



TROPOTHEN-X CABLES

CROSS LINKED POLYTHYLENE
HT XLPE CABLES

TOTAL CABLE SERVICE
FROM CONCEPT TO COMMISSIONING

 **CABLE
CORPORATION
OF INDIA LTD.**



1960 : Our mission begins

Cable Corporation of India set up its manufacturing complex in 1960, aided by a technical collaboration with Siemens AG of Germany.

Since then, Cable Corporation of India has taken giant steps right to the forefront of cable technology.

Today it has two manufacturing activities at Borivli-Mumbai and Nashik with state-of-the-art machines with latest technologies and faster machine speeds, from wire drawing, to finished cable testing, from purchase to despatch.

Wide range of cables : to match every requirement

CCI has been manufacturing a complete range of cables and supplying cable accessories to meet the ever-growing needs of today's industry. Meeting the demands of a vast spectrum of electrical distribution requirements.

In addition, CCI was the first cable manufacturer in Asia (outside Japan) to secure a licence to make the highly advanced EHV (Extra High Voltage) Cable upto 220 kV by employing the patented MDCV process - from Mitsubishi of Japan, which brings with it the capacity to create large, high current carrying cables of unparalleled quality. Today, there are only a handful of cable manufacturers in the world manufacturing these sophisticated cables, and CCI is one of them.

Today, CCI continues to meet the ever-growing needs of new industries and applications like cables for seismic and undersea applications, defence marine applications, degaussing, mine sweeping. All designed to work in extraordinary conditions.

Creating reliability : Through strict quality control

At CCI, strict quality checks are carried out at every stage of cable manufacture. Our in-house electrical, mechanical and chemical laboratories are equipped with the most modern range of testing facilities. Our laboratories are capable of testing equipment up to a range of 400 kV and impulse voltage up to 2500 kV.

From concept to commissioning

Our commitment to customers does not end with sales. In fact, that's where it begins because when you comes to CCI, you get more than just cables that meet international standards. We also offer you an integrated package of cable service that takes care of your essential needs.

For example, we provide compatible cable accessories with our quality cables. Our Engineers will advise you on which cable will work best for your industry's requirements and plan a special design

for your cable network and help you understand the product capabilities and to maintain them at peak performance levels. We also have a Contracts division to execute turnkey projects. Right from concept design to commissioning.

Our highly experienced engineers have been trained in India, Japan and Germany to give this integrated package of services.

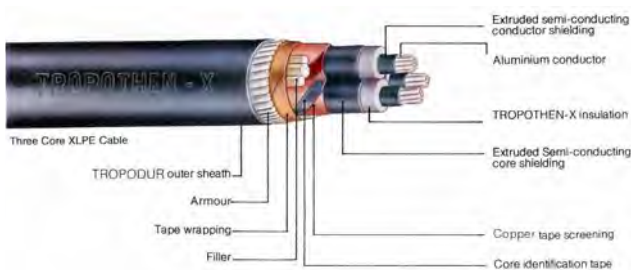
CCI is the first cable manufacturing company to have successfully designed, tested and commissioned for the first time in India 230 kV XLPE insulated cable feeders.



MILESTONES

- | | | |
|---|--|--|
| <ul style="list-style-type: none"> 1960 - TROPODUR (PVC) wires and cables introduced in India. 1977 - Developed PVC Compound suitable for operation upto 105°C as per VDE 0209 1979 - Commenced manufacture of 33 kV TROPOTHEN-XXLPE cables. 1984 - Flame Retardant Low Smoke (FRLS) & Fire Survival (FS) developed for the first time in India 1985 - Application oriented recipes for Elastomer Cable for Mining, Material Handling, Shipwiring, Locomotives, etc. 1986 - Manufacture of TROPOTHERM Silicon Rubber insulated cables commenced 1989 - First in Asia, outside Japan, to Get licence to make EHV cables with patented MDCV process from Mitsubishi, Japan. 1991 - Seismic, Undersea, Degaussing, and HVDC cables developed as import substitution. | <ul style="list-style-type: none"> - Seismic, Undersea, Degaussing, X-ray HVDC Cables. - 132kV Super Tension TROPOTHEN-S XLPE cables. 1992 - 220 kV Super Tension TROPOTHEN-S XLPE cables. - TROPOTHEN-S 230 kV EHV cables manufactured for the first time in India. 1993 - Successfully tested 230kV EHV and 220kV XLPE cables at NV-KEMA, Netherlands 1993 - Successfully manufactured and installed the 220kV XLPE cable for TNEB at Kadamparai, Tamil Nadu - Became first cable company in India to obtain ISO 9001 Certification. 1995 - Commissioned India's only Aluminium press for metallic sheathing of EHV cables. 1997 - Successfully manufactured Milliken conductor cables for the first time in India | <ul style="list-style-type: none"> - Manufacturing plant at Nashik set up for LTXLPE cable. - Becomes India's largest exporter of power cables 2000 - First Indian company to export 230 kV cables 2001 - Supply of EHV accessories manufactured in India via J.V. with Sumitomo. 2004 - Erection & commissioning of 230kV cable in a tunnel at Pykara hydro electric plant 2005 - Erection & commissioning of 132 kV cable system across the river Ganges in Patna - Successful type test of 230kV, 1200 sq mm cable and accessories as per IEC 62067 2007 - Supply, Erection & commissioning of 3 Km long Submarine cable at Dwarka |
|---|--|--|

TROPOTHEN -X- XLPE Cables



TROPOTHEN-X XLPE Cables are offered with compact circular standard (rm/v) Copper / Aluminium conductors, provided with conductor screening of semi-conducting compound, XLPE insulated, provided with insulation screening over individual cores, consisting of extruded semi-conducting compound followed by copper tape, cores laid up together with suitable fillers in the interstices, covered with plastic tape wrapping or extruded inner sheath Type ST2, galvanised round / Flat steel strip armoured and overall Type ST2 outer sheathed cable, conforming to IS:7098 (Part-II)-1985 with upto date amendments.

High quality TROPOTHEN-X insulating used for insulation is applied by Triple extrusion process and chemically cross linked by continuous vulcanization process using dry cure technique

TROPOTHEN - X Cables in the voltage grade 3.3 to 33 kV (E) are being used today in Utilities and industries.

TROPOTHEN -X Cables can be operated even at 130 Deg. C during emergency. They have low dielectric loss angle and charging currents are considerably lower. Low weight and small bending radii make laying and installation very easy and high safety against mechanical and vibrations.

TROPOTHEN -X THREE CORE - ALUMINIUM / COPPER CONDUTOR, XLPE SEMICON, INSULATION, WRAP TAPE INNER SHEATH, FLAT WIRE AND PVC OUTER SHEATH CABLE AS PER IS 7098 (PART II) OF 1985

Table 1

Type-A2XFY / 2XFY UNSCREENED 1.9 / 3.3 kV (E)						
No. of Cores & Cross-sectional area of Conductor	Nominal thickness of XLPE insulation	Minimum thickness of inner sheath	Minimum thickness of PVC outer sheath	Approx. overall diameter	Delivery Normal length	
					Aluminium	Copper
No. x sq. mm	mm	mm	mm	mm	m	m
3 x 25 sm or rm/v	2.2	0.3	1.40	28	500	500
3 x 35 sm or rm/v	2.2	0.3	1.56	30	500	500
3 x 50 sm or rm/v	2.2	0.4	1.56	33	500	500
3 x 70 sm or rm/v	2.2	0.4	1.56	36	500	500
3 x 95 sm or rm/v	2.2	0.4	1.72	40	500	500
3 x 120 sm or rm/v	2.2	0.4	1.72	42	500	500
3 x 150 sm or rm/v	2.2	0.5	1.88	44	500	500
3 x 185 sm or rm/v	2.2	0.5	2.04	48	500	500
3 x 240 sm or rm/v	2.2	0.6	2.20	54	500	500
3 x 300 sm or rm/v	2.2	0.6	2.20	58	400	400
3 x 400 sm or rm/v	2.2	0.7	2.52	64	400	400

Table 2

Type-A2XCFY / 2XCFY 3.8 / 6.6 kV (E)						
No. of Cores & Cross-sectional area of Conductor	Nominal thickness of XLPE insulation covering	Minimum thickness of common sheath	Minimum thickness of PVC outer	Approx. overall diameter	Delivery Normal length	
					Aluminium	Copper
No. x sq. mm	mm	mm	mm	mm	m	m
3 x 25 rm/v	2.8	0.4	1.56	39	500	500
3 x 35 rm/v	2.8	0.4	1.72	42	500	500
3 x 50 rm/v	2.8	0.5	1.72	44	500	500
3 x 70 rm/v	2.8	0.5	1.88	48	500	500
3 x 95 rm/v	2.8	0.5	1.88	52	500	500
3 x 120 rm/v	2.8	0.6	2.04	56	500	500
3 x 150 rm/v	2.8	0.6	2.20	60	500	500
3 x 185 rm/v	2.8	0.6	2.20	63	500	500
3 x 240 rm/v	2.8	0.7	2.36	69	500	500
3 x 300 rm/v	3.0	0.7	2.52	76	400	400
3 x 400 rm/v	3.3	0.7	2.84	84	400	400

Table 3

Type-A2XCFY / 2XCFY 6.35 / 11 kV (E)						
No. of Cores & Cross-sectional area of Conductor	Nominal thickness of XLPE insulation	Minimum thickness of common sheath	Minimum thickness of PVC outer	Approx. overall diameter	Delivery Normal length	
					Aluminium	Copper
No. x sq. mm	mm	mm	mm	mm	m	m
3 x 25 rm/v	3.6	0.4	1.72	43	500	500
3 x 35 rm/v	3.6	0.5	1.72	45	500	500
3 x 50 rm/v	3.6	0.5	1.88	48	500	500
3 x 70 rm/v	3.6	0.5	1.88	52	500	500
3 x 95 rm/v	3.6	0.6	2.04	56	500	500
3 x 120 rm/v	3.6	0.6	2.20	60	500	500
3 x 150 rm/v	3.6	0.6	2.20	63	500	500
3 x 185 rm/v	3.6	0.7	2.36	68	500	500
3 x 240 rm/v	3.6	0.7	2.52	73	500	500
3 x 300 rm/v	3.6	0.7	2.68	78	400	400
3 x 400 rm/v	3.6	0.7	2.84	86	400	400

Table 4

Type-A2XCFY / 2XCFY 11/11 kV (UE)						
No. of Cores & Cross-sectional area of Conductor	Nominal thickness of XLPE insulation covering	Minimum thickness of common sheath	Minimum thickness of PVC outer	Approx. overall diameter	Delivery Normal length	
					Aluminium	Copper
No. x sq. mm	mm	mm	mm	mm	m	m
3 x 25 rm/v	5.5	0.5	1.88	52	500	500
3 x 35 rm/v	5.5	0.5	2.04	55	500	500
3 x 50 rm/v	5.5	0.6	2.20	57	500	500
3 x 70 rm/v	5.5	0.6	2.20	61	500	500
3 x 95 rm/v	5.5	0.6	2.36	65	500	500
3 x 120 rm/v	5.5	0.7	2.36	69	300	300
3 x 150 rm/v	5.5	0.7	2.52	73	300	300
3 x 185 rm/v	5.5	0.7	2.68	77	300	300
3 x 240 rm/v	5.5	0.7	2.84	83	300	300
3 x 300 rm/v	5.5	0.7	3.00	88	300	300
3 x 400 rm/v	5.5	0.7	3.00	95	300	300

Table 5

Type-A2XCFY / 2XCFY 12.7/22 kV (E)						
No. of Cores & Cross-sectional area of Conductor	Nominal thickness of XLPE insulation	Minimum thickness of common sheath	Minimum thickness of PVC outer	Approx. overall diameter	Delivery Normal length	
					Aluminium	Copper
No. x sq. mm	mm	mm	mm	mm	m	m
3 x 35 rm/v	6.0	0.6	2.04	57	500	500
3 x 50 rm/v	6.0	0.6	2.20	60	500	500
3 x 70 rm/v	6.0	0.6	2.36	64	500	500
3 x 95 rm/v	6.0	0.7	2.36	68	500	500
3 x 150 rm/v	6.0	0.7	2.68	75	300	300
3 x 185 rm/v	6.0	0.7	2.68	79	300	300
3 x 240 rm/v	6.0	0.7	2.84	85	300	300
3 x 300 rm/v	6.0	0.7	3.00	90	300	300
3 x 400 rm/v	6.0	0.7	3.00	97	300	300

Table 6

Type-A2XCFY / 2XCFY 19/33 kV (E)						
No. of Cores & Cross-sectional area of Conductor	Nominal thickness of XLPE insulation covering	Minimum thickness of common sheath	Minimum thickness of PVC outer	Approx. overall diameter	Delivery Normal length	
					Aluminium	Copper
No. x sq. mm	mm	mm	mm	mm	m	m
3 x 50 rm/v	8.8	0.7	2.52	73	500	500
3 x 70 rm/v	8.8	0.7	2.68	77	500	500
3 x 95 rm/v	8.8	0.7	2.84	81	500	500
3 x 120 rm/v	8.8	0.7	2.84	84	300	300
3 x 150 rm/v	8.8	0.7	3.00	88	300	300
3 x 185 rm/v	8.8	0.7	3.00	92	300	300
3 x 240 rm/v	8.8	0.7	3.00	98	300	300
3 x 300 rm/v	8.8	0.7	3.00	103	300	300
3 x 400 rm/v	8.8	0.7	3.00	109	300	300

Nominal dimensions of flat strip - 4.0 x 0.8 mm

sm - Sector shape type

rm/v Circular & compacted

NOTE: 33KV(UE) & Special Cable will be manufactured on customer's demand

Table 7

CURRENT RATING FOR 3 CORE ALUMINIUM / COPPER HT XLPE CABLES

Standard Conditions of installation :		
The below Current Rating is based on following Operating Conditions :		
Maximum continuous operating conductor temperature	90 Deg C	
Standard Ground temperature	30 Deg C	
Ambient Air temperature	40 Deg C	
Thermal Resistivity of soil	150 Deg C cm/watt	
Depth of laying (For cables laid directly in ground)		
For cables upto 11 kV (E) or (UE) Grade	90 cms	
For cables for 22kV and 33 kV Grade	105 cms	
Method of installation	Three Core	Independently
Single Core		Trefoil touching each other

Table 8

AL COND. 3 CORE XLPE CABLES FROM 3.3 kV to 33 kV (E)

Conductor Cross-section	3.3 kV to 11 (UE)	3.3 kV	6.6 kV	11 kV	11 kV (UE)	22 kV to 33 (E)	22 kV	33kV
	Direct in ground	In air	In air	In air	In air	Direct in ground	In air	In air
Sq. mm.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.
25	95	100	100	105	110			
35	110	125	120	125	135	110	135	
50	130	150	145	155	160	130	155	160
70	160	180	180	180	195	160	190	200
95	190	220	220	220	235	190	220	230
120	215	250	255	255	255	210	255	270
150	245	290	290	290	290	240	290	290
185	275	330	330	330	330	270	330	350
240	320	390	390	390	390	310	390	410
300	360	455	450	450	450	350	445	450
400	410	530	525	525	525	400	520	520

Table 9

CU. COND. 3 CORE XLPE CABLES FROM 3.3 kV to 33 kV (E)

Conductor Cross-section	3.3 kV to 11 (UE)	3.3 kV	6.6 kV	11 kV	11 kV (UE)	22 kV to 33 (E)	22 kV	33kV
	Direct in ground	In air	In air	In air	In air	Direct in ground	In air	In air
Sq. mm.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.
25	120	125	130	135	140			
35	145	155	155	160	160	145	160	
50	170	185	185	190	190	165	190	195
70	205	230	235	235	240	205	240	240
95	245	280	285	285	290	240	290	290
120	280	325	325	325	330	275	330	330
150	310	375	375	375	375	305	375	375
185	350	425	420	425	425	345	425	425
240	405	500	500	500	500	395	500	500
300	455	575	575	570	570	445	570	570
400	510	660	660	660	660	505	660	660

Table 10

Conductor Crosssection	D.C. RESISTANCE AND A.C. RESISTANCE			
	Max. D.C. Resistance at 20°C	Approx. A.C. Resistance at operating Temp. 90°C	Max. D.C. Resistance at 20°C	Approx. A.C. Resistance at operating Temp. 90°C
	Aluminium		Copper	
Sq. mm	ohm/km	ohm/km	ohm/km	ohm/km
25	1.2000	1.5500	0.7270	0.9260
35	0.8680	1.1200	0.5240	0.6680
50	0.6410	0.8280	0.3870	0.4930
70	0.4430	0.5720	0.2680	0.3410
95	0.3200	0.4140	0.1930	0.2460
120	0.2530	0.3270	0.1530	0.1950
150	0.2060	0.2660	0.1240	0.1580
185	0.1640	0.2120	0.0991	0.1260
240	0.1250	0.1620	0.0754	0.0961
300	0.1000	0.1290	0.0601	0.0766
400	0.0778	0.1010	0.0470	0.0600
500	0.0605	0.0782	0.0366	0.0466
630	0.0469	0.0606	0.0283	0.0360
800	0.0367	0.0474	0.0221	0.0281
1000	0.0291	0.0376	0.0176	0.0224

Table 11

SHORT CIRCUIT RATINGS OF CONDUCTOR	
Short Circuit Rating for 1 Sec.	
Aluminium	Copper
kA (rms)	kA (rms)
2.35	3.58
3.29	5.00
4.70	7.15
6.58	10.01
8.93	13.58
11.30	17.16
14.10	21.45
17.40	26.45
22.60	34.32
28.20	42.90
37.60	57.20
47.00	71.50
59.20	90.10
75.20	114.40
94.00	143.00

Table 12

Conductor Crosssection	ESTIMATED VOLTAGE DROP FOR XLPE ALUMINIUM CONDUCTOR ARMoured THREE CORE CABLES				
	Voltage Drop V/kM/A				
	3.8/6.6 kV	6.6/6.6 & 6.35/11kV	11/11 kV	12.7/22 kV	19/33 kV
25	2.67	2.67	2.67	-	-
35	1.94	1.94	1.94	1.94	-
50	1.44	1.44	1.44	1.44	1.44
70	1.00	1.00	1.01	1.01	1.01
95	0.70	0.74	0.74	0.74	0.74
120	0.56	0.59	0.60	0.60	0.60
150	0.48	0.49	0.49	0.49	0.50
185	0.40	0.40	0.41	0.41	0.42
240	0.30	0.32	0.33	0.33	0.32
300	0.26	0.27	0.28	0.28	0.29
400	0.21	0.23	0.24	0.24	0.25

Table 14

Short Circuit rating og TROPOTHEN - X Cables	
Conductor temperature prior to Short Circuit	90 Deg C
Max. Short Circuit Conductor	250 Deg C
IK = 0.094A/Sq. root of t for Aluminium conductor	
IK = 0.143 A/Sq. root of t for Copper conductor	
IK : Short circuit current in KA (rms)	
t : Duration of short circuit in seconds	
A : Area of aluminium/ copper conductor in sq mm	

Table 13

Bending Radius for TROPOTHEN - X	
Single Core	
Upto 11 kV (E)	15xD
Above 11 kV (E)	20xD
Multi Core	
Above 1.1 kV (E)	15xD

Table 15

Test Voltages	
Rating in kV	for 5 minutes
1.9/3.3 (E)	10 kV
3.3/3.3 (UE)	10 kV
3.8/6.6 (E)	12 kV
6.35/11 (E)	17 kV
11/11(UE)	28 kV
12.7/22 (E)	32 kV
19/33 (E)	48 kV

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