

PRODUCT CATALOG



Dynamic Cables Ltd.

(A Govt. Recognised Export House)

AN ISO 9001:2015 & OHSAS 18001:2007 Certified Company

www.dynamiccables.co.in



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(Govt. Recognised Export House)
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INTRODUCTION



Dynamic cables was initially formed as a partnership company in 1986, as "Dynamic Engineers". We were manufacturing only Super Enamelled and DPC wires for the Transformer Industry till about 1995-96, whereupon we started manufacturing overheads conductors to cater to requirements of majority of electricity boards in India.

With quality products and excellent customer services, we started getting queries of other related products also from the present customers as well as new prospective clients. This prompted us to plan a major expansion project in the year 2003, whereupon, we decided to enter into cable segment, especially the aerial bunched cable. The unit was successfully established in the year 2006.

Planning forward, we started work on our next expansion in the year 2007 and the third unit, spread over 100000 sq. ft. was established in Vishwakarma Industrial Area (Jaipur), to manufacture LV and HV cables up to 33 KV, using Sioplas technology. With increasing demand from the market, we planned our fourth unit. This unit had been planned in the year 2016 over an area of 200000 sq.ft and is established at Khatushyamji Industrial Area, Reengus, Rajasthan.

The Reengus plant, has further increased the current production capacity and adds the 66 KV high voltage cables into the existing range. The next phase is to manufacture railway signaling cables for RDSO (Research Designs & Standards Organization) division of Indian railways.

Our range in cables itself has become comprehensive and with continuous advancement in technology there are plans to extend this range further. Currently, the range includes - LV, HV & EHV Power cables, LV & HV aerial bunched cables, LV communication cables, LV Control Cables, Solar Cables, ACSR/AA/AAA /AL59 conductors, HTLS Conductors. Bare and insulated copper conductors, The company is also manufacturing and supplying the AL 59 type of conductors.

Our products are type tested & approved by globally recognized NABL Accredited testing laboratories such as: **CPRI, ERDA & TAG CORPORATION.**

Our production facilities are **ISO: 9001:2015 & OHSAS 18001:2007 certified** & products are CE certified.

On the Business front we are further strengthening our position In the Indian Market. We have established 5 strategically located marketing offices across India at New Delhi, Mumbai, Vadodara, Hyderabad & Kolkata. We are now exporting to **30 Countries** in the Asian subcontinent, Africa and Middle East dynamic Cables is continuously expanding its footprints in all sectors like - **INDUSTRIAL, TURNKEY PROJECTS, POWER TRANSMISSION & DISTRIBUTION, INFRASTRUCTURE WORKS** in India and abroad. With 20% of the total turnover coming from exports, we are ever diligently working towards making investments in growing market segments in Europe and Latin America.

Our major Indian Government clients include PGCIL, BHEL, BSES, Railways, Airport Authority of India, NTPC, MSEDCL, MSETCL, KPTCL, UGVCL, MGVCL and majorly all state electricity boards in India.

The notable overseas government clientele includes: KPLC & REA - Kenya, TANESCO- Tanzania, EEP - Ethiopia, IDECO - Jordan, LEC - Liberia, EDM - Mozambique, NEA - Nepal, BPC-Bhutan & many more.

Our Indian EPC Clientele includes companies such as : PEC Limited, Bajaj electrical, L&T, Transrail Lighting Limited, Voltas Ltd., Tata Projects, ABB , Kalpataru power, Lucky Exports, Jaguar Overseas among many companies who are currently operating on projects in India & Overseas.

Dynamic Cables Motto of "**Follow the Process, Quality shall follow**" is the mantra which guides it to plan the road ahead with a sharp focus on strategic growth & expansion viz a viz quality product, customer satisfaction and carrying along a dedicated and satisfied work force. Due to Dynamic Cables vision and continued focus on exports, The Government of Rajasthan has bestowed Dynamic Cables with "Rajasthan State award for Export Excellence", for stellar performance in exports for the year 2013-14.

In the year 2017 , Dynamic cables has become a publicly listed Company. We aspire to build a stock which adds value to the shareholder community. Dynamic Cables is evolving as time progresses, carefully and gradually, with one eye on our past experiences and the other towards the future.

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Total Quality. Assured.

CERTIFICATE OF REGISTRATION

This is to certify that the management system of:

DYNAMIC CABLES LIMITED

Site 1: F259-260, Road No.13, V.K.I.A., Jaipur-302013, Rajasthan, India
Site 2: H 581A - 592 A, Road No. 6, V.K.I.A., Jaipur-302013, Rajasthan, India

has been registered by Intertek as conforming to the requirements of:

OHSAS 18001:2007

The management system is applicable to:

Site 1: Design, Development, Manufacture, Testing and Supply of LT Polyvinyl Chloride (PVC) & Crosslinked Polyethylene (XLPE) Power & Control Cables, HT & LT Crosslinked Polyethylene (XLPE) Aerial Bunched Cables & XLPE UG Power Cables, All Aluminium Conductors (AAC), All Aluminium Alloy Conductors (AAAC), Aluminium Conductor Steel Reinforced (ACSR) and HTLS-ACSS Conductors.

Site 2: Design, Development, Manufacture, Testing and Supply of LT Polyvinyl Chloride (PVC) & Crosslinked Polyethylene (XLPE) Power & Control Cables, HT & LT Crosslinked Polyethylene (XLPE) Aerial Bunched Cables & XLPE UG Power Cables and Airdac Concentric Communication Cables, All Aluminium Conductors (AAC), All Aluminium Alloy Conductors (AAAC) & Aluminium Conductor Steel Reinforced (ACSR) and Bare Copper Conductors.

Certificate Number: 0066688-00
Issue Date: 04 September 2017
Certificate Expiry Date: 03 September 2020




Calin Moldoveanu
President, Business Assurance

Intertek Certification Limited, 10A Victory Park,
Victory Road, Derby DE24 8B7, United Kingdom



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CT-ISO-9001:2015-UKAS-MLT-P-01-jul-17

Certificate Number: 0067850-00
Date of Certification Decision: 11 October 2017
Issuing Date: 11 October 2017
Valid Until: 10 October 2020





Calin Moldoveanu
President Business Assurance

Intertek Certification Limited, 10A Victory Park,
Victory Road, Derby DE24 8ZF, United Kingdom



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TYPE TEST CERTIFICATES

CENTRAL POWER RESEARCH INSTITUTE

CPRI


TEST REPORT
CPRI/TLCC20131177 Dated: January 20, 2014

Test Report Number	CPRI/TLCC20131177	Dated: January 20, 2014
Name and Address of the Customer	M/s. Dynamic Cables Pvt. Ltd., H-581 (A) - 592(A), Road No. 6, VKI Area, Jaipur	
Name and Address of the Manufacturer	M/s. Dynamic Cables Pvt. Ltd., H-581 (A) - 592(A), Road No. 6, VKI Area, Jaipur	
Particulars of Sample tested	19/33 KV, 3C x 300 sq.mm XLPE cable Conductor Aluminium Size 300 sq mm Insulation XLPE No. of cores Three Armour GI strips Inner sheath PVC, Type ST-2 Outer sheath PVC, Type ST-2 Drum Number A-726 Drawing Number DG/PL/13-14/CPRI/01 The Cable was embossed as "DYNAMIC CABLES 19/33 KV ELECTRIC 3C X 300 SQMM AXZFY 2013 PROPERTY OF M/VNVL SPEC. NO. - MEDCO/763/2913"	
Condition of sample on receipt	Good	
Type	AXZFY	
Designation	ALUXLPE/PVC/FLAT STRIP/PVC	
Serial Number	Nil	
Number of Samples tested	One only	
Date(s) of test(s)	06.12.2013 to 17.01.2014	
CPRI Sample Code Number	CPRI/TLCC2013S254	
Particulars of tests conducted	Type & Optional tests	
Test in accordance with Standard/Specification	As per clause 18.1 & 18.4 of IS: 7098 (Part II) 1985 with latest amendments	
Sampling Plan	Not Applicable	
Customer's requirement	Nil	
Deviation, if any	Nil	
Name of the witnessing persons	Nil	
Customer's representative	Nil	
Other than Customer's representative	Nil	
Test subcontracted with address of the laboratory	None	
Document constituting this report (in words)	Good	
Number of sheets	Ten	
Number of oscillograms	Twelve	
Number of graphs	Nil	
Number of photos	Nil	
Number of test circuit diagrams	Nil	
Number of drawings	One	

(Vijay Sharma)
Test Engineer

(S. M. Fankar)
Head of Division
Approved by

CABLES LABORATORY
CENTRAL POWER RESEARCH INSTITUTE
REGIONAL TESTING LABORATORY NO. 3A, INSTITUTIONAL AREA,
SECTOR 62, INDIA - 201 509 (UP), INDIA
Telephone: 0120 - 2402823, Fax: 0120 - 2402824

CENTRAL POWER RESEARCH INSTITUTE

CPRI

TEST REPORT
CPRI/TLCC20131121 Dated: 04.12.2017

Test Report Number	CPRI/TLCC20131121	Dated: 04.12.2017
Name and Address of the Customer	Dynamic Cables Pvt. Ltd. Jaipur F-260, Road No.13, VKIA, Jaipur-302013 Rajasthan	
Name and Address of the Manufacturer	Dynamic Cables Pvt. Ltd. Jaipur F-260, Road No.13, VKIA, Jaipur-302013 Rajasthan	
Particulars of Sample Tested	1.1 KV, 4C x 300 sq.mm Cable AXZFY Conductor Aluminium Size 300 sq mm Insulation XLPE No. of cores Four Armour GI Strip Inner sheath PVC Type-ST2 Outer sheath PVC Type-ST2 Drum Number A-1846 The Cable was printed as " DC 1.1KV AXZFY 4C X 300 BRPL OCT- 2017 IS:7098 PART-1, P.O. NO. 23082226 " with sequential length marking	
Condition of sample on receipt	Duly packed & sealed by TUV Inspecting Officer	
Type	AXZFY	
Designation	AXZFY	
Serial Number	Nil	
Number of Samples tested	One only	
Date(s) of test(s)	01.11.2017 to 04.12.2017	
CPRI Sample Code Number	CPRI/TLCC2017S128	
Particulars of tests conducted	Type Tests	
Test in accordance with Standard/Specification	As per clause 15.1 of IS: 7098 (Part I) 1988 with latest amendments	
Sampling Plan	Not Applicable	
Customer's requirement	Nil	
Deviation, if any	Nil	
Name of the witnessing persons	Nil	
Customer's representative	Nil	
Other than Customer's representative	None	
Test subcontracted with address of the laboratory	None	
Document constituting this report (in words)	Good	
Number of sheets	Eight	
Number of oscillograms	Nil	
Number of graphs	Nil	
Number of photos	One	
Number of test circuit diagrams	Nil	
Number of drawings	Nil	

(Dr. Neha Adhikari)
Test Engineer

(S. Bhattacharya)
Head of division
Approved by


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TEST REPORT
SHEET 1 OF 3

NAME & ADDRESS OF CUSTOMER	REPORT No. RP-1718-010800 31-05-2017	DATE 04-05-2017
Dynamic Cables Pvt. Ltd. Unit-1, F-260, Road No.13, V. K. I. Area, Jaipur - 302 013.	CUSTOMER REF No. DCPL/16-17/QUOT/312	DATED 04-05-2017
	DATE OF SAMPLE RECEIPT 10-05-2017	DATES OF TESTING 10-05-2017 to 31-05-2017
SAMPLE DESCRIPTION	SAMPLE IDENTIFICATION	
Dumbbell shape specimens prepared from the outer sheath of 1.1 KV LT AB Cable, Size: 3CX150+150+125+16 Sq. mm Voltage grade: 1.1 KV Type: AB Cable Drum No.: BW 74	ERDA SAMPLE CODE NO.: ERDA-00199157 Embossing: d.c. 1.1 KV LT ABC XLPE-90 3CX150+150+16+125 SQMM BRPL PO NO. 23081710 APRIL 2017	
Sr. TEST DETAILS	TEST SPECIFICATION	
1. Exposure to UV radiation	ASTM G 154-12a	
2. Tensile strength and elongation at break before & after UV exposure	IS:10810 (Pt.7)-1984 (Method of test)	
REMARKS:	1) Requirement is not mentioned in the specification hence, remark for conformity is not given in the test report. 2) Sample was duly sealed by BSES nominated QSS Inspecting officer vide Hologram/seal No. 0176046 & 0176047. Photograph of sample and seal is on SHEET 3 OF 3	
PREPARED BY Note: 1. This report relates only to the particular sample received for testing in good condition at ERDA, Vadodra. 2. This report cannot be reproduced in part under any circumstances. 3. Publication of this report requires prior permission in writing from Director, ERDA. 4. Only the tests asked for by the customer have been carried out. 5. In case of any dispute, Vadodra will be the exclusive jurisdiction & shall be construed as where the cause has arisen. Caution: ERDA is not responsible for the authenticity of photocopied or reproduced test reports. ERDA provides support to customers for verification of the authenticity of test reports issued by ERDA.	CHECKED BY (S. M. Fankar)	APPROVED BY

GLOBAL POWER RESEARCH INSTITUTE
An NABL approved ISO/IEC 17025 Laboratory

11096 & 11097

TEST REPORT
Page : 1 of 5
Date : 09.05.2016

Test Report No: GPRI/EN/DYC/036

- Sample tested : ACSR MOOSE Conductors in Twin Bundle.
- Name and Address of Customer : M/s. Dynamic Cables Private Limited, F-260, Road No.13, V.K.I Area, Jaipur-302013.
- Name and Address of Manufacturer : M/s. Dynamic Cables Private Limited, F-260, Road No.13, V.K.I Area, Jaipur-302013.
- Sample Description : ACSR MOOSE Conductors.
- Condition of the Sample Receipt : Good
- Date of sample receipt : 06/05/2016
- GPRI Sample Code : GPRI/SC-0041/16
- No. of Samples tested : 01 Set (In Twin)
- Tests conducted : 1) RIV Test
2) Corona Extinction Voltage Test
- Date of testing : 06/05/2016
- Test specification : In General Accordance with IS 398-part V, IS 8263:1976 and customer's request.
- Witnessed by : -----

THIS REPORT CONSISTS OF

1. Total Number of Pages	: 05
2. Number of Oscillograms	: --
3. Number of Graphs/Fig	: 01
4. Number of Photographs	: 01
5. Number of Drawings	: --

PREPARED BY
(A.PASUPATHY)
TEST ENGINEER

APPROVED BY
(V.PANDIYAN)
AUTHORISED SIGNATORY

Note:
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3) Any correction/errata invalidates this test report.
4) The verification of sample drawings by GPRI is limited to dimensional check only wherever possible.

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E-mail : globalpower07@gmail.com, lab@gpri.co.in, Web : www.gpri.co.in Ph : 9677077814 / 55 / 56
Regd. address : No.15, New Gin Road, Opp. Accord Hotel, Thiruvananthapuram, Chennai-600 017.
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2195401

CABLES RANGE AT A GLANCE

Type & Size	Options	Cross Sectional View
LV Power Cables 1.1kv PVC/XLPE Power cables as per IS: 1554-I & IS: 7098 - I Sizes: Single Core 1.5 to 1000 sq. mm Multi core 1.5 to 630 sq. mm	Conductor - Stranded / Solid / Circular/shaped/Aluminium/Copper Insulation - PVC / XLPE / HR PVC / Zero Halogen Innersheath - PVC / HR PVC / FR / FRLS PVC Unarmoured / Armoured - G.S. Roud Wire/ Flat Strip or Aluminium wire / Flat Strip Outer sheath - PVC / HR PVC / FR / FRLS PVC / Zero Halogen	
Copper Control Cables 650/1100 v Annealed electrolytic copper conductor, PVC/XLPE, Insulated, PVC Sheathed as per IS: 1554-I & IS: 7098 - I Sizes: 1.5/2.5 sq. mm up to 61 core 4&6 sq. mm up to 4 core	Conductor - Solid / Stranded / Plain / Tinned Insulation - PVC / HR PVC / XLPE / Zero Halogen Innersheath - PVC / HR PVC / FR / FRLS / Zero Halogen Unarmoured / Armoured - G.S. Roud Wire / Flat Strip Outersheath - PVC / HR PVC / FR / FRLS / Zero Halogen	
Mining Cable - for coal mines and refineries up to 3.3 kv as per customer specifications	Conductor - Circular / Shaped - Aluminium / Copper Insulation - PVC Amouring - Wire / Strip Additional Option - Normally Double Wire Armoured with Tinned Copper wire - Conductivity not less than 75% of Phased Conductor	
MV Power Cables Upto 33 KV XLPE Power Cable as per IS : 7098 Part - II	Conductor - Aluminium /Copper Insulation - Semicon / XLPE / Copper Tape Innersheath - PVC Armoured - Wire/Strip Outersheath - PVC / HR PVC / FR / FRLS	
Flat Cables 1.1 KV Stranded Plain Copper/Aluminium, PVC Insulated & PVC sheathed as per IS : 694 Sizes : 2 & 3 Core - 1.5 to 35 sq. mm	Conductor - Copper/Aluminium Insulation - PVC / HR PVC sheathing - PVC / HR PVC	
LV & MV Aerial Bunched Cables 1100 Volts, Polyethelene / cross linked polyethelene insulated cables with aluminium conductor twisted over central bare/insulated alloy messenger wire IS:14255- 1995 & IS:7098 (Part - 2)1985 Size : Phase conductor upto - 300 sq. mm Messenger conductor up to - 300 sq. mm	Conductor - All Aluminium / alloy Insulation - Polythelene / Cross linked polythelene (upto 1.1KV) - Semicon/XLPE/Copper Tape (upto 33KV) Outer Sheath - PVC/HDPE (upto 33KV)	
Flexible Multi core Cables 1100V Multi strand, Flexible, bright annealed electrolytic copper conductor, PVC insulated and sheathed as per IS : 694 Sizes : Two, Three or Four core	Conductor - Multi stranded Plain/ Tinned Insulation - PVC / XLPE / HR PVC / FR / FRLS / Zero Halogen Sheathed - PVC / HR PVC / FR / FRLS / Zero Halogen	
Solar Cable 1100V Multi strand, Aluminium/Copper, PVC/XLPE Cables Sizes : Single core 1.5 to 630 sq.mm & Multi core upto 400 sq.mm	Conductor - Bright Annealed Copper / Aluminium Insulation - PVC / HR PVC / XLPE / FR / FRLS PVC / Zero Halogen Outer Sheath - PVC / FR / FRLS / Zero Halogen	

MANUFACTURING PROCESS

Copper or Aluminium Rod

WIRE DRAWING	Wire are drawn for required size.
ANNEALING	Drawn Copper/Aluminium wire are annealed.
STRANDING	Required conductor size is manufactured with specified design i. e. Shaped / Round / Compacted Circular.
INSULATION	Conductors are insulated with PVC / XLPE / PE as per required specification to make Core.
CORE REWINDING & CURING	Cores to be rewound & Cured with specified required (for XLPE only)
LAYING UP	All rewound cores are laid together to form a cable with specified design.
INNER SHEATHING	Is done with required specification either with Tape or Extrusion
ARMOURING	Is done with required specification with galvanised strip / aluminium strip / wire.
OUTER SHEATHING	Is done by Extrusion with specified type of PVC as per specification.
REWINDING & TESTING	All cables are rewound on Wooden Drums & Tests are carried-out as per required specification.
PACKING	All tested and passed cables are packed in required sized wooden / steel drums prior to dispatch.

MANUFACTURING OF CABLES

Cable with aluminium and copper conductor and polymer insulation are manufactured at works at Jaipur (Rajasthan). Essentially cables comprise of conductors, insulation, innersheath, armour and outersheath.

CONDUCTOR

Dynamic Cables are available with both aluminium and copper conductor.

Dynamic Cables are manufactured with solid / stranded circular / shaped / aluminium / copper conductor.

Stranding makes cables flexible and easy to handle while shaping makes them compact.

Compaction is provided to all stranded constructions as under:

1. Circular Conductor : With one wire in the center conductor contains 6, 12, 18, 24, 30..... wire layers in either unilay or opposite helical directions. The conductor is compacted.
2. Shaped Conductor : In all multicore low voltage from 16 sq. mm & above upto 400 sq.mm size, conductors are generally "shape".

Dynamic copper conductor cables are of the same construction as that of cables with aluminium conductor except for higher tensile strength, higher current carrying capacity, superior conductivity, better flexibility and ease of jointing. Copper cables are used in power control, instrumentation, winding, submarine, mining and ship wiring application etc.

All conductors of Dynamic Cables are manufactured strictly in accordance with National and International Specification.

National Specification	IS:8130
International Specification	IS: 602228/BS:6360/IEC:60502

INSULATION

Insulation for dynamic cables is strictly as per National and International Specifications

Dynamic cables are designed and manufactured with polymer dielectrics to bear thermal and thermomechanical stresses safely at continuous normal and short circuit temperature conditions.

Dynamic Cables available with both thermoplastic & thermo setting insulations

- PVC Cables	Thermoplastic dielectric
- XLPE Cables	Thermo setting dielectric

Dynamic PVC Cable use PVC Compound that take care of over load short circuit current with both coarse & fine protection systems.

Dynamic XLPE Cables use XLPE compound with anti oxidant stabilizers and traces of aromatic polynuclear hydrocarbon. Thus improving electrical treeing characteristics and mechanical strength of insulation.

LAYING UP

Cores are laid up together to make cable. control is observed within tight tolerance limit for dimensions in case of PVC/XLPE insulation.

INNERSHEATH

Laid up cables are provided with innersheath to tape/extruded PVC with high quality of PVC which acts as bedding for steel wire / strip armouring and to maintain circularity. Taped inner sheath is provided during laying up to process where as extruded PVC inner sheath is provided by extrusion process separately.

Dynamic Cables polymers used for innersheath are softer than insulation or outersheath & are compatible with temperature rating of cables & do not have deleterious effects on any other component of cable.

The Innersheath dimensions are maintained strictly in accordance with laid down specification.

Specification	For PVC Cables IS: 1554 (Part-I), For XLPE Cables IS: 7098 (Part-I) & (Part-II)
---------------	--

ARMOURING

Mechanical protection to the cable is provided with armouring. Dynamic single core cables are armoured with aluminium wire / aluminium strip. Thus avoiding magnetic hysteresis losses on A.C. system.

Multicore cables are provided with galvanized steel wire / steel strips. Dynamic cables are provided with galvanized wire armouring, where cables are to run vertically and are subjected to stresses.

Dynamic cables are armoured with double steel wire and tinned copper wires. so as to provide conductivity of armouring more than 75% of main conductor of cable.

Dynamic cables armour wire / strips are of low resistivity material and meet the requirement of IS : 3975.

OUTERSHEATH

All Dynamic cables are provided with PVC/HR PVC / FR / FRLS outersheath.

Dynamic cables are manufactured with various characteristics of sheathing compounds.

General purpose sheathing compound	ST-1
Heat resistant compound for sheath (H.R.)	ST-2
Fire Retardant Low smoke compounds (FRLS)	IEC 754 Part I IEC- 332 Part I&III IEEE - 383 ASTM - 2843 ASTM - 2863

Anti Rodent and Anti Termite Compound is applied wherever the customers ask for it.

PVC compound used for Dynamic cables are of various grades to meet specifications IS:5831.

In order to be indentified, Dynamic cables have their name embossed / printed / indented on outersheath at regular intervals.

On the outersheath of Dynamic cables, Voltage grade, Cable size, Trade name & Year of manufacture are embossed, as desired by the customer.

Cables / wires are sequentially marked for length at **every meter** throughout its length.

PROCESS INSPECTION

Process inspection is carried out at each step & proper records are maintained. Tools used for process inspection are calibrated and well maintained. High standards of workmanship are laid down. This is achieved through regular inspection & checks at different stages of productions. The process checks are supervised by experienced technicians and monitored by the product satisfying the design parameters and quality standards is released for the next process.

FINAL TESTING

Each Dynamic cable is tested for all applicable routine tests. Each lot of cable is Type tested, as per relevant specification.

Dynamic conducts the testing at it's works at Jaipur for acceptance test as per relevant specifications.

Testing of Dynamic cables are carried out as per Dynamic work standards for testing, besides applicable standards.

ROUTINE TESTS

- | | | |
|-------------------------|-----------------|--|
| 01 Conductor Resistance | 02 High Voltage | 03 Armour resistance (for Mining cables) |
|-------------------------|-----------------|--|

TYPE TESTS

- | | | |
|---|---|-------------------------------------|
| 01 Annealing (for Copper) | 02 Tensile strength (for Aluminium) | 03 Wrapping (for Aluminium) |
| 04 Conductor - resistance | 06 Test for thickness for insulation & sheath | |
| 07 Physical tests for insulation | | |
| (a) Tensile strength and elongation. | (b) Ageing in air oven | (c) Loss of mass (where applicable) |
| (d) Hot deformation (XLPE cable only) | (e) Heat Shock | (f) Shrinkage |
| (g) Thermal stability | | |
| 08 Water absorption (for insulation, where applicable) | 09 Dielectric retention test (for insulation, where applicable) | |
| 10 Insulation resistance | 11 High voltage (room temperature) | 12 High Voltage (water immersion) |
| 13 Flammability / fire resistance | 14 Cold bend (optional) | 15 Cold impact (optional) |
| 16 Anti rodent / termite (for outer sheath where specified by customer) | | |

ACCEPTANCE TESTS

The Following tests are carried out by the customer on sample taken from a lot for the purpose of acceptance of the lot.

- | | | |
|---|---|-----------------------------|
| 01 Annealing (for copper) | 02 Tensile (for aluminium) | 03 Wrapping (for aluminium) |
| 04 Conductor resistance | 05 Test for thickness for insulation & sheath | |
| 06 Tensile strength and elongation of insulation & sheath | | |
| 07 Insulation resistance | 08 High voltage test at room temperature | |

LV PVC CABLES

The cables are suitable for use on AC single phase or three phase (earthed or unearthed) systems for rated voltage up to and including 1100 volts. These cables can be used on DC systems for rated voltage up to and including 1500 volts to earth.

CONDUCTOR

The most acceptable metals for conductors are copper and aluminium due to their higher conductivity and ductility.

As copper has got higher affinity for sulphur, it corrodes in the atmosphere where sulphur fumes are present. In these conditions tinned copper should be used.

Aluminium oxide film which is always present on Aluminium conductor surface acts as barrier and it protects the Aluminium conductor from corrosion in fumes laden atmosphere.

CONDUCTOR CONSTRUCTION

The most economical construction for conductor is solid conductor i.e. conductor is made of one single wire. As the area of conductor increase, solid conductor becomes more stiff and hence difficult to handle. In this case stranded construction is adopted. Here the conductor is made of number of strands. The strands are arranged in spiral layers in 1+6+12+18+..... formations. This construction provides more flexibility. Where crimping of lugs are required, the conductor has to be of stranded construction only.

To economise in insulating material, weight and overall diameter, shaped conductors are employed in bigger sized cables. Here the stranded conductor is shaped in to a segment of a circle so that when all the cores are laid together, they form a complete circle. I.S. 1554 permits solid conductor construction upto 10 sq.mm in Aluminium and upto 6 sq.mm in copper. It permits the use of shaped conductors for sizes from 16 sq.mm onwards.

INSULATION

The PVC covering over conductor is called insulation and is provided by extrusion process only. The insulated conductor is called core. I.S. 1554 permits two types of PVC insulation as follows :

- 1) Insulation with TYPE A PVC compound as per I.S. 5831 which is suitable for 70 deg.C continuous operation.
- 2) Insulation with TYPE C PVC compound as per I.S. 5831 which is suitable for 85 deg.C continuous operation

The following colour code is used for identification :

- Single Core : Red, Black, Yellow or Blue (any one) .
- Two Cores : Red and Black
- Three Cores : Red, Yellow and Blue.
- Three & Half : Red, Yellow, Blue and Black (Reduced neutral).
- Four Core : Red, Yellow, Blue and Black.
- Five Core : Red, Yellow, Blue, Black, and Grey
- Six Cores : Two adjacent cores. Blue and Yellow (Counting and direction core) And remaining Grey in each layer. OR By printing numbers on each core.

LAYING UP

The cores are laid up together with suitable lay. The final layer always has a right hand lay i.e. if you look along the cable, the cores move to your right hand.

INNERSHEATH

Innersheath is provided over the laid up cores. It is provided to give circular shape to the cable and it provides bedding for the armouring.

I.S. 1554 permits following two methods of applying the innersheath of any thermoplastic material i.e. PVC, Polyethylene, etc.

a) **EXTRUDED INNERSHEATH:** Here the innersheath is provided by extrusion of Thermoplastic over the laid up cores. This type of innersheath is generally provided in cables having round cores i.e in control cables and power cables upto 10 sq.mm size. This type of innersheath also acts as a water barrier between cores and outersheath. In case of puncture in the outersheath the water can not reach to the cores and hence we recommend that cables for outdoor underground uses should have extruded innersheath.

b) **TAPPED INNERSHEATH:** Here the innersheath is provided by wrapping a thermoplastic tape over the laid up cores. It is generally employed in cables having sector shaped cores i.e. multicore cables of 16 sq.mm and above. This method saves a process and hence manufacturers always provide this type of innersheath unless the purchase specifications ask for extruded innersheath.

ARMOURING

In case of armoured cables, generally galvanized steel wire / strip armouring is provided over the innersheath in multi-core cables and over the insulation in single core cables. It provides mechanical protection to inside cores and it carries earth return current in case of a short circuit.

In long run of cables and in case of mines, round wire armouring is must, as strip construction provides higher resistance to earth fault current and sometimes this current may not be sufficient to operate the circuit breaker in case of earth fault.

In mines, the resistance of the armour in no case should exceed the resistance of the main core by more than 33% for safety reasons. To achieve this, sometimes tinned hard drawn copper wires are required to be used along with galvanized steel wires. Most of Times two layers of steel wires are provided to give extra protection.

In case of single core armoured cables for use in AC circuits, the material for armouring has to be non magnetic, as in this case the return current is not passing through the same cable and hence it will not cancel the magnetic lines produced by the current. These magnetic lines which are oscillating in case of AC current will give rise to eddy current in magnetic armouring and hence armouring will become hot, and this may lead to the failure of the cable. Generally hard drawn aluminium wires / strip are used for armouring in this case.

OUTERSHEATH

The PVC covering on armouring in case of armoured cables and over the innersheath in case of unarmoured cables is called outersheath. I.S. 1554 specifies nominal and minimum thicknesses of outer sheath for unarmoured cables and only minimum thickness of outer sheath for armoured cables.

It permits the following types of outer sheath PVC compounds.

- 1) Outer sheath with type ST1 PVC compound as per IS-5831, which is suitable for 70 deg.C continuous operation.
- 2) Outer sheath with Type ST2 PVC compound as per IS-5831, which is suitable for 85 deg.C continuous operation.

PVC has got fire retardant properties due to its halogen content. The fire in the cable gets extinguished immediately on removal of the fire source.

In the modern Power, Chemical, Fertilizer and Cement Plants many PVC cables are bunched in the cable shaft or on cable trays. In case of fire in these cables, the fire becomes self sustaining. Moreover due to the burning of PVC a dense corrosive smoke is emitted which makes fire fighting very difficult, due to poor visibility and toxic nature of the smoke. HCL content of the smoke, not only damages other costly equipment lying nearby, but also penetrates the RCC and corrodes the steel reinforcement. Due to this there is an extensive damage to the property.

To overcome these deficiencies FRLS i.e. Fire Retardant Low Smoke PVC was developed.

If required, DCPL can provide Fire Retardant Low Smoke (FRLS) PVC Inner sheath and / or outer sheath. This PVC compound, apart from meeting the requirements of Type ST2 as per IS-5831, has got better fire retardant properties and it emits lower smoke and acid fumes when it catches fire.

CABLE CODE

The following codes are used for designating the cables as per IS-1554.

CONSTITUENT	CODE LETTER
COPPER CONDUCTOR	-
ALUMINIUM CONDUCTOR	A
PVC INSULATION	Y
STEEL ROUND WIRE ARMOUR	W
STEEL STRIP ARMOUR	F
STEEL DOUBLE ROUND WIRE ARMOUR	WW
STEEL DOUBLE STRIP ARMOUR	FF
PVC OUTER SHEATH	Y

YY means Copper conductor, PVC insulated, unarmoured and PVC sheathed cable.

YWY means Copper conductor, PVC insulated, round wire armoured and PVC sheathed cable.

YFY means copper conductor , PVC insulated, flat GI strip armour and PVC sheathed cable.

AYY means Aluminium conductor, PVC insulated, unarmoured and PVC sheathed cable.

AYWY means aluminum conductor, PVC insulated, round wire armoured and PVC sheathed cable.

AYFY means aluminum conductor, PVC insulated, flat GI strip armoured and PVC sheathed cable.

A2XY means aluminum conductor, XLPE Insulated unarmoured cable & PVC sheathed cable.

A2XWY means aluminum conductor, XLPE Insulated round wire armored & PVC sheathed cable.

A2XFY means aluminum conductor, XLPE Insulated Flat GI sprit armoured & PVC sheathed cable.

LV PVC TECHNICAL DATA

Table - 1 : Single Core PVC Insulated armoured & unarmoured cable with Aluminium / Copper Conductor Conf. to IS:1554 (P-I)

Area	Thickness of PVC Insulation		Dimension of Armour		Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable				Max.D.C. Resistance at 20°C		Approx. A.C. Resistance at Opt. Temp.70°C		Approx. Reactance at 50Hz.		Current Rating						Short Circuit Rating for 1 Sec.				
	Arm	Un-Arm	Wire	Strip	Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured	kg / km	Al	Cu	Al	Cu	Ohm / km	Al	Cu	Arm	Ohm / km	Ohm / km	Direct in Ground	In Duct		In Air		Al	Cu	Al
4	1.3	1.0	1.4	-	1.24	1.8	11	9	140	165	80	105	7.41	4.61	8.89	5.52	0.153	0.137	31	39	30	38	27	35	27	35	0.30	0.46	
6	1.3	1.0	1.4	-	1.24	1.8	12	9.5	170	205	100	140	4.61	3.08	5.53	3.69	0.147	0.131	39	49	37	48	35	44	35	44	0.46	0.69	
10	1.3	1.0	1.4	-	1.24	1.8	13	10	200	260	125	185	3.08	1.83	3.70	2.19	0.136	0.121	51	65	51	64	47	60	47	60	0.76	1.15	
16	1.3	1.0	1.4	-	1.24	1.8	14	11	225	320	150	245	1.91	1.15	2.29	1.38	0.125	0.111	66	85	65	83	64	82	64	82	1.22	1.84	
25	1.5	1.2	1.4	-	1.24	1.8	15	13	290	440	200	350	1.20	0.727	1.44	0.87	0.118	0.107	86	110	84	110	84	110	84	110	1.90	2.88	
35	1.5	1.2	1.4	-	1.24	1.8	16	14	340	555	240	455	0.868	0.524	1.04	0.627	0.111	0.101	100	130	100	125	105	130	105	130	2.66	4.03	
50	1.7	1.4	1.4	-	1.24	1.8	18	16	420	705	305	590	0.641	0.387	0.77	0.463	0.108	0.098	120	155	115	150	130	165	130	165	3.80	5.75	
70	1.7	1.4	1.4	-	1.4	1.8	20	17	530	960	385	815	0.443	0.268	0.53	0.321	0.100	0.090	140	190	135	175	155	205	155	205	5.32	8.05	
95	1.9	1.6	1.6	-	1.4	1.8	21	20	620	1200	500	1075	0.320	0.193	0.38	0.232	0.094	0.087	175	220	155	200	190	245	190	245	7.22	10.9	
120	1.9	1.6	1.6	-	1.4	2.0	23	21	720	1450	605	1335	0.253	0.153	0.30	0.184	0.090	0.085	195	250	170	220	220	280	220	280	9.12	13.8	
150	2.1	1.8	1.8	-	1.4	2.0	25	23	860	1765	725	1645	0.206	0.124	0.25	0.150	0.089	0.084	220	280	190	245	250	320	250	320	11.4	17.3	
185	2.3	2.0	2.0	-	1.4	2.0	27	25	1020	2135	875	2005	0.164	0.0991	0.20	0.120	0.086	0.082	240	305	210	260	290	370	290	370	14.1	21.3	
240	2.5	2.2	2.2	-	1.4	2.0	30	28	1255	2675	1095	2515	0.125	0.0754	0.15	0.0924	0.084	0.080	270	345	225	285	335	425	335	425	18.2	27.6	
300	2.8	2.4	2.4	-	1.4	2.0	32	31	1510	3345	1320	3145	0.100	0.0601	0.12	0.0746	0.082	0.078	295	375	245	310	380	475	380	475	22.8	34.5	
400	3.0	2.6	2.6	-	1.4	2.2	36	35	1870	4240	1685	4140	0.0778	0.0470	0.0934	0.0597	0.081	0.078	325	400	275	335	435	550	435	550	30.4	46.0	
500	3.4	3.0	3.0	-	1.4	2.2	40	38	2325	5310	2110	5165	0.0605	0.0366	0.0726	0.0481	0.080	0.077	345	425	295	355	455	580	455	580	38.0	57.5	
630	3.9	3.4	3.4	-	1.4	2.4	43	44	2955	6865	2695	6500	0.0469	0.0283	0.0563	0.0395	0.077	0.077	390	470	320	375	550	660	470	660	47.9	72.5	
800	3.9	3.4	3.4	-	1.4	2.4	50	48	3620	8565	3285	7940	0.0367	0.0221	0.0440	0.0314	0.078	0.075	440	530	360	420	620	745	420	745	60.8	92.0	
1000	4.0	3.4	3.4	-	1.4	2.6	54	53	4375	10530	4010	10065	0.0291	0.0176	0.0349	0.0271	0.076	0.074	490	590	400	470	700	835	470	835	76.0	115.0	

Table - 2 : 2 Core PVC Insulated armoured & unarmoured cable with Aluminium / Copper Conductor Conf. to IS:1554 (P-I)

Area	Thickness of PVC Insulation	Thickness of Inner Sheath	Dimension of Armour	Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable				Max.D.C. Resistance at 20°C		Approx. A.C. Resistance at Opt. Temp.70°C		Approx. Reactance at 50Hz.	Current Rating						Short Circuit Rating for 1 Sec.				
				Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured	kg / km	Al	Cu	Al	Cu	Ohm / km		Al	Cu	Ohm / km	Al	Cu	Al	Cu	Al	Cu	Al	Cu
2.5	0.9	0.3	1.4	-	1.24	1.8	13	13	420	450	200	210	12.1	7.41	14.5	8.87	0.106	25	32	21	27	21	27	21	27	0.19	0.29
4	1.0	0.3	1.4	-	1.24	1.8	14	14	495	540	230	280	7.41	4.61	8.9	5.52	0.102	32	41	27	35	27	35	27	35	0.30	0.46
6	1.0	0.3	1.4	-	1.24	1.8	15	15	565	635	280	350	4.61	3.08	5.54	3.69	0.097	40	50	34	44	35	44	35	44	0.46	0.70
10	1.0	0.3	1.4	-	1.24	1.8	19	17	680	775	350	475	3.08	1.83	3.7	2.19	0.091	55	70	45	58	47	60	47	60	0.76	1.16
16	1.0	0.3	1.4	-	1.4	2.0	19	19	720	820	425	515	1.91	1.15	2.3	1.38	0.086	70	90	58	75	59	78	59	78	1.22	1.86
25	1.2	0.3	1.4	-	1.4	2.0	21	19	865	990	425	515	0.868	0.524	1.04	0.627	0.085	90	115	76	97	78	105	78	105	1.90	2.90
35	1.2	0.3	1.4	-	1.4	2.0	21	21	800	1225	515	955	0.668	0.413	0.77	0.464	0.083	110	140	92	120	99	125	99	125	2.66	4.06
50	1.4	0.3	1.4	-	1.4	2.0	25	23	975	1550	640	1230	0.641	0.387	0.77	0.464	0.083	135	165	115	145	125	155	125	155	3.80	5.80
70	1.4	0.3	1.4	-	1.4	2.0	27	26	1185	2024	815	1675	0.443	0.268	0.85	0.533	0.077	160	205	140	180	150	195	150	195	5.32	8.12
95	1.6	0.4	1.4	-	1.4	2.2	31	29	1500	2665	1090	2260	0.320	0.193	0.96	0.633	0.077	190	240	170	215	185	230	185	230	7.22	11.0
120	1.6	0.4	1.4	-	1.4	2.2	33	31	1700	3185	1275	2790	0.253	0.153	1.04	0.726	0.075	210	275	190	235	210	265	210	265	9.12	13.9
150	1.8	0.4	1.4	-	1.4	2.2	34	34	1845	3365	1335	3365	0.206	0.124	1.15	0.726	0.075	240	310	210	270	240	305	240	305	11.4	17.4
185	2.0	0.5	1.4	-	1.4	2.4	39	37	2425	4680	1865	4120	0.164	0.0991	1.15	0.726	0.074	275	350	240	300	275	350	275	350	14.1	21.5
240	2.2	0.5	1.4	-	1.4	2.4	42	42	3020	5690	2385	5260	0.125	0.0754	1.22	0.633	0.074	320	405	275	345	325	415	325	415	18.2	27.8
300	2.4	0.6	1.4	-	1.4	2.4	48	46	3725	7295	2930	6640	0.100	0.0601	1.38	0.633	0.074	355	430	305	385	365	465	365	465	22.8	34.8
400	2.6	0.7	1.4	-	1.4	2.6	53	52	4485	9280	3720	8500	0.0778	0.0470	1.52	0.633	0.073	385	490	345	425	420	530	420	530	30.4	46.4
500	3.0	0.7	1.4	-	1.4	2.6	57	57	5420	11500	4665	10700	0.0605	0.0366	1.66	0.633	0.073	437	555	391	482	476	601	476	601	38.0	58.0
630	3.4	0.7	1.4	-	1.4	2.8	64	64	6875	14500	5935	13750	0.0489	0.0283	1.81	0.633	0.073	490	631	444	548	541	683	541	683	47.9	73.1

* The above data is indicative & may be changed without prior information. * Conductor up to 16 mm² will be non-compact. * Above 16 mm² compacted sector conductor. * Cables can be supplied in multiples of 250 / 500 / 1000 mtrs per customers requirement.
Operating Conditions : * Ambient Air temp. 40°C * Ground temp. 30°C * Depth of laying. 75cm * Thermal resistivity of soil. 150°C-cm/W

LV PVC TECHNICAL DATA

Table - 3 : 3 Core PVC Insulated armoured & unarmoured cable with Aluminium / Copper Conductor Conf. to IS:1554 (P-I)

Area	Thickness of PVC Insulation		Thickness of PVC Inner Sheath		Dimension of Armour		Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable				Max.D.C. Resistance at 20°C		Approx. A.C. Resistance at Opt. Temp.70°C		Approx. Reactance at 50Hz.		Current Rating				Short Circuit Rating for 1 Sec.							
	(Nom)	mm	(Min)	mm	Wire	Strip	Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured	kg / km	kg / km	kg / km	kg / km	Ohm / km	Ohm / km	Ohm / km	Ohm / km	Ohm / km	Al	Cu	Al	Cu	Al	Cu	Al	Cu			
2.5	0.9	0.3	0.3	1.4	1.4	1.4	1.24	1.8	16	13	460	505	205	250	12.1	7.41	14.5	8.87	0.106	0.106	21	27	18	24	18	24	21	27	18	24	0.19	0.29
4	1.0	0.3	0.3	1.4	1.4	1.4	1.24	1.8	17	15	550	625	260	330	7.41	4.61	8.9	5.52	0.102	0.102	28	36	23	30	23	30	28	36	23	30	0.30	0.46
6	1.0	0.3	0.3	1.4	1.4	1.4	1.24	1.8	19	16	615	730	315	420	4.61	3.08	5.54	3.69	0.097	0.097	35	45	30	38	30	38	35	45	30	38	0.46	0.70
10	1.0	0.3	0.3	1.4	1.4	1.4	1.4	1.8	21	18	755	950	395	585	3.08	1.83	3.7	2.19	0.091	0.091	46	60	39	50	40	52	46	60	39	50	0.76	1.16
16	1.0	0.3	0.3	1.4	1.4	1.4	1.4	1.8	20	19	670	965	400	685	1.91	1.15	2.3	1.38	0.086	0.086	60	77	50	64	51	66	60	77	50	64	1.22	1.86
25	1.2	0.3	0.3	1.4	1.4	1.4	1.4	2.0	23	22	870	1325	575	1030	1.20	0.727	1.44	0.87	0.085	0.085	76	99	63	81	70	90	76	99	63	81	1.90	2.90
35	1.2	0.3	0.3	1.4	1.4	1.4	1.4	2.0	25	24	1010	1660	710	1365	0.668	0.524	1.04	0.627	0.083	0.083	92	120	77	99	86	110	92	120	77	99	2.66	4.06
50	1.4	0.3	0.3	1.4	1.4	1.4	1.56	2.0	28	27	1270	2150	900	1765	0.441	0.387	0.77	0.464	0.083	0.083	110	145	95	125	105	135	110	145	95	125	3.80	5.80
70	1.4	0.4	0.4	1.4	1.4	1.4	1.56	2.2	31	30	1565	2880	1180	2470	0.443	0.368	0.533	0.321	0.077	0.077	135	175	115	150	130	165	135	175	115	150	5.32	8.12
95	1.6	0.4	0.4	1.4	1.4	1.4	1.56	2.2	35	33	1935	3725	1515	3280	0.320	0.193	0.385	0.232	0.075	0.075	165	210	140	175	155	200	165	210	140	175	7.22	11.0
120	1.6	0.4	0.4	1.4	1.4	1.4	1.72	2.2	38	36	2280	4540	1790	4000	0.253	0.184	0.305	0.184	0.075	0.075	185	240	155	195	180	230	185	240	155	195	9.12	13.9
150	1.8	0.5	0.5	1.4	1.4	1.4	1.88	2.4	42	40	2745	5540	2190	4935	0.206	0.124	0.249	0.149	0.074	0.074	210	270	175	225	205	265	210	270	175	225	11.4	17.4
185	2.0	0.5	0.5	1.4	1.4	1.4	2.6	2.6	45	44	3245	6690	2695	6075	0.164	0.0991	0.198	0.121	0.074	0.074	235	300	200	255	240	305	235	300	200	255	14.1	21.5
240	2.2	0.6	0.6	1.4	1.4	1.4	2.2	2.8	52	50	4250	8475	3465	7780	0.125	0.0754	0.152	0.0929	0.074	0.074	275	345	235	295	280	355	275	345	235	295	18.2	27.8
300	2.4	0.6	0.6	1.4	1.4	1.4	2.36	3.0	58	55	5080	10500	4295	9900	0.100	0.0601	0.122	0.0753	0.074	0.074	305	385	260	335	315	400	305	385	260	335	22.8	34.8
400	2.6	0.7	0.7	1.4	1.4	1.4	2.52	3.4	64	62	6230	13500	5375	12500	0.078	0.0470	0.096	0.0604	0.073	0.073	335	425	290	360	375	455	335	425	290	360	30.4	46.4
500	3.0	0.7	0.7	1.4	1.4	1.4	2.84	3.6	72	69	7770	17000	6770	15800	0.0605	0.0366	0.076	0.0489	0.073	0.073	380	482	329	408	425	516	380	482	329	408	38.0	58.0

* The above data is indicative & may be changed without prior information. * Conductor up to 16 mm² will be non-compacted. * Above 16 mm² compacted sector conductor. * Cables can be supplied in multiples of 250 / 500 / 1000 mtrs per customers requirement.

Operating Conditions : • Ambient Air temp: 40°C • Ground temp: 30°C • Thermal resistivity of soil: 150°C-cm/W

• Depth of laying: 75cm

Table - 4 : 3½ Core PVC Insulated armoured & unarmoured cable with Aluminium / Copper Conductor Conf. to IS:1554 (P-I)

Area	Thickness of PVC Insulation		Thickness of PVC Inner Sheath		Dimension of Armour		Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable				Max.D.C. Resistance at 20°C		Approx. A.C. Resistance at Opt. Temp.70°C		Approx. Reactance at 50Hz.		Current Rating				Short Circuit Rating for 1 Sec.							
	Power	Neutral	mm	mm	Wire	Strip	Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured	kg / km	kg / km	kg / km	kg / km	Ohm / km	Ohm / km	Ohm / km	Ohm / km	Ohm / km	Al	Cu	Al	Cu	Al	Cu	Al	Cu			
25	1.2	1.0	0.3	4.0 X 0.8	1.4	2.0	2.0	2.0	25	23	985	1535	690	1245	1.20	0.727	1.44	0.87	0.085	0.085	76	99	63	81	70	90	76	99	63	81	1.90	2.90
35	1.2	1.0	0.3	4.0 X 0.8	1.4	2.0	2.0	2.0	27	26	1150	1900	820	1560	0.868	0.524	1.04	0.627	0.083	0.083	92	120	77	99	86	110	92	120	77	99	2.66	4.06
50	1.4	1.2	0.4	4.0 X 0.8	1.56	2.0	2.0	2.0	30	28	1450	2460	1050	2060	0.641	0.387	0.77	0.464	0.083	0.083	110	145	95	125	105	135	110	145	95	125	3.80	5.80
70	1.4	1.2	0.4	4.0 X 0.8	1.56	2.2	2.2	2.2	33	32	1780	3290	1370	2985	0.443	0.268	0.533	0.321	0.077	0.077	135	175	115	150	130	165	135	175	115	150	5.32	8.12
95	1.6	1.4	0.4	4.0 X 0.8	1.56	2.2	2.2	2.2	38	36	2270	4315	1780	3815	0.320	0.193	0.385	0.232	0.077	0.077	165	210	140	175	155	200	165	210	140	175	7.22	11.0
120	1.6	1.4	0.5	4.0 X 0.8	1.72	2.4	2.4	2.4	41	40	2715	5350	2185	4815	0.253	0.153	0.305	0.184	0.075	0.075	185	240	155	195	180	230	185	240	155	195	9.12	13.9
150	1.8	1.4	0.5	4.0 X 0.8	1.88	2.4	2.4	2.4	45	43	3160	6330	2590	5760	0.206	0.124	0.249	0.149	0.075	0.075	210	270	175	225	205	265	210	270	175	225	11.4	17.4
185	2.0	1.6	0.5	4.0 X 0.8	2.04	2.6	2.6	2.6	50	48	3840	7810	3165	7165	0.164	0.0991	0.198	0.121	0.074	0.074	235	300	200	255	240	305	235	300	200	255	14.1	21.5
240	2.2	1.6	0.6	4.0 X 0.8	2.20	3.0	3.0	3.0	57	55	4845	9860	4070	9085	0.125	0.0754	0.152	0.0929	0.074	0.074	275	345	235	295	280	355	275	345	235	295	18.2	27.8
300	2.4	1.8	0.6	4.0 X 0.8	2.36	3.2	3.2	3.2	62	60	5745	12360	4950	11370	0.100	0.0601	0.122	0.0753	0.074	0.074	305	385	260	335	315	400	305	385	260	335	22.8	34.8
400	2.6	2.0	0.7	4.0 X 0.8	2.68	3.4	3.4	3.4	70	68	7040	15585	6240	14625	0.0778	0.0470	0.096	0.0604	0.073	0.073	335	425	290	360	375	455	335	425	290	360	30.4	46.4
500	3.0	2.2	0.7	4.0 X 0.8	2.84	3.8	3.8	3.8	78	77	8920	19500	7970	18500	0.0605	0.0366	0.076	0.0489	0.073	0.073	380	482	329	408	425	516	380	482	329	408	38.0	58.0

* The above data is indicative & may be changed without prior information. * Conductor up to 16 mm² will be non-compacted. * Above 16 mm² compacted sector conductor. * Cables can be supplied in multiples of 250 / 500 mtrs per customers requirement.

Operating Conditions : • Ambient Air temp: 40°C • Ground temp: 30°C • Thermal resistivity of soil: 150°C-cm/W

• Depth of laying: 75cm

LV PVC TECHNICAL DATA

Table - 5 : 4 Core PVC Insulated armoured & unarmoured cable with Aluminium / Copper Conductor Conf. to IS:1554 (P-I)

Area	Thickness of PVC Insulation (Nom)	Thickness of Inner Sheath (Min)	Dimension of Armour		Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable				Max.D.C. Resistance at 20°C		Approx. A.C. Resistance at Opt. Temp.70°C		Approx. Reactance at 50Hz.	Current Rating						Short Circuit Rating for 1 Sec.				
			Wire	Strip	Arm	Un-Arm	Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured	Armoured	Unarmoured	Ohm / km	Al		Cu	Ohm / km	Al	Cu	Direct in Ground	In Duct	In Air	Al	Cu	Al	Cu
2.5	0.9	0.3	1.4	-	1.24	1.8	17	14	515	580	235	295	7.41	14.5	8.87	0.106	21	27	18	24	18	24	18	24	18	24	0.19	0.29
4	1.0	0.3	1.4	-	1.24	1.8	19	16	625	720	305	400	7.41	8.9	5.52	0.102	28	36	23	30	23	30	23	30	23	30	0.30	0.49
6	1.0	0.3	1.4	-	1.24	1.8	20	18	715	860	370	510	4.61	5.54	3.69	0.097	35	45	30	38	30	38	30	38	30	38	0.46	0.70
10	1.0	0.3	-	4 X 0.8	1.40	2.0	22	20	720	970	465	715	3.08	3.7	2.19	0.091	46	60	39	50	40	52	40	52	40	52	0.76	1.16
16	1.0	0.3	-	4 X 0.8	1.40	2.0	21	21	800	1180	510	895	1.91	2.3	1.38	0.086	60	77	50	64	51	66	51	66	51	66	1.22	1.86
25	1.2	0.3	-	4 X 0.8	1.40	2.0	26	25	1055	1680	725	1330	1.20	1.44	0.87	0.085	76	99	63	81	70	90	70	90	70	90	1.90	2.80
35	1.2	0.3	-	4 X 0.8	1.40	2.0	28	27	1260	2130	900	1775	0.868	1.04	0.627	0.083	92	120	77	99	86	110	86	110	86	110	2.66	4.06
50	1.4	0.4	-	4 X 0.8	1.56	2.2	32	31	1590	2740	1190	2345	0.641	0.77	0.464	0.083	110	145	95	125	105	135	105	135	105	135	3.80	5.80
70	1.4	0.4	-	4 X 0.8	1.56	2.2	36	34	1910	3710	1510	3230	0.443	0.533	0.321	0.077	135	175	115	150	130	165	130	165	130	165	5.32	8.12
95	1.6	0.4	-	4 X 0.8	1.72	2.4	40	39	2525	4860	1985	4335	0.320	0.385	0.232	0.077	165	210	140	175	155	200	155	200	155	200	7.22	11.0
120	1.6	0.5	-	4 X 0.8	1.88	2.4	44	42	3000	5935	2370	5320	0.253	0.305	0.194	0.075	185	240	155	195	180	230	180	230	180	230	9.12	13.9
150	1.8	0.5	-	4 X 0.8	1.88	2.6	48	46	3535	7190	2875	6530	0.206	0.249	0.149	0.075	210	270	175	225	205	265	205	265	205	265	11.4	17.4
185	2.0	0.6	-	4 X 0.8	2.04	2.8	54	52	4290	8860	3560	8070	0.164	0.198	0.121	0.074	235	300	200	255	240	295	240	295	240	295	14.1	21.5
240	2.2	0.6	-	4 X 0.8	2.36	3.0	61	58	5395	11100	4545	10285	0.125	0.152	0.0929	0.074	275	345	235	295	280	355	280	355	280	355	16.2	27.8
300	2.4	0.7	-	4 X 0.8	2.52	3.4	67	66	6550	13925	5685	13100	0.100	0.122	0.0763	0.074	305	385	260	335	315	400	315	400	315	400	22.8	34.8
400	2.6	0.7	-	4 X 0.8	2.84	3.6	75	73	8080	17845	7060	16630	0.0778	0.096	0.0604	0.073	335	425	290	360	375	455	360	455	360	455	30.4	46.4
500	3.0	0.7	-	4 X 0.8	3.0	4.0	84	83	10115	22350	8980	21050	0.0605	0.076	0.0489	0.073	380	482	329	408	425	516	408	425	516	38.0	58.0	

• The above data is indicative & may be changed without prior information. • Conductor up to 16 mm² will be non-compacted. • Above 16 mm² compacted sector conductor. • Cables can be supplied in multiples of 250 / 500 / 1000 mtrs per customers requirement.
Operating Conditions : • Ambient Air temp: 40°C • Ground temp: 30°C • Depth of laying: 75cm • Thermal resistivity of soil: 150 C-cm/W



LV PVC TECHNICAL DATA

Table - 6 : PVC Insulated armoured & unarmoured Control cable with Copper Conductor of 1.5mm² Conf. to IS:1554 (P-I)

No. of Cores X Area	Thick. of PVC Insulation (Nom)	Thickness of Inner Sheath (Min)	Dimension of Armour		Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable		Max.D.C. Resistance at 20°C	Approx. A.C. Resistance at Opt. Temp.70°C	Approx. Reactance at 50Hz.	Current Rating			Short Circuit Rating for 1 Sec.	
			Wire	Strip	Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured				Direct in Ground	In Duct	In Air		Amps
No X mm ²	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg / km	kg / km	Ohm / km	Ohm / km	Ohm / km	Amps	Amps	Amps	kA(rms)
2 X 1.5	0.8	0.3	1.4	—	1.24	1.8	13.5	11	170	410	12.1	14.5	0.110	0.110	23	20	20	0.173
3 X 1.5	0.8	0.3	1.4	—	1.24	1.8	14	12	190	450	12.1	14.5	0.110	0.110	21	17	17	0.173
4 X 1.5	0.8	0.3	1.4	—	1.24	1.8	15	13	225	495	12.1	14.5	0.110	0.110	21	17	17	0.173
5 X 1.5	0.8	0.3	1.4	—	1.24	1.8	16	14	260	540	12.1	14.5	0.110	0.110	21	17	17	0.173
6 X 1.5	0.8	0.3	1.4	—	1.24	1.8	17	15	292	605	12.1	14.5	0.110	0.110	15	13	13	0.173
7 X 1.5	0.8	0.3	1.4	—	1.24	1.8	17	15	315	620	12.1	14.5	0.110	0.110	14	13	13	0.173
10 X 1.5	0.8	0.3	1.4	—	1.40	1.8	21	18	640	640	12.1	14.5	0.110	0.110	13	11	11	0.173
12 X 1.5	0.8	0.3	—	4 X 0.8	1.40	1.8	20	18	725	480	12.1	14.5	0.110	0.110	12	10	10	0.173
14 X 1.5	0.8	0.3	—	4 X 0.8	1.4	1.8	21	19	820	535	12.1	14.5	0.110	0.110	11	10	10	0.173
16 X 1.5	0.8	0.3	—	4 X 0.8	1.4	1.8	22	20	900	595	12.1	14.5	0.110	0.110	11	9	9	0.173
19 X 1.5	0.8	0.3	—	4 X 0.8	1.4	2.0	23	22	985	695	12.1	14.5	0.110	0.110	10	9	9	0.173
24 X 1.5	0.8	0.3	—	4 X 0.8	1.4	2.0	26	25	1215	860	12.1	14.5	0.110	0.110	9	8	8	0.173
27 X 1.5	0.8	0.3	—	4 X 0.8	1.4	2.0	27	26	1280	930	12.1	14.5	0.110	0.110	9	8	8	0.173
30 X 1.5	0.8	0.3	—	4 X 0.8	1.4	2.0	28	28	1390	1010	12.1	14.5	0.110	0.110	8	7	7	0.173
37 X 1.5	0.8	0.3	—	4 X 0.8	1.4	2.0	30	28	1600	1200	12.1	14.5	0.110	0.110	8	7	7	0.173
44 X 1.5	0.8	0.3	—	4 X 0.8	1.56	2.0	33	32	1870	1410	12.1	14.5	0.110	0.110	7	6	6	0.173
52 X 1.5	0.8	0.4	—	4 X 0.8	1.56	2.2	35	34	2135	1655	12.1	14.5	0.110	0.110	7	6	6	0.173
61 X 1.5	0.8	0.4	—	4 X 0.8	1.56	2.2	37	36	2395	1895	12.1	14.5	0.110	0.110	6	6	6	0.173

• The above data is indicative & may be changed without prior information. • Conductor up to 16 mm² will be non-compacted. • Above 16 mm² compacted sector conductor. • Cables can be supplied in multiples of 500 /1000 mtrs per customers requirement.
Operating Conditions : • Ambient Air temp: 40°C • Ground temp: 30°C • Depth of laying: 75cm • Thermal resistivity of soil: 150°C-cm/W



LV PVC TECHNICAL DATA

Table - 7 : PVC Insulated armoured & unarmoured Control cable with Copper Conductor of 2.5mm² Conf. to IS:1554 (P-I)

No. of Cores X Area	Thick. of PVC Insulation (Nom)	Thick. of Inner Sheath (Min)	Dimension of Armour		Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable		Max.D.C. Resistance at 20°C	Approx. A.C. Resistance at Opt. Temp.70°C	Approx. Reactance at 50Hz.	Current Rating			Short Circuit Rating for 1 Sec.
			Wire	Strip	Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured				Direct in Ground	In Duct	In Air	
No X mm ²	mm	mm	mm	mm	mm	mm	mm	mm	kg / km	kg / km	Ohm / km	Ohm / km	Ohm / km	Amps	Amps	Amps	kA(rms)
2 X 2.5	0.9	0.3	1.4	-	1.24	1.8	15	12.5	480	215	7.41	8.89	0.106	32	27	27	0.288
3 X 2.5	0.9	0.3	1.4	-	1.24	1.8	16	13.0	520	250	7.41	8.89	0.106	27	24	24	0.288
4 X 2.5	0.9	0.3	1.4	-	1.24	1.8	17	14	605	295	7.41	8.89	0.106	27	24	24	0.288
5 X 2.5	0.9	0.3	1.4	-	1.24	1.8	18	15	675	345	7.41	8.89	0.106	27	24	24	0.288
6 X 2.5	0.9	0.3	1.4	-	1.24	1.8	19	17	755	395	7.41	8.89	0.106	21	18	18	0.288
7 X 2.5	0.9	0.3	1.4	-	1.24	1.8	19	17	775	450	7.41	8.89	0.106	20	17	17	0.288
10 X 2.5	0.9	0.3	-	4 X 0.8	1.40	1.8	22	21	895	590	7.41	8.89	0.106	18	15	15	0.288
12 X 2.5	0.9	0.3	-	4 X 0.8	1.40	2.0	23	22	970	685	7.41	8.89	0.106	17	14	14	0.288
14 X 2.5	0.9	0.3	-	4 X 0.8	1.40	2.0	24	23	1075	765	7.41	8.89	0.106	16	13	13	0.288
16 X 2.5	0.9	0.3	-	4 X 0.8	1.40	2.0	25	24	1185	850	7.41	8.89	0.106	15	12	12	0.288
19 X 2.5	0.9	0.3	-	4 X 0.8	1.40	2.0	26	25	1330	975	7.41	8.89	0.106	14	12	12	0.288
24 X 2.5	0.9	0.3	-	4 X 0.8	1.40	2.0	30	29	1600	1205	7.41	8.89	0.106	13	11	11	0.288
27 X 2.5	0.9	0.3	-	4 X 0.8	1.40	2.0	31	29	1745	1320	7.41	8.89	0.106	12	10	10	0.288
30 X 2.5	0.9	0.3	-	4 X 0.8	1.56	2.0	32	30	1900	1435	7.41	8.89	0.106	12	10	10	0.288
37 X 2.5	0.9	0.4	-	4 X 0.8	1.56	2.2	35	33	2215	1760	7.41	8.89	0.106	11	9	9	0.288
44 X 2.5	0.9	0.4	-	4 X 0.8	1.56	2.2	38	37	2595	2070	7.41	8.89	0.106	10	8	8	0.288
52 X 2.5	0.9	0.4	-	4 X 0.8	1.56	2.2	40	39	2920	2375	7.41	8.89	0.106	10	8	8	0.288
61 X 2.5	0.9	0.4	-	4 X 0.8	1.56	2.2	42	41	3315	2725	7.41	8.89	0.106	9	8	8	0.288

• The above data is indicative & may be changed without prior information. • Conductor up to 16 mm² will be non-compacted. • Above 16 mm² compacted sector conductor. • Cables can be supplied in multiples of 500 /1000 mtrs per customers requirement.
Operating Conditions : • Ambient Air temp. 40°C • Ground temp. 30°C • Depth of laying: 75cm • Thermal resistivity of soil: 150°C-cm/W



Table 8 : Group Rating Factors for Circuits for Three Single Core Cables in Trefoil and Touching Horizontal Formation laid Direct in Ground

No. of Circuits	Spacing (Between Centers of Circuits)				
	Touching	15 cm	30 cm	45 cm	60 cm
2	0.78	0.81	0.85	0.88	0.90
3	0.68	0.71	0.77	0.81	0.83
4	0.61	0.65	0.72	0.76	0.79
6	0.53	0.58	0.66	0.71	0.76
8	0.50	0.64	0.62	0.67	0.72

Table 9 : Rating Factors for Groups of Twin and Multicore Cables laid Direct in Ground in Tier Formation

No. of Circuits	Spacing (Between Centres of Circuits)				
	Touching	15 cm	30 cm	45 cm	60 cm
4	0.6	0.67	0.73	0.76	0.78
6	0.52	0.58	0.63	0.67	0.69
8	0.47	0.51	0.57	0.59	0.61

Table 10 : Rating Factors for Variation in thermal resistivity of soil (Multicore Cables laid Direct in Ground)

Nominal area of conductor mm ²	For values of 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
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	0.8
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	0.9	0.83	0.76
95	1.15	1.08	1.0	0.9	0.83	0.76
120	1.17	1.09	1.0	0.9	0.82	0.76
150	1.17	1.09	1.0	0.9	0.82	0.76
185	1.18	1.09	1.0	0.89	0.81	0.75
140	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	1.1	1.0	0.89	0.81	0.75
500	1.21	1.1	1.0	0.88	0.80	0.74
630	1.22	1.1	1.0	0.88	0.80	0.74

Table 11 : Rating Factors for Variation in thermal resistivity of soil, three single core cables laid direct in the Ground (three cables in trefoil touching)

Nominal area of conductor mm ²	For values of thermal resistivity of soil in °C-cm/W					
	100	120	150	200	250	300
	1.5	1.18	1.09	1.0	0.90	0.82
2.5	1.18	1.09	1.0	0.90	0.82	0.76
4	1.18	1.09	1.0	0.90	0.82	0.76
6	1.18	1.09	1.0	0.90	0.82	0.76
10	1.18	1.09	1.0	0.89	0.81	0.75
16	1.19	1.09	1.0	0.89	0.81	0.74
25	1.19	1.09	1.0	0.88	0.80	0.74
35	1.2	1.09	1.0	0.88	0.80	0.74
50	1.2	1.09	1.0	0.88	0.80	0.74
70	1.21	1.1	1.0	0.88	0.80	0.74
95	1.22	1.1	1.0	0.88	0.80	0.74
120	1.22	1.1	1.0	0.88	0.79	0.74
150	1.22	1.1	1.0	0.88	0.79	0.73
185	1.22	1.1	1.0	0.88	0.79	0.73
140	1.22	1.1	1.0	0.88	0.79	0.73
300	1.22	1.1	1.0	0.88	0.79	0.72
400	1.24	1.11	1.0	0.88	0.79	0.72
500	1.24	1.11	1.0	0.88	0.79	0.72
630	1.24	1.11	1.0	0.88	0.79	0.72

Table 12 : Rating Factors for Variation in Dept. of laying in Ground

Dept. of Laying (cm)	75	90	105	120	150	180 & Above
Rating Factor upto 22 mm ²	1	0.99	0.98	0.97	0.96	0.95
Rating Factor above 22 mm ² and upto 300 mm ²	1	0.98	0.97	0.96	0.94	0.93
Rating Factor above 300 mm ²	1	0.97	0.96	0.95	0.92	0.91

Table 13 : Rating Factors for Variation in Ambient Air Temperature

Air temp. °C	15	20	25	30	35	40	45	50	55
Rating Factor	1.4	4.32	1.25	1.16	1.09	1.0	0.9	0.8	0.68

Table 14 : Rating Factors for Variation in Ground Temperature

Group temp. °C	15	20	25	30	35	40	45	50	55
Rating Factor	1.17	1.12	1.06	1.0	0.94	0.87	0.79	0.71	0.61

Table 15A : Rating Factors for multicore cables laid on open racks in air, cables laid on cable trays exposed to air, the cables spaced by one cable diameter & trays in tier by 300 mm. The clearance between the wall & the cable is 25 mm.

No. of Racks	No. of Cables per Rack			
	2	3	6	9
1	0.98	0.96	0.93	0.92
2	0.95	0.93	0.9	0.89
3	0.94	0.92	0.89	0.88
6	0.93	0.9	0.87	0.86

Table 15B : Rating Factors for multicore cables laid on open racks in air, cables laid on cable trays exposed to air, the cables are touching & trays in tier by 300 mm. The clearance between the wall & the cable is 5 mm.

No. of Racks	No. of Cables per Rack			
	2	3	6	9
1	0.84	0.8	0.75	0.73
2	0.8	0.76	0.7	0.69
3	0.78	0.74	0.7	0.68
6	0.76	0.72	0.68	0.66

Table 15C : Rating Factors for single core cables in trefoil circuits laid on open racks in air, cables laid on cable trays exposed to air, the trefoil group spaced by two cable diameter & trays in tier by 300 mm. The clearance between the wall & the cable is 25 mm.

No. of Racks	No. of Cables per Rack		
	1	2	3
1	1	0.98	0.96
2	1	0.95	0.93
3	1	0.94	0.92
6	1	0.93	0.90

Table 16 : Rating Factors for Groups of Twin and multicore cables laid direct in ground in horizontal formation.

No. of Cables	No. of Cables per Rack				
	Touching	15 cm	30 cm	45 cm	60 cm
2	0.79	0.82	0.85	0.88	0.90
3	0.69	0.71	0.77	0.81	0.83
4	0.62	0.65	0.72	0.76	0.79
6	0.54	0.58	0.66	0.71	0.76
8	0.48	0.54	0.62	0.67	0.72

Table 17 : Rating Factors for Circuits of Two Single core cables, side by side and Touching, Horizontal formation, Laid Direct in Ground.

No. of Cables	No. of Cables per Rack				
	Touching	15 cm	30 cm	45 cm	60 cm
2	0.79	0.86	0.91	0.93	0.95
3	0.69	0.78	0.84	0.88	0.91
4	0.64	0.73	0.81	0.86	0.88
6	0.56	0.67	0.77	0.83	0.87
8	0.51	0.65	0.75	0.82	0.86

LV XLPE CABLES

The XLPE insulated heavy duty cables are introduced worldwide in mid sixties. These cables have overcome the limitations of PVC Insulated Cables such as thermal degradation, poor moisture resistant and thermo plastic in nature.

The advantages of XLPE Insulated cables in comparison to PVC insulated cables are as under:-

Technical Advantage

- 1) Higher current rating, higher short Circuit Rating. Approx. 1.2 times that of PVC.
- 2) Thermosetting in nature.
- 3) Higher insulation resistance, 100 times more than PVC cables.
- 4) Higher resistance to moisture.
- 5) Better resistance to surge currents.
- 6) Low Dielectric Losses.
- 7) Better resistance to chemicals.
- 8) Longer Service life
- 9) Comparatively higher cable operation temperature 90°C and short circuit temperature 250°C. against 70°C and 160°C Short Circuit Temperature of PVC.

Commercial Advantage

- 1) Lower laying cost because of comparatively smaller diameter of cable and lighter weight*.
- 2) Lower installation Charges as the diameter of cable is comparatively lesser with smaller bending radius, requiring less space requirement for laying of cables.
- 3) One size lower cable can be used as compared to PVC insulated cable.**
* Density of XLPE is lower than PVC. (0.92 against 1.4)
** For longer cable length voltage drop shall be considered.

Selection Of Power Cables

Power cables are generally selected considering the application. However following factors are important for selection of suitable cable construction required to transport electrical energy from one end to the other.

- 1) Maximum operating voltage.
- 2) Insulation level.
- 3) Frequency.
- 4) Load to be carried.
- 5) Possible overloading duration & magnitude.
- 6) Route length and voltage drop.
- 7) Mode of installation considering installation environment such as ambient & ground temperature, chemical & physical properties of soil.
- 8) Flame retardant properties.

All size of DCPL XLPE cables are designed to standard operating in India and abroad. The standards are adopted considering the geographical/chemical conditions and general applications of power for utilities, distribution and generation purposes.

The cables are manufactured conforming to India and International cables specifications for XLPE Insulated cables. Customer specifications can also be met.

DCPL is manufacturing wide range of cables, so it is important that while placing enquiries or orders, as much information as possible shall be given to DCPL, so that the enquiries and orders are dealt quickly and efficiently.

DCPL guidelines for the same are as under

- 1) Voltage Grade – 650/1100 Volts.
- 2) Relevant Indian Standard – IS-7098 (part-1) – 1988 or International standard – IEC-60502 & BS -5467.
- 3) Number of cores. – Single, Two, Three, Three & Half or Four Cores.
- 4) Conductor – 1.5 mm² to 1000 mm²
- 5) Conductor Material- Copper / Aluminium.
- 6) Type of Insulation -XLPE.
- 7) Type of Inner Sheathing – PVC Wrapped / PVC Extruded.
- 8) Type of Armour – Unarmoured / Strip Armoured / Wire Armoured.
- 9) Type of Outer Sheath – PVC / Flame Retardant / Flame Retardant Low Smoke / Zero Halogen (LSOH).
- 10) Total Length of cable required and drum length.

The Various details to the above guidelines are tabulated in The preceding pages tables.

HANDLING STORAGE AND LAYING OF DCPL XLPE CABLES

A) HANDLING

- 1) The cable with drum shall not be thrown or dropped on the ground from the carriers such as trucks or railway wagons, during unloading.
- 2) The cable drum shall be unloaded with the help of cranes or forklifts or using a proper ramp having inclination 1:3 to 1:4 in order to avoid mechanical damage to the outer layers of the cables.
- 3) The cables drum shall be lifted or stored with its flanges always vertical.
- 4) The cables drum shall be rolled in the direction of the arrow only in order to avoid loosening of cable winding. The drum shall not be rolled on rocky, uneven surface and for longer distances, it may damage the drum and cable.

B) STORAGE

- 1) The cable shall be stored in dry covered places having concrete / firm surface capable of bearing the load of drum.
- 2) The cables end shall be sealed properly in order to prevent moisture ingress.
- 3) Antirodent / termite repulsion treatment shall be applied to the site wherever the drum are stored for very long period of time.

C) LAYING

- 1) DCPL recommend the laying installation of cables as per IS : 1255/84.
- 2) Care shall be taken during laying to avoid sharp bending and twisting.
- 3) Cable shall be un wound from the drum by lifting the drum on the center shaft supported both ends with suitable jacks /stands.
- 4) Under no circumstances the cable winding shall be lifted off a coil or drum laying flat at the flanges. This would cause serious twist and damages.
- 5) Suitable protection shall be provided to the cables against mechanical damages, it includes covers, pipes etc.

D) Recommended minimum bending radius for 650/1100 volts heavy duty cables

Single Core – 15 X D
 Multi Core – 12 X D

Where D = Diameter of cable in mm

E) Recommended safe pulling force with stockings

A) For Unarmoured Cables : $P = 5D^2$
 B) For Armoured Cables : $P = 9D^2$

Where P = Pulling force
 D = Diameter of cable in mm

F) Recommended safe pulling force when Pulled with pulling eyes

A) For Aluminium Conductors : 30N / mm²
 B) Copper Conductor : 50N / mm²



Advantages

Advantages of XLPE cable as compared to thermoplastic cable like PVC are listed below:

- | | |
|--|---|
| <ul style="list-style-type: none"> • Higher power rating. • Higher emergency overload rating. • Higher insulation resistance (100 times more than that of PVC.) • Higher resistance to moisture (100 times more than that of PVC.) • Better resistance to surge currents. | <ul style="list-style-type: none"> • Capacity to withstand localized hot spot temperature (very important for industrial wiring in steel power stations etc.) • Resistant to chemicals and corrosive gases etc. - hence suitable for installation in polluted atmosphere. • Resistance to vibration, impact etc. - no hazard of hot deformation. • Quick method of jointing and termination with simple, - non expensive accessory. • Longer cable life. |
|--|---|

COMPARATIVE CURRENT RATINGS OF 1.1KV PVC AND XLPE CABLES continuous current rating of 3 & 4 core cables armoured and unarmoured laid Direct in the Ground or in air 650/1100V Aluminium conductor.

NOMINAL AREA OF CONDUCTOR	3 or 4 core cables to IS: 1554/1 (PVC)				3 or 4 core cables to IS: 7098/1 (XLPE)			
	In Ground	In Air	Approx. Voltage Drop	kA	In Ground	In Air	Approx. Voltage Drop	kA
(mm ²)	(Amps)	(Amps)	(mv/Amps/m)	sec.	(Amps)	(Amps)	(mv/Amps/m)	sec.
16	60	51	4.0	1.22	73	70	4.2	1.50
25	76	70	2.5	1.90	94	96	2.7	2.35
35	92	86	1.8	2.66	113	117	1.9	3.29
50	100	105	1.3	3.80	133	142	1.4	4.70
70	135	130	0.9	5.32	164	179	0.99	6.58
95	165	155	0.7	7.22	196	221	0.72	8.93
120	185	180	0.5	9.12	223	257	0.58	11.28
150	210	205	0.5	11.40	249	292	0.48	14.10
185	235	240	0.4	14.06	282	337	0.39	17.39
240	275	280	0.3	18.24	326	399	0.31	22.56
300	305	315	0.2	22.80	367	456	0.26	28.20
400	335	375	0.2	30.40	418	530	0.21	37.60



LV XLPE TECHNICAL DATA

Table - 1 : Single Core XLPE Insulated armoured & unarmoured cable with Aluminium / Copper Conductor Conf. to IS:7098 (P-I)

Area	Thickness of XLPE Insulation		Dimension of Armour		Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable				Max.D.C. Resistance at 20°C		Approx. A.C. Resistance at Opt. Temp.90°C		Approx. Reactance at 50Hz.		Current Rating						Short Circuit Rating for 1 Sec.								
	Arm	Un-Arm	Wire	Strip	Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured	kg / km	Al	Cu	kg / km	Al	Cu	Ohm / km	Al	Cu	Ohm / km	Arm	Un-Arm	Direct in Ground	In Duct	In Air	Amps	Al	Cu	Amps	Al	Cu	kA(rms)	Al
1.5	1.0	0.7	-	-	1.8	-	-	7	-	-	65	-	-	7.41	15.43	0.158	-	25	24	-	-	25	24	-	24	-	22	-	-	22	0.21	-	22
2.5	1.0	0.7	-	-	1.8	-	-	7.5	-	-	80	-	-	12.1	9.45	0.146	-	34	33	-	-	34	33	-	33	-	30	-	-	30	0.36	-	30
4	1.0	0.7	1.4	-	1.24	1.8	10.5	8	130	155	70	100	7.41	5.88	0.136	0.152	44	43	34	34	44	44	34	43	30	39	30	39	0.38	0.57	39		
6	1.0	0.7	1.4	-	1.24	1.8	11	9	155	190	90	125	4.61	5.91	0.143	0.143	56	55	42	42	56	42	55	39	49	49	49	49	0.56	0.86	49		
10	1.0	0.7	1.4	-	1.24	1.8	12	10	175	235	105	170	3.08	3.95	0.132	0.132	58	58	74	74	58	74	58	73	53	67	67	67	0.94	1.43	67		
16	1.0	0.7	1.4	-	1.24	1.8	13	11	210	300	130	225	1.91	2.45	0.118	0.125	75	74	95	95	74	95	74	95	72	92	92	92	1.54	2.29	92		
25	1.2	0.9	1.4	-	1.24	1.8	15	12	275	425	170	320	1.20	1.54	0.119	0.119	96	96	125	125	96	125	96	125	94	123	123	123	2.35	3.58	123		
35	1.2	0.9	1.4	-	1.24	1.8	16	13	325	540	205	420	0.868	1.113	0.102	0.114	114	114	148	148	114	148	114	148	118	142	142	142	3.29	5.01	142		
50	1.3	1.0	1.4	-	1.24	1.8	17	15	385	670	260	545	0.641	0.822	0.100	0.109	138	138	180	180	138	180	138	180	152	203	203	203	4.70	7.15	203		
70	1.4	1.1	1.4	-	1.24	1.8	17	17	485	910	345	770	0.443	0.568	0.092	0.101	170	170	222	222	170	222	169	217	194	260	260	260	6.58	10.01	260		
95	1.4	1.1	1.4	-	1.24	1.8	20	18	550	1130	430	1010	0.320	0.411	0.089	0.096	203	203	265	265	203	265	199	255	238	319	319	319	8.93	13.6	319		
120	1.5	1.2	1.4	-	1.24	1.8	22	20	650	1380	535	1265	0.253	0.325	0.087	0.093	231	231	301	301	231	301	225	286	276	370	370	370	11.28	17.2	370		
150	1.7	1.4	-	-	1.40	2.0	24	22	795	1660	695	1565	0.206	0.265	0.088	0.092	258	258	337	337	258	337	246	309	319	425	425	425	14.1	21.5	425		
185	1.9	1.6	-	-	1.40	2.0	26	25	915	2030	785	1915	0.164	0.211	0.089	0.092	292	292	379	379	292	379	273	341	367	488	488	488	17.4	26.5	488		
240	2.0	1.7	-	-	1.40	2.0	29	27	1115	2540	990	2410	0.125	0.162	0.086	0.087	338	338	436	436	338	436	290	382	435	576	576	576	22.6	34.3	576		
300	2.1	1.8	-	-	1.40	2.0	31	29	1350	3185	1160	2985	0.100	0.130	0.085	0.081	359	359	486	486	359	486	310	417	487	656	656	656	28.2	42.9	656		
400	2.4	2.0	-	-	1.56	2.2	35	33	1680	4050	1515	3895	0.0778	0.1023	0.083	0.080	371	371	539	539	371	539	322	443	498	749	749	749	37.6	57.2	749		
500	2.6	2.2	-	-	1.56	2.2	38	37	2080	5060	1890	4890	0.0605	0.0809	0.082	0.079	393	393	597	597	393	597	326	480	538	847	847	847	47.0	71.5	847		
630	2.8	2.4	-	-	1.72	2.2	43	41	2590	6460	2325	6285	0.0469	0.0644	0.080	0.077	447	447	657	657	447	657	382	518	616	954	954	954	59.2	90.1	954		
800	3.1	2.6	-	-	1.88	2.4	48	46	3210	7970	2930	7965	0.0367	0.0524	0.079	0.077	505	505	693	693	505	693	432	540	690	1037	1037	1037	75.2	114.4	1037		
1000	3.3	2.8	-	-	2.04	2.6	53	51	3955	10110	3650	9705	0.0291	0.0438	0.078	0.077	567	567	735	735	567	735	485	574	775	1125	1125	1125	94.0	143.0	1125		

• The above data is indicative & may be changed without prior information. • Conductor up to 16 mm² will be non-compacted. • Above 16 mm² compacted sector conductor. • Cables can be supplied in multiples of 500/1000 mtrs as per customers requirement.
Operating Conditions : • Ambient Air temp: 40°C • Ground temp: 30°C • Depth of laying: 75cm • Thermal resistivity of soil: 150°C-cm/W



LV XLPE TECHNICAL DATA

Table - 2 : 2 Core XLPE Insulated armoured & unarmoured cable with Aluminium / Copper Conductor Conf. to IS:7098 (P-I)

Area	Thickness of XLPE Insulation (Nom)	Thickness of Inner Sheath (Min)	Dimension of PVC Outer Sheath		Approx. Overall Diameter	Approx. Net Wt. of Cable		Max.D.C. Resistance at 20°C		Approx. A.C. Resistance at Opt. Temp.90°C	Approx. Reactance at 50Hz.	Current Rating						Short Circuit Rating for 1 Sec.								
			Wire	Strip		Arm	Un-Arm	Armoured	Unarmoured			Ohm / km	Al	Cu	Ohm / km	Al	Cu	Ohm / km	Al	Cu	Al	Cu				
1.5	0.7	0.3	1.4	—	1.24	1.8	13	11	—	150	—	15.43	0.106	—	30	—	24	—	27	—	—	0.21	—			
2.5	0.7	0.3	1.4	—	1.24	1.8	14	12	—	185	—	9.45	0.099	—	38	—	32	—	36	—	—	0.36	—			
4	0.7	0.3	1.4	—	1.24	1.8	15	13	435	485	190	240	4.61	9.50	4.61	3.08	5.91	3.93	4.1	52	39	62	0.56	0.86		
6	0.7	0.3	1.4	—	1.24	1.8	16	14	490	560	230	300	3.08	3.95	3.95	2.33	3.95	2.33	63	41	52	69	84	1.43		
10	0.7	0.3	1.4	—	1.24	1.8	17	15	480	650	250	415	3.08	2.42	1.91	1.15	2.42	1.47	89	90	84	111	150	2.29		
16	0.7	0.3	1.4	—	1.4	1.8	18	16	585	705	290	440	1.91	0.81	0.81	0.81	0.81	0.81	110	69	90	84	111	150	2.29	
25	0.9	0.3	1.4	4 X 0.8	1.4	2.0	19	18	600	900	325	625	1.20	0.727	1.34	0.927	0.081	0.081	108	143	87	116	107	144	2.35	3.58
35	0.9	0.3	1.4	4 X 0.8	1.4	2.0	21	19	705	1145	400	825	0.868	0.524	1.11	0.668	0.079	0.079	129	139	131	178	178	3.29	5.01	
50	1.0	0.3	1.4	4 X 0.8	1.4	2.0	23	21	825	1410	500	1060	0.641	0.387	0.822	0.494	0.641	0.641	153	165	158	215	4.70	7.15		
70	1.1	0.3	1.4	4 X 0.8	1.56	2.0	26	24	1065	1925	690	1500	0.443	0.268	0.568	0.342	0.443	0.443	203	203	200	269	6.58	10.01		
95	1.1	0.4	1.4	4 X 0.8	1.56	2.2	29	27	1300	2450	880	2000	0.320	0.193	0.411	0.247	0.320	0.320	257	184	244	333	8.33	13.6		
120	1.2	0.4	1.4	4 X 0.8	1.56	2.2	31	30	1540	3015	1080	2550	0.253	0.153	0.325	0.197	0.253	0.253	228	279	246	385	11.3	17.2		
150	1.4	0.4	1.4	4 X 0.8	1.72	2.2	34	32	1800	3625	1330	3100	0.206	0.124	0.265	0.160	0.206	0.206	214	313	269	439	14.1	21.5		
185	1.6	0.5	1.4	4 X 0.8	1.72	2.2	37	35	2165	4400	1600	3800	0.164	0.0991	0.211	0.128	0.164	0.164	214	313	269	439	14.1	21.5		
240	1.7	0.5	1.4	4 X 0.8	1.88	2.6	41	40	2600	5500	2000	4800	0.125	0.0754	0.162	0.0999	0.125	0.125	314	427	288	358	507	17.4	26.5	
300	1.8	0.6	1.4	4 X 0.8	2.04	2.8	45	43	3275	6990	2520	6100	0.100	0.0601	0.130	0.08	0.100	0.100	365	493	330	411	364	588	22.6	34.3
400	2.0	0.6	1.4	4 X 0.8	2.36	3.0	51	49	4040	8825	3120	7900	0.0778	0.0470	0.102	0.0641	0.0778	0.0778	439	624	414	522	470	785	37.6	57.2
500	2.2	0.7	1.4	4 X 0.8	2.52	3.4	56	54	4950	11000	3900	10000	0.0605	0.0366	0.081	0.0519	0.0605	0.0605	498	707	469	592	533	890	47.0	71.5
630	2.4	0.7	1.4	4 X 0.8	2.88	3.6	62	60	6060	13800	4950	12600	0.0469	0.0283	0.0644	0.0424	0.0469	0.0469	565	804	533	673	606	1012	59.2	90.1

Table - 3 : 3 Core XLPE Insulated armoured & unarmoured cable with Aluminium / Copper Conductor Conf. to IS:7098 (P-I)

Area	Thickness of XLPE Insulation (Nom)	Thickness of Inner Sheath (Min)	Dimension of PVC Outer Sheath		Approx. Overall Diameter	Approx. Net Wt. of Cable		Max.D.C. Resistance at 20°C		Approx. A.C. Resistance at Opt. Temp.90°C	Approx. Reactance at 50Hz.	Current Rating						Short Circuit Rating for 1 Sec.								
			Wire	Strip		Arm	Un-Arm	Armoured	Unarmoured			Ohm / km	Al	Cu	Ohm / km	Al	Cu	Ohm / km	Al	Cu	Al	Cu				
1.5	0.7	0.3	1.4	—	1.24	1.8	14	12	—	170	—	15.43	0.106	—	22	—	20	—	23	—	—	0.21	—			
2.5	0.7	0.3	1.4	—	1.24	1.8	15	13	—	215	—	9.45	0.099	—	29	—	27	—	31	—	—	0.36	—			
4	0.7	0.3	1.4	—	1.24	1.8	16	14	475	545	205	280	4.61	9.50	4.61	3.08	5.91	3.93	28	35	29	41	0.38	0.57		
6	0.7	0.3	1.4	—	1.24	1.8	17	16	550	655	235	325	3.08	3.95	3.08	2.33	3.95	2.33	42	47	36	44	38	52	0.56	0.86
10	0.7	0.3	1.4	—	1.24	1.8	19	17	645	830	325	510	1.83	0.84	1.83	1.15	2.42	1.47	63	63	44	59	50	72	0.94	1.43
16	0.7	0.3	1.4	4 X 0.8	1.24	1.8	19	17	575	865	335	625	1.91	1.15	2.42	1.47	0.84	0.84	71	93	58	75	71	94	1.50	2.29
25	0.9	0.3	1.4	4 X 0.8	1.4	2.0	21	20	740	1195	450	900	1.20	0.727	1.54	0.927	0.081	0.081	119	119	74	97	93	123	2.35	3.58
35	0.9	0.3	1.4	4 X 0.8	1.4	2.0	23	22	900	1560	550	1200	0.868	0.524	1.11	0.668	0.079	0.079	109	142	88	116	114	151	3.29	5.01
50	1.0	0.3	1.4	4 X 0.8	1.56	2.0	26	24	1075	1950	720	1530	0.641	0.387	0.822	0.494	0.641	0.641	129	169	105	138	138	184	4.70	7.15
70	1.1	0.4	1.4	4 X 0.8	1.56	2.2	30	29	1400	2700	990	2220	0.443	0.268	0.568	0.342	0.443	0.443	158	200	130	170	174	231	6.58	10.01
95	1.1	0.4	1.4	4 X 0.8	1.56	2.2	33	31	1720	3500	1260	2910	0.320	0.193	0.411	0.247	0.320	0.320	191	249	157	205	215	285	8.93	13.6
120	1.2	0.4	1.4	4 X 0.8	1.72	2.2	36	34	2030	4250	1440	3660	0.253	0.153	0.325	0.197	0.253	0.253	217	283	180	234	249	331	11.3	17.2
150	1.4	0.5	1.4	4 X 0.8	1.88	2.4	40	38	2430	5200	1800	4500	0.206	0.124	0.265	0.160	0.206	0.206	243	317	202	264	285	378	14.1	21.5
185	1.6	0.5	1.4	4 X 0.8	2.04	2.6	44	42	2950	6350	2220	5610	0.164	0.0991	0.211	0.128	0.164	0.164	276	358	230	298	330	436	17.4	26.5
240	1.7	0.6	1.4	4 X 0.8	2.20	2.8	50	48	3750	8100	2700	7200	0.125	0.0754	0.162	0.0989	0.125	0.125	319	413	267	345	391	514	22.6	34.3
300	1.8	0.6	1.4	4 X 0.8	2.36	3.0	55	53	4440	9990	3600	9000	0.100	0.0601	0.130	0.08	0.100	0.100	360	462	301	387	447	586	28.2	42.9
400	2.0	0.7	1.4	4 X 0.8	2.68	3.2	61	59	5550	12825	4500	11700	0.0778	0.0470	0.102	0.0641	0.0778	0.0778	406	521	342	445	461	674	37.6	57.2
500	2.2	0.7	1.4	4 X 0.8	2.88	3.6	68	66	6600	15900	5550	14700	0.0605	0.0366	0.081	0.0519	0.0605	0.0605	460	591	388	505	523	764	47.0	71.5
630	2.4	0.7	1.4	4 X 0.8	2.84	3.8	75	73	8400	20100	7200	18900	0.0469	0.0283	0.0644	0.0424	0.0469	0.0469	523	671	440	573	594	868	59.2	90.1

* The above data is indicative & may be changed without prior information. • Conductor up to 16 mm² will be non-compacted. • Above 16 mm² compacted sector conductor. • Cables can be supplied in multiples of 250/500 /1000 mtrs per customers requirement.
Operating Conditions : • Ambient Air temp: 40°C • Ground temp: 30°C • Depth of laying: 75cm • Thermal resistivity of soil: 150 C-cm/W

LV XLPE TECHNICAL DATA



Table - 4 : 3/2 Core XLPE Insulated armoured & unarmoured cable with Aluminium / Copper Conductor Conf. to IS:7098 (P-I)

Area	Thickness of XLPE Insulation (Nom)		Thickness of Inner Sheath (Min)	Dimension of Armour Strip	Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable				Max.D.C. Resistance at 20°C	Approx. A.C. Resistance at Opt. Temp.90°C		Approx. A.C. Reactance at 50Hz.	Current Rating						Short Circuit Rating for 1 Sec.	
	Power	Neutral			Arm	Un-Arm	Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured		Ohm / km	Ohm / km		Ohm / km	Al	Cu	Al	Cu	Al	Cu	Al
25	16	0.9	0.7	0.3	4.0 X 0.8	1.40	2.0	23	22	860	1400	540	1080	1.20	0.827	0.081	91	119	74	97	93	123	2.35	3.58
35	16	0.9	0.7	0.3	4.0 X 0.8	1.40	2.0	25	24	1000	1760	660	1440	0.868	0.668	0.079	109	142	88	116	114	151	3.29	5.01
50	25	1.0	0.9	0.3	4.0 X 0.8	1.40	2.0	27	26	1235	2225	810	1890	0.641	0.494	0.078	129	169	105	138	138	184	4.70	7.15
70	35	1.1	0.9	0.4	4.0 X 0.8	1.56	2.2	32	31	1600	3100	1110	2700	0.443	0.368	0.0742	158	208	130	170	174	231	6.58	10.01
95	50	1.1	1	0.4	4.0 X 0.8	1.56	2.2	35	34	1900	4000	1440	3510	0.320	0.411	0.0725	191	249	157	205	215	285	8.93	13.6
120	70	1.2	1.1	0.4	4.0 X 0.8	1.72	2.2	39	38	2390	5040	1710	4440	0.253	0.197	0.0722	217	283	180	234	249	331	11.28	17.2
150	70	1.4	1.1	0.5	4.0 X 0.8	1.72	2.4	43	42	2770	5975	2160	5400	0.124	0.160	0.0727	243	317	202	264	285	378	14.1	21.5
185	95	1.6	1.1	0.5	4.0 X 0.8	1.88	2.6	48	45	3400	7380	2160	6690	0.0991	0.128	0.072	276	358	230	298	330	436	17.4	26.5
240	120	1.7	1.2	0.6	4.0 X 0.8	2.04	2.8	54	52	4200	9300	3420	8550	0.125	0.0754	0.0713	319	413	267	345	391	514	22.6	34.3
300	150	1.8	1.4	0.6	4.0 X 0.8	2.20	3.0	59	56	5100	11400	4140	10620	0.100	0.0601	0.071	360	462	301	387	447	586	28.2	42.9
400	185	2.0	1.6	0.7	4.0 X 0.8	2.52	3.4	67	65	6300	14820	5400	13900	0.0778	0.0641	0.070	406	521	342	445	461	674	37.6	57.2
500	240	2.2	1.7	0.7	4.0 X 0.8	2.68	3.6	74	73	7770	18300	6660	17400	0.0605	0.0366	0.070	460	591	388	505	523	764	47.0	71.5
630	300	2.4	1.8	0.7	4.0 X 0.8	3.00	4.0	84	82	9900	23400	8100	22200	0.0605	0.0366	0.0697	523	671	440	573	594	868	59.2	90.1

* The above data is indicative & may be changed without prior information. • Conductor up to 16 mm² will be non-compacted. • Above 16 mm² compacted sector conductor. • Cables can be supplied in multiples of 250/500 mtrs per customers requirement. Operating Conditions : • Ambient Air temp. 40°C • Ground temp. 30°C • Depth of laying: 75cm • Thermal resistivity of soil: 150°C-cm/W

Table - 5 : 4 Core XLPE Insulated armoured & unarmoured cable with Aluminium / Copper Conductor Conf. to IS:7098 (P-I)

Area	Thickness of XLPE Insulation (Nom)	Thickness of Inner Sheath (Min)	Dimension of Armour	Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable				Max.D.C. Resistance at 20°C	Approx. A.C. Resistance at Opt. Temp.90°C		Approx. A.C. Reactance at 50Hz.	Current Rating						Short Circuit Rating for 1 Sec.		
				Wire	Strip	Arm	Un-Arm	Armoured	Unarmoured	Armoured	Unarmoured		Ohm / km	Ohm / km		Ohm / km	Al	Cu	Al	Cu	Al	Cu	Al	Cu
1.5	0.7	0.3	1.4	1.4	1.8	12	15	440	440	200	200	12.1	15.43	0.106	22	22	20	20	20	20	23	23	0.21	0.21
2.5	0.7	0.3	1.4	1.4	1.8	13	16	515	515	250	250	7.41	9.45	0.099	29	29	27	27	27	27	31	31	0.36	0.36
4	0.7	0.3	1.4	1.4	1.8	17	15	625	625	335	335	7.41	9.50	0.093	34	34	34	34	34	34	29	29	0.38	0.57
6	0.7	0.3	1.4	1.4	1.8	18	16	620	750	290	435	3.08	3.93	0.089	42	47	47	47	47	47	38	52	0.56	0.86
10	0.7	0.3	1.4	1.4	1.8	18	18	750	1000	375	625	3.08	3.95	0.084	55	63	63	63	63	63	50	72	0.96	1.43
16	0.7	0.3	1.4	1.4	1.8	21	19	695	1050	405	795	1.91	2.42	0.081	71	93	93	93	93	93	71	94	1.50	2.29
25	0.9	0.3	1.4	1.4	1.8	23	20	1100	1985	555	1200	1.20	0.727	0.081	91	119	119	119	119	119	93	123	2.35	3.58
35	0.9	0.3	1.4	1.4	1.8	26	25	1110	1985	690	1590	0.868	0.524	0.079	109	142	88	116	114	151	151	3.29	5.01	
50	1.0	0.3	1.4	1.4	1.8	29	28	1350	2500	900	2100	0.641	0.387	0.078	129	169	105	138	138	184	184	4.70	7.15	
70	1.1	0.4	1.4	1.4	1.8	34	33	1740	3460	1200	2970	0.443	0.268	0.0742	158	208	130	170	174	231	231	6.58	10.01	
95	1.1	0.4	1.4	1.4	1.8	37	36	2130	4465	1530	4000	0.320	0.193	0.0725	191	249	157	205	215	285	285	8.93	13.6	
120	1.2	0.5	1.4	1.4	1.8	41	41	2610	5550	1800	4950	0.253	0.153	0.0722	217	283	180	234	249	331	331	11.3	17.2	
150	1.4	0.5	1.4	1.4	1.8	46	45	3090	6800	2340	6180	0.206	0.124	0.0727	243	317	202	264	285	378	378	14.1	21.5	
185	1.6	0.5	1.4	1.4	1.8	50	50	3750	8300	3000	7500	0.0991	0.128	0.0713	276	358	230	298	330	436	436	17.4	26.5	
240	1.7	0.6	1.4	1.4	1.8	58	56	4700	10500	3900	9630	0.0754	0.0612	0.0713	319	413	267	345	391	514	514	22.6	34.3	
300	1.8	0.7	1.4	1.4	1.8	64	62	5700	13000	4590	12335	0.0601	0.0411	0.071	360	462	301	387	447	586	586	28.2	42.9	
400	2.0	0.7	1.4	1.4	1.8	71	70	7200	16800	6000	15750	0.0778	0.0470	0.070	406	521	342	445	461	674	674	37.6	57.2	
500	2.2	0.7	1.4	1.4	1.8	80	79	8860	20820	7500	19000	0.0605	0.0366	0.0697	460	591	388	505	523	764	764	47.0	71.5	
630	2.4	0.7	1.4	1.4	1.8	89	88	10800	27000	9600	25200	0.0469	0.0283	0.0697	523	671	440	573	594	868	868	59.2	90.1	

* The above data is indicative & may be changed without prior information. • Conductor up to 16 mm² will be non-compacted. • Above 16 mm² compacted sector conductor. • Cables can be supplied in multiples of 250/500/1000 mtrs per customers requirement. Operating Conditions : • Ambient Air temp. 40°C • Ground temp. 30°C • Depth of laying: 75cm • Thermal resistivity of soil: 150°C-cm/W

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Table - 6 : XLPE insulated armoured & unarmoured Control cable with Copper Conductor of 1.5mm² Conf. to IS:7098 (P-I)

No. of Cores X Area	Thick. of XLPE Insulation (Nom)	Thickness of Linner Sheath		Dimension of Armour		Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable		Max.D.C. Resistance at 20°C	Approx. A.C. Resistance at Opt. Temp.70°C	Approx. Reactance at 50Hz.	Current Rating			Short Circuit Rating for 1 Sec.		
		(Min)	(mm)	Wire	Strip	Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured				kg / km	kg / km	Ohm / km		Ohm / km	Ohm / km
No X mm ²																				
2 X 1.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	13	11	365	150	12.1	15.43	0.106	30	24	27	0.215		
3 X 1.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	14	12	400	170	12.1	15.43	0.106	22	20	23	0.215		
4 X 1.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	15	12	440	200	12.1	15.43	0.106	22	20	23	0.215		
5 X 1.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	15	13	510	225	12.1	15.43	0.106	22	20	23	0.215		
6 X 1.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	16	14	570	250	12.1	15.43	0.106	20	16	18	0.215		
7 X 1.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	16	14	585	275	12.1	15.43	0.106	19	15	17	0.215		
10 X 1.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	19	17	750	360	12.1	15.43	0.106	17	13	15	0.215		
12 X 1.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	18	16	800	400	12.1	15.43	0.106	16	13	14	0.215		
14 X 1.5	0.7	0.3	1.4	1.4	mm	1.40	1.8	21	19	900	450	12.1	15.43	0.106	15	12	13	0.215		
16 X 1.5	0.7	0.3	1.4	1.4	mm	1.40	1.8	21	19	790	500	12.1	15.43	0.106	14	11	12	0.215		
19 X 1.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	22	20	880	575	12.1	15.43	0.106	13	11	12	0.215		
24 X 1.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	25	24	1060	725	12.1	15.43	0.106	12	10	11	0.215		
27 X 1.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	26	24	1125	780	12.1	15.43	0.106	11	9	10	0.215		
30 X 1.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	27	25	1200	850	12.1	15.43	0.106	11	9	10	0.215		
37 X 1.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	28	27	1375	1000	12.1	15.43	0.106	10	8	9	0.215		
44 X 1.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	32	30	1600	1110	12.1	15.43	0.106	9	7	9	0.215		
52 X 1.5	0.7	0.3	1.4	1.4	mm	1.56	2.2	33	31	1800	1350	12.1	15.43	0.106	9	7	8	0.215		
61 X 1.5	0.7	0.4	1.4	1.4	mm	1.56	2.2	35	34	2070	1600	12.1	15.43	0.106	8	7	8	0.215		

* The above data is indicative & may be changed without prior information. * Conductor up to 16 mm² will be non-compacted. * Above 16 mm² compacted sector conductor. * Cables can be supplied in multiples of 500/1000 mtrs per customers requirement.
Operating Conditions : * Ambient Air temp. 40°C * Ground temp. 30°C * Depth of laying. 75cm * Thermal resistivity of soil. 150°C-cm/W

Table - 7 : XLPE insulated armoured & unarmoured Control cable with Copper Conductor of 2.5mm² Conf. to IS:7098 (P-I)

No. of Cores X Area	Thick. of XLPE Insulation (Nom)	Thickness of Linner Sheath		Dimension of Armour		Thickness of PVC Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable		Max.D.C. Resistance at 20°C	Approx. A.C. Resistance at Opt. Temp.70°C	Approx. Reactance at 50Hz.	Current Rating			Short Circuit Rating for 1 Sec.		
		(Min)	(mm)	Wire	Strip	Arm	Un-Arm	Armoured	Unarmoured	kg / km	kg / km				Ohm / km	Ohm / km	Ohm / km		Direct in Ground	In Duct
No X mm ²																				
2 X 2.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	14	12	405	185	7.41	9.45	0.089	38	32	36	0.358		
3 X 2.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	15	13	465	215	7.41	9.45	0.089	29	27	31	0.358		
4 X 2.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	16	13	515	250	7.41	9.45	0.089	22	20	23	0.358		
5 X 2.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	17	14	600	295	7.41	9.45	0.089	22	20	23	0.358		
6 X 2.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	18	15	660	325	7.41	9.45	0.089	25	21	24	0.358		
7 X 2.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	18	15	700	350	7.41	9.45	0.089	24	20	23	0.358		
10 X 2.5	0.7	0.3	1.4	1.4	mm	1.24	1.8	20	19	750	480	7.41	9.45	0.089	21	18	20	0.358		
12 X 2.5	0.7	0.3	1.4	1.4	mm	1.40	1.8	21	20	825	550	7.41	9.45	0.089	20	17	19	0.358		
14 X 2.5	0.7	0.3	1.4	1.4	mm	1.40	1.8	22	20	925	600	7.41	9.45	0.089	19	16	17	0.358		
16 X 2.5	0.7	0.3	1.4	1.4	mm	1.40	1.8	23	22	1000	700	7.41	9.45	0.089	18	15	16	0.358		
19 X 2.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	24	23	1100	800	7.41	9.45	0.089	17	14	16	0.358		
24 X 2.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	28	26	1350	1000	7.41	9.45	0.089	16	13	15	0.358		
27 X 2.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	28	27	1450	1050	7.41	9.45	0.089	14	12	13	0.358		
30 X 2.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	29	28	1550	1150	7.41	9.45	0.089	14	12	13	0.358		
37 X 2.5	0.7	0.3	1.4	1.4	mm	1.40	2.0	31	30	1825	1400	7.41	9.45	0.089	13	11	12	0.358		
44 X 2.5	0.7	0.4	1.4	1.4	mm	1.56	2.2	34	34	2150	1700	7.41	9.45	0.089	12	10	11	0.358		
52 X 2.5	0.7	0.4	1.4	1.4	mm	1.56	2.2	37	36	2450	1950	7.41	9.45	0.089	12	10	11	0.358		
61 X 2.5	0.7	0.4	1.4	1.4	mm	1.56	2.2	39	38	2750	2220	7.41	9.45	0.089	11	9	11	0.358		

* The above data is indicative & may be changed without prior information. * Conductor up to 16 mm² will be non-compacted. * Above 16 mm² compacted sector conductor. * Cables can be supplied in multiples of 500/1000 mtrs per customers requirement.
Operating Conditions : * Ambient Air temp. 40°C * Ground temp. 30°C * Depth of laying. 75cm * Thermal resistivity of soil. 150°C-cm/W

Group Rating Factors for Circuits for Three Single Core Cables in Trefoil formation

Table 8A : Touching Horizontal Formation laid Direct in Ground

No. of Circuits	Spacing (Between Centres of Circuits)				
	Touching	15 cm	30 cm	45 cm	60 cm
2	0.78	0.81	0.85	0.88	0.90
3	0.68	0.71	0.77	0.81	0.83
4	0.61	0.65	0.72	0.76	0.79
5	0.56	0.61	0.68	0.73	0.78

Table 8B : Cables laid in Trefoil Ducts in horizontal formation

No. of Circuits	Spacing (Between Centres of Circuits)		
	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	0.79

Table 8C : 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. Ga between them.

No. of Racks / Trays in tiers	No. of Trefoils in horizontal formation		
	1	2	3
1	0.95	0.96	0.88
2	0.9	0.85	0.83
3	0.88	0.83	0.81
6	0.86	0.81	0.79

Table 8D : Cables laid as in 'C' but open air

No. of Racks	No. of Cables per Rack		
	1	2	3
1	1	0.98	0.96
2	1	0.95	0.93
3	1	0.94	0.92
6	1	0.93	0.90

Group Rating Factors for Circuits for Multi-core Cables

Table 9A : Cables laid inside concrete trench with removable covers, on cable trays where air circulation is restricted. The cables spaced by one cable diameter and trays in tiers by 300mm. The clearance of the cable from the wall is 25 mm.

No. of Cable trays in Tier	Number of Cables				
	1	2	3	6	9
1	0.95	0.9	0.88	0.85	0.84
2	0.9	0.85	0.83	0.81	0.8
3	0.88	0.83	0.81	0.79	0.78
6	0.86	0.81	0.79	0.77	0.76

Table 9B : Cables laid on cable trays exposed to air, the cables spaced by one cable diameter & trays in tiers by 300 mm. The clearance between the wall & the cable is 25 mm.

No. of Cable trays in Tier	No. of Cables per Rack			
	2	3	6	9
1	0.98	0.96	0.93	0.92
2	0.95	0.93	0.9	0.89
3	0.94	0.92	0.89	0.88
6	0.93	0.9	0.87	0.86

Table 9C : Cables laid on cable trays exposed to air, the cables are touching & trays in tiers by 300 mm. The clearance between the wall & the cable is 25 mm.

No. of Cable trays in Tier	No. of Cables per Rack			
	2	3	6	9
1	0.84	0.8	0.75	0.73
2	0.8	0.76	0.71	0.69
3	0.78	0.74	0.7	0.68
6	0.76	0.72	0.68	0.66

Table 9D : Cables laid Direct in Ground in horizontal formation

No. of Cable in Group	Spacing of Cables			
	Touching	15 cm	30 cm	45 cm
2	0.79	0.82	0.87	0.90
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

Table 9E : Cables laid Direct in Single Way ducts/pipes in horizontal formation.

No. of Cable in Group	Spacing of Cables			
	Touching	30 cm	45 cm	60 cm
2	0.88	0.9	0.92	0.94
3	0.82	0.84	0.87	0.89
4	0.77	0.8	0.84	0.87
5	0.74	0.78	0.82	0.85
6	0.71	0.76	0.81	0.84

Table 10 : Rating Factors for Variation in Dept. of laying in Ground

Dept. of Laying (cm)	75	90	105	120	150	180 & Above
Rating Factor upto 25 mm ²	1	0.99	0.98	0.97	0.96	0.95
Rating Factor above 25 mm ² and upto 300 mm ²	1	0.98	0.97	0.96	0.94	0.93
Rating Factor above 300 mm ²	1	0.97	0.96	0.95	0.92	0.91

Table 11 : Rating Factors for Variation in Ambient Air Temperature

Air temp. °C	15	20	25	30	35	40	45	50	55
Rating Factor	1.22	1.18	1.14	1.1	1.05	1.0	0.95	0.89	0.84

Table 12 : Rating Factors for Variation in Ground Temperature

Group temp. °C	15	20	25	30	35	40	45	50	55
Rating Factor	1.12	1.08	1.04	1.0	0.96	0.91	0.87	0.82	0.76

Table 13 : Rating Factors for Variation in thermal resistivity of soil (multicore cables laid Direct in Ground)

Nominal area of conductor mm ²	For values 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	0.8
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	0.9	0.83	0.76
95	1.15	1.08	1.0	0.9	0.83	0.76
120	1.17	1.09	1.0	0.9	0.82	0.76
150	1.17	1.09	1.0	0.9	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	1.1	1.0	0.89	0.81	0.75
500	1.21	1.1	1.0	0.88	0.80	0.74
630	1.22	1.1	1.0	0.88	0.80	0.74

Table 14 : Rating Factors for Variation in thermal resistivity of soil, three single core cables laid Direct in the Ground (three cables in cable in trefoil touching).

Nominal area of conductor mm ²	For values thermal resistivity of soil in °C-cm/W					
	100	120	150	200	250	300
1.5	1.18	1.09	1.0	0.90	0.82	0.76
2.5	1.18	1.09	1.0	0.90	0.82	0.76
4	1.18	1.09	1.0	0.90	0.82	0.76
6	1.18	1.09	1.0	0.90	0.82	0.76
10	1.18	1.09	1.0	0.89	0.81	0.75
16	1.19	1.09	1.0	0.89	0.81	0.74
25	1.19	1.09	1.0	0.88	0.80	0.74
35	1.2	1.09	1.0	0.88	0.80	0.74
50	1.2	1.09	1.0	0.88	0.80	0.74
70	1.21	1.1	1.0	0.88	0.80	0.74
95	1.22	1.1	1.0	0.88	0.80	0.74
120	1.22	1.1	1.0	0.88	0.79	0.74
150	1.22	1.1	1.0	0.88	0.79	0.73
185	1.22	1.1	1.0	0.88	0.79	0.73
240	1.22	1.1	1.0	0.88	0.79	0.73
300	1.22	1.1	1.0	0.88	0.79	0.72
400	1.24	1.11	1.0	0.88	0.79	0.72
500	1.24	1.11	1.0	0.88	0.79	0.72
630	1.24	1.11	1.0	0.88	0.79	0.72



COMPARATIVE CHART FOR NORMAL / FR / FRLS / LSZH / FS CABLES

S. No	Component	Normal PVC Cable	Fire Retardant (FR) Cable	Fire Retardant Low Smoke (FRLS) Cable	Low Smoke Zero Halogen (LSZH) Cables	Fire Survival (FS) Cables
1	CONDUCTOR	Cu/Al	Cu/Al	Cu/Al	Cu/Al	Cu/Al
2	INSULATION & ITS PROPERTIES	PVC	PVC/XLPE	PVC/XLPE	PVC/XLPE/ Special Polymer	XLPE
a	INSULATION PROPERTY	Good	Good/Excellent	Good/Excellent	Good/Excellent/ Very Good	Excellent
b	TEMPERATURE RATING	70°C	70/90°C	70/90°C	70/90/90°C	90°C
c	THERMAL STABILITY	Good	Good/Excellent	Good/Excellent	Good/Excellent/ Very good	Excellent
d	FLAME RETARDANCY	Average	Good	Very good	Better than FRLS	Excellent
e	SAFETY DURING BURNING	Average	Fairly Good	Good	Very Good	Excellent
f	HALOGEN CONTENT DURING BURNING (%)	30 to 37	<20	<20	<2	<2
3	FIRE BARRIER OVER INSULATION	No	No	No	No	Yes
4	INNER SHEATH	Normal PVC FR PVC	Normal/ FRLS PVC	Normal/ Special Polymer	FR/FRLS/ Polymer	Special
5	ARMOURING	Normal	Normal	Normal	Normal	Special
6	FIRE BARRIER	No	No	No	No	Yes
7	FINAL SHEATHING PVC	Normal	FR PVC	FRLS PVC Polymer	Special Polymer	Special

FIRE PROPERTIES OF FINISHED CABLE

1	OXYGEN INDEX OF OUTERSHEATH	21 to 24	29 to 32	29 to 32	32 to 36	32 to 36
2	FLAME RETARDANCY	Average	Good	Good	Very Good	Excellent
3	TEMPERATURE REQUIRED TO CATCH FIRE (WITH 21% OXYGEN)	Room Temp.	>250°C	>250°C	>300°C	>3000°C
4	VISIBILITY DURING BURNING (%)	5 to 10	5 to 10	>40	>95	>95
5	ACID GAS GENERATE BY WEIGHT	30 to 37	30 to 37	<18	<0.5	<0.5
6	CIRCUIT INTEGRITY AT 950°C FOR THREE HRS. (BS:6387)	No	No	No	No	Yes
7	TOXIC INDEX (NEC 713)	>50	>50	>40	<5	<5

MV XLPE CABLES

Criteria for Selection For Power Cables

1) **SYSTEM VOLTAGE** What are the system voltage and the type of system? Single phase, Three phase, earthed or unearthed AC or DC?

2) **CURRENT CARRYING CAPACITY** The current rating is the main and the basic criteria. Tables give the current carrying capacity of various types and size of cables, under different conditions of laying. These points should be considered before laying as under:

- 2.1: Depth of laying.
- 2.2: Ambient temperature of ground and Air.
- 2.3: Soil resistivity.
- 2.4: Whether one or more groups of the cables are laid together.
- 2.5: Any heating source near cable run.

3) **MODE OF INSTALLATION** The mode of installation determines the types of cable to be used. Electricity regulations require the, use of Armoured cables for underground applications. In general, Armoured cables are recommended where there is any chance of mechanical damage. If chances of mechanical damage after laying cables is not likely, cheaper Unarmoured cables can be used.

4) **PERMISSIBLE VOLTAGE DROP** For longer length of cable run it is necessary to check that with the cable size selected, the voltage drop does not exceed the prescribed regulations limit. A higher size cable may have to be used if the voltage drop exceed the limits.

5) **LOAD CHARACTERISTIC** One should take into account the characteristics of load. It is essential to ensure that the cable selected is capable of handling temporary overloads. DCPL cables permit a conductor temperature of up to 130°C under temporary overload conditions. (If possible, the complete load cycle may be furnished).

6) **SHORT CIRCUIT RATING** Short circuit rating depends on the expected level and the duration of the short circuit. In certain cases a larger size of cable than the cable required for normal full load may be needed. The cables with high KVA capacity are expected to carry short circuit of high magnitude, "DCPL" permit a short circuit temperature of 250°C.

7) **ECONOMIC CONSIDERATION** The most economical construction and size of cables persistent with current carrying capacity and laying condition has to be selected. A detail study of 3 or 4 approximate sizes are performed and actual running cost are worked out taking into consideration I²R loss and interest, depreciation of the total cable cost. The size, which gives minimum running cost, is to be preferred.

8) **Type of installation** For implementing right choice and selection of cables, depend on atmospheric conditions of area, temperature variations, type of place to be used, type of industries-chemical/minning/shipping/fire hazardous etc.



MV XLPE TECHNICAL DATA

Table - 2A : 3.8/6.6 (7-2) KV Single Core XLPE Insulated Screened Armoured & Unarmoured cable with Aluminium / Copper Conductor Conf. to IS:7098 (P-II)

Area	Thickness of XLPE Insulation	Dimension of Armour Wire	Thickness of Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable				Max.D.C. Resistance at 20°C				Approx. A.C. Resistance at Opt. Temp.90°C				Approx. Reactance at 50Hz.				Current Rating for Armoured Cables				Short Circuit Rating for 1 Sec.					
			Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured	kg / km	kg / km	kg / km	kg / km	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu
25	2.8	1.6	1.40	1.8	21	19	525	670	370	520	1.20	0.727	1.54	0.927	0.134	0.142	99	125	87	110	115	150	150	150	2.35	3.58	2.35	3.58	115	150	150	150
35	2.8	1.6	1.40	2.0	22	20	580	800	440	650	0.868	0.524	1.113	0.668	0.129	0.135	115	150	105	135	140	180	180	180	3.29	5.01	3.29	5.01	140	180	180	180
50	2.8	1.6	1.40	2.0	23	22	650	935	500	790	0.641	0.387	0.822	0.494	0.122	0.122	140	175	3120	155	165	215	215	215	4.70	7.15	4.70	7.15	165	215	215	215
70	2.8	1.6	1.40	2.0	25	23	765	1190	600	1025	0.443	0.268	0.568	0.342	0.118	0.113	170	215	145	190	210	270	270	270	6.58	10.01	6.58	10.01	210	270	270	270
95	2.8	1.6	1.40	2.0	26	25	880	1460	700	1275	0.320	0.193	0.411	0.247	0.108	0.103	200	255	175	225	255	325	325	325	8.93	13.6	8.93	13.6	255	325	325	325
120	2.8	1.6	1.40	2.0	28	26	1000	1730	810	1540	0.253	0.153	0.325	0.196	0.104	0.104	225	290	195	250	295	375	375	375	11.28	17.2	11.28	17.2	295	375	375	375
150	2.8	1.6	1.56	2.0	30	28	1140	2060	915	1840	0.206	0.124	0.265	0.159	0.101	0.101	250	320	220	280	330	425	425	425	14.1	21.5	14.1	21.5	330	425	425	425
185	2.8	1.6	1.56	2.0	31	29	1285	2400	105	2185	0.164	0.0991	0.211	0.128	0.101	0.097	285	360	245	315	380	485	485	485	17.4	26.5	17.4	26.5	380	485	485	485
240	2.8	2.0	1.56	2.2	35	33	1645	3050	1300	2750	0.125	0.0754	0.162	0.0980	0.100	0.095	325	410	280	355	450	570	570	570	22.6	34.3	22.6	34.3	450	570	570	570
300	3.0	2.0	1.56	2.2	37	35	1900	3775	1550	3440	0.100	0.0601	0.130	0.0791	0.098	0.093	365	455	315	395	510	640	640	640	28.2	42.9	28.2	42.9	640	830	830	830
400	3.0	2.0	1.72	2.2	42	39	2330	4790	1900	4370	0.0778	0.0470	0.1017	0.0631	0.095	0.090	410	510	355	435	590	730	730	730	37.6	57.2	37.6	57.2	730	930	930	930
500	3.5	2.0	1.72	2.4	45	43	2780	5900	2350	5500	0.0605	0.0366	0.0802	0.0508	0.083	0.083	455	550	395	475	650	800	800	800	47.0	71.5	47.0	71.5	800	1010	1010	1010
630	3.5	2.0	1.88	2.4	49	46	3350	7250	2850	6750	0.0469	0.0283	0.0636	0.0414	0.090	0.080	510	600	435	520	700	860	860	860	59.2	90.1	59.2	90.1	860	1100	1100	1100
800	3.5	2.5	2.04	2.6	55	51	4230	9150	3500	8450	0.0367	0.0221	0.0515	0.0345	0.088	0.077	550	640	470	540	740	900	900	900	75.2	114.4	75.2	114.4	900	1150	1150	1150
1000	3.6	2.5	2.20	2.8	60	56	5050	11200	4275	10400	0.0291	0.0176	0.0428	0.0298	0.086	0.076	590	670	500	570	780	960	960	960	94.0	143.0	94.0	143.0	960	1250	1250	1250

* The above data is indicative & may be changed without prior information. * All Conductors will be compacted circular. * Construction with Copper tape screen can also be offered on request. * Cables can be supplied in multiples of 500 mtrs. or as per customers requirement.

Operating Conditions: • Ambient Air temp: 40°C • Ground temp: 30°C • Depth of laying: 75 cm • Thermal resistivity of soil: 150°C-cm/W

Table - 2B : 3.8/6.6 (7-2) kV Three Core XLPE Insulated Screened Armoured cable with Aluminium / Copper Conductor Conf. to IS:7098 (P-II)

Area	Thickness of XLPE Insulation	Thickness of Inner Sheath	Dimension of Armour Strip	Thickness of Outer Sheath	Approx. Overall Diameter	Approx. Net Wt. of Cable				Max.D.C. Resistance at 20°C				Approx. A.C. Resistance at Opt. Temp.90°C				Approx. Reactance at 50Hz.				Current Rating for Armoured Cables				Short Circuit Rating for 1 Sec.					
						kg / km	kg / km	kg / km	kg / km	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu
25	2.8	0.4	4.0 X 0.8	1.56	38	1775	2225	1775	2225	1.20	0.727	1.54	0.927	0.121	0.121	95	120	82	105	105	135	135	135	2.35	3.58	2.35	3.58	105	135	135	135
35	2.8	0.4	4.0 X 0.8	1.72	41	2000	2650	2000	2650	0.868	0.524	1.113	0.668	0.115	0.115	115	145	97	125	125	165	165	165	3.29	5.01	3.29	5.01	125	165	165	165
50	2.8	0.5	4.0 X 0.8	1.72	44	2325	3185	2325	3185	0.641	0.387	0.822	0.494	0.109	0.109	130	170	115	150	150	195	195	195	4.70	7.15	4.70	7.15	150	195	195	195
70	2.8	0.5	4.0 X 0.8	1.88	48	2740	4040	2740	4040	0.443	0.268	0.568	0.342	0.101	0.101	160	210	140	180	180	240	240	240	6.58	10.01	6.58	10.01	180	240	240	240
95	2.8	0.5	4.0 X 0.8	1.88	51	3150	4900	3150	4900	0.320	0.193	0.411	0.247	0.097	0.097	190	250	165	215	215	295	295	295	8.93	13.6	8.93	13.6	215	295	295	295
120	2.8	0.6	4.0 X 0.8	2.04	56	3750	5960	3750	5960	0.253	0.153	0.325	0.196	0.093	0.093	220	280	190	240	240	335	335	335	11.28	17.2	11.28	17.2	240	335	335	335
150	2.8	0.6	4.0 X 0.8	2.20	59	4200	7000	4200	7000	0.206	0.124	0.265	0.159	0.091	0.091	245	310	210	270	270	380	380	380	14.1	21.5	14.1	21.5	270	380	380	380
185	2.8	0.6	4.0 X 0.8	2.20	63	4800	8225	4800	8225	0.164	0.0991	0.211	0.1283	0.088	0.088	275	350	240	305	305	430	430	430	17.4	26.5	17.4	26.5	305	430	430	430
240	2.8	0.7	4.0 X 0.8	2.36	69	5785	10050	5785	10050	0.125	0.0754	0.162	0.0986	0.087	0.087	315	400	275	350	350	485	485	485	22.6	34.3	22.6	34.3	485	650	650	650
300	3.0	0.7	4.0 X 0.8	2.52	76	6825	12500	6825	12500	0.100	0.0601	0.130	0.0799	0.085	0.085	355	445	310	390	390	500	500	500	28.2	42.9	28.2	42.9	500	650	650	650
400	3.3	0.7	4.0 X 0.8	2.84	85	8375	15800	8375	15800	0.0778	0.0470	0.1024	0.0641	0.083	0.083	400	500	350	440	440	520	520	520	37.6	57.2	37.6	57.2	520	650	650	650

* The above data is indicative & may be changed without prior information. * All Conductors will be compacted circular. * Cables can be supplied in multiples of 250/ 500 mtrs. or as per customers requirement.

Operating Conditions: • Ambient Air temp: 40°C • Ground temp: 30°C • Depth of laying: 90 cm • Thermal resistivity of soil: 150°C-cm/W

MV XLPE TECHNICAL DATA

Table - 3A : 6.5/11 (12) kV Single Core XLPE Insulated Screened Armoured & Unarmoured cable with Aluminium / Copper Conductor Conf. to IS:7098 (P-IJ)

Area	Thickness of XLPE Insulation	Dimension of Armour Wire	Thickness of Outer Sheath		Approx. Overall Diameter		Approx. Net Wt. of Cable		Max.D.C. Resistance at 20°C	Approx. A.C. Resistance at Opt. Temp.90°C		Approx. Reactance at 50Hz.		Current Rating for Armoured Cables						Short Circuit Rating for 1 Sec.				
			Arm	Un-Arm	Arm	Un-Arm	Armoured	Unarmoured		Ohm / km	Ohm / km	Ohm / km	Ohm / km	Arm	Un-Arm	Direct in Ground		In Duct		In Air		AI	Cu	
mm ²	mm	mm	mm	mm	mm	mm	kg / km	kg / km	Ohm / km	Ohm / km	Ohm / km	Ohm / km	Ohm / km	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	kA(rms)
25	3.6	1.6	1.40	2.0	22	20	590	740	1.20	0.727	1.54	0.927	0.146	99	125	87	110	115	150	150	150	150	2.95	3.68
35	3.6	1.6	1.40	2.0	23	21	650	865	0.868	0.524	1.113	0.668	0.140	115	150	105	135	140	180	180	180	180	3.29	5.01
50	3.6	1.6	1.40	2.0	25	23	725	1010	0.641	0.387	0.822	0.494	0.133	140	175	3120	155	165	215	215	215	215	4.70	7.15
70	3.6	1.6	1.40	2.0	26	24	840	1270	0.443	0.268	0.568	0.342	0.122	170	215	145	190	210	270	270	270	270	6.58	10.01
95	3.6	1.6	1.40	2.0	28	26	965	1545	0.320	0.193	0.411	0.247	0.117	200	255	175	225	255	325	325	325	325	8.93	13.6
120	3.6	1.6	1.56	2.0	30	27	1090	1825	0.253	0.153	0.325	0.196	0.113	225	290	195	250	295	375	375	375	375	11.28	17.2
150	3.6	1.6	1.56	2.0	31	29	1230	2150	0.206	0.124	0.265	0.159	0.104	250	320	220	280	330	425	425	425	425	14.1	21.5
185	3.6	2.0	1.56	2.2	34	31	1465	2595	0.164	0.0991	0.211	0.1277	0.106	285	360	245	315	380	485	485	485	485	17.4	26.5
240	3.6	2.0	1.56	2.2	36	34	1740	3160	0.125	0.0754	0.162	0.0979	0.103	325	410	280	355	450	570	720	720	720	22.6	34.3
300	3.6	2.0	1.56	2.2	39	36	1985	3855	0.100	0.0601	0.130	0.0790	0.100	365	455	315	395	510	640	820	820	820	28.2	42.9
400	3.6	2.0	1.72	2.2	42	39	2375	4835	0.0778	0.0470	0.1017	0.0630	0.096	410	510	355	435	590	730	930	930	930	37.6	57.2
500	3.6	2.0	1.72	2.4	45	43	2795	5920	0.0605	0.0366	0.0802	0.0508	0.089	455	550	395	475	680	830	1070	1070	1070	47.0	71.5
630	3.6	2.0	1.88	2.4	49	46	3370	7265	0.0469	0.0283	0.0636	0.0413	0.090	510	600	435	520	780	930	1200	1200	1200	59.2	90.1
800	3.6	2.5	2.04	2.6	55	51	4265	9200	0.0367	0.0221	0.0515	0.0345	0.088	550	640	470	540	870	1010	1350	1350	1350	75.2	114.4
1000	3.6	2.5	2.20	2.8	60	56	5060	11200	0.0291	0.0176	0.0428	0.0298	0.086	590	670	500	570	960	1090	1450	1450	1450	94.0	145.0

* The above data is indicative & may be changed without prior information. * All Conductors will be compacted Circular. * Construction with Copper tape screen can also be offered on request. * Cables can be supplied in multiples of 500 mtrs. or as per customers requirement.

Operating Conditions: * Ambient Air temp: 40°C * Ground temp: 30°C * Depth of laying: 75 cm * Thermal resistivity of soil: 150°C-cm/W

Table - 3B : 6.5/11 (12) kV Three Core XLPE Insulated Screened Armoured cable with Aluminium / Copper Conductor Conf. to IS:7098 (P-IJ)

Area	Thickness of XLPE Insulation	Thickness of Inner Sheath	Dimension of Armour Strip	Thickness of Outer Sheath	Approx. Overall Diameter	Approx. Net Wt. of Cable	Max.D.C. Resistance at 20°C	Approx. A.C. Resistance at Opt. Temp.90°C		Approx. Reactance at 50Hz.	Current Rating for Armoured Cables						Short Circuit Rating for 1 Sec.					
								Ohm / km	Ohm / km		Direct in Ground		In Duct		In Air		AI	Cu	AI	Cu		
mm ²	mm	mm	mm	mm	mm	kg / km	Ohm / km	Ohm / km	Ohm / km	Ohm / km	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	kA(rms)	kA(rms)
25	3.6	0.4	4.0 X 0.8	1.72	42	2050	1.20	0.727	1.54	0.927	95	120	82	105	105	135	135	135	135	135	2.35	3.58
35	3.6	0.5	4.0 X 0.8	1.72	44	2300	0.868	0.524	1.113	0.668	115	145	97	125	125	165	165	165	165	165	3.29	5.01
50	3.6	0.5	4.0 X 0.8	1.88	48	2635	0.641	0.387	0.822	0.494	130	170	115	150	150	195	195	195	195	195	4.70	7.15
70	3.6	0.5	4.0 X 0.8	2.04	51	3020	0.443	0.268	0.568	0.342	160	210	140	180	180	240	240	240	240	240	6.58	10.01
95	3.6	0.6	4.0 X 0.8	2.04	56	3720	0.320	0.193	0.411	0.247	190	250	165	215	215	285	285	285	285	285	8.93	13.6
120	3.6	0.6	4.0 X 0.8	2.20	60	4230	0.253	0.153	0.325	0.196	220	280	190	240	240	320	320	320	320	320	11.28	17.2
150	3.6	0.6	4.0 X 0.8	2.20	62	4665	0.206	0.124	0.265	0.159	245	310	210	270	270	350	350	350	350	350	14.1	21.5
185	3.6	0.7	4.0 X 0.8	2.36	66	5200	0.164	0.0991	0.211	0.1281	275	350	240	305	305	400	400	400	400	400	17.4	26.5
240	3.6	0.7	4.0 X 0.8	2.52	73	6295	0.125	0.0754	0.162	0.0985	315	400	275	350	350	450	450	450	450	450	22.6	34.3
300	3.6	0.7	4.0 X 0.8	2.68	78	7195	0.100	0.0601	0.130	0.0797	355	445	310	390	390	510	510	510	510	510	28.2	42.9
400	3.6	0.7	4.0 X 0.8	2.84	86	8565	0.0778	0.0470	0.1023	0.0640	400	500	350	440	440	570	570	570	570	570	37.6	57.2

* The above data is indicative & may be changed without prior information. * All Conductors will be compacted circular. * Cables can be supplied in multiples of 250/500 mtrs. or as per customers requirement.

Operating Conditions: * Ambient Air temp: 40°C * Ground temp: 30°C * Depth of laying: 90 cm * Thermal resistivity of soil: 150°C-cm/W

Group Rating Factors for Circuits for Three Single Core Cables in Trefoil formation

Table 7A : Touching Horizontal Formation laid Direct in Ground

No. of circuits in group	spacing between trefoil group centers, cm			
	touching	20	40	60
2	0.76	0.83	0.87	0.90
3	0.64	0.72	0.79	0.83
4	0.58	0.67	0.75	0.8
5	0.53	0.63	0.71	0.77

Table 7B : 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	0.9	0.85	0.83
3	0.88	0.83	0.81
6	0.86	0.81	0.79

Table 7C : Cables laid as per 'B' but in open

No. of Cable trays in Tier	Number of Cables per Rack		
	1	2	3
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 Circuits for Multi-core Cables

Table 8A : Cables laid inside concrete trench with removable covers, on cable 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	Number of Cables				
	1	2	3	6	9
1	0.95	0.9	0.88	0.85	0.84
2	0.9	0.85	0.83	0.81	0.8
3	0.88	0.83	0.81	0.79	0.78
6	0.86	0.81	0.79	0.77	0.76

Table 8B : Cables laid on cable trays exposed to air, 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	Number of Cables per Rack				
	1	2	3	6	9
1	1.0	0.98	0.96	0.93	0.92
2	1.0	0.95	0.93	0.9	0.89
3	1.0	0.94	0.92	0.89	0.88
6	1.0	0.93	0.9	0.87	0.86

Table 8C : Cables laid on cable trays exposed to air, The cables are touched & trays in tiers by 300 mm. The clearance of the cable from the wall is 25 mm.

No. of Cable trays in Tier	Number of Cables per Rack				
	1	2	3	6	9
1	1.0	0.84	0.8	0.75	0.73
2	1.0	0.8	0.76	0.71	0.69
3	1.0	0.78	0.74	0.7	0.68
6	1.0	0.76	0.72	0.68	0.66

Table 8D : Cables laid Direct in Ground in horizontal formation

No. of Cable in Group	Spacing of cables, cm			
	Touching	20	40	60
2	0.79	0.86	0.90	0.92
3	0.67	0.77	0.82	0.86
4	0.61	0.72	0.79	0.83
5	0.56	0.68	0.76	0.81
6	0.53	0.65	0.74	0.80

Table 9 : Rating Factors for Variation in Dept. of laying in Ground

Dept. of Laying (cm)	90	105	120	150	180	200	250	300 & Above
For Voltage Grades 3.3 to 11/11 kV, all sizes	1.0	0.99	0.97	0.95	0.94	0.093	0.91	0.9
For Voltage grades 22 & 33 kV, all sizes	—	1.0	0.99	0.97	0.95	0.94	0.92	0.91

Table 10 : Rating Factors for Variation in Ambient Air Temperature

Air temp. °C	15	20	25	30	35	40	45	50	55
Rating Factor	1.22	1.18	1.16	1.11	1.06	1.0	0.94	0.88	0.81

Table 11 : Rating Factors for Cables laid Direct. in the Ground.

Group temp. °C	15	20	25	30	35	40	45	50	55
Rating Factor	1.12	1.08	1.04	1.0	0.96	0.91	0.87	0.82	0.76

Table 12 : Rating Factors for Three Core Cables laid Direct. in the Ground.

Nominal area of conductor mm ²	For values of thermal resistivity of soil in °C-cm/W					
	100	120	150	200	250	300
25	1.16	1.08	1.0	0.9	0.82	0.75
35	1.16	1.08	1.0	0.9	0.81	0.75
50	1.16	1.08	1.0	0.89	0.81	0.75
70	1.16	1.09	1.0	0.89	0.81	0.75
95	1.16	1.09	1.0	0.89	0.81	0.75
120	1.16	1.09	1.0	0.89	0.81	0.75
150	1.16	1.09	1.0	0.89	0.81	0.75
185	1.16	1.09	1.0	0.89	0.81	0.75
240	1.17	1.09	1.0	0.89	0.81	0.75
300	1.17	1.09	1.0	0.89	0.81	0.75
400	1.17	1.09	1.0	0.89	0.81	0.75

Table 13 : Rating Factors for Variation in thermal resistivity of soil, three single core cables laid Direct in the Ground (three cables in trefoil touching).

Nominal area of conductor mm ²	For values of thermal resistivity of soil in °C-cm/W					
	100	120	150	200	250	300
25	1.17	1.09	1.0	0.88	0.80	0.74
35	1.18	1.10	1.0	0.88	0.80	0.74
50	1.19	1.10	1.0	0.88	0.80	0.73
70	1.19	1.10	1.0	0.88	0.80	0.73
95	1.19	1.10	1.0	0.88	0.79	0.73
120	1.19	1.10	1.0	0.88	0.79	0.73
150	1.19	1.10	1.0	0.88	0.79	0.73
185	1.19	1.10	1.0	0.88	0.79	0.72
240	1.20	1.11	1.0	0.88	0.79	0.72
300	1.20	1.11	1.0	0.87	0.79	0.72
400	1.20	1.11	1.0	0.87	0.79	0.72
500	1.20	1.11	1.0	0.87	0.79	0.72
630	1.21	1.11	1.0	0.87	0.78	0.72
800	1.21	1.11	1.0	0.87	0.78	0.72
1000	1.21	1.11	1.0	0.87	0.78	0.72

Salient Features of CCV Line Manufacturing Process

The system adopted for triple extrusion of EHV XLPE Cables with dry cure dry cooled process in a CCV line ensures the following excellent characteristics :

- The Insulation has no eccentricity.
- The cross-linking of XLPE is of the highest grade which guarantees excellent electro-mechanical characteristics.
- The simultaneous extrusion of the inner and outer semi conducting layers and the insulation prevents treeing and other irregularities.
- Uniformity of quality is maintained for all products, as the manufacturing processes are controlled.

EHV cables are manufactured and supplied in accordance to the following applicable standards :

- IEC - 62067
- IEC - 60840
- IS 7098 (Part III)

And any other international specifications like ASTM, BS, DIN, JIS etc.

MANUFACTURING

Conductor

Compacted circular conductors

Aluminium

Up to 1000 sqmm

Copper

Up to 800 sqmm

Segmental (Milliken) type circular conductor

Aluminium

1200 sqmm and above

Copper

1000 sqmm and above

Compound handling and clean room

The material handling system of DCL ensures ultimate cleanliness and state of the art feeding system. The semi-conducting feeding area is maintained at clean class 10000, whereas the XLPE insulation compound feeding area is maintained at clean class 1000. The gravity feeding system of the compound reduces the inter granular friction.



Triple Extrusion

The extrusion of semi-conducting conductor screen, XLPE insulation and semi-conducting insulation screen in one operation by triple extrusion through single cross head ensures perfect bonding of all the layers and results in optically smooth interface which removes all possibilities of irregularities and microvoids formation.

Curing under inert (Nitrogen) atmosphere

The cross linking process under inert atmosphere keeps the insulation absolutely dry which eliminates all chances of electro-mechanical treeing during whole life of the cable.

TESTING

High Voltage Test system

The series resonance test system 120 kV/2000 kVA at DCL test lab is capable of testing long lengths of Extra High Voltage up to 66 kV rating at a small input power. This helps in a major saving to its customers in time and money required for extra joints in the cable system.

Impulse voltage test

The impulse voltage test equipment of DCL lab is rated 500 kV/25 kJ. The high energy rating of the test equipment can test extra high voltage cable samples up to 66 kV rating having very low capacitances.

Partial discharge test

The shielded room of DCL cable testing is capable of detecting partial discharges of less than 2 pc.

Other electrical and physical tests

DCL cable laboratory is fully equipped to perform all routine, acceptance and type tests for Extra High Voltage cables upto 66 kV rating. As per requirements of IEC 62067, IEC 60840, IS 7098 part-3 and other relevant international specifications.



Construction Details of EHV ELPE Cables

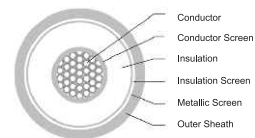
The XLPE Cable has the construction of a conductor (copper or aluminium) insulated with cross-linked polyethylene and then shielded with metallic screen (seam welded corrugated aluminium or copper wire shield), to be covered by PVC or polyethylene for anticorrosion followed by a semi conducting layer.

Conductor The conductor consists of annealed copper or hard aluminium stranded wires and classified into two major types viz compacted circular and segmental compacted circular (Milliken Conductor).

The compacted circular conductor consists of annealed copper or hard drawn aluminium stranded wires. The Milliken (segmented compacted circular) conductor consists of wires stranded together in segmental form, normally 4-5 segments and then compacted to get a circular shape. Conductor sizes up to and including 1000 sq.mm. may be compacted circular and 1200 sq. mm. and above size of conductors are made in 4-5 segments. The segmental conductors help in minimizing the increase in AC resistance caused by skin effect and proximity effect.

Conductor Screen The conductor screen consists of an extruded semi-conducting polyethylene to minimize electrical stresses due to the stranded configuration of the conductor. The semi-conducting material used for conductor screen has no deleterious effect on the conductor. Semi-conducting tape is generally applied over the conductor before the extruded semi-conducting layer.

Insulation Screen The insulation screen is provided over the insulation by extruded semi-conducting compound. This minimizes the possibility of ionization on the outer surface of insulation to make the dielectric stresses radial.



Insulation The insulation material is extruded cross-linked polyethylene. The conductor screen, the insulation and the insulation screen are extruded simultaneously in one process (TRIPLE EXTRUSION) to ensure that the screen and insulation are intimately bonded together and free from all possibilities of voids between layers. The extrusion process is carried out under strictly controlled atmospheric conditions. The dry cured & dry cooled process under the inert atmosphere (N₂ Gas) enables to enhance the electromechanical and thermal characteristics of XLPE insulation, which further helps in increasing conductor stress, thereby reducing the thickness of insulation.

Metallic Screen The metallic screen consists of wire shield, corrugated aluminium sheath or lead sheath. The lead sheath is provided with or without copper wire screen to withstand the SC rating of screen. The corrugated aluminium sheath and lead sheath also provides a radial moisture barrier to the cable construction.

Outer Sheath To protect the metallic sheath from electrical or chemical corrosion, it is covered by PE or PVC sheath.



EHV XLPE TECHNICAL DATA

Table- 6A - 38/66 KV Single Core XLPE Insulated Screened Cable with Aluminium/ Copper Conductor Conf. to IS : 7098 (P-III)

Area	Thickness of XLPE Insulation		Thickness of Outer Sheath		Approx Overall Diameter	Approx Net Wt. of Cable				Max. D.C. Resistance at 20° C				Approx A.C. Resistance at Opt. Temp. 90° C				Current Rating For Cable						Short Circuit Rating for 1 Sec.	
	mm		mm			kg/km		kg/km		Ohm/km		Ohm/km		Ohm/km		Direct in Ground		In Air		Amps		KA(rms)			
	Nom		Nom			Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu		
240	11.0		2.7		56			8500	0.125	0.0754	0.161	0.0975	429	666	22.6	34.3									
300	11.0		2.7		59			9200	0.100	0.0601	0.129	0.0784	483	762	28.2	42.9									
400	11.0		2.8		62	8100	0.0778	10500	0.0778	0.0470	0.101	0.0623	548	882	37.6	57.2									
500	11.0		2.9		65	8900	0.0605	11900	0.0605	0.0366	0.0796	0.0498	620	1021	47.0	71.5									
630	11.0		3.0		69	9900	0.0469	13700	0.0469	0.0283	0.0628	0.0402	701	1179	59.2	90.1									
800	11.0		3.2		75	11400	0.0367	16300	0.0367	0.0221	0.0506	0.0334	781	1341	75.2	114.4									
1000	11.0		3.3		79	12600	0.0291	18700	0.0291	0.0176	0.0417	0.0285	905	1592	94.0	143.0									



LV & MV Aerial Bunched Cables

ABC Cables are highly reliable and insulation has been developed to withstand head cold and intense sunlight. Disturbance and faults occur five to ten times more often in open wire lines than in ABC Lines. There is no risk in touching the live cable and the insulation reduces the number of short circuits and over-voltage faults in overhead cables during thunderstorms. Few hardware accessories are needed as each one can be used with different sizes of cables. This makes installation and storage easier. Streets can easily be lit only at little extra cost by using the ABC cables that have an extra conductor for lighting. The cable can be supplied with one or two insulated conductors for street lighting.

Advantages

- 1) Less fault rate on Account of good protection against line and ground faults.
- 2) High Insulation resistance to earth in all seasons and polluted atmosphere. Negligible leakage currents and low losses.
- 3) Better adaptability to run concurrently with existing overhead bare conductor system without any interference.
- 4) High Capacitance and low inductance leading to low impedance of lines.
- 5) Lower voltage drop, higher current carrying capacities vis-a-vis better voltage regulation.
- 6) ABC Cables are much safer than bare Conductors.
- 7) It can be overhang in dense vegetation and forest areas.
- 8) Additional connections can be easily and quickly made with hot line connectors.
- 9) Overall lines cost is reduced & maintenance is very convenient.
- 10) Very difficult to tap the AB cables, thus reducing theft which leads to lower distribution losses.
- 11) Since, the tension from the current carrying conductor is totally removed by introduction of messenger wire, the operating temperature of the conductor is 90°C as against 75°C of the bare conductor under tension thereby allowing ABC to carry Current equivalent to that of bare conductor of the same size.

Typical Constructional Details (MV ABC):

Power Cores

Conductors: Composed of H2/H4 grade Aluminium to class 2 grade of IS 8130 or IEC 60228 or other equivalent standards. It can be from 35mm² to 300mm².

Conductor Screen: (applicable for cable above 3.3 kV grade) Extruded semiconducting layer as per IS 7098 (part 2) or IEC 60502 or any other equivalent international standard.

Insulation: Typically this may be XLPE insulation as per IS 7098 (part 2) or IEC 60502 which gives both material property as well as thickness level required.

Insulation Screen: wherever applicable (mostly 6.6 kV onwards) it comprises of an extruded layer semiconducting material followed by a metallic tape (mostly copper).

Jacket: ST2 grade PVC to IS 5831 / ST7 Grade Polyethylene (PE) to IEC – 60502-II

Messenger Wire

This typically consists of either strands of aluminium alloy wire as per IS 398 (part-4) or galvanized steel wire to BS 183 as chosen by the customer. It may have a jacket similar to Power cores.

Core identification: By printing numbers 1, 2, 3 or Ridges I, II & III on the jackets of power cores and 0 or ridges IIII on the jackets of messenger core.

Table 1 : Technical Particulars LV Aerial Bunched cable 1.1kV. Reference Standard to IS:14255:1995

Sl. No.	Description	3CX16+25	3CX25+25	3CX35+25	3CX50+35	3CX70+50	3CX95+70
1.	Power/Messenger core						
1.1	Conductor						
	a) Nom. Cross sectional Area						
	(i) Power core (sq. mm.)	16	25	35	50	70	95
	(ii) Messenger cores (sq. mm.)	25	25	25	35	50	70
	b) Max. D.C. resistance conductor at 20 deg C						
	(i) Power core (ohm/km)	1.91	1.20	0.868	0.641	0.443	0.320
	(ii) Messenger cores (ohm/km)	1.38	1.38	1.38	0.986	0.689	0.492
	c) Approx. diameter of conductor						
	(i) Power core (mm)	4.8	6.0	7.0	8.2	9.8	11.5
	(ii) Messenger cores (mm)	6.0	6.0	6.0	7.0	8.2	9.8
1.2	Insulation						
	Minimum Average Thickness:						
	(i) Power core (sq. mm.)	1.2	1.2	1.2	1.5	1.5	1.5
	(ii) Messenger cores (sq. mm.)	1.2	1.2	1.2	1.2	1.5	1.5
2.	Current ratings: Continuous current carrying Capacity of cable in Air at Ambient temp. 40 deg C (Amp.)	65	99	122	149	190	235

3. De rating factor: De rating factors for variation In air Temp.							
Air Temp (deg C)	30	35	40	45	50	55	60
Rating factor	1.1	1.06	1.00	0.94	0.88	0.81	0.74

4. Number of Cores:		
(i) Power core	(No) : 3	
(ii) Messenger cores	(No) : 1	
5. (i) Identification of Power Cores:		By providing ridges on the insulation:
(ii) Laying		Three power cores and one messenger core shall be suitably twisted.

Table 2 : LV Aerial Bunched Cables 1100 Volts. Reference Standard: IS:14255:1995

Sl.No.	Description	3 X 25 + 1 X 16 + 1 X 35	3 X 35 + 1 X 16 + 1 X 35	3 X 50 + 1 X 25 + 1 X 35	3 X 70 + 1 X 35 + 1 X 35
	Power/Neutral Core:				
1	Conductors				
	a) Nom. Cross sectional area				
	(i) Power cores (mm ²)	25	35	50	70
	(ii) Neutral cores (mm ²)	16	16	25	35
	Max. D.C. resistance conductor at 20 deg C				
	(i) Power cores (ohm/km)	1.20	0.868	0.641	0.443
	(ii) Neutral cores (ohm/km)	1.91	1.910	1.200	0.868
	Approx. diameter of conductor				
	(i) Power cores (mm)	6.2	7.3	8.35	10.1
	(ii) Neutral cores (mm)	5.1	5.1	6.20	7.30
2	Insulation:				
	Minimum Thickness:				
	(i) Power cores (mm)	1.2	1.2	1.5	1.5
	(ii) Neutral cores (mm)	1.2	1.2	1.2	1.2
	Messenger Wire (Bare):				
	(i) Nom. Cross sectional area (sq. mm)	35	35	35	55
	(ii) Approx. Breaking load (KN)	9.8	9.8	9.8	9.8
	Current ratings: Continuous current carrying Capacity of cable in Air at Ambient temp. 40° C (Amp.)	99	122	149	190

3. De rating factor: De rating factors for variation In air Temp.					
Air Temp °C	30	35	40	45	50
Rating factor	1.12	1.06	1.0	0.94	0.88

6. Detail of the Power/Neutral core :	
(i) Conductor :	
(a) Material	: Aluminium to IS:8130/84
(b) Flexibility class as per IS: 8130/84	: Class - 2
(c) Form of Conductor	: Compacted circular
(ii) Insulation:	
(a) Material	: Cross linked Polyethylene to IS: 7098(I)/88
(b) Colour of Insulation	: Black

4. Number of Cores:	
(i) Power cores	(No) : 3
(ii) Neutral cores	(No) : 1
(iii) Bare messenger	(No) : 1

5. (i) Identification of Power core :		By providing ridges on the insulation:
(ii) Laying :		Three power cores and one Neutral core shall be twisted around bare Steel Messenger / AAAC
7. Details of the Messenger Wire (Bare)		
(i) Material		: ACSR/AAAC Conductor to IS: 398(II) & (IV) resp
(ii) Form of Conductor		: Standard circular / compacted circular

Table 3 : Technical Parameters 11 KV MV Aerial Bunched Cables as per IS : 7098(Part II)

Size	Nominal Cross Sectional Area (mm ²)		Max. D.C. Resistance of Power Core(ohm/Km)	Insulation Thickness (mm) (Nominal)	Current Rating in Air at ambient air temperature of 40° C (Amps.)	Short Circuit Capacity for 1 second (KA)
	Power Core	Messenger Core				
3 Core X 35 + 35 mm ²	35	35	0.868	3.6	135	3.29
3 Core X 50 + 35 mm ²	50	35	0.641	3.6	160	4.70
3 Core X 70 + 70 mm ²	70	70	0.443	3.6	200	6.58
3 Core X 95 + 70 mm ²	95	70	0.320	3.6	245	8.93
3 Core X 120 + 70 mm ²	120	70	0.253	3.6	285	11.28
3 Core X 150 + 150 mm ²	150	150	0.206	3.6	320	14.1
3 Core X 185 + 240 mm ²	185	240	0.164	3.6	370	17.4
3 Core X 240 + 240 mm ²	240	240	0.125	3.6	440	22.6
3 Core X 300 + 300 mm ²	300	300	0.100	3.6	510	28.2

Table 4 : Technical Parameters 33 KV MV Aerial Bunched Cables as per IS : 7098(Part II)

Size	Nominal Cross Sectional Area (mm ²)		Max. D.C. Resistance of Power Core(ohm/Km)	Insulation Thickness (mm) (Nominal)	Current Rating in Air at ambient air temperature of 40° C (Amps.)	Short Circuit Capacity for 1 second (KA)
	Power Core	Messenger Core				
3 Core 120 + 70 mm ²	120	70	0.253	8.8	300	11.28
3 Core 150 + 150 mm ²	150	150	0.206	8.8	345	14.10
3 Core 185 + 240 mm ²	185	240	0.164	8.8	385	17.40
3 Core 240 + 240 mm ²	240	300	0.125	8.8	450	22.60
3 Core 300 + 300 mm ²	300	300	0.100	8.8	510	28.20

De rating Factor:								
Variation in Air Temp in °C	25	30	35	40	45	50	55	60
Rating Factor	1.16	1.11	1.06	1.00	0.94	0.88	0.81	0.74

Identification of Power Core: By providing coloured tape under copper tape screening/ by providing 1, 2 & 3 Ridges

Laying: Three Power Cores and one messenger core shall be Suitably twisted



(DCPV) PV-DCPL Cables for Photovoltaics

SOLAR ENERGY

The recent growth of the renewable energy market applies to both wind energy as well as to solar energy. In many countries this growth is supported by governmental subsidies. Outdoor applications in renewal energy plants demand high thermal and mechanical requirements from cables and other components.

We are aware of this task and already combines technology, innovation and ecological awreens today. "Environmentally compatible manufacture for environmentally compatible enery production through renewable energy" : That is our motto.

Our solar Cables uses only high quality insulation and outer sheath compounds to ensure that the products will survive the harshest of conditions. Dynamic solar DCPV Cables are tested and certified to national and international approvals not only by our own laboratory but also by independent testing institutes. The many benefits of our cables make them popular with installers,as not only they are UV resistant,but also resistant to extreme weather and temperature conditions.

PROPERTIES :

- * Lasts up to 35 years under tough conditions.
- * Equipped with UV Resistance.
- * HFLS -Halogen free, Low smoke Emission and low tox
- * Flame and Fire Retardent.
- *Easy Installation : with color identification.
- * TUV certified.* Used in extreme weather conditions



TECHNICAL DATA

Manufacturer	Dynamic cables Pvt. Ltd. An ISO 9001:2008 Mangal Group company
Trademark	Dynamic (DCPV)
Type designation	PV-DCPL
Approvals	Requirements for cables for PV systems, DKE/VDE AK 411.2.3 VDEReg.No. 7985 TÜV 2 PfG 1169/08.2007 Cert.No. R 60013989*
Application	Dynamic Solar cables DCPV are intended for use in photovoltaic power supply systems and similar applications as free movable, free hanging, fixed installation and buried in ground in constructional covered systems. The cables can be used indoor, outdoor, in explosion hazard areas, in industry and agriculture. They are suitable for applications in/at equipment with protective insulation (protecting class II). In other respects IEC 61215 and 61646, IEC 603647712:2002 and DIN VDE 0100 part 520 applies.

ELECTRICAL PARAMETERS

Rated voltage	AC 0.6/1.0 kV
Maximum PVSystem voltage	DC up to 2.0 kV possible
Maximum permissible operating voltages in AC systems	0.7/1.2 kV
Maximum permissible operating voltages in DC systems	0.9/1.8 kV
Test voltage	AC 6 kV / DC 10 kV (15 min.)
Ampacity	According to Requirements for cables for PV systems, DKE/VDE AK 411.2.3
Tests	According to HD 22.2 conductor resistance, test voltages AC and DC, electric strength, surface resistance, spark test on insulation, insulation resistance at 20°C and 90°C in water and at 120°C in air. EN 50305 Part 6 DCstability (10 days, 85°C, salt water, 1.5 kV DC)

THARMAL PARAMETERS

Maximum permissible ambient temperature	+90°C (stationary and in motion)
Minimum permissible temperature	40°C (stationary and in motion)
Maximum permissible operating temperature of the conductor.	+120°C~ Interpretation according to IEC 60216: permanent temperature 120°C for 20.000 h (= 2.3 years), at max. 90°C permanent temperature (= 30 years)
Short circuit temperature	+250°C (at the conductor max. 5 sec.)
Resistance to cold	Bending test at low temperature according to DIN EN 6081114 Impact test similar to DIN EN 50305
Damp Heat Test	According to EN 60068278 1.000h at 90°C and 85 humidity

MECHANICAL PARAMETERS

Tensile load	15 N/mm ² in operation, 50 N/mm ² during installation
Minimum bending radii	see selection and ordering data
Abrasion	According to DIN EN 53516: against abrasive paper Sheath against sheath (internal testing) Sheath against metal (internal testing) Sheath against plastics (internal testing)
Shrinkage test	According to EN 6081113
Pressure test at high temperature	According to EN 6081131
Dynamic penetration test	According to Requirements for cables for PV systems, DKE/VDE 411.2.3
Shore hardness	85 according to DIN EN 53505
Gnawer resistance	An optimum safety can be reached with protective hoses and by use of special cable types with metallic coating such as spinning or braid.

CHEMICAL PARAMETERS

Mineral oil resistance	24h, 100°C according to DIN VDE 047381121, DIN EN 6081121
Acid and alkaline resistance	According to EN 6081121 7 days, 23°C (NOxalic acid, NSodium hydroxide)
Ammonia resistance	30 days in saturated ammonia atmosphere (internal testing)
Weather resistance	Ozone resistance according to DIN EN 50396 test type B, HD 22.2 test type B UVresistance according to UL 1581 (XenoTest), ISO 48922 (Method A) and HD506/A12.4.20 Absorption of water (gravimetric) according to DIN VDE 047381113, DIN EN 6081113
Behaviour in case of fire	Flame propagation Single cable according to DIN VDE 0482 Part 33212, DIN EN 6033212 Multiple cable according to DIN VDE 0482 Part 26625, DIN EN 503059 Low smoke emission according to DIN VDE 0482 Part 2682, DIN EN 502682 -light transmittance > 70 Corrosivity according to DIN EN 5026722 Toxicity according to DIN EN 50305, ITCindex < 3
Ecological innocuousness	TECSUN (PV) cables are in accordance with the codes 2000/53/EG, 2002/96/EG, 2003/11/EG and exempt from metallic lead, mercury, hexavalent chromium und bromine containing compounds. RoHS conform.

DESIGN FEATURES

Type designation	PV-DCPL
Conductor	Electrolytic copper, tinned, Class 5 according to IEC 60228 (DIN VDE 0295)
Insulation	HEPR 120°C similar to IEC 605021 (compound type EI6 / EI8)
Core identification	Natural colour bright
Sheath	EVA 120 °C based on DIN VDE 0282 part 1, HD 22.1 (compound type EM4 / EM8) Insulation and sheath are connected solidly (Twolayerinsulation)
Sheathcolours	black, blue, red
Marking	DYNAMIC CABLES(DCPV) PV-DCPL (crosssection) 0.6/1 KV (VDEREG./ TÜV)

Selection and ordering data

Nominal cross-section and colour	Order No.	Conductor diameter	Overall diameter of cable		Approx. weight [kg/km]	Min. bending radius [mm]	max. permissible tensile load [N]	current carrying capacity at 60°C ambient temperature (free in air) [A]	Permissible short circuit current [kA]
			Min. value	Max. value					
			[mm]	[mm]					
DCPV									
1,5mm ² black	DCPV15B	1,6	4,4	4,8	29	14,4	23	29	0,19
1,5mm ² blue	DCPV15BL	1,6	4,4	4,8	29	14,4	23	29	0,19
1,5mm ² red	DCPV15R	1,6	4,4	4,8	29	14,4	23	29	0,19
2,5mm ² black	DCPV25B	1,9	4,7	5,1	43	15,3	38	41	0,32
2,5mm ² blue	DCPV25BL	1,9	4,7	5,1	43	15,3	38	41	0,32
2,5mm ² red	DCPV25R	1,9	4,7	5,1	43	15,3	38	41	0,32
4,0mm ² black	DCPV4B	2,4	5,2	5,6	58	16,8	60	55	0,50
4,0mm ² blue	DCPV4BL	2,4	5,2	5,6	58	16,8	60	55	0,50
4,0mm ² red	DCPV4R	2,4	5,2	5,6	58	16,8	60	55	0,50
6,0mm ² black	DCPV6B	2,9	5,7	6,1	76	18,3	90	70	0,76
6,0mm ² blue	DCPV6BL	2,9	5,7	6,1	76	18,3	90	70	0,76
6,0mm ² red	DCPV6R	2,9	5,7	6,1	76	18,3	90	70	0,76
10mm ² black	DCPV10B	4,0	6,8	7,2	120	21,6	150	98	1,26
16mm ² black	DCPV16B	5,5	8,3	9,0	178	36	240	132	2,01
25mm ² black	DCPV25B	6,4	10,0	10,7	273	43	375	176	3,15
35mm ² black	DCPBV35B	7,5	11,1	11,8	364	47	525	218	4,41
50mm ² black	DCPV50B	9,0	12,6	13,3	500	53	750	276	6,30
70mm ² black	DCPV70B	10,8	14,4	15,2	686	61	1.05	347	8,82
95mm ² black	DCPV95B	12,6	16,2	17,0	899	68	1.425	416	12,0
120mm ² black	DCPV120B	14,3	17,7	18,7	1.131	75	1.8	488	15,1
150mm ² black	DCPV150B	15,9	19,7	20,7	1.382	83	2.25	566	18,9
185mm ² black	DCPV185B	17,5	21,3	22,3	1.669	89	2.775	644	23,3
240mm ² black	DCPV240B	20,5	24,2	25,5	2.208	102	3.6	775	30,4



ACSR, AAA & AA CONDUCTORS

Looking to the need greater strength to weight ratio ACSR is first choice of designers and therefore the use of ACSR has gone up consistently. Experiments have proved that stranding of high purity Aluminium conducting portion around a steel core produce better results.

The Aluminium Conductor Steel Reinforced (ACSR) is a conductor, combining the light weight high current capacity of aluminium with high strength of a galvanized steel core wire. The Aluminium members are standard around the galvanized steel core, the core may be solid or stranded and the Aluminium may be arranged in one or more layers depending on the size and strength of conductor required.

ACSR Conductor Advantage

- High Conductivity
- High Strength/Weight Ratio
- Lightness
- Resistance to Atmospheric Attack and very low Maintenance
- Better behavior in contact with other materials
- Economy & Long life.

The use of AAAC is increasing fast for transmission and distribution purposes and is now gradually replacing AAC/ACSR due to its various advantages over traditional AAC/ACSR Conductors. The main features of AAAC are reduced line losses, increased span. Longer life, homogeneous character and its anticorrosion properties.

AAA Conductors is a new concept for energy conservation.

AAA Conductor Advantage

- AAAC exhibits excellent corrosion resistance especially in sea coast areas and in polluted industrial areas due to absence of steel core.
- Since AAAC is homogeneous (with strands of Aluminium Alloy) with no steel component the resistance of AAAC is lower as compared to ACSR.
- AAAC can carry at least 15-20% extra current as compared to ACSR of equal size.
- Experience in foreign countries shows that All Aluminium Alloy Conductors are in service for over 60 years, which is about double the life of ACSR Conductors.
- The surface hardness of AAAC is 80 BHN as compared to 35 BHN of ACSR. This reduces the damage to surface during handling and therefore leading to lesser corona losses and ratio interference at EHV.
- AAAC are stable up to 90 °C against ACSR conductors which are stable up to 75 °C.
- Since AAAC has higher strength to weight ratio, span can be increased from 2 to 15% as in case of ACSR resulting in overall reduction of cost in towers supports and other accessories in transmission line system.

AA Conductor Advantage

- High Conductivity
- Very high degree of corrosion Resistance.
- Excellent conductor of heat & Electricity

Physical Properties of AAA Conductor

Melting Temperature	652°C
Density	2.7 kg/mm ³
Coefficient of linear Expansion per °C	23 X 10 ⁻⁶
Brittle Hardness	80 BHN
Elongation (percent in 200 mm)	4.5 to 5.5%
Electrical conductivity at 200 °C	52.2
Typical Electrical Resistivity at 20°C	53.5
Standard	0.0325
Typical	0.0320
Ultimate Tensile	30 kg/mm ²
Modulus of Elasticity in kg/mm ²	
Initial	5200 to 5600
Final	6250 to 6450

Basic Data Assumed for Calculation

1. Sag tension

Conductor Type	Construction (AL + ST) / AAA Wire Nos. / Nos.	Mod. of Elasticity Kg/sq. cm	Co-Effi. of liner expansion per °C
ACSR & AAC	6 + 1	0.8055 X 10 ⁹	19.1 X 10 ⁻⁶
	6 + 7	0.7750 X 10 ⁹	19.8 X 10 ⁻⁶
	26 + 7	0.8158 X 10 ⁹	18.9 X 10 ⁻⁶
	30 + 7	0.8158 X 10 ⁹	17.8 X 10 ⁻⁶
	42 + 7	0.7546 X 10 ⁹	21.5 X 10 ⁻⁶
	54 + 7	0.7036 X 10 ⁹	19.3 X 10 ⁻⁶
AAAC & ACSR	3	B) 0.6500 X 10 ⁶	23.0 X 10 ⁻⁶
	7	A) 0.6000 X 10 ⁶	23.0 X 10 ⁻⁶
	7	B) 0.6324 X 10 ⁶	23.0 X 10 ⁻⁶
	19	A) 0.5700 X 10 ⁶	23.0 X 10 ⁻⁶
	37	A) 0.5700 X 10 ⁶	23.0 X 10 ⁻⁶
	37	B) 0.5814 X 10 ⁶	23.0 X 10 ⁻⁶
	61	A) 0.5500 X 10 ⁶	23.0 X 10 ⁻⁶
	61	B) 0.5508 X 10 ⁶	23.0 X 10 ⁻⁶

(A) AAAC to IS 398 ((Part 4 1979) (Second Revision) & ACSR
 (B) AAAC to IS 398 ((Part 4 1974) (Third Revision)

2. Current Carrying Capacity:

Solar Absorption Constant A = 0.5
 Emissivity Constant E = 0.5
 Solar Irradiation S = 985 Watts /Sq. m.
 Wind Velocity V = 2200 M / Hr.
 Ambient Temperature Ta = 40 X C
 Height MSL

ACSR CONDUCTOR

Table 1 : Construction for Aluminium Conductor Steel Reinforced as per IS:398(Part-II)

No. of wire in Conductor	Construction	Lay Ratio for each Layer							
		6 Wire (ST)	6 Wire (Al)	8 Wire (Al)	12 Wire (Al)	14 Wire (Al)	18 Wire (Al)	20 Wire (Al)	24 Wire (Al)
7	1 + 6	-	10 to 14	-	-	-	-	-	-
13	1 + 6 + 6	13 to 28	10 to 14	-	-	-	-	-	-
37	1 + 6 + 12 + 18	13 to 28	-	-	10 to 16	-	10 to 14	-	-
49	1 + 6 + 8 + 14 + 20	13 to 28	-	10 to 17	-	10 to 16	-	10 to 14	-
61	1 + 6 + 12 + 18 + 24	13 to 28	-	-	10 to 17	-	10 to 16	-	10 to 14

Table 2 : Basic data for Aluminium Conductors Steel Reinforced as per IS:398 (Part-II)

Code Word	Aluminium Area		Total Sectional Area	Stranding and Wire Diameter				Overall Diameter (approx)	Weight		Mass	Resistance at 20°C (Max)	Ultimate Breaking Load
	Nominal Area	Sectional Area		Aluminium		Steel			Aluminium	Steel			
	(Sq.mm)	(Sq.mm)	(Sq.mm)	No.	Dia (mm)	No.	Dia (mm)	(mm)	Kg/Km	Kg/Km	Net	Ohm/Km	KN
MOLE	10	10.60	12.37	6	1.50	1	1.50	4.50	29	14	43	2.780	3.97
ROSE	18	18.10	21.12	6	1.96	1	1.96	5.88	49.5	23.5	73	1.618	6.74
SQUIRREL	20	20.98	24.48	6	2.11	1	2.11	6.33	58	27	85	1.394	7.61
WEASEL	30	31.61	36.88	6	2.59	1	2.59	7.77	87	41	128	0.9289	11.12
RABBIT	50	52.88	61.70	6	3.35	1	3.53	10.05	145	69	214	0.5524	18.25
RACCOON	80	78.83	91.97	6	4.09	1	4.09	12.27	215	103	318	0.3712	26.91
DOG	100	105.0	118.5	6	4.72	7	1.57	14.15	288.3	105.7	394	0.2792	32.41
WOLF	150	158.1	194.9	30	2.59	7	2.59	18.13	438	289	727	0.1871	67.34
PANTHER	200	212.1	261.5	30	3.00	7	3.00	21.00	588.5	387.5	976	0.1390	89.67
KUNDAH	400	404.1	425.2	42	3.50	7	1.96	26.88	1119	163	1282	0.07311	88.79
ZEBRA	420	428.9	484.5	54	3.18	7	3.18	28.62	1182	439	1621	0.06868	130.32
MOOSE	520	528.5	597.0	54	3.53	7	3.53	31.77	1463	535	1998	0.05595	159.60
MORCULLA	560	562.7	591.7	42	4.13	7	2.30	31.68	1553	228	1781	0.05231	120.16

Table 3 : Basic data for ACSR Conductors as per IS:398 (Part-II)

Code Word	Nominal Equivalent Copper Area	Sectional Aluminium Area	Total Sectional Area	Stranding and Wire Diameter				Overall Diameter (approx)	Weight			Resistance at 20°C (Max)	Ultimate Breaking Load
				Aluminium		Steel			Aluminium	Steel	Net		
	(Sq.mm)	(Sq.mm)	(Sq.mm)	No.	Dia (mm)	No.	Dia (mm)	(mm)	Kg/Km	Kg/Km	Kg/Km	Ohm/Km	Kgf
GOPHER	16	25.90	30.62	6	2.36	1	2.36	7.08	72	34	106	1.0980	952
FERRET	25	41.87	49.98	6	3.00	1	3.00	9.00	116	55	171	0.6795	1503
MINK	40	63.32	73.65	6	3.66	1	3.66	10.98	173	82	255	0.4565	2207
HORSE	42	71.58	116.20	12	2.75	7	2.79	13.95	204	338	542	0.3977	6108
BEAVER	45	74.07	87.53	6	3.99	1	3.99	11.97	205	98	303	0.3841	2613
OTTER	50	82.85	97.91	6	4.22	1	4.22	12.66	230	109	339	0.3434	2923
CAT	55	94.21	111.30	6	4.50	7	4.50	13.50	261	124	385	0.3020	3324
LEOPARD	80	129.70	148.40	6	5.28	7	1.76	15.48	360	133	493	0.2193	4137
COYOTE	80	128.50	151.60	26	2.54	7	1.90	15.86	365	156	521	0.2214	4638
TIGER	80	128.10	161.80	30	2.36	7	2.36	16.52	363	241	604	0.2221	5758
LYNX	110	179.00	226.20	30	2.79	7	2.79	19.53	506	338	844	0.1589	7950
LION	140	232.50	293.90	30	3.18	7	3.18	22.26	659	438	1097	0.1223	10210
BEAR	160	258.10	326.10	30	3.35	7	3.35	23.45	734	485	1219	0.1102	11310
GOAT	185	316.50	400.00	30	3.71	7	3.71	25.97	896	596	1492	0.0898	13780
SHEEP	225	366.10	462.60	30	3.99	7	3.99	27.93	1036	690	1726	0.0777	15910
DEER	260	419.30	529.80	30	4.27	7	4.27	29.89	1188	789	1977	0.0678	18230
FLK	300	465.70	588.40	30	4.50	7	4.50	31.50	1320	876	2196	0.0611	20240
CAMEL	300	464.50	537.70	54	3.35	7	3.35	30.15	1318	486	1804	0.0612	14750
SPARROW	20	33.16	39.22	6	2.67	7	2.67	8.01	92	43	135	0.8578	1208
FOX	22	36.21	42.92	6	2.79	7	2.79	8.37	101	48	149	0.7857	1313
GUINEA	49	78.56	127.20	12	2.92	7	2.92	14.60	224	366	590	0.3620	6664
LARK	125	196.10	247.80	30	2.92	7	2.92	20.44	556	366	922	0.1451	8559

AAA CONDUCTOR

Table 4 : Construction for All Aluminium Alloy Conductor as per IS:398(Part IV)

No. of wire in Conductor	Construction	Lay Ratio for each Layer				
		3 Wire	6 Wire	12 Wire	18 Wire	24 Wire
3	3	10 to 14	-	-	-	-
7	1 + 6	-	10 to 14	-	-	-
19	1 + 6 + 12	-	10 to 16	10 to 14	-	-
37	1 + 6 + 12 + 18	-	10 to 17	10 to 16	10 to 14	-
61	1 + 6 + 12 + 18 + 24	-	10 to 17	10 to 16	10 to 15	10 to 14

Table 5 : Basic Data for AAAC Conductor As per IS : 398 (Part IV)

AAAC Code Word	Actual Area (Sq.mm)	Stranding and Wire Diameter		Overall Diameter (Approx) (mm)	Mass (Approx) Kg/Km	Resistance at 20°C (Max) Ohm/Km	Ultimate Breaking Load KN
		No.	Dia. (mm)				
MOIE	15	3	2.50	5.39	40.15	2.3040	4.33
SQUIRREL	22	7	2.00	6.00	60.16	1.5410	6.45
WEASEL	34	7	2.50	7.50	94.00	0.9900	10.11
RABBIT	55	7	3.15	9.45	149.20	0.6210	16.03
RACCOON	80	7	3.81	11.43	218.26	0.4250	23.41
DOG	100	7	4.26	12.78	272.86	0.3390	29.26
DOG (UP)	125	19	2.89	14.45	342.51	0.2735	36.64
COYOTE	148	19	3.15	15.75	406.91	0.2290	43.50
WOLF	173	19	3.40	17.00	474.02	0.1969	50.54
WOLF(UP)	200	19	3.66	18.30	549.40	0.1710	58.66
PANTHER	232	19	3.94	19.70	636.67	0.1471	68.05
PANTHER (UP)	288	37	3.15	22.05	794.05	0.1182	84.71
PANTHER (UPP)	346	37	3.45	24.15	952.56	0.0984	101.58
KUNDAH	400	37	3.71	25.97	1101.63	0.0829	117.40
ZEBRA	465	37	4.00	28.00	1280.50	0.0734	136.38
ZEBRA (UP)	525	61	3.31	29.79	1448.39	0.0651	146.03
MOOSE	570	61	3.45	31.05	1573.71	0.0598	158.66
MORCULLA	604	61	3.55	31.95	1666.00	0.0568	167.99
MOOSE (UP)	642	61	3.66	32.94	1771.36	0.0534	178.43
MORCULLA (UP)	695	61	3.81	34.29	1919.13	0.0492	193.25
BERSIMIS	767	61	4.00	36.00	2115.54	0.0446	213.01



AA CONDUCTOR

Table 6 : Basic Data for Lay Ratio

No. of wire in Conductor	Construction	Lay Ratio for each Layer		
		6 Wire	12 Wire	18 Wire
7	1 + 6	10 to 14	-	-
19	1 + 6 + 12	10 to 16	10 to 14	-
37	1 + 6 + 12 + 18	10 to 17	10 to 16	10 to 14

Table 7: Basic Data for AAC Conductor as per IS:398 (Part - I)

Code Word	Aluminium Area	Total Sectional Area	Stranding and Wire Diameter		Overall Diameter (Approx)	Mass (Approx)	Resistance at 20°C (Max)	Ultimate Breaking Load
	(Sq.mm)	(Sq.mm)	No.	Dia (mm)	(mm)	(Kg/Km)	(Ohm/Km)	(KN)
GNAT	25	26.85	7	2.21	6.63	74	1.096	4.52
ANT	50	52.83	7	3.10	9.30	145	0.5525	8.25
WASP	100	106.00	7	4.39	13.17	290	0.2752	15.96
SPECIAL	150	150.90	19	3.18	15.90	415	0.1942	23.28
SPIDER	240	237.60	19	3.99	19.95	654	0.1235	35.74
BUTTERFLY	300	322.70	19	4.65	23.25	888	0.09107	48.74

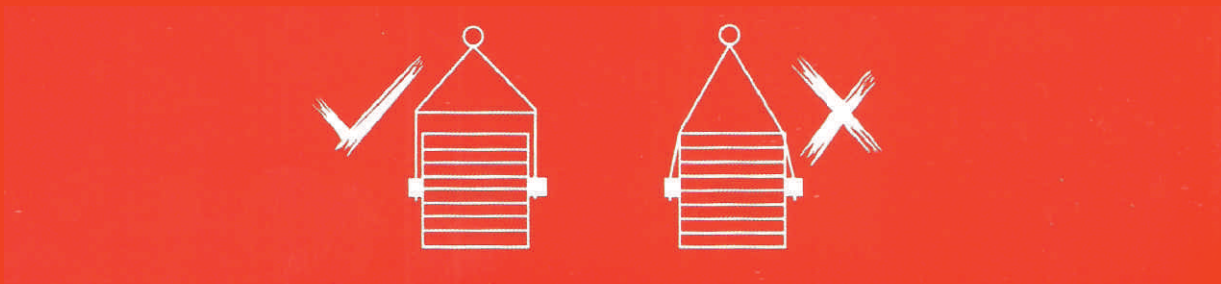
Table 8: Basic Data for AAC Conductor as per IS:398 (Part - I)

Code Word	Aluminium Area	Total Sectional Area	Stranding and Wire Diameter		Overall Diameter (Approx)	Mass (Approx)	Resistance at 20°C (Max)	Ultimate Breaking Load
	(Sq.mm)	(Sq.mm)	No.	Dia (mm)	(mm)	(Kg/Km)	(Ohm/Km)	(Kgf)
ROSE	20.89	21.12	7	1.96	5.88	58	1.362	385
LADY BIRD	42.33	42.80	7	2.79	8.37	117	0.6721	737
FLY	62.86	63.65	7	3.40	10.20	174	0.4526	1051
BLUE BOTTLE	72.84	73.65	7	3.66	10.95	201	0.3936	1203
EARWIG	77.70	78.55	7	3.78	11.34	215	0.3662	1272
GRASS HOPPER	83.13	84.05	7	3.91	11.73	230	0.3422	1356
CLEGG	94.56	95.60	7	4.17	12.51	261	0.3009	1523
CATERPILLAR	183.00	186.00	19	3.53	17.65	511	0.1555	2985
CHAFFER	209.90	213.20	19	3.78	18.90	586	0.1356	3381
COCKROACH	261.50	265.80	19	4.22	21.10	730	0.1088	4144
MOTH	367.20	373.10	19	5.00	25.00	1025	0.0774	5695
LOCUST	421.90	428.70	19	5.36	26.80	1176	0.0674	6516
MAY BUG	473.60	486.10	37	4.09	28.63	1343	0.0598	7289
SCORPION	518.40	529.80	37	4.27	29.89	1464	0.0548	7878
IRIS	33.45	33.81	7	2.48	7.44	92	0.8506	582
PANSY	42.02	42.49	7	2.78	8.34	116	0.6770	730

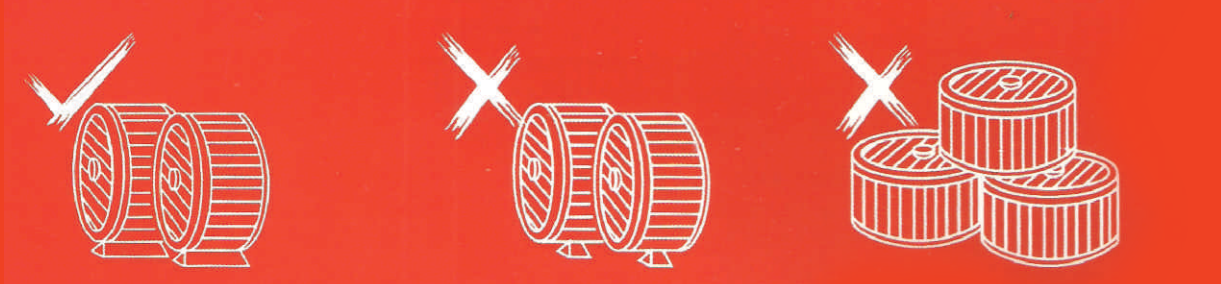
Handling & Laying Instructions

Handling Instructions

Cables should be installed and stored according to international regulation by trained persons with good engineering practice. Cable are supplied on heavy wooden/steel drum and handling these drums can constitute real hazardous. Indicated some of the common mistake can be committed during the handling, care should be taken during loading and unloading.



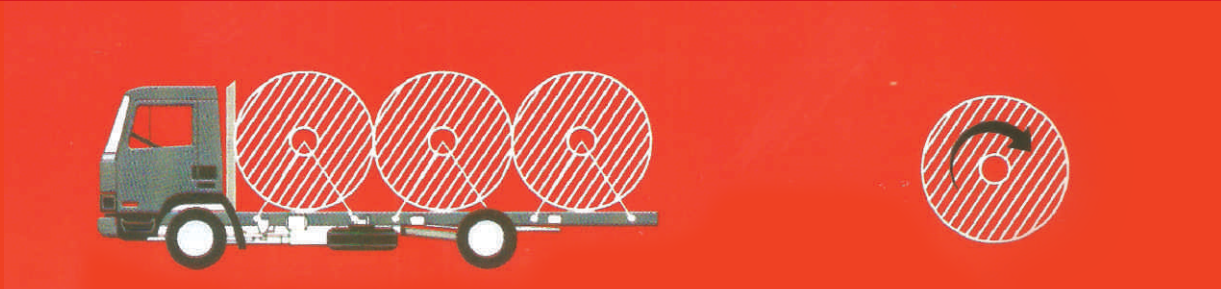
Lifting Cable Drums



Don't lay drums flat on their sides, use proper stops to prevent drums rolling



Lift Drums on Fork Trucks



Secure drums adequately before moving

Roll in the direction shown by the arrow

- 
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