

THE POWER IS WITHIN



COMPANY PROFILE AND TECHNICAL BROCHURE



GLOSTER CABLES LIMITED

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THE POWER IS WITHIN

“GLOSTER CABLES LIMITED” was incorporated in the year 1995, with Fort Gloster Industries Limited (FGI) as one of the Equity Participants. FGI are also our Technical & Marketing Collaborators. Manufacturers of Quality Power and Control Cables, we have inherited the 'GLOSTER' brand name, and along with it, the high standards of manufacturing and quality, that FGI is renowned for.

The Plant has been accredited for conforming to the quality standards of **ISO 9001:2008** by **DNV**.

Located at around 35 kms from Secunderabad on National Highway NH 44, the plant encompasses an area of 41,000 sq.mts., with a total built-up area of 23,000 sq.mts. Production facilities have been designed to match customer expectations and are compatible with the requirements of the National and International Standards. In its efforts to manufacture an outstanding product, a state-of-the-art infrastructure equipped with sophisticated machinery and testing equipment has been created at its manufacturing units. A vigilant internal quality control cell ensures that every Gloster Cable is tested to conform to the highest standards in the state-of-the-art In-House Laboratory.

Far outperforming the rest of the industry with a scorching CAGR of almost 40%, the ISO 9001:2008 company, has chalked out an ambitious growth plan aimed at catapulting it into a ₹450 crore company by FY 2014-15.

Obsessed with a vision of delivering not only a product of the highest quality but also ensuring utmost customer satisfaction through prompt and personalized service, a highly networked marketing and distribution arrangement spread across the length and breadth of the country has been set up to forge intimate relationship with its numerous clients.

Quality and service are the cornerstones of Gloster Cables. An extremely stringent vendor selection mechanism ensures all raw materials are sourced only from the top manufacturers in their respective fields, irrespective of their premium pricing. It has a state-of-the-art in-house PVC/XLPE compounding plant and is well-equipped with all manufacturing and testing facilities.

HISTORY OF EXCELLENCE

- 2012: Massive capacity expansion in Domestic/Flexible Cables with HR-FRLSH+FRLSH+FRLSH.
- 2010: Introduction of Flexible/Domestic Cables with FR PVC.
- 2005: Massive capacity expansion with State-of-the-art Production/Testing facility and opening of Unit-2
- 2004: Introduction of HT Sioplas Facility
- 2002: Establishment of a dedicated conductor manufacturing facility
- 1999: Introduction of XLPE as insulation medium
- 1998: In-house PVC Compounding Plant
- 1998: ISO Certification
- 1995: Incorporation of “GLOSTER”





OUR PRODUCT RANGE

LOW VOLTAGE CABLES (With XLPE Insulation):

Voltage Grade: 1.1 KV

Aluminium Power Cables:

Single Core upto 1000mm²

Multi Core upto 630 mm²

Copper Control Cables:

1.5 mm², 2.5 mm²: upto 61 Core

Copper Power Cables:

Single Core upto 1000mm²

Multi Core upto 630 mm²

(Above cables can also be manufactured with PVC insulation on requirement).

Aerial Bunched Cables

Special application cables with special PVC:

FR/FRLS / HR / HRFRLS / ZHLS / ZFFR etc.

MEDIUM VOLTAGE CABLES:

Voltage Grade: 3.3 KV To 11 KV (Earthed/Uneearthed)

Single Core upto 1000 mm²

Three Core upto 400 mm²

HIGH VOLTAGE CABLES:

Voltage Grade: 11 KV to 33 KV (Earthed/Uneearthed)

Single Core upto 1000 mm²

Three Core upto 400 mm²

AERIAL BUNCHED CABLES:

Manufactured as per customer requirement

Airport lighting cables

Copper conductor cables

Cables with special technical specification

DOMESTIC/INDUSTRIAL FLEXIBLE CABLES:

Standard manufacturing of Domestic Cables with Triple Layer FRLSH with Heat Resistance, Flame Retardent, Low Smoke and Low Halogen.
(HR-FRLSH+ FRLSH+ FRLSH PVC)

Standard manufacturing of Single and Multi core Industrial Flexible Cables with FR PVC.
Cables can also be manufactured with special PVC (FRLS+ZHLS/HRFR etc).

FUTURE EXPANSION PROGRAMME

Elastomeric Insulated Cables
Mining Cables
Extra High Voltage Cables
Instrumentation Cables
Turnkey Cabling Projects

Cables are manufactured as per following IS

specifications (with latest amendments):

IS-1554 (Part I): 1.1 KV grade Low Voltage PVC Cables

IS-7098 (Part-I): 1.1 KV grade Low Voltage XLPE Cables

IS-7098 (Part-II): 3.3 KV grade to 33 KV grade High Voltage HT Cables

IS: 14255-1995: LT Aerial Bunched Cables

IS-694: Domestic and Industrial Flexible Cables

Cables are also manufactured with following

International Standards:

IEC (International Electric Commission)
BS (British Standards)
Other International Specifications

AREA OF THE MANUFACTURING UNIT

Area (Sqmtrs)	UNIT-1	UNIT-2	TOTAL
Built-up area	10000	13000	23000
Open area	8000	10000	18000
Total area (Sq.Mtrs)	18000	23000	41000

MANUFACTURING CAPACITY (Per Annum)

PRODUCT TYPE	CAPACITY (Kms)
LT Power Cables	6000
HT Power Cables	960
LT Control Cables (Aluminium & Copper)	9600
Copper Multi Core Cables	720
Industrial Flexible Cables	300000
TOTAL MANUFACTURING CAPACITY	317280

MAJOR RAW MATERIAL SOURCES

RAW MATERIAL PARTICULARS	SOURCES
ALUMINIUM ROD (E.C. Grade 61.5%)	नालको NALCO <small>NATIONAL ALUMINIUM CO LTD</small> ADITYA BIRLA HINDALCO <small>HINDALCO INDUSTRIES LTD</small> balco <small>BHARAT ALUMINIUM COMPANY LTD.</small>
COPPER ROD/WIRE (99.9% Purity)	Sterlite Industries India Limited Birla Copper Limited
DOP/ STABILIZERS AND CATALYSTS	KLJ Group <small>KLJ Plastizers</small> Makwell Plastizers Pvt. Ltd. <small>Makwell Organics Pvt. Ltd.</small>
ARMOURING WIRE/STRIP	TATA STEEL <small>Tata Steel Limited</small> usha martin <small>Usha Martin Industries Limited</small>
PVC RESIN	Finolex Industries SANMAR <small>Chemplast Sanmer</small> Reliance <small>Industries Limited</small> Kalpana Industries Limited
COPPER TAPE (HT Cables)	neosym <small>Neosym Industry Ltd. (From: Indian Smelting)</small> Amex Resources Limited
LT XLPE/HT XLPE INSULATING COMPOUND	Kalpana Industries Limited DOW <small>DOW Chemicas (33 KV Grade-Imported)</small>
SEMICONDUCTING COMPOUND	Kalpana Industries Limited SUN <small>SUN Petrochemicals</small>
PVC COMPOUND	In-House Production (PVC-A/PVC-ST1/PVC-ST2/HR/FR/FRLS/HR-FRLS etc)





MAJOR CUSTOMER LIST

AUTOMOBILE

• TM Tyres & Tubes Pvt. Ltd., AP • Mahindra & Mahindra Ltd., AP • Hyundai Motor India Ltd., TN • MRF Ltd., TN • Ashok Leyland Ltd., Chennai • Tata Engineering & Locomotive Co. Ltd, Pune

CEMENT

• Maharaja Shree Umair Mills Ltd., Rajasthan • Binani Cements Limited • J.K. Lakshmi Cement Limited • Shree Cements Limited • The Associated Cement Companies Ltd., TN • The India Cements Ltd., TN • Vasavdatta Cement, Gulbarga • Arsmeta Cement Plant, Chattisgarh • Dalmia Cement • Orient Cement • Penna Cements • Chettinad Cement Corporation Limited • Sourashtra Cement Ltd., Gujarat • Digvijay Cement, Gujarat • My Home cement Ind. Ltd., AP • Sonadih Cement Plant • Hirimi Cement Works

CHEMICALS & FERTILISERS

• Ashoka Distillers & Chemicals Pvt. Ltd., Delhi • EID Parry India Ltd., TN • FACT Limited, Kerala • Godavari Fertilisers & Chemicals Ltd., Karnataka • Shree Rayalseema Alkalies • EMPEE Sugars & Chemical Ltd., AP • Madras Fertilisers Ltd, Chennai • Asian Paints Gujarat • Alkalies & Chemicals Ltd., Baroda • Gujarat Heavy Chemicals Ltd., Veraval • Gujarat Narmda Fertilisers, Bharuch • Gujarat Paguthan Energy Corp., Gujarat • Gujarat State Fertilisers Ltd., Vadodara • Hemani Organics & Chemicals Pvt. Ltd., Ankaleshwar • Hindustan Antibiotics Ltd., Pune • Nirma Ltd., Gujarat • Rashtriya Chemicals & Fertilisers Ltd., Thane • IFFCO, Kandla • Indo Rama Petrochemicals • Indian Petrochemicals • Saurashtra Chemicals • Tata Chemicals Ltd., Gujarat • Uranium Corporation Of India Ltd., Raipur • Hind Lever Chemicals Ltd., WB • Meghalaya Carbide & Chemicals P. Ltd.

COAL & MINERAL

• National Mineral Development Corp., MP • Cochin Minerals & Rutile Ltd, Kerala • Indian Rare Earths Ltd., TN • Indian Rare Earths Ltd., Kerala • National Mineral Development Corp., Karnataka • Uranium Corporation of India Ltd., Raipur

DAIRY

• Amudham Dairy Product Pvt. Ltd., TN • Kanakpura Milk Chilling Centre, Karnataka • NDDDB Mega Dairy Project, Karnataka • NDDDB, AP • Sabar Dairy, AP • Tumkara Distict. Co-Operative Milk Producers Ltd., AP • Baroda District CO-Operative Milk, Baroda • Dudh Sagar Dairy, Mehsana • Indian Dairy Machinery Co. Ltd., Gujarat • Mother Dairy, Gujarat • NDDDB, Anand

DEFENCE & RESEARCH CENTRE

• Ordnance Factory, Tiruchirapally • Military Engineering Services, Belgaum • Hyudai Motor India Ltd., TN • MRF Ltd., TN • Ashok Leyland Ltd., Chennai • DRDO, Jagadapur, • DIVI's Laboratories Ltd., AP • Bharat Dynamics Ltd., AP • Indian Navy, INS Vasura, Jamnagar • Department Of Atomic Energy, Indore • Military Engineering Services, Vasco • Institute For Plasma Research, Gandhinagar • National Defence Academy, Pune • Ordnance Factory, Ambasari • Director General Naval Project, Mumbai • Centre for Advanced Technology, Indore • Bhabha Atomic Reserch Centre, Mumbai • Ordnance Factory, Jabalpur • Central Fuel Research, Dhanbad

ENGINEERING (OEM'S/COMMUNICATION/AIRPORT/IT/CONSULTANTS)

• HCL Computers, Noida • Indira Gandhi International Airport, Delhi • Controls & Switchgear Co.Ltd., Delhi • Procter & Gamble India Ltd., Delhi • Greater Noida Industrial Development Authority • Amara Raja Batteries Ltd., AP • Apollo Tyres Ltd., Kerala • Samaria Pipes Pvt. Ltd., AP • Controls & Schematics Ltd., AP • Heritage Granites Ltd., TN • Hindustan Sanitaryware & Inds.Ltd., AP • Hyderabad Industries Ltd., AP • India Meters Ltd., Chennai • Indian Telephone Industries Ltd., Karnataka • ITC, Bangalore • Kamal Wineries, AP • Kerala Karkarshakha Federation Ltd., Kerala • Kerry Jost Engineering Ltd., AP • Babuchand Engineers, Kochi • BTP India Ltd., TN • Cethar Vessels Pvt. Ltd., TN • Markwel Hose Industries Ltd., AP • Mahindra Holidays & Resorts India Ltd., Karnataka • Nithiya Packaging Pvt. Ltd., Kerala • Pokarna Ltd., TN • Pomona Farms & Products, TN • Prime Properties Developers, Kerala • Satellite Printing Pvt. Ltd., TN • Vatech Vabag Ltd., Chennai • Max India Ltd., Karnataka • National Aerospace Laboratories, Karnataka • Popuri Enggineering Consultancy AP • Rank Cranes P.Ltd., AP • Reliance Fire & Safety Equipments, AP • Schaltech Automation Pvt. Ltd., AP • Transformer & Elctrical Kerala Ltd., Kerala • Tranvancore Titanium Products Ltd., Kerala • Popuri Enggineering Consultancy, AP • Rank Cranes Pvt. Ltd., AP • Reliance Fire & Safety Equipments, AP • Schaltech Automation P.Ltd., AP • Transformer & Elctrical Kerala Ltd., Kerala • Tranvancore Titanium Products Ltd.,Kerala • Alfa Laval India Ltd., Pune • Thermax Babcock & Wilcox Ltd., Pune • Fag Bearings India Ltd., Baroda • Emco Ltd., Mumbai • Filatex India Ltd., Daman • Megi Control systems P.Ltd., Goa • Ion Exchange (India) Ltd., Mumbai • Kalpataru Properties, Thane • National Highways Authority of India, Pune • Rainbow Plastic Industry, Daman • Sahara India Ltd., Pune • National Aluminim Company, Orissa • Lurgi India Co.Ltd., Kolkata • Exide Industries Ltd., Kolkata • Paharpur Cooling Towers Ltd., Kolkata • Bhutan Constructions

MAJOR CUSTOMER LIST

EPC CONTRACTOR

• Subhash Projects & Marketing Ltd., Karnataka • SNC Lavalin/Acres INC. • Bharat Heavy Electricals Ltd., Hardwar • Aar Gee Consultants Pvt. Ltd., Delhi • Omaxe Limited • Jeet Builders • AREVA T&D India Limited • Bajaj Eco-Tec India Limited • Voltas Limited, Secunderabad • Shriram EPC Limited, Chennai • Singhal Enterprises Pvt.Ltd., RaigarH • Tata Honeywell Ltd., Pune • Qilon Consulting Engineers, Trivendram • Reunion Engineering Co.Ltd., AP • Samsung Engineering Ltd., Baroda • P. L. Raju Construction Ltd., AP • Nagarjuna Construction Co. Ltd., AP • Kumar Raja Associates, Vishakhapatnam • KW Kumar Raju , AP • L&T Komatsu Limited, Karnataka • Kirloskar Electric Co.Ltd., Bangalore • Siemens Ltd., Bangalore • IVRCL Infrastructure & Porjects Ltd., AP • Harrison Malyalam Ltd., Kerala • M/s Greaves Ltd., Chennai • FEE Minerals India P.Ltd., Chennai • Bharat Heavy Electricals Ltd., AP • HCL Technologies Limited • K B Contractors • Pokarna Limited • Mantri Developers • MAYTAS • Promac Engineering • Purvankara Project • Seimens Limited • Best & Crompton Engg. Ltd., AP • J.K. Paper Limited • J.K. Coporation Limited • Kirloskar Brothers Ltd. • Danielli Engineering, Kolkata • Durgapur Porjects Ltd., WB • Thermax Ltd., Pune • Larsen & Toubro Limited, Mumbai • M/s Greaves Ltd., Pune • Krupp Industries Limited, Pune • Hindustan Dorr Oliver Ltd., Mumbai • Elecon Engineering Co. Ltd., Baroda • Crompton Greaves Ltd., Mumbai • Batliboi Ltd., Mumbai • Bechtel International Ltd., Mumbai • Bells Control Ltd., Mumbai • Blue Star Ltd., Mumbai • BSES Ltd., Mumbai • Bajaj Electricals Ltd., Mumbai • Godrej & Boyce • John Galt International

INFORMATION TECHNOLOGY

• Arihant Techno Park • Satyam Computers • Cyber Park • HCL Computers • IBM • Motorola • Pristige Technology Park • WIPRO

IRON AND STEEL

• Bhushan Steel & Strips • Raipur Alloys • Abhishek Steels Ltd., AP • AGP Steels Pvt. Ltd., Medak • Bilasaraika Spong Iron P. Ltd., A.P., • Drolia Electro Steels Pvt. Ltd., Raipur • FLSMIDTH Minerals Pvt. Ltd. • Gasha Steels Pvt. Ltd., Palakkad • Jaiswal NECO Ltd.(SPD), Chennai • Jaycee Sponge Profiles Pvt. Ltd., AP • Kairally Steel & Alloys Pvt. Ltd., Pallakad • Kalyani Steels Ltd., Hospet • Kirloskar Ferrous Ind. Ltd., Bovinhalli • Mahendra Sponge & Power Pvt. Ltd., Raipur • Mangal Sponge & Steel Ltd., Raipur • Raipur Sponge & Power Ltd., Raipur • Ramnivash Ispat Ltd., Medak • Salem Steel Plant , Salem • Satyarth Steel & Power Ltd., Raipur • SJK Steels Ltd., Hyderabad • Steel Abrasive Ltd., Raipur • Steel Authority Of India Ltd., Bhilai • Steel Industries Ltd., Kerala • Sunder Ispat Ltd., AP • Tirupathi Udyog, AP • Hindalco Industries Ltd., Dahej • Ispat Industries Ltd., Mumbai • Mondovi Pallest Ltd., Thane • Mukand Ltd., Thane • S.A.L. Steels Ltd., Gujarat • Steelco Gujarat Ltd. • SWIL Ltd., Bharuch • Vikram Ispat, Raigad • Ballasore Alloys Ltd., Orissa • Bhihar Sponge Iron Ltd., Chandil • Haldia Steels Ltd., WB • Jindal Stainless Ltd., Orissa • Neelachal Ispat Ltd., Dhubri • Ram Saroop Lohh Udyog • Satyam Iron & Steel Co. Ltd., Ranigunj • Scan Steels Ltd., Rajgangapur • Shivam Iron & Steel Co. Ltd., Jharkhand • Shri Madhav Ispat Ltd., Orissa • Shrishti Ispat Ltd., Orissa

LIGHTING

• Glaxo Pharmaceuticals • Bajaj Electricals, AP • Philips India Ltd., AP • Bajaj Electricals, Mumbai

PAPER

• Tamilnadu Papers & Newsprint Ltd., TN • The Mysore Paper Mills Ltd., Karnataka • The Sirpur Paper Mills Ltd., AP • Shes Sayee Paper & Boards Ltd., Eorde • Ballarpur Industries Ltd., AP • Andhra Pradesh Paper Mills Ltd., AP • West Coast Paper Mills Limited • Ramdas Paper Board • J.K.Paper Limited • J.K.Coporation Limited

PETROLEUM & REFINERIES

• Manglore Refineries & Petrochemical • Bharath Petroleum Corporation, AP • Kochi Refinery Ltd., Kochi • HPCL, Vizag • IOCL, AP • ONGC, TN • Cochin Refineries Ltd., Kerala • IOCL, Gujarat Refinery Ltd., Gujarat • ONGC, Ankleshwar • Mumbai Refineries Ltd., Mumbai • Chiripaul Petrochemical Ltd., Gujarat • IPCL, Bharuch • Gail (India) Ltd., Bharuch • HPCL, Mumbai • Numaligarh Reifinery Ltd., Assam • South Asian Petrochemicals Ltd., WB



MAJOR CUSTOMER LIST

PHARMACEUTICAL

• Vamsi Organics Pvt. Ltd., AP • Smithkline Becham Pharmaceuticals, Bangalore • Satyam Plasticizers & Chemicals, AP • Reliance Cellulose Products Ltd., AP • Dr. Reddy's Lab • Tonira Pharma Ltd., Baroda • Taiyo Lucid Pvt. Ltd., Aurangabad • Sovereign Pharma, Daman • Ranbaxy Laboratories Ltd., Goa • Emcure Pharmaceuticals Pvt. Ltd., Pune • Serum Institute of India, Pune • Ronit Pharma Ltd., AP • Mega Fine Pharma Pvt. Ltd., Nasik

POWER AND ENERGY

• Uttaranchal Power Corp. Ltd., Dehradun • National Hydroelectric Power, HP • Nuclear Power Corporation of India, Rajasthan. • BSES Rajdhani Power Ltd., Delhi • BSES Yamina Power Ltd., Delhi • Jaipur Vidyut Vitaran Nigam Limited • Amrit Bio Energy • Maharshi Solar Technology Pvt. Ltd., AP • Karnataka Power Transmission Corp., Bangalore • Kerala State Electricity Board, Kochi • Chattisgarh State Electricity Co. Ltd., Raipur • AP Power Generation Corp. Ltd, AP • Jaiprakash Industries Ltd., Sikkim • CESC Ltd., Kolkata • Gujarat Paguthan Energy Corp., Bharuch • Gujrath Electric Company, Vadodara • Ahmedabad Electricity Co. Ltd., Gujarat • Adani Energy Limited

SERVICE (HOTEL/EDUCATION/PORT/HOSPITAL)

• Central Railway, MP • Arihant Educational Society, AP • Bank of Baroda, AP • Dataware Design Lab Pvt. Ltd., TN • Hotel Babylon International Pvt. Ltd., AP • Hyderabad Control University, AP • M.M. Publication, Kerala • PSG Industrial Institute, TN • MES College Of Engineering, Kerala • Rajan Hotels Pvt. Ltd., Chennai • Sankara Eye Hospital, AP • Shree Sadguru Seva Sangh Trust, AP • Siddharth Academy Of Education, AP • Shri Kanchi Kamkoti Medical Trust, Kerala • Vishakhapatnam Port Trust, Vishakhapatnam • VSNL, Pune • Western Railways, Ahmedabad • MIDC, Mhape • Goa State Co-op. • State Bank, Panaji • Hyatt Regency, Goa • I.I.M., Indore • Indian Institute of Geomagnetism, Mumbai • Mormugao Port Trust, Goa • National Institute Of Fashion Design, Ahmedabad • State Bank of India, Mumbai • Indian Institute Of Management, Indore • Municipal Corporation of Pharola, Aurangabad • Tulsi Eye Hospital, Nashik • Aisan Hotels Ltd., Kolkata

SUGAR & FOOD

• The SIRSA Co-Op. Sugar Mills Ltd., Haryana • The Pratap Pur Sugar & Industries Ltd. • Sarjoo Sahakari Chinni Mills, UP • Dwarikesh Sugar Industries Ltd., UP • Lakshmi Sugar Mills Ltd., Uttaranchal • Kisan Sahakari Chinni mills Ltd., UP • Ch. Devilal Co-Op. Sugar Mills Ltd., UP • Arunachal Sugar Mills Ltd., TN • Chilwaria Sugars • India Glycols Limited • Balarampur Chinni Mills • Van Melle Confectionary (I) Pvt. Ltd., TN • Vimala Feeds Pvt. Ltd., AP • The Trident Sugars Ltd., AP • The Mysore Sugar Co.Ltd., Karnataka • The Nizam Sugars Ltd., AP • SCM Sugars Ltd., Karnataka • Shamanur Sugars Ltd., Karnataka • Naranja Sahakari Sakhar Karkhana, Bidar • Mysore Fruit Products Ltd., AP • Shakti Sugars Ltd., Orisa • SPR Sugars P.Ltd., Bangalore • KCP Sugar & industries Ltd., AP • Kamapur Sugar Industries, Karnataka • HIC ABF Special Foods P.Ltd., Kochi • Ganapati Sugar industries Ltd., Medak,A.P., • Gayatri Sugars Ltd., AP • Davengare Sugar Co. Ltd., Karnataka • Bannari Amman Sugars Ltd., Kerala • West Kenya Sugars • Walchandnagar Industries Ltd., Pune • Parakh Foods Ltd., Pune • IDMC Limited • Pooja Food products Ltd., Pune

TEXTILE AND JUTE

• Maharaja Shree Umaid Mills Ltd., Rajasthan • Vijay Anand Textile Mills Pvt. Ltd., AP • VKSM Cotton Mills Ltd., Coimbatore • Surya Lakshmi Cotton Mills Ltd., AP • Suryavanshi Spinning Mills Ltd., AP • Sanghi Polysters Ltd., AP • Raymond Ltd., Bilaspur • KalaiMangal Textiles, Coimbatore • Selvathy Spinning Mills, Coimbatore • GTN Textiles Ltd., Alwaye • Grasim industries Ltd., Karnataka • GTN Textiles Ltd., Medak, A.P. • Welspun India Ltd., Gujarat • Surya Lakshmi Cotton Mills Ltd., Nagpur • Maruti Textiles Ltd., Surat • DCL Polysters Ltd., Nagpur • Arvind Mills Ltd., Santej • Ludlow Jute Mills, Howrah

UTILITIES

• Airport Authorities Of India • Central Organisation Railway • Northern Railway • Global Auto • Hero Motors • North Western Railway • KESCO • Airport Authorities Of India • ABG Shipyard • Central Railway • Western Railway • Konkan Railway • Cochin Shipyard • Integrated Coach Factory • Mormogoa Port Trust, Goa • National Highways Authorities of India • Airport Authorities of India Calicut • Vishakhapatnam Port Trust, Vishakhapatnam • South West Port • Airport Authorities of India

MAJOR INSPECTIONS

GOVERNMENT INSTITUTIONS

• Airport Authority Of India (AAI) • Bhabha Atomic Research Centre (BARC) • Central Power Research Institute (CPRI) • Centre For Advance Technology (CAT) • Cochin International Airport • Department Of Atomic Energy • Director General - Aeronautical • Electronics Trust & Development Centre (ETDC) • Hindustan Aeronautical Ltd • Indian Institute of Technology (IIT) • Indian Institute of Space Research Organisation (IISRO) • Maharashtra Electricity Board • Maharashtra Industrial. Development Corporation • Military Engineering Services (MES) • Mumbai Port Trust • National Remote Sensing Agency • Naval Academy • RITES • Western Railways

PUBLIC SECTOR UNITS

• Bharat Heavy Electricals Limited (BHEL) • Bharat Petroleum Corporation Ltd (BPCL) • Electronics Trust & Development Centre • FACT Engg and Design Organisation • Greater Noida Industrial Authority • Indian Oil Corporation Ltd (IOCL) • Kochi Refineries Ltd • National Bank Of Agriculture And Rural Development • National Hydroelectric Power Corporation. • National Mineral Development Corp. Ltd (NMDC) • National Remote Sensing Agency • National Thermal Power Corporation Ltd • Nuclear Power Corporation Of India Ltd • Oil And Natural Gas Commission (ONGC) • Projects & Development India Ltd (PDIL) • Rashtriya & Ispat Nigam Ltd • Rashtriya Chemicals & Fertilisers • Royal Government of Bhutan

PRIVATE INSPECTING AUTHORITIES

• AREVA T & D India Limited • Bajaj Electricals Ltd • Bureau Veritas Industrial Serum India Pvt. Ltd • Crompton Greaves Ltd • Engineering Projects India Ltd • Engineers India Ltd (EIL) • E.G.S.C.T. Pvt. Ltd • Enviro Clean Systmes Ltd • Gherzi Eastern Ltd • Hindustan Dorr-O-Lever Ltd • Hindustan Organic & Chemical Ltd • Hindustan Petroleum Corpn. Ltd. (HPCL) • Intertek • ISGEC John Thompson • JMC • Kirloskar Electric Company • KRIBHCO • Larsen & Toubro (L&T) • Lloyds Register Asia • M.N.Dastur & Co • My Home Industries • Nagarjuna • Nirma Ltd • Orient Cement • Paramount Ltd • Praxair • Promac • Ramsarup Lohh Udyog • SAAB Controls (India) Ltd • Semi-Conductors Complex • SGS India Ltd. • Siemens • Simplex Engineering • Tata Consultancy Services • Tata Project • Team Asia Greaves Semi-Conductors • Thermopads • Toyo Engineering Corp. Ltd • Tuv India • Voltas • Walchandnagar Industries

POWER SECTOR

• Adani Energy • AP Transco • CESC Limited • Kerala State Electricity Board • Kochi Refineries • MESCOM • Nuclear Power Corp • Reliance Energy





Single Core Triple Layer FRLSH PVC Insulated Domestic Cables

(with Heat Resistance+Flame Retardent+Low Smoke+Low Halogen)

THE PRODUCT FEATURE

Wires are very important and integral part of our lives.

Wires work like our arteries and they, in fact, are arteries of our house or any building.

It is with this understanding and inspiration that 'GLOSTER' is offering latest in wire design & engineering.

'GLOSTER' wires have been designed solely with application & function in mind, nevertheless aesthetics has been given due consideration. Accordingly, while designing 'GLOSTER' wires, safety has been given the utmost importance along with improved conductivity, zero current leakage and ease in handling .

The wires being offered, are manufactured with latest Triple Extrusion Technology, wherein three layers of insulation is provided to offer to our valued customers/end users one cable suited for all applications and maximum value for their money.

'GLOSTER' has now become the First Manufacturer in India to provide FRLSH properties in addition to HR properties as a standard product. 'GLOSTER' is the only company in India offering Single Core Domestic Cables with HR-FRLSH PVC and Multi Core Industrial Flexible cables with FR PVC Insulation as a standard product, keeping in view our extreme concern for safety.

CONDUCTOR: 'GLOSTER' is offering, as a standard product, wires with uni-lay design of conductor resulting in lower conductor resistance, better conductivity, protection against voltage fluctuations & non eccentric cable with perfectly circular conductor facilitating Perfect stripping and crimping during installation.

INSULATION: GLOSTER Domestic wires are insulated with Triple Layer FRLSH with Heat Resistance+FRLSH +FRLSH, a superior grade PVC Compound that is specially formulated and manufactured in-house with rigorous testing at every stage of manufacturing.

1st layer of HR-FRLSH Insulation: A layer of specially formulated HR-FRLSH Insulation is provided over conductor to enhance current carrying capacity of cable along with addressing safety concerns.

2nd layer of FRLSH Insulation: A thick layer of FRLSH insulation is provided to restrict the spread of flames and to ensure near total absence of smoke as well as toxic and corrosive fumes.

3rd layer of FRLSH Skin: A layer of specially formulated colour FRLSH master batch is provided to ensure complete safety and clear colour identification.

Automatic self-centering is ensured with the intelligent microprocessor controlled equipment enabling to maintain the conductor perfectly in the centre of insulation providing exact and equal protection from all sides of conductor preventing short circuit occurrences due to uneven thickness and eccentricity of FRLSH PVC insulation.

PRINTING: The wires are printed with brand name, size in sq.mm & voltage grade.

CONSISTENT QUALITY: Supporting the unique design, our wires & cables are manufactured from the purest of Copper and HR-FRLSH PVC Compounds with rigorous testing at every stage of manufacturing. FRLSH characteristics like Oxygen Index, Temperature Index, Smoke Density, % Halogen, Flammability etc., are maintained as per applicable BIS/ASTM/IEC and International Standards.



TRIPLE LAYER FRLSH PVC INSULATED (HR-FRLSH+FRLSH+FRLSH) SINGLE CORE UNSHEATHED WITH MULTI STRAND BARE COPPER CONDUCTOR VOLTAGE GRADE 1100V TO IS-694 : 1990 (Supplied in 90 Mtrs. Length in attractive carton)

TABLE - 1

Nominal area of Conductor	Number / Nominal Dia of Wire	Thickness of Insulation (Nom)	Approx. Overall Diameter	Current carrying capacity 2 Cables, Single Phase #		Resistance (Max) at 20°C
				In conduit	Unenclosed	
Sq.mm	mm	mm	mm	Amps	Amp	Ohms/Km
1.0	14/0.30*	0.7	2.8	11	12	18.10
1.5	22/0.30*	0.7	3.1	13	16	12.10
2.5	36/0.30*	0.8	3.7	18	22	7.41
4.0	56/0.30**	0.8	4.2	24	29	4.95
6.0	84/0.30**	0.8	4.8	31	37	3.30



Standard Colours: Black, Red, Blue, Yellow and Green (for earthing)

As per IS 3961 (Part V) - 1968

* As per conductor Class 2 of IS: 8130 / 1984

** AS per conductor Class 5 of IS: 8130 / 1984

BIS Licence No: CM/L 6487791 And CM/L 4410544

FR PVC Insulated Industrial Flexible Cables

ASSURANCE OF MULTIPLE BENEFITS

- Safe, Reliable, Quality Wires.
- No Electric Shocks, No Short Circuits and No Electric Fires.
- Does withstand rise of temperature up to 105 degree C with Triple Extrusion process under emergency conditions.
- On Line High Voltage Spark Testing to make sure of no spots in the insulation.
- Greater Ease in Concealed & Conduit Wiring due to flexibility.

GLOSTER Flexible cables have a wide range of application in Machine Tools, Appliances, Control Panels, USP, Tower Lighting, Machinery and industries of every nature.



FR PVC INSULATED SINGLE CORE / MULTICORE INDUSTRIAL FLEXIBLE CABLES
VOLTAGE GRADE 1100V TO IS-694 : 1990
 (Supplied in 100 Mtrs. Length in Coils / In Drums Above 500 Mtrs.)

TABLE - 2

Conductor	Area Sq.mm		0.5	0.75	1	1.5	2.5	4	6	10	16	25	35	50
	No. & Size of Wire (Nom.) @ 20°C	No./mm	16 / 0.2	24 / 0.2	32 / 0.2	30 / 0.25	50 / 0.25	56 / 0.3	84 / 0.3	80 / 0.4	126 / 0.4	196 / 0.4	276 / 0.4	396 / 0.4
	Resistance (max) @ 20°C	Ohms/Km	39.00	26.00	19.50	13.30	7.98	4.95	3.30	1.91	1.21	0.780	0.554	0.386
	Current Rating DC or AC	Amps	4	7	12	15	20	27	35	46	62	80	102	138
Insulation	Thickness (Nom.)		0.6	0.6	0.6	0.6	0.7	0.8	0.8	1.0	1.0	1.2	1.2	1.4
Single Core Unsheathed	Overall Diameter (approx)	mm	2.20	2.40	2.60	2.80	3.50	4.20	4.80	6.20	7.50	9.20	10.30	12.40
Single Core Sheathed	Sheath Thickness (Nom.)	mm	0.9	0.9	0.9	0.9	1.0	1.0						
	Overall Diameter (approx)	mm	4.0	4.3	4.4	4.7	5.5	6.3						
Twin Flat Sheathed	Overall Width (Approx)	mm	6.2	6.7	7.0	7.5	9.1	10.55						
	Overall Height (Approx)	mm	4.0	4.3	4.4	4.7	5.6	6.3						
2 Core	Sheath Thickness (Nom.)	mm	0.9	0.9	0.9	0.9	1.0	1.0						
	Overall Diameter (approx)	mm	6.2	6.7	7.0	7.5	9.1	10.55						
3 Core	Sheath Thickness (Nom.)	mm	0.9	0.9	0.9	0.9	1.0	1.0						
	Overall Diameter (approx)	mm	6.5	7.1	7.4	8.0	9.6	11.20						
4 Core	Sheath Thickness (Nom.)	mm	0.9	0.9	0.9	1.0	1.0	1.0						
	Overall Diameter (approx)	mm	7.1	7.7	8.0	8.9	10.6	12.3						
5 Core	Sheath Thickness (Nom.)	mm	0.9	0.9	1.0	1.0	1.0	1.1						
	Overall Diameter (approx)	mm	7.7	8.4	9.0	9.7	11.6	13.7						



Note: The conductor construction given above is indicative only and will be such that all requirements of strand diameter and conductor resistance as per IS 8130 are met.

FR PVC INSULATED SINGLE CORE INDUSTRIAL FLEXIBLE CABLES (UNSHEATHED)
CONFORMING TO IS 694: 1990, VOLTAGE GRADE 1100 VOLTS (Supplied in 100 Mtrs. Length in Coils / In Drums Above 500 Mtrs.)

TABLE - 3

Conductor	Area Sq.mm		70	95	120	150	185	240
	No. & Size of Wire	No/mm	360/.5	475/.5	608/.5	750/.5	925/.5	1221/.5
Conductor	Max Res. @ 20°C	Ohms/Km	0.272	0.206	0.161	0.129	0.106	0.0801
	Current DC / AC	Amps	214	260	305	355	415	500
Insulation	Thickness (Nom.)	mm	1.4	1.6	1.6	1.8	2	2.2
	O D (Approx)	mm	14.40	16.15	18.10	20.00	22.60	25.50



FR PVC INSULATED MULTICORE INDUSTRIAL FLEXIBLE CABLES (6 CORES TO 24 CORES)
COMFORMING TO IS 694 : 1990, VOLTAGE GRADE 1100 VOLTS
(Supplied in 100 Mtrs. Length in Coils / In Drums Above 500 Mtrs.)

TABLE - 4

Core	Area (sqmm)	0.5	0.75	1	1.5	2.5	4
6	Sheath Thickness (Nom.) mm	0.9	0.9	1.0	1.0	1.1	1.2
	Overall Diameter (Approx) mm	8.4	9.1	9.75	10.5	12.9	15.2
7	Sheath Thickness (Nom.) mm	0.9	0.9	1.0	1.0	1.1	1.2
	Overall Diameter (Approx) mm	8.4	9.1	9.75	10.5	12.9	15.2
8	Sheath Thickness (Nom.) mm	0.9	1.0	1.0	1.1	1.1	1.2
	Overall Diameter (Approx) mm	9.1	10.1	10.5	11.4	14.0	16.5
10	Sheath Thickness (Nom.) mm	1.0	1.0	1.1	1.1	1.2	1.4
	Overall Diameter (Approx) mm	10.8	11.7	12.5	13.5	16.6	19.8
12	Sheath Thickness (Nom.) mm	1.0	1.0	1.1	1.1	1.2	1.4
	Overall Diameter (Approx) mm	11.1	12.1	12.9	14.0	17.1	20.5
14	Sheath Thickness (Nom.) mm	1.0	1.1	1.1	1.2	1.3	1.4
	Overall Diameter (Approx) mm	11.7	12.9	13.5	14.9	18.2	21.6
16	Sheath Thickness (Nom.) mm	1.1	1.1	1.1	1.2	1.4	1.5
	Overall Diameter (Approx) mm	12.7	13.9	14.5	16.0	19.8	23.5
19	Sheath Thickness (Nom.) mm	1.1	1.1	1.2	1.2	1.4	1.6
	Overall Diameter (Approx) mm	13.2	14.4	15.3	16.6	20.5	24.6
24	Sheath Thickness (Nom.) mm	1.2	1.2	1.3	1.4	1.6	1.7
	Overall Diameter (Approx) mm	15.5	17.0	18.1	19.85	24.5	28.9

FR PVC INSULATED THREE & FOUR CORE INDUSTRIAL FLEXIBLE CABLES
COMFORMING TO IS 694 : 1990, VOLTAGE GRADE 1100 VOLTS
(Supplied in 100 Mtrs. Length in Coils / In Drums Above 500 Mtrs.)

TABLE - 5

Area (Sqmm)		6	10	16	25	35	50	70	95	120
Conductor	No. & Size of Wire	84/0.3	80/0.4	126/0.4	196/0.4	276/0.4	396/0.4	360/0.5	475/0.5	608/0.5
	Max Res @ 20°C	3.300	1.910	1.210	0.780	0.554	0.386	0.272	0.206	0.161
Insulation	Current	31	42	57	72	91	120	165	200	225
	Thickness	0.8	1.0	1.0	1.2	1.2	1.4	1.4	1.6	1.6
3 Core	Sheath Thickness (Nom.)	1.1	1.2	1.3	1.5	1.6	1.7	1.8	2.0	2.1
	Outer Diameter (Approx)	12.70	15.80	18.90	23.00	25.40	30.10	34.60	38.90	43.20
4 Core	Sheath Thickness (Nom.)	1.2	1.3	1.4	1.6	1.7	1.8	2.0	2.1	2.2
	Outer Diameter (Approx)	14.10	17.60	21.10	25.50	28.20	33.50	38.80	43.35	48.10

COLOUR CODING

TABLE - 6

Type	Colour	
	Core	Sheath
Single Core Unsheathed	Red; Yellow; Blue; Black; White; & Grey	
Single Core Sheathed	Red; Yellow; Blue; Black; White; & Grey	Black
Twin Twisted	Red & Black	
Twin Flat Sheathed	Red & Black	Black
2 Core Round Sheathed	Red & Black	Black
3 Core Round Sheathed	Red; Black & Green for earth	Black
4 Core Round Sheathed	Red; Yellow; Blue & Green for earth	Black
5 Core Round Sheathed	Red; Yellow; Blue; Black & Grey	Black

Note: • Any required colour can be provided on specific request.
 • Cables can be supplied in longer lengths, in multiples of 90/100, OR as required by the customer.

LOW VOLTAGE XLPE CABLES

Low Voltage XLPE Cables are manufactured according to IS:7098 (Part -I), up to and including the latest amendments. All cables have the ISI Certification.

XLPE, as insulation has the following superior features:

- Low dielectric loss.
- Higher power rating and higher emergency overload rating.
- Superior short circuit rating.
- Much better insulation resistance
- Higher resistance to moisture
- Capacity to withstand localized hot spot temperature, very vital to steel plants, power stations, etc.
- Resistant to chemicals and corrosive gases, etc.
- Exhibits better properties, such as resistance to vibration, impact, ageing and hot deformation.
- Termination and jointing methods are very easy, simple and non-expensive as compared to other cables.

DESIGN AND CONSTRUCTION

CONDUCTORS

The conductors of power cables are made from electrical purity aluminium, and those of control cables are of annealed high conductivity copper. However, copper conductor power cables can also be supplied against orders. All conductors conform to IS:8130-1984.

INSULATION

High quality Cross Linked Polyethylene (XLPE) unfilled insulating compound is used for XLPE Cables.

LAYING UP

In multicore cables, cores are laid up as per the above color scheme and interstices are filled up wherever necessary to make the laid up cable circular.

INNER SHEATH

For all cables having two or more cores, a common covering (inner sheath) is applied over the laid up cores either by extruded sheath of PVC Compound or wrapping of thermoplastic or proofed tapes.

ARMOURING

For multi-core cables, armouring is applied over the inner sheath. In case of cables where the fictitious diameter over the inner sheath does not exceed 13mm., the armour consists of galvanised round steel wires; above this size, normally the armour is of galvanised formed steel wires. Any metallic, non-metallic wire/strip can be available on request.

OUTER SHEATH

Outer sheath is extruded over the armouring. In case of multi-core unarmoured cables, over the inner sheath, whereas, in case of unarmoured single-core cables, it is extruded over the insulation. This is always black in colour for best resistance to outdoor exposure. Any other colour can be available on request.

CORE IDENTIFICATION

Colour Scheme: Cores are identified by the colour scheme of insulation. The following colour scheme is normally adopted:

- 1 Core red, black, yellow, blue or natural (non pigmented)
- 2 Core red and black
- 3 Core red, yellow and blue

- .4 Core red, yellow, blue and black (also 3½ core reduced neutral is black)
- 5 Core red, yellow, blue, black and grey

For cables having more than 5 cores:

Two adjacent cores (counting and direction core) in each layer are coloured blue and yellow respectively and the remaining cores are grey.

Alternatively, cores with number printing can be

TESTING AND QUALITY ASSURANCE

The various tests carried out on Low Voltage cables are classified in three different groups: • Routine Tests • Type Tests and • Acceptance Tests.

ROUTINE TESTS

The following tests constitute Routine Tests which are carried out on each and every length of cable as per relevant IS specification before it leaves the factory.

(A) Conductor Resistance Test

The Test ensures that conductor resistance is within the specified limit, thereby verifying that the continuity of conductor is maintained throughout the cable length and that the conductor has the required electrical section. D.C. resistance is measured at room temperature and is then corrected to standard reference temperature of 20°C.

(B) High Voltage Test

The test ensures that insulation will safely withstand the rated voltage with permissible variation in normal operation.

TYPE TESTS

These tests are carried out on samples taken from each production lot as per relevant IS specification. They are carried out to prove conformity as regards the general qualities and design to the specification of particular type of cables.

ACCEPTENCE TESTS

These tests are again carried out as per relevant IS specification in the presence of the concerned Inspecting Authority for testing, approval and release of material offered for inspection.

PACKING

Cables are normally supplied in wooden drums. Special drums are also provided on request. While installing LT PVC/LT XLPE cables, the following minimum bending radii should be observed in order so that the cable, especially insulation, may not undergo damage. Wherever possible larger bending radii should be used.

CABLES EXPOSED TO SUN

On account of heating of the exposed core due to solar radiation, the rating of the cable installed out-doors and not shielded from the sun is less than if so shielded. To reduce the effect of solar radiation, it is recommended that the cores should be shielded from the direct rays of the Sun without restricting the ventilation.

SHORT CIRCUIT RATING OF XLPE CABLES:

Thermally admissible short circuit current are depicted in the graph below:-

Full load conductor temperature prior to short circuit 90° C

Maximum short circuit conductor temperature: 250° C

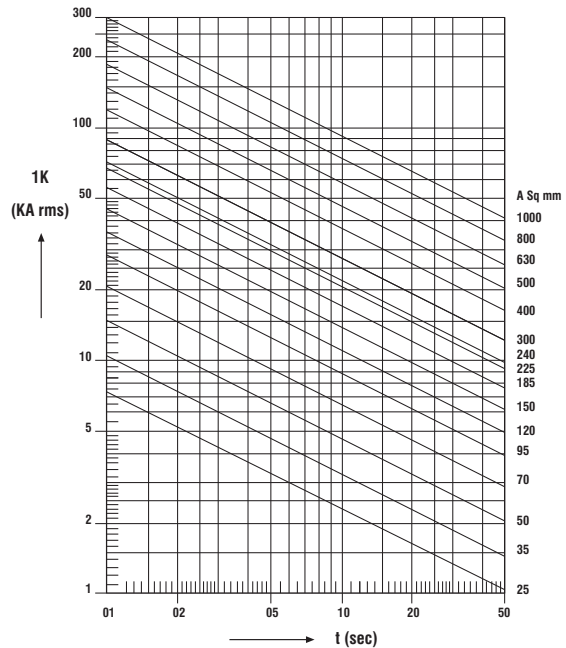
Formula $I_k = 0.094 A / \sqrt{t}$

I_k : Short Circuit Current In KA (rms)

t : Duration of short circuit in seconds

A: Area of aluminum conductor in mm²

Short circuit ratings of cables for one-second duration are given in the respective tables 1-10. For any other duration of t seconds divide the value given in the respective table by (\sqrt{t}) .

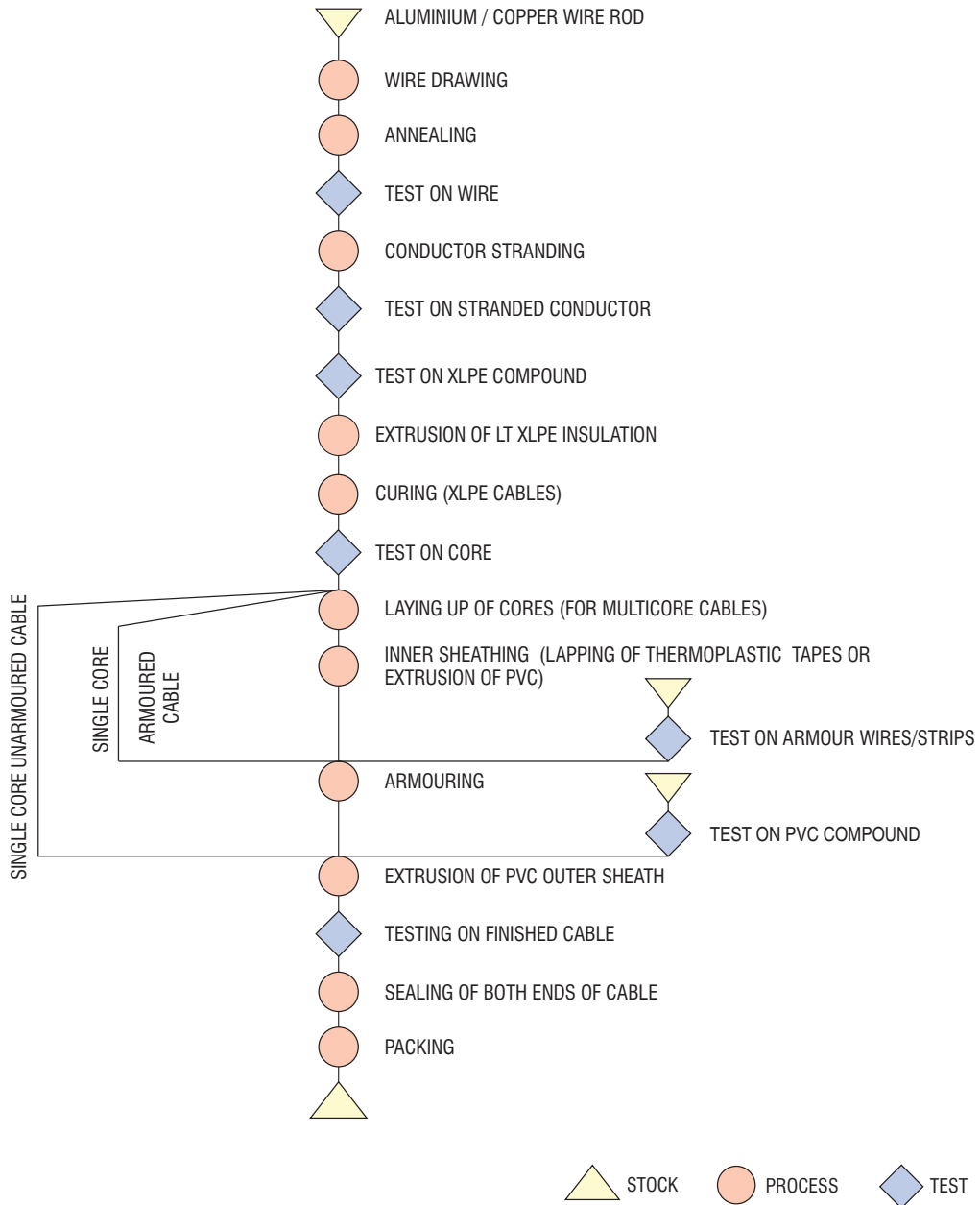


OPERATING CHARACTERISTICS:

The construction data and current rating of cables with aluminum conductor are shown in tables. These are based on standard conditions of installations as provided below:

Maximum continuous operating conductor temperature for XLPE Cables	= 90° C
Standard ground temperature	= 30° C
Ambient air temperature	= 40° C
Thermal Resistivity of soil	= 150° C
Depth of laying (for cables laid direct in ground)	= 75 cms for cables up to 1.1 KV

Flow Chart for Manufacturing Processes & Quality Control Checks for Cables Conforming to IS: 7098 (Part - I)



1.1 KV SINGLE CORE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured / UN-ARMoured, PVC OUTER SHEATH CABLES CONFORMING TO IS:7098 (Part - I)

TABLE - 1

Nominal size of conductor	UN-ARMoured CABLES A2XY				ARMoured CABLES								
	Nominal thickness of insulation	Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable	Single Layer - Wire (A2XWY)				Single Layer - Strip (A2XFaY)				
					Nominal thickness of insulation	Nominal diameter of armour wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable
Sq. mm	mm	mm	mm	Kg/Km	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
4	0.7	1.8	9.0	70	1.0	1.4	1.24	11.5	120	-	-	-	-
6	0.7	1.8	10.0	80	1.0	1.4	1.24	12.5	140	-	-	-	-
10	0.7	1.8	11.0	100	1.0	1.4	1.24	13.0	160	-	-	-	-
16	0.7	1.8	12.0	120	1.0	1.4	1.24	14.0	200	-	-	-	-
25	0.9	1.8	14.0	170	1.2	1.4	1.24	16.0	260	-	-	-	-
35	0.9	1.8	15.0	210	1.2	1.4	1.24	17.0	300	-	-	-	-
50	1.0	1.8	16.0	260	1.3	1.4	1.24	18.0	360	-	-	-	-
70	1.1	1.8	18.0	340	1.4	1.4	1.24	20.0	460	-	-	-	-
95	1.1	1.8	20.0	420	1.4	1.6	1.40	22.0	580	0.8	1.40	20.0	520
120	1.2	1.8	22.0	510	1.5	1.6	1.40	24.0	690	0.8	1.40	22.0	610
150	1.4	2.0	24.0	640	1.7	1.6	1.40	25.5	800	0.8	1.40	24.0	710
185	1.6	2.0	26.0	770	1.9	1.6	1.40	28.0	960	0.8	1.40	26.5	870
240	1.7	2.0	29.0	970	2.0	1.6	1.40	30.5	1190	0.8	1.40	29.0	1060
300	1.8	2.0	31.5	1160	2.1	1.6	1.56	33.0	1400	0.8	1.56	31.5	1290
400	2.0	2.2	35.0	1480	2.4	2.0	1.56	38.0	1770	0.8	1.56	35.0	1610
500	2.2	2.2	39.0	1840	2.6	2.0	1.56	41.0	2210	0.8	1.56	39.0	1980
630	2.4	2.2	44.0	2300	2.8	2.0	1.72	45.5	2690	0.8	1.72	43.0	2490
800	2.6	2.4	48.0	3000	3.1	2.0	1.88	51.0	3460	0.8	1.72	48.0	3230
1000	2.8	2.6	52.0	3670	3.3	2.5	2.04	56.0	4430	0.8	1.88	54.0	3930

1.1 KV TWO CORE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured / UN-ARMoured, PVC OUTER SHEATH CABLES CONFORMING TO IS:7098 (Part - I)

TABLE - 2

Nominal size of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UN-ARMoured CABLES A2XY			ARMoured CABLES							
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable	Single Layer - Wire (A2XWY)				Single Layer - Strip (A2XFY)			
						Nominal diameter of armour wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable
Sq. mm	mm	mm	mm	mm	Kg /Km	mm	mm	mm	Kg /Km	mm	mm	mm	Kg /Km
4	0.7	0.3	1.8	13.5	130	1.40	1.24	15.0	380	-	-	-	-
6	0.7	0.3	1.8	15.0	150	1.40	1.24	16.0	440	-	-	-	-
10	0.7	0.3	1.8	16.0	190	1.40	1.24	17.0	450	-	-	-	-
16	0.7	0.3	1.8	15.0	230	1.40	1.40	17.0	480	-	-	-	-
25	0.9	0.3	2.0	18.0	340	1.60	1.40	20.0	670	0.8	1.40	18.0	530
35	0.9	0.3	2.0	19.5	410	1.60	1.40	21.0	780	0.8	1.40	19.5	590
50	1.0	0.3	2.0	21.5	510	1.60	1.40	23.0	930	0.8	1.40	21.5	740
70	1.1	0.3	2.0	25.0	700	1.60	1.56	26.0	1180	0.8	1.56	24.5	960
95	1.1	0.4	2.2	27.5	880	2.00	1.56	29.5	1590	0.8	1.56	27.0	1160
120	1.2	0.4	2.2	29.5	1060	2.00	1.56	32.0	1840	0.8	1.56	29.5	1380
150	1.4	0.4	2.2	33.0	1320	2.00	1.72	35.0	2170	0.8	1.72	33.0	1660
185	1.6	0.5	2.4	37.0	1600	2.00	1.88	39.0	2590	0.8	1.72	36.0	1990
240	1.7	0.5	2.6	42.0	2090	2.50	2.04	44.0	3470	0.8	1.88	44.0	2450
300	1.8	0.6	2.8	45.0	2500	2.50	2.20	48.0	4040	0.8	2.04	44.0	2970
400	2.0	0.6	3.0	51.0	3230	2.50	2.36	53.0	4860	0.8	2.36	50.0	3700
500	2.2	0.7	3.4	56.0	4030	3.15	2.68	60.0	6540	0.8	2.52	55.5	4600
630	2.4	0.7	3.6	62.0	5090	3.15	2.84	65.5	7760	0.8	2.68	60.5	5620



1.1 KV THREE CORE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured / UN-ARMoured, PVC OUTER SHEATH CABLES CONFORMING TO IS:7098 (Part - I)

TABLE - 3

Nominal size of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UN-ARMoured CABLES A2XY			ARMoured CABLES							
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable	Single Layer - Wire (A2XWY)				Single Layer - Strip (A2XFY)			
						Nominal diameter of armour wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable
Sq. mm	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
4	0.7	0.3	1.8	14.0	160	1.40	1.24	15.0	400	-	-	-	-
6	0.7	0.3	1.8	15.5	190	1.40	1.24	16.5	490	-	-	-	-
10	0.7	0.3	1.8	17.0	240	1.40	1.24	18.5	570	-	-	-	-
16	0.7	0.3	1.8	17.0	300	1.60	1.40	19.0	670	0.8	1.24	17.5	500
25	0.9	0.3	2.0	20.5	450	1.60	1.40	22.5	870	0.8	1.40	20.5	670
35	0.9	0.3	2.0	22.0	550	1.60	1.40	24.0	1000	0.8	1.40	22.5	800
50	1.0	0.3	2.0	25.0	690	1.60	1.56	26.5	1250	0.8	1.40	25.0	990
70	1.1	0.4	2.2	28.5	960	2.00	1.56	31.0	1760	0.8	1.56	28.5	1310
95	1.1	0.4	2.2	31.0	1210	2.00	1.56	34.0	2090	0.8	1.56	31.5	1610
120	1.2	0.4	2.2	34.0	1470	2.00	1.72	36.5	2470	0.8	1.56	34.0	1910
150	1.4	0.5	2.4	38.0	1830	2.00	1.88	41.0	2960	0.8	1.72	38.0	2310
185	1.6	0.5	2.6	42.0	2270	2.50	2.04	45.5	3830	0.8	1.88	42.0	2820
240	1.7	0.6	2.8	47.0	2900	2.50	2.20	50.0	4660	0.8	2.04	47.0	3500
300	1.8	0.6	3.0	52.0	3550	2.50	2.36	55.0	5460	0.8	2.20	51.0	4200
400	2.0	0.7	3.2	59.0	4510	3.15	2.68	63.0	7370	0.8	2.52	58.0	5320
500	2.2	0.7	3.6	65.0	5650	3.15	2.84	69.0	8820	0.8	2.68	64.0	6550
630	2.4	0.7	3.8	72.0	7180	4.00	3.00	77.5	11570	0.8	2.84	71.0	8090

1.1 KV 3 1/2 CORE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured / UN-ARMoured, PVC OUTER SHEATH CABLES CONFORMING TO IS:7098 (Part - I)

TABLE - 4

Nominal size of conductor	Nominal thickness of insulation Main/Neutral	Minimum thickness of inner sheath	UN-ARMoured CABLES A2XY			ARMoured CABLES							
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable	Single Layer - Wire (A2XWY)				Single Layer - Strip (A2XFY)			
						Nominal diameter of armour wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable
Sq. mm	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
25	0.9/0.7	0.3	2.0	21.5	510	1.60	1.40	23.5	930	0.8	1.40	21.5	740
35	0.9/0.7	0.3	2.0	23.0	610	1.60	1.40	25.0	1070	0.8	1.40	23.0	860
50	1.0/0.9	0.3	2.0	26.0	780	1.60	1.56	28.0	1320	0.8	1.40	26.0	1070
70	1.1/0.9	0.4	2.2	30.0	1080	2.00	1.56	32.5	1880	0.8	1.56	30.0	1400
95	1.1/1.0	0.4	2.2	33.0	1380	2.00	1.56	35.5	2270	0.8	1.56	33.0	1740
120	1.2/1.1	0.4	2.2	36.5	1700	2.00	1.72	39.5	2720	0.8	1.72	37.0	2130
150	1.4/1.1	0.5	2.4	40.5	2060	2.00	1.88	43.0	3190	0.8	1.72	40.5	2520
185	1.6/1.1	0.5	2.6	45.0	2580	2.50	2.04	48.5	4160	0.8	1.88	45.0	3060
240	1.7/1.2	0.6	2.8	51.0	3300	2.50	2.20	54.0	5060	0.8	2.04	50.0	3840
300	1.8/1.4	0.6	3.0	56.0	4040	2.50	2.36	59.0	5970	0.8	2.20	55.5	4630
400	2.0/1.6	0.7	3.4	63.0	5170	3.15	2.68	67.0	7970	0.8	2.52	62.5	5800
500	2.2/1.7	0.7	3.6	69.5	6510	3.15	2.84	73.5	9580	0.8	2.68	69.0	7190
630	2.4/1.8	0.7	4.0	77.5	8230	4.00	3.00	83.0	12700	0.8	3.00	76.5	8950

1.1 KV FOUR CORE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured / UN-ARMoured, PVC OUTER SHEATH CABLES CONFORMING TO IS:7098 (Part - I)

TABLE - 5

Nominal size of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UN-ARMoured CABLES A2XY			ARMoured CABLES							
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable	Single Layer - Wire (A2XWY)				Single Layer - Strip (A2XFY)			
						Nominal diameter of armour wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of Aluminium cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable
Sq. mm	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
4	0.7	0.3	1.8	15.0	180	1.40	1.24	16.0	470	-	-	-	-
6	0.7	0.3	1.8	17.0	230	1.40	1.24	17.5	550	-	-	-	-
10	0.7	0.3	1.8	19.5	290	1.40	1.40	20.0	670	-	-	-	-
16	0.7	0.3	1.8	19.0	370	1.60	1.40	20.0	780	0.8	1.40	19.5	590
25	0.9	0.3	2.0	23.5	550	1.60	1.40	24.5	1030	0.8	1.40	22.5	800
35	0.9	0.3	2.0	24.5	680	1.60	1.40	26.5	1220	0.8	1.40	24.5	970
50	1.0	0.3	2.0	27.0	870	1.60	1.56	30.0	1480	0.8	1.56	27.5	1200
70	1.1	0.4	2.2	32.0	1210	2.00	1.56	34.0	2110	0.8	1.56	32.0	1600
95	1.1	0.4	2.2	35.0	1540	2.00	1.72	38.0	2570	0.8	1.56	35.0	2010
120	1.2	0.5	2.4	38.5	1930	2.00	1.88	41.5	3050	0.8	1.72	39.0	2440
150	1.4	0.5	2.6	43.0	2380	2.50	2.04	46.5	3970	0.8	1.88	43.0	2950
185	1.6	0.5	2.8	47.5	2950	2.50	2.20	51.0	4740	0.8	2.04	47.8	3590
240	1.7	0.6	3.0	53.0	3760	2.50	2.36	56.5	5760	0.8	2.20	53.0	4490
300	1.8	0.7	3.2	59.0	4630	3.15	2.52	63.0	7490	0.8	2.36	58.0	5490
400	2.0	0.7	3.6	66.0	5850	3.15	2.84	70.0	9080	0.8	2.68	65.5	6820
500	2.2	0.7	3.8	73.0	7420	4.00	3.00	79.0	11910	0.8	2.84	72.5	8400
630	2.4	0.7	4.0	81.0	9330	4.00	3.00	86.5	14230	0.8	3.00	80.0	10350

1.1 KV 1.5 Sq.mm SOLID COPPER CONDUCTOR, XLPE INSULATED, ARMoured / UN-ARMoured, PVC OUTER SHEATH COPPER CONTROL CABLES CONFORMING TO IS:7098 (Part - I)

TABLE - 6

Number of cores	Nominal thickness of insulation	Minimum thickness of inner sheath	UN-ARMoured CABLES 2XY			ARMoured CABLES							
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Single Layer - Wire (2XWY)				Single Layer - Strip (2XFY)			
						Nominal diameter of armour wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable
Sq. mm	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
2	0.7	0.3	1.8	11.0	120	1.4	1.24	13.0	310	-	-	-	-
3	0.7	0.3	1.8	11.5	140	1.4	1.24	14.0	340	-	-	-	-
4	0.7	0.3	1.8	12.5	160	1.4	1.24	14.5	390	-	-	-	-
5	0.7	0.3	1.8	13.0	190	1.4	1.24	15.0	400	-	-	-	-
6	0.7	0.3	1.8	14.0	210	1.4	1.24	15.5	450	-	-	-	-
7	0.7	0.3	1.8	14.0	230	1.4	1.24	15.5	470	-	-	-	-
8	0.7	0.3	1.8	15.0	260	1.4	1.24	16.5	500	-	-	-	-
9	0.7	0.3	1.8	16.0	280	1.4	1.24	17.5	540	-	-	-	-
10	0.7	0.3	1.8	17.0	310	1.4	1.24	19.0	590	-	-	-	-
12	0.7	0.3	1.8	17.5	350	1.4	1.24	19.5	640	-	-	-	-
14	0.7	0.3	1.8	18.5	390	1.4	1.40	20.0	680	-	-	-	-
16	0.7	0.3	1.8	19.0	440	1.6	1.40	21.5	850	0.8	1.40	20.0	670
19	0.7	0.3	1.8	20.0	500	1.6	1.40	22.0	930	0.8	1.40	21.0	730
24	0.7	0.3	2.0	21.5	640	1.6	1.40	25.0	1100	0.8	1.40	23.5	890
27	0.7	0.3	2.0	24.0	690	1.6	1.40	25.5	1170	0.8	1.40	24.0	940
30	0.7	0.3	2.0	24.5	750	1.6	1.40	26.0	1250	0.8	1.40	25.0	1020
37	0.7	0.3	2.0	26.0	890	1.6	1.40	28.0	1430	0.8	1.40	26.0	1190
44	0.7	0.3	2.0	29.0	1050	1.6	1.56	30.8	1680	0.8	1.40	29.0	1380
52	0.7	0.3	2.0	30.0	1240	1.6	1.56	32.0	1900	0.8	1.56	31.0	1620
61	0.7	0.4	2.2	32.5	1420	2.0	1.56	35.0	2290	0.8	1.56	32.5	1790



1.1 KV 2.5 Sq.mm SOLID COPPER CONDUCTOR, XLPE INSULATED, ARMoured / UN-ARMoured, PVC OUTER SHEATH COPPER CONTROL CABLES CONFORMING TO IS:7098 (Part - I)

TABLE - 7

Number of cores	Nominal thickness of insulation	Minimum thickness of inner sheath	UN-ARMoured CABLES 2XY			ARMoured CABLES							
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Single Layer - Wire (2XWY)				Single Layer - Strip (2XFY)			
						Nominal diameter of armour wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable
mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	
2	0.7	0.3	1.8	12.0	140	1.4	1.24	14.5	370	-	-	-	-
3	0.7	0.3	1.8	14.0	170	1.4	1.24	15.0	410	-	-	-	-
4	0.7	0.3	1.8	15.0	210	1.4	1.24	16.0	450	-	-	-	-
5	0.7	0.3	1.8	16.0	240	1.4	1.24	17.0	480	-	-	-	-
6	0.7	0.3	1.8	17.0	280	1.4	1.24	18.0	540	-	-	-	-
7	0.7	0.3	1.8	17.0	310	1.4	1.24	18.0	560	-	-	-	-
8	0.7	0.3	1.8	18.0	340	1.4	1.24	19.0	610	-	-	-	-
9	0.7	0.3	1.8	20.0	380	1.4	1.40	20.0	670	-	-	-	-
10	0.7	0.3	1.8	22.0	420	1.6	1.40	22.0	820	0.8	1.40	20.0	650
12	0.7	0.3	1.8	22.5	480	1.6	1.40	22.5	890	0.8	1.40	21.0	730
14	0.7	0.3	1.8	23.0	540	1.6	1.40	23.0	960	0.8	1.40	21.5	790
16	0.7	0.3	2.0	24.5	620	1.6	1.40	24.5	1060	0.8	1.40	22.0	880
19	0.7	0.3	2.0	25.0	710	1.6	1.40	25.0	1160	0.8	1.40	23.0	990
24	0.7	0.3	2.0	28.0	880	1.6	1.40	28.5	1400	0.8	1.40	26.0	1200
27	0.7	0.3	2.0	29.0	960	1.6	1.40	29.0	1500	0.8	1.40	27.0	1280
30	0.7	0.3	2.0	30.0	1050	1.6	1.40	29.5	1620	0.8	1.40	28.0	1390
37	0.7	0.3	2.2	32.0	1260	1.6	1.56	32.0	1890	0.8	1.40	30.0	1660
44	0.7	0.4	2.2	36.0	1520	2.0	1.56	36.0	2420	0.8	1.56	33.0	1940
52	0.7	0.4	2.2	37.5	1800	2.0	1.56	37.0	2720	0.8	1.56	34.5	2230
61	0.7	0.4	2.2	39.5	2020	2.0	1.56	38.5	3010	0.8	1.56	36.0	2480

CURRENT RATING FOR XLPE INSULATED COPPER CONDUCTOR 1.1 KV GRADE POWER CABLES

TABLE - 8

Nominal size of conductor	CABLE IN GROUND			CABLE IN AIR		
	Three Single Core Cable	Two Core Cable	Three, Three & Half & Four Core Cables	Three Single Core Cable	Two Core Cable	Three, Three & Half & Four Core Cables
Sq.mm	Amp.	Amp.	Amp.	Amp.	Amp.	Amp.
1.5	28	31	26	23	27	-
2.5	36	41	34	28	36	-
4	47	54	45	37	48	32
6	58	67	56	47	61	42
10	77	89	74	71	83	70
16	98	115	92	94	108	89
25	126	147	119	126	140	119
35	150	175	144	154	172	147
50	177	206	174	187	208	179
70	216	256	210	238	262	226
95	260	300	252	303	322	279
120	295	344	288	354	368	320
150	329	379	324	403	419	365
185	371	425	360	468	482	422
240	427	486	410	553	566	500
300	477	541	462	634	644	574
400	537	602	528	737	734	662
500	598	665	593	844	831	760
630	661	728	661	961	936	870
800	721	-	-	1077	-	-
1000	772	-	-	1188	-	-

CURRENT RATING FOR XLPE INSULATED ALUMINIUM CONDUCTOR 1.1 KV GRADE POWER CABLES

TABLE - 9

Nominal size of conductor	CABLE IN GROUND				CABLE IN AIR			
	SINGLE CORE CABLES		Two Core Cable	Three, Three & Half & Four Core	SINGLE CORE CABLES		Two Core Cable	Three, Three & Half & Four Core
	Two Cables	Three Cables			Two Cables	Three Cables		
Sq.mm	Amp.	Amp.	Amp.	Amp.	Amp.	Amp.	Amp.	Amp.
4	42	36	43	34	38	33	39	31
6	52	44	55	43	50	43	50	40
10	69	59	71	57	64	55	67	53
16	90	76	91	73	82	73	88	70
25	116	96	114	94	108	98	117	96
35	139	114	136	113	136	121	133	117
50	162	135	167	133	163	150	162	142
70	199	166	204	164	208	187	204	179
95	241	198	235	196	258	230	251	221
120	273	225	266	223	303	276	287	249
150	305	253	296	249	348	314	328	284
185	347	286	335	282	407	366	378	329
240	407	332	385	326	488	433	448	399
300	458	376	432	367	569	501	513	455
400	518	431	487	418	647	596	593	530
500	592	490	548	470	751	693	683	612
630	666	546	612	542	868	793	784	707
800	737	608	-	-	992	907	-	-
1000	814	665	-	-	1117	1022	-	-

CURRENT RATING (A.C.) FOR COPPER CONDUCTOR 1.1 KV XLPE INSULATED CONTROL CABLES CONF. TO IS:7098 (Part-1) XLPE INSULATION

TABLE - 10

No. of Cores	1.5 Sq. mm		2.5 Sq. mm	
	Laid in Ground	Laid in Air	Laid in Ground	Laid in Air
	Amp.	Amp.	Amp.	Amp.
2	31	27	41	36
3	26	23	34	30
4	26	23	34	30
5	24	21	31	28
6	22	19	29	26
7	21	18	27	25
8	20	18	26	24
9	19	17	25	22
10	18	16	24	21
12	17	15	22	20
14	16	14	21	19
16	16	14	20	18
19	15	13	19	17
21	14	12	18	16
24	13	12	17	16
27	13	11	16	15
30	12	11	15	14
37	11	10	15	13
44	11	9	14	12
52	10	9	13	12
61	9	8	12	11



SOLID / STRANDED CONDUCTOR FOR INSULATED CABLES CONFORMING TO IS:8130

TABLE - 11

Nominal size of conductor Sq.mm	SOLID CONDUCTOR CLASS-1		STRANDED CONDUCTOR CLASS - 2					
	Minimum Resistance Conductor at 20°C		Minimum number of Wires in Conductors				Maximum Resistance Conductor at 20°C	
			Circular Conductor (non-compacted)		Circular Conductor (Shaped Compacted)		Plain Copper	Aluminium
	Plain Copper Ohm / km	Aluminium Ohm / km	Copper	Aluminium	Copper	Aluminium	Ohm / km	Ohm / km
1.5	12.10	18.10	3	3	-	-	12.10	18.10
2.5	7.41	12.10	3	3	-	-	7.41	12.10
4	4.61	7.41	7	3	-	-	4.61	7.41
6	3.08	4.61	7	3	-	-	3.08	4.61
10	-	3.08	7	7	6	-	1.83	3.08
16	-	-	7	7	6	6	1.15	1.91
25	-	-	7	7	6	6	0.727	1.200
35	-	-	7	7	6	6	0.524	0.868
50	-	-	19	19	6	6	0.387	0.641
70	-	-	19	19	12	12	0.268	0.443
95	-	-	19	19	15	15	0.193	0.320
120	-	-	37	37	18	15	0.153	0.253
150	-	-	37	37	18	15	0.1240	0.206
185	-	-	37	37	30	30	0.0991	0.164
240	-	-	61	61	34	30	0.0754	0.125
300	-	-	61	61	34	30	0.0601	0.1000
400	-	-	61	61	53	53	0.0470	0.0778
500	-	-	61	61	53	53	0.0366	0.0605
630	-	-	91	91	53	53	0.0283	0.0469
800	-	-	91	91	53	53	0.0221	0.0367
1000	-	-	91	91	53	53	0.0176	0.0291

CALCULATED VALUE OF A.C. RESISTANCE / REACTANCE / CAPACITANCE OF XLPE CABLES

TABLE - 12

Nominal size of conductor (Sq.mm)	AC resistance of Aluminium Conductor, Maximum Operating Temperature (Ohm/Km) Maximum Conductor Temperature 90°C	Reactance @ 50Hz (Ohm / Km)			Capacitance (Micro Faradas / Km)		
		XLPE INSULATED CABLE		Twin & Multicore	XLPE INSULATED CABLE		Twin & Multicore
		Single Core Cables			Single Core Cables		
		Un-armoured	Armoured	Un-armoured	Armoured		
4	9.48	0.132	-	0.0927	0.29	-	0.22
6	5.90	0.123	-	0.0884	0.34	-	0.25
10	3.94	0.114	0.134	0.0837	0.43	0.32	0.31
16	2.44	0.108	0.125	0.0808	0.51	0.38	0.36
25	1.54	0.1030	0.120	0.0805	0.49	0.38	0.41
35	1.11	0.0986	0.114	0.0783	0.57	0.44	0.47
50	0.820	0.0937	0.108	0.0750	0.58	0.46	0.50
70	0.567	0.0900	0.102	0.0740	0.63	0.51	0.53
95	0.410	0.0865	0.1000	0.0724	0.73	0.59	0.61
120	0.325	0.0841	0.0968	0.0712	0.74	0.61	0.63
150	0.265	0.0839	0.0941	0.0716	0.73	0.61	0.60
185	0.211	0.0836	0.0932	0.0718	0.69	0.59	0.60
240	0.162	0.0813	0.0900	0.0710	0.74	0.64	0.63
300	0.1300	0.0795	0.0881	0.0705	0.80	0.69	0.67
400	0.1023	0.0787	0.0873	0.0704	0.83	0.70	0.67
500	0.0808	0.0779	0.0859	0.0702	0.83	0.71	0.69
630	0.0648	0.0765	0.0843	0.0698	0.87	0.75	0.73
800	0.0530	0.0750	0.0820	-	0.95	0.86	-
1000	0.0440	0.0690	0.0810	-	0.99	0.88	-

SHORT CIRCUIT RATING OF XLPE INSULATED HEAVY DUTY CABLES (FOR ONE SECOND DURATION)

TABLE - 13

Nominal size of conductor	ALUMINIUM CONDUCTOR	COPPER CONDUCTOR
Sq.mm	K.Amp.	K.Amp.
1.5	-	0.210
2.5	-	0.360
4	0.380	0.570
6	0.570	0.860
10	0.940	1.430
16	1.500	2.290
25	2.350	3.580
35	3.290	5.010
50	4.700	7.150
70	6.580	10.010
95	8.930	13.590
120	11.280	17.160
150	14.100	21.450
185	17.390	26.460
240	22.560	34.320
300	28.200	42.900
400	37.600	57.200
500	47.000	71.500
630	59.220	90.090
800	75.500	114.300
1000	94.000	143.000

RATING FACTOR FOR VARIATION IN GROUND AND DUCT TEMPERATURE

TABLE - 14

Temperature °C	Rating Factor (Maximum conductor temperature 90° C)
15	1.12
20	1.08
25	1.04
30	1.00
35	0.96
40	0.91
45	0.87
50	0.82
55	0.78

RATING FACTOR FOR VARIATION IN AMBIENT AIR TEMPERATURE FOR XLPE CABLES

TABLE - 15

Temperature °C	Rating Factor (Maximum conductor temperature 90° C)
25	1.16
30	1.11
35	1.06
40	1.00
45	0.94
50	0.88
55	0.81
60	0.74

RATING FACTOR FOR DEPTH OF LAYING (CABLES LAID DIRECT IN THE GROUND)

TABLE - 16

Depth of Laying Cm	1.1 KV XLPE Cables
90	1.00
105	0.99
120	0.97
150	0.95
180	0.94
200	0.93
250	0.91
300	0.90
or more	

GROUP RATING FACTORS FOR CIRCUITS OF THREE SINGLE - CORE CABLES, IN TREFOIL LAID 'DIRECT IN THE GROUND

TABLE - 17

No. of Circuits	Spacing between Trefoil Group Centres (Cm)				
	Touching	20	40	60	80
2	0.76	0.83	0.87	0.90	0.92
3	0.64	0.72	0.79	0.83	0.86
4	0.58	0.67	0.75	0.80	0.84
5	0.53	0.63	0.71	0.77	0.81
6	0.50	0.60	0.69	0.76	0.80
7	0.47	0.58	0.67	0.74	0.79
8	0.45	0.56	0.66	0.73	-
9	0.43	0.55	0.65	0.73	-
10	0.42	0.54	0.64	-	-
11	0.41	0.53	0.64	-	-
12	0.40	0.52	0.63	-	-



RATING FACTORS FOR CABLES LAID ON RACKS IN AIR WITH CABLE TOUCHING, TRAYS ARE IN TIERS SPACED BY 30cm AND CLEARANCE BETWEEN THE WALL AND CABLE IS 25cm

TABLE - 18

No. of Racks	Number of Cables per Rack				
	1	2	3	6	9
1	1.00	0.84	0.80	0.75	0.73
2	1.00	0.80	0.76	0.71	0.69
3	1.00	0.78	0.74	0.70	0.68
6	1.00	0.76	0.72	0.68	0.66

RATING FACTORS FOR THREE SINGLE CORE CABLES IN TREFOIL ON RACKS IN AIR (WITH SPACING BETWEEN CABLES EQUAL TO TWICE THE CABLE DIAMETER)

TABLE - 19

No. of Racks	Number of Cables per Rack		
	1	2	3
1	1.00	0.98	0.96
2	1.00	0.95	0.93
3	1.00	0.94	0.92
6	1.00	0.93	0.90

GROUP RATING FACTORS FOR MULTICORE CABLES IN GROUND HORIZONTAL FORMATION

TABLE - 20

Number of Cables in group	Spacing			
	Touching	15 cm	30 cm	45 cm
2	0.78	0.81	0.85	0.88
3	0.68	0.71	0.76	0.79
4	0.61	0.65	0.71	0.75
5	0.56	0.60	0.67	0.72
6	0.53	0.57	0.64	0.69
7	0.50	0.55	0.62	0.67
8	0.48	0.53	0.60	0.66
9	0.46	0.51	0.59	0.65
10	0.45	0.50	0.58	0.64

RATING FACTORS FOR MULTICORE CABLES LAID ON RACKS IN AIR (WITH CABLE SPACING BETWEEN CABLES EQUAL TO DIAMETER OF CABLE)

TABLE - 21

Number of racks	Number of cables per rack				
	1	2	3	6	9
1	1.00	0.98	0.96	0.93	0.92
2	1.00	0.95	0.93	0.90	0.89
3	1.00	0.94	0.92	0.89	0.88
6	1.00	0.93	0.90	0.87	0.86

RATING FACTORS FOR VARIATION IN THERMAL RESISTIVITY OF SOIL FOR THREE SINGLE - CORE CABLES AND THREE CORE XLPE CABLES LAID DIRECT IN THE GROUND

TABLE - 22

Nominal size of conductor	Three single core cables Thermal Resistivity of Soil in °C CM/W						Three core cables Thermal Resistivity of Soil in °C CM/W					
	Sq. mm	100	120	150	200	250	300	100	120	150	200	250
25	1.17	1.09	1.00	0.88	0.80	0.74	1.16	1.08	1.00	0.90	0.82	0.75
35	1.18	1.10	1.00	0.88	0.80	0.74	1.16	1.08	1.00	0.90	0.81	0.75
50	1.19	1.10	1.00	0.88	0.80	0.73	1.16	1.08	1.00	0.88	0.81	0.75
70	1.19	1.10	1.00	0.88	0.80	0.73	1.16	1.09	1.00	0.88	0.81	0.75
95	1.19	1.10	1.00	0.88	0.79	0.73	1.16	1.09	1.00	0.88	0.81	0.75
120	1.19	1.10	1.00	0.88	0.79	0.73	1.16	1.09	1.00	0.88	0.81	0.75
150	1.19	1.10	1.00	0.88	0.79	0.73	1.16	1.09	1.00	0.88	0.81	0.75
185	1.19	1.10	1.00	0.88	0.79	0.72	1.16	1.09	1.00	0.88	0.81	0.75
240	1.20	1.11	1.00	0.88	0.79	0.72	1.17	1.09	1.00	0.88	0.81	0.75
300	1.20	1.11	1.00	0.87	0.79	0.72	1.17	1.09	1.00	0.88	0.81	0.75
400	1.20	1.11	1.00	0.87	0.79	0.72	1.17	1.09	1.00	0.88	0.81	0.75
500	1.20	1.11	1.00	0.87	0.79	0.72	1.17	1.09	1.00	0.88	0.81	0.74
630	1.21	1.11	1.00	0.87	0.78	0.72	-	-	-	-	-	-
800	1.21	1.11	1.00	0.87	0.78	0.72	-	-	-	-	-	-
1000	1.21	1.11	1.00	0.87	0.78	0.72	-	-	-	-	-	-

Estimated Voltage Drops in XLPE Cables (Aluminium Conductor)
(Voltage drop unit: Volts/Km/Amps)

TABLE - 23

Cores	Cable Sqmm.																		
	4	6	10	16	25	35	50	70	95	120	150	185	240	300	400	500	630	800	1000
Single Core	18.98	11.80	7.88	4.90	3.08	2.23	1.65	1.15	0.83	0.66	0.55	0.44	0.35	0.30	0.24	0.23	0.21	0.20	0.18
Multi Core	16.44	10.22	6.82	4.24	2.67	1.94	1.44	1.00	0.70	0.56	0.48	0.40	0.30	0.26	0.22	0.20	0.18	----	----

* Above voltage drops (volts/km/amps) to be multiplied with rated current and length of cable in K.M. to calculate total voltage drop in particular length and size of Cables.

Estimated Voltage Drops in XLPE Cables 1100 Volts Armoured Control Cables (Copper Conductor)
(Voltage drop unit: Volts/Km)

TABLE - 24

Sqmm.	No. of Cores																			
	2	3	4	5	6	7	8	9	10	12	14	16	19	24	27	30	37	44	52	61
1.5	725	859	859	644	564	537	510	483	483	456	430	403	376	349	322	295	295	268	268	242
2.5	584	691	691	522	445	430	415	399	384	369	338	322	307	276	261	230	230	215	215	200

"The above Data are approximate and subject to manufacturing tolerance"

GROUP RATING FACTORS FOR TWIN AND MULTI - CORE CABLES IN HORIZONTAL FORMATION, LAID DIRECT IN THE GROUND

TABLE - 25

No. of Cables	Spacing of Cables (Centre to Centre)				
	Touching	15 Cm	30 Cm	45 Cm	60 Cm
2	0.80	0.84	0.87	0.90	0.91
3	0.68	0.74	0.79	0.83	0.86
4	0.62	0.69	0.75	0.80	0.83
5	0.58	0.65	0.72	0.77	0.80
6	0.55	0.62	0.69	0.75	0.78
7	0.52	0.59	0.67	0.73	0.77
8	0.50	0.57	0.66	0.72	0.75
9	0.48	0.55	0.65	0.71	0.75
10	0.46	0.54	0.64	0.70	0.74
11	0.45	0.53	0.63	0.70	0.74
12	0.44	0.52	0.62	0.69	0.73

GROUP RATING FACTORS FOR TWIN AND MULTI - CORE CABLES IN TIER FORMATION, LAID DIRECT IN THE GROUND

TABLE - 26

No. of Cables	No. of Tiers	Spacing of Cables (Centre to Centre)				
		Touching	15 Cm	30 Cm	45 Cm	60 Cm
2	1	0.88	0.84	0.87	0.90	0.91
3	1	0.68	0.74	0.79	0.83	0.86
4	2	0.60	0.66	0.73	0.77	0.79
5	2	0.55	0.61	0.68	0.71	0.73
6	2	0.51	0.57	0.63	0.67	0.69
7	3	0.48	0.54	0.59	0.63	0.64
8	3	0.46	0.51	0.56	0.60	0.61
9	3	0.44	0.48	0.53	0.57	0.58
10	4	0.42	0.47	0.52	0.55	0.56
11	4	0.41	0.46	0.50	0.54	0.55
12	4	0.40	0.45	0.49	0.53	0.54



BENDING RADIUS:

While Installing 'GLOSTER' Cables, the following minimum bending radius should be observed such that the cables, and especially the insulation, are not damaged. Wherever possible, larger bending radii should be used.

RECOMMENDED MINIMUM BENDING RADII

(12 X D) For Multi Core Cables

(15 X D) For Single Core Cables

Where 'D' is the overall diameter of Cables.

TESTING INSULATION RESISTANCE MEASUREMENT OF CABLE

The voltage rating of I R Tester (Megger) should be chosen as following table:

VOLTAGE GRADE OF CABLES	RATING OF IR TESTER (MEGGER)
1.1 KV	500 V

TESTING DURING LAYING:

All new cables shall be megger-tested before jointing. After jointing is completed all cables shall be megger-tested.

JOINTING OF CABLE:

The emphasis should be laid on quality and selection of proper cable accessories, proper jointing techniques and skill and workmanship of the working personnel. The quality of joint should be such that it does not add any resistance to the circuit. The materials and techniques employed should give adequate mechanical and electrical protection to the joints under all service conditions. The joint should further be resistant to corrosion and other chemical effects. Termination and jointing of power and control cables shall be done by means of compression methods using solder less tinned copper/Aluminum terminal lugs.

HIGH VOLTAGE TEST:

Cables after jointing and terminations are subjected to dc high voltage test. The recommended test voltage are given in I.S. 1255 - 1983.

The cable cores must be discharge after completion of dc high voltage test.

AERIAL BUNCHED CABLES

With the growing need for long term economy, safety and reliability overhead conductors are now being replaced by Aerial Bunched Cables both in LT & HT distribution network with limited space for clearance.

APPLICATIONS

Aerial Bunched Cables are specially suitable for the following types of installation conditions:

Where space is limited like those in densely populated area or dense forests.

- Where existing overhead distribution feeders capacity has to be up graded without raising the system voltage with limited budget.
- Temporary installations or for those regions where building plan have not been fully approved.

ADVANTAGES:

- Safety system because phase conductors are insulated, no risk or danger of accidental touching live conductors.
- Accidental short circuit eliminated.

- Supply interruption minimized thus the life of transformers increased.
- Reduction in pole height, elimination of insulators and associated hardwares lowering total cost of system.
- It can be fixed to poles, walls or trees thus easy and economical to install.
- Multiple circuits of power & telephone cable can be strung in the same set of poles or any other supports.

LT AERIAL BUNCHED CABLES.

The LT Aerial Bunched Cables consist of insulated phase conductors (with additional street lighting conductor, if provided) are twisted around the bare/insulated aluminum alloy messenger conductor, which takes all the mechanical stress and also serves as the earth-cum-neutral conductor.

The phase conductors and street lighting conductor are insulated with black weather resistant polyethylene or cross-linked polyethylene.

LT AERIAL BUNCHED CABLES AS PER IS 14255-1995

Size and Requirement of Phase, Street Lighting and Messenger Conductors.									
Phase Conductor (Aluminium)			Street Lighting Conductor			Messenger Conductors.			
			(Aluminium)			(Aluminium)			
Nominal Area	Maximum conductor D.C. resistance at 20deg.C	Nominal thickness of insulation XLPE / PE	Nominal Area	Maximum conductor D.C. resistance at 20deg.C	Nominal thickness of insulation XLPE / PE	Nominal Area	Maximum conductor D.C. resistance at 20deg.C	Maximum breaking load	AC Current rating in Air at 40 deg.C
Sq.mm	Ohm / Km	mm	Sq.mm	Ohm / Km	mm	Sq.mm	Ohm / Km	'kN	Amps
16	1.91	1.2	16	1.91	1.2	25	1.38	7	64
25	1.2	1.2	16	1.91	1.2	25	1.38	7	84
35	0.868	1.2	16	1.91	1.2	25	1.35	7	105
50	0.641	1.5	16	1.91	1.2	35	0.986	9.5	130
70	0.443	1.5	16	1.91	1.2	50	0.689	14	152
95	0.32	1.5	16	1.91	1.2	70	0.942	19.7	185

HIGH VOLTAGE CABLES

Cross Linked Polyethylene Cable i.e. XLPE Cable was developed in late 1970 to overcome the susceptibility of PILC Cables to ingress of moisture. Hence the advent of XLPE cables marked the beginning of a gradual but steady replacement of Paper Cables in almost all voltage applications.

The excellent thermal properties of XLPE Cable permit maximum continuous conductor operating temperature of 90°C and short circuit temperature of 250°C. Moreover, it has low dielectric loss, which does not vary much over the entire operating temperature range. These characteristics, along with the low dielectric constant, make XLPE Cable particularly suitable for high voltage applications. Given below are additional outstanding features.

HIGH CONTINUOUS CURRENT RATING:

Its ability to withstand higher operating temperature of 90°C enables much higher current rating than those of PVC or PILC cables.

HIGH SHORT CIRCUIT RATING:

Maximum allowable conductor temperature during short circuit of 250°C is considerably higher than for PVC or PILC Cables resulting in greater short circuit withstand capacity.

HIGH EMERGENCY LOAD CAPACITY:

XLPE Cables can be operated even at 130°C during emergency, therefore in systems, where cables are installed in parallel; failure of one of two cables will not bring down the system capacity for some time.

LOW DIELECTRIC LOSSES:

XLPE Cables have low dielectric loss angle. Moreover, these losses occur continuously in every charged cable whether it carries load or not. Hence use of XLPE Cable at higher voltage would result in considerable saving in costs.

LOWER CHARGING CURRENTS:

The charging currents are considerably lower permitting close setting of protection relays.

EASY LAYING AND INSTALLATION:

Low weight and small bending radii make laying and installation of cable very easy. The cable requires less supports due to low weight.

HIGH SAFETY:

Cables have High safety against mechanical damage and vibrations.

APPLICATIONS:

- 1 Used extensively in all power generating plants and industrial plants.
- 2 Used in chemical and fertilizer units where cables are exposed to chemical corrosion.
- 3 Used in heavy industries where severe load fluctuations occur.
- 4 Used in systems where there are frequent over voltages.
- 5 Used at higher ambient temperatures on account of their higher operating temperatures.
- 6 Used even under most difficult cable route conditions such as city distribution network.

DESIGN AND CONSTRUCTION

CONDUCTOR

The conductors made from E.C. grade aluminum wires, are stranded together and compacted. All sizes of conductors of single or three core cables are circular in shape.

Conductor construction and testing comply to IS 8130-1984 as amended up to date.

Cables with copper conductor can also be offered.

CONDUCTOR SCREENING

Conductor screening is employed for all cables above 3.3 KV grade in the form of a semi conducting extrusion over the conductor.

XLPE INSULATION

High quality XLPE unfilled insulating compound of natural color is used for insulation. Insulation is applied by extrusion process and is chemically cross-linked by silane process.

A tough Outer Sheath of Heat Resisting PVC compound (Type ST2) as per IS - 5831 is extruded over the armouring in case of armoured cables or over non-magnetic metallic tape covering the insulation or over the non-magnetic metallic part of insulation screening in case of unarmoured single core cables. This is always black in color for best resistance to outdoor exposure. The Outer Sheath is embossed with "Gloster", the voltage grade and the year of manufacture.

CORE IDENTIFICATION

The Core identification complies with the requirements of IS-7098 (Part II) as shown below:

- By numerals (1, 2, 3) printed on cores. OR
- By colored strips applied on the cores.

OUTER SHEATH:

A tough Outer Sheath of Heat Resisting PVC compound (Type ST2) as per IS - 5831 is extruded over the armouring in case of armoured cables or over non-magnetic metallic tape covering the insulation or over the non-magnetic metallic part of insulation screening in case of unarmoured single core cables. This is always black in color for best resistance to outdoor exposure. The Outer Sheath is embossed with "Gloster", the voltage grade and the year of manufacture.

CORE IDENTIFICATION

The Core identification complies with the requirements of IS-7098 (Part II) as shown below:

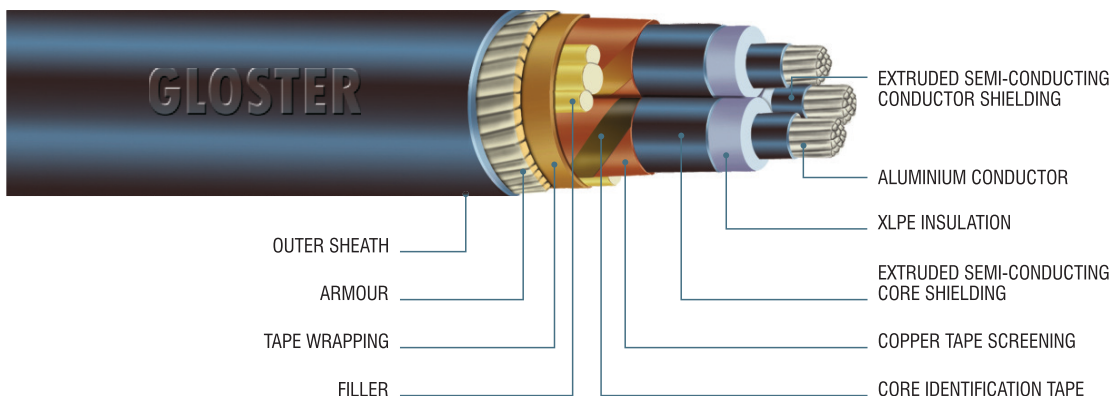
- By numerals (1, 2, 3) printed on cores. OR
- By colored strips applied on the cores.

TESTING AND QUALITY ASSURANCE

XLPE Cables are manufactured under advanced manufacturing and testing facilities. The cables are type tested and routine tested in accordance with IS - 7098 (Part - II) 1985.

The following tests are carried out as routine tests on every length of cables manufactured:

- Conductor resistance test
- Partial discharge tes
- High Voltage test



TEST VOLTAGES:

The following test voltage is applied between conductor and screen / armour:

VOLTAGE RATING OF CABLES	TEST VOLTAGE
1.9/3.3 or 3.3/3.3KV	10 KV (rms) for 5 Minutes
3.8/6.6 KV (E)	12 KV (rms) for 5 Minutes
6.35/11 KV (E)	17 KV (rms) for 5 Minutes
11/11 KV (UE)	28 KV (rms) for 5 Minutes
12.7/22 KV (E)	32 KV (rms) for 5 Minutes
19/33 KV (E)	48 KV (rms) for 5 Minutes

In order to achieve consistency in quality, in addition to above tests, rigorous quality control measures are effected at every stage of production. Accordingly every batch of raw materials and process cables are tested to check for their physical and electrical properties.

SHORT CIRCUIT RATING OF HT XLPE CABLES:

Thermally admissible short circuit current are depicted in the graph below:-

Full load conductor temperature prior to short circuit 90° C

Maximum short circuit conductor temperature: 250° C

Formula $I_k = 0.094 A / \sqrt{t}$

I_k : Short Circuit Current In KA (rms)

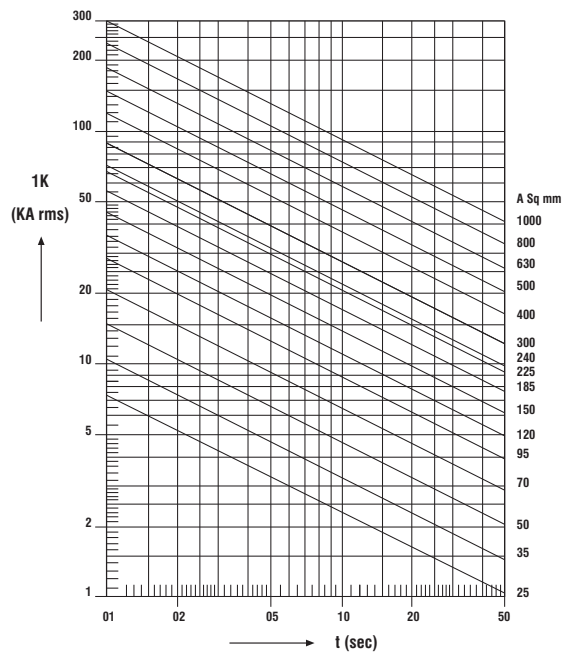
t : Duration of short circuit in seconds

A: Area of aluminum conductor in mm²

Short circuit ratings of cables for one-second duration are given in the respective tables 1-10. For any other duration of t seconds divide the value given in the respective table by (\sqrt{t}) .

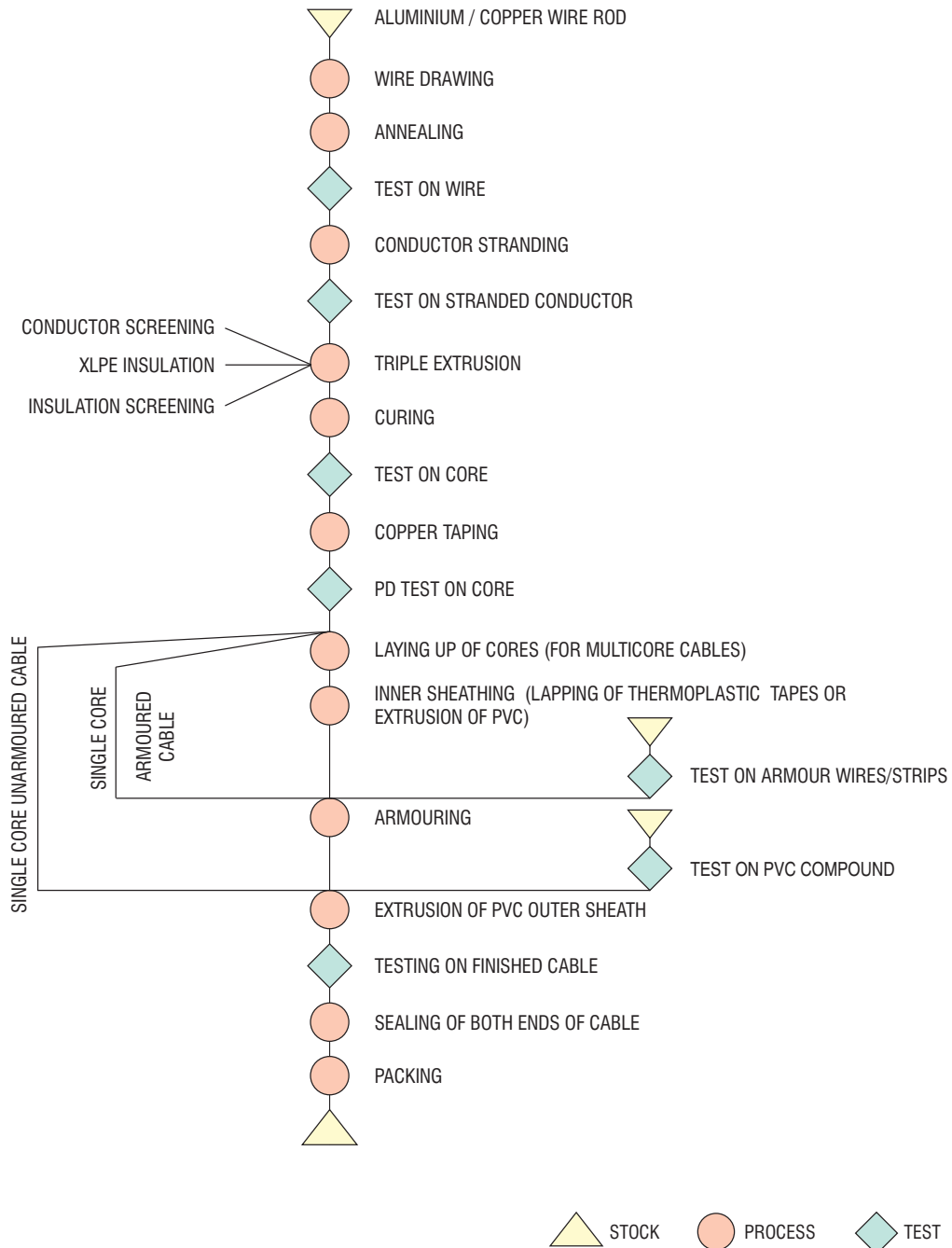
OPERATING CHARACTERISTICS:

The construction data and current rating of cables with aluminum conductor are shown in tables. These are based on standard conditions of installations as provided below:



Maximum continuous operating conductor temperature for XLPE Cables	= 90° C
Standard ground temperature	= 30° C
Ambient air temperature	= 40° C
Thermal Resistivity of soil	= 150° C
Depth of laying (for cables laid direct in ground)	= 90 cms for cables up to 11 KV (E) / (UE) grade = 105 cms for 22KV and 33 KV grade cables

**FLOW CHART FOR MANUFACTURING PROCESSES AND QUALITY CONTROL
CHECKS FOR XLPE CABLES CONFORMING TO IS: 7098 (PART - II) 85**



3.3 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, UNSCREENED, ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 1

Nominal area of conductor	UNARMoured CABLE				HARD DRAWN ALUMINIUM WIRE ARMOUR					CURRENT RATING	
	Nominal thickness of insulation	Nominal thickness of sheath	Approx overall dia of cable	Approx wt of cable	Nominal thickness of insulation	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx overall dia of cable	Approx wt of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	kg/km	mm	mm	mm	mm	kg/km	Amps	Amps
25	2.2	1.8	14.4	240	2.5	1.4	1.24	17.0	340	97	104
35	2.2	1.8	15.4	310	2.5	1.4	1.24	18.0	390	115	127
50	2.2	1.8	16.5	330	2.5	1.4	1.4	19.0	460	136	153
70	2.2	1.8	18.0	410	2.5	1.6	1.4	21.0	580	166	192
95	2.2	2.0	20.0	550	2.5	1.6	1.4	23.0	670	196	237
120	2.2	2.0	21.6	720	2.5	1.6	1.4	24.5	790	225	275
150	2.2	2.0	23.0	850	2.5	1.6	1.4	26.0	870	253	317
185	2.2	2.0	25.0	1010	2.5	1.6	1.4	27.5	1010	285	362
240	2.2	2.0	27.0	1250	2.5	1.6	1.56	30.0	1230	330	433
300	2.2	2.0	29.0	1490	2.6	1.6	1.56	32.2	1440	373	504
400	2.2	2.2	32.4	1890	2.6	2.0	1.56	36.0	1780	427	598
500	2.4	2.2	36.0	2360	2.8	2.0	1.56	39.2	2170	485	694
630	2.6	2.2	40.0	2940	3.1	2.0	1.72	43.6	2700	551	815
800	2.8	2.4	44.5	3720	3.3	2.0	1.88	58.6	3360	625	969
1000	3.0	2.6	50.0	4630	3.6	2.5	2.04	54.3	4320	692	1103

3.8 / 6.6 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, SCREENED, ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 2

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE			HARD DRAWN ALUMINIUM WIRE ARMOUR				CURRENT RATING	
		Nominal thickness of sheath	Approx overall dia of cable	Approx wt of cable	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx overall dia of cable	Approx wt of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
25	2.8	1.8	18.0	350	1.6	1.40	21.3	520	97	106
35	2.8	2.0	19.3	420	1.6	1.40	22.3	580	118	130
50	2.8	2.0	20.4	470	1.6	1.40	23.4	650	136	156
70	2.8	2.0	22.0	570	1.6	1.40	25.1	760	166	196
95	2.8	2.0	23.6	680	1.6	1.40	26.7	870	197	239
120	2.8	2.0	25.1	780	1.6	1.40	28.2	990	224	286
150	2.8	2.0	26.4	880	1.6	1.56	29.8	1120	252	318
185	2.8	2.0	28.0	1000	1.6	1.56	31.7	1280	284	368
240	2.8	2.2	31.0	1230	2.0	1.56	35.0	1560	329	440
300	3.0	2.2	33.3	1460	2.0	1.56	37.5	1820	372	509
400	3.3	2.2	36.8	1790	2.0	1.72	41.3	2220	427	602
500	3.5	2.4	40.8	2220	2.0	1.88	45.5	2720	485	699
630	3.5	2.4	44.0	2670	2.0	1.88	48.7	3210	551	817
800	3.5	2.6	48.5	3290	2.5	2.04	54.1	4050	624	965
1000	3.6	2.8	52.9	4010	2.5	2.20	58.8	4920	692	1096



6.35 / 11 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, SCREENED / ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 3

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE			HARD DRAWN ALUMINIUM WIRE ARMOUR				CURRENT RATING	
		Nominal thickness of sheath	Approx overall dia of cable	Approx wt of cable	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx overall dia of cable	Approx wt of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
25	3.6	2.0	20.0	420	1.6	1.40	23.0	600	97	107
35	3.6	2.0	21.0	470	1.6	1.40	24.0	660	115	134
50	3.6	2.0	22.0	530	1.6	1.40	25.0	730	135	160
70	3.6	2.0	23.5	630	1.6	1.40	26.6	830	165	200
95	3.6	2.0	25.0	740	1.6	1.40	28.3	960	197	245
120	3.6	2.0	26.7	850	1.6	1.56	30.2	1100	224	286
150	3.6	2.0	28.0	960	1.6	1.56	31.4	1210	251	324
185	3.6	2.2	30.0	1110	2.0	1.56	34.5	1440	283	373
240	3.6	2.2	32.4	1310	2.0	1.56	36.6	1670	328	445
300	3.6	2.2	34.5	1520	2.0	1.56	38.8	1900	371	513
400	3.6	2.2	37.5	1820	2.0	1.72	42.0	2270	425	603
500	3.6	2.4	41.0	2240	2.0	1.72	45.3	2690	484	705
630	3.6	2.4	44.0	2690	2.0	1.88	48.8	3230	550	821
800	3.6	2.6	48.6	3300	2.5	2.04	54.3	4100	623	964
1000	3.6	2.8	52.8	4010	2.5	2.20	58.8	4920	690	1094

11 / 11 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, SCREENED / ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 4

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE			HARD DRAWN ALUMINIUM WIRE ARMOUR				CURRENT RATING	
		Nominal thickness of sheath	Approx overall dia of cable	Approx wt of cable	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx overall dia of cable	Approx wt of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
25	5.5	2.0	24.0	560	1.6	1.40	26.8	770	97	112
35	5.5	2.0	25.0	620	1.6	1.40	27.8	840	115	137
50	5.5	2.0	26.0	690	1.6	1.56	29.3	940	136	165
70	5.5	2.0	27.5	790	1.6	1.56	31.0	1060	166	206
95	5.5	2.0	29.0	920	2.0	1.56	33.3	1220	198	250
120	5.5	2.2	31.0	1060	2.0	1.56	35.2	1390	225	291
150	5.5	2.2	32.0	1180	2.0	1.56	36.5	1510	252	330
185	5.5	2.2	34.0	1310	2.0	1.56	38.3	1680	285	379
240	5.5	2.2	36.0	1530	2.0	1.72	40.8	1960	330	450
300	5.5	2.2	38.4	1750	2.0	1.72	43.0	2210	373	518
400	5.5	2.4	42.0	2110	2.0	1.88	46.5	2620	427	608
500	5.5	2.4	45.0	2500	2.5	2.04	51.0	3280	486	709
630	5.5	2.6	48.5	3020	2.5	2.04	54.1	3810	553	822
800	5.5	2.8	53.0	3890	2.5	2.20	58.9	4580	628	964
1000	5.5	2.8	56.9	4350	2.5	2.36	63.1	5380	697	1090

12.7 / 22 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, SCREENED / ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 5

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE			HARD DRAWN ALUMINIUM WIRE ARMOUR				CURRENT RATING	
		Nominal thickness of sheath	Approx overall dia of cable	Approx wt of cable	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx overall dia of cable	Approx wt of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
35	6.0	2.0	26.0	670	1.6	1.40	29.0	900	114	143
50	6.0	2.0	27.0	740	1.6	1.56	30.4	990	134	167
70	6.0	2.0	28.5	840	1.6	1.56	32.1	1110	164	207
95	6.0	2.2	30.5	1000	2.0	1.56	34.9	1320	195	253
120	6.0	2.2	32.0	1120	2.0	1.56	36.4	1460	221	291
150	6.0	2.2	33.5	1240	2.0	1.56	37.7	1580	250	333
185	6.0	2.2	35.0	1370	2.0	1.56	39.4	1760	280	380
240	6.0	2.2	37.4	1590	2.0	1.72	42.0	2040	326	450
300	6.0	2.2	39.6	1820	2.0	1.72	44.1	2290	367	521
400	6.0	2.4	43.0	2180	2.0	1.88	47.6	2700	420	616
500	6.0	2.6	46.4	2620	2.5	2.04	52.1	3380	478	709
630	6.0	2.6	49.6	3100	2.5	2.04	55.2	3900	530	770
800	6.0	2.8	54.0	3730	2.5	2.20	60.1	4700	590	920
1000	6.0	3.0	58.2	4500	2.5	2.36	64.1	5490	640	980

19 / 33 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, SCREENED / ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 6

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE			HARD DRAWN ALUMINIUM WIRE ARMOUR				CURRENT RATING	
		Nominal thickness of sheath	Approx overall dia of cable	Approx wt of cable	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx overall dia of cable	Approx wt of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
50	8.8	2.2	33.0	1060	2.0	1.56	37.3	1400	135	170
70	8.8	2.2	35.0	1180	2.0	1.56	38.9	1540	165	212
95	8.8	2.2	36.0	1320	2.0	1.72	40.9	1730	196	258
120	8.8	2.2	38.0	1450	2.0	1.72	42.4	1880	223	297
150	8.8	2.2	39.0	1580	2.0	1.72	43.7	2020	250	339
185	8.8	2.4	41.3	1770	2.0	1.72	46.0	2270	282	386
240	8.8	2.4	43.6	2010	2.0	1.88	48.2	2530	326	464
300	8.8	2.6	46.0	2300	2.5	2.04	51.7	3050	369	526
400	8.8	2.6	49.0	2650	2.5	2.04	54.6	3450	423	617
500	8.8	2.8	52.6	3120	2.5	2.20	58.5	4020	481	713
630	8.8	2.8	56.0	3640	2.5	2.20	62.0	4630	530	770
800	8.8	3.0	60.2	4340	2.5	2.36	66.2	5330	590	920
1000	8.8	3.2	64.5	5120	3.15	2.52	72.0	6380	640	980



1.9 / 3.3 KV & 3.3 / 3.3 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured, AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 7

Nominal area of conductor	Nominal thickness of insulation	Nominal thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMoured				FLAT GALVANISED STEEL STRIP ARMoured				CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
25	2.2	0.3	1.6	1.56	30.2	1360.0	4.0x0.80	1.40	28.2	1070.0	93	97
35	2.2	0.3	1.6	1.56	32.3	1600.0	4.0x0.80	1.56	30.7	1260.0	111	119
50	2.2	0.4	2.0	1.56	35.7	2070.0	4.0x0.80	1.56	33.3	1550	132	148
70	2.2	0.4	2.0	1.56	39.1	2470.0	4.0x0.80	1.56	36.7	1870	160	185
95	2.2	0.4	2.0	1.72	43.0	2740.0	4.0x0.80	1.72	40.7	2250	192	225
120	2.2	0.5	2.0	1.88	46.7	3410.0	4.0x0.80	1.72	44.0	2660	218	253
150	2.2	0.5	2.5	2.04	50.9	4280.0	4.0x0.80	1.88	46.3	3080	245	290
185	2.2	0.5	2.5	2.04	54.8	4890.0	4.0x0.80	2.04	51.4	3600	275	330
240	2.2	0.6	2.5	2.20	60.1	5790.0	4.0x0.80	2.20	56.7	4410	318	400
300	2.2	0.6	2.5	2.36	65.1	6690.0	4.0x0.80	2.20	61.3	5100	360	453
400	2.2	0.7	3.15	2.68	73.4	8890.0	4.0x0.80	2.52	68.5	6370	410	530

3.8 / 6.6 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured, AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 8

Nominal area of conductor	Nominal thickness of insulation	Nominal thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMoured				FLAT GALVANISED STEEL STRIP ARMoured				CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
25	2.8	0.4	2.00	1.72	38.4	2260.0	4.0x0.80	1.56	36.0	1640	94	100
35	2.8	0.4	2.00	1.72	40.6	2510.0	4.0x0.80	1.72	38.5	1880	111	121
50	2.8	0.5	2.00	1.88	43.6	2840.0	4.0x0.80	1.72	41.0	2120	130	145
70	2.8	0.5	2.00	1.88	47.0	3240.0	4.0x0.80	1.88	45.0	2540	160	181
95	2.8	0.5	2.50	2.04	51.8	4140.0	4.0x0.80	1.88	48.5	2970	191	221
120	2.8	0.6	2.50	2.20	55.6	4770.0	4.0x0.80	2.04	52.0	3440	217	254
150	2.8	0.6	2.50	2.20	58.4	5210.0	4.0x0.80	2.20	55.0	3900	243	290
185	2.8	0.6	2.50	2.36	62.6	5960.0	4.0x0.80	2.20	59.0	4460	274	330
240	2.8	0.7	3.15	2.52	69.2	7670.0	4.0x0.80	2.36	64.5	5310	317	390
300	3.0	0.7	3.15	2.68	74.9	8810.0	4.0x0.80	2.52	70.2	6280	358	450
400	3.3	0.7	4.00	3.00	84.9	11720.0	4.0x0.80	2.84	78.6	7790	408	525

6.6 / 6.6 KV & 6.35 / 11 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured, AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 9

Nominal area of conductor	Nominal thickness of insulation	Nominal thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMoured				FLAT GALVANISED STEEL STRIP ARMoured				CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
25	3.6	0.4	2.0	1.72	42.0	2540.0	4.0x0.80	1.72	40.0	1940	93	100
35	3.6	0.5	2.0	1.88	45.0	2890.0	4.0x0.80	1.72	42.4	2160	111	121
50	3.6	0.5	2.5	2.04	48.4	3600.0	4.0x0.80	1.88	45.0	2400	130	145
70	3.6	0.5	2.5	2.04	52.0	4100.0	4.0x0.80	1.88	48.5	2840	160	181
95	3.6	0.6	2.5	2.20	56.0	4660.0	4.0x0.80	2.04	52.0	3360	191	221
120	3.6	0.6	2.5	2.36	59.5	5270.0	4.0x0.80	2.20	56.0	3840	217	254
150	3.6	0.6	2.5	2.36	62.4	5770.0	4.0x0.80	2.20	59.0	4260	243	290
185	3.6	0.7	3.15	2.52	68.0	7220.0	4.0x0.80	2.36	63.0	4900	274	330
240	3.6	0.7	3.15	2.68	73.2	8260.0	4.0x0.80	2.52	68.5	5790	317	390
300	3.6	0.7	3.15	2.84	78.0	9300.0	4.0x0.80	2.68	73.3	6670	357	450
400	3.6	0.7	4.00	3.00	86.3	11990.0	4.0x0.80	2.84	80.0	7970	408	525

11 / 11 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured, AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 10

Nominal area of conductor	Nominal thickness of insulation	Nominal thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMoured				FLAT GALVANISED STEEL STRIP ARMoured				CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
25	5.5	0.5	2.50	2.04	52.0	3860	4.0x0.80	1.88	49.0	2570.0	94	100
35	5.5	0.5	2.50	2.20	55.0	4210	4.0x0.80	2.04	51.0	2820.0	112	121
50	5.5	0.6	2.50	2.20	57.5	4550	4.0x0.80	2.20	54.0	3130.0	131	145
70	5.5	0.6	2.50	2.36	61.0	5250	4.0x0.80	2.20	57.8	3560.0	160	181
95	5.5	0.6	3.15	2.52	66.4	6560	4.0x0.80	2.36	62.0	4100.0	191	221
120	5.5	0.7	3.15	2.52	70.0	7190	4.0x0.80	2.52	65.0	4620.0	217	257
150	5.5	0.7	3.15	2.68	73.0	7810	4.0x0.80	2.52	68.0	5030.0	243	290
185	5.5	0.7	3.15	2.84	77.2	8640	4.0x0.80	2.68	72.5	5740.0	273	330
240	5.5	0.7	3.15	3.00	82.2	9760	4.0x0.80	2.84	77.5	6630.0	316	390
300	5.5	0.7	4.00	3.00	88.6	12010	4.0x0.80	3.00	82.5	7600.0	357	448
400	5.5	0.7	4.00	3.00	94.8	13640	4.0x0.80	3.00	88.6	8890.0	408	523



12.7 / 22 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured, AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 11

Nominal area of conductor	Nominal thickness of insulation	Nominal thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMoured				FLAT GALVANISED STEEL STRIP ARMoured				CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
35	6.0	0.6	2.50	2.20	57.0	4570	4.0x0.80	2.04	53.5	3170	110	132
50	6.0	0.6	2.50	2.36	59.1	4910	4.0x0.80	2.20	56.0	3520	129	157
70	6.0	0.6	2.50	2.36	63.5	5430	4.0x0.80	2.36	60.0	4010	158	194
95	6.0	0.7	3.15	2.52	69.0	6870	4.0x0.80	2.36	64.0	4560	188	224
120	6.0	0.7	3.15	2.68	72.4	7540	4.0x0.80	2.52	67.0	5100	213	257
150	6.0	0.7	3.15	2.68	75.2	8160	4.0x0.80	2.68	70.4	5630	239	292
185	6.0	0.7	3.15	2.84	79.5	8990	4.0x0.80	2.68	74.3	6270	269	332
240	6.0	0.7	4.00	3.00	86.2	11250	4.0x0.80	2.84	79.4	7230	312	390
300	6.0	0.7	4.00	3.00	90.8	12390	4.0x0.80	3.00	84.3	8200	352	448
400	6.0	0.7	4.00	3.00	96.9	14030	4.0x0.80	3.00	90.5	9520	402	523

19 / 33 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured, AND PVC SHEATHED CABLES CONFORMING TO IS : 7098 (PART - 2)

TABLE - 12

Nominal area of conductor	Nominal thickness of insulation	Nominal thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMoured				FLAT GALVANISED STEEL STRIP ARMoured				CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx overall diameter of cable	Approx weight of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	Amps	Amps
50	8.8	0.7	3.15	2.68	74.9	7540	4.0x0.80	2.52	69.6	5010	130	158
70	8.8	0.7	3.15	2.84	78.4	8240	4.0x0.80	2.68	73.3	5580	158	198
95	8.8	0.7	3.15	3.00	82.2	8960	4.0x0.80	2.84	77.0	6130	188	236
120	8.8	0.7	4.00	3.00	87.0	10880	4.0x0.80	2.84	80.3	6780	214	270
150	8.8	0.7	4.00	3.00	90.0	11570	4.0x0.80	3.00	83.5	7360	239	293
185	8.8	0.7	4.00	3.00	93.9	12420	4.0x0.80	3.00	87.4	8070	270	348
240	8.8	0.7	4.00	3.00	99.0	13630	4.0x0.80	3.00	92.1	9050	312	408
300	8.8	0.7	4.00	3.00	103.2	14850	4.0x0.80	3.00	98.8	10020	352	449
400	8.8	0.7	4.00	3.00	109.4	16610	4.0x0.80	3.00	102.9	11370	402	522

STRANDED CONDUCTOR FOR INSULATED CABLES CONFORMING TO IS:8130

TABLE - 13

Nominal size of conductor	STRANDED CONDUCTOR CLASS - 2					
	Minimum number of Wires in Conductors				Maximum dc Resistance Conductor at 20°C	
	Circular Conductor (non-compacted)		Circular Conductor Shaped Conductor		Plain Copper	Aluminium
Sq.mm	Copper	Aluminium	Copper	Aluminium	Ohm / km	Ohm / km
25	7	7	6	6	0.727	1.200
35	7	7	6	6	0.524	0.868
50	19	19	6	6	0.387	0.641
70	19	19	12	12	0.268	0.443
95	19	19	15	15	0.193	0.320
120	37	37	18	15	0.153	0.253
150	37	37	18	15	0.1240	0.206
185	37	37	30	30	0.0991	0.164
240	61	37	34	30	0.0754	0.125
300	61	61	34	30	0.0601	0.1000
400	61	61	53	53	0.0470	0.0778
500	61	61	53	53	0.0366	0.0605
630	91	91	53	53	0.0283	0.0469
800	91	91	53	53	0.0221	0.0367
1000	91	91	53	53	0.0176	0.0291

SHORT CIRCUIT RATING OF XLPE INSULATED HEAVY DUTY CABLES (FOR ONE SECOND DURATION)

TABLE - 14

Nominal size of conductor	ALUMINIUM CONDUCTOR	COPPER CONDUCTOR
Sq.mm	K.Amp.	K.Amp.
25	2.350	3.580
35	3.290	5.010
50	4.700	7.150
70	6.580	10.010
95	8.930	13.590
120	11.280	17.160
150	14.100	21.450
185	17.390	26.460
240	22.560	34.320
300	28.200	42.900
400	37.600	57.200
500	47.000	71.500
630	59.220	90.090
800	75.200	114.300
1000	94.000	143.000

AC RESISTANCE TO CIRCULAR / COMPACTED CONDUCTORS FOR INSULATED CABLES CONFORMING

TABLE - 15

Nominal area	Minimum number of wires		Max A C resistance at 90°C (Copper)	AC resistance at 90°C (Aluminium)
	Circular Conductor	Compacted Conductors		
Sq mm	mm	mm	(ohm/km)	(ohm/km)
25	7	6	0.927	1.5400
35	7	6	0.669	1.1100
50	19	6	0.494	0.8220
70	19	12	0.343	0.5680
95	19	15	0.247	0.4110
120	37	15	0.197	0.3250
150	37	15	0.161	0.2650
185	37	30	0.130	0.2110
240	37	30	0.0966	0.1620
300	61	30	0.0769	0.1300
400	61	53	0.0602	0.1020
500	61	53	0.0468	0.0804
630	91	53	0.0369	0.0639
800	91	53	0.0285	0.0518
1000	91	53	0.0227	0.0432

CALCULATED VALUE OF REACTANCE FOR THREE CORE CABLES TABLE - 16

Nominal area (Sq mm)	Reactance (ohms/km) (at 50Hz)					
	3.3 KV	3.8/6.6 KV	6.35/11 KV	11/11 KV	12.7/22 KV	19/33 KV
25	0.098	0.120	0.125	0.140	-	-
35	0.094	0.114	0.119	0.134	0.137	-
50	0.086	0.110	0.114	0.128	0.131	0.146
70	0.084	0.101	0.105	0.118	0.121	0.138
95	0.081	0.097	0.101	0.112	0.115	0.128
120	0.078	0.094	0.098	0.108	0.111	0.124
150	0.076	0.092	0.095	0.105	0.108	0.120
185	0.075	0.088	0.091	0.101	0.103	0.115
240	0.073	0.086	0.088	0.097	0.099	0.110
300	0.072	0.085	0.086	0.094	0.096	0.106
400	0.071	0.084	0.083	0.091	0.093	0.102

CALCULATED VALUE OF REACTANCE FOR THREE SINGLE CORE CABLES (CABLES IN TREFOIL TOUCHING)

TABLE - 17

Nominal area (Sq mm)	3.8/6.6 KV		6.35/11 KV		11/11 KV		12.7/22 KV		19/33 KV	
	Un Arm	Arm.	Un Arm	Arm.	Un Arm	Arm.	Un Arm	Arm.	Un Arm	Arm.
25	0.139	0.149	0.146	0.164	0.154	0.164	-	-	-	-
35	0.132	0.142	0.137	0.156	0.146	0.156	0.149	0.158	-	-
50	0.125	0.133	0.128	0.147	0.138	0.147	0.140	0.149	0.153	0.161
70	0.117	0.127	0.121	0.139	0.130	0.139	0.133	0.14	0.144	0.152
95	0.111	0.121	0.115	0.133	0.124	0.132	0.126	0.134	0.137	0.145
120	0.106	0.116	0.111	0.127	0.119	0.126	0.121	0.13	0.131	0.140
150	0.104	0.113	0.108	0.124	0.115	0.124	0.117	0.126	0.128	0.135
185	0.101	0.109	0.105	0.12	0.112	0.120	0.114	0.122	0.123	0.130
240	0.0977	0.105	0.101	0.117	0.108	0.116	0.11	0.118	0.119	0.126
300	0.0955	0.104	0.0976	0.113	0.104	0.112	0.106	0.113	0.115	0.122
400	0.094	0.102	0.0952	0.11	0.102	0.109	0.103	0.11	0.111	0.117
500	0.0928	0.0998	0.0931	0.107	0.0983	0.105	0.1	0.107	0.108	0.113
630	0.0899	0.0964	0.0901	0.104	0.0956	0.102	0.0969	0.103	0.104	0.111
800	0.0881	0.0938	0.0876	0.0998	0.0917	0.0971	0.0934	0.0997	0.0995	0.105
1000	0.0854	0.0918	0.0857	0.0983	0.0899	0.0959	0.0911	0.097	0.0967	0.102

CAPACITANCE VALUE OF XLPE INSULATED CABLES (AT 50 HZ)

TABLE - 18

Nominal area (Sq mm)	Capacitance (mfd/km)					
	3.3 KV	3.8/6.6 KV	6.35/11 KV	11/11 KV	12.7/22 KV	19/33 KV
25	0.260	0.237	0.198	0.149	-	-
35	0.293	0.264	0.219	0.163	0.154	-
50	0.330	0.293	0.242	0.178	0.168	0.132
70	0.382	0.336	0.275	0.201	0.189	0.146
95	0.438	0.381	0.310	0.224	0.210	0.162
120	0.484	0.418	0.339	0.243	0.228	0.174
150	0.530	0.454	0.368	0.262	0.246	0.186
185	0.592	0.504	0.407	0.288	0.269	0.203
240	0.666	0.563	0.453	0.319	0.297	0.222
300	0.741	0.586	0.500	0.350	0.326	0.242
400	0.837	0.605	0.560	0.389	0.362	0.267
500	0.864	0.622	0.60	0.40	0.374	0.27
630	0.882	0.680	0.66	0.44	0.410	0.29
800	0.946	0.764	0.74	0.51	0.460	0.34
1000	0.992	0.830	0.830	0.58	0.520	0.37

RATING FACTOR FOR VARIATION IN GROUND AND DUCT TEMPERATURE FOR

TABLE- 19

Temperature °C	15	20	25	30	35	40	45	50	55
Rating Factor (Maximum conductor temperature 90°C)	1.12	1.08	1.04	1.00	0.96	0.91	0.87	0.82	0.78

RATING FACTOR FOR VARIATION IN AMBIENT AIR TEMPERATURE FOR XLPE CABLES

TABLE- 20

Temperature °C	25	30	35	40	45	50	55	60
Rating Factor (Maximum conductor temperature 90°C)	1.16	1.11	1.06	1.00	0.94	0.88	0.81	0.74

**RATING FACTOR
FOR DEPTH OF LAYING
(CABLES LAID DIRECT
IN THE GROUND)**

TABLE - 21

Depth of Laying Cm	22433 KV Cables	
	UP TO 11 KV XLPE Cables	22433 KV Cables
90	1.00	-
105	0.99	1.00
120	0.97	0.99
150	0.95	0.97
180	0.94	0.96
200	0.93	0.94
250	0.91	0.93
300	0.90	0.92
or more		

**GROUP RATING FACTORS FOR CIRCUITS OF
THREE SINGLE - CORE CABLES,
IN TREFOIL LAID 'DIRECT IN THE GROUND**

TABLE - 22

No. of Circuits	Spacing between Trefoil Group Centres (Cm)				
	Touching	20	40	60	80
2	0.76	0.83	0.87	0.90	0.92
3	0.64	0.72	0.79	0.83	0.86
4	0.58	0.67	0.75	0.80	0.84
5	0.53	0.63	0.71	0.77	0.81
6	0.50	0.60	0.69	0.76	0.80
7	0.47	0.58	0.67	0.74	0.79
8	0.45	0.56	0.66	0.73	-
9	0.43	0.55	0.65	0.73	-
10	0.42	0.54	0.64	-	-
11	0.41	0.53	0.64	-	-
12	0.40	0.52	0.63	-	-

**RATING FACTORS FOR CABLES LAID ON RACKS IN AIR
WITH CABLE TOUCHING, TRAYS ARE IN TIERS SPACED
BY 30cm AND CLEARANCE BETWEEN THE WALL AND
CABLE IS 25cm**

TABLE - 23

No. of Racks	Number of Cables per Rack				
	1	2	3	6	9
1	1.00	0.84	0.80	0.75	0.73
2	1.00	0.80	0.76	0.71	0.69
3	1.00	0.78	0.74	0.70	0.68
6	1.00	0.76	0.72	0.68	0.66

**RATING FACTORS FOR THREE SINGLE CORE CABLES
IN TREFOIL ON RACKS IN AIR
(WITH SPACING BETWEEN CABLES EQUAL TO
TWICE THE CABLE DIAMETER)**

TABLE - 24

No. of Racks	Number of Cables per Rack		
	1	2	3
1	1.00	0.98	0.96
2	1.00	0.95	0.93
3	1.00	0.94	0.92
6	1.00	0.93	0.90

**GROUP RATING FACTORS FOR MULTICORE CABLES IN
GROUND HORIZONTAL FORMATION**

TABLE - 25

Number of Cables in group	Spacing			
	Touching	15 cm	30 cm	45 cm
2	0.78	0.81	0.85	0.88
3	0.68	0.71	0.76	0.79
4	0.61	0.65	0.71	0.75
5	0.56	0.60	0.67	0.72
6	0.53	0.57	0.64	0.69
7	0.50	0.55	0.62	0.67
8	0.48	0.53	0.60	0.66
9	0.46	0.51	0.59	0.65
10	0.45	0.50	0.58	0.64

**RATING FACTORS FOR MULTICORE CABLES LAID ON RACKS IN AIR
(WITH CABLE SPACING BETWEEN CABLES
EQUAL TO DIAMETER OF CABLE)**

TABLE - 26

Number of racks	Number of cables per rack				
	1	2	3	6	9
1	1.00	0.98	0.96	0.93	0.92
2	1.00	0.95	0.93	0.90	0.89
3	1.00	0.94	0.92	0.89	0.88
6	1.00	0.93	0.90	0.87	0.86

RATING FACTORS FOR VARIATION IN THERMAL RESISTIVITY OF SOIL FOR THREE SINGLE - CORE CABLES AND THREE CORE XLPE CABLES LAID DIRECT IN THE GROUND

TABLE - 27

Nominal size of conductor	Three single core cables Thermal Resistivity of Soil in °C CM/W						Three core cables Thermal Resistivity of Soil in °C CM/W					
	Sq. mm	100	120	150	200	250	300	100	120	150	200	250
25	1.17	1.09	1.00	0.88	0.80	0.74	1.16	1.08	1.00	0.90	0.82	0.75
35	1.18	1.10	1.00	0.88	0.80	0.74	1.16	1.08	1.00	0.90	0.81	0.75
50	1.19	1.10	1.00	0.88	0.80	0.73	1.16	1.08	1.00	0.88	0.81	0.75
70	1.19	1.10	1.00	0.88	0.80	0.73	1.16	1.09	1.00	0.88	0.81	0.75
95	1.19	1.10	1.00	0.88	0.79	0.73	1.16	1.09	1.00	0.88	0.81	0.75
120	1.19	1.10	1.00	0.88	0.79	0.73	1.16	1.09	1.00	0.88	0.81	0.75
150	1.19	1.10	1.00	0.88	0.79	0.73	1.16	1.09	1.00	0.88	0.81	0.75
185	1.19	1.10	1.00	0.88	0.79	0.72	1.16	1.09	1.00	0.88	0.81	0.75
240	1.20	1.11	1.00	0.88	0.79	0.72	1.17	1.09	1.00	0.88	0.81	0.75
300	1.20	1.11	1.00	0.87	0.79	0.72	1.17	1.09	1.00	0.88	0.81	0.75
400	1.20	1.11	1.00	0.87	0.79	0.72	1.17	1.09	1.00	0.88	0.81	0.75
500	1.20	1.11	1.00	0.87	0.79	0.72	1.17	1.09	1.00	0.88	0.81	0.74
630	1.21	1.11	1.00	0.87	0.78	0.72	-	-	-	-	-	-
800	1.21	1.11	1.00	0.87	0.78	0.72	-	-	-	-	-	-
1000	1.21	1.11	1.00	0.87	0.78	0.72	-	-	-	-	-	-

**Estimated Voltage Drops in XLPE Cables (Aluminium Conductor)
(Voltage drop unit: Volts/Km/Amps)**

TABLE - 28

Cores	Cable Sqmm.														
	25	35	50	70	95	120	150	185	240	300	400	500	630	800	1000
Single Core	3.08	2.23	1.65	1.15	0.83	0.66	0.55	0.44	0.35	0.30	0.24	0.23	0.21	0.20	0.18
Multi Core	2.67	1.94	1.44	1.00	0.70	0.56	0.48	0.40	0.30	0.26	0.22	0.20	0.18	----	----

* Above voltage drops (volts/km/amps) to be multiplied with rated current and length of cable in K.M. to calculate total voltage drop in particular length and size of Cables.

GROUP RATING FACTORS FOR THREE - CORE CABLES IN HORIZONTAL FORMATION, LAID DIRECT IN THE GROUND

TABLE - 29

No. of Cables	Spacing of Cables (Centre to Centre)				
	Touching	15 Cm	30 Cm	45 Cm	60 Cm
2	0.80	0.84	0.87	0.90	0.91
3	0.68	0.74	0.79	0.83	0.86
4	0.62	0.69	0.75	0.80	0.83
5	0.58	0.65	0.72	0.77	0.80
6	0.55	0.62	0.69	0.75	0.78
7	0.52	0.59	0.67	0.73	0.77
8	0.50	0.57	0.66	0.72	0.75
9	0.48	0.55	0.65	0.71	0.75
10	0.46	0.54	0.64	0.70	0.74
11	0.45	0.53	0.63	0.70	0.74
12	0.44	0.52	0.62	0.69	0.73

GROUP RATING FACTORS FOR THREE - CORE CABLES IN TIER FORMATION, LAID DIRECT IN THE GROUND

TABLE - 30

No. of Cables	No. of Tiers	Spacing of Cables (Centre to Centre)				
		Touching	15 Cm	30 Cm	45 Cm	60 Cm
2	1	0.88	0.84	0.87	0.90	0.91
3	1	0.68	0.74	0.79	0.83	0.86
4	2	0.60	0.66	0.73	0.77	0.79
5	2	0.55	0.61	0.68	0.71	0.73
6	2	0.51	0.57	0.63	0.67	0.69
7	3	0.48	0.54	0.59	0.63	0.64
8	3	0.46	0.51	0.56	0.60	0.61
9	3	0.44	0.48	0.53	0.57	0.58
10	4	0.42	0.47	0.52	0.55	0.56
11	4	0.41	0.46	0.50	0.54	0.55
12	4	0.40	0.45	0.49	0.53	0.54



BENDING RADIUS:

While Installing 'GLOSTER' Cables, the following minimum bending radius should be observed such that the cables, and especially the insulation, are not damaged. Wherever possible, larger bending radii should be used.

RECOMMENDED MINIMUM BENDING RADII

- (15 X D) For Single Core Cables up to 11 KV
- (20 X D) For Single Core Cables
- (15 X D) For Multi Core Cables

Where 'D' is the overall diameter of Cables.

TESTING INSULATION RESISTANCE MEASUREMENT OF CABLE

The voltage rating of I R Tester (Megger) should be chosen as following table:

VOLTAGE GRADE OF CABLES	RATING OF IR TESTER (MEGGER)	VOLTAGE GRADE OF CABLE	RATING OF IR TESTER (MEGGER)
3.3 KV	1000 V	22 KV	2500 V
6.6 KV	1000 V	33 KV	2500 V

TESTING DURING LAYING:

All new cables shall be megger-tested before jointing. After jointing is completed all cables shall be megger-tested.

JOINTING OF CABLE:

The emphasis should be laid on quality and selection of proper cable accessories, proper jointing techniques and skill and workmanship of the working personnel. The quality of joint should be such that it does not add any resistance to the circuit. The materials and techniques employed should give adequate mechanical and electrical protection to the joints

under all service conditions. The joint should further be resistant to corrosion and other chemical effects. Termination and jointing of power and control cables shall be done by means of compression methods using solder less tinned copper/Aluminum terminal lugs.

HIGH VOLTAGE TEST:

Cables after jointing and terminations are subjected to dc high voltage test. The recommended test voltage are given in I.S. 1255 - 1983.

The cable cores must be discharge after completion of dc high voltage test.

PACKING, HANDLING AND STORAGE

PACKING

Cables are generally received wound on wooden drums, both the ends of the cable being easily accessible for inspection and testing. However short length may be transported in coils without drums with prior intimation to customer.

In case of paper-insulated lead-sheathed cables, both the ends of cables should be protected from moisture by means of plumbed lead caps. In case of PVC and XLPE cables sealed plastic caps or heat shrinkable caps should be used. The cable shall be wound on drums and packed.

The cable drums shall carry the following information either stenciled or contained in a label attached to it.

- Reference of Indian standard,
- Manufacture's name or trade-mark;
- Type of cable and voltage grade;
- Number of cores;
- Nominal cross sectional area of conductor;
- Cable code;
- Length of cable on the drum;
- Number of length on the drum (if more than one);
- Direction of rotation of drum (by arrow);
- Gross mass;
- Country of manufacture;
- Year of manufacture
- The cable drums or label may also be marked with ISI Standard mark.

HANDLING

On receipt of cable drums visual inspection of drums should be made ensuring drum packing is original. When unloading the cables, certain precautions should be taken to ensure the safety of the cables:-

a) The cable drums should not be dropped or thrown from railway wagons or trucks during unloading operations as the shock may cause serious damage to cable layers. A crane should be used for unloading of

cable drums. When lifting drums with the crane, it is recommended that the lagging should be kept in place to prevent the flanges from crushing on to the cable. If the crane is not available, a ramp should be prepared with approximate inclination of 1:3 or 1:4. The cable drum should be rolled over the ramp by means of ropes and winches. Additionally, a sand bed at the foot of the ramp may be prepared to brake the rolling of the cable drum.

b) Cable should not be dragged along the earth surface.

c) The arrows painted on the flange of the drum indicate the direction in which the drum should be rolled. The cable will unwind and become loose if the drum is rolled in the opposite direction. Improper handling or uncoiling of cable from reels or coils often results in the "springing" of armour of the cable and kinking of the cables both of which are very difficult to be corrected. It reduces effective cable life considerably. To avoid this, the following steps are to be followed:

- i) If the cable is supplied on a reel, it should be mounted on a shaft and cable paid off from the reel while it rotates. Suitable brakes should be applied on the flanges of the reel.
- ii) If the cable is supplied in large coils these should be mounted on a turn table with suitable brakes and cable paid off while the turn table rotates.
- iii) Small coils of cables can be made to roll along the ground for uncoiling.
- iv) Cable should neither be pulled straight from the coil while the coil rests on the ground nor be taken off turning from reel while it is lying on its flange on the ground.
- v) Also never allow the reel to rotate at high speed during pay off.

.STORAGE

The site chosen for storage of cables should be well drained. Cable should be stored in a dry and covered place to prevent exposure to climatic conditions and wear and tear of wooden drums and it should preferably be on a concrete surface/firm surface, which will not cause the drums to sink and thus lead to flange rot and extreme difficulty in moving the drums.

However cable drum can be stored in uncovered area, but the area should be free from corrosive agents such as chemicals and fumes etc. Also the lagging should be kept in place to avoid cable surface from direct sunrays. The cables stored in hot condition at higher temperature may cause oxidation of outer sheath jacket, whenever a cable length is cut, it should be recappeded to avoid ingress of water in the cable.

All drums should be stored in such a manner as to leave sufficient space between them for air circulation. It is desirable for drums to stand on battens placed directly under the flanges. During storage the drum should be rolled to an angle of 90° once every 3 months, This will avoid collapsing of barrel of drum due to weight pressure continuously in one direction for longer period. In no case, should the drum be stored "on the flat" that is, with flange horizontal.

If it is necessary to rewind a cable on to another drum, the barrel of the drum should have a diameter not less than that of the original drum.

LAYING

The selection of the route should first be decided keeping in view the intermediate and ultimate use of the cable as an intermediate part of the transmission and distribution system.

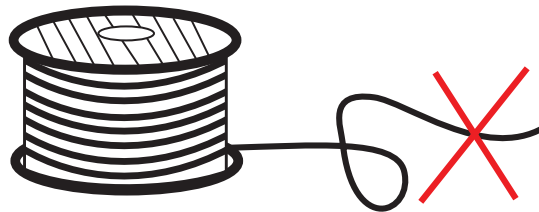
For transporting the cable drum to site, it is necessary to check the road condition, whether it has loose soil, is marshy, water logged etc.

If possible, cables should be laid along the footpath rather than the carriageway. Plans for future building projects should be considered. The route should be away from parallel running gas, water pipes and telephone cables. Also suitable locations for cable joints and end termination should be selected as required.

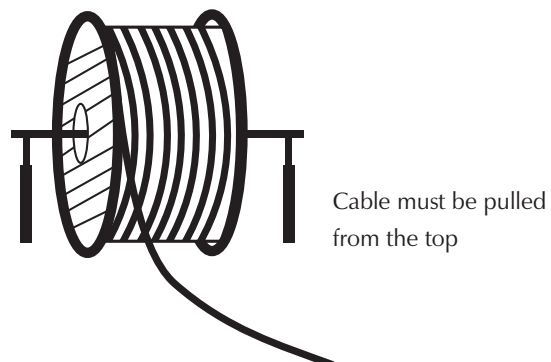
On receipt of the drum at site, the plank should be removed and the cable is examined for exterior damage, if any. To avoid damage to the protective covering and the insulation the cable must not be pulled across hard and sharp objects.

For laying of cables special cares to be taken to prevent sharp bending, kinking, twisting. Cable should be unwound from drum by proper mounting the cable drum on a cable wheel making sure the spindle is strong enough to carry the weight without bending and that it is lying horizontally in the bearings so as to prevent the drum creeping to one side or the other while it is rotating.

This is incorrect way of pulling the cable & will cause kinks & twist in cable. Shall be avoided at all.

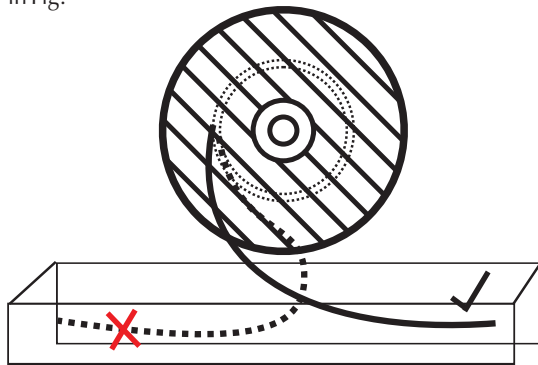


Provision should be made to break the drum to avoid further rolling & buckling of cable during sudden stop. A simple wooden plank can serve this purpose



Cable must not be pulled across hard & sharp object to avoid the damage to the covering & insulation.

Cable must be laid in ducts or trenches as showing in Fig.



However, following salient points are to be considered during laying procedure of cables laid in racks and in build-in trenches.

- 1 For laying of cables, power cables are to be placed at the bottom most layer and control cables at top most layer.
- 2 Single core power cable for use on a.c system shall be laid in delta formation supported by non-magnetic material. Trefoil clamps of suitable size are to be placed at regular intervals but preferably not more than 800 mm. Axial spacing of two circuits in delta formation shall not be less than 4 times the cable dia. In case of multicore power cables, cables shall be laid side by side, with spacing not less than one cable diameter. However derating factors for cables laid on trenches are to be referred.

Multicore power cables and single core d.c circuits may be clamped by means of galvanized mild steel saddles. The saddles shall not be placed at intervals more than 1500 mm. for horizontal and 1200 mm. for vertical runs.

- 3 Multicore control cables can be laid touching each other on cable racks and wherever required may be taken in two layers. They should be clamped by means of PVC straps both for horizontal and vertical runs, (alternatively, fabricated aluminum clamps may be used) at regular intervals.

- 4 a) If the cable are buried directly in ground. I.S. 1255 is to be followed for code of practice. However generally cables are laid 1000 mm. below finished ground level at any point of cable run and 75 mm. of sand cushioning to be provided.

- b) In loose soil concrete pillar should be provided for as support and hence pipes are recommended to the used for cable path

- 5 If there is a possibility of mechanical damage, cable should be protected by means of mild steel covers placed on racks.

- 6 Method of Installation:

- Three Core Cables: Installed independently
- Single Core Cables: Three cables in a trefoil touching each other

- 7 Maximum safe pulling force (when pulled by pulling eye)

Aluminum conductor cables: 3.0 kg/mm²

Copper conductor cables: 5.0 kg/mm²

Proper method of pulling of cable should be used. Refer I.S. 1255-1983, code of practice for installation and maintenance of power cables.

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