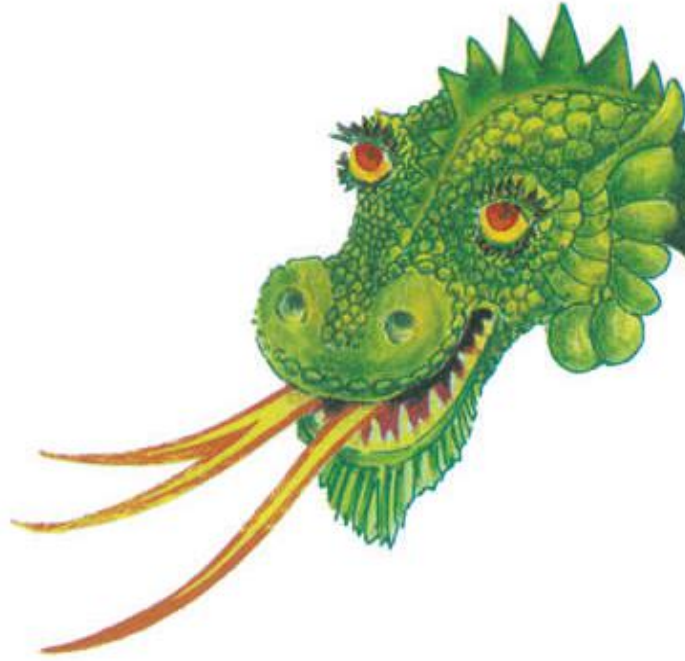


PVC INSULATED WIRING FLEXIBLE AND CONTROL CABLES



PIONEER BY NAME.
PIONEER BY DEED.



Some Cables Love To Devour Power **You** Pay For

Electricity flows through the copper strands inside the cables used for wiring. If the copper is not conductor grade, the cables will have less conductivity and greater resistance. Which means that much of the power flowing in from the mains to user outlets will be wasted. But it will be billed.

Some cables may initially cost less due to low grade material used. Low conductivity and high resistance of these cables increases risk of damage and current leakage and also contributes to increased power bills.

Use Pioneer Cables, manufactured by a company committed to excellence in product quality. Pioneer Cables are produced on a most modern plant using **prime conductor grade 99.9% pure copper**. Every single meter is subjected to stringent quality control and conforms to international standards. This is the reason why professionals prefer Pioneer Cables.

Ask for Pioneer Cables by name.

Make The Professionals Choice - Your Choice



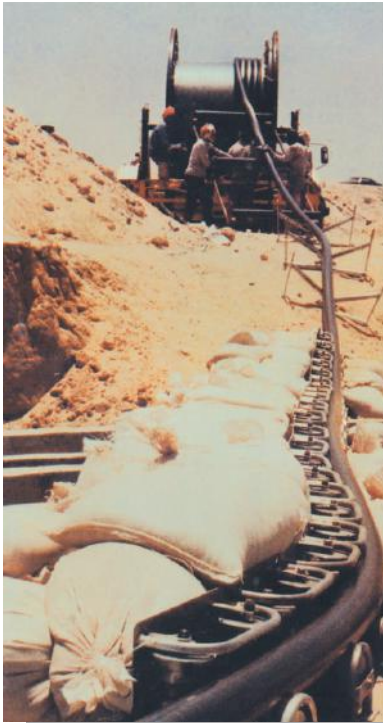
HEAD/SALES OFFICE KARACHI:1001, Unitowers, I.I. Chundrigar Road, P.O. Box No. 6643, Karachi-74000 (Pakistan).

Phone: +92-21-32416511-14. Sales: +92-21-32410553, 32417786. Fax: +92-21-32475078. ☎+92335 (PIONEER) 7466337

E-mail: enquiry@pioneerables.com, raza@pioneerables.com, hasnain@pioneerables.com Website: www.pioneerables.com



Leaders in Cable Technology Paving the way for future generations



Installation of Power Cables



- ✓ Conforming to International Standards
- ✓ High Conductivity 99.9% Pure Copper
- ✓ Economical




High Conductivity 99.9% Pure Copper Rod.
99.5% Minimum Purity Aluminium Rod.
Made by Bawany Metals Ltd.



Transmission Line Conductors

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Phone: +92-21-32416511-14. Sales: +92-21-32410553, 32417786. Fax: +92-21-32475078.  +92335 (PIONEER) 7466337

E-mail: enquiry@pioneercables.com, raza@pioneercables.com, hasnain@pioneercables.com Website: www.pioneercables.com



Quality Assurance at its most powerful



**The only
Pakistani
manufacturer to
be awarded
ISO 9001-2008
Certification for
the manufacture
of upto
33 kV High
Voltage Cables**



In line with our Total Customer Satisfaction, Pioneer Cables is the first cable manufacturer to have our cable successfully Type Tested at the prestigious HV & SC Testing Laboratory, NTDC Rawat.

Pioneer Cables: Leaders in cable technology, Paving the way for future generations



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E-mail: enquiry@pioneercables.com, raza@pioneercables.com, hasnain@pioneercables.com Website: www.pioneercables.com

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A Brief Profile

Pioneer Cables, established in 1980, is an ISO 9001:2008 certified company engaged in the manufacturing of H.T. /LT. Power Cables, Conductors & General Wiring Cables according to international standards.



Pioneer Cables is the flag ship company of Bawany Group, a well-known and trusted name in Pakistan with a rich history of success and good business ethics that goes back 100+ years. Our sister concern, Bawany Metals Limited is the FIRST in Pakistan to manufacture 99.9% Copper Rods conforming to ASTM B-49. It also produces 99.5% Aluminium Rods conforming to ASTM B-233.

Our manufacturing facilities are based at Hub Chowki, Balochistan about 30 KM from Karachi and

occupy 52,600 sq. meters of prime manufacturing space with associated management and design offices, laboratories, quality control and other departments.

Pioneer Cables is committed to the production of the best product quality utilizing cutting edge European technology in production processes, material applications and logistics procedures. We have the capability to provide a versatile product range to serve individual home consumers as well as the construction, electric utilities, distribution and industrial sectors.

The Company is managed by qualified professionals specializing in different fields. Most of the heads of technical and manufacturing departments have been trained at the plant of AEI Cables Ltd, Gravesend, U.K. Improvements in facilities and upgrading of equipment is a continuing process at our plant.

The scope of this catalogue is to provide an in depth view of the technical information of our PVC Insulated Wiring Flexible and Control Cables.

We are the Pioneers



We are
Registered with
almost all
government,
semi-government
Organizations in
Pakistan i.e.
WAPDA,
K-Electric
(formerly KESC),
MES, FWO, POF,
PAEC, NDC,
DHA, OGDC
Multinational
Companies like
Nestle, Unilever,
Siemens etc. &
Prestigious
Industrial Groups,
Housing Schemes
and Commercial
Plazas.

Pioneer by name.
Pioneer by deed.

With over 30 years of cable manufacturing Pioneer Cables has the honour to be the **1st:**

Unit in Pakistan to bring the technology of manufacturing XLPE 15 kV grade cables with the technical collaboration of AEI-UK in 1980.

To produce Jelly Filled Telephone Cables up to 1200 pairs by sister concern Pakistan Telephone Cable in 1983.

To have Copper / Aluminium Rod manufacturing industry by sister concern Bawany Metals Limited in 1983.

Pakistani manufacturer having the privilege of cable testing in **KEMA Laboratories, Holland in 1984.**

Cable manufacturer to have cables successfully type tested at the prestigious HV & SC Testing Laboratories, NTDC Rawat.

Manufacturer to produce Triple Extruded H.T XLPE 15 kV cables as per IEC-60502-2 and KESC specifications-123 (the latest in cable technology) in 2008.

To use 100% prime quality Copper / Aluminium Rods (made by our sister concern Bawany Metals Limited) and genuine imported insulating material.

Cable manufacturer with in-house testing facilities in the most modern laboratory in Pakistan for all its products handling various types of tests.

...And the **ONLY** Pakistani manufacturer to be awarded ISO 9001:2008 Certification for making up to 33 kV grade cables (the highest electrical rating manufacturing and testing facility in Pakistan).

Foreword

To help conserve the country's foreign exchange resources and keeping in view such innovation and future requirements arising out of technological development in the field of Power Cables, the Pioneer Cables Limited was established at Hub Chowki in the District of Lasbella, Balochistan in Technical Collaboration with AEI of U.K. (a subsidiary of GEC) to manufacture all sorts of Power Cables including cross linked polyethylene insulated Low Tension/High Tension Cables for the first time in Pakistan in order to meet the demand and to power the progress of the country.

Pioneer Cables Limited manufactures low and medium voltage PVC insulated armoured & unarmoured Power Cables, besides, XLPE low and medium voltage cables alongside the XLPE HV Cables.

The Cable Plant is the most modern and automated and is fully equipped with adequate testing facilities. It is managed by skilled, highly qualified and experienced personnel trained abroad.

MANAGEMENT OF COMPANY

The Company is managed by professional Managers in different fields. Almost all heads of technical/manufacturing departments have been trained in AEI Cables Ltd., plant at Gravesend U.K.

Quality Policy

The Quality Policy of PCL is to produce and supply cables and conductors according to international standards, adhering strictly to specifications to suit customer's requirement.

In order to achieve the objective, the company ensures that suitable plant / machinery and testing facilities are provided and that it is manned by proper trained and qualified staff who can effectively provide quality production.

It is our policy that quality control checks take place at all stages of production right from the start i.e. the selection and receipt of raw material to the finish i.e. completion of Cables / Conductors and its final testing, in order to ensure that it conforms to international standards in respect to quality.

According to the Quality Policy of PCL, if a cable / conductor is found deviating from standards at any stage of production it is not allowed to move further unless remedial action is taken as suggested by the Quality Control Department and if that is not possible it is scrapped altogether.

We firmly believe in producing quality product using the best of materials available and the right production technique so that it is comparable in quality with cables / conductors of international repute and satisfies our customers now and in future and are not prepared to compromise on this point under any circumstances.

We stand by **≈PRACTICE WHAT YOU PREACHΔ**

**AEI
CABLES**

AEI Cables Limited
Gravesend Kent DA11 9AF

Telephone - Gravesend (STD 0474) 64466
International + 44 474 64466

Telex - 25829
Telegrams - Assoclect Gravesend

Your ref

Our ref

Tel ext.

To whom it may concern

Dear Sirs,

This letter serves to confirm that an agreement was drawn up between Associated Electrical Industries Ltd. whose registered office is 1 Stanhope Gate, London W1A IEH, England, and Pioneer Cable Company Ltd. of Uni Tower Building, I.I. Chundrigar Road, Karachi, Pakistan, on the 26th day of November 1980 whereby AEI, who had developed certain technological expertise in the manufacture and know-how of production of elastomeric type power cables in the range up to 35000 volts, would provide technical collaboration with Pioneer Cable Company for the latter to develop cables in the same range. Additionally, AEI has agreed to make available particular insulating materials to enable Pioneer Cables to manufacture cross-linked polyethylene cables in the range quoted above. Within the terms of the agreement, AEI will afford instruction to Pioneer Cables engineers at its Gravesend Factory and that at any reasonable time an AEI engineer, on request, will be available to visit Pioneer Cables factory site to provide immediate assistance.

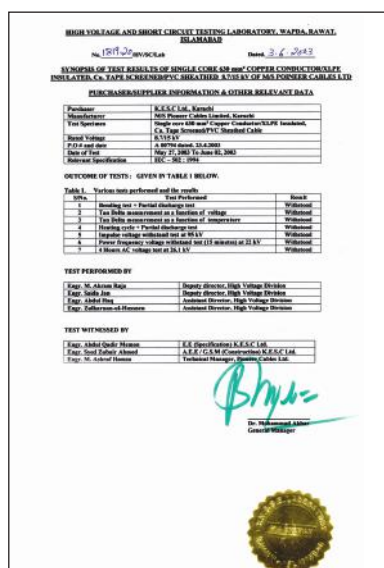
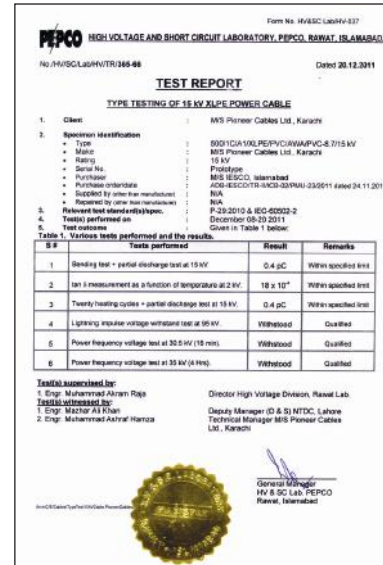
The duration of technical collaboration agreement is ten years from November 26, 1980. Provisions, however, are made whereby in the event of default either party may terminate the agreement at six months notice.

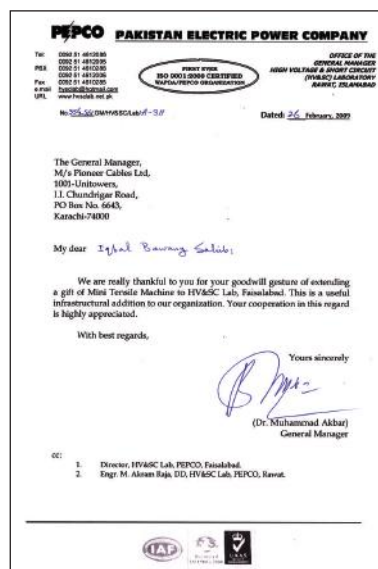
Yours faithfully



R. H. Simpson
Manager - Group Services

Certificates





1. INTRODUCTION

This publication provides details of the following types of electric cables:

- a) SINGLE CORE WIRING CABLES, PVC insulated with or without PVC oversheath.
- b) TWO TO FOUR CORE WIRING CABLES, PVC insulated and PVC oversheath.
- c) MULTICORE ARMoured CABLES, variously described as "CONTROL" or "AUXILIARY" cables, PVC insulated, steel wire armoured and PVC over sheathed conductor sizes 1.5 sq. mm to 35 sq. mm with coloured core and 7 to 37 core cables of conductor sizes 1.5 sq. mm to 4 sq. mm with core numbers printed on white insulation.
- d) Flexible Cables.



■ SOLID / STRANDED / FLEXIBLE AND CONTROL CABLES ■

2. SPECIFICATIONS AND STANDARDS

Items 1(a) i.e., single core cables conform to BS 6004 ≈PVC Insulated cables (non-armoured) for electric power and lightingΔ. PVC insulated non-sheathed cables are in the size range 1.5 sq. mm to 630 sq. mm and are rated 450/750 Volts. Single core cables with additional PVC oversheath go up to and including 35 sq. mm conductor size only and are rated 600/1000 Volts.

Items 1(b) i.e., 2 to 4 Core PVC/PVC cables also conform to BS 6004 i.e. flat cables (up to 2x10 sq. mm) and circular cables of conductor size in the range 1.5 sq. mm to 35 sq. mm are dealt with. These unarmoured cables are rated 300/500 Volts.

Item 1(c) i.e. multicore PVC/SWA/PVC cables comply with BS 6346 ≈PVC Insulated Power Cables for Electricity SupplyΔ.

Items 1(d) i.e., Single Core and 2 to 5 Core PVC/PVC flexible cables conform to BS 6500.

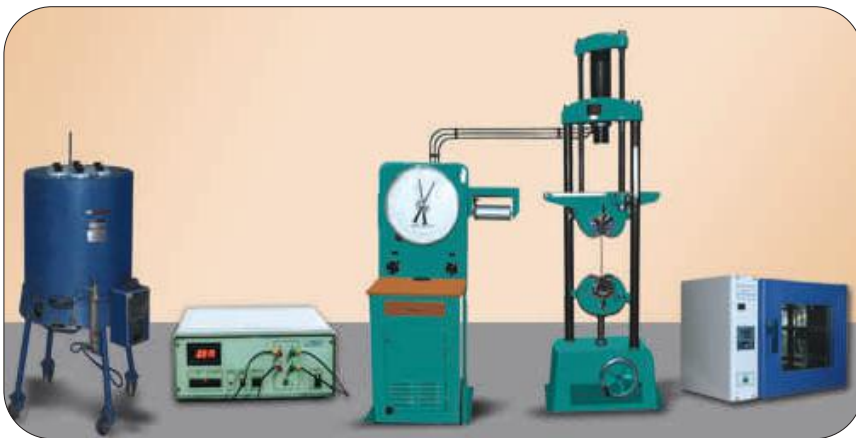
Copper conductor which are generally stranded, comply with BS 6360 and IEC Publication No. 60228 i.e. the standards for insulated electric conductors. PVC Insulating and sheathing compounds exceed the requirements of Type TI1 (70 °C) and Type TM1 respectively of BS 7655. Where specifically required heat resistant Type 5 (85 °C) PVC insulation and/or sheath can be offered.

The construction of the wiring cables in this publication also satisfy international specification IEC publication 60227 and German standard VDE 0281.

Unless specifically stated otherwise, colour of cores manufactured are as follows:

1. core cables : Green, Red, Yellow, Blue or any other colour
2. core cables : Red and Black
3. core cables : Red, Yellow, Blue
4. core cables : Red, Yellow, Blue and Black
5. core cables : Red, Yellow, Blue, Black and Green

More than 5 cores : White with numbers printed in black.



Dimensions & Weights of Single Core PVC Insulated Cables

Table 1

Nominal Conductor area mm. sq.	PVC insulated, non-sheathed 450/750 V		PVC insulated, non-sheathed 300/500 V		
	Mean overall + Diameter-mm upper limit	Approximate weight Kg / Km	Overall diameter		Approximate weight Kg / Km
			minimum mm	maximum mm	
1.5*	3.2	21	4.2	4.9	36
1.5	3.3	23	—	—	
2.5*	3.9	33	4.8	5.8	51
2.5	4.0	35	—	—	
4.0*	4.4	48	—	—	
	4.04.6	50	5.4	6.8	75
6.0	5.2	70	6.0	7.4	100
10	6.7	120	7.2	8.8	150
16	7.8	180	8.4	10.5	215
25	9.7	280	10.0	12.5	330
35	10.9	370	11.0	13.5	430
50	12.8	500			
70	14.6	710			
95	17.1	960			
120	18.8	1190			
150	20.9	1470			
185	23.5	1840			
240	26.6	2400			
300	29.6	3010			
400	33.7	3820			
500	36.9	4900			
630	41.1	6270			

Note:

* Conductors are solid and all others are stranded. Refer Table 3 for details.

Dimensions & Weights of Circular PVC/ PVC (Unarmoured) Multicore Cables

Table 2

Conductor Size Sq. mm	Two Core			Three Core			Four Core		
	Diameter mm		Weight	Diameter mm		Weight	Diameter mm		Weight
	Min.	Max.	kg/km	Min.	Max.	kg/km	Min.	Max.	kg/km
1.5*	8.4	10.0	}	8.8	10.5	}	9.6	11.5	}
1.5	8.4	10.5	}	8.8	11.0	}	9.6	12.0	}
2.5*	9.6	11.5	}	10.0	12.0	}	11.0	13.0	}
2.5	9.6	12.0	}	10.0	12.5	}	11.0	13.5	}
4.0	10.5	13.0	238	11.0	13.5	284	12.5	15.0	361
6.0	11.5	14.0	304	12.5	15.5	383	14.0	17.0	486
10.0	15.0	17.5	428	15.5	19.0	538	17.0	20.5	694
16.0	16.5	20.0	580	18.0	21.5	770	20.0	23.5	970
25.0	20.5	24.0	860	22.0	26.0	1170	24.5	28.5	1510
35.0	23.0	27.5	1145	24.5	29.0	1520	27.0	32.0	1945

* Conductors are solid and all others are stranded

3. PERFORMANCE CHARACTERISTICS

3.1 Voltage Ratings

The non-sheathed general purpose cables rated at 450/750 V (450 V to earth, 750 V between conductors). These cables are considered suitable for fixed protected installations in lighting fittings and inside appliances, switch gear and control gear for voltages upto 1000 V a.c. or upto 750 V to earth d.c.

Single core sheathed 2-core, 3-core and 4-core PVC/PVC cables are rated 300/500 V (300 V to earth, 500 V between conductors).

3.2 Conductors Resistances

Table 3

Nominal conductor area mm ²	Number and nominal diameter of wires: mm	Nominal diameter of conductor mm	Maximum conductor Resistance at 20.C per KM: ohm	Nominal conductor area mm ²	Number of wires	Nominal diameter of conductor mm	Maximum conductor Resistance at 20.C per KM: ohm
1.0*	1/1.13	1.13	18.1	35	7	7.30	0.524
1.0	7/0.44	1.32	18.1	50	19	8.40	0.387
1.5*	1/1.38	1.38	12.1	70	19	10.05	0.268
1.5	7/0.53	1.59	12.1	95	19	11.75	0.193
2.5*	1/1.78	1.78	7.41	120	37	13.40	0.153
2.5	7/0.67	2.01	7.41	150	37	14.80	0.124
4.0*	1/2.25	2.25	4.61	185	37	16.16	0.0991
4.0	7/0.85	2.55	4.61	240	37	18.06	0.0754
6.0	7/1.04	3.12	3.08	300	37	21.30	0.0601
10	7/1.35	4.05	1.83	400	61	24.20	0.0470
16	7	4.90	1.15	500	61	27.20	0.0366
25	7	6.25	0.727	630	91	30.75	0.0283

(*) Solid Conductors.

3.3 Current Carrying capacities at ambient temperature 30 °C

The tabulated current carrying capacities relate to continuous loading and are also known as the ≈full thermal ratingsΔ implying that the cables will operate at their maximum conductor continuous temperature of 70 °C. The data are extracted from IEE Wiring Regulations.

3.4 Volt. Drop data at ambient temperature 30 °C

For a given cable run, to calculate the voltage drop (in mV), the tabulated value (mV/A/m) has to be multiplied by cable route length in meters and design current. For three-phase circuits the tabulated mV/Am values relate to the line voltage.

For cables of 16 mm² or less cross sectional area, the inductances can be ignored and ≈mV/A/mΔ values are based on resistance only. For cables of cross sectional area greater than 16 mm², ≈mV/A/mΔ values based on resistance and inductance (x) are significant. However for brevity, in the table 4A for single core cables of sizes larger than 16 mm² (mV/A/m) z values based on total impedance (z) only are given while the table for multicore cables provides data for all components.

Where power factor of A.C. load is widely different from the cable power factor, use of (m/V/A/m) z value for calculating the volt drop may give a pessimistically high value. For detailed information, reference should be made to the IEE Wiring Regulations.

Single Core PVC Insulated Non-sheathed Cables

Cables in conduit on a wall or ceiling or in trunking or conduit embedded in masonry (non-thermal insulating)

Table 4

Conductor Cross Sectional Area (mm ²)	Current carrying capacities (amperes)		Volts Drops (mV/A/m)		Conductor Cross Sectional Area (mm ²)	Current carrying capacities (amperes)		Volts Drops (mV/A/m)*					
								2 cables single phase ac			3 or 4 cables three phase ac		
	r	x	z	r		x	z						
1	13.5	12	44	38	50	151	134	0.95	0.30	1.00	0.8	0.26	0.85
1.5	17.5	15.5	29	25									
2.5	24	21	18	15	70	192	171	0.65	0.29	0.72	0.56	0.25	0.61
4	32	28	11	9.5	95	232	207	0.49	0.28	0.56	0.42	0.24	0.48
6	41	36	7.3	6.4	120	269	239	0.39	0.27	0.47	0.33	0.23	0.41
					150	300	262	0.31	0.27	0.41	0.27	0.23	0.36
10	57	50	4.4	3.8	185	341	296	0.25	0.27	0.37	0.22	0.23	0.32
16	76	68	2.8	2.4									
25	101	89	1.8	*1.55	240	400	346	0.20	0.26	0.33	0.17	0.23	0.29
35	125	110	1.3	*1.10	300	458	394	0.16	0.26	0.31	0.14	0.23	0.27
					400	546	467	0.13	0.26	0.29	0.12	0.22	0.25
					500	626	533	0.11	0.26	0.28	0.10	0.22	0.25
					630	720	611	0.09	0.25	0.27	0.08	0.22	0.24

* Volt drop based on total impedance "z"

Note: Data in above table is based on IEE Wiring Regulations

Single Core PVC Insulated PVC Sheathed Cables

Table 4A

CURRENT CARRYING CAPACITIES (Amperes)								VOLT DROPS (mV/A/m)+				
Conductor Cross Sectional Area (mm ²)	Clipped direct to or lying on a non-metallic surface		On a perforated cable tray-unenclosed (perforations occupying atleast 30% surface area)		# In free air (any metal support- occupying less than 10% plan area)			Clipped direct or on trays touching		In Free Air (Middle column below also applicable to cables in TREFOIL under other Installation conditions)		
					Space between cables =D (min)		3 cables in trefoil with distance from wall: >0.5D (one cable) >0.75D(two cables)					
	Horizontal flat spaced	Vertical flat spaced	2 cables single- phase ac or dc or 3 cables three phase ac	2 cables single- phase ac or dc or 3 cables three phase ac	3 cables in trefoil with three phase ac	2 cables single phase ac		3 or 4 cables three phase ac (flat)	2 cables single phase ac (spaced*) Trefoil)	In trefoil	Flat (Spaced*)	
1	15.5	14						44	38	44	38	38
1.5	20	18						29	25	29	25	25
2.5	27	25						18	15	18	15	15
4	37	33						11	9.5	11	9.5	9.5
6	47	43						7.3	6.4	7.3	6.4	6.4
10	65	59						4.4	3.8	4.4	3.8	3.8
16	87	79						2.8	2.4	2.8	2.4	2.4
25	114	104	126	112	146	130	110	1.75	1.55	1.80	1.5	1.55
35	141	129	156	141	181	162	137	1.25	1.10	1.30	1.1	1.15
50	182	167	191	172	219	197	167	0.95	0.84	0.97	0.82	0.86
70	234	214	246	223	281	254	216	0.66	0.60	0.69	0.57	0.63
95	284	261	300	273	341	311	264	0.50	0.47	0.54	0.43	0.51
120	330	303	349	318	396	362	308	0.41	0.40	0.45	0.36	0.44
150	381	349	404	369	456	419	356	0.34	0.34	0.39	0.30	0.40
185	436	400	463	424	521	480	409	0.29	0.31	0.35	0.26	0.36
240	515	472	549	504	615	569	485	0.25	0.27	0.31	0.22	0.34
300	594	545	635	584	709	659	561	0.22	0.25	0.29	0.190	0.32
400	694	634	732	679	852	795	656	0.20	0.24	0.27	0.175	0.31
500	792	723	835	778	982	920	749	0.185	0.23	0.26	0.160	0.30
630	904	826	953	892	1138	1070	855	0.175	0.22	0.25	0.150	0.29

D = cable diameter

+ Volt drop for sizes 25 mm² and above are based on total impedance «Z» only. For «r» and «x» data, IEE Wiring Regulations should be referred.

* Spacing larger than those indicated will result in larger volt drops.

Note: Data in above table is based on IEE WIRING REGULATIONS

Multicore PVC Insulated PVC Sheathed (Unarmoured) Cables

Table 5

Conductor Cross Sectional Area (mm ²)	CURRENT CARRYING CAPACITIES (Amperes)								VOLT DROPS (mV/A/m)*	
	In conduit in a thermally insulating wall or installed directly in a thermally insulating wall/ceiling but in contact with conductive surface on one side or in building voids		In conduit on a wall or ceiling on in flush floor trunking		Clipped direct to or lying on a non-metallic surface or embedded directly in a masonry or plaster (non-insulating)		On a perforated cable tray unenclosed (perforations occupying atleast 30% surface area) VOLT DROPS + (mV/A/m)			
	1 two core cable* single phase ac or dc	1 three core cable* or 1 four core cable, three phase ac	1 two core cable* single phase ac or dc	1 three core cable* or 1 four core cable, three phase ac	1 two core cable* single phase ac or dc	1 three core cable* or 1 four core cable, three phase ac	1 two core cable* single phase ac or dc	1 three core cable* or 1 four core cable, three phase ac	Two core cable single phase ac	Three or four core cable three phase ac
1	11	10	13	11.5	15	13.5	17	14.5	44	38
1.5	14	13	16.5	15	19.5	17.5	22	18.5	29	25
2.5	18.5	17.5	23	20	27	24	30	25	18	15
4	25	23	30	27	36	32	40	34	11	9.5
6	32	29	38	34	46	41	51	43	7.3	6.4
10	43	39	52	46	63	57	70	60	4.4	3.8
16	57	52	69	62	85	76	94	80	2.8	2.4
25	75	68	90	80	112	96	119	101	1.7	1.5
35	92	83	111	99	138	119	148	126	1.2	1.1

+ Volt drop due to resistive (r) component only given for conductor size upto 16 mm².

* With or without protective conductor.

Note: Data in above table is based on IEE WIRING REGULATIONS

3.5 Rating Factors

For ambient temperature other than 30°C; the tabulated current ratings should be adjusted by factors as follows:

Table 6

Ambient temperature Deg. Cent.	25	30	35	40	45	50	55	60	65
Semi-enclosed fuse to BSS 3036 (formerly coarse excess current protection)	1.03	1.0	0.97	0.94	0.91	0.87	0.84	0.69	0.48
Overload protection afforded by device other than semi-enclosed fuse to BS 3036	1.03	1.0	0.94	0.87	0.79	0.71	0.61	0.5	0.35

Thermal Insulation

Current ratings pertaining to cables or cable conduits totally surrounded by thermally insulating material are not included in the foregoing tables. For such situations, in absence of precise information, a rating factor of 0.5 may be applied to the appropriate current ratings.

For Multicore cables, current ratings of cables installed in thermally insulated wall or above thermally insulated ceiling but in contact with a thermally conductive surface on one side are stated. For similar information applicable to single core cable, reference should be made to the IEE Wiring Regulations.

Correction factors for groups of cables are as follows:

Table 7

Method of Installation		Correction factor													
		Number of circuits or multicore cable													
		2	3	4	5	6	7	8	9	10	12	14	16	18	20
Enclosed in conductor trunking or bunched and clipped direct to a non-metallic surface		0.80	0.70	0.65	0.60	0.57	0.54	0.52	0.50	0.48	0.45	0.43	0.41	0.39	0.38
Single layer clipped to a non-metallic surface	Touching	0.85	0.79	0.75	0.73	0.72	0.72	0.71	0.70	√	√	√	√	√	√
	Spaced*	0.94	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Single layer multicore on a perforated metal cable tray, vertical or horizontal	Touching	0.86	0.81	0.77	0.75	0.74	0.73	0.73	0.72	0.71	0.70	√	√	√	√
	Spaced*	0.91	0.89	0.88	0.87	0.87	√	√	√	√	√	√	√	√	√
Single layer single-core on a perforated metal cable tray, touching	Horizontal	0.90	0.85	√	√	√	√	√	√	√	√	√	√	√	√
	Vertical	0.85	√	√	√	√	√	√	√	√	√	√	√	√	√
Single layer multicore touching on ladder supports		0.86	0.82	0.80	0.78	0.78	0.78	0.78	0.77	√	√	√	√	√	√

* «Spaced» means a clearance between adjacent surfaces of at least one cable diameter (D). Where the horizontal clearances between adjacent cables exceeds 2D no correction factor need be applied.

Notes to Table 7

1. The factors in the table are applicable to groups of cables all of one size. The value of current derived from application of the appropriate factors is the maximum continuous current to be carried by any of the cables in the group.
2. If, due to known operating conditions, a cable is expected to carry not more than 30% of its grouped rating, it may be ignored for the purpose of obtaining the rating factor for the rest of the group.

3.6 Conductor short circuit ratings

Clause 4.25 may be referred to for values of short circuit current ratings based on the cable being fully loaded at the start of short circuit (conductor temperature 70 °C) and a final conductor temperature of 160 °C.

3.7 Installation

Wiring cables should be installed in accordance with IEE Wiring Regulations or appropriate installation authority regulations.

Minimum internal radius at bends:

CABLE DIAMETER	Min. internal radius
Upto 10 mm	- 3 x cable diameter
Exceeding 10.0 mm but less than 25 mm	- 4 x cable diameter
Exceeding 25 mm	- 6 x cable diameter

4. CONTROL CABLES

4.1 Dimensions and weights

Two, Three & Four core PVC/SWA/PVC-600/1000 Volts Cables

Table 8

Cable Reference	Conductor Area	Size	Nominal diameter			Diameter Overall	Approximate Weight
			Under Armour	Wire Size	Over Armour		
	mm ²	mm	mm	mm	mm	mm	kg/km
Two Core	1.5	1/1.38	6.9	0.9	8.7	11.7	280
	1.5	7/0.53	7.4	0.9	9.2	12.0	298
	2.5	1/1.78	8.1	0.9	9.9	13.1	350
	2.5	7/0.67	8.6	0.9	10.4	13.2	355
	4	7/0.85	10.0	0.9	11.8	15.1	460
	6	7/1.04	11.2	0.9	13.0	16.5	550
	10	7/1.35	13.9	1.25	16.4	20.1	880
Three Core	1.5	1/1.38	7.3	0.9	9.1	12.3	310
	1.5	7/0.53	7.9	0.9	9.7	12.5	344
	2.5	1/1.78	8.6	0.9	10.4	13.6	390
	2.5	7/0.67	9.2	0.9	11.0	13.8	413
	4	7/0.85	10.7	0.9	12.5	15.8	520
	6	7/1.04	11.9	1.25	14.4	18.0	730
	10	7/1.35	14.9	1.25	17.4	21.2	1010
Four Core	1.5	1/1.38	8.0	0.9	9.8	13.0	350
	1.5	7/0.53	8.6	0.9	10.4	13.2	383
	2.5	1/1.78	9.5	0.9	11.3	14.5	440
	2.5	7/0.67	10.1	0.9	11.9	14.7	470
	4	7/0.85	11.8	1.25	14.3	17.8	710
	6	7/1.04	13.2	1.25	15.7	19.2	850
	10	7/1.35	16.5	1.25	19.0	22.8	1200



7 to 37 - Core PVC/SWA/PVC-600/1000 Volts Auxiliary Cables

Table 9

Cable Reference	Number of Cores	Nominal diameter			Diameter Overall	Approximate Weight
		Under Armour	Wire Size	Over Armour		
		mm	mm	mm		
Conductor 1.5 mm ² (1/1.38 mm)	7	9.5	0.9	11.4	14.5	445
	12	12.6	1.25	15.1	18.6	740
	19	14.8	1.25	17.4	21.1	965
	27	18.3	1.6	21.5	25.4	1420
	37	20.5	1.6	23.7	27.3	1730
Conductor 1.5 mm ² (7/0.53 mm)	7	10.3	0.9	12.1	14.9	470
	12	13.6	1.25	16.1	19.1	784
	19	16.0	1.25	18.5	21.7	1023
	27	19.7	1.6	22.9	26.3	1506
	37	22.1	1.6	25.3	28.9	1834
Conductor 2.5 mm ² (1/1.78 mm)	7	11.3	0.9	13.5	16.6	590
	12	15.1	1.25	17.6	21.4	975
	19	18.2	1.6	21.4	25.4	1500
	27	22.0	1.6	25.2	29.3	1910
	37	24.7	1.6	27.9	32.4	2360
Conductor 2.5 mm ² (7/0.67 mm)	7	12.1	1.25	14.6	17.6	729
	12	16.2	1.25	18.7	21.9	1049
	19	19.5	1.6	22.7	26.1	1584
	27	23.5	1.6	26.7	30.3	2043
	37	26.5	1.6	29.7	33.5	2517
Conductor 4 mm ² (7/0.85 mm)	7	14.3	1.25	16.8	20.5	940
	12	19.6	1.6	22.8	26.8	1560
	19	23.1	1.6	26.3	30.5	2080
	27	28.4	2.0	32.4	37.1	8040

4.2 PERFORMANCE CHARACTERISTICS

4.21 Voltage Rating

All cables in this category i.e. PVC SWA PVC construction as per BS 6346 are rated 600/1000 Volts.

4.22 Conductor Resistances

For corresponding conductor sizes, conductor resistances as per tables 3 are applicable.

4.23 Current ratings and Voltage drop

Table 10 gives the current ratings in conditions stated below and the voltage drop values per ampere load per meter length of cable. The current ratings apply to cables with upto only four cores.

Table 10

Installation ambient temperature	Conductor area	Twin cable single phase ac or dc		3 or 4 core cable three phase ac	
		Current rating	Approximate volt drop per amp per meter	Current rating	Approximate volt drop per amp per meter
	mm ²	amp	mV	amp	mV
In air, clipped direct to a surface or on a cable tray	1.5	21	29	18	25
	2.5	28	18	25	15
	4	38	11	33	9.5
	6	49	7.3	42	6.4
	10	67	4.4	58	3.8
In 100 mm diameter single way ducts in the ground	1.5	28	29	22	25
	2.5	34	18	29	15
	4	45	11	38	9.5
	6	57	7.3	48	6.4
	10	76	4.4	64	3.8
Direct in the ground	1.5	32	29	27	25
	2.5	41	18	35	15
	4	55	11	47	9.5
	6	69	7.3	59	6.4
	10	92	4.4	78	3.8

4.24 Installation conditions for current ratings:

Ambient air temperature : 30 °C Cables shielded from direct sunlight and laid on cable tray or clipped direct to a surface.

Ground temperature : 15 °C

Soil thermal resistivity : 1.2 C m/w

Depth of laying : 0.5 m

(when directly buried or in single way ducts in ground)

Maximum continuous conductor operating temperature : 70 °C

Maximum conductor short circuit temperature : 160 °C

The full current ratings of these cables correspond to a maximum continuous conductor operating temperature of 70 °C, and are derived from ERA report and IEE Wiring Regulations.

Accordingly, these cables should only be continuously operated at their tabulated rating if the minimum current at which the circuit protection operates does not exceed 1.45 times the tabulated value for cables in air or single way ducts, or 1.3 times the tabulated values for cables installed direct in the ground.

The ratings are for single circuits installed thermally independent of other cables or any other heat source. For conditions of installation other than those given, or for grouping, reference should be made to the section on grouping for cables in air, and to the latest edition of ERA Report for cables in ducts and ground.

(A) TEMPERATURE RATING FACTORS

Cables in air

Data as per Table 6 are applicable

Cables in ground

Data as per Table 12 are applicable

(B) GROUPING CORRECTION FACTORS

Factors as per table 7 are applicable

Thermal insulation

Please see items between Table 6 and 7

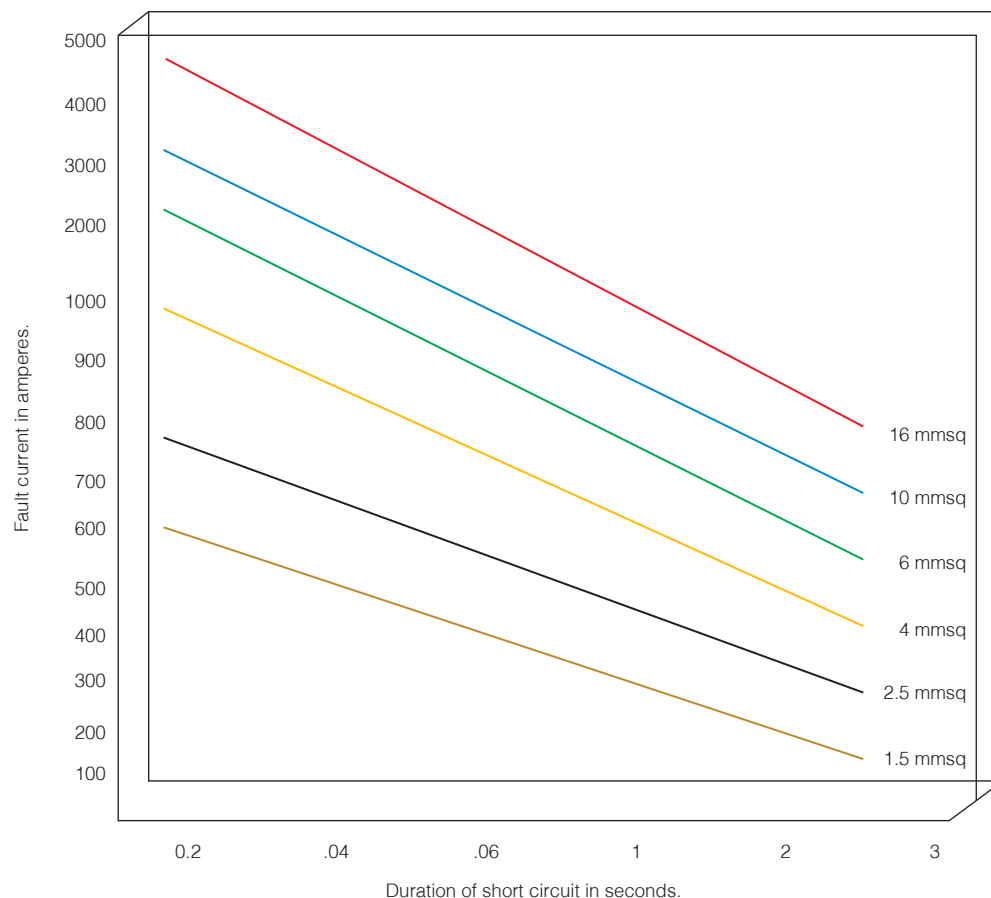
Steel wire armour - cross sectional area and electrical resistance

Table 11

Conductor area mm ²	Cross section area of round armour wires			Maximum resistance per km of cable at 20°C.			
	Standard conductors			Copper Conductor ohm/km	Steel wire armour		
	Two core mm ²	Three core mm ²	Four core mm ²		Two core ohm/km	Three core ohm/km	Four core ohm/km
1.5	16	17	19*	12.1	10.7	0.2	9.5
2.5	19*	20*	21	7.41	9.1	8.8	7.9
4	22	23	36	4.61	7.5	7.0	4.6
6	24	37	40	3.08	6.8	4.6	4.1
10	42	45	49	1.83	3.9	3.7	3.4

4.25 Short Circuit Ratings

Short circuit ratings (conductors)



The value of short circuit current ratings given in this graph are based on the cable being fully loaded at the start of the short circuit (conductor temperature 70°C) and a final conductor temperature of 160°C.

For ground temperature other than 15°C ratings must be adjusted by temperature rating factors as follows:

Table 12

Ground temperature °C.	15	20	25	30	35
Semi-enclosed fuse BS 3036 (formerly coarse) excess current protection	1.0	0.98	0.95	0.93	0.91
Fuse to BS 88 or BS 1361, or circuit breaker to BS 3871 Part-I or BS 4752 Part-I (formerly close) excess current protection	1.0	0.95	0.90	0.85	0.80

Short circuit ratings (armour)

Armour fault currents to earth (for fault duration of 1 second)

Table 13

Nominal area of conductor mm ²	Steel wire armour		
	Two core amp	Three core amp	Four core amp
1.5	700	700	700
2.5	800	800	900
4	900	1000	1500
6	1000	1500	1700
10	1800	1900	2100
16	2000	2200	3200



5. FLEXIBLE CABLES

Table 14, PVC insulated, non-sheathed general purpose cable, 450/750 V, single core

Construction

Conductor √ class 5 copper, flexible.

Insulation √ PVC type TI1.

Colours for core identification

Green/yellow, blue or other colours.

Table 14

Nominal cross sectional area of conductor mm ²	Radial thickness of insulation mm	Mean overall diameter		Minimum insulation resistance at 70°C M Ω km
		Lower limit mm	Upper limit mm	
1.5	0.7	2.8	3.4	0.010
2.5	0.8	3.4	4.1	0.009 5
4	0.8	3.9	4.8	0.007 8
6	0.8	4.4	5.3	0.006 8
10	1.0	5.7	6.8	0.006 5
16	1.0	6.7	8.1	0.005 3
25	1.2	8.4	10.2	0.005 0
35	1.2	9.7	11.7	0.004 3
50	1.4	11.5	13.9	0.004 2
70	1.4	13.2	16.0	0.003 6
95	1.6	15.1	18.2	0.003 6
120	1.6	16.7	20.2	0.003 2
150	1.8	18.6	22.5	0.003 2
185	2.0	20.6	24.9	0.003 2
240	2.2	23.5	28.4	0.003 1

Flexible Cables

Table 15, PVC insulated, PVC Sheathed single core 300/500 V parallel twin, circular twin, 3-core, 4-core and 5-core

Construction

Annealed copper conductor. Class 5 flexible conductor.

For circular cords, the cores and fillers, if any, shall be twisted together to give a practically circular cross section. A centre filler may be used except for twin cords.

For twin circular cords, the spaces between the cores shall be filled either by separate fillers or by the sheath filling the interstices.

For flat cords, the two cores are laid parallel.

A separator may be used which shall not adhere to the cores.

The sheath may fill the outer interstices thus forming a filling but it shall not adhere to the cores.

Colours for core identification

Unless specifically stated otherwise, colour of cores manufactured are as follows:

Twin : Blue & Brown

3-core : Blue, Brown & Green

4-core : Black, Blue, Brown & Green

5-core : Red, Blue, Brown, Black & Green

Colour of sheath: Grey or other Colours

Table 15

Number of cores and nominal cross sectional area of conductor mm ²	Radial thickness of insulation mm	Radial thickness of sheath mm	Mean overall diameter or dimensions		Minimum insulation resistance at 70°C M Ω km
			Lower limit ¹⁾ mm	Upper limit mm	
2 x 0.5	0.6	0.8	5.6	7.0	0.013
2 x 0.75	0.6	0.8	3.8 x 6.0	5.2 x 7.6	0.011
2 x 0.75	0.6	0.8	6.0	7.6	0.011
2 x 1	0.6	0.8	3.9 x 6.4	5.2 x 8.0	0.010
2 x 1	0.6	0.8	6.4	8.0	0.010
2 x 1.25	0.7	0.8	7.0	8.6	0.010
2 x 1.5	0.7	0.8	7.4	9.0	0.010
2 x 2.5	0.8	1.0	8.9	11.0	0.009
2 x 4	0.8	1.1	10.1	12.0	0.007
3 x 0.75	0.6	0.8	6.4	8.0	0.011
3 x 1	0.6	0.8	6.8	8.4	0.010
3 x 1.25	0.7	0.9	7.6	9.4	0.010
3 x 1.5	0.7	0.9	8.0	9.8	0.010
3 x 2.5	0.8	1.1	9.6	12.0	0.009
3 x 4	0.8	1.2	11.0	13.0	0.007
4 x 0.75	0.6	0.8	6.8	8.6	0.011
4 x 1	0.6	0.9	7.6	9.4	0.010
4 x 1.5	0.7	1.0	9.0	11.0	0.010
4 x 2.5	0.8	1.1	10.5	13.0	0.009
4 x 4	0.8	1.2	12.0	14.0	0.007
5 x 0.75	0.6	0.9	7.4	9.6	0.011
5 x 1	0.6	0.9	8.3	10.0	0.010
5 x 1.5	0.7	1.1	10.0	12.0	0.010
5 x 2.5	0.8	1.2	11.5	14.0	0.009
5 x 4	0.8	1.4	13.5	15.5	0.007

Comparison between Standard Imperial and the Nearest Standard Metric sizes of Conductors for Electric Cables

Table 16

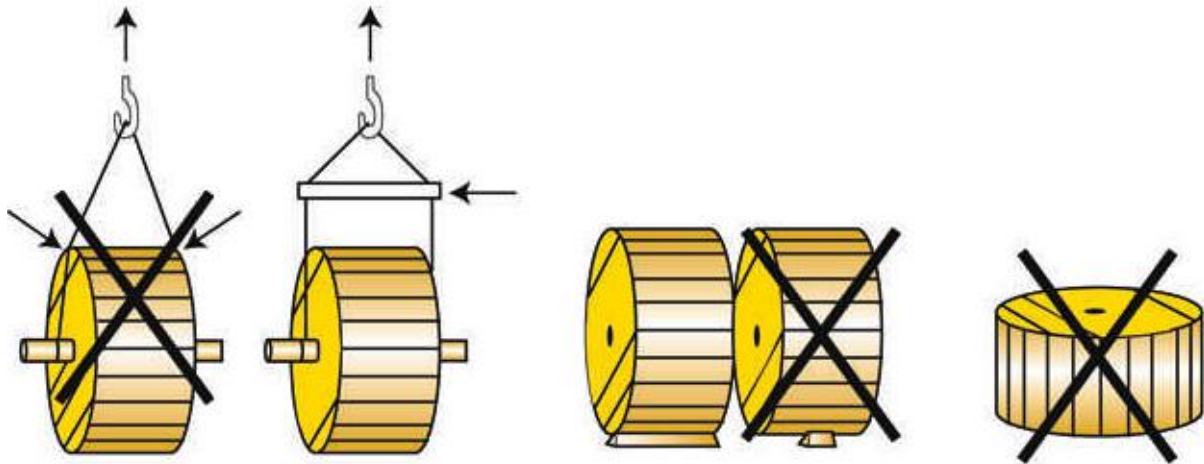
(1) Standard Imperial Stranding / Wire		(2) Column (1) Converted to mm ²	(3) Nearest Metric Standard Size mm ²
Diameter Inch	Inch ²		
(3/.029)	.0020	(1.29)	1.5
(3/.036)	.0030	(1.94)	1.5
(7/.029)	.0045	(2.90)	2.5
(7/.036)	0.007	(4.52)	4
(7/.044)	0.01	(6.45)	6
(7/.052)	0.0145	(9.35)	10
(7/.064)	0.0225	(14.52)	16
(19/.052)	0.04	(25.81)	25
(19/.064)	0.06	(38.71)	35
(19/.072)	.075	(48.39)	50
(19/.083)	0.10	(64.52)	70
(37/.072)	0.15	(96.77)	95
(37/.083)	0.2	(129.0)	120
(37/.093)	0.25	(161.3)	150
(37/.103)	0.3	(193.6)	185
(61/.093)	0.4	(258.1)	240
(61/.103)	0.5	(322.6)	300
(91/.093)	0.6	(387.1)	400
(91/.103)	0.75	(483.9)	500
(127/.103)	1.0	(645.2)	630
	1.25	(806.4)	800
	1.5	(967.7)	1000

Note: Sizes (3/.029Δ, 3/.036Δ, 7/0.029Δ) are manufactured by us in both Imperial & Metric Sizes.

The Right Way of Handling Cable Drums

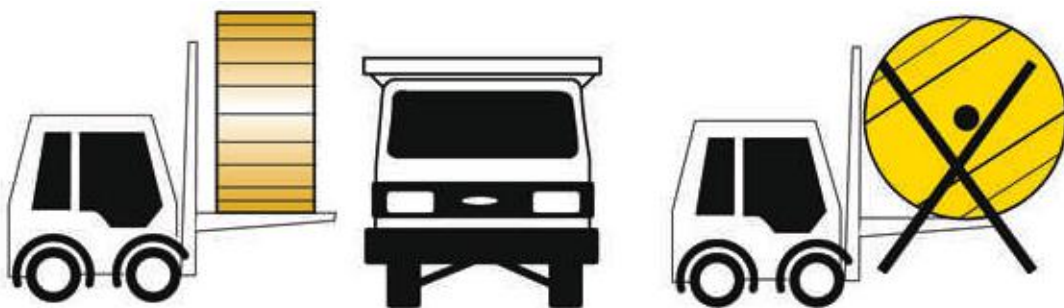
Incorrect handling of cable drums while lifting, loading / unloading and storing can be very hazardous. Cables are supplied on heavy wooden / steel drums and should be handled by trained persons according to International Regulations.

Follow these Instructions

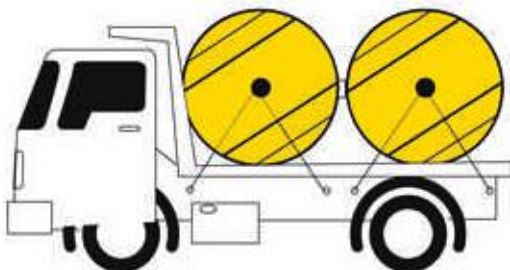


Lifting cable drum using cranes

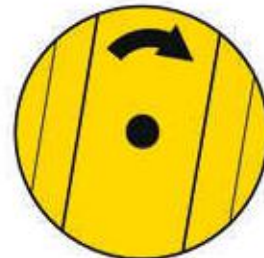
Drums should never be laid flat on their sides
Always use proper wedges to prevent drums rolling



Lifting cable drums correctly using fork lifts



Secure drums properly for transportation



The right way to roll the drums
Follow the direction shown by the arrow



Leaders in
Cable Technology
Paving the way for
future generations

ISO 9001:2008



Visit our site on
www.pioneercables.com

Certificate Number 1595 has been awarded to
Pioneer Cables Limited in recognition of the
Organization's Quality Systems.



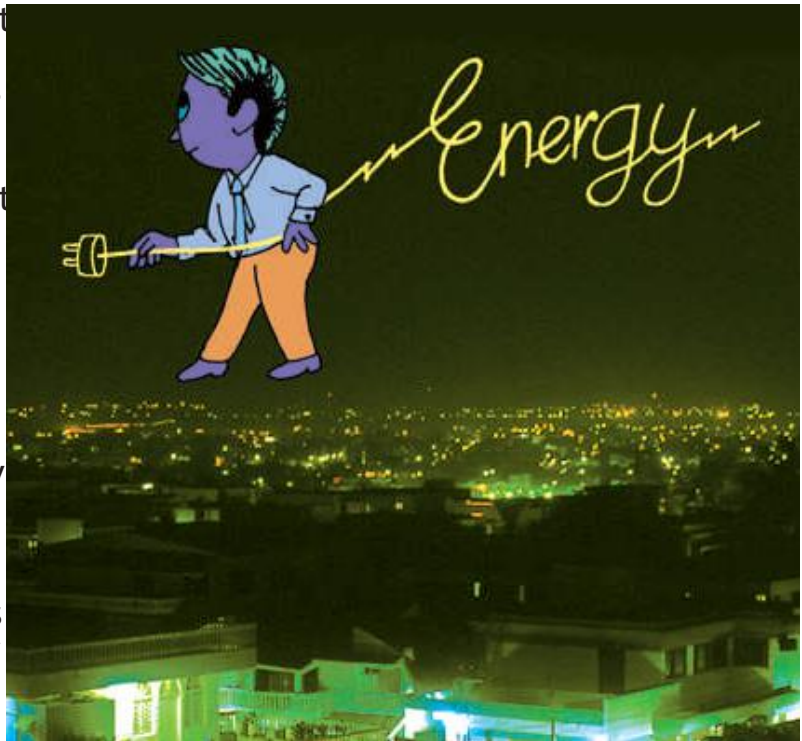
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PIONEER CABLES are energy efficient. A Company devoted to product quality using Prime Grade Raw Materials and 99.9% pure Copper Rod. Every meter of cable manufactured is subject to stringent quality control tests to conform to international standards.



SURVEY : Samples Test of 3/.029 CU/PVC Market Survey.

	Standard	ST Value	Pioneer Cables	Brand X	Brand XX
1	Conductivity	100.00%	102.56	97.51	37.10
2	Resistivity	17.241	16.8107	17.68107	46.470
3	Cond. Resistance	13.76 Ohms/KM	12.90	13.57	35.66
4	Elog. PVC	125%	225	350	190
5	T/s PVC	12.5 N/sqmm	14.16	16.98	11.68
6	Overall Dia	3.36 mm	3.50	3.50	3.65
7	Ins. Thick	0.889 mm	0.9-1.0	0.85-1.0	1.0-1.2
8	Lay Length	40 to 47.7	42.0 RH	103.0 R.H.	Straight
9	Dia of Strand	0.736 mm	0.74	0.72	0.71

COSTS : Brand xx/Brand x may cost less initially but increase Risk of damages and Current Leakages, causing continuous increased power bills and overload on our already scarce energy resources.

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بعض کیبلز بڑے شوق سے بجلی ہڑپ کر جاتی ہیں ۔ اور بل آپ کو ادا کرنا پڑتا ہے۔

بجلی تانے کے ان باریک تاروں میں سفر کرتی ہے جو وائرنگ میں استعمال ہونے والے کیبلز کے اندر ہوتے ہیں۔ اگر استعمال شدہ تانبہ ضروری معیار کا (کنڈیکٹر گریڈ) نہیں ہے تو کیبلز میں بجلی کی روکرواں رکھنے کی استعداد کم ہوگی اور مزاحمت زیادہ۔ جس کا سیدھا سیدھا مطلب یہ ہے کہ مین لائن سے آنے والی بہت ساری بجلی استعمال کے پوائنٹس تک پہنچتے پہنچتے کیبلز کی مزاحمتی قوت کی نذر ہو جائے گی۔ مگر اس کا بل تو آئے گا۔

بعض کیبلز ہلکے میٹیریل کے استعمال کی بدولت بظاہر سستی معلوم ہوتی ہیں۔ ان کیبلز میں بجلی رواں رکھنے کی کم استعداد اور از حد زیادہ مزاحمتی قوت کرنٹ لیک ہونے کے خطرہ اور نقصان کے امکان میں اضافہ کرتے ہی ہیں۔ آپ کے بلوں میں بھی ہر ماہ اضافہ کرتے رہتے ہیں۔

پائیر کیبلز استعمال کیجئے جو ایک ایسی کمپنی کے تیار کردہ ہیں جو اپنی مصنوعات کے معیار کی ضامن ہے۔ پائیر کیبلز جدید ترین پلانٹ پر عمدہ ترین ۹۹.۹ فیصد خالص کنڈیکٹر گریڈ تانبے سے بنائے جاتے ہیں اور ہر میٹر کو انتہائی سخت کوالٹی کنٹرول کے مراحل سے گزرا جاتا ہے۔ پائیر کیبلز بین الاقوامی معیار پر پورے اترتے ہیں۔ اسی لئے ماہرین انہیں دوسرے کیبلز پر فوقیت دیتے ہیں۔

پائیر کیبلز نام لے کر طلب کریں۔ ماہرین کے انتخاب کو اپنائیں۔



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