



TROPODUR CABLES

PVC POWER & CONTROL 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

- | | | |
|--|--|--|
| 1960 - TROPODUR (PVC) wires and cables introduced in India. | Material Handling, Shipwiring, Locomotives, etc. | 1994 - Became first cable company in India to obtain ISO 9001 Certification. |
| 1961 - Manufacture of 11 kV Paper Insulated lead Sheathed cables (PILC) commenced. | 1986 - Manufacture of TROPOTHERM Silicon Rubber insulated cables commenced | 1995 - Commissioned India's only Aluminium press for metallic sheathing of EHV cables. |
| 1962 - Indigenous manufacture of "TROPODUR" PVC Compound | 1988 - Manufacture of TROPOTFLURO Fluoro plastic wires and cables commenced | 1997 - Successfully manufactured Milliken conductor cables for the first time in India |
| 1963 - Unique welding process for Aluminium conductor cable Termination/Joints. | 1989 - First in Asia, outside Japan, to Get licence to make EHV cables with patented MDCV process from Mitsubishi, Japan. | - Manufacturing plant at Nashik set up for LTXLPE cable. |
| 1966 - TROPODUR 3.3kV cables for mining applications. | 1991 - Seismic, Undersea, Degaussing, and HVDC cables developed as import substitution. | - Becomes India's largest exporter of power cables |
| 1968 - Manufacture of 33 kV Paper Insulated Lead Sheathed cables commenced. | - Seismic, Undersea, Degaussing, X-ray HVDC Cables. | First Indian company to export 230 kV cables |
| 1969 - 11KV TROPODUR cables introduced for first time in India as replacement for PILC | - 132kV Super Tension TROPOTHEN-S XLPE cables. | 2000 - Supply of EHV accessories manufactured in India via J.V. with Sumitomo. |
| 1977 - Developed PVC Compound suitable for operation upto 105°C as per VDE 0209 | 1992 - 220 kV Super Tension TROPOTHEN-S XLPE cables. | 2004 - Erection & commissioning of 230kV cable in a tunnel at Pykara hydro electric plant |
| 1979 - Commenced manufacture of 33 kV TROPOTHEN-XXLPE cables. | - TROPOTHEN-S 230 kV EHV cables manufactured for the first time in India. | 2005 - Erection & commissioning of 132 kV cable system across the river Ganges in Patna |
| 1983 - TROPOTFLEX Elastomer Trailing Flexible cables upto 11kV, in single continuous length of 1000m. | 1993 - Successfully tested 230kV EHV and 220kV XLPE cables at NV-KEMA, Netherlands | - Successful type test of 230kV, 1200 sq mm cable and accessories as per IEC 62067 |
| 1984 - Flame Retardant Low Smoke (FRLS) & Fire Survival (FS) developed for the first time in India | 1994 - Successfully manufactured and installed the 220kV XLPE cable for TNEB at Kadamparai, Tamil Nadu | 2007 - Supply, Erection & Commissioning of 3 km long submarine cable at Dwarka |
| 1985 - Application oriented recipes for Elastomer Cable for Mining, | | |

TROPODUR PVC Cables

TROPODUR PVC insulated and sheathed cables are offered with Copper/Aluminium conductors, unarmoured or armoured with galvanised steel wire/strip.

The PVC insulating and Sheathing compound recipes have been developed through continuous research and is manufactured in-house in a modern Compounding plant.

These cables are suitable for heavy duty power, control and instrumentation applications in power generation, utilities, industrial distribution, chemical & fertilizer industries and mining installations. Cables are also designed and manufactured for specialised applications.

These cables are marketed in voltage grades from 1.1 to 11kV as per IS 1554 (Part I & II)

TROPODUR ARMoured SINGLE CORE CABLE
TYPE : AYWaY / YWaY 1100 VOLTS

TABLE 1

No. Of cores & Cross-sectional area of conductor	Nominal Thickness of PVC insulation	Min. Thickness of PVC outer sheath	Approx. overall Diameter of cable	Approx. Net weight of the cable	
				Al	Cu
	(mm)	(mm)	(mm)	kg/km	kg/km
1 x 16 rm	1.30	1.24	14.00	240.0	340.0
1 x 25 rm/v	1.50	1.24	15.00	300.0	450.0
1 x 35 rm/v	1.50	1.24	16.50	350.0	560.0
1 x 50 rm/v	1.70	1.24	18.00	420.0	710.0
1 x 70 rm/v	1.70	1.40	20.00	530.0	950.0
1 x 95 rm/v	1.90	1.40	22.50	690.0	1270.0
1 x 120 rm/v	1.90	1.40	24.00	800.0	1530.0
1 x 150 rm/v	2.10	1.40	26.00	930.0	1840.0
1 x 185 rm/v	2.30	1.40	28.00	1100.0	2230.0
1 x 225 rm/v	2.50	1.56	31.00	1320.0	2710.0
1 x 240 rm/v	2.50	1.56	32.00	1380.0	2860.0
1 x 300 rm/v	2.70	1.56	34.00	1640.0	3500.0
1 x 400 rm/v	3.00	1.56	39.00	2100.0	4470.0
1 x 500 rm/v	3.40	1.72	43.00	2610.0	5610.0
1 x 630 rm/v	3.90	1.88	47.00	3230.0	7250.0

rm - Circular non compacted type rm/v - Circular & compacted

TROPODUR ARMoured 3 CORE CABLE
TYPE : YWY 1100 VOLTS up to 6 sq mm
TYPE : AYWY/YWY 1100 VOLTS up to 10 sq mm
TYPE : AYFY/YFY 1100 VOLTS above 10 sq mm

TABLE 2

No. of cores & Cross-sectional area of conductor	Nominal Thickness of PVC insulation	Min. Thickness of PVC Inner Sheath	Min Thickness overall outer Sheath	Approx. overall Diameter of cable	Approx. Net weight of the cable	
					Al	Cu
	(mm)	(mm)	(mm)	(mm)	Kg/km	Kg/km
3 x 2.5 re/rm	0.90	0.3	1.24	15.50	-	475.0
3 x 4 re/rm	1.00	0.3	1.24	17.00	-	570.0
3 x 6 re/rm	1.00	0.3	1.24	18.00	-	670.0
3 x 10 re/rm	1.00	0.3	1.40	19.00	620.0	800.0
3 x 16 sm	1.00	0.3	1.40	19.50	620.0	910.0
3 x 25 sm	1.20	0.3	1.40	22.00	810.0	1260.0
3 x 35 sm	1.20	0.3	1.40	24.00	940.0	1570.0
3 x 50 sm	1.40	0.3	1.56	28.00	1200.0	2060.0
3 x 70 sm	1.40	0.4	1.56	31.00	1500.0	2740.0
3 x 95 sm	1.60	0.4	1.56	35.00	1890.0	3620.0
3 x 120 sm	1.60	0.4	1.72	37.00	2190.0	4400.0
3 x 150 sm	1.80	0.5	1.88	41.00	2610.0	5430.0
3 x 185 sm	2.00	0.5	1.88	45.00	3150.0	6560.0
3 x 225** sm	2.20	0.6	2.04	50.00	3820.0	8020.0
3 x 240 sm	2.20	0.6	2.20	52.00	4070.0	8460.0
3 x 300 sm	2.40	0.6	2.36	57.00	4870.0	10570.0
3 x 400 sm	2.60	0.7	2.52	64.00	6020.0	13320.0

re - Solid type ** - Similar to IS: 1 554 (P-I) rm - circular non-compactd type sm - Sector shaped type

TROPODUR ARMoured 3 1/2 CORE CABLE TYPE: AYFY / YFY 1100 VOLTS

TABLE 3

No. of cores & Cross-sectional area of conductor	Nominal Thickness of PVC insulation	Min. Thickness of PVC Inner Sheath	Min Thickness overall outer Sheath	Approx. overall Diameter of cable	Approx. Net weight of the cable	
					Al	Cu
	(mm)	(mm)	(mm)	(mm)	Kg/km	Kg/km
3.5 x 25/16 sm	1.20	0.3	1.40	24.50	920.00	1470.0
3.5 x 35/16 sm	1.20	0.3	1.40	26.00	1050.00	1780.0
3.5 x 50 sm	1.40	0.3	1.56	29.50	1330.00	2350.0
3.5 x 70 sm	1.40	0.4	1.56	33.00	1670.00	3120.0
3.5 x 95 sm	1.60	0.4	1.56	38.00	2120.00	4140.0
3.5 x 120 sm	1.60	0.5	1.72	41.00	2540.00	5150.0
3.5 x 150 sm	1.80	0.5	1.88	44.00	2970.00	5690.0
3.5 x 185 sm	2.00	0.5	2.04	50.00	3640.00	7630.0
3.5 x 225 sm**	2.20	0.6	2.20	55.00	4390.00	9330.0
3.5 x 240 sm	2.20	0.6	2.20	56.00	4620.00	9780.0
3.5 x 300 sm	2.40	0.6	2.36	62.00	5570.00	12180.0
3.5 x 400 sm	2.60	0.7	2.68	69.00	6920.00	15360.0

re - Solid type ** - Similar to IS: 1 554 (P-I) rm - circular non-compactd type sm - Sector shaped type

TROPODUR ARMoured 4 CORE CABLE
TYPE : YWY 1100 VOLTS upto 6 sq. mm.
TYPE : AYFY/YFY 1100 VOLTS above 6 sq. mm.

TABLE 4

No. of cores & Cross-sectional area of conductor	Nominal Thickness of PVC insulation	Min. Thickness of PVC Inner Sheath	Min Thickness overall outer Sheath	Approx. overall Diameter of cable	Approx. Net weight of the cable	
					Al	Cu
	(mm)	(mm)	(mm)	(mm)	Kg/km	Kg/km
4 x 4 re/rm	1.00	0.3	1.24	17.00	-	600.0
4 x 6 re/rm	1.00	0.3	1.24	18.00	-	725.0
4 x 10 re/rm	1.00	0.3	1.40	20.00	590.0	925.0
4 x 16 sm	1.00	0.3	1.40	21.50	720.0	1120.0
4 x 25 sm	1.20	0.3	1.40	24.50	950.0	1560.0
4 x 35 sm	1.20	0.3	1.40	27.00	1150.0	2000.0
4 x 50 sm	1.40	0.4	1.56	32.00	1470.0	2630.0
4 x 95 sm	1.60	0.4	1.72	40.00	2370.0	4670.0
4 x 120 sm	1.60	0.5	1.88	43.00	2820.0	5760.0
4 x 150 sm	1.80	0.5	1.88	47.00	3320.0	6960.0
4 x 185 sm	2.00	0.6	2.04	53.00	4060.0	8600.0
4 x 225 sm**	2.20	0.6	2.20	57.00	4860.0	10470.0
4 x 240 sm	2.20	0.6	2.36	60.00	5180.0	11100.0
4 x 300 sm	2.40	0.7	2.52	66.00	6280.0	13880.0

re - Solid type ** - Similar to IS: 1 554 (P-I) rm - circular non-compacted type sm - Sector shaped type

TROPODUR ARMoured CONTROL CABLE
TYPE : 2 to 10 cores, YWY, 1.5 Sq.mm. re/rm
TYPE : 12 to 27 cores, YFY, 1.5 Sq.mm. re/rm

TABLE 5

No. Of cores & Cross-sectional area of conductor	Nominal Thickness of PVC insulation	# Min. Thickness of Inner insulation	Min. Thickness of PVC Outer Sheath	Approx. overall Diameter Sheath of cable	Approx. Net weight of the cable
2 x 1.5 re/rm	0.80	0.3	1.24	14.0	380.0
3 x 1.5 re/rm	0.80	0.3	1.24	15.5	420.0
4 x 1.5 re/rm	0.80	0.3	1.24	16.5	480.0
5 x 1.5 re/rm	0.80	0.3	1.24	16.0	490.0
7 x 1.5 re/rm	0.80	0.3	1.24	17.0	565.0
10 x 1.5 re/rm	0.80	0.3	1.40	20.5	775.0
12 x 1.5 re/rm	0.80	0.3	1.24	18.5	610.0
14 x 1.5 re/rm	0.80	0.3	1.40	19.5	710.0
19 x 1.5 re/rm	0.80	0.3	1.40	21.5	855.0
27 x 1.5 re/rm	0.80	0.3	1.40	25.0	1110.0

#- Upto 19 core Inner sheath shall be extruded and above 19 core Inner sheath shall be wrapped or extruded.

re - Solid type rm - Stranded Circular type

TROPODUR ARMoured CONTROL CABLE
TYPE : 2 to 7 cores, YWY, 2.5 Sq.mm. re/rm
TYPE : 10 to 27 cores, YFY, 2.5 Sq.mm. re/rm

TABLE 6

No. Of cores & Cross-sectional area of conductor	Nominal Thickness of PVC insulation	# Min. Thickness of Inner insulation	Min. Thickness of PVC Outer Sheath	Approx. overall Diameter Sheath of cable	Approx. Net weight of the cable
2 x 2.5 re/rm	0.90	0.3	1.24	14.5	420.0
3 x 2.5 re/rm	0.90	0.3	1.24	15.0	475.0
4 x 2.5 re/rm	0.90	0.3	1.24	16.0	540.0
5 x 2.5 re/rm	0.90	0.3	1.24	17.0	580.0
7 x 2.5 re/rm	0.90	0.3	1.24	18.0	670.0
10 x 2.5 re/rm	0.90	0.3	1.40	22.5	995.0
12 x 2.5 re/rm	0.90	0.3	1.40	21.5	850.0
14 x 2.5 re/rm	0.90	0.3	1.40	22.0	950.0
16 x 2.5 re/rm	0.90	0.3	1.40	23.0	1040.0
19 x 2.5 re/rm	0.90	0.3	1.40	24.5	1165.0
24 x 2.5 re/rm	0.90	0.3	1.40	28.0	1430.0
27 x 2.5 re/rm	0.90	0.3	1.40	28.0	1550.0

#- Upto 19 core Inner sheath shall be extruded and above 19 core Inner sheath shall be wrapped or extruded.

re - Solid type rm - Stranded Circular type

Short ckt rating for PVC Insulated cable 1100 V

TABLE 7

Short ckt Rating for 1 sec	conductor cross section	Conductor temperature prior to short circuit 70 deg. C																					
		Single Core Cable					Multi Core (3.31/2, 4) Cable																
		In Air			In Ground		In Air		In Ground		In Air		In Ground		In Air		In Ground						
sq mm	1.5	2.5	4	6	10	16	25	35	50	70	95	120	150	185	225	240	300	400	500	630	800	1000	
	AL KA (RMS)	0.114	0.19	0.304	0.456	0.76	1.22	1.9	2.66	3.8	5.32	7.22	9.12	11.4	14.1	17.1	18.2	22.8	30.4	38	47.90	60.8	76
	70 deg. C CU KA (RMS)	0.172	0.287	0.46	0.69	1.15	1.84	2.88	4.03	5.75	8.05	10.93	13.8	17.25	21.88	25.88	27.6	34.5	46	57.5	72.45	92	115

Current Ratings for AL & Cu conductor PVC insulated LT cables for 70°C operation

TABLE 8

Conductor cross-section	Conductor temperature prior to short circuit 70 deg. C															
	Single Core Cable					Multi Core (3.31/2, 4) Cable										
	In Air			In Ground		In Air		In Ground		In Air		In Ground		In Air		In Ground
sq.mm.	T.T.	F.T.	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu
1.5	15	18	20	24	17	21	22	25	13	17	16	21	Amp	Amp	Amp	Amp
2.5	21	25	27	32	24	28	30	35	18	24	21	27	Amp	Amp	Amp	Amp
4	27	32	35	43	31	36	39	46	23	30	28	36	Amp	Amp	Amp	Amp
6	35	41	44	54	39	44	49	57	30	39	35	45	Amp	Amp	Amp	Amp
10	47	56	60	72	51	59	65	75	40	52	46	60	Amp	Amp	Amp	Amp
16	64	72	82	92	66	75	85	94	51	66	60	77	Amp	Amp	Amp	Amp
25	84	99	110	125	86	97	110	125	70	90	76	99	Amp	Amp	Amp	Amp
35	105	120	130	155	100	120	130	150	86	110	92	120	Amp	Amp	Amp	Amp
50	130	150	165	190	120	145	155	180	105	135	110	145	Amp	Amp	Amp	Amp
70	155	185	205	235	140	170	190	220	130	165	135	175	Amp	Amp	Amp	Amp
95	190	215	245	275	175	205	220	265	155	200	165	210	Amp	Amp	Amp	Amp
120	220	240	280	310	195	230	250	300	180	230	180	240	Amp	Amp	Amp	Amp
150	250	270	320	345	220	265	280	340	205	265	210	270	Amp	Amp	Amp	Amp
185	290	305	370	390	240	300	305	380	240	305	235	300	Amp	Amp	Amp	Amp
240	335	350	425	445	270	335	345	420	280	355	275	345	Amp	Amp	Amp	Amp
300	380	395	475	500	295	370	375	465	315	400	305	385	Amp	Amp	Amp	Amp
400	435	455	550	570	325	410	400	500	375	455	335	425	Amp	Amp	Amp	Amp
500	480	490	590	610	345	435	425	540	405	500	355	440	Amp	Amp	Amp	Amp
630	550	560	660	680	390	485	470	590	-	-	-	-	Amp	Amp	Amp	Amp
800	600	640	725	832	440	530	530	668	-	-	-	-	Amp	Amp	Amp	Amp
1000	720	740	870	879	490	580	590	734	-	-	-	-	Amp	Amp	Amp	Amp

TT - Trefoil Touching

FT - Flat Touching

RATING FACTOR FOR LT PVC

TABLE 11

Air Temperature°C	15	20	25	30	35	40	45	50	55
PVC cables (Max. Conductor temp 70°C)	1.40	1.32	1.25	1.16	1.09	1.00	0.90	0.80	0.68
HR. PVC cables (Max. Conductor temp 85°C)	1.28	1.22	1.17	1.12	1.06	1.00	0.94	0.87	0.80

RATING FACTOR FOR LT PVC

TABLE 12

Ground Temperature°C	15	20	25	30	35	40	45	50	55
PVC cables (Max. Conductor temp 70°C)	1.17	1.12	1.06	1.00	0.94	0.87	0.79	0.71	0.61
HR. PVC cables (Max. Conductor temp 85°C)	1.13	1.09	1.04	1.00	0.95	0.90	0.85	0.80	0.74

Rating factors for variation in Thermal Resistivity of soil, Three single core cables laid directly in Ground. (Three cables in Trefoil touching)

TABLE 9

Nominal Area of conductor	Rating Factors for Values of Thermal Resistivity of soil in Ccm/ watt										
	Sq. mm.	100	120	150	200	250	300	400	500	630	800
25	1.19	1.09	1.00	0.88	0.80	0.74					
35	1.20	1.09	1.00	0.88	0.80	0.74					
50	1.20	1.09	1.00	0.88	0.80	0.74					
70	1.21	1.10	1.00	0.88	0.80	0.74					
95	1.22	1.10	1.00	0.88	0.80	0.74					
120	1.22	1.10	1.00	0.88	0.79	0.74					
150	1.22	1.10	1.00	0.88	0.79	0.73					
185	1.22	1.10	1.00	0.88	0.79	0.73					
240	1.22	1.10	1.00	0.88	0.79	0.73					
300	1.22	1.10	1.00	0.88	0.79	0.72					
400	1.24	1.11	1.00	0.88	0.79	0.72					
500	1.24	1.11	1.00	0.88	0.79	0.72					
630 to 1000	1.24	1.11	1.00	0.88	0.79	0.72					

TABLE 10

Rating Factors for Variation in Depth of laying in Ground : 1100 volts

Rating Factors upto 25 sq.mm. And upto 300 sq. Mm.	Depth of laying (cm)						
	75	90	105	120	150	180	&Above
Rating Factors upto 25 sq.mm.	1.00	0.99	0.98	0.97	0.96	0.95	0.95
Above 25 300 sq.mm.	1.00	0.98	0.97	0.96	0.94	0.93	0.93
Above 300 sq. mm.	1.00	0.97	0.96	0.95	0.92	0.91	0.91

Cable Corporation of India Ltd.

Registered Office

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Plot No. F-3/1, MIDC
Sinnar Industrial Area,
(Malegaon),
Nashik - 422 103. (Maharashtra)
Tel.:91-952551-230328/329/392
Fax:91-952551-230038

EHV Works

Plot No. F-3/2 MIDC
Sinnar Industrial Area,
Malegaon, Dist. Nashik - 422 103.
Tel.: 952251 230697

Western Region

Laxmi Building, 1st Floor,
6, Shoorji Vallabhdas Marg,
Ballard Estate,
Mumbai - 400 001
Tel.: 91-22-6614 4150 /52/54
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Eastern Region

34, Allenby Road, 2nd Floor, II-A
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Northern Region

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New Delhi - 110 002.
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Southern Region

6-D, 6th Floor, Century Plaza,
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Authorised Distributors



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