

Glossary  
Excerpt  
from  
PRYSMIAN'S  
*WIRE AND CABLE  
ENGINEERING GUIDE*

## GLOSSARY

### A

**Abrasion Machine** - A laboratory device for determining the abrasive resistance of wire or cable. Testing devices include the squirrel cage with square steel bars and the abrasive grit types.

**Abrasion Resistance** - A measure of the ability of a wire, wire covering or material to resist surface wear or damage by mechanical means.

**Accelerated Life Test** - A test in which certain conditions such as voltage, temperature, etc., to which a cable or material is subjected, are increased in magnitude above normal operating values to obtain observable deterioration in a reasonable period of time, and thereby provide a relative measure of the probable cable or material life under operating voltage, temperature, etc.

**Accelerator** - A chemical additive which hastens a chemical reaction under given conditions, known also as a promoter. It is commonly used in plastics and rubber compounding to reduce curing time.

**Acceptance Test** - A test made to demonstrate the degree of compliance with specified requirements.

**Accordion** - A retractile cable with a series of equally spaced transverse folds.

**Acrylic** - A synthetic resin made from acrylic acid or from an acrylic acid derivative. For enamel film coated magnet wire, the base resin is a copolymer of acrylonitrile plus acrylate and phenolic resin. The enamel film is applied from an aqueous dispersion. The film is resistant to refrigerants and many solvents. Suggested for use in hermetic motors. Temperature rating of 105°C applies only to use in air. Modifications include solderable acrylic not intended for use with refrigerants and a solderable acrylic with a nylon overcoat. Also available in fibrous form for yarn servings and braids but not used widely. For special purpose insulation, acrylic elastomers can be used. Excellent ozone resistance and good aging properties are provided, but chemical resistance is spotty.

**AAAC** - Designation for all-aluminum alloy-conductors (of 5005-H19 or 6201-T81).

**AAC** - Designation for all-aluminum conductors (of EC, electrical conductor grade). Used for underground distribution/transmission lines.

**ACAR** - Designation for aluminum conductor aluminum alloy-reinforced (high strength 6201-T81 reinforcement).

**ACSR** - Designation for aluminum-conductor steel-reinforced. Aluminum wires stranded around a steel core. Used for high voltage transmission lines.

**Activator** - A chemical additive used to initiate a chemical reaction in a chemical mixture.

**Active Wire** - The wire in an armature winding which produces useful voltage. That portion of the winding in which induction takes place.

**Adhesive** - A material capable of holding other materials together by surface attachment.

**Admittance** - The measure of ease with which an alternating current flows in a circuit. The reciprocal of impedance.

**Aging** - The change in properties of a material with time under specific conditions.

**Aircraft Ignition Cable** - High-tension cable for ignition systems of internal combustion aircraft engines.

**Aircraft Wire** - Wire for airborne equipment. It often must meet severe environmental conditions, such as heat, cold, altitude, solvents, fuels, etc.

**Air Spaced Coaxial Cable** - One in which air is essentially the dielectric material. A spirally wound synthetic filament, beads or braided filaments may be used to center the conductor.

**Alligator Clip** - A mechanical device, shaped similar to the jaws of an alligator, generally used as a temporary connection on the end of a test lead or interconnections wire.

**Alloy** - A metal formed by combining two or more other materials.

**All-Rubber Cable** - A cable in which all interstices between conductors are filled with rubber compound. This provides greater resistance to impact, adds strength, reduces tendency to kink and reduces flexibility.

**Alternating Current** - Electric current that periodically and regularly reverses its direction. The frequency of the change in flow is expressed in cycles per second (Hertz or Hz).

**Aluminum** - Metal characterized by high resistance to corrosion, good electrical and thermal conductivity, and a density, which is about one-third or less that of steel, copper or nickel. It can be fabricated, joined and treated by most methods used for other metals. Because of its relatively high conductivity in relation to its lightweight and low cost, aluminum is being used increasingly as a conductor. It is used extensively in wire form for power lines. Other major applications include magnet strip or foil, net wire and shielding for wire and cable and other products.

**Aluminum Conductor** - A wire or group of wires of aluminum not insulated from each other suitable for carrying electrical current.

**Aluminum-Steel Conductor** - An aluminum-steel conductor is a composite conductor made up of a combination of aluminum and steel wires. In the usual construction, the aluminum wires surround the steel.

**Ambient Temperature** - The temperature of a medium, such as gas or liquid, surrounding an object.

**American Wire Gauge (AWG)** - The standard system used for designating wire diameter. Also referred to as the Brown and Sharpe (B&S) wire gauge.

**Ampacity** - Current carrying capacity expressed in amperes.

**Ampere** - The unit expressing the rate of flow of an electrical current. One ampere is the current flowing through one ohm of resistance at one volt potential.

**Ampere's Rule** - Current in a certain direction is equivalent to the motion of positive charges in that direction. The

magnetic flux generated by a current in a wire encircles the current in the counter-clockwise direction when it is approaching the observer.

**Angle of Advance** - The angle between a line perpendicular to the axis of the cable and the axis of any one member or strand of the braid.

**Anneal** - To heat and then gradually cool in order to relieve mechanical stresses. Annealing copper makes it softer and less brittle.

**Annealed-in-Process Wire** - Wire annealed at an intermediate stage between rod size and finished size in order to produce a softer wire of fairly uniform temper.

**Annealed Wire** - Wire that has been softened by heating. Sometimes referred to as soft drawn wire.

**Annular Conductor** - A number of wires stranded in three reversed concentric layers around a core.

**Anodic Films** - Anodic film insulation (aluminum oxide coating on aluminum conductor) can be used on magnet wire, but some other wire applications have been suggested. The coating is thin, space saving, inorganic and resistant to extreme temperatures (3600°F melting point). Although anodic film insulated conductors can be bent and processed without rupturing the film, flexibility is limited relative to other insulations.

**Antenna Wire** - Wire generally with high tensile strength used as an antenna. It may be insulated or uninsulated.

**Arc Resistance** - Time required for an arc to establish a conductive path in a material. Breakdown between two electrodes usually occurs as a conducting path is burned on the surface of the dielectric material.

**Armored Cable** - A cable provided with a wrapping of metal, usually steel wires or tapes, primarily for the purpose of mechanical protection.

**Asbestos** - A silicate mineral that readily separates into flexible fibers suitable for use as an incombustible, nonconducting, chemically resistant material. Fibrous asbestos wire and cable insulation is used in the form of yarn servings, felts, lap, roving

and braid. Asbestos reinforced or combined with other materials also is used. Where space is important, asbestos papers and purified asbestos papers may be used.

**Asphalt** - A dark colored viscous to solid hydrocarbon complex also referred to as bitumen. Used to impregnate textile braid on wire to provide some degree of weatherproofing.

**Attenuation** - Power loss in an electrical system. Applied to coaxial cables, the power drop of signal loss in a circuit, expressed in decibels, dB. It is also the decrease in amplitude of a wave with distance in the direction of wave propagation when the amplitude at any given place is constant in time or the decrease in amplitude with time at a given place. Attenuation is generally expressed in dB per unit, usually 1000 ft., and is indicative of the power loss.

**Audio Channel Wire** - Small diameter shielded and jacketed wire used in wiring radio and TV consoles, panels, etc.

**Automotive Primary Wire** - Low voltage single or multi-conductor wire for automotive applications. Resistant to oil and weather.

**AWG** - Abbreviation for "American Wire Gauge" (Same as B and S, Brown and Sharpe).

## B

**"B" Stage (of Resin)** - The condition of a resin polymer when it is more viscous, with higher molecular weight, being insoluble but plastic and fusible.

**Backshell Mold** - A mold used to mold a covering over the backshell of a connector or plug after it is connected to a cable.

**Bail** - Loop of wire used to prevent permanent separation of two or more parts assembled together, such as the bail holding dustcaps on round connectors.

**Banded Cable** - Two or more cables banded together by stainless steel strapping.

**Band Width** - The frequency range of electrical signals transmitted. Coaxial cable has broadband width and will transmit signals from 0 to 5,000,000 Hertz.

**Bar** - A conductor of any section, bare and in straight lengths.

**Bare Conductor** - A conductor not covered with insulating materials.

**Battery Cable** - A single conductor cable, insulated or uninsulated, used for carrying current from batteries to the point power is needed. Also used for grounding.

**Beaded Coax** - Coaxial cable with a dielectric consisting of beads made of various materials.

**Bell Wire** - AWG 18 insulated copper wire used for making doorbell and thermostat connections in homes.

**Belt** - Number of layers of insulation on a conductor, or number of layers of jacket on a cable.

**Belted-Type Cable** - Multiple conductor cable having a layer of insulation over the assembled insulated conductors.

**Beryllium** - A metal lighter than aluminum, non-magnetic and characterized by good electrical conductivity and high thermal conductivity. It is available in sheets, foil and wire forms. Strong conductor wire can be made from beryllium for use in applications where lightweight is critical. The most important use for beryllium is in alloys, especially beryllium-copper alloys.

**Binder** - Spirally served tape or thread used for holding assembled cable components in place until additional manufacturing operations are performed.

**Binding Post** - A device for clamping or holding electrical conductors in a rigid position.

**Birmingham Wire Gauge (BWG)** - Also known as Stubs' Iron Gauge. The BAG was used extensively in Great Britain and the United States for many years, but is now obsolete. Its uses have persisted, however, for certain purposes, including galvanized steel wire for cable armor.

**Blasting Wire** - Wire for detonating explosives.

**Blown Jacket** - Term used for outer cable covering applied by the controlled inflation of

the cured jacket tube and the pulling of the cable through it.

**Bond Strength** - Amount of adhesion between bonded surfaces.

**Bondable Wire** - An insulated wire whose surface has been treated to facilitate adherence to other materials, such as potting compounds. The term also could be applied to magnet wires used in making coils, where bonding the turns together is desirable.

**Boot** - Protective covering over any portion of a cable, wire, or connector in addition to the normal jacketing or insulation. It is also a form placed around wire termination of a multi-contact connector to contain the liquid potting compound before it hardens. Also a protective housing usually made from a resilient material to prevent entry of moisture into a connector.

**Braid** - Woven bare metallic or tinned copper wires used as shielding for wires and cables and as ground wire for batteries or heavy industrial equipment. Also, a woven fibrous protective outer covering over a conductor or cable.

**Braid Angle** - The angle between the axis of the cable and the axis of any one member or strand of the braid (also known as angle of advance). It is further the smaller of the two angles formed by the carrier and the longitudinal axis of the braid.

**Braid Carrier** - The spool or bobbin on a braiding machine, which holds one group of strands or filaments consisting of a specific number of ends. The carrier revolves during the braiding operation.

**Braid Ends** - The number of strands used to make up one carrier. The strands are wound side by side on the carrier bobbin and lay parallel in the finished braid.

**Brake Wire** - Wires used in automotive and truck trailers to supply current to the electrical braking system.

**Breakdown (Puncture)** - A disruptive discharge through insulation.

**Breakdown Voltage** - The voltage at which the insulation between two conductors will break down.

**Breakout** - The point at which a conductor or conductors break out from a multi-conductor cable to complete circuits at various points along the main cable. The rest of the conductors continue on within the jacket.

**British Standard Wire Gauge** - A modification of the Birmingham Wire Gauge and the legal standard of Great Britain for all wires. It is variously known as Standard Wire Gauge (SWG), New British Standard (NBS), English Legal Standard and Imperial Wire Gauge.

**Buffing Stripper** - A motorized device for removing flat cable insulation by means of one or two buffing wheels that melt the insulation and brush it away from the conductors.

**Building Wire** - Insulated wires used in building for light and power, 600 V or less. Usually not exposed to outdoor environment.

**Bunched Stranding** - Term applied to a group of strands twisted together in a random manner in the same direction in one operation without regard to geometric arrangement of specific strands.

**Bus** - Wire used to connect two terminals inside of an electrical unit. A common point for electrical circuits to return. Can be bare, tinned or insulated.

**Busbar** - A heavy copper (or other metal such as aluminum) strip or bar used on switchboards and in power plants to carry heavy currents.

**Bushings** - A mechanical device used as a lining for an opening to prevent abrasion to wire and cable. Also used as a low cost method of insulating, anchoring, cushioning and positioning. Usually a non-metallic material is preferred.

**Butt** - Joining of two conductors end-to-end, with no overlap with their axes in line.

**Butt Wrap** - Tape wrapped around an object or conductor in an edge-to-edge condition.

**Butyl (IIR-Isobutylene-Isoprene) Rubber** - A polymer of isobutylene with small amounts of isoprene. This insulation and jacketing material is characterized by excellent resistance to oxidation and aging, exceptional ozone resistance and very good electrical properties. Resistance to moisture, physical

abuse and chemicals also good. Applications include power cables, apparatus and equipment leads, control cables and various other cables. It is alkali-sensitive and may revert under hot, wet conditions.

## C

**“C” Stage (of Resin)** - The condition of a resin polymer when it is in the solid state with high molecular weight, being insoluble and infusible.

**Cable** - Either a stranded conductor with or without insulation and other coverings (single-conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

**Cable Assembly** - A cable with plugs or connectors on each end.

**Cable Clamp** - A device used to give mechanical support to the wire bundle or cable at the rear of a plug or receptacle.

**Cable Clamp Adapter** - A mechanical adapter that attaches to the rear of a plug or receptacle to allow the attachment of a cable clamp.

**Cable Core** - The portion of an insulated cable lying under the protective covering or coverings.

**Cable Core Binder** - A wrapping of tapes or cords around the several conductors of a multiple-conductor cable used to hold them together. Cable core binder is usually supplemented by an outer covering of braid, jacket or sheath.

**Cable Filler** - The material used in multiple-conductor cables to occupy the interstices formed by the assembly of the insulated conductors, thus forming a cable core of the desired shape (usually circular).

**Cable-in-Duct** - System for direct burial in which a flexible conduit is extruded over electrical cables for a single, pre-assembled unit.

**Cable Pullers** - Firms that fabricate cable assemblies by pulling the conductors through a plastic, rubber or neoprene tube. Also, a tool for pulling cables through a conduit.

**Cable Sheath** - The protective covering applied to cables.

**Cable Terminal** - In power work, also known as a pothead or end bell - it is a device that seals the end of a cable and provides insulated egress for the conductors.

**Cable Vulcanizers** - These devices are essentially simple compression molding machines that are used to repair cable jacketing that has had a part removed for splicing, for adding connectors or other devices, or for replacing damaged sections. Both portable and stationary models are available.

**Cabling** - Twisting together two or more insulated conductors by machine to form a cable. This also is a term loosely applied to bundling of wires together, such as in forming of wire harnesses.

**Cabling Factor** - Used in formula for calculating the overall diameter of a cable.  $D = fd$  where  $D$  - cable diameter,  $f$  = factor, and  $d$  = diameter of once conductor.

**Cadmium-Chromium-Copper** - An alloy that provides high strength with a slight sacrifice in conductivity, of interest for high temperature applications. Good flex life.

**Cadmium-Copper** - Another high strength alloy. Easy to work with and relatively inexpensive, but has a softening temperature of 175-200°C.

**Caged Armor** - Armor wires within a polyethylene jacket often used in submarine cables.

**Cambric** - Fine weave linen or cotton fabric used for insulating purposes.

**Camfer** - Angle on the inside edge of the barrel entrance of a connector which permits easier insertion of the cable into the barrel.

**Capacitance (Capacity)** - That property of a system of conductors and dielectrics that permits the storage of electricity when a potential difference exists between the conductors. Its value is expressed as the ratio of a quantity of electricity to a potential difference. A capacitance value is always positive. The alternating-current phenomenon associated with electrical capacitance is important in wire and cable. At most commercial voltages and frequencies used in

power distribution, the capacitance effects are negligible. At relatively high voltages, the current due to capacitance may reach sufficient value to affect the circuit, and insulation for such applications is designed for moderately low dielectric constant. In communication work, the capacitance effect is pronounced and of great importance. Among other effects, the capacitance of the wire determines the maximum length of line over which the signal may be transmitted without excessive attenuation. It is important that insulations are designed with low dielectric constant in the communication field.

**Capacitive Coupling** - Electrical interaction between two conductors caused by the capacitance between them.

**Capillary Action** - Phenomenon of liquid passing along the path of a small interstice due to surface tension.

**Carrier** - The basic woven element of a braid consisting of one or more ends (strands), which create the interlaced effect.

**Catalyst** - A substance that initiates and/or accelerates a chemical reaction, but normally does not enter into the reaction.

**Cavity** - Depression in a mold.

**Cellular Insulation** - Material in foamed or sponge form with the cells closed or interconnected.

**Cellulose Lacquer** - Coating for magnet wire based on cellulose acetate.

**Ceramic** - Inorganic, non-metallic materials. Available in the form of fibrous alumina-silica yarns for servings and braids and also in the form of magnet wire coatings. Ceramic beads are another form used to provide physical separation. Heat and radiation resistances are excellent.

**Characteristic Impedance** - Characteristic impedance of a uniform line is the ratio of an applied potential difference to the resultant current at the point where the potential difference is applied, when the line is of infinite length. Note that the term is applied only to a uniform line. Coaxial cable is such a uniform line. There are three main impedance groups in coaxial cable, namely, 50, 70 and 93 ohms.

**Chlorosulfonated Polyethylene** - This vulcanizable material has good electrical properties and exceptional resistance to ozone. It has very good resistance to oxidation by sunlight, weather, chemicals and relatively high temperatures.

**Cigarette Wrap** - Tape insulation wrapped longitudinally instead of spirally over a conductor.

**Circuit** - A complete path over which electrons can flow from the negative terminals of a voltage source through parts and wires to the positive terminals of the same voltage source.

**Circular Mill** - A unit of area equal to the area of a circle, whose diameter is 1 mil (0.001 inch); equal to square mil x 0.78540. Used chiefly in specifying cross-sectional areas of round conductors.

**Cladding** - A method of applying a layer of metal over another metal, whereby the junction of the two metals is continuously welded.

**Coating** - Plating surface of a conductor to prevent corrosion and facilitate soldering. One coating commonly used on copper wire is tin. Term can also apply to an insulating coating.

**Coaxial Cable** - A cable consisting of two cylindrical conductors with a common axis. The two conductors are separated by a dielectric. The outer conductor, normally at ground potential, acts as a return path for current flowing through the center conductor and prevents energy radiation from the cable. The outer conductor, or shield, is also commonly used to prevent external radiation from affecting the current flowing in the inner conductor. The outer shield or conductor consists of woven strands of wire, or is a metal sheath.

**Coefficient of Expansion** - The fractional change in dimension of a material given a unit change in temperature.

**Coil, Electric** - Successive turns of insulated wire, which creates a magnetic field when an electric current is passed through them. It may also consist of a number of separately insulated sections, which lie side by side around the same magnetic circuit.

**Cold Bend** - Test procedure whereby sample of wire or cable is wound around a mandrel of a specified size, within a cold chamber, at a specified temperature for a given number of turns at a given rate of speed. The sample is then removed and examined for defects or deterioration in the materials or construction.

**Cold-Blade Stripper** - Device for removing insulation utilizing a cold knife blade.

**Cold Flow** - Permanent deformation of material due to mechanical force or pressure (not due to heat softening).

**Cold Work** - Hardening and embrittlement of metal due to repeated flexing action.

**Combination Strand** - A strand whereby the wires in the outer layer of a conventional concentric conductor are larger in diameter than the wires in the inner layer or layers, and the diameters of all wires are within plus and minus five percent of the nominal wire diameter for the same size non-combination stranded conductor.

**Compact Conductor** - Stranded conductor which is rolled to deform the round wires to fill the normal interstices between the wires in a strand.

**Compact Strand** - A strand whereby the individual round wires are pressed together to the point where the normal interstices between the wires in a strand are eliminated. The resulting conductor is either unidirectional or conventional concentric, manufactured to a specific diameter that is eight to ten percent below the nominal diameter of a non-compact conductor of the same cross-sectional area.

**Composite (Clad) Wire** - A wire having a core of one metal to which is fused an outer shell of one or more different metals.

**Composite Conductor** - Two or more strands of different metals, such as aluminum and steel or copper and steel, assembled and operated in parallel.

**Composite Cable** - A cable consisting of more than one conductor, each having a specific electrical application (i.e., power, control), manufactured together to operate mechanically as part of a single construction.

**Compressed Strand** - A type of strand whereby the individual wires are pressed

together forming a conventional concentric conductor, manufactured to a diameter not more than three percent below the nominal diameter of a non-compressed conductor of the same cross-sectional area.

**Compression Cable** - A pipe type cable in which the pressure medium (oil or gas) is separated from the insulation by a membrane or sheath.

**Concentric** - A central core surrounded by one or more layers of helically wound strands in a fixed round geometric arrangement. It is optional for the direction of lay for successive layers to be alternately reversed or in the same direction. If the direction of lay for successive layers is the same, the lay length will increase with each successive layer. The standard direction of lay of the outer layer is left hand.

**Concentric-Lay Conductor** - A conductor composed of a central core surrounded by one or more layers of helically laid wires. (Note: In the most common type of concentric-lay conductor, all wires are of the same size and the central core is a single wire.)

**Concentric Strand** - A strand that consists of a central wire or core surrounded by one or more layers of spirally laid wires. Each layer after the first has six more strands than the preceding layer and is applied in a direction opposite to that of the layer under it.

**Concentricity** - In a wire or cable, the measurement of the location of the center of the conductor with respect to the geometric center of the circular insulation.

**Conductance** - the reciprocal of resistance. It is the ratio of current passing through a material to the potential difference at its ends.

**Conductivity** - Reciprocal of volume resistivity. Conductance of a unit cube of any material.

**Conductor** - A wire or combination of wires not insulated from one another, suitable for carrying electric current.

**Conductor Overlay** - Layer of insulation applied over the conductor pattern in a printed circuit.

**Conductor Unilay** – A concentric conductor in which each layer surrounding the core is laid in the same direction.

**Conduit** - A tube or trough for protecting electrical wires or cables. It may be a solid or flexible tube in which insulated electrical wires are fun.

**Connection** - That part of a circuit which has negligible impedance and which joins components, devices, etc., together.

**Connector** - A device used to physically and electrically connect two or more conductors.

**Contact** - The element in a connector, which makes the actual electrical contact between two halves. Also, the point of joining in an electrical connection.

**Contact Area** - Area in contact between two conductors or a conductor and a connector permitting flow of electricity.

**Contact Inspection Hole** - A hole in the cylindrical rear portion of contact used to check the depth to which a wire has been inserted. Crimp-type contacts usually have inspection holes; solder-type seldom do, except larger sizes in which the hole's function is to allow solder and air to bleed out during soldering.

**Continuity Check** - A test performed on a length of finished wire or cable to determine if the electrical current flows continuously throughout the length. Each conductor may also be checked against each other to ascertain that no short exists.

**Continuous Vulcanization** - After a rubber or rubber-like compound is extruded on to a conductor, the wire is then passed into a vulcanizing chamber where the insulation or jacket is continuously vulcanized under high pressure and temperature control.

**Contrahelical** - The direction of a layer with respect to the previous layer, meaning a layer spiraling in an opposite direction than the preceding layer within a wire or cable.

**Control Cable** - A cable used for remote control operation of any type of electrical power equipment.

**Controlled Impedance Cable** - Package of two or more insulated conductors where

impedance measurements between respective conductors is kept essentially constant throughout entire length.

**Copolymer** - A compound resulting from the chemical reaction of two chemically different monomers with each other.

**Copper** - Available in rod, sheet, foil, tube and wire forms. On a volume basis, copper has the best conductivity of the common (non-precious) metals. Copper and copper alloys offer excellent corrosion resistance, high thermal conductivity and ease of fabricating, joining and forming. The strength-to-weight ratio of copper is relatively low and it loses strength at elevated temperatures. Copper is the most widely used electrical conductor in wires and cables. Some of the common types of electrical coppers and copper alloys are:

Electrolytic tough pitch copper (ETPC) has a minimum copper content of 99.9%. Annealed conductivity averages 101% with a 100% minimum. It is widely used for wire and bus bars.

Silver bearing copper with a 99.9% copper content provides nearly the same electrical conductivity as the ETP copper, but offers a higher softening point, greater resistance to creep and higher strength at elevated temperatures.

Oxygen-free high-conductivity copper (OFHC) has 99.95% minimum copper content with an average annealed conductivity of 101%. This copper has no residual deoxidant. Other coppers use phosphorus, boron or lithium as deoxidizers to eliminate susceptibility to hydrogen embrittlement and improve weld ability.

Generally, the addition of sulfur, lead or tellurium improves machinability. Cadmium improves tensile strength and wearing qualities. Chromium gives very good mechanical properties at temperatures well above 200°C. Zirconium provides hardness, ductility, strength and relatively high electrical conductivity at temperatures where copper and common high conductivity alloys tend to weaken. Nickel improves corrosion resistance while silicon offers much higher mechanical properties. Beryllium when present in an approximate 2% content in copper alloys permits maximum strength, while about 0.5% content offers high conductivity.

**Copper Constantan** - Copper and constantan are two alloys used in making thermocouple wires. The copper is the positive wire and the constantan is the negative wire. Constantan is an alloy of copper, nickel, manganese and iron.

**Copper-Covered Steel Wire** - A wire having a steel core to which is fused an outer shell of copper.

**Cord** - A small, very flexible insulated cable constructed to withstand mechanical abuse. (Note: There is no sharp dividing line in respect to size between a cord and a cable, but generally, a cord is considered to be a size No. 10 and smaller.)

**Cord Sets** - Portable cords fitted with any type of wiring device at one or both ends.

**Core** - In cables, a term used to express a component or assembly of components over which other materials are applied, such as additional components, shield, sheath or armor.

**Corona** - A luminous discharge due to ionization of the gas surrounding a conductor, around which exists a voltage gradient exceeding a certain critical value.

**Corona Resistance** - The time that insulation will withstand a specified level, field-intensified ionization that does not result in the immediate complete breakdown of the insulation.

**Corrosion** - Chemical action that causes destruction of the surface of a metal by oxidation or chemical combination. Also caused by reduction of the electrical efficiency between the metal and a contiguous substance, or to the disintegrating effect of strong electrical currents or ground return currents in electrical systems. The latter is known as electrolytic corrosion.

**Cotton** - Used for servings and braids. Flexibility and strength are good. Treatments are required to provide chemical and fungus resistance. Heat resistance is limited.

**Coulomb** - Unit quantity of electricity; i.e., the quantity transferred by 1 ampere in one second.

**Coverage** - The calculated percentage that defines the completeness with which a metal

braid covers the underlying surface. The higher percentage of coverage, the greater the protection against external interference.

**Coverings** - Textile braids or jackets of rubber, plastics or other materials applied over wire and cables to provide mechanical protection and perhaps identification.

**Crazing** - Minute cracks on or near the surface of materials, such as plastics.

**Creep** - The dimensional change with time of a material under load.

**Creepage** - Electrical leakage on a solid dielectric surface.

**Creepage Surface** - An insulating surface, which provides physical separation as a form of insulation between two electrical conductors of different potential.

**Crimp** - Act of compressing (deforming) a connector barrel around a cable in order to make an electrical connection.

**Cross-Linking** - The setting up of chemical links between the molecular chains.

**Cross-Sectional Area of a Conductor** - The sum of the cross-sectional areas of its component wires, that of each wire being measured perpendicular to its individual axis.

**Crosstalk** - Signal interference between nearby conductors caused by the pickup of stray energy.

**Cure** - To change the physical properties of a material by chemical reaction, by the action of heat and catalysts, alone or in combination, with or without pressure.

**Curing Cycle** - The time, temperature and pressure required for curing.

**Current** - The rate of transfer of electricity. Practical unit is the ampere that represents the transfer of one coulomb per second.

**Current (A.C. – Alternating Current)** – An electric current that periodically reverses direction of electron flow. The rate at which this occurs in a given unit of time (generally a second) is called the “frequency” of the current (i.e. 60 cycles per second, or 60 Hertz).

**Current (D.C. – Direct Current)** – Electrical current whose electrons flow in one direction only.

**Current Carrying Capacity** - The maximum current a conductor can carry without heating beyond a safe limit.

**CV** – Continuous Vulcanization – simultaneous extrusion and extrusion and vulcanization of wire coating materials.

**Cycle** - The complete sequence, including reversal of the flow of an alternating electric current.

## D

**“D” cable** - A two-conductor cable, each conductor having the shape of the capital letter D with insulation between the conductors themselves and between conductors and sheath.

**Daisy Chain** - A cable assembly with 3 or more connectors. The term is also used as a verb.

**Db. Loss** - The loss of a signal in a conductor expressed in decibels.

**Decibel (db).** - Unit to express differences of power level. Used to express power gain in amplifiers or power loss in passive circuits or cables.

**Delay Line** - A cable made to provide a very low velocity of propagation with long electrical delay for transmitted signals.

**Derating Factor** - A factor used to reduce a current carrying capacity of a wire when used in other environments from that for which the value was established.

**Dielectric** - 1) Any insulating medium which intervenes between two conductors and permits electrostatic attraction and repulsion to take place across it. 2) A material having the property that energy required to establish an electric field is recoverable in whole or in part, as electric energy.

**Dielectric Absorption** - That property of an imperfect dielectric whereby there is an accumulation of electric charges within the body of the material when it is placed in an electric field.

**Dielectric Constant (Permittivity or Specific Inductive Capacity)** - That property of a dielectric which determines the electrostatic energy stored per unit volume for unit potential gradient.

**Dielectric Loss** - The time rate at which electric energy is transformed into heat in a dielectric when it is subjected to a changing electric field.

**Dielectric Loss Angle (Dielectric Phase Difference)** - The difference between ninety degrees (90°) and the dielectric phase angle.

**Dielectric Loss Factor (Dielectric Loss Index)** - The product of its dielectric constant and the tangent of its dielectric loss angle.

**Dielectric Phase Angle** - The angular difference in phase between the sinusoidal alternating potential difference applied to a dielectric, and the component of the resulting alternating current having the same period as the potential difference.

**Dielectric Strength** - The voltage which an insulating material can withstand before breakdown occurs, usually expressed as a voltage gradient (such as volts per mil).

**Dielectric Test** - Tests which consist of the application of a voltage higher than the rated voltage for a specified time for the purpose of determining the adequacy against breakdown of insulating materials and spacing under normal conditions.

**Dip Coating** - An insulating coating applied to the conductor by passing the conductor through an applicator containing liquid insulating medium. This method can be used for magnet wire.

**Dip Soldered** - Process of making electrical connections, usually to a printed circuit board, by the use of dipping one side of the board in molten solder, thus soldering the projecting component leads to the circuitry printed on the board.

**Direct Current** - An electric current that flows in only one direction.

**Direction of Lay** - The lateral direction in which the elements of a cable run over the top of the cable as they recede from an observer looking along the axis of the cable.

ASTM symbols are used to indicate direction; S for left-handed, Z for right-hand.

**Displacement Current** - A current that exists in addition to ordinary conduction current in a-c circuits. It is proportional to the rate of change of the electric field.

**Disruptive Discharge** - The sudden and large increase in current through an insulation medium due to the complete failure of the medium under the electrostatic stress.

**Dissipation Factor (loss tangent,  $\tan \delta$ , approx. power factor)** - The tangent of the loss angle of the insulating material. The ratio of the power loss to the circulating KVA.

**Double-Faced Tape** - Fabric tape finished on both sides with a rubber or synthetic compound.

**Double Shield** - Two shields, one over the other. Maximum coverage 98%.

**Drain Wire** - In a cable, an uninsulated wire laid over the component or components and used as a ground connection.

**Drawing** - In the manufacture of wire, pulling the metal through a die or series of dies for reduction of diameter to a specified size.

**Dual Coaxial Cable** - Two individually insulated conductors laid parallel or twisted and placed within an overall shield and sheath.

**Duct** - An overhead or underground tube used for carrying electrical conductors.

**Duplex Cable** - A cable composed of two insulated single conductor cables twisted together. (Note: The assembled conductors may or may not have a common covering of binding or protecting material.)

**Durometer** - A measurement used to denote the hardness of a substance.

## E

**Eccentricity** - A measure of the center of a conductor's location with respect to the circular cross section of the insulation. Expressed as a percentage of center displacement of one circle within the other.

**Elastomer** - A material which at room temperature stretches under low stress to at least twice its length, and snaps back to original length upon release of stress.

**Electric Strength (Dielectric Strength) (Disruptive Gradient)** - The maximum potential gradient that the material can withstand without rupture. The value obtained for the electric strength will depend on the thickness of the material and on the method and conditions of test.

**Electrode** - A conductor, not necessarily metal, through which a current enters or leaves an electrolytic cell, arc, furnace, vacuum tube, gaseous discharge tube or any conductor of the non-metallic class.

**Electromagnet** - A coil of wire, usually wound on an iron core, which produces a strong magnet field when current is sent through the coil.

**Electromotive Force (e.m.f.)** - Pressure or voltage. The force that causes current to flow in a circuit.

**Electronic Hook-Up Wire** - Wires used to make the internal connections between the various electrical parts of electronic assemblies.

**Electronic Interconnecting Wire** - Wires or cables used to make external connections between various units of electronic equipment.

**Electro-Tinned** - Electrolytic process of tinning wire using pure tin.

**Elongation** - The fractional increase in length of a material stressed in tension.

**EMF – Electromagnetic Field** – Magnetic field developed by a current of electricity.

**EMT – Electrical Metallic Tubing** – A raceway of metal having a circular cross-section into which it is intended that conductors be drawn and which has a wall thinner than that of rigid metal conduit and an outside diameter sufficiently different from that of rigid conduit to render it impracticable for anyone to thread it with a standard pipe thread.

**Embossing** - A marker identification by means of thermal indentation leaving raised lettering on the sheath material of cable.

**Enameled Wire** - A conductor with baked-on enamel film insulation. In addition to magnet wire, enameled insulation is used on thermocouple type wires and other wires.

**End Bell** - an accessory similar to a cable clamp that attaches to the back of a plug or receptacle. It serves as an adaptor for the rear of connectors.

**End-To-End Check** - Tests conducted on a completed wire and/or cable run to assure electrical continuity.

**Ends** - The number of wires or threads on a braider carrier.

**Epoxy Resins** - Straight-chain resins based on ethylene oxide, its derivatives or homologs. Used for bonding, potting connectors and for splicing in some in-field splicing kits. For magnet wire enamels, the basic resin is an epoxy of high epoxide equivalent with urea formaldehyde modifying resins. Other resins may be present as modifiers in some enamels. 130°C thermal rating. This wire is of particular value in oil filled transformers.

**Ethylene-Propylene Rubbers** - These materials offer excellent resistance to ozone and weathering, good low temperature properties, good to excellent heat resistance and high temperature properties and excellent electrical properties. Two types of the polymer are available - the copolymer based on ethylene and propylene only, and the terpolymer in which a small amount of unsaturation pendant to the chain is added.

**Extender** - A substance added to a plastic composition to reduce the amount of the primary resin required per unit volume.

**Extrusion** - Method of forcing plastic, rubber or elastomer material through an orifice in more-or-less continuous fashion to apply insulation or jacketing to a conductor or cable.

## F

**Factor of Assurance of Wire or Cable Insulation** - The ratio of the voltage at which completed lengths are tested to that at which they are used.

**Farad** - Unit of capacitance. The capacitance of a capacitor which, when charged with one coulomb, gives a difference of potential of one volt.

**Fatigue Resistance** - Resistance to metal crystallization, which leads to conductors or wires breaking from flexing.

**Feeder** - A conductor or group of conductors which transmits electrical energy from a service supply, transformer, switchboard, distribution center, generator or other source of supply to branch circuit over current devices.

**Feed Through** - Terminal or connector for walls or panels.

**Filament** - Fiber characterized by extreme length.

**Filled-Core Annular Conductor** - A conductor composed of a plurality of conducting elements disposed around a non-conducting supporting material, which substantially fills the space enclosed by the conducting elements.

**Filled Tape** - Fabric tape that has been thoroughly filled with a rubber or synthetic compound, but not necessarily finished on either side with this compound.

**Filler** - Materials used in multi-conductor cables to occupy the interstices formed by the assembled conductors. Also, a substance, often inert, added to a plastic to improve properties and/or decrease cost.

**Film** - Sheetting having a nominal thickness not greater than 0.010 inch.

**Foils** - Metal foils such as copper and aluminum are used as the conductors for printed circuits, as electrodes in capacitors, for electrical coils as a replacement for copper magnet wire, for static shielding, contacts and other electrical applications.

**Flame Resistance** - Ability of the material to extinguish flame once the source of heat is removed.

**Flame Retardant** - When applied to a material this term means that the material in ordinary locations will not burn for more than a specified period of time nor will the flame travel or extend beyond a specified distance.

**Flashover** - A disruptive discharge around or over the surface of a solid or liquid insulator.

**Flat Braid** - A woven braid, composed of tinned copper strands, which is rolled flat at time of manufacture to a specific width, depending upon construction. It is generally used as a high current conductor at low voltages.

**Flat Cable** - Any cable with two smooth or corrugated, but essentially flat surfaces.

**Flat Conductor** - A conductor with a width-to-thickness ratio of arbitrarily 5 to 1 or greater.

**Flat Conductor Cable** - A cable with a plurality of flat conductors.

**Flexibilizer** - An additive that makes a resin or rubber more flexible. Also a plasticizer.

**Flex Life** - The time of heat aging that an insulating material can withstand before failure when bent around a specific radius (used to evaluate thermal endurance). Also, ability of a conductor, wire or cable to withstand repeated bending.

**Fluorinated Ethylene Propylene** - FEP is similar to polytetrafluoroethylene, but has a melting point about 50°C lower and slightly different physical properties. It is more easily processed than PTFE. Heat resistance and chemical inertness are outstanding. Foamed FEP with a dielectric constant of about 1.6 is also used.

**Flux** - The rate of flow of energy across or through a surface. Also a substance used to promote or facilitate fusion, such as a material used to remove oxides from surfaces to be joined by soldering or welding.

**Foamed Plastics** - Resins in flexible or rigid sponge form with the cells closed or interconnected. Foamed insulations provide low dielectric constants and weight savings.

**Foaming Agents** - Chemicals added to plastics and rubbers that cause them to assume a cellular structure.

**Frequency** - The number of times an alternating current repeats its cycle in one second.

**Fuse Wire** - Wire made from an alloy that melts at a relatively low temperature.

**Fused Spiral Tape** - This refers to a type of PTFE insulated hookup wire. The spiral wrapped conductor is passed through a sintering oven where the overlaps are fused together.

## G

**Gage** - A term used to denote the physical size of a wire.

**Gas-Filled Cable** - A self-contained pressure cable in which the pressure medium is an inert gas having access to the insulation.

**Gas-Filled Pipe Cable** - A pipe cable in which the pressure medium is an inert gas having access to the insulation.

**Glass** - Glass fibers are used in yarn servings and braids and as strength members. High tensile strength, nonflammability, flexibility and resistance to moisture and high temperatures are characteristics of glass fibers. Dielectric properties and protection against abrasion depend on other materials or treatments.

**Gold** - Used primarily as a coating or plating because of its cost and other properties. It is a very soft, ductile material that is noted for its resistance to corrosive media.

**Ground** - An electrical term meaning to connect to the earth or other large conducting body to serve as an earth, thus making a complete electrical circuit.

**Ground Insulation** - The major insulation used between a winding and the magnetic core or other structural parts, usually at ground potential.

**Ground Power Cable** - A cable assembly fitted with appropriate terminations to supply power to an aircraft from a ground power unit.

**Ground Support Cable** - Cable construction, usually rugged and heavy, for use in ground support control or power systems.

**Ground Wire** - A conductor leading from radio equipment to an electrical connection with the ground.

**Grounded** - Connected to earth or to some conducting body that serves in place of the earth.

**GTO** - Designation for gas tube sign and oil burner ignition cable. 5,000-15,000V.

## H

**Hard Drawn Copper Wire** - Copper wire that has not been annealed after drawing.

**Hardener** - A substance or mixture of substances added to plastic composition to promote or control the curing reaction by taking part in it.

**Harness** - A group of conductors laid parallel or twisted by hand, usually with many breakouts, laced or bundled together or pulled into a rubber or plastic sheath; used to interconnect electrical circuits.

**Heat Endurance** - The time of heat aging that a material can withstand before failing a specific physical test.

**Heat Seal** - In cabling, a method of sealing a tape wrap jacket by means of thermal fusion.

**Heat Shock** - Test to determine stability of a material by sudden exposure to a high temperature for a short period of time.

**Heater Cord** - Flexible stranded copper conductor, cotton wrapped, rubber insulation, asbestos roving. For indoor use on household appliances.

**Helix** - Spiral winding.

**Henry** - Unit of inductance when the induced electromotive force of one volt is produced by the inducing current, changing at the rate of one ampere per second.

**Hertz (Hz)** - A term replacing cycles-per second as an indication of frequency.

**Hi-Pot** - A test designed to determine the highest potential that can be applied to a conductor without breaking through the insulation.

**High Strength Alloy Conductor** - A conductor which shows a maximum 20% increase in resistance and a minimum of a

70% increase in breaking strength over the equivalent construction in pure copper, while exhibiting a minimum elongation of 5% in 10 inches. As required, the alloy should be capable of sustaining continuous exposure to temperatures as high as 300°C without suffering an appreciable permanent change in properties.

**High Voltage Time Test** - An accelerated life test on a cable sample in which voltage is the factor increased.

**Hollow Copper Conductors** - An electrical conductor that integrally provides a means of heat exchange. A cooling fluid is passed through the interior of the conductor and carries away the heat generated by the flow of the electrical current.

**Hollow-Core Annular Conductor (Hollow-Core Conductor)** - A conductor composed of a plurality of conducting elements disposed around a supporting member which does not fill the space enclosed by the elements; alternately a plurality of such conducting elements disposed around a central channel and interlocked one with the other, or so shaped that they are self-supporting.

**Hook-Up Wire** - Insulated wire used for low current, low voltage (under 1000V) applications internally within enclosed electronic equipment.

**Hot Tin Dip** - A process of passing bare wire through a bath of molten tin to provide a coating.

**Hybrid Cable** - Multi-conductor cable containing two or more types of components.

## I

**Ignition Cable** - Cable designed primarily for automotive ignition systems.

**Impact Strength** - Test for ascertaining the punishment a cable configuration can withstand without physical or electrical breakdown, by impacting with a given weight, dropped a given distance, in a controlled environment.

**Impedance** - The total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency. It is a combination of resistance R

and reactance  $X$ , measured in ohms and designated by  $Z$ .

$$Z = \sqrt{R^2 + X^2}$$

**Impregnate** - To fill the voids and interstices of a material with a compound. (This does not imply complete fill or complete coating of the surfaces by a hole-free film.)

**Impulse** - A surge of unidirectional polarity.

**Impulse Ratio** - The ratio of the flashover, spark over or breakdown voltage of an impulse to the crest value of the power-frequency flashover, spark over or breakdown voltage.

**Impulse Strength** - The voltage breakdown of insulation under voltage surges on the order of microseconds in duration.

**Impulse Test** - An insulation test in which the voltage applied is an impulse voltage of specified wave shape.

**Inductance** - The property of a circuit or circuit element that opposes a change in current flow. Inductance thus causes current changes to lag behind voltage changes. Inductance is measured in henrys.

**Inhibitor** - A corrosion inhibitor is a material that prevents or delays oxidation and galvanic action on a connector surface, or the interface of different conductors. Also, a chemical compound added to a mixture to restrain its chemical reaction until a desired condition exists.

**Insulated Wire** - A conductor of electricity covered with a non-conducting material.

**Insulating Joint** - A device that mechanically couples and electrically insulates the sheath and armor of contiguous lengths of cable.

**Insulation** - Material having a high resistance to the flow of electric current, to prevent leakage of current from a conductor.

**Insulation Grip** - Certain crimp-type contacts have extended cylinders at the rear designed to accept the bared wire and a small length of its insulation. When crimped, both the wire and insulation are held firmly in place. This insulation grip prevents the wire from being exposed by the insulation receding and thus it minimizes conductor breakage where it leaves the crimped area.

**Insulation Resistance** - The ratio of the applied voltage to the total current between two electrodes in contact with a specific insulator.

**Insulation System** - All of the insulation materials used to insulate a particular electrical or electronic product.

**Insulator** - A material of such low electrical conductivity that the flow of current through it can usually be neglected.

**Integral Belt** In a cable, a layer of insulation or semi-conductive material applied usually by extrusion over two or more insulated, twisted or parallel conductors, to form a round smooth diameter.

**Intercalated Tapes** - Two or more tapes, generally of different composition, applied simultaneously in such a manner that a portion of each tape overlies a portion of the other tape.

**Intercom Wire** - Wire used to connect communications instruments, telephones, telegraph, etc.

**Interconnecting Wire** - The physical wiring between components (outside a module) between modules between units or between larger portions of a system or systems.

**Interstice** - A minute space between one thing and another, especially between things closely set or between the parts of a body.

**Ionization Factor** - The difference between percent power factors of a dielectric at two specified values of electrical stress. The lower of the two stresses is usually selected so that the effect of ionization on power factor at this stress is negligible.

**Ionization Voltage (Corona Level)** - The minimum value of falling r.m.s. voltage that sustains electrical discharge within the vacuous or gas-filled spaces in the cable construction or insulation.

**Iron-Constantan** - A combination of metals used in thermocouples, thermocouple wires and thermocouple lead wires. Constantan is an alloy of copper, nickel, manganese and iron. The iron wire is positive, the constantan negative.

**Irradiation** - The exposure of a material to high-energy emissions. In insulations for the

purpose of favorably altering the molecular structure.

**Isocyanate Resins** - This resin is generally reacted with polyols such as polyester, polyethers, etc. The reactants are joined through the formation of the urethane linkage.

## J

**Jacket** - A rubber or synthetic covering sometimes fabric reinforced, over the insulation, core or sheath of a cable.

**Jan Specification** - Joint Army-Navy Specification.

**Jumper** - A short length of conductor used to make a connection between terminals or around a break in a circuit, or around an instrument. It is usually a temporary connection.

**Junction** - A point in a circuit where two or more wires are connected.

**Jute** - A natural fiber of plant base formed into rope-like strands. Used in cables for filling the interstices to give a round cross-section.

## K

**Kilocycle** - A term denoting one thousand cycles.

**Kilowatt** - A unit of power equal to one thousand watts.

**Kilovolt Ampere** - 1000 volts x amperes.

**Kilovolts** - 1000 volts.

**Kirchoff's laws** - 1) The algebraic sum of the currents which meet at any point is zero. 2) In any closed circuit, the algebraic sum of the products of the current and the resistance in each conductor in the circuit is equal to the electromotive force in the circuit.

## L

**Lacing Cord or Twine** - Used for lacing and tying cable forms, hookup wires, cable ends, cable bundles and wire harness assemblies.

Available in various materials and impregnants.

**Lacing Tape** - Flexible flat fabric tape for tying harnesses and wire bundles, securing of sleeves and other items, and general lacing and tying applications. Available in various materials and impregnants.

**Lacquer Finish** - A finish applied over braided wire or cable for appearance and protection against fraying, wicking, moisture absorption, abrasion, etc.

**Laminates** - Two or more layers, usually of different materials, bonded or laminated together.

**Lamp Cord** - Flexible stranded conductor cord, rubber or plastic insulated. Used for speaker cord, fans, lamps, etc. Not subject to hard usage.

**Lanyard** - A device attached to certain quick-disconnect connectors that permits uncoupling and separation of connector halves by a pull on a wire or cable.

**Latex** - Rubber material used for insulation of wire.

**Lay** - The lay of any helical element of a cable is the axial length of a turn of the helix of that element. (Note: Among the helical elements of a cable may be each strand in a concentric-lay cable, or each insulated conductor in a multiple-conductor cable.) Lay is often referred to as pitch.

**Lap Wrap** - Tape wrapped around an object in an overlapping condition.

**Layer** - Consecutive turns of a coil lying in a single plane.

**Lead Covered Cable (Lead Sheathed Cable)** - A cable provided with a sheath of lead for the purpose of excluding moisture and affording mechanical protection.

**Lenz's Law** - When an electromotive force is induced in a conductor by any change in the relation between the conductor and the magnetic field, the direction of the electromotive force is such as to produce a current whose magnetic field will oppose the change.

**LESCW** - Designation for low energy safety circuit wire.

**Line Cord** - A two-wire cord terminating in a two-prong plug at one end used to connect equipment or appliances to a power outlet.

**Line Voltage** - The voltage existing in a cable or circuit such as at a wall outlet or other terminals of power line system. The line voltage is usually between 115 and 120 volts, with 117 as an average, but may vary at times as much as five volts above or below the 115 and 120 volt limits. It is also the voltage existing in a cable or circuit.

**Litz Wire** - Wire made from a number of fine, separately insulated strands specially braided or woven together for reduced skin effect and, hence, lower resistance to high frequency currents for lower RF losses. The full name is Litzendraht wire.

**Load Factor** - The ratio of average load to peak load over a given time period, usually considered over a 24 hour period in the power utility industry.

**Longitudinal Wrap** - Tape applied longitudinally with the axis of the core being covered, as opposed to a helical or spiral tape wrapped core.

**Loop Resistance** - Total resistance of two conductors, measured round trip from one end (twisted pair, shield and conductor, etc.).

**Looping-In** - Wiring method that avoids tee joints by carrying the conductor or cable to and from the point to be supplied.

**Loss** - Energy dissipated without accomplishing useful work.

**Loss Index** - The product of the power factor and the dielectric constant.

**Lossy Line** - A cable having large attenuation per unit of length.

**Low Loss** - Term applied to a dielectric material or cable that has a small amount of power loss over long lengths, making it suitable for transmission of radio frequency energy.

**Low Tension** - Low voltage, as applied to ignition cable.

**Low Noise Cable** - Cable configuration specially constructed to eliminate spurious electrical disturbances caused by

capacitance changes or self-generated noise induced by either physical abuse or adjacent circuitry.

**Lug** - Termination, usually crimped or soldered to the conductor, with provision for screwing on to terminal.

## M

**Magnet Strip** - Magnet strip is sheet or foil aluminum (either bare or insulated) used as the conductor in electric windings. Copper is also used. The largest application has been in distribution transformers. There has also been some use in small coils for devices such as relays and automobile horns. Most use has been in the form of bare aluminum strip with shaped, rounded or contoured edges. This is wound with paper, plastic film, mica paper or other sheet insulation between layers. Coated strip (of both aluminum and copper) also has been developed.

**Magnet Wire** - Insulated wire intended for use in windings on motor, transformer and other coils for electromagnetic devices.

**Magnetic Field** - The region surrounding a magnet through which magnetic forces act. Composed of lines of force.

**Magnetic field due to a current** - The intensity of the field in oersteds at the center of a circular conductor  $r$  in which a current is flowing, is represented by

$$H = \frac{2 \cdot \pi \cdot n \cdot i}{r}$$

where:

$H$  = Magnetic Field (oersteds)  
 $n$  = the number of turns  
 $r$  = the radius of the conductor  
 $i$  = Current flowing (amps)

**Marker Tape** - A tape laid parallel to the conductors under the sheath in a cable, imprinted with the manufacturer's name and the specification to which the cable is made.

**Marker Thread** - A colored thread laid parallel and adjacent to the strands of an insulated conductor, which identifies the wire manufacturer and sometimes the

specification under which the wire is constructed.

**Matteucci Effect** - Voltage generating property of a twisted ferro-magnetic wire upon change of magnetization.

**Mega** - Prefix denoting one million.

**Megacycle** - A term denoting one million cycles.

**Megavolt** - A term denoting one million volts.

**Megawatt** - A term denoting one million watts

**Megohm** - A term denoting one million ohms.

**Melt Index** - Extrusion rate of a thermoplastic material through an orifice of specified diameter and length of under specified conditions of time, temperature and pressure.

**Melt Range** - The difference in degrees F or C between the melt point of material and its flow point.

**Melt Point** - The point at which a material melts.

**Metered Solder Cup** - Term used when the cylindrical portion of the contact (into which the wire is inserted) is partially filled with a specific amount of solder before assembly of the connector. Thus, the wire can be soldered into the contact with heat and without additional solder.

**Mica** - A silicate which separates into layers and has high insulation resistance, dielectric strength and heat resistance. It is used as an insulation wrap in wires and cables to a limited degree, where radiation resistance requirements are severe and for high temperature work demanding good heat resistance.

**Micro** - Prefix denoting one-millionth.

**Microphone Cable** - A special shielded cable used to connect a microphone to an amplifier.

**Microwave** - A short electrical wave with a wavelength usually of less than 30 cm.

**Microwave Frequency** - Frequency usually above 1000 megahertz.

**Migration of Plasticizer** - Loss of plasticizer from an elastomeric plastic compound with subsequent absorption by an adjacent medium of lower plasticizer concentration.

**Mil** - A term denoting one one thousandth of an inch

**Mineral Insulation** - Mineral insulated (MI) cable and thermocouple wire consists of one or more conductors surrounded by magnesium oxide insulation and enclosed in a liquid-and gas-tight metallic sheathing. Because the construction is completely inorganic, the cable is very heat resistant and inert to most conditions.

**Miniature Wire** - Insulated conductors of approximately 20 to 34 AWG with small overall diameters.

**Mis-Match** - A termination having a different impedance than that for which a circuit or cable is designed.

**Modulus of Elasticity** - The ratio of stress to strain in a material that is elastically deformed.

**Moisture Absorption** - Generally, the amount of moisture in percentage that an insulation will absorb under specified conditions.

**Moisture Resistance** - The ability of a material to resist absorbing moisture from the air or when immersed in water.

**Molecular Weight** - The weight of any molecule that is the sum of the weights of its constituent atoms.

**Monomer** - The simple, unpolymerized form of a compound, which is the building block of a polymer.

**Multiple-Conductor Cable** - A combination of two or more conductors, cabled together and insulated from one another and from sheath or armor where used. (Note: Special cables are referred to as 3-conductor cable, 7-conductor cable, 50-conductor cable, etc.).

**Multiple-Conductor Concentric Cable** - A cable composed of an insulated central conductor with one or more tubular stranded

conductors laid over it concentrically and insulated from one another.

## N

**Natural Rubber (NR-isoprene)** - Rubber by itself is lacking in many properties required of wire and cable insulating and jacketing materials. However, by proper compounding and mixing with other products, it can be converted to a material with excellent physical properties, good electrical properties, and fair to moderate ozone resistance and chemical resistance.

**Neoprene (CR-Chloroprene) Rubber** - Chemically, this synthetic rubber is known as polychloroprene. Although the electrical properties of neoprene are inferior to many other insulations, they are adequate for low voltage work. The physical properties of neoprene are similar in some respects to natural rubber, but it is considerably better from the standpoint of resistance to oil, ozone, heat, weather, sunlight and aging. It does not support combustion and resists abrasion and cutting. It is used for a wide variety of wire and cable jacketing applications.

**Nickel** - This metal offers combination of corrosion resistance, formability and tough physical properties. For these reasons, nickel is used for alloying purposes and in nickel-clad copper wire.

**Nitrile-Butadiene Rubber (NBR)** - Also known as nitrile rubber. Specific properties depend on the actual composition but generally, this rubber offers excellent resistance to oils and solvents. Low temperature flexibility is good. Nitrile rubber has a very low resistivity value. Tensile strength, hardness, toughness, oil and solvent resistance and resilience vary with the acrylonitrile content (the rubber is the result of the copolymerization of acrylonitrile and butadiene).

**Neutral** - That conductor (when one exists) of a polyphase circuit, or of a single phase 3-wire circuit which is intended to have a potential such that the potential differences between it and each of the other conductors are approximately equal in magnitude and are equally spaced in phase.

**Nylon** - The generic name for synthetic fiber-forming polyamides. Available in three forms

for wires and cables; as a yarn for wire serving and braid; as an extrusion material (primarily for jackets); and a coating. For conductors of any but a small size, the electrical properties and hygroscopic properties of nylon limit its use to jacketing rather than primary insulation. Nylon extrusions are characterized by toughness and excellent oil resistance. Nylon magnet wire has excellent wind ability due in part to the smooth coating that resists rubbing abrasion. It can be soldered through by using rosin alcohol flux and tin-lead solders.

## O

**Ohm** - The electrical unit of resistance. The value of resistance through which a potential difference of one volt will maintain a current of one ampere.

**Ohm's Law** - Current in terms of electromotive force **E** and resistance **R**; given by equation:

$$I = \frac{E}{R}$$

**Oil feeding Reservoirs** - Oil storage tanks situated at intervals along the route of an oil filled cable at oil filled joints of solid cable for the purpose of keeping the cable constantly filled with oil under pressure.

**Oil-Filled Cable** - A self-contained pressure cable in which the pressure medium is low viscosity oil having access to the insulation.

**Oil-Filled Pipe Cable** - A pipe cable in which the pressure medium is oil-having access to the insulation.

**Oscillating Surge** - A surge that includes both positive and negative polarity values.

**Overlap** - The amount the trailing edge laps over the leading edge of a spiral tape wrap.

**Overpotential** - A voltage above the normal operating voltage of a device or circuit.

**Oxygen Bomb Test** - A method of determining aging effect on wire under heat, tensile strength and elongation conditions (wire is placed in a bomb at 70°C, under 300 psi using pure oxygen gas for a period of 48 to 96 hours).

**Ozone** - Form of oxygen produced by discharge of electricity into air.

## P

**Pan Cured** - Method of vulcanizing. Coils of unvulcanized insulated wire are coiled in pans and vulcanized under pressure with live steam.

**Paper** - Insulation used for telephone cable, high voltage cable, magnet wire and with a lead sheath for underground service conductors. Oil impregnated paper has improved electrical and moisture resistance properties. Paper is also used as a cable filler.

**Parallel Pair** - A duplex construction where the two insulated conductors are laid parallel and then covered overall with a braid or jacket. It is often referred to as a "duplex cable."

**Patch Cable** - A cable with plugs or terminals on each end of the conductor or conductors used to temporarily connect circuits of equipment together.

**Percent Conductivity** - Conductivity of a material expressed as a percentage by weight; thus, for the same percentage, as the conductor diameter increases, so does the thickness of the plating.

**Permittivity** - Preferred term for dielectric constant.

**pH** - The measure of the acidity or alkalinity of a substance, neutrality being at pH 7. Acid solutions are under 7, alkaline solutions over 7.

**Phase** - A particular state or point of advancement in an electrical cycle. The fractional part of the period through which the time has advanced measured from some arbitrary point, usually expressed in electrical degrees where 360° represents one cycle.

**Phase Shift** - Change in phase of a voltage or current after passing through a circuit or cable.

**Picks Per Inch** - The number of times the carriers in a braid cross over each other in the same direction along the longitudinal axis for each inch of length.

**Pigtail Wire** - Fine stranded, extra flexible, rope lay lead wire.

**Pipe Cable** - A pressure cable in which the container for the pressure medium is a loose fitting, rigid metal pipe.

**Pitch** - In a flat cable, nominal distance between the index edge of any conductor and the index edge of an adjacent conductor, expressed in decimal inches or millimeters.

**Pitch Diameter** - Diameter of a circle passing through the center of the conductors in any layer of a multiconductor cable.

**Plain Conductor** - A conductor consisting of one metal only.

**Plain Enamel** - Magnet wire film coating.

**Planetary Twister** - A twisting machine whose payoff spools are mounted in rotating cradles that hold the axis of the spool in a fixed direction as the spools are revolved about one another, so the wire will not kink as it is twisted.

**Plastic** - High polymeric substances, including both natural and synthetic products, but excluding the rubbers, that are capable of flowing under heat and pressure at one time or another.

**Plastic Deformation** - Change in dimensions of an object under load that is not recovered when the load is removed.

**Plasticizer** - Chemical agent added to plastics to make them softer and more flexible.

**Plating** - One method of applying a coating, one metal over another.

**Polarity** - 1) An electrical condition determining the direction in which current tends to flow. 2) The quality of having two opposite charges.

**Polyamide** - A compound characterized by more than one amide group.

**Polyamide-Imide Enamel** - Magnet wire insulating film based on an aromatic polyamide-imide resin. It is based on trimellitic anhydride (TMA). The film is tough, smooth and abrasion resistant. It has high dielectric strength, which is maintained under humid conditions and after long-time aging. It

resists deformation under heat and pressure. It can be used in applications as high as 220°C. This enamel has found its greatest use as an over coating for other enamels.

**Polyester** - Supplied in the form of yarns for servings and braids and film for wire wraps. The film may also be used as a separator either under or over other insulations - for example, to protect fibrous strands from the penetration of saturants, as well as for magnet strip interleaving. Generally, the polyesters are characterized by an excellent balance of strength, electrical and thermal properties. They contribute to considerable space savings in communication and other wires and cables. The films are used on both round conductors and in ribbon of flat cables. A colored, heat sealable material uses a polyester film base with a coating of polyethylene resin.

**Polyester Magnet Wire Enamels** - These films are composed of synthetic resin, based on polyesters of terephthalic acid and polyhydric alcohols with or without a superimposed polyester film. The polyesters may be modified with other resins. The enamels can be used alone or two may be employed, where one serves as an overcoat for the other. In addition, they may be over coated with other polymers including nylon, amide-imide, epoxy, etc. There also are polyester-amide-imide and polyester-imide enamels. The many different types available provide a variety of desirable properties.

**Polyethylene** - A thermoplastic material composed of polymers of ethylene. A variety of types of polyethylene are used in wires and cables in very large amounts. Polyethylene has excellent electrical properties for wire and cable insulation, plus superior abrasion and solvent resistance, moisture resistance, lightweight, low brittle point and durability. Polyethylene is used as an insulation or jacketing material for hook-up wire, coaxial cable, communication cable, line wire, lead wire, high voltage cable, etc. Flame retardant types of polyethylene are available. High-density polyethylene reportedly offers properties similar to conventional polyethylene, with some improvement in physical toughness.

Copolymers of ethylene-butene resins are in the high density, low melt index range and have very high values for environmental stress cracking resistance. Special flame retardant compounds can be supplied.

A polyethylene-butadiene copolymer is said to combine the hardness of a plastic with the springiness of rubber.

Chlorinated polyethylene can be produced in a wide range of elastomeric to rigid polymers. They impart flame retardance and flexibility to blends with polyethylene. Other features reported for chlorinated polyethylene include resistance to low temperature cracking, as well as ozone and oil resistance. CPE/PE blends have excellent heat and abrasion resistance.

Chemically cross-linking converts PE from a thermoplastic to a material with thermosetting properties. Properties are quite similar to conventional PE, except for a significant improvement in heat resistance, mechanical properties (including toughness and abrasion resistance), aging characteristics and freedom from environmental stress cracking.

Polyethylene can also be cross-linked by irradiating the insulation on the wire, but the process is generally limited to thin wall insulations if fair uniformity of cross-link density is desired.

Foamed or cellular polyethylene represents a small but important part of the wire and cable insulation field. Uniform dispersion of gas cells makes possible a relatively low dielectric constant (1.5-1.7), which permits telephone singles insulation with reduced wall thickness and resultant lighter weight.

**Polyimide** - Available for wire insulation in both film form and as a magnet wire enamel. The resin is produced by reacting pyromellitic dianhydride (PMDA) with an aromatic diamine. The enamel can be used in applications where a wire is required to operate over a wide temperature range, as high as 220°C. It is chemically inert and is radiation resistant. One Polyimide in film form, in combination with FEP film, is a heat sealable material that offers possibilities as a space and weight saving wire insulation. As a supplementary insulation, particularly with PTFE and FEP insulation, it improves cut-through and abrasion resistance. It possesses very high heat resistance. There also is use of Polyimide coatings over extruded FEP and PTFE for increased cut-through resistance and potability without surface preparation.

**Polyisobutylene** - The polymerization product of isobutylene.

**Polymer** - A compound formed by polymerization, which results in the chemical union of monomers or the continued reactions between lower molecular weight polymers.

**Polypropylene** - A plastic made by the polymerization of high-purity propylene gas in the presence of an organometallic catalyst at relatively low pressures and temperatures. It is similar to polyethylene but is lighter and offers even better heat resistance, tensile strength, abrasion resistance and lower dielectric constant. For high frequency work, a specially purified grade is required. The material is used in solid extruded forms, and there is also some work being done with foams. In addition, polypropylene film is being used, either alone or in combination with other materials, as a cable or core wrap to act as a thermal (during extrusion) or moisture barrier in cable constructions-and, providing additional electrical and mechanical side benefits.

**Polytetrafluoroethylene** - This is the most thermally stable and chemically resistant of all carbonaceous insulating compounds. It is unaffected by sunlight, moisture and practically all chemicals. Temperature range is -90°C to +250°C, and electrical properties are very constant over the temperature range and a wide range of frequencies. Insulation may be applied by extrusion, taping, dip coating, and in cases where another material is used, by dispersion coating. Both conventional and ribbon type wires and cables are made, as well as magnet wire. PTFE is used for both primary insulation and extruded jackets.

**Polytrifluorochloroethylene** - This material approaches PTFE in many properties, but is characterized by somewhat lower heat resistance.

**Polyurethane** - This material is primarily of interest as a magnet wire enamel for wires, which can be soldered without prior removal of the film. The mechanical, chemical and electrical characteristics of the wires are such as to render them suitable for withstanding winding hazards. Extruded polyurethane is being used for jacketing coaxial and hook-up cables. In tape form, it is suggested as a cable-jacketing wrap.

**Polyvinyl Chloride (PVC)** - A thermoplastic material composed of polymers of vinyl chloride. PVC is widely used for primary wire

insulation or jacketing on communication wires, control cables, bell wire, building wire, hook-up wire, fixture wire, appliance cords, power cords, lighting cables, motor leads and other low voltage work (to 600 V). Many different formulations are available, including grades for high temperatures, low temperatures, flame resistance, deformation resistance, etc. Dielectric strength is excellent and flexibility is very good. Some formulations may have limitations when considering toughness, moisture resistance and resistance to chemicals. PVC is probably the most versatile of the lower cost, conventional temperature wire insulations in round and ribbon forms. A conductive vinyl can be used to obtain shielding and mechanical protection at the same time.

**Polyvinyl Formal** - This magnet wire film is formed in place from a solution of two principal resins. In some cases one or more other resins may be added. The resin present in the larger proportion is polyvinyl formal. The resin present in smaller proportion is an alkyl phenol-formaldehyde condensation reaction product. This wire has been used in very large quantities. The characteristics are such that it is suitable for use in most electrical apparatus designed for operation as class A devices. It has excellent windability. It is compatible with most insulations, varnishes and compounds.

**Polyvinylidene Fluoride** - This thermoplastic resin, a fluorocarbon, is characterized by good mechanical, electrical and chemical properties. In primary insulation and in jackets for multi-conductor cables, it has performed successfully at temperatures from -80°F to +300°F. The material can be extruded, or applied as a film, or solution or dispersion coating. PVF<sub>2</sub> offers excellent resistance to abrasion and cut-through. Radiation crosslinking provides improved heat resistance. Applications include hook-up, control, aircraft, lead and computer wires and cables.

**Portable Power Cable** - Flexible, all rubber insulated for hard usage. Some cables have shielded conductors (metallic or non-metallic) and can have neoprene sheath overall.

**Potting** - Sealing of a cable termination or other part with a liquid composition, which hardens into an elastomer or solid plastic material.

**Power Cables** - Cables of various sizes, construction and insulation, single or multi-conductor, designed to distribute primary power to various types of equipment.

**Power developed by a direct current** - Expressed as  $P = EI = I^2R$ . When amperes, volts and ohms are used, power is expressed in watts.

**Power Factor** - 1) In an alternating current circuit, it is the number of watts indicated by a watt meter, divided by the apparent watts, the latter being the watts as measured by a voltmeter and ammeter. 2) It is the multiplier used with the apparent watts to determine how much of the supplied power is available for use. 3) That quantity by which the apparent watts must be multiplied in order to give the true power. 4) Mathematically, the cosine of the angle of phase difference between current and voltage applied.

**Power in watts for alternating current** - Expressed as  $P = EI\cos\phi$ , where E and I are the effective values of the electromotive force and current in volts and amperes respectively, and  $\phi$  the phase angle between the current and impressed electromotive force.

**Pressure Cable** - An oil-impregnated, paper-insulated cable in which the positive gauge pressure is maintained on the insulation under all operating conditions.

**Primary Insulation** - A non-conductive material, usually the first layer over a current carrying conductor, whose primary function is to act as an electrical barrier for the applied potential.

**Printed Wiring** - A printed circuit, or a portion thereof, intended primarily to provide point-to-point electrical connections.

**Promoter** - A chemical, itself a feeble catalyst, that greatly increases the activity of a given catalyst.

**Propagation Delay** - Time delay between input and output of signal, usually measured in nanoseconds per foot of cable.

**Proximity Effect** - The phenomena of non-uniform current distribution over the cross-section of a conductor, caused by the variation of the current in a neighboring conductor.

**Pulling Eye** - A device which may be fastened to the conductor or conductors of a cable or formed by or fastened to the wire armor and to which a hook or rope may be directly attached in order to pull the cable into or from a duct.

## Q

**Quad** - A four-conductor cable.

**Quadruplex** - A cable composed of four insulated single conductors, all twisted together. (Note: The assembled conductors may or may not have a common covering of binding or protecting material).

## R

**Random Winding** - A winding in rotating equipment wherein the wires do not lie in an even pattern.

**Rayon** - A synthetic used for yarn serving and braid applications, generally in the same applications where cotton can be used.

**Reactance** - Opposition offered to the flow of an alternating current by inductance or capacitance of a component or circuit.

**Red Plague** - A powder, brown-red growth sometimes found on silver-coated copper conductors and shield braids. It is fungus-like in appearance and will appear in random spots along the length of a conductor or shield. It most often occurs at the point of crossover in a shield, or in the interstices of a standard conductor. Proper design and material selection has largely eliminated this problem.

**Reducing Joint** - A joint between two lengths of cable, where the conductors are not the same size.

**Reinforcement** - A material used to reinforce, strengthen or give dimensional stability to another material, such as the braid portion of a sheath constructed in layers.

**Resin** - An organic substance of natural or synthetic origin characterized by being polymeric in structure and predominantly amorphous. Most resins, though not all, are of high molecular weight and consist of long chain or network molecular structure. Usually

resins are more soluble in their lower molecular weight forms.

**Resistance** - Property of a conductor that determines the current produced by a given difference of potential. The ohm is the practical unit of resistance.

**Resistive Conductor** - A conductor used primarily because it possesses the property of high electrical resistance.

**Resistivity** - The ability of a material to resist passage of electrical current, either through its bulk or on a surface. The unit of volume resistivity is the ohm-cm, of surface resistivity, the ohm.

**Respool** - To rerun material from one package spool to another for various purposes, such as to verify lengths, inspect for defect, etc.

**Return Wire** - A common wire, a ground wire or the negative wire in a direct-current circuit.

**RF Connector** - Connector used for connecting or terminating coaxial cable.

**Ribbon Cable** - Flat cable with conductors that have been individually insulated together. Structure is usually characterized by individual colors of insulation for each conductor, although a single color may be used for all conductors.

**Ridge Marker** - One or more ridges running laterally along the outer surface of plastic wire for purposes of identification.

**Rockwell Hardness** - A test for hardness (resistance to indentation) of a material in which a hardened steel ball or diamond point is pressed into the material under test.

**Rod Mills** - A factory in which copper rod is drawn down to a smaller size. This may then be sold to other wire mills for drawing to still smaller sizes.

**Roentgen** - The amount of radiation that will produce one electrostatic unit of ions per cubic centimeter volume.

**Root-Mean-Square (RMS) Current** - The alternating current value that corresponds to the direct current value that will produce the same heating effect.

**Rope Concentric** - A group of standard conductors assembled in a concentric manner. The direction of lay of the outer rope members is left-handed.

**Rope-Lay Conductor or Cable** - A cable composed of a central core, surrounded by one or more layers of helically laid groups of wires. (Note: This kind of cable differs from a concentric-lay conductor in that the main strands are themselves stranded. In the most common type of rope-lay conductor or cable, all wires are of the same size, and the central core is a concentric-lay conductor).

**Rope Unilay** - A group of stranded conductors assembled in a unilay manner. The direction of lay of the unilay rope is left hand.

**Round Conductor Flat Cable** - A cable made with parallel round conductors in the same plane.

**Rubber** - An elastomer capable of rapid elastic recovery. Specifically, natural rubber, the standard of comparison for elastomers.

**Rupture** - In breaking strength or tensile strength tests, the point at which a material physically comes apart as opposed to yield strength, elongation, etc.

## S

**Screen** - A semi-conducting or high resistance material used to reduce stress concentrations at the surface of stranded conductors or edges of outer shielding tapes. May be extruded plastic, rubber-filled tapes, carbon black paper or thin aluminum foil laminated to paper (metallized paper). In the U.S., a screen at the conductor is frequently called a strand shield, although a shielded cable frequently has no strand shield.

**Secondary Insulation** - A non-conductive material whose primary functions are to protect the conductor against abrasion and provide a secondary electrical barrier. Placed over the primary insulation.

**Sector Cable** - A multi-conductor cable in which the cross-section of each conductor is approximately the sector of a circle. (Note: Sector conductors are used in order to obtain, with a given conductor sectional area, a cable of decreased overall diameter, or to

obtain, in a cable of given overall diameter, conductors of a larger sectional area).

**Segmental Conductor** - A stranded conductor consisting of three or more stranded conducting elements, each element having approximately the shape of the sector of a circle, assembled to give a substantially circular cross-section. The sectors are usually lightly insulated from each other and, in service, are connected in parallel.

**Self-Contained Pressure Cable** - A pressure cable in which the container for the pressure medium is an impervious flexible metal sheath, reinforced, if necessary, which is factory-assembled with the cable core.

**Self-Extinguishing** - The characteristic of a material that extinguishes its own flame after the igniting flame is removed.

**Self-Supporting Aerial Cable** - A cable consisting of one or more insulated conductors, factory-assembled to a messenger which supports the assemblage, and which may or may not form a part of the electric circuit.

**Semi-Conductor** - A material possessing electrical conduction properties that fall somewhere between conductors and insulators. Often of specially compounded plastics, and commonly referred to as "semicon".

**Semi-Conducting Jacket** - A jacket having a sufficiently low resistance so that its outer surface can be kept at substantially ground potential by a grounded conductor in contact with it at frequent intervals.

**Separator** - A layer of material such as textile, paper, mylar, etc placed between a conductor and its insulation or between a cable core and the jacket. Used to improve stripping qualities and/or flexibility and may offer additional mechanical or electrical protection.

**Serving** - A wrapping applied over the core of a cable or over a wire. Servings may be in the form of filaments, fibers, yarn, tape, etc.

**Sheath** - The outer covering or jacket over the insulated conductors to provide mechanical protection for the conductors. Also known as the external conducting surface of a shielded transmission line.

**SHFS** - Designation for polyvinyl insulated with felted asbestos, flame proof cotton or rayon braid. Navy switchboard wire, 600V.

**Shield** - A metallic layer placed around an insulated conductor or group of conductors to prevent electrostatic or electromagnetic interference between the enclosed wires and external fields. This shield can be braided or served wires, foil wrap, foil backed tape, a metallic tube, or conductive vinyl or rubber. When a metallic braid of tinned or bare copper is applied over the insulated conductors, the shielding effectiveness is in proportion to the amount of coverage, usually expressed in percentage.

**Shielded-Type Cable** - A cable in which each insulated conductor is enclosed in a conducting envelope so constructed that substantially every point on the surface of the insulation is at ground potential, or at some predetermined potential with respect to ground under normal operating conditions.

**Short Circuit** - An abnormal connection of relatively low resistance between two points on a circuit having a difference in potential.

**Shrinkable Tubing** - A tubing used to provide protection against mechanical damage for wires, cables, wire harnesses, splices, terminations, etc. They shrink to a predetermined size upon application of heat or solvent evaporation. Available in various plastic or elastomeric materials.

**Shunt Wire** - A conductor joining two parts of an electric circuit to divert part of the current.

**Silica** - Silica fibers produced from melted quartz offer properties similar to fiberglass, but even higher heat resistance (above 2000°F). They offer possibilities as yarn servings.

**Silicone** - Polymeric materials in which the recurring chemical group contains silicon and oxygen atoms as links in the main chain. Silicone rubber extrusions offer retention of good electrical properties, resilience and flexibility after long long-time heat aging. Excellent ozone resistance, low temperature flexibility, long life, low moisture absorption, weather resistance, radiation resistance and corona resistance are other characteristics. Resistance to some oils, solvents and strong acids is relatively poor. Aircraft wires, nuclear cable, lighting wire, power cable, control cable, shipboard cable, heat and cold

appliance wires, lead wires, hook-up wire, ignition cable and fixture wire are uses.

**Silver** - Silver is similar to gold in corrosion resistance. It costs less than other precious metals. It is very soft when fully annealed but work hardens during fabrication. It provides very good conductivity and solderability. It is widely used as a plating or coating.

**Single-Faced Tape** - Fabric tape finished on one side with a rubber or synthetic compound.

**Sintering** - Forming articles from fusible powders at a temperature below melting point such as with PTFE.

**Skeleton Braid** - May be widely separated braid of fiber, copper or steel. Used to hold core together, for reinforcing jacket or for shielding.

**Skived Tape** - Tape shaved in a thin layer from a cylindrical block of material, such as skived PTFE tape.

**Skim Tape** - Filled tape coated on one or both sides with a thin film of uncured rubber or synthetic compound to produce a coating suitable for vulcanization.

**Skin Effect** - The phenomenon wherein the depth of penetration of electric currents into a conductor decreases as the frequency of the current increases.

**Sleeving** - A braided, knitted or woven tube.

**Solder** - A metallic alloy for uniting metals.

**Solder Cup** - A tubular end of a terminal in which a conductor is inserted prior to being soldered. It is also the hollow cylinder at the rear of a solder contact, where a wire is inserted and soldered in place.

**Solder-Eye** - A solder-type terminal provided with a hole at its end through which a wire can be inserted prior to being soldered.

**Solid Conductor** - A conductor consisting of a single wire.

**Spacer** - A metal piece placed between two conductors in a connector. Example: Most aluminum to copper connectors use a spacer located between the dissimilar cables to reduce galvanic corrosion.

**Spark Test** - A test performed on wire and cable to determine the amount of detrimental porosity (pin holes) or defects in the insulation.

**Sparkover** - A disruptive discharge between electrodes of a measuring gap, such as a sphere gap or oil-testing gap.

**Specific Gravity** - The density (mass per unit volume) of any material divided by that of water at a standard temperature.

**Splice** - A connection of two or more conductors or cables to provide good mechanical strength, as well as good conductivity.

**Split Conductor Cable** - A cable in which each conductor is composed of two or more insulated conductors, normally connected in parallel.

**Spurious Signals** - Undesired voltages in conductors caused by electromagnetic or electrostatic coupling from other conductors, or from external sources such as a transformer.

**Stability Factor** - The difference between the percentage factor at 80 volts/mil and at 40 volts/mil measured on wire immersed in water at 75 °C for a specific time.

**Stabilizer** - An ingredient used in some plastics to maintain physical and chemical properties throughout processing and service life.

**Stand-Off Insulator** - An insulator used to support a wire at a distance from a surface, building, or pole in which the insulator is mounted.

**Staple Fibers** - Fibers of spinnable length manufactured directly or by cutting continuous filaments to short lengths.

**Strain Insulators** - An insulator inserted into a guy wire, antenna or other stretched wire to break up the wire into insulated sections.

**Strand** - One of the wires, or groups of wires, of any stranded conductor.

**Stranded Conductor** - A conductor composed of a group of wires, or of any combinations of groups of wires. (Note: The wires in a stranded conductor are usually twisted or braided together).

**Striking Distance** - The effective distance between two conductors, separated by an insulating fluid. (Air clearance is typical).

**Strip Process Insulation** - Insulation consisting of one or more strips of unvulcanized thermosetting material, folded around a conductor and vulcanized after application.

**Styrene-butadiene** - Copolymer synthetic rubber characterized by good electrical properties and moisture resistance. Ozone resistance, physical properties and chemical resistance are generally improved by blending with other materials.

**Submarine Cable** - Cable used underwater from one point to another for power or communication. Lead sheath and/or rubber jacket typically used.

**Superconductors** - These are materials in which the resistance drops to almost zero at a temperature near absolute zero. Superconductivity is exhibited by many of the metallic elements, their alloys and intermetallic compounds.

**Surface Leakage** - The passage of current over the boundary surfaces of an insulator, as distinguished from passage through its volume.

**Surface Resistivity** - The resistance of a material between two opposite sides of a unit square of its surface. Surface resistivity may vary widely with the conditions of measurement.

**Surge** - A transient variation in the current and/or potential at a point in the circuit.

**Switchboard Wire** - Chemically crosslinked polyethylene or asbestos insulated wire used to wire up switchboards and control apparatus. Heat, flame and corrosive vapor resistant.

**Sweep Test** - A test given to check attenuation by oscilloscope, as in coaxial cable.

## T

**Tank Test** - A term used to describe a voltage dielectric test where the specimen to be tested is submerged in a liquid (usually water), and a voltage potential applied

between the conductor and the liquid as ground.

**Tap** - A special lead brought out from an intermediate point of a coil or winding.

**Tape** - A relatively narrow, woven or cut, strip of fabric, paper or film material.

**Tape Cable** - A form of multiple conductor consisting of parallel metal strips imbedded in insulating material. Also called flat flexible cable.

**Taped Insulation** - Insulation of helically wound tapes applied over a conductor or over an assembled group of insulated conductors. (a) When successive convolutions of a type overlap each other for a fraction of the tape width, the tape insulation is lap wound. This is also called positive lap wound. (b) When a tape is applied so that there is an open space between successive convolutions, this construction is known as open butt or negative lap wound. (c) When a tape is applied so that the space between successive convolutions is too small to measure with the unaided eye, it is a closed butt taping. Where there are multiple layers of tape, indexing refers to the fact that they are started a certain distance from each other along the axis of the cable to assure full coverage.

**Tear Strength** - Force required to initiate or continue a tear in a material under specified conditions.

**Tensile Strength** - The pulling stress required to break a given specimen.

**Tension Meter** - A meter used to measure and test the tension in all types of wire, yarn, tape and film during production, processing and winding.

**Tension Set** - The condition when a plastic material shows a permanent deformation caused by a stress, after the stress is removed.

**Temperature Rating** - The maximum temperature at which the insulating material may be used in continuous operation without loss of its basic properties.

**Terminal** - A terminal is any fitting used for making a convenient electrical connection.

**Test Lead** - A flexible, insulated lead wire that usually has a test prod on one end. It is ordinarily used for making tests, connecting instruments to a circuit temporarily, or for making temporary electrical connections.

**Thermal Conductivity** - Ability of a material to conduct heat.

**Thermal Endurance** - The time at a selected temperature for an insulating material or system of materials to deteriorate to some predetermined level of electrical, mechanical or chemical performance under prescribed conditions of test.

**Thermal Expansion (Coefficient of)** - The fractional change in length (sometimes volume) of a material for a unit change in temperature.

**Thermal Resistance of a Cable** - The resistance offered by the insulation and other coverings to the flow of heat from the conductor or conductors to the outer surface. (Note: The thermal resistance of the cable is equal to the difference of temperature between the conductor or conductors and the outside surface of the cable, divided by rate of flow of heat produced thereby).

**Thermal Shock** - The resulting characteristics when a material is subjected to rapid and wide range changes in temperature in an effort to discover its ability to withstand heat and cold. In connectors, the effect can cause inserts and other insulation materials to pull away from metal parts.

**Thermocouple** - A device for measuring temperature where two electrical conductors of dissimilar metals are joined at the point of heat application and a resulting voltage difference, directly proportional to the temperature, is developed across the free ends and is measured potentiometrically.

**Thermocouple Lead Wire** - An insulated pair of wires used from the couple to a junction box, or to the recording instrument.

**Thermoplastic** - A classification of resin that can be readily softened and resoftened by repeated heating.

**Thermosetting** - A classification of resin that cures by chemical reaction when heated and, when cured, cannot be resoftened by heating.

**Three-Phase Current** - Current delivered through three wires, with each wire serving as a return for the other two and with three current components differing in phase successively by one-third cycle or 120 electrical degrees.

**Three-Phase Three-Wire System** - An alternating current supply system comprising three conductors over which three phase power is sent. A four-wire system, which includes a ground, is sometimes used in local installations.

**Three-Wire System** - A d-c or single-phase a-c system comprising three conductors, one of which (the neutral wire) is maintained at a potential midway, between the potential of the other two.

**Tinned Wire** - Copper wire that has been coated with a layer of tin or solder to simplify soldering.

**Tinsel Wire** - A low voltage, stranded wire where each strand is a very thin conductor ribbon, spirally wrapped around a textile yarn. Insulation is generally a textile braid. Intended usage is for severe flexing.

**Tolerance** - A specified allowance for error from a standard or given dimension, weight or property.

**Tracer** - A means of identifying polarity. Two common types are ridges along the axis of the insulation perceptible to the touch, and bands of contrasting color in braid or wind.

**Tracer Stripe** - When more than one color-coding stripe is required, the first, or widest, stripe is the base stripe; the other, usually narrower stripes, being termed tracer stripes.

**Transformer** - An electrical device which changes voltage in direct proportion to currents and inverse proportion to the ratio of the number of turns of its primary and secondary windings.

**Transmission Lines** - A term used to denote a decrease or loss in power during the transmission of energy from one point to another. Usually expressed in decibels.

**Transportation** - Interchanging the relative positions of wires to neutralize the effects of induction to or from other circuits or, in **two-wire** parallel lead-ins for an antenna, to minimize interference pickup by the lead-in during reception.

**Trap Wire** - A low voltage wire used at hinge points, where severe flexing occurs, usually in burglar alarm systems. It is made with tinsel conductor.

**Tree Wire** - A conductor with an abrasion-resistant outer covering, usually non-metallic, and intended for use on overhead lines passing through trees.

**Triaxial** - Refers to a three-conductor cable with one conductor in the center, a second circular conductor shield concentric with the first, and third circular conductor shield insulated from and concentric with the first and second, usually with insulation, and a braid or impervious sheath overall.

**Triplex Cable** - A cable composed of three insulated single conductors and often times one bare conductor, all twisted together. (Note: The assembled conductors may or may not have a common covering of binding or protecting material).

**Tubing** - Extruded non-supported plastic or elastomer materials.

**Twin Cable** - A pair of insulated conductors twisted and/or sheathed, or held together mechanically and not identifiable from each other in a common covering.

**Twin Coaxial** - A configuration containing two separate, complete coaxial cables laid parallel or twisted around each other in one complex.

**Twin Line** - A type of transmission line that has a solid insulating material, in which the two conductors are placed in parallel to each other and whose impedance is determined by the diameter and spacing of the conductors and the insulating material. Also known as Twin Lead.

**Twisted Pair** - A cable composed of two small-insulated conductors, twisted together without a common covering. (Note: The two conductors of a twisted pair are usually substantially insulated, so that the combination is a special case of a cord).

**Two-Phase Current** - Current delivered through two pairs of wires (or a three wire system to a single load) with a phase difference of one-quarter cycle or 90 degrees between the currents in the two pairs. Commonly called quarter phase.

## U

**Ultra Violet Degradation** - Deterioration caused by long time exposure of a material to sunlight, or other ultraviolet rays containing radiation.

**Unidirectional Concentric Stranding** - A stranding where each successive layer has a different lay length, thereby retaining a circular form without migration of strands from one layer to another.

**Unidirectional Stranding** - A term denoting that in a stranded conductor, all layers have the same direction of lay.

**Unilay Strand** - A conductor constructed with a central core, surrounded by more than one layer of helically laid wires, with all layers having a common length and direction of lay.

## V

**Varnish Cloth** - Tape wraps of varnished cambric for insulation of wires and cable offer properties that lie between those of rubber and impregnated paper. This applies to dielectric strength, flexibility, resistance to moisture and heat, and handling cable connections and terminations. It provides a greater measure of moisture resistance than paper. In dry locations, it may be used without a lead sheath. It can be used for low and moderate voltage cables.

**Velocity of propagation** - Applied to coaxial cables, velocity of propagation is the ratio of the dielectric constant of air to the square root of the dielectric constant of the insulator. It indicates the transmission speed of an electrical signal down a length of cable, compared to speed in free space.

**Vinyl Resin** - A synthetic resin formed by the polymerization of compounds containing the group  $\text{CH}_2 = \text{CH}-$ .

**Viscosity** - A measure of the resistance of a fluid flow (usually through a specific orifice).

**Volt** - Unit of electromotive force. It is the difference of potential required to make a current of one ampere flow through a resistance of one ohm.

**Voltage** - The term most often used in place of electromotive force, potential, potential difference, or voltage drop, to designate

electric pressure that exists between two points and is capable of producing a flow of current when a closed circuit is connected between the two points.

**Voltage Drop** - The amount of voltage loss from original input in a conductor of given size and length.

**Voltage Standing Wave Ratio (VSWR)** - The ratio of the maximum effective voltage to the minimum effective voltage, measured along the length of a mismatched radio frequency transmission line.

**Voltage Rating** - The highest voltage that may be continuously applied to a wire or cord in conformance with standards or specifications.

**Voltage Stress** - That stress found within a material when subjected to an electrical charge.

**Volume Resistivity (Specific Insulation Resistance)** - The electrical resistance between opposite faces of a 1-cm cube of insulating material, commonly expressed in ohm-centimeters.

**Vulcanization** - A chemical reaction in which the physical properties of an elastomer are changed by reacting it with sulfur or other cross-linking agents.

## W

**Wall Thickness** - A term used that expresses the thickness of a layer of applied insulation or jacket.

**Water Absorption** - Ratio of the weight of water absorbed by a material to the weight of the dry material.

**Waterblocked Cable** - A cable constructed with no internal voids in order to allow no longitudinal water passage under a given pressure.

**Watt** - Unit of power, or work done at a rate of one joule per second, or rate of work represented by current of one ampere under a pressure of one volt (volt-ampere).

**Wave Length** - The distance, measured in the direction of propagation, of a repetitive electrical pulse or waveform between two successive points that are characterized by the same phase of vibration.

**Wicking** - The longitudinal flow of a liquid in a wire or cable construction, due to capillary action.

**Wire and Cable Markers** - Identification marking of wire or cable can be accomplished in many ways, such as: silk screen letters and/or numerals, helical stripes, colored insulation, hot stamp, printed adhesive tape or sleeving and tubing, clip-on or crimp-on bands (metallic or non-metallic) and wrap-arounds.

**Wire Gauge** - A system of numerical designations of wire sizes.

**Wiring Ducts** - A hollow conduit or raceway through which wires are passed. A duct is used as a protective shield for the wires it contains. Unlike a cable or harness assembly, it permits the addition or removal of individual wires.

**Working Life** - The period of time during which a liquid resin or adhesive after mixing with catalyst, solvent or other compounding ingredients, remains usable.

**Wrapping** - The method of insulating wire by serving insulating tapes around a conductor.

## Y

**Yield Strength** - The lowest stress at which a material undergoes plastic deformation. Below this stress, the material is elastic; above it, viscous.

## ABBREVIATIONS

**A** - Asbestos.

**AA** - Asbestos-insulated, asbestos or glass braid wiring. In raceways, only for leads to or within apparatus. Limited to 300V, 200°C. Dry locations only.

**AAR** - Association of American Railroads.

**AB** - High-voltage butyl cable.

**ABC** - Armored bushed cable. BX-armored building wire with polyvinyl chloride insulation, 600V.

**ABP** - Butyl-polyethylene high voltage cable, 75°C.

**AC** - Branch circuit and feeder cables with flexible metal tape armor.

**A.C. or A-C** - Abbreviation for alternating current.

**ACA** - Synthetic tapes, felted asbestos wire with glazed cotton or glass braid, 1000V, 90°C.

**ACR** - Cable with corona-resisting insulation.

**ACU** - Armored cable with latex rubber-insulated conductors.

**ACV** - Varnished cambric insulation, polyvinyl chloride, interlocked armor, 5000V.

**AEIC** - Association of Edison Illuminating Companies.

**AF** - Asbestos-insulated, single solid or stranded conductor fixture wire. Impregnated with moisture-resisting, flame-retarding compound. With or without braid, 300V, 150°C.

**AFC** - Two or three individually braided (with cotton or rayon) AF conductors twisted together without overall covering, 300V, 150°C.

**AFPD** - Two AF conductors twisted together with cotton or asbestos braid overall, 300V, 150°C.

**AFPO** - Two AF conductors, without individual braid, laid parallel and braided overall, 300V, 150°C.

**AFS** - Two or three-conductor, heat-resistant cord with impregnated-asbestos insulation and rubber jacket. For use in damp locations, 300V.

**AFSJ** - Same as AFS but for lighter (junior) service, 300V.

**AGS** - Solid, stranded or flexible nickel conductor, silicone-impregnated asbestos insulation with glass braid. For appliance wiring, 300V, 200°C.

**AI** - Appliance wire same as type A, but moisture-resistant as well as heat and flame-resistant. Dry locations only. Without braid, 300V, 125°C.

**AIA** - Felted asbestos fibers with outer asbestos or glass braid. Impregnated with heat, flame and moisture-resistant compound. Dry locations only, 600V, 125°C.

**AIEE** - American Institute of Electrical Engineers. Now known as Institute of Electrical and Electronics Engineers.

**AL or ALS** - Used as a suffix to denote a wire or cable having an aluminum sheath.

**AN** - Aircraft wire.

**ASA** - American Standards Association.

**ASE** - Service entrance cable, above ground use. Some constructions suitable for underground use. Flame-retardant, moisture-resistant, abuse-resistant covering.

**ASTM** - American Society for Testing and Materials.

**AV or AVC** - Asbestos and varnished-cambric insulated power and control cables.

**AVA** - Impregnated asbestos and varnished-cambric insulated, with asbestos or glass braid, 600V, 110°C.

**AVB** - Same as AVA, but with cotton braid, 600V, 90°C.

**AVL** - Same as AVA, except lead sheath replaces asbestos or glass braid, 600V-110°, 5000V-100°C.

**AVPD** - Two- or three-conductor heat and moisture-resistant cord, asbestos and

varnished-cambic insulation with asbestos braid. Round construction, flame-retarding, moisture-resisting finish. For use in damp locations, 600V, 110°C.

**AVPO** - Same as AVPD, but two-conductor flat construction.

**AWG** - American Wire Gauge. Based on the circular mil system. 1 mil equals 0.001 inch.

**AWM** - Appliance wiring material.

**B** - Same as AVC. Motor lead wire.

**BC** - Bare copper or bell cord.

**BDC** - Plastic busdrop cable.

**B&S** - Stands for Brown & Sharpe Gauge, a wire diameter standard that is the same as AWG.

**BT** - Bus tie.

**BTU** - British thermal unit.

**BW** - Braided wire armor. Basket weave.

**BWG** - Birmingham Wire Gauge.

**BX** - Armored building wire, 600V.

**C** - Lamp cord, two or more conductors twisted together. Rubber insulation, cotton braid. For pendant or portable use in dry places. No overall covering, 300V to 600V, 60°C.

**CAC** - Flexible copper, synthetic tapes, felted asbestos and lacquered braid, 1000V, 125°C.

**CB** - Rubber-insulated brewery cord, with weatherproof braid on each conductor. Twisted, no overall covering.

**CBO** - Neoprene-insulated brewery cord for use in damp locations.

**CCW** - Continuous Corrugated and Welded. A type of armored cable featuring a metallic sheath covering welded together over the cable core, then corrugated for extra mechanical strength.

**CF** - Fixture wire, heat-resistant, with flame-retardant, moisture-resistant, impregnated cotton insulation. With or without plain or fancy cotton or rayon braid, 300V, 90°C.

**CFC** - Two or three CF type wires twisted together without overall covering. Color-coded, 300V, 90°C.

**CFPD** - Two or three CF type wires twisted together with overall braid. Color-coded, 300V, 90°C.

**CFPO** - Two CF type wires laid parallel with overall braid. Color-coded, 300V, 90°C.

**CM** - Circular mil. Equal to the area of a circle 1/1000 of an inch in diameter.

**CPE** - Chlorinated Polyethylene.

**CS** - Used as a suffix to denote wire or cable having a copper sheath.

**CSA** - Canadian Standards Association.

**CSPE** - Insulating and jacketing compound based upon chlorosulfonated polyethylene. Also known as Hypalon® (DuPont registered trademark).

**CT** - Cable Tray.

**CV** - Abbreviation for continuous vulcanization.

**CX** - Two-conductor, #18 AWG, plastic-insulated, twisted Christmas tree cord, 300V.

**CXT** - Two-conductor, #18 AWG, plastic-insulated, twisted Christmas tree wire, 300V.

**D** - Used as a suffix to indicate a twin wire with two insulated conductors laid parallel under an outer non-metallic covering.

**DLO** - Diesel locomotive.

**DR** - Rubber range & dryer cord (CSA).

**DRO** - Neoprene range & dryer cord (CSA).

**DRT** - Plastic range & dryer cord (CSA).

**E** - Enamel.

**E** - Elevator lighting and control cable. Rubber insulation, three overall braids, outer one flame-retardant and moisture-resistant. May have steel supporting strand in center, 300V.

**EHV** - Extra High Voltage.

**EIA** - Electronic Industries Association.

**EMF** - Electromotive force or current.

**EO** - Elevator lighting and control cable. Rubber insulation, cotton braid, neoprene jacket. May have steel supporting strand in center, 300V.

**EPCV** - Ethylene Propylene Continuous Vulcanization.

**EP, EPR, EPM, EPDM** - Designations for synthetic rubber based upon ethylene-propylene hydrocarbon.

**ET** - Elevator lighting and control cable. Polyvinyl chloride insulation, three braids, flame-retardant and moisture-retardant finish. May have steel supporting strand in center, 300V.

**ETP** - Electrolytic tough pitch copper.

**F** - Flat band metallic armor.

**FCC** - Flexible control cable or flat conductor cable.

**FEP** - Fluorinated ethylene propylene insulated wire.

**FEPB** - Fluorinated ethylene propylene insulated wire with glass or asbestos braid.

**FF-1** - Fixture wire, flexible, rubber insulated, single conductor, 300V, 60°C.

**FF-2** - Same as FF-1, but with 600V rating.

**FFH-1** - Heat resistant fixture wire, otherwise same as FF-1, 300V.

**FFH-2** - Same as FFH-1, but with 600V rating.

**FRMR** - Flame-retarding, moisture-resisting finish.

**FX** - Single rubber-insulated Christmas tree wire with outer braid, 125V, 60°C.

**FXT** - Single plastic-insulated Christmas tree wire, 125V, 60°C.

**G** - Rubber-insulated, neoprene jacketed, portable power cable with two to five #8 AWG or larger conductors with ground wires, 95°C.

**GND or GRD** - Abbreviations for ground.

**GOR** - Gasoline and oil-resistant wire.

**GTO** - Gas tube sign and oil-burner ignition cable, 5000V - 15,000V.

**H** - Shielded power cable. Multi-conductor cables have paper or varnish-cambric insulation applied directly over individual conductors. Spiraled metallic shielding tape over insulation with overall protective covering.

**HC** - Two or more conductor heater cord, asbestos and rubber insulation with cotton braid over each conductor. Twisted, no overall covering.

**HDPE** - High-density polyethylene.

**HF** - Polyethylene-insulated radio hookup wire with or without braid.

**HMWPE** - High Molecular Weight Polyethylene.

**HPD** - Rubber and asbestos-insulated heater cord. No braid on individual conductors, but with braid overall. Also made with neoprene insulation and no asbestos or PVC/NBR.

**HPN** - Two-conductor, neoprene-insulated heater cord. Parallel construction. For use in damp locations.

**HS** - Rubber and asbestos-insulated heater cord. Cotton serve and rubber-jacketed overall. For use in damp locations #14 or #12 conductors. Also made with neoprene insulated inners and asbestos.

**HSJ** - Same as type HS but with #18 or #16 conductors and differing thickness of jacket.

**HSJO** - Same as type HSJ, but with neoprene jacket.

**HSO** - Neoprene jacketed heater cord.

**HV** - High voltage, generally used to describe a cable with an operating capability of over 600 volts.

**HW** - Radio hookup wire with polyvinyl insulation. With or without nylon jacket, braid or shield, 2500V.

**I** - Interlocked armor of aluminum, bronze or steel.

**IAC** - Interlocked Armored Cable, characterized by a helically wound metal tape which overlaps the cable core on successive turns to form a strong, flexible armor.

**IACS** - International Annealed Copper Standard.

**ICEA** - Insulated Cable Engineers Association.

**ID** - Inside Diameter.

**IEC** - International Electrotechnical Commission.

**IEEE** - Institute of Electrical and Electronics Engineers, formally known as the AIEE.

**IGS** - Denotes integrated gas spacer cable, one or more conductors each individually insulated and enclosed in a loose fitting non-metallic flexible conduit.

**IPCEA** - Insulated Power Cable Engineers Association.

**IPE** - Irradiated polyethylene tape.

**ISO** - International Organization for Standardization.

**J** - Asphalted jute, non-metallic armor.

**K** - Constant used to denote insulation resistance.

**KCMIL** - Thousands of circular mils (replaces MCM).

**L** - Denoted lead sheath.

**LESCW** - Low energy safety circuit wire.

**LDPE, LLDPE** - Designation for Low Density Polyethylene or Linear Low Density Polyethylene.

**LV** - Low voltage, generally used to describe a cable with an operating capacity of 600 volts or less.

**LW** - Radio hookup wire with polyvinyl insulation. With or without nylon jacket, braid, or shielding braid, 300V.

**M** - Suffix indicating two or more insulated, twisted conductors under an outer, non-metallic covering.

**MC** - Denotes cable with interlocking metal tape or corrugated tube enclosure.

**MCM** - Denotes a thousand circular mils.

**MDPE** - Medium Density Polyethylene.

**Mfd** - Abbreviation for microfarad, one millionth of a farad, the unit of capacitance.

**MHD** - Medium hard drawn copper wire.

**Mho** - Unit of conductance. Reciprocal of an ohm. One ampere of current passing through a material under a potential difference of one volt provides one ohm of conductance.

**MI** - One or more conductors insulated with a highly compressed refractory minerals and enclosed in a liquid-tight and gas-tight metallic tube sheathing.

**MIL** - Abbreviation for military as in military specifications for wire.

**ML** - Single-conductor, paper-lead cables twisted together without overall covering. Type A-AVC mine locomotive cable; Type B-motor lead wire.

**MM** - Mining machine cable.

**MPF** - Mine power feeder, 5-8-15KV.

**MP-GC** - Mine power, ground check wire.

**MRFR** - Moisture-resistant, flame-retardant finish.

**MTW** - Thermoplastic-insulated machine tool wire, 90°C to 105°C, 600V.

**MV** - Medium voltage 5-35KV.

**MW** - Radio hookup wire with polyvinyl insulation and plain or nylon jacket, or braid, or shield, 1000V.

**MS** - Military Standard.

**MYD** - Marina Yard and Dock Cable.

**NBC** - (Same properties as EZC) A blend of acrylonitrile-butadiene rubber and polyvinyl chloride (PVC). Used for jacketing.

**NBR/PVC** - A blend of nitrile rubber and polyvinyl chloride, recommended for oil and ozone resistant jacketing of flexible cord and fixture wires, cables and ignition wires.

NBR/PVC is said to offer toughness, smoothness, flame resistance, flexibility and resistance to abrasion and heat deformation, and provides outstanding service when exposed to weather, light, fuel, oil, or ozone.

**NBS** - New British Standard.

**NEC** - Abbreviation for National Electrical Code, which covers the use of wire and cable in many applications.

**NEMA** - National Electrical Manufacturers Association.

**NFPA** - National Fire Protection Association.

**NM** - Non-metallic sheathed cable, braid or plastic covered. For dry use, 60°C.

**NMC** - non-metallic sheathed cable, plastic or neoprene covered. Wet or dry use, 60°C.

**NP** - Abbreviation for nickel plate.

**NRHW** - Moisture- and heat-resistant rubber insulation with neoprene jacket for use in ducts. Dry and wet locations, 600V, 75°C. Also RHWN.

**OD** - Outside diameter.

**Ohm** - Unit of electrical resistance. Resistance of a circuit in which a potential difference of one volt produces a current of one ampere.

**OSHA** - Occupational Safety and Health Act of 1970 administered by U.S. Department of Labor which establishes standards and safety requirements for all businesses.

**P** - Two or more rubber-insulated stranded conductors with cotton braid over each. Reinforced with overall covering of cotton braid over rubber filler. For pendant or portable use in damp locations, 300V-600V.

**PCG** - Portable mine cable with power, control and ground conductors.

**PD** - Rubber-insulated stranded conductors with cotton braid over each. Conductors twisted with braid overall. Light duty, dry locations on appliances, 300V.

**PFA** - Perfluoroalkoxy insulated wire, 90°C dry and damp locations.

**PFAH** - Same as Type PFA except nickel or nickel-clad copper conductor, dry locations only, °C.

**PG** - Portable mine cables having power and ground conductors, 600V.

**PL** - Two rubber-insulated, parallel-laid, lamp cords with overall cotton or rayon braid. For light duty on small appliances in dry locations, 300V.

**PLSJ** - All-rubber, parallel-jacketed, two conductor, light duty cord for pendant or portable use in damp locations, 300V.

**PLT** - Same as PLSJ except thermoplastic insulation.

**PNA, PNR, PNW** - Polyethylene-insulated control cables with nylon sheath or individual conductors. Cabled tape and polyvinyl chloride jacket. Dry or wet locations, 600V, 75°C.

**PO** - Two stranded copper conductors with separator and code rubber insulation and cotton braid over each. Laid parallel with cotton or rayon braid overall. For use in dry locations on small appliances, 300V-600V.

**POSJ** - All-rubber, parallel, light duty ripcord for use on lamps and small appliances, 300V, 60°C.

**POSJX** - All-rubber, parallel, #20 AWG ripcord for use on lamps, clocks and Christmas trees, 125V.

**POT** - Thermoplastic, parallel, light duty ripcord, 300V, 60°C to 105°C.

**POXT** - Same as POT, but #20 AWG for clock and Christmas tree use, 125V.

**PS** - Thermostat cable with solid conductors, individual rubber insulation and cotton braid. Twisted, rubber jacket and cotton braid overall.

**PTFE** - Polytetrafluoroethylene.

**PVC** - Denotes Polyvinyl Chloride.

**PW** - Moisture-proof, reinforced, portable cord with two or more rubber-insulated conductors with individual cotton braid. Moisture-resistant cotton braid finish over rubber jacket, 300V-600V.

**R** - Code for rubber-insulated building wire, 600V, 60°C.

**RD** - Rubber-insulated twin conductors, fibrous covered.

**RDL** - Rubber-insulated twin conductors, lead covered.

**RF** - Fixture wire, code or latex rubber-insulation and braid over solid or stranded conductor, 60°C.

**RFH** - Same as RF, but rubber or latex rubber insulation heat-resistant, 75°C.

**RH** - Rubber-insulated, heat-resistant building wire, dry and damp locations, 75°C.

**RHD** - Rubber-insulated, twin conductor, heat-resistant, fibrous covered wire.

**RHDL** - Same as RHD, except lead instead of fibrous covering.

**RHH** - Rubber-insulated, heat-resistant building wire, dry and damp locations, 90°C.

**RHL** - Same as RHH, but with lead sheath overall.

**RHM** - Rubber-insulated multiple conductors, heat-resistant and overall fibrous covered.

**RHML** - Same as RHM, but with lead cover overall.

**RH/RW** - Rubber-insulated, heat and moisture resistant building wire, 75°C dry, 60°C wet.

**RHW** - Rubber-insulated building wire, heat and moisture resistant, 75°C dry or wet.

**RHW-2** - Same as RHW except approved for 90°C, dry and wet locations.

**RJ** - Rubber-insulated and jute covered cable.

**RJFJ** - Rubber-insulated cable with flat band armor.

**RJIJ** - Rubber-insulated cable with interlock armor.

**RL** - Rubber-insulated cable with lead sheath.

**RLJFJ** - Rubber-insulated cable with lead, jute, flat band armor and overall jute covering.

**RLJWJ** - Rubber-insulated cable with lead, jute, steel wire armor and overall jute covering.

**RM** - Rubber-insulated multiple conductors with fibrous covering.

**RML** - Same as RM, but lead instead of fibrous covering.

**RP** - Performance grade rubber insulation, 60°C.

**RR** - Rubber insulation, neoprene jacket. See type USE.

**RS** - Integral rubber insulation and jacket on single conductor cables.

**RU** - Rubber-insulated, latex building wire, 60°C.

**RUH** - Same as RU, but heat-resistant, 75°C.

**RUW** - Same as RU, but moisture-resistant, 60°C.

**RW** - Rubber-insulated building wire, moisture-resistant, 60°C.

**RWS** - Same as RW, but synthetic rubber.

**S** - Heavy duty, rubber-insulated portable cord. Stranded copper conductors with separator and individual rubber insulation. Two or more color-coded conductors cables with filler, wrapped with separator and rubber jacketed overall, 600V.

**SA** - Silicone rubber insulation, asbestos or glass braid, for use in dry locations. Maximum operating temperatures for special applications, 125°C.

**SAE** - Society of Automotive Engineers.

**SB** - Slow burning wire. Three cotton braids, impregnated, 90°C.

**SD** - Service drop cable. Two code-rubber-insulated conductors, tape, laid parallel with neutral conductor concentric thereover. Tape and braid overall. Also round construction.

**SDN** - Small diameter multi-conductor control cable with neoprene jacket and nylon sheath over polyethylene insulation.

**SDT/TC** - Thermoplastic 90°C tray cable.

**SE** - Above ground service entrance cable, not protected against mechanical abuse. Flame-retardant, moisture-resistant covering. Overall neoprene sheath, 60°C-75°C.

**SEA** - Service entrance cable, steel-armored under outer braid, one or two rubber-insulated conductors with neutral conductor served concentrically, moisture-resistant tape, weatherproof-braid finish, 300V, 75°C.

**SEU** - Same as SEA, but not armored.

**SEW, SEWF** - Silicone Rubber insulated equipment wire (CSA).

**SF** - Silicone rubber insulated fixture wire, solid or 7 strand conductor, 200°C.

**SFF** - Same as SF, except flexible stranding, 150°C.

**SG** - Same as SW, except with ground wires (CSA).

**SGO** - Same as SWO, except with ground wires (CSA).

**SH-A** - Portable mine power cable, three or four individually shielded conductors, 5000V.

**SH-B** - Same as SH-A, except shield is overall.

**SH-C** - Same as SH-B but with grounding conductors.

**SH-D** - Same as SH-A, but with grounding conductors.

**SHFS** - Polyvinyl-insulated with felted-asbestos, flame-proof cotton or rayon braid. Navy switchboard wire, 600V.

**SIS** - Indicates single conductor having synthetic thermosetting insulation of heat-resistant, moisture-resistant, flame-retarding grade. Also made with chemically cross-linked polyethylene insulation. Used for switchboard wiring only, 90°C.

**SJ** - Junior hard service, rubber-insulated pendant or portable cord. Same construction as Type S, but 300V. Jacket thickness different.

**SJO** - Same as SJ, but neoprene, oil-resistant compound outer jacket. Can also be made "water-resistant", 300V, 60°C.

**SJT** - Junior hard service thermoplastic or rubber-insulated conductors with overall thermoplastic jacket, 300V, 60°C to 105°C.

**SJTO** - Same as SJT but oil-resistant thermoplastic outer jacket, 60°C.

**SL** - Single-conductor paper-lead cables twisted together, without overall covering (same as ML).

**SNM** - Denotes shielded non-metallic sheathed cable, assembly of two or more insulated conductors in an extruded core of moisture- and flame-resistant non-metallic material, covered with an overlapping spiral metal tape and wire shield and jacketed with a moisture-, flame-, oil-, corrosion-, fungus-, and sunlight-resistant non-metallic material.

**SO** - Hard service cord, same construction as Type S except oil-resistant neoprene jacket, 600V, 60°C to 90°C.

**SOW** - Water resistant neoprene jacketed portable cord (CSA).

**SP** - Silver plate.

**SP-1** - All rubber, parallel-jacketed, two-conductor light duty cord for pendant or portable use in damp locations, 300V.

**SP-2** - Same as SP-1, but heavier construction, with or without third conductor for grounding purposes, 300V.

**SP-3** - Same as SP-2, but heavier construction for refrigerators or room air conditioners, 300V.

**SPC** - Submersible pump cable. Also, silver-plated copper.

**SPT-1** - Same as SP-1, except all-thermoplastic, with or without third conductor for grounding purposes, 300V.

**SPT-1** - Same as SP-1, except all-thermoplastic, with or without third conductor for grounding purposes, 300V.

**SPT-3** - Same as SP-3, except all-thermoplastic, with or without third conductor for grounding purposes, 300V.

**SR** - Silicone rubber control cable, 600V, 125°C.

**SR-AW** - Flexible, nickel-plated copper conductor, silicone rubber insulation, glass braid, 600V, 200°C.

**SR-C** - Solid copper conductor, silicone rubber insulation, glass braid, 600V, 125°C.

**SRD** - Portable range or dryer cable. Three or four rubber-insulated conductors with rubber or neoprene jacket, flat or round construction, 300V, 60°C.

**SRDT** - Same as SRD, except all-thermoplastic with a maximum temperature of 90°C.

**SR-H** - Silicone rubber-insulated, asbestos braid, 500V, 125°C.

**ST** - Hard service cord, jacketed, same as Type S, except all-plastic construction, 600V, 60°C to 105°C.

**STO** - Same as ST, but with oil-resistant thermoplastic outer jacket, 600V, 60°C.

**SV** - Vacuum cleaner cord, two- or three-conductor, rubber-insulated. Overall rubber jacket. For light duty in damp locations, 300V, 60°C.

**SVO** - Same as SV except neoprene jacket, 300V, 60°C.

**SVT** - Same as SV except all-plastic construction. With or without third conductor for grounding purposes only, 300V, 60°C to 90°C.

**SVTO** - Same as SVT except with oil-resistant thermoplastic jacket, 60°C.

**SW** - Rubber jacketed power supply cable, #8 AWG to #2 AWG, 600V (CSA).

**SWO** - Same as SW except neoprene jacketed (CSA).

**SWT** - Plastic jacketed power supply cable, #8 AWG to #@ AWG, 600V (CSA).

**T** - Thermoplastic vinyl, building wire, 60°C.

**TA** - Switchboard wire, thermoplastic and asbestos insulation, 90°C.

**TAA** - Flexible nickel or nickel-clad copper, Teflon tape, felted asbestos, asbestos braid, 200°C.

**TBS** - Switchboard wire, thermoplastic insulation, flame-proof cotton braid, 600V, 90°C.

**TBWP** - Three cotton braids, weather-proof saturated. No voltage rating.

**TC** - Tray cable art 340 NEC.

**TEW** - Canadian Standards Association type appliance wires. Solid or stranded single conductor, plastic-insulated, 600V, 105°C.

**TF** - Fixture wire, thermoplastic-covered solid or 7 strands, 60°C.

**TFE** - Nickel or nickel-clad copper conductors, tetrafluoroethylene insulated, dry locations only, 250°C.

**TFF** - Same as TF, but flexible stranding, 60°C.

**TFFN** - Same as TFF, but with nylon sheath.

**TG** - Flexible nickel or nickel-clad copper conductor, Teflon tape, glass braid, 200°C.

**TGS** - Solid or flexible copper, nickel-clad iron or copper, or nickel conductor. Teflon tape, silicone glass braid, 600V, 250°C.

**THHN** - Nylon jacketed building wire, 600V, dry and damp locations, 90°C.

**THW** - Thermoplastic vinyl insulated building wire. Flame-retardant, moisture- and heat-resistant, 75°C. Dry and wet locations.

**THW-2** - Same as THW except approved for 90°C, dry and wet locations.

**THWN** - Same as THW, but with nylon jacket overall, 75°C.

**THWN-2** - Same as THWN except approved for 90°C, dry and wet locations.

**TP** - Parallel tinsel cord. All-rubber insulation and jacket over two extremely flexible conductors. Light duty, attached to appliances of 50W or less. For use in damp locations in lengths of eight feet or less.

**TPO** - Same construction as Type PO, but with extra flexible tinsel conductors, 125V.

**TPT** - Same as TP, but all-thermoplastic insulation and jacket, 125V.

**TRXLPE** - Tree Retardant Cross-Linked Polyethylene.

**TS** - Two- or three-conductor rubber-insulated and jacketed tinsel cord. Light duty, attached to an appliance of 50W or less. Fir use in damp places in lengths of eight feet or less.

**TSO** - Same as Type TS, but with neoprene jacket, 125V.

**TST** - Same as Type TS, but all-thermoplastic insulation and jacket.

**TT** - Polyvinyl chloride insulation and sheath, aerial and duct.

**TW** - Thermoplastic vinyl-jacketed building wire, moisture-resistant, 60°C.

**UD** - Underground Distribution.

**UD-P** - Underground Distribution - Primary.

**UD-S** - Underground Distribution - Secondary.

**UF** - Thermoplastic underground feeder and branch circuit cables.

**UHF** - Ultra High Frequency.

**UL** - Underwriters Laboratories, Inc. A company supported by several underwriters for the purpose of establishing safety standards on types of equipment or components.

**URC** - Weatherproof wire.

**URD** - Underground Residential Distribution.

**USE** - Underground service entrance cable, rubber-insulated, neoprene-jacketed.

**USE-2** - Same as USE except approved for 90°C, dry and wet locations.

**V** - Varnished-cambric insulation, with fibrous covering.

**VCB** - Varnished-cambric insulation, cotton braid, flame-retarding, moisture-resisting finish.

**VCL** - Varnished-cambric insulation, lead-covered cable. Ends must be hermetically sealed.

**VD** - Indicates a twin wire having two type V conductors laid parallel under an outer fibrous covering.

**VG** - Varnished-glass tape over a flexible copper conductor. Varnished-glass or nylon braid, 600V or 3000V, 130°C.

**VHF** - Very High Frequency.

**VM** - Indicates a cable having two or more Type V conductors twisted together under an outer fibrous covering.

**VT** - Denotes varnished cloth-thermoplastic insulated cables enclosed in a metallic sheath.

**VWI** - Underwriters Laboratories vertical flame test applicable to single conductor wires and cables.

**W** - Heavy-duty portable power cable, one to six conductors, without grounds, 600V.

**WP** - Weatherproof construction, two or three impregnated cotton braids, 80°C.

**X** - Two FX wires twisted together, color-coded, 125V, 60°C.

**XHHW** - High temperature (90°C) thermosetting jacketed small diameter building wire.

**XLPE** - Cross-Linked Polyethylene.

**XT** - Two FXT wires twisted together, color-coded, 125V, 60°C.