

# GLOSSARY OF TERMS

This glossary describes and explains terms related to the manufacture, preparation, application and testing of rubber and elastomeric lining materials used in the protective linings industry. Many of the terms are used in the specification and application of corrosive and abrasive resistant materials. This glossary includes chemical names, abbreviations, identifications, and colloquial expressions.

## SECTION 21: GLOSSARY OF TERMS



### A

#### **ABRASION RESISTANCE**

The resistance of a material to loss of surface particles due to frictional forces.

#### **ACID RESISTANT**

The ability to resist the action of identified acids within specified limits of concentration and temperature.

#### **ACTIVATOR**

A chemical used in elastomer compounding in small quantities to increase the effectiveness of an accelerator.

#### **ADHESION**

The force in which two surfaces are held together. Adhesion values for tank lining are often determined by the procedures described in ASTM D429-test methods for rubber adhesion to rigid substrates.

#### **AGE RESISTANCE**

The resistance to deterioration by oxygen, heat, light, ozone, alone or in combination, during storage or use.

#### **AGE RESISTOR**

Also known as an antioxidant, a chemical that when added to an elastomeric compound will retard deterioration due to heat, light, oxygen, alone or in combination thereof.

#### **AMBIENT TEMPERATURE**

The temperature of the atmosphere or medium surrounding the object under consideration.

#### **ANTIOXIDANT**

Same as age resistor, a chemical compounding material used to retard deterioration caused by oxygen.

#### **ANTIOZONANT**

A chemical compounding material used specifically to retard deterioration caused by ozone.

#### **ASTM**

The abbreviation for the American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103.

#### **ATMOSPHERIC CRACKING**

Small fissures in the surface of rubber articles resulting from exposure to atmospheric conditions.

#### **ATMOSPHERIC STEAM CURE**

Same as exhaust steam cure.

#### **AUTOCLAVE**

A pressure vessel used for the curing or vulcanization of rubber parts by means of steam under pressure.

## SECTION 21: GLOSSARY OF TERMS

### B

#### **BLASTING**

Surface cleaning and preparation of substrate using abrasives such as airborne sand, grit or shot.

#### **BLAST PROFILE**

A measure of surface roughness.

#### **BLEMISH**

A superficial mark or impression on the surface of green or cured rubber lining.

#### **BLIND FLANGE TEST METHOD**

A method of testing rubber lining materials specified in ASTM D3491-Methods of Testing Vulcanizable Rubber Tank and Pipe Lining. Similar to the Atlas Cell.

#### **BLISTER**

A cavity or a sac deforming the surface of a material usually due to expansion of an entrapped liquid or gas. Permeation failures of tank linings in service is sometimes evidenced by blister formation.

#### **BLOOM**

A discoloration or change in appearance of the surface of a rubber product caused by the migration of a liquid or solid to the surface. (Examples: sulfur bloom, wax bloom.) Not to be confused with dust on a surface from external sources.

#### **BLOW DOWN**

Periodic opening of the bottom drain in an autoclave or vessel during cure to remove condensate.

#### **BOND**

The union of materials by use of adhesives, usually used in relation to parts vulcanized after attaching or being assembled together.

#### **BONDING AGENT**

See adhesive.

#### **BRICK LINING**

One or more courses of brick laid on a cured tank lining. Used in high temperature applications for the protection of rubber linings.

#### **BUFFING**

The grinding of a surface producing a roughened or a velvety surface. Usually done to obtain dimensional conformance, or as a preparation for repair.

#### **BUTT SEAM**

A seam made by placing two pieces to be joined edge to edge.

#### **BUTT SPLICE**

A joint made in a rubber part before or after vulcanization by placing the two pieces to be joined edge to edge.

## SECTION 21: GLOSSARY OF TERMS



### BUTYL RUBBER

A copolymer of isobutylene and isoprene rubber; ASTM designation IIR; butyl rubber is the common name for such materials.

## C

### CALENDER

A machine equipped with two or more heavy, internally heated or cooled rolls, used for the continuous sheeting or plying up of rubber compounds.

### CALENDER BLISTER

Trapped air between calender plies of a multi-ply rubber buildup.

### CAP STRIP

Strip of rubber approximately four inches to six inches wide used to cover a lap seam.

### CEMENT

A dispersion or solution of an elastomer or compound in a solvent for use as an adhesive or coating.

### CHALKING

The formation of a powdery residue on the surface of a material resulting from degradation.

### CHECKING

Short, shallow cracks on the surface of a rubber product, resulting from environmental conditions.

### CHEMICAL CURE

A tank lining system which can cure at low temperatures by topically applying a liquid curing agent.

### CHOLORBUTYL

Used in a general sense to mean a chlorobutyl tank lining construction. ASTM designation CIIR.

### CHLOROSULFONATED POLYETHYLENE

Generic name of an elastomeric material sold as Hypalon (\*TM). ASTM designation CSM.

### CLOSED SKIVE

A reverse angle cut along the edge of a rubber panel. This enables the installer to stitch down the cut edge so that the tie gum is protected from exposure to the commodity contained in a tank.

### COEFFICIENT OF THERMAL EXPANSION

The fractional change in dimension of a material for a unit change in temperature.

### COEFFICIENT OF FRICTION

Between rubber and dry surfaces, the ratio of the force required to move one surface over the other to the force pressing the two surfaces together.

## SECTION 21: GLOSSARY OF TERMS



### COHESION

The attraction between molecules of a substance, and the property which prevents separation of a substance into parts when acted upon by external forces.

### COLD BOND CEMENT

A cement used to repair materials at ambient temperature.

### COMPATIBILITY

The ability of different materials to blend and form a homogeneous system. Also, the ability of different tank lining materials to adhere and function together.

### COMPOSITE

A lining created by the assembly of two or more rubber stocks.

### COMPOUND

An intimate mixture of one or more polymers with all the ingredients necessary for the finished article. Sometimes called stock.

### CONDENSATE

Water from condensed steam which lies in the bottom of a pressure vessel or exhaust steam cured tank. It can insulate and prevent proper cure.

### COUPON

A rubber or rubber-covered metal sample used for chemical immersion tests.

### CR

ASTM designation for Chloroprene rubber (neoprene).

### CRACKING

A sharp break or fissure in the surface of rubber articles that develops on exposure to light, heat, ozone or repeated bending or stretching. Harsh chemical exposure can lead to gradual cracking of linings.

### CRAZING

A surface effect on rubber or plastic articles characterized by many minute cracks. This is generally not a serious degradation for a tank lining, unlike cracking.

### CREEP

The deformation in either vulcanized or unvulcanized rubber under stress that occurs in time after the immediate deformation.

### CROSS-LINKING

When chemical bonds set up between molecular chains, the material is said to be cross-linked. Once cross-linked, materials cannot be reprocessed. A form of curing.

### CRYSTALLINITY

Orientation of disordered long chain molecules of a polymer into repeating patterns. Degree of crystallinity effects stiffness, hardness, low temperature flexibility and heat resistance. Crystallinity can make some linings still and boardy, difficult to lay.

## SECTION 21: GLOSSARY OF TERMS



### **CSM**

ASTM designation for chlorosulfonated polyethylene (Hypalon (\*TM)).

### **CURE**

Similar to cross-linking, while cure covers all types (sulfur, peroxide, radiation, etc.).

### **CURE TIME**

The time required to produce vulcanization at a given temperature. (Cure time varies widely, being dependent on the type of compounding used and the thickness of the product.)

### **CURING AGENT**

A chemical which will cause cross-linking to occur.

### **CUTTING TABLE**

A table used for laying out, cutting and cementing tank lining panels. Often it is heated.

## **D**

### **DAMPING**

The ability of a material to absorb energy to reduce vibration.

### **DEFORMATION**

A change in the shape or dimensions of a body, resulting from stress, strain.

### **DELAMINATION**

Separation or splitting, either between plies in laminated goods or occasionally within the homogeneous part itself.

### **DENSITY**

The mass (weight) per unit volume of material (lbs/cubic foot or grams/cubic centimeter).

### **DEW POINT**

- 1) The temperature of the air at which dew begins to be deposited.
- 2) The temperature at which a given sample of air will have a relative humidity of 100%.

### **DIELECTRIC STRENGTH**

The measure of a product's ability to resist passage of a disruptive discharge produced by an electric stress.

### **DOUBLE BOND**

A double union of two carbon atoms instead of one union. Materials containing double bonds are chemically unsaturated.

### **DRAIN**

The line leading from the bottom of an autoclave.

### **DUROMETER**

An instrument for measuring the hardness of rubber and plastics. The "A" durometer scale is used for flexible materials and the "D" for rigids.

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### DUROMETER HARDNESS

A value that indicates the indentation or resistance to indentation of the indenter point of a durometer. High values indicate harder materials. See ASTM D2240-Test Method for Rubber Property - durometer hardness.

## E

### EPDM

ASTM abbreviation for a terpolymer of ethylene, propylene, and a diene with the residual unsaturated portion of the diene in the side chain.

### EBONITE

A term for natural hard rubber.

### ELASTOMER

A polymeric material which, at room temperature, is capable of recovering substantially in shape and size after removal of a deforming force.

### ELONGATION

Extension produced by tensile stress, usually expressed as a percent of original unit length.

### EMBRITTLEMENT

A rubber compound becoming brittle during a low or high temperature exposure or as a result of aging.

### EXHAUST STEAM CURE

Non-pressurized steam cure. A method commonly used for large tanks which cannot be pressurized.

### EXOTHERMIC

A chemical reaction in which heat energy is liberated. In tank linings, very thick layers of ebonite compounds may exotherm during cure.

### EXTRACTION

The process of removing one or more components of a homogeneous mixture by treating the mixture with a liquid (solvent) in which the components to be removed are soluble but not the mixture as a whole.

## F

### FACE

The commodity-contacting surface in tank lining construction.

### FACE STOCK

The commodity-contacting stock in a multi-component lining.

### FISH EYE

A thin elongated void in a calendered sheet. A surface imperfection. Not detrimental to service life.

### FLOW MARKS

Imperfections, cracks in the surface, causes flowing in uncured rubber.

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## SECTION 21: GLOSSARY OF TERMS



### FRESHENING

Solvent washing of a rubber surface to provide tack.

## G

### GASKET

A deformable material clamped between essentially stationary faces to prevent the escape of matter through an opening or joint.

### GAUGE (GAGE)

Refers to a dimension, of the thickness of a rubber lining.

### GRAIN

The unidirectional orientation of rubber or filler particles occurring during processing (extrusion, milling, calendering) resulting in anisotropy of a rubber vulcanizate.

### GREEN STRENGTH

- 1) The resistance to deformation of a rubber stock in the uncured state.
- 2) Uncured adhesion between plied or spliced surfaces.

## H

### HALOGEN

Group of elements containing fluorine, chlorine, bromine and iodine.

### HARDNESS

The measured resistance to indentation of a material. See durometer.

### HARD RUBBER

See ebonite.

### HEAT AGING

A procedure where vulcanized rubber is aging in air oxygen at elevated temperatures.

### HEAT RESISTANCE

The property or ability of rubber articles to resist the deteriorating effects of elevated temperatures.

### HOLIDAY

A small uncovered or non-coated area in a substrate; usually refers to pinholes in thin coatings of rubber sheeting.

### HOLLAND CLOTH

A completely filled woven fabric usually with a glass-smooth finish on both sides; used as a separating medium for uncured rubber stock.

### HOT WATER CURE

A method for curing rubber in hot or boiling water.

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## SECTION 21: GLOSSARY OF TERMS



### HYDROCARBON

An organic chemical compound containing the elements carbon and hydrogen. Aliphatic hydrocarbons are saturated compounds and aromatic hydrocarbons are based on the cyclic or benzene ring. They may be gaseous, (methane, ethylene, butadiene); liquid (hexane, benzene); or solid (natural rubber, naphthalene, cis-polybutadiene).

### HYDROLYSIS

Chemical decomposition of a substance involving a reaction with water.

### HYSTERESIS

The heat generated by rapid deformation of a vulcanized rubber part. It is the difference between the energy of the deforming stress and the energy of the recovery cycle.

## I

### I.D. OR ID

Abbreviation for inside diameter.

### IR

ASTM designation for isoprene rubber, cis- and trans- polyisoprene are examples.

### IMMERSION TESTING

Commonly used to determine the resistance of tank lining compounds to various chemicals. See ASTM D-471-Test Method for Rubber Property-Effect of Liquids.

### IMPRESSION

A design formed on the surface of a rubber article by a method of transfer, such as fabric mold, embossed poly impression.

### INHIBITOR

A chemical that is added to a system to slow down or prevent the rate of reaction, as in a monomer to prevent its premature polymerization.

### INORGANIC CHEMICAL

Chemicals whose composition is based on atoms other than carbon (salt, clay, silica, caustic, hydrochloric acid, etc.).

### INTERMEDIATE PRIMER OR CEMENT

A primer or cement which is part of a total tank lining adhesive system.

### INTERNAL STEAM PRESSURE CURE

A rubber-lined vessel which can be sealed and is structurally strong enough to take steam pressure during cure. Examples are railroad tank cars and chemical reactors.

## SECTION 21: GLOSSARY OF TERMS



### L

#### LAP

A part that extends over itself or like part, usually by a desired and predetermined amount.

#### LAP SEAM

A seam made by extending the flat edge of one piece of material flat over the edge of a second piece of material.

#### LEGS

Tension filaments that appear between two adhering plies of material as they are pulled apart. Usually indicates a failure due to wet cement.

#### LINER

A separator, usually of cloth, plastic film or paper, used to prevent adjacent layers of material from sticking together.

#### LOT

- 1) A mass of material or collection of articles of similar composition and characteristics.
- 2) An amount of material produced at one time and of uniform composition.

### M

#### MECHANICAL PROPERTIES

Physical properties of a material associated with reaction to various applied forces, as in tensile strength, compression set, elongation, DeMattia Flex, etc.

#### MEK

Methyl ethyl ketone. Solvent used in some cements and primers.

#### MIBK

Methyl iso butyl ketone. Solvent used in some cements and primers.

#### MICROMETER

An instrument by which highly accurate minute measurements of length, depth, or thickness may be made.

#### MIGRATION

The movement of materials within a rubber product to its surface, or from an area of high concentration to one of low concentration, or into another material to which it is laminated.

#### MIGRATION STAIN

A discoloration on a surface of a rubber article touching a discolored surface.

#### MODULUS

In the testing of rubber, it is the force in per unit area psi or mega-pascals of initial cross-sectional area necessary to produce a given percentage of elongation.

## SECTION 21: GLOSSARY OF TERMS



### MODULUS OF ELASTICITY

Ratio of stress to strain within the elastic range. Same as Young's modulus.

### MPA

The abbreviation for mega-pascal, a metric unit of measurement for pressure.

### MUSLIN

A broad term describing a wide variety of plain-weave cotton or polyester/cotton fabrics ranging from lightweight sheers to heavier shirting and sheeting. Quite frequently used as a liner in rolling up cemented tank lining panels.

## N

### NATURAL RUBBER

Rubber formed in a living plant or tree, usually *Hevea brasiliensis*. ASTM designation NR.

### NBR

ASTM designation for copolymers of acrylonitrile and butadiene.

### NECKING

The localized reduction in cross section that may occur in a material under tensile stress.

### NEOPRENE

Originally the trade name, now the generic name of polymers and copolymers based on chloroprene. ASTM designation CR.

### NERVE

The elastic resistance of raw rubber or compounds to permanent deformation during processing. A nery tank lining will be difficult to lay around tight bends or in corners because of spring back.

### NITRILE RUBBER

Copolymers of acrylonitrile and butadiene. Same as NBR or Buna-N.

### NON-STAINING

An accelerator, antioxidant or similar substance that will not discolor other goods placed next to the rubber in which it is used. Sometimes used as well to describe nondiscoloring in white or colored goods.

### NR

ASTM designation for natural rubber.

## O

### O. D. AND OD

Abbreviation for outside diameter.

## SECTION 21: GLOSSARY OF TERMS



### **OIL RESISTANCE**

The ability to withstand swelling and deterioration by a specified oily liquid. None of the available elastomers are oil proof. Some elastomers are oil “resistant” to varying degrees.

### **OIL SWELL**

The change in volume of a rubber article resulting from contact with oil.

### **OPEN SEAM**

A seam in which edges do not meet, forming a void or lifting away of one rubber sheet from another at the seam.

### **OPEN STEAM CURE**

A method of vulcanization in which the steam is in direct contact with the product being vulcanized at atmospheric pressure.

### **OPTIMUM CURE**

The time and temperature of cure necessary to develop the desired combination of properties.

### **ORANGE PEEL**

Used to describe a rough surface imperfection of a cured part. Usually formed from many small surface blisters.

### **ORGANIC**

Refers to chemical structure based on the carbon atom, natural and synthetic.

### **OVERCURE**

A state of vulcanization beyond the optimum, often resulting in a decline in certain physical properties. Usually indicated by a sticky or gooey rubber surface.

### **OVERLAP SPLICE**

The edge of a panel which overlaps the end of an adjoining panel. The splice can be open or closed.

### **OVERLAY**

To add another layer of lining over an in-place tank lining construction. Typical over lays are cap strips and dome ends of tank cars.

### **OXIDATION**

The reaction of oxygen with a rubber product, usually accompanied by a change in feel, appearance of surface, or a change, usually adverse, in physical properties.

### **OZONE (O<sup>3</sup>)**

An allotropic form of oxygen. A gas with a characteristic odor which is a powerful oxidizing agent. It is present in the atmosphere at low levels and causes cracking in certain types of elastomeric compounds when they are stretched or compressed.

### **OZONE CRACKING**

The surface cracks, checks or crazing caused by exposure to an atmosphere containing ozone.

### **OZONE RESISTANT**

Having the ability to withstand the deteriorating effects of ozone (generally cracking).

## SECTION 21: GLOSSARY OF TERMS



### P

#### PERMANENT SET

The percentage by which an elastic material fails to return to its original form after deformation.

#### PEEL STRENGTH

Inexact term for tank lining. See adhesion.

#### PH

The measure, on a logarithmic scale of 1 to 14, of the relative acidity or alkalinity of an aqueous solution. Neutral pH (pure water) is 7. Hydrochloric acid is approximately 1 and sodium hydroxide approximately 13.

#### PHASE

A physically homogeneous, mechanically separable portion of a material system.

#### PLASTIC FLOW

The deformation of a plastic material beyond the point of recovery, accompanied by continuing deformation with no further increase in stress.

#### PLASTICITY

The tendency of a material to remain deformed after reduction of the deforming stress to or below its yield stress.

#### PLASTICIZER

A substance incorporated into a material to increase its workability, flexibility or distensibility.

#### PLY ADHESION

The force required to separate two adjoining plies in a specified width of a rubber product.

#### PLY SEPARATION

A condition which occurs due to a loss of adhesion between plies.

#### POLY

Abbreviation for polyethylene film. Used to prevent layers of rubber from sticking together.

#### POLYMER

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

#### POLYMER CHAIN

The chain of elements that form the basis of the structure of a polymer. The elements may be all carbon atoms, carbon and oxygen, silicon, nitrogen, etc.

#### POT HEATER

See autoclave.

#### PRECURE

Premature vulcanization taking place during the process prior to vulcanization. Similar to scorch.

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## SECTION 21: GLOSSARY OF TERMS



### **PRESSURE CURE**

Vulcanization under pressure.

### **PROFILE**

Surface profile is a measure of the roughness of a surface which results from abrasive blast cleaning. The height of the profile produced on the surface is measured from the bottom of the lowest valley to the top of the highest peak.

### **PRIMER**

A coating applied to the surface of a material, prior to the application of an adhesive; sometimes considered as a part of the adhesive system.

### **PSI**

The abbreviation for pound per square inch.

## **Q**

### **QUALITY CONFORMANCE INSPECTION OR TEST**

The examination of samples from a production run of products to determine adherence to a given specification for acceptance of that production run.

## **R**

### **RATE OF CURE**

The relative time required to reach a predetermined state of vulcanization under specified conditions.

### **RECOVERY**

The degree to which a rubber product returns to its normal dimensions after being distorted.

### **REINFORCEMENT**

The stiffening effect of solids, such as carbon black, on an unvulcanized elastomer mixture and the enhancement of the physical properties of the vulcanized compound, such as tensile, elongation, modulus, abrasion resistance, tear, etc.

### **RESILIENCE**

The ratio of energy output to energy input in a rapid (or instantaneous) full recovery of a deformed specimen.

### **REVERSION**

The softening of vulcanized rubber when it is heated too long or exposed to elevated temperatures. It is a deterioration in physical properties. (Extreme reversion may result in tackiness.) This most commonly affects natural rubber linings.

### **ROLL**

- 1) A part generally of circular cross section designed to revolve about a fixed axis. The face may be corrugated, ribbed, fluted, straight, tapered, concave or otherwise contoured.
- 2) Sheet rubber and gasket material of a uniform width rolled up on itself.

## SECTION 21: GLOSSARY OF TERMS



### RUBBER

An elastomer, generally implying natural rubber, but used loosely to mean any elastomer, vulcanized and unvulcanized. By definition, a material that is capable of recovering from large deformations quickly and forcibly.

## S

### SADDLE

The rubber lining applied to the outside center area of tank cars for protection from acid spills when loading or unloading.

### SAGS

Sag marks - voids created by the flow of uncured rubber.

### SAND BLAST

To clean with sand or steel grit in a high velocity stream of air.

### SCORCH

Premature vulcanization of a rubber compound, generally due to excessive heat history.

### SEAM

A line formed by joining material to form a single ply or layer. A splice or overlap.

### SEAMING STRIP

A strip of material laid over a seam to act as a cap.

### SEMI-CURE

A preliminary incomplete cure applied to an article in the process of manufacture, to cause the rubber to acquire a degree of stiffness or to maintain some desired shape.

### SEMI-HARD RUBBER

A term used for hard rubber which when fully cured is flexible and can be bent without shattering.

### SERVICE TEST

A test in which the product is evaluated under actual service conditions.

### SET

Percentage of deformation remaining after complete release of the force producing the deformation.

### SET UP

Some degree of precure in tank lining gum. Colloquial.

### SHELF AGING

The natural deterioration of rubber articles kept in storage or "on the shelf" under normal atmospheric conditions. This slow deterioration is due primarily to oxygen and ozone attack.

## SECTION 21: GLOSSARY OF TERMS



### SHELF LIFE

An expression describing the time a material can be stored without losing any of its properties.

### SHORE HARDNESS

A term denoting a hardness value derived from an instrument developed by the Shore Instrument & Mfg. Co., Inc.

### SHORT

Low elongation and elastic limit.

### SHRINKAGE

The drawing up of high viscosity or nery uncured gum.

### SI

Abbreviation for International System of Units (see ASTM 380).

### SINK MARK

A depression in the surface of a part caused by the collapse of a blister or bubble.

### SKIVE

A cut made on an angle to the surface to produce a tapered or feathered edge.

### SKIVE BUTT SEAM

Two skived edges joined edge-to-edge to form a smooth surface. Usually each edge is cut at a 45° bevel so the seam fits snug together.

### SOAPSTONE

A soft powder or stone, basically hydrated magnesium silicate, having a soapy feel, used to dust the surface of unvulcanized rubber compounds to keep them from sticking together. Similar to talc.

### SOFT RUBBER

A term used for rubber which cures under 70 durometer "A" scale.

### SOLVENT WASH

See freshening.

### SPARK TESTER

A high voltage test unit used to detect breaks or holes in a lining.

### SPECIFIC GRAVITY

The ratio of the mass of a unit volume of a material to that of the same volume of water at a specified temperature. Specific Gravity is:

$$\frac{\text{grams / cc of material}}{\text{grams / cc of water (1)}} \quad \text{or} \quad \frac{\text{pounds / ft}^3 \text{ of material}}{\text{pounds / ft}^3 \text{ of water (62.4)}}$$

### SPOT CURE

A localized area being cured. Commonly used with repairs.

## SECTION 21: GLOSSARY OF TERMS



### **SSPC**

Abbreviation for Steel Structures Painting Council, 4400 Fifth Ave., Pittsburgh, PA 15231.

### **STANDARD**

A document, or an object for physical comparison, for defining product characteristics, products, or processes, prepared by a consensus of a properly constituted group of those substantially affected and having the qualifications to prepare the standard for use.

### **STATIC SPARK**

A high voltage of static electricity.

### **STATE OF CURE**

The cure condition of a vulcanization relative to that at which optimum physical properties are obtained.

### **STEAM ASSIST**

A term used when steam is used to speed up the cure of a chemical cure repair.

### **STEAM CURE (OPEN)**

A method of vulcanizing rubber parts by exposing them directly to steam.

### **STIFFENER**

A steel beam on the outside of a tank being lined. They often act as a heat sink and will have an influence on cure state.

### **STITCHING**

A method of joining two pieces of uncured rubber compound together by means of a stitching roller, and a hand held tool comprised of a wheel with a narrow edge which is often serrated. It is commonly used to make tank lining splices.

### **STOCK**

An uncured rubber compound of a definite composition from which a given article is manufactured.

### **STRAIN**

Deformation resulting from a stress.

### **STRESS**

Force per unit of original cross sectional area that is applied to a part or specimen.

### **STRESS RELAXATION**

The time dependent decrease in stress for a specimen at constant strain.

### **SUBSTRATE**

The surface on which a coating or lining is applied.

### **SUMP**

A well at the lowest position in a tank car where condensate can collect during cure.

### **SUN CHECKING**

Surface deterioration in the form of cracks, checks or crazing caused by exposure to direct or indirect sunlight.

## SECTION 21: GLOSSARY OF TERMS



### **SURFACE PREPARATION**

The preparation of a substrate prior to applying tank lining: welding, grinding, blasting, cleaning.

### **SURGE**

To rise suddenly to an excessive or abnormal value.

### **SURGE PRESSURE**

The maximum pressure reached at surge, frequently the result of rapidly activating a valve.

### **SWELLING**

An increase in volume or linear dimension of a specimen immersed in liquid or exposed to a vapor.

### **SYNERGISTIC**

Relating to the cooperative action of two or more substances where their combined effect is (usually) greater than the sum of their individual effects. This is a common occurrence in chemical solutions that tank linings must handle.

## **T**

### **TACK**

The property of a polymer, compound, or adhesive that causes two layers to stick together on application of mild pressure. Tacky polymers or compounds do not necessarily stick to other surfaces.

### **TACK CEMENT**

A formulated rubber/cement mixture which can be rolled or brushed on surfaces which will hold the rubber panel in place until cure takes place. Normally considered a part of the adhesive system.

### **TENSILE STRENGTH**

The maximum tensile stress applied during stretching of a specimen to rupture expressed per unit area of the specimen, i.e., PSI and Mpa.

### **TENSILE STRESS**

The applied force per unit of original cross-section area of a specimen.

### **THERMOSETTING**

Capable of being changed into a substantially infusible or insoluble product when cured under application of heat or chemical means. Vulcanization is a type of thermosetting.

### **TIE GUM**

An intermediate layer of rubber employed to promote bonding of two surfaces; usually a soft rubber compound.

### **TIGHT CURE**

A cured state where high degree of cross-linking has taken place. The best service life is obtained with a tight cure.

## SECTION 21: GLOSSARY OF TERMS



### TOLERANCE

The amount by which a property of a material or object can vary from a specified value and still be acceptable.

### TOLUENE

An organic solvent used in tank lining cements and primers.

### TRAPPED AIR

Air that is enclosed between two materials; between steel and lining or two lining sheets.

Note: trapped air can occur between vulcanized and unvulcanized rubber.

### TRIM

To bring a piece of rubber to the required smoothness or shape.

## U

### ULTRAVIOLET LIGHT

A form of energy occupying a position in the spectrum of sunlight beyond the violet, and having wave-lengths of less than four micrometers which is the limit of visible light. UV (ultraviolet) rays are very active chemically, exhibit bactericidal action, and cause many substances to fluoresce. UV rays accelerate deterioration of rubber parts exposed to them and can initiate polymerization.

### UNDER CURE

A low state of cross-linking. Often an under cured lining will be low in durometer hardness and fluid and acid resistance will be poor.

## V

### VAPOR PHASE

Vapor above the liquid in a tank car or closed storage tank; often the most severe conditions for rubber tank lining.

### VISCOSITY

The resistance of a material to flow either by gravity or under stress.

### VOLUME COST

Costs calculated on the basis of unit volume rather than unit weight.

### VOID

The absence of material or an area devoid of materials where not intended. See also blister and sink.

### VULCANIZATE

Preferably used to denote the product of vulcanization, without reference to shape or form.

### VULCANIZATION

- 1) An irreversible process during which a rubber compound, through a change in its chemical structure (cross-linking), becomes less plastic and more elastic. Elastic properties are conserved, improved, or extended over a greater range of temperature.
- 2) It often refers to the reaction of rubber specifically with sulfur, while "curing" covers other methods of cross-linking. Both terms are often used interchangeably.



## SECTION 21: GLOSSARY OF TERMS



### **VULCANIZING AGENT**

Any material that can produce in rubber the change in physical properties known as vulcanization, such as Chemcure™ applied to chemical cure rubber linings.

## **W**

### **WEATHERING**

A surface deterioration of a rubber article during outdoor exposure.

### **WETTING AGENT**

A substance that reduces the surface tension of a liquid, thereby causing it to spread more readily on a solid surface.

### **WRAPPED CURE**

A vulcanizing process using a tensioned wrapper (usually fabric tape) to apply external pressure.

### **WHITE METAL BLAST**

To send or shot blast a steel substrate to a SSPC No. 5 finish, as specified by the Steel Structures Painting Council.

## **X**

### **XYLENE**

An organic solvent used in tank lining cements and primers.

## **Y**

### **YIELD POINT**

The stress in a material, at which there occurs a marked increase in strain without an increase in stress. Rubber is said to have a zero yield point except under very rapid elongation and release.

### **YIELD STRENGTH**

The stress at which a material exhibits a specified limiting permanent set. Determined by a measurable value of plastic yielding of the material above which the material is considered to be damaged and below which the damaging effects are considered to be negligible.

### **YOUNG'S MODULUS**

Stress per unit strain for perfectly elastic materials. The method of determination of Young's modulus in flexure of natural and synthetic elastomers at normal and subnormal temperatures is given in ASTM Method D 797.



## SECTION 21: GLOSSARY OF TERMS



### Z

#### ZERO LOAD

A reference load applied to sheet material in the course of getting initial thickness reading and prior to determining compressibility.