Pioneer Electro Cables Pvt. Ltd.

An ISO 9002 Company

Low Voltage ABC Cable

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.... pioneer always pioneer

Pioneer Electro Cables Private Limited was established in 1988 by Nepal's leading Industrial and Trading House popularly known as "Sarda Group".

Pioneer is the leader in the Nepalese cable industry with the widest product range and their cables are known by the brand PIONEER CABLE. Now pioneer brings the ABC (Aerial Bundled Conductor) in Nepal.

PIONEER AERIAL BUNDLED CONDUCTORS (ABC)

Application :

Cables are used for low voltage and medium voltage over head distribution.

Construction :

Conductors	:	Compacted Stranded Aluminium
Insulation	:	XLPE
Voltage	:	600/1000 Volt, 3300 Volt

Identification :

Cores identification longitudinally continuous raised ribs.

Standards :

BS 7870-5:1999, IS 14255

Why ABC Cables ?

Worldwide experience demonstrates that ABC has advantage for consumers, linesmen, and supply authority.

For Customers :

- ☐ Improved safety and streetscape aesthetics.
- ☐ Improved reliability - Supply can be maintained if suspension system collapses and significant reduction in the tree clearing.

For Linesmen :

- ☐ Improved safety, particularly when working on live mains.
- ☐ Reduced manual handling. No cross arm lifting, no poles top stretching to connect services.

For Supply Authority :

- ☐ Reductions in the amount of free clearing & pruning necessary.
- ☐ No clashing-bushfire can be initiated from clashing conductors and improved reliability arises from reduced interruption.
- ☐ Minimum construction resources required due to quicker and easier erection.

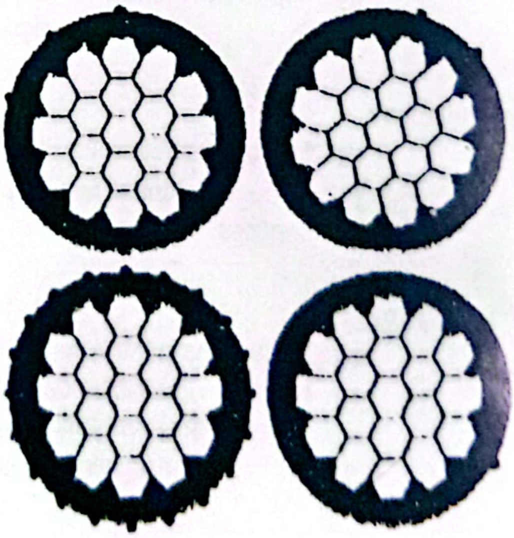
CABLE TECHNICAL DETAILS

Characteristic	Unit	Nominal Cross sectional area of conductor, mm^2							
		16	25	35	50	70	95	120	150
Number of cores		2/4	2/3/4	2/3/4	2/3/4	4	2/4	4	4
Form of conductors		Stranded compacted circular							
Number of wires in conductor		7	7	7	7	19*	19*	19*	19*
Diameter of conductor									
- minimum	mm	4.5	5.8	6.8	8.0	9.6	11.3	12.8	14.1
- maximum	mm	4.8	6.1	7.2	8.4	10.1	11.9	13.5	14.9
Maximum d.c. resistance of conductor in the cable at 20° c.	Ω/km	1.91	1.20	0.868	0.641	0.443	0.320	0.253	0.206
Minimum breaking load of conductor (calculation based on a minimum conductor tensile stress of 140 MPa)	kN	2.2	3.5	4.9	7.0	9.8	13.3	16.8	21.0
Minimum average thickness of insulation at any point (not measured at location of indenting or embossing)	mm	1.3	1.3	1.3	1.5	1.5	1.7	1.7	1.7
Minimum thickness of insulation at any point (not measure at location of indenting)	mm	1.07	1.07	1.07	1.25	1.25	1.43	1.43	1.43
Maximum thickness of insulation at any point excluding ribs	mm	1.9	1.9	1.9	2.1	2.1	2.3	2.3	2.3
Maximum diameter or core (excluding ribs)	mm	7.9	9.2	10.3	11.9	13.6	15.9	17.5	18.9

** Subject to tolerance of ± 1 wire.*

PREFERRED DRUM SIZES (DIAMETER/WIDTH)

Cable size mm2	Timer drum	
	Cable length 500m	Cable length 1000m
2x16	800/400	1000/500
4x16	900/500	1100/600
2x25	1000/500	1200/600
3x25	1000/500	1200/600
4x25	1100/600	1200/600
2x35	1000/500	1200/600
3x35	1100/600	1200/600
4x35	1100/600	1400/700
2x50	1100/600	1400/700
3x50	1200/600	1400/700
4x50	1200/600	1600/800
4x70	1400/700	1800/900
2x95	1400/700	1800/900
4x95	1600/800	1800/900
4x120	1800/900	2200/1100
4x150	1800/900	2200/1100



XLPE insulated Aerial bundled
For working voltages up to and
including 0.6/1 kv.

CABLE DATA - Two Core, Three Core

Characteristic	Units	Nominal Cross sectional area of conductor, mm²							
		16	25	35	50	95	25	35	50
Number of cores		2	2	2	2	2	3	3	3
Calculated maximum diameter of circumscribing circle over laid-up cores	mm	15.8	18.4	20.6	23.8	31.8	19.8	22.2	25.6
Approximate mass of cable	kg/m	0.14	0.20	0.26	0.35	0.68	0.30	0.39	0.53
Maximum a.c. resistance of conductor in cable at 80° c	Ω/km	2.37	1.49	1.08	0.796	0.398	1.49	1.08	0.796
Positive sequence reactance of cable at 50 Hz**	Ω/km	0.0942	0.00800	0.0845	0.0842	0.0783	0.0880	0.0845	0.0842
Maximum continuous current carrying capacity per phase***	A	96	125	155	185	285	105	125	150
Minimum breaking load (MBL) of cable	kN	4.4	7.0	9.8	14.0	26.6	10.5	14.7	21.0
Minimum bending radius of single core	mm	30	40	60	70	95	40	60	70
Minimum bending radius of cable	mm	95	110	125	145	285	120	135	155
Highest value for maximum working tension (28%MBL)****	kN	1.23	1.96	2.74	3.92	7.45	2.94	4.12	5.88
Highest value for everyday tension (18%MBL)****	kN	0.79	1.26	1.76	2.52	4.79	1.89	2.65	3.78

CABLE DATA - Four Core

Characteristic	Units	Nominal Cross sectional area of conductor, mm²							
		16	25	35	50	70	95	120	150
Number of cores		4	4	4	4	4	4	4	4
Calculated maximum diameter of circumscribing circle over laid-up cores	mm	19.1	22.2	24.9	28.7	32.8	38.4	42.2	45.6
Approximate mass of cable	kg/m	0.28	0.40	0.52	0.70	0.96	1.35	1.66	2.02
Maximum a.c. resistance of conductor in cable at 80° c	Ω/km	2.37	1.49	1.08	0.796	0.551	0.398	0.315	0.257
Positive sequence reactance of cabl- at 50 Hz**	Ω/km	0.102	0.0953	0.0918	0.0915	0.0857	0.0853	0.0835	0.0821
Maximum continuous current carrying capacity per phase***	A	78	105	125	150	185	225	260	285
Minimum breaking load (MBL) of cable	kN	8.8	14.0	196	28.0	39.2	53.2	67.2	84.0
Minimum bending radius of single core	mm	30	40	60	70	80	95	105	115
Minimum bending radius of cable	mm	115	135	150	160	285	345	380	410
Highest value for maximum working tension (28% MBL)****	kN	2.46	3.92	5.49	7.84	11.0	14.9	18.8	23.5
Highest value for everyday tension (18% MBL)****	kN	1.58	2,52	3.53	5.00	7.10	9.60	12.1	15.1

** *In most instances the same values may be used for zero sequence reactance.*

*** *Based on : conductor temperature of 80°C, ambient temperature of 40°C, solar radiation of 1000 W/m², and a wind speed of 1 m/s normal to the axis of the cable.*

**** *In most installation, Lower values will be used.*

ADVANTAGE OF FULLY SUPPORTED CABLE

There are five designs of LV ABC in common use throughout the world. These follow one of the two basic forms :

- ☐ Fully supported (Refer figure 1) - where all the equal-sized phase and neutral cores share the mechanical load.
- ☐ Neutral supported (Refer figure 2) - the phase cores are laid up around an aluminium alloy neutral, which acts as a catenary to support the whole bundle.

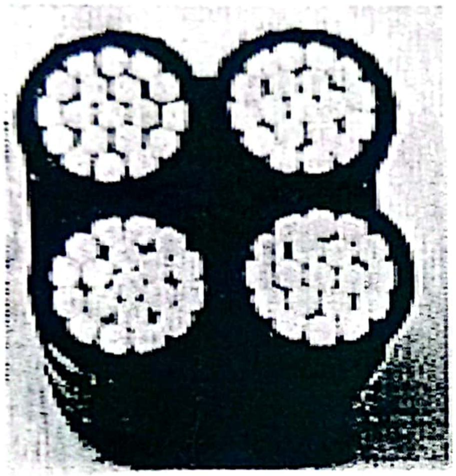


Figure 1 : Fully Supported Cable

Figure 2 : Neutral Supported Cable

Supply authorities who have used both systems have chosen the Fully Supported Cable system for the following reasons :

- ☐ The fully supported cable was easier to erect because all cores, rather than just the neutral are supported at suspension and strain (anchor) clamps. The experience with the neutral supported cable demonstrated :

☐ At suspension and strain poles	:	difficulty of accessing neutral.
	:	difficulty of separating neutral
☐ At suspension poles	:	need to lift cable.

- ☐ The fully supported cable is cheaper to manufacture.
- ☐ The neutral of the fully supported cable is the same size as the phase cores. This is an advantage on multiple earthen neutral systems and avoids excessive losses due to unbalanced loading.
- ☐ The neutral of the fully supported cable is at less mechanical risk, and
- ☐ Longer spans are achievable with the fully supported cable - an important factor when existing poles are to be retained for reconstruction work and rural applications. The fully supported cable can withstand higher mechanical loads due to wind.

COMPARISON OF MECHANICAL PERFORMANCE OF NEUTRAL SUPPORTED AND FULLY SUPPORTED CABLES.

The following shows mechanical characteristics of the support conductor

		Neutral Supported		Fully Supported
		3 x 95 + 54.6	3 x 95 + 70	4 x 95
Cross Sectional Area	mm^2	54.6	70	4x95 = 380
Type		AAAC	AAAC	AAC
Alloy		6201	6201	1350
Minimum Breaking Stress	MPa	295	295	140
Minimum Breaking Load (MBL)	kN	$\frac{54.6 \times 295}{1000} = 16.1$	$\frac{70 \times 295}{1000} = 20.7$	$\frac{380 \times 140}{1000} = 53.2$
Maximum	% of MBL	18	18	18
Everyday Tension = EDT	kN	$\frac{16.1 \times 18}{100} = 2.9$	$\frac{20.7 \times 18}{100} = 3.7$	$\frac{53.2 \times 18}{100} = 9.6$
Maximum Design Load can be no more the 50% MBL	kN	$\frac{61.1}{2} = 8.05$	$\frac{20.7}{2} = 10.35$	$\frac{53.2}{2} = 26.6$
Actual Maximum Load	kN	5.3	6.5	$\frac{4 \times 95 \times 40MPa}{1000} = 15.2$
	Values calculated from EDT's above		40 MPa is maximum Tensile Stress that can be transmitted through XLPE insulation at strain clamp.	

The following table shows a comparison between the cable for a few selected examples. The maximum span and sag figures have been derived using the data provided in the above table.

		Neutral Supported		Fully Supported
		3 x 95 + 54.6 N	3 x 95 + 70 N	4 x 95
Actual Maximum Load	kN	5.3	6.5	15.2
Maximum Stress in Neutral	MPa	$\frac{5.3 \times 1000}{54.6} = 98$	$\frac{6.5 \times 1000}{70} = 93$	$\frac{15.2 \times 1000}{4 \times 95} = 40$
Maximum Span (Sag = 3.1m & Level Ground)	m	73	80	110
Sag for 100m Span	m	5.5	4.6	2.7

For urban areas where short spans apply both neutral supported and fully supported cables have similar mechanical loading performance. Therefore similar strength and length poles can be used for either cable.

For rural areas where longer spans apply :

- ☐ fully supported cable is the only cable capable of achieving long spans
- ☐ pole stays are required to enable the fully supported cable to achieve its maximum capacity
- ☐ pole stays may be required for neutral supported cable even though the spans are shorter
- ☐ to separate the cores of either cable on very long spans the cables cannot be under the highest tension i.e. install IPC's on non tension side of strain clamp.