.0	521	"	"	22.5	1006	"	"	21.0	778	"
19	"	"	2.0	21.5	607	"	"	23.5	1091	"	"	22.0	871	"
21	"	"	"	22.5	670	"	"	24.5	1184	"	"	23.0	959	"
24	"	"	"	24.5	749	"	"	26.5	1309	"	"	25.0	1060	"
27	"	"	"	25.0	817	"	"	27.0	1393	"	"	25.5	1127	"
30	"	"	"	26.0	890	"	"	28.0	1498	"	"	26.5	1225	"
33	"	"	"	27.0	967	"	"	29	1589	"	"	27.0	1327	"
37	"	"	"	28.0	1058	"	"	30.0	1711	"	"	28.0	1416	"
44	"	"	"	31.0	1240	"	1.56	33.5	1998	"	1.56	31.5	1670	"
52	"	0.4	2.2	33.0	1464	2.0	"	35.5	2446	"	"	33.0	1891	"
61	"	0.4	2.2	34.5	1678	2.0	"	37.5	2734	"	"	35.0	2153	"

TABLE 9

## DIMENSIONS &amp; WEIGHTS

'Unistar' 1.1 kv 1.5 sq. mm (Stranded) PVC insulated unarmoured & armoured Multicore Control cable with copper conductor conforming to IS-1554/1/1988.

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	0.8	0.3	1.8	12.0	164	1.4	1.24	14.0	378	-	-	-	-	500
3	"	"	"	12.5	189	"	"	14.5	415	-	-	-	-	"
4	"	"	"	13.5	222	"	"	15.0	471	-	-	-	-	"
5	"	"	"	14.5	262	"	"	16.0	535	-	-	-	-	"
6	"	"	"	15.5	279	"	"	17.0	576	-	-	-	-	"
7	"	"	"	15.5	290	"	"	17.0	587	-	-	-	-	"
8	"	"	"	16.5	334	"	"	18.5	654	-	-	-	-	"
9	"	"	"	17.5	379	"	"	19.5	722	-	-	-	-	"
10	"	"	"	19.0	393	"	1.4	21.0	777	-	-	-	-	"
12	"	"	"	19.5	443	1.6	"	21.5	896	4.0 x 0.8	1.24	20.0	685	"
14	"	"	"	20.0	498	"	"	22.5	983	"	1.4	21.0	755	"
16	"	"	"	21.0	558	"	"	23.5	1059	"	"	22.0	840	"
19	"	"	2.0	22.5	650	"	"	24.5	1164	"	"	23.0	939	"
21	"	"	"	23.5	717	"	"	25.5	1262	"	"	24.0	1004	"
24	"	"	"	26.0	801	"	"	28.0	1409	"	"	26.5	1136	"
27	"	"	"	26.5	875	"	"	28.5	1498	"	"	27.0	1208	"
30	"	"	"	27.5	952	"	"	29.5	1591	"	"	27.5	1311	"
33	"	"	"	28.0	1037	"	"	30.0	1706	"	"	28.5	1420	"
37	"	"	"	29.0	1133	"	"	31.5	1818	"	"	29.5	1514	"
44	"	"	"	32.5	1329	"	1.56	35.0	2134	"	1.56	33.5	1783	"
52	"	0.4	2.2	34.5	1570	2.0	"	37.5	2626	"	"	35.0	2046	"
61	"	"	"	36.0	1799	2.0	"	39.5	2903	"	"	37.0	2270	"

## DIMENSIONS & WEIGHTS

'Unistar' 1.1 kV 2.5 sq. mm. (Solid) PVC insulated unarmoured & armoured Multicore Control cable with Copper Conductor conforming to IS-1554/1/1988.

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	0.9	0.3	1.8	13.0	200	1.4	1.24	14.5	438	-	-	-	-	500
3	"	"	"	13.5	234	"	"	15.0	483	-	-	-	-	"
4	"	"	"	14.5	281	"	"	16.0	554	-	-	-	-	"
5	"	"	"	15.5	331	"	"	17.5	628	-	-	-	-	"
6	"	"	"	16.5	356	"	"	18.5	676	-	-	-	-	"
7	"	"	"	16.5	374	"	"	18.5	694	-	-	-	-	"
8	"	"	"	18.0	434	"	1.4	20.0	793	-	-	-	-	"
9	"	"	"	19.0	492	1.6	"	21.5	946	4.0 x 0.8	1.4	20.0	750	"
10	"	"	"	20.5	512	"	"	23.0	998	"	"	21.0	795	"
12	"	"	2.0	21.5	602	"	"	23.5	1086	"	"	22.0	866	"
14	"	"	"	22.5	680	"	"	24.5	1194	"	"	23.0	969	"
16	"	"	"	23.5	764	"	"	25.5	1310	"	"	24.0	1051	"
19	"	"	"	24.5	870	"	"	26.5	1446	"	"	25.0	1181	"
21	"	"	"	26.0	961	"	"	28.0	1569	"	"	26.5	1296	"
24	"	"	"	28.5	1077	"	1.56	31.0	1770	"	"	29.0	1459	"
27	"	"	"	29.0	1182	"	"	31.5	1892	"	"	29.5	1564	"
30	"	"	"	30.0	1292	"	"	32.5	2017	"	1.56	30.5	1723	"
33	"	"	"	31.0	1407	"	"	33.5	2165	"	"	32.0	1837	"
37	"	0.4	2.2	32.5	1588	2.0	"	35.5	2570	"	"	33.0	2014	"
44	"	"	"	36.5	1866	"	"	39.5	2970	"	"	37.0	2365	"
52	"	"	"	38.0	2150	"	1.72	41.5	3336	"	"	38.5	2646	"
61	"	"	"	40.0	2472	"	"	43.5	3733	"	"	40.5	2990	"

TABLE 11

## DIMENSIONS &amp; WEIGHTS

'Unistar' 1.1 kv 2.5 sq. mm (Stranded) PVC insulated unarmoured & armoured Multicore Control cable with copper conductor conforming to 15-1554/1/1988.

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	0.9	0.3	1.8	13.5	210	1.4	1.24	15.0	447	..	..	-	-	500
3	..	..	..	14.0	246	..	..	15.5	507	..	..	-	-	..
4	..	..	..	15.0	294	..	..	17.0	579	..	..	-	-	..
5	..	..	..	16.0	347	..	..	18.0	655	..	..	-	-	..
6	..	..	..	17.5	373	..	..	19.0	704	..	..	-	-	..
7	..	..	..	17.5	390	..	..	19.0	721	..	..	-	-	..
8	..	..	..	18.5	451	..	1.40	21.0	835	..	..	-	-	..
9	..	..	..	20.0	514	1.6	..	22.5	983	4.0 X 0.8	1.4	21.0	772	..
10	..	..	..	21.5	533	..	..	24.0	1050	..	..	22.0	815	..
12	..	..	2.0	22.5	628	..	..	24.5	1143	..	..	23.0	917	..
14	..	..	..	23.5	708	..	..	25.5	1237	..	..	24.0	995	..
16	..	..	..	24.5	796	..	..	26.5	1356	..	..	25.0	1107	..
19	..	..	..	26.0	904	..	..	28.0	1495	..	..	26.0	1239	..
21	..	..	..	27.0	1001	..	..	29.0	1640	..	..	27.5	1360	..
24	..	..	..	29.5	1121	..	1.56	32.0	1846	..	..	30.0	1501	..
27	..	..	..	30.5	1230	..	..	33.0	1971	..	..	31.0	1636	..
30	..	..	..	31.5	1344	..	..	34.0	2117	..	1.56	32.0	1799	..
33	..	..	..	32.5	1467	..	..	35.0	2272	..	..	33.5	1921	..
37	..	0.4	2.2	34.5	1653	2.0	..	37.0	2684	..	..	34.5	2104	..
44	..	..	..	38.5	1943	..	..	41.0	3096	..	..	38.5	2439	..
52	..	..	..	40.0	2237	..	1.72	43.0	3498	..	..	40.0	2755	..
61	..	..	..	42.5	2575	..	..	45.5	3912	..	..	42.5	3142	..

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

## CURRENT RATINGS

\*PVC insulated Aluminium Conductor 1.1 kv grade power cable.

Nominal area of conductor (mm <sup>2</sup> )	Cables in ground					Cables in air				
	Single core cables			Two core cables (Amps)	Three, Three and half and four core cables (Amps)	Single core cables			Two core cables (Amps)	Three, Three and half and four core cables (Amps)
	Two cables		Three cables (Amps)			Two cables		Three cables (Amps)		
	AC (Amps)	DC (Amps)		AC (Amps)	DC (Amps)					
4	36	36	31	32	28	32	32	27	27	23
6	44	44	39	40	35	41	41	35	35	30
10	59	59	51	55	46	56	56	47	47	40
16	75	75	66	70	60	72	72	64	59	51
25	97	97	86	90	76	99	99	84	78	70
35	120	120	100	110	92	120	120	105	99	86
50	145	145	120	135	110	150	155	130	125	105
70	170	175	140	160	135	185	190	155	150	130
95	205	210	175	190	165	215	225	190	185	155
120	230	240	195	210	185	240	260	220	210	180
150	265	270	220	240	210	270	300	250	240	205
185	300	305	240	275	235	305	345	290	275	240
240	335	355	270	320	275	350	405	335	325	280
300	370	400	295	355	305	395	470	380	365	315
400	410	460	325	385	335	455	560	435	420	375
500	435	510	345	415	370	490	630	480	455	425
630	485	600	390	460	405	560	750	550	520	480
800	530	705	440	-	-	640	900	640	-	-
1000	580	845	490	-	-	740	1090	720	-	-

TABLE 13

## CURRENT RATINGS

HR PVC insulated Aluminium Conductor 1.1 kv grade power cable.

Nominal area of conductor	Cables in ground		Cables in air	
	Two core cables	Three, three & half and four core cables	Two core cables	Three, three & half and four core cables
(mm <sup>2</sup> )	(Amps)	(Amps)	(Amps)	(Amps)
4	36	32	32	28
6	46	40	42	36
10	63	52	56	48
16	80	68	71	61
25	103	87	94	84
35	125	105	119	103
50	154	125	150	126
70	182	154	180	156
95	217	188	222	186
120	239	211	252	216
150	274	239	288	246
185	314	268	330	288
240	365	314	390	336
300	405	348	438	378
400	439	382	504	450
500	473	422	546	510
630	524	462	624	576

## CURRENT RATINGS

PVC and HR PVC insulated Copper Conductor 1.1 kv grade control cable.

Number of Cores (No.)	Nominal area of conductor (1.5 mm <sup>2</sup> )				Nominal area of conductor (2.5 mm <sup>2</sup> )			
	With PVC insulation		With HR PVC insulation		With PVC insulation		With HR PVC insulation	
	In ground (Amps)	In air (Amps)	In ground (Amps)	In air (Amps)	In ground (Amps)	In air (Amps)	In ground (Amps)	In air (Amps)
2	23	20	26	24	32	27	36	32
3	21	17	24	20	27	24	31	29
4	21	17	24	20	27	24	31	29
5	16	14	18	17	23	19	26	23
6	15	13	17	16	21	18	24	22
7	14	13	16	16	20	17	23	20
8	14	12	16	14	19	16	22	19
9	13	12	15	14	18	15	21	18
10	13	11	15	13	18	15	21	18
12	12	10	14	12	17	14	19	17
14	11	10	13	12	16	14	18	17
16	11	9	13	11	15	13	17	16
19	10	9	11	11	14	12	16	14
21	10	8	11	10	13	11	15	13
24	9	8	10	10	13	11	15	13
27	9	8	10	10	12	10	14	12
30	9	7	10	8	12	10	14	12
33	8	7	9	8	11	9	13	11
37	8	7	9	8	11	9	13	11
44	7	6	8	7	10	9	11	11
52	7	6	8	7	10	8	11	10
61	6	6	7	7	9	8	10	10

TABLE 15



**BASIC ASSUMPTIONS**

Continuous current ratings given are based on the following assumptions:

- (i) Max. conductor temperature for continuous operation
  - PVC : 70°C
  - HR PVC : 85°C
- (ii) Thermal resistivity of soil : 150°C cm/watt.
- (Hi) Thermal resistivity of PVC : 650°C cm/watt.
- (iv) Depth of laying (to the highest point of the cable laid direct in the ground or to the top surface of the duct) : 75 Cm.
- (v) Method of installation:
  - (A) Single core cables : (a) Two cables in horizontal touching.
  - : (b) Three cables in trefoil touching formation installed singly
  - (B) Multicore cables
- (vi) In case of control cables all cores are assumed to be carrying full load current.

**TABLE 16**

**SHORT CIRCUIT RATINGS**

Short circuit rating of conductors for one second duration (kilo Amps)

Nominal area of conductor (sq. mm.)	PVC Cables		HR PVC Cables	
	Copper	Aluminium	Copper	Aluminium
1.5	0.17	-	0.16	-
2.5	0.29	-	0.26	-
4	0.46	0.30	0.42	0.28
6	0.69	0.46	0.63	0.41
10	1.2	0.76	1.00	0.69
16	1.8	1.2	1.70	1.1
25	2.9	1.9	2.60	1.7
35	4.0	2.7	3.70	2.4
50	5.8	3.8	5.20	3.5
70	8.1	5.3	7.30	4.8
95	10.9	7.2	9.90	6.6
120	13.8	9.1	12.50	8.3
150	17.2	11.4	15.60	10.4
185	21.3	14.0	19.30	12.8
240	27.6	18.2	25.00	16.6
300	34.5	22.7	31.30	20.7
400	46.0	30.3	41.70	27.6
500	57.5	37.9	52.10	34.5
630	72.4	47.7	65.60	43.5
800	92.0	60.6	83.30	55.2
1000	114.9	75.8	104.20	69.0

- (1) Max. conductor temperature prior to short circuit
    - for normal PVC : 70°C
    - for HR PVC : 85°C
  - (2) Max. conductor temperature at the termination of short circuit : 160°C
- Formula for calculating the short circuit rating for other duration

$$I_s = \frac{I_1}{k}$$

where  $I_1$  = Short circuit rating for one second.  
 $I_s$  = Short circuit rating for 'k' second.  
 k = Duration in seconds

(The above formula is valid for 'K' from 0.2 to 5 seconds)

## RATING FACTORS

For air and ground temperatures

**TABLE 17**

a) Rating factors for variation in ambient air temperature -						
Ambient temp (°C)	25	30	35	40	45	50
Rating factors for PVC	1.25	1.16	1.09	1.0	0.9	0.81
Rating factors for HR PVC	1.15	1.10	1.05	1.0	0.94	0.88
b) Rating factors for variation in ground temperature -						
Ground temp. (°C)	15	20	25	30	35	40
Rating factors for PVC	1.17	1.12	1.06	1.0	0.94	0.87
Rating factors for HR PVC	1.12	1.08	1.04	1.0	0.95	0.90

## RATING FACTORS

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

**TABLE 18**

Depth of laying cm	Size		
	up to 25 mm <sup>2</sup>	Above 25 mm <sup>2</sup> up to 300 mm <sup>2</sup>	Above 300 mm <sup>2</sup>
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

## RATING FACTORS

for variation in thermal resistivity of soil (twin and multi-core cables laid direct in the ground)

**TABLE 19**

Nominal area of conductor mm <sup>2</sup>	For value to 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

## RATINGIS FACTORS

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

Nominal area of conductor mm <sup>2</sup>	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	1.03	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.9	0.82	0.76
2.5	1.15	1.03	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.9	0.82	0.76
4	1.15	1.03	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.9	0.82	0.76
6	1.15	1.03	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.9	0.82	0.76
10	1.15	1.03	1.00	0.9	0.83	0.77	1.18	1.09	1.00	0.89	0.81	0.75
16	1.17	1.09	1.00	0.9	0.83	0.77	1.19	1.09	1.00	0.89	0.81	0.74
25	1.18	1.09	1.00	0.9	0.82	0.76	1.19	1.09	1.00	0.88	0.8	0.74
35	1.18	1.09	1.00	0.9	0.82	0.75	1.2	1.09	1.00	0.88	0.8	0.74
50	1.18	1.09	1.00	0.9	0.82	0.75	1.2	1.09	1.00	0.88	0.8	0.74
70	1.19	1.09	1.00	0.89	0.81	0.74	1.21	1.1	1.00	0.88	0.8	0.74
95	1.19	1.09	1.00	0.89	0.81	0.74	1.22	1.1	1.00	0.88	0.8	0.74
120	1.21	1.1	1.00	0.89	0.8	0.74	1.22	1.1	1.00	0.88	0.79	0.74
150	1.21	1.1	1.00	0.89	0.8	0.74	1.22	1.1	1.00	0.88	0.79	0.73
185	1.21	1.1	1.00	0.89	0.8	0.74	1.22	1.1	1.00	0.88	0.79	0.73
240	1.21	1.1	1.00	0.89	0.8	0.74	1.22	1.1	1.00	0.88	0.79	0.73
300	1.21	1.1	1.00	0.89	0.8	0.74	1.22	1.1	1.00	0.88	0.79	0.72
400	1.21	1.1	1.00	0.88	0.8	0.74	1.24	1.11	1.00	0.88	0.79	0.72
500	1.21	1.1	1.00	0.88	0.8	0.74	1.24	1.11	1.00	0.88	0.79	0.72
630	1.22	1.1	1.00	0.88	0.8	0.74	1.24	1.11	1.00	0.88	0.79	0.72

**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**

- 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.
- 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.
- 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.
- 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.
- In no case should the drums be stored 'on the flat'; that is, with flange horizontal.
- 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.
- 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.

**GUIDELINES  
FOR CABLE  
LAYING**

(1) Recommended minimum bending radius of 1.1 kv grade cables for fixed installations:

Single core	- 15 D
Multi core	- 12 D

Where D = overall diameter of cable.

(2) Maximum permissible tensile strength for cables

(a) For cables pulled with stocking	
armoured cables	$P = 9 D^2$
unarmoured cables	$P = 5 D^2$

Where

P = Pulling force in Newtons

D = Outer diameter of cables in mm

(b) For cables pulled by pulling eye:

If the cables are pulled by gripping the conductor directly with pulling eye, the maximum permissible tensile stress depends on the material of the conductor and on their cross section as given below:

For Aluminium conductors	: 30 N/mm <sup>2</sup>
For Copper conductors	: 50 N/mm <sup>2</sup>

*Note: All figures given in the various tables are indicative only and may change without prior notice.*