



A Marmon Wire & Cable/Berkshire Hathaway Company

## Wire & Cable Terms

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**Abrasion Resistance** - Ability of material or cable to resist surface wear.

**Alternating Current** - An electric current that continually reverses its direction giving a definite plus and minus wave form at fixed intervals.

**Alternating Current Resistance** - The resistance offered by any circuit to the flow of alternating current.

**Ambient Temperature** - Any all-encompassing temperature within a given area.

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

**Ampacity** - (See current-carrying capacity).

**Anneal** - To subject to heat with subsequent cooling. When annealing copper; the act of softening the metal by means of heat to render it less brittle.

**Anti-Oxidant** - A substance which prevents or slows down oxygen decomposition of a material.

**Anti-Ozonant** - A substance which prevents or slows down material degradation due to ozone reaction.

**Armor** - Mechanical protection usually accomplished by a metallic layer of tape, braid or served wires. Normally found only over the outer sheath.

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

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

**AWG** - Abbreviation for American Wire Gage, a standard system used for designating wire diameter. Also referred to as the Brown and Sharpe (B&S) wire gage.

**B&S Gage** - Brown and Sharpe wire gage used for copper conductor (same as American Wire Gage).

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

**Boot** - A protective covering over any portion of a cable or conductor in addition to its jacket or insulation.



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**Braid** - A fibrous or metallic group of filaments interwoven in cylindrical form to form a covering over one or more wires.

**Breakdown (Puncture)** - A disruptive discharge through insulation due to failure under electrostatic stress.

**Breakdown Voltage** - The voltage at which the insulation between two conductors, or a conductor and ground will break down.

**Building Wire** - Wire used for light and power in permanent installations utilizing 600 volts or less. Usually in an enclosure and which will not be exposed to outdoor environments.

**Bunch Stranding** - A method of stranding where a single conductor is formed from any number of wires twisted together in the same direction, such that all strands have the same lay length, but no specific geometric arrangement.

**Butt Joint** - A splice or connection formed by placing the ends of two conductors together and joining them by welding, brazing or soldering.

**Butt Wrap** - Tape wrapped in an edge- to -edge manner with no over-lapping between adjacent turns.

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

**Cable Filler** - The material used in multiple conductor cables to occupy the spaces formed by the assembly of components, thus forming a core of the desired shape.

**Capacitance (Capacity)** - That property of a system of conductors and dielectrics which permits the storage of electricity when potential difference exists between the conductors.

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

**Capillary Action** - The phenomenon of liquid rising in a small interstice due to surface tension.

**Carbon Black**- A black pigment. It imparts useful ultraviolet protective properties, and so is frequently suspended into plastic and elastomeric compounds intended for outside weather exposure.

**Charging Current** - The current produced when a d-c voltage is first applied to conductors of an unterminated cable. It is caused by the capacitive reactance of the cable, and decreases exponentially with time.

**Chlorinated Polyethylene (CPE)** - A synthetic rubber jacketing compound.



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**Chlorosulfonated Polyethylene (CSPE)** - A synthetic rubber jacketing compound manufactured by Du Pont under trade name of Hypalon.

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

**Coating** - A material applied to the surface of a conductor to prevent environmental deterioration, facilitate soldering or improve electrical performance.

**Cold Flow** - Any permanent deformation due to pressure or mechanical force, without the aid of heat softening.

**Cold Joint** - A soldered joint made with insufficient heat.

**Cold Test** - Any test to determine the performance of cables during or after subjection to a specified low temperature for a specified time.

**Cold Work** - The hardening and embrittlement of metal by repeated flexing action.

**Color Code** - A color system for circuit identification by use of solid colors tracers, braids surface Printing, etc.

**Compact Stranded Conductor** - A unidirectional or conventional concentric conductor manufactured to a specified diameter, approximately 8 to 10% below the nominal diameter of a noncompact conductor of the same cross-sectional area.

**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.

**Concentric - lay Conductor** - Conductor constructed with a central core surrounded by one or more layers of helically laid wires. Several types are as follows:

**Compact round conductor** - A conductor constructed with a central core surrounded by one or more layers of helically laid wires and formed into final shape by rolling, drawing, or other means.

**Conventional concentric conductor** - Conductor constructed with a central core surrounded by one or more layers of helically laid wires. The direction of lay is reversed in successive layers and generally with an increase in length of lay for successive layers.

**Equilay conductor** - Conductor constructed with a central core surrounded by more than one layer of helically laid wires, all layers having a common length of lay, direction of lay being reversed successive layers.



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**Rope-lay conductor** - Conductor constructed of a bunch-stranded or a concentric-stranded member or members, as a central core, around which are laid one or more helical layers of such members.

**Unidirectional conductor** - Conductor constructed with a central core surrounded by more than one layer of helically laid wire, all layers having a common direction of lay, with increase in length of lay for each successive layer.

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

**Concentric Stranding** - A method of stranding, wherein a single conductor is formed from a central wire surrounded by one or more layers of helically layed wires. Each layer is applied with an opposite direction of lay. The first layer has six wires, and each additional layer has six more wires than does the previous one. Thus the second layer has twelve wires, the third layer has eighteen wires, etc.

**Conductivity** - A term used in describing the capability of a material to carry an electrical charge. Usually expressed as a percentage of copper conductivity -- copper being one hundred (100%) percent. Conductivity is expressed for a standard configuration of conductor.

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

**Conductor Core** - The center strand or member about which one or more layers of wires or members are laid helically to form a concentric-lay or rope-lay conductor.

**Continuous Vulcanization** - Simultaneous extrusion and vulcanization of wire coating materials. It is abbreviated CV.

**Contrahelical** - A term meaning the application of two or more layers of spirally twisted, served, or wrapped materials where each successive layer is wrapped in the opposite direction to the preceding layer.

**Cord** - Small, flexible insulated cable usually size 10AWG or smaller.

**Core** - Any portion of a cable over which some other cable component, such as a shield, jacket, sheath or armor, is applied.

**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. Also called voltage endurance.



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**Corona Test** - A test to determine the ability of a cable to withstand the formation of corona under an increasing applied voltage, and to extinguish corona when a corona-producing voltage is reduced.

**Crazing** - Minute lines appearing in or near the surface of materials, such as ceramics and plastics usually resulting as a response to environment. Crazing cannot be felt by running a fingernail across it. If the fingernail catches, it is a crack, not crazing.

**Creep** - The dimensional change with time of a material under load. At room temperature, it is sometimes called cold flow.

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

**Crimp Termination** - A wire termination that is applied by physical pressure of terminal to wire.

**Cross Linking** - The establishment of chemical bonds between polymer molecule chains. It may be accomplished by heat, vulcanization, irradiation or the addition of a suitable chemical agent.

**Cross Sectional Area** - The area of the cut surface of an object cut at right angles to the length of the object.

**Cross Sectional Area of a Conductor** - The sum of cross sectional areas of all the individual wires composing the conductor. It is generally expressed in circular mils.

**Crush Resistance Test** - A test to determine the ability of a cable to resist damage from radial compression, such as might be encountered in service.

**Cure** - (See Vulcanization.)

**Current-carrying Capacity** - The maximum current an insulated conductor or cable can continuously carry without exceeding its temperature rating. It is also called ampacity.

**Cut-through** - Resistance of solid material to penetration by an object under conditions of pressure, temperature, etc.

**Cut-through Resistance** - The ability of a given material to withstand penetration by a solid object of specified dimensions and weight, which is permitted to free fall onto this material from a specified height.

**CV (Continuous Vulcanization)** - Simultaneous extrusion and vulcanization of wire coating materials.

**Cycle** - One complete sequence of variations in an alternating current. The number of cycles occurring in one second is called the frequency.



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**Decibel** - Unit to express differences of power level. It is used to express power loss in cables.

**Density** - The weight per unit volume of a substance.

**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 breakdown** - The voltage at which a dielectric material is punctured; which is divisible by thickness to give dielectric strength.

**Dielectric Constant** - That property (K) of an insulating material which is the ratio of the parallel capacitance (C) of a given configuration of electrodes with the material as the dielectric, to the capacitance of the same electrode configuration with a vacuum as the dielectric.

**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 Tests** - **1).** 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 spacings under normal conditions. **2).** The testing of insulating materials by application of constantly increasing voltage until failure occurs.

**Direction of Lay** - The lateral direction, designated as left-hand or right-hand, in which the wires of a member or units of a conductor run over the top of the member or conductor as they recede from an observer looking along the axis of the member or conductor.

**Dissipation** - Unusable or lost energy, as the production of unused heat in a circuit.

**Drain Wire** - An uninsulated wire, usually placed directly beneath and in electrical contact with a grounded shield, which is used for making ground connections.

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

**Durometer** - A measurement used to denote the hardness of a substance (usually of thermosetting and thermoplastic materials).

**Eccentricity** - A measure of the lack of coincidence of longitudinal axes of a circular cross-sectional wire and its surrounding circular cross-sectional insulation. It is expressed as the percentage ratio of the distance between wire and insulation centers to the difference between wire and insulation radii.

**Elastic Deformation** - A change in a substance whereby it reverts to its original dimensions on release of an applied stress.



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**Elastomer** - A material that at room temperature returns rapidly to approximately its initial dimensions and shape after substantial deformation by a weak stress and release of the stress.

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

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

**Environmental Stress Cracking Resistance** - The ability of a material to resist crack formation and crack propagation when subjected to stress within a contaminating environment.

**Equilay Conductor** - (See Concentric-lay Conductor.)

**Ethylene Propylene Rubber** - A synthetic rubber insulation based upon ethylene propylene hydrocarbon.

**Extrusion** - The process of continuously forcing either a plastic or elastomer and a conductor or core through a die, thereby applying an insulation or jacket to the conductor or core.

**Fatigue Resistance** - The ability of a repeatedly deformed material to resist crystallization and accompanying failure.

**Fault Current** - The maximum electrical current that will flow in a short-circuited system prior to the actuation of any current-limiting device. It is far in excess of normal current flow and is limited only by a system's generating capacity and a cable's impedance.

**Fibrous Filler** - A material used to fill interstices in cables made from fibers, such as jute, polypropylene, cotton, glass, etc.

**Filler** - Any material used in multiconductor cables to occupy interstices between insulated conductors or form a core into a desired shape (usually circular). Also, any substance, often inert, added to a plastic or elastomer to improve its properties or decrease its cost.

**Film** - Thin, plastic sheeting having nominal thickness usually not greater than 0.010 inch.

**Flame Resistance** - The ability of a burning material to extinguish its own flame, once its flame-initiating heat source is removed.

**Flame Retardance** - Ability of a material to prevent the spread of combustion by a low rate of travel so the flame will not be conveyed.

**Flexing Test** - Any test to determine the ability of a cable to withstand repeated bending and twisting.

**Flex Life** - The number of bends or twists, of specified type, that a cable will withstand before failure.



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**Ground** - A conducting connection, intentional or accidental, between an electric circuit or equipment and the earth or some conducting body serving in place of the earth.

**Ground Potential** - Zero potential with respect to the ground or earth.

**Grounded Neutral** - A circuit operates with grounded neutral when the neutral is metallically connected to ground and there is a provision for immediate removal of a faulted element.

**Grounding Conductor** - A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes; usually colored green.

**Hard-drawn Wire** - As applied to aluminum and copper, wire that has been cold drawn to final size so as to approach the maximum strength obtainable.

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

**Heat Resistance** - Ability of a substance to maintain physical and chemical identity and chemical identity and electrical integrity under specified temperature conditions.

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

**Helix** - A spiral winding.

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

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

**Hygroscopic** - Attracting or absorbing moisture from the ambient atmosphere.

**Hypalon** - Du Pont trademark for chlorosulfonated polyethylene (CSPE) synthetic rubber.

**ICEA** - Insulated Cable Engineers Association (Formerly IPCEA). An Association of Engineers of most cable manufacturers.

**Irradiation** - The exposure of a material to high energy emissions. In insulations for the purpose of favorably altering the molecular structure. Excessive exposure can be detrimental to the physical and electrical properties.

**Jacket** - A material covering over a wire insulation or an assembly of components, usually an extruded plastic or elastomer.



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

**Lap Splice** - A permanent joint formed in a short overlapping region of two parallel conductors or tapes. Also called parallel splice.

**Lay** - The distance along a cable occupied by one complete helix of a strand or conductor. The direction of lay (left or right hand) is the direction of the helix looking away from an observer. Also to arrange the wires or members of a conductor either by twisting them or by forming them into one or more layers helically applied.

**Length of Lay** - The axial length of one turn of the helix of a wire or member.

**Marker Tape** - A narrow strip of fabric, paper or plastic laid longitudinally within a cable; it bears printed information such as the specification to which the cable was made and the name of the cable's manufacturer.

**Marker Threads** - Colored strings laid parallel and adjacent to the strands of an insulated conductor to reveal information such as the conductor's manufacturer, the specification to which it was made, or its thermal capability.

**Messenger Wire** - A metallic supporting member either solid or stranded which may also perform the function of a conductor.

**Migration** - The loss of plasticizer from a plastic, usually due to heat or aging. It is undesirable since it will make the plastic hard and brittle. It is also called leaching.

**Mil** - Unit of measure equal to 1/1000 of an inch.

**Mining Cable** - A flame retardant cable especially constructed to withstand rough handling and exposure to moisture for underground use in the environment of a mine or tunnel, or surface use where exposed to sunlight and extremes of temperature.

**Moisture Absorption** - The amount of water that an insulation or jacket, which is initially dry, will absorb under specified conditions. It is expressed as the percentage ration of the absorbed water's weight to the weight of the jacket or insulation alone.

**NEMA Standards** - Property values adopted as standard by the National Electrical Manufacturers Association.

**Neoprene** - Trade name for polychloroprene, used for jacketing (See Polychloroprene).

**Nitrile Rubber** - A rubbery copolymer of butadiene and acrylonitrile. It is usually compounded and vulcanized.



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**Nominal** - Name or identifying value of a measurable property by which a conductor or component or property of a conductor is identified, and to which tolerances are applied.

**Nordel** - Du Pont trademark for EPDM synthetic rubber.

**Oxygen Bomb Test** - A test to determine the ability of conductors and insulations to withstand physical and electrical change when immersed in pure oxygen gas of specified temperature and pressure for a specified time.

**Plastic** - Any solid material employing organic matter of a high molecular weight as a principal constituent, which can be shaped by heat and pressure during manufacturing or processing into a finished article.

**Plasticizer** - A substance incorporated into a material to increase its workability or flexibility.

**Plating** - Any thin metallic coating applied over a metallic substratum.

**Polychloroprene** - Chemical name for neoprene A rubber-like compound used for jacketing where wire and cable will be subject to rough usage, moisture, oil, greases, solvents and chemicals.

**Polyester** - A resin generally used as a thin film in tape form.

**Polyethylene** - A thermoplastic material composed of polymers of ethylene.

**Polymer** - A material formed by the chemical combination of monomers having either the same or different chemical composition.

**Polypropylene** - A thermoplastic polymer of propylene.

**Polyvinyl Chloride (PVC)** - A thermoplastic material composed of polymers of vinyl chloride, which may be rigid or elastomeric, depending on specific formulation.

**Pothed** - An insulator used in making a sealed joint between an underground cable and an overhead line.

**Potting** - Applying a hydrostatic seal and mechanical reinforcement by means of a thermosetting liquid, which cures either at room temperature or at a slightly elevated temperature.

**Quad** - A structural unit employed in cables, consisting of four separately insulated conductors twisted together.

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



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**Rope-lay Conductor** - (See Concentric-lay Conductor.)

**Rubber** - A material that is capable of recovering from large deformations quickly and forcibly, and can be, or already is, modified to a state in which it is essentially insoluble (but can swell) in boiling solvent.

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

**Screen** - (See Shield.)

**Secondary Insulation** - Any extremely high resistance material which is placed over primary insulation to protect it from abrasion.

**Semi-conductor** - A solid material characterized by comparatively high resistivities.

**Serve** - Any helical wrapping applied over a wire or cable core. It may consist of wires, fibers, yarns or tapes.

**Served Wire Shield** - A barrier to the passage of interference formed by a helical wrapping of wires over a cable core. It is also called spiral shield.

**Sheath** - The material, usually an extruded plastic or elastomer, applied outermost to a wire or cable. Very often referred to as a jacket, or an impervious metal covering usually lead.

**Shield** - Any barrier to the passage of interference - causing electrostatic or electromagnetic fields, formed by a conductive layer surrounding a cable core. It is usually fabricated from a metallic braid, foil or wire serving.

**Shield Coverage** - The amount of cable core surface area which is covered by a shield. It is expressed as a percentage of the cable core's total surface area. It is also called braid coverage when applied to a braided shield.

**Shielding** - The practice of confining the electrical field around a conductor to the primary insulation of the cable by putting a conducting layer over and/or under the insulation. (External shielding is a conducting layer on the outside of the insulation. Strand or internal shielding is a conducting layer over the conductor itself).

**Skeleton Braid** - A braid of widely separated wires or fibers, used to reinforce a jacket, bind a cable core, or prevent the passage of electrostatic or electromagnetic fields.

**Soft Wire** - Wire that has been drawn or rolled to final size and then heated to remove the effects of cold working.



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**Spark Test** - A test designed to locate pin-holes in an insulated wire by application of an electrical potential across the material for a very short period of time while the wire is drawn through an electrode field.

**Specific Dielectric Strength** - The dielectric strength per millimeter of thickness of an insulating material.

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

**Specific Inductance Capacitance** - That property of a dielectric material which determines how much electrostatic energy can be stored per unit volume when unit voltage is applied.

**Specific Resistance** - The resistance of a unit conductor having a length of one foot and across-sectional area of one circular mil.

**Spiral Wrap** - A term given to describe the helical wrap of a tape or thread over a core.

**Splice** - A joint used for connecting two lengths of conductor or cable with good mechanical strength as well as good conductivity.

**Stabilizer** - Any ingredient added to plastics to preserve their physical and chemical properties.

**Static** - Electrical discharges in the atmosphere such as lightning, corona, etc.

**Strand** - One of the wires of any stranded conductor.

**Stranded Conductor** - A conductor composed of a group of wires, usually twisted, or of any combination of such groups of wires.

**Strand Lay** - The distance of advance of one strand of a spirally stranded conductor, in one turn, measured axially.

**Stress Cone** - A conical section built up of insulating tapes or a pennant to relieve the stress at the terminal end of the cable.

**Tank Test** - 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.

**Tape Wrap** - A term denoting a spirally or longitudinally applied tape material wrapped around the wire, either insulated or uninsulated, used as an insulation or mechanical barrier.

**Tear Strength** - The force required to initiate or continue a rip in a jacket or other insulation under specified conditions.



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**Temperature Rating** - The maximum temperature at which a given insulation or jacket may be safely maintained during continuous use, without incurring any thermally-induced deterioration.

**Tensile Strength** - The longitudinal stress required to break a specimen of prescribed dimension divided by the original cross-sectional area at the point of rupture (usually expressed in pounds per square inch).

**Termination** - 1). The load connected to the output end of a transmission line. 2). The provisions for ending a transmission line and connecting to a bus bar or other terminating device.

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

**Thermal Endurance** - The time in hours at a selected temperature for an insulating material or system of 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 Rating** - The maximum and/or minimum temperature at which a material will perform its function without undue degradation.

**Thermoplastic** - A classification of resin that can be readily softened and reformed by heating and be rehardened by cooling.

**Thermoset** - 1). To cure through chemical reaction by heat to a point of not being resoftened by subsequent heating. 2). A resin which cures by chemical reaction.

**Tinned Wire** - Copper wire that has been coated during manufacture with a layer of tin or solder to prevent corrosion or facilitate soldering.

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

**TPR** - A trade name for thermoplastic rubber.

**Triad** - Any grouping of three conductors or three assemblages of conductors, generally twisted together and found within a cable.

**Triplex** - Three single conductors twisted together, usually three single conductor cables twisted without over-all covering. Do not use for three conductors laid parallel on a reel.

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



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**Unidirectional Conductor** - (See Concentriclay Conductor.)

**Unilay Conductor** - (See Concentric-lay Conductor.)

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

**Voltage Drop** - The voltage developed between the terminals of a circuit component by the flow of current through the resistance or impedance of that part.

**Voltage Rating** - The maximum voltage at which a given cable or insulated conductor may be safely maintained during continuous use in a normal manner. It is also called working voltage.

**Vulcanization** - An irreversible process during which a rubber compound through a change in its chemical structure (for example, cross-linking), becomes less plastic and more resistant to swelling by organic liquids and elastic properties are conferred, improved, or extended over a greater range of temperature.

**Water Absorption** - The ratio of the weight of water absorbed by a given material under specified conditions, to the weight of that material when dry. It is generally expressed as a percentage.

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

**Wire Gage** - Any of several standard systems for designating wire sizes. As an example, see American Wire Gage.

**Work Hardening** - The increased stiffness and brittleness accompanying plastic deformation of metal.

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