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BUREAU OF INDIAN STANDARDS

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भारतीय मानक **मसौदा**

गास्केट और पैकिंग — पारिभाषिक शब्दावली

DRAFT *Indian Standard*

GASKET AND PACKING — GLOSSARY OF TERMS

ICS 21.140

Gasket and Packing Sectional Committee, MED 30	**Last date for receipt of comments: 7 Feb 2025**

FOREWORD

(*Formal clause will be added later*)

This Indian Standard provides a comprehensive glossary of terms related to gaskets and packing, serving as a valuable reference for professionals, manufacturers, and users in the field.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2:2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

DRAFT *Indian Standard*

GASKET AND PACKING — GLOSSARY OF TERMS

1 SCOPE

This standard covers the glossary of terms related to gasket and packing.

2 TERMINOLOGY

For the purpose of this standard, following terminologies shall apply.

2.1 Abrasion Resistance — Ability of material to resist mechanical wear.

2.2 Accelerated Ageing — Procedures for subjecting pressure-sensitive label stock to special environmental conditions to predict the course of natural ageing.

2.3 Acid Resistant — Ability of material to withstand the actions of various acids.

2.4 Acrylic Adhesive — It is made from acrylic monomers that have been polymerized. They have good resistance to UV radiation, plasticizer, and extreme temperatures.

2.5 Adhesion (a) — The state in which two surfaces are held together by interfacial forces which may consist of molecular forces or interlocking action, or both.

2.6 Adhesion (b) — The clinging or sticking of two material surfaces to one another. In rubber parlance, the strength of bond or union between two rubber surfaces or plies cured or uncured. The bond between a cured rubber surface and a non-rubber surface. For examples, glass, metal, wood, fabric.

2.7 Adhesion Failure — The separation of two materials at the surface interface rather than within one of the materials itself.

2.8 After Cure — Continuation of vulcanisation after the desired cure is affected and the heat source is removed.

2.9 Ageing — The changes in physical properties over time.

2.10 Aluminium — A pliable, lightweight metal that has good electrical and thermal conductivity, high reflectivity, and resistance to oxidation.

2.11 Aluminium Seal Rings — Sealing rings for pistons made from high grade aluminium alloy.

2.12 Ambient Temperature — Temperature designated as 30 ^{o}C (±5 ^{o}C).

2.13 Annealing — A process involving high-temperature heating and cooling of the as-rolled cold rolled steel substrate to make it softer and more formable.

2.14 Anodize — The controlled oxidation of aluminium using an electro-chemical process to create a porous surface that is receptive to colour dying.

2.15 Anti-Extrusion Rings — Rings used to fit behind rubber O-ring seals to prevent extrusion into the gap between the metal pieces. It is also known as back-up rings or anti-extrusion rings.

2.16 Antioxidants — A substance which inhibits, or retards, oxidation, and certain other kinds of ageing. Some antioxidants cause staining or discoloration of the rubber compound on exposure to light and are used only in black or dark-coloured goods. Others (phenolic), described as non-staining, are used in white or light-coloured goods. It is usually organic and nitrogenous.

2.17 Aramid Fibers — Aramid fibers are a class of synthetic fibers known for their exceptional strength, heat resistance, and lightweight properties. They are derived from polyamide polymers with an aromatic structure, which contributes to their high performance. They are available in fibers or pulp form. They can withstand temp upto 250 °C.

2.18 Asbestos — Asbestos is a collective name given to naturally occurring fibrous silicate material. The most commonly used is the sealing industry is chrysotile fibre.

2.19 Assembly Load — Load generated by the bolts on the gasket during assembly.

2.20 Assembly Pressure — Load generated on gasket during assembly.

2.21 Back-up Ring — A ring (often metallic) around the back-up ring outer periphery of the sealing material.

2.22 Baffle Rings — A ring used to slow the flow of fluids along a shaft.

2.23 Ball Valve Seats — A engineering plastic or semi metallic or metallic ring shaped to fit against the ball in a flow control valve.

2.24 Batch — The product of the one mixing operation in an intermittent process.

2.25 Bearing Seals — Seal ring made to snap-fit into a ball, roller or spherical bearing to exclude dust, dirt or trash.

2.26 Bearings — A machined or moulded plastic ring used as a guide ring or wear ring in a hydraulic cylinder.

2.27 Beater Addition Product — Gasket material manufactured by a paper-making process.

2.28 Belleville Washer — Washer with a slightly conical section, which acts as a spring when compressed axially.

2.29 Bellows — A corrugated rubber or plastic piece which can stretch with a shaft to keep the shaft clean.

2.30 Bias Angle

a) Acute angle between the direction of the cut and the diameter of the wrap in the production of wrapping for hose; and

b) Acute angle between the direction of the cut and the direction of the cords in the production of fabric plies.

2.31 Bill of Material — Total list of all components/materials required to manufacture the final product.

2.32 Binder — A substance (usually organic) used to bond the components of a gasket material into a matrix.

2.33 Boiler Door Joint — A boiler door joint is a gasket, or seal, for a boiler door (such as on a steam engine). Boiler door joints can be supplied as dovetail type joints or manufactured from non-woven materials or supplied in one piece.

2.34 Bolt — Threaded fastener used to secure the members of a flange joint together and to apply compressive force to flange.

2.35 Bolt Load — Means of applying compressive pressure to the gasket.

2.36 Bolt Tension — Tension (tensile stress) created in a bolt by assembly preloads and/or thermal expansion, service condition, etc.

2.37 Bond — The union of materials by use of adhesives, usually used in related parts vulcanized after attaching.

2.38 Bonded Seals — A flat steel washer with an elastomer or thermoplastic sealing ring moulded into the centre to fit over a bolt to provide a seal.

2.39 Bonding Agents — Substances or mixtures of substances that are used for attaching rubber to metal, fabrics or other substrates. Generally, the rubber compound is vulcanised by heat in the process. Cyclized rubber or rubber isomers, halogenated rubber, rubber hydrochloride, reaction product of natural rubber and acrylonitrile, polymers containing diisocyanates are all used.

2.40 Bore — The bore specifies the inner dimension (I.D.) of the gasket.

2.41 Brittleness — Tendency to crack when subjected to deformation**.**

2.42 Buna N or NBR — A general term for the copolymers of butadiene and acrylonitrile. These elastomers are extremely resilient to oil, fuels and chemicals.

2.43 Buna S — A general term for the copolymers of butadiene and styrene.

2.44 Bushing — A rubber or plastic spacer to provide a wear surface around a shaft.

2.45 Butyl Rubber — A copolymer of isobutylene and isoprene, polymerized almost instantaneously in methyl chloride with aluminium chloride at about 60 °C. Butyl is resistant to ozone and the action of many other corrosive chemicals. Butyl rubber is resistant to permeation by gases.

2.46 Cloth-Inserted (CI) — A sheet of rubber containing one or more plies of fabric covered with rubber.

2.47 Compressed Asbestos Fibre (CAF) — Gasket made from chrysolite asbestos fibres bonded with elastomers and fillers, with or without metallic reinforcement.

2.48 Calendar Sheets — A machine with two or more heavy rolls, which may be internally heated or cooled, used for the manufacture of compressed sheeting materials.

2.49 Calliper — The thickness of a sheet material. The thickness is usually expressed in one thousands of an inch and in millimetres (that is 0.050 is expressed as 50 mils).

2.50 Carbon Fibers — These are strong, lightweight composed of carbon atoms. They are long thin strands and differ from expanded graphite in their temperature handling ability. Carbon fibers can handle upto 400 °C.

2.51 Carbon Steel (CS) — Carbon steel is steel in which the main alloy is carbon.

2.52 Catalyst — A chemical in small quantities which accelerates a chemical reaction without itself necessarily becoming part of the final product.

2.53 Cavity — The area on a die where blades are formed to cut. A die with 1 or more cut-outs that are the same size for each label cut.

2.54 Cellular Rubber — Rubber products which contain cells or small hollow receptacles. The cells may either be open or interconnecting or closed and not interconnecting.

2.55 Cellulosic Fiber — Cellulosic fiber is a fiber made from bark, wood and leaves of plant that is heat resistant up to 200 °C and continuous temp 150 °C.

2.56 Characteristics Matrix — An analytical technique for displaying the relationship between process parameters and manufacturing stations.

2.57 Chemical Resistant — The resistance offered by elastomer products to physical or chemical reactions because of contact with or immersion in various solvents, acids, alkalis, salts, etc.

2.58 Chemical Treatment — An aqueous solution of corrosion-inhibiting chemicals, typically chromates or chromate/phosphate.

2.59 Chevron Packing — Also called V-Packing, Vee-packing, parachute packing, or V-set packing. A complete vee packing set contains multiple ‘V’ shaped sealing rings stacked and nested together with a male adapter on one end and a female adapter on the other end.

2.60 Chloroprene — 2-Chloro-l, 3-butadiene, a volatile, colourless liquid which boils at 59 °C, synthesized from acetylene. It is used in the manufacture of polychloroprene sheets, which is obtained by polymerizing chloroprene under suitable conditions.

2.61 Class — The class of a gasket specifies its standard sizes/rating (for examples, PN16, PN40, CL150, etc). It is analogous to the flange class.

2.62 Closed Cell — A cell totally enclosed by its walls and hence not interconnecting with other cells.

2.63 Coefficient of Expansion — The coefficient of linear expansion is the ratio of the change in length per degree to the length at 0 °C. The coefficient of surface expansion is two times the linear coefficient. The coefficient of volume expansion (for solids) is three times the linear coefficient. The coefficient of volume expansion for liquids is the ratio of the change in volume per degree to the volume at 0 °C.

2.64 Cold Flow — Continued deformation under stress at lower or room temperature.

2.65 Cold Rolled Products — Flat rolled products for which the required final thickness has been obtained by rolling at room temperature.

2.66 Cold Working — Applying a mechanical force (such as deep drawing) to metal at room temperature at such a rate that strain-hardening occurs.

2.67 Compact Steels — Multi-piece seal sets, generally used as piston seals in a hydraulic cylinder. Made to fit in a limit space, compact piston seals contain a primary sealing component, guide rings and back-up rings in one convenient set.

2.68 Compound

a) A term applied to either vulcanised or unvulcanised mixtures of elastomers and other ingredients necessary to make a useful rubber-like material;

b) In chemistry, it is the material resulting from the chemical union of two or more elements in definite proportions and in which the properties of the individual elements have disappeared; and

c) In rubber manufacture, it is the composition or formula of stock, the ingredients of which, however, may not all be chemically combined and is therefore more of a physical mixture.

2.69 Compressed Non-Asbestos Fibre (CNAF) or Non-Asbestos Fibre (NAF) — Gasket material, primarily containing fibres, rubber and fillers, manufactured on a calendar under high load. The fibres can be various but not limited to aramid, carbon, glass fibres in various combination. The final gasket material does not contain any asbestos in any amount.

2.70 Compressibility — Percentage reduction of thickness under a compressive pressure, applied at a constant rate, at room temperature.

2.71 Compression Set — Residual deformation of a gasket after it has been subjected to, and then released from a specified compressive pressure, over a defined time and at a given temperature.

2.72 Conductive Adhesive — An adhesive that incorporates conductive fibres. These fibres could conduct electricity through the thickness of the adhesive and/or in the plane of the adhesive. Ideal for EMI/RFI shield and EMI/RFI gasket attachment.

2.73 Conformability — The ability of an adhesive tape to mould itself to the shape of an object without wrinkling or creasing.

2.74 Converting — The process of taking a material or adhesive and altering it from one form to another.

2.75 Controlled Swell — Property of gasket material to swell to a defined extent when in contact with the retained fluid, to provide additional sealing pressure.

2.76 Co-polymer

a) A polymer consisting of two different monomers chemically combined; and
b) A copolymer is a high polymer consisting of molecules containing large numbers of units of two or more chemically different types in irregular sequence.

2.77 Copper Seal rings — Rings made from thin copper formed over fibrous filler to seal in high temperature.

2.78 Cork — A gasket material manufactured from the cork tree. Cork material is typically combined with rubbers to give it greater resistance to chemicals and solvents. Cork is a low compression jointing.

2.79 Corrugated Metallic Gasket — Gasket with compliant, wave-form metal core, faced usually with a sealing material.

2.80 Creep Deformation — Percentage loss of thickness over a specified time under constant load, applied at a specified rate, at a specified temperature.

2.81 Critical Surface — Intended for material applied to critical exposed/painted applications where cosmetic surface imperfections are objectionable. The prime side surface will be free of repetitive type imperfections, gouges, scratches, scale and slivers. This surface can only be furnished as a pickled product.

2.82 Cross Linked — The establishment of a chemical bond between the molecular chains of a given polymer, thereby enhancing physical properties.

2.83 Cross Section — An O-ring as viewed if cut at right angles to the axis showing internal structure.

2.84 Crush Washers — A washer made to be crushed to form a seal.

2.85 Cure — Cross-linking reaction of elastomer with various chemicals, creating a matrix of greater stability.

2.86 Cushioning Seals — Sealing rings mounted into a cylinder to cushion the stroke or prevent metal to metal contact.

2.87 Custom Moulded Products — Special shaped parts moulded from rubber or plastic made to fit the machine or device it is used in.

2.88 Crystallinity — Stretched natural rubber forms a high oriented state and shows X-ray diffraction patterns and other properties common to truly crystalline materials. The amorphous and crystalline regions are not mechanically separable phases, but the same molecule may at the same time have part of its length in a crystalline, and the remainder in an amorphous region.

2.89 Damper — The use of a variety of materials to deaden or damp a vibration.

2.90 Density — The weight per unit volume of a material, usually expressed in kg/cm^3 or designated unit.

2.91 Design Failure Mode and Effects Analysis (DFMEA) — An analytical technique used by a design responsible engineer/team to assure, to the extent possible, that potential failure modes and their associated causes/mechanisms have been considered and addressed.

2.92 Design for Manufacturability and Assembly — A simultaneous engineering process designed to optimize the relationship between design function, manufacturability; and ease of assembly.

2.93 Design Information Checklist — A mistake proofing checklist designed to assure that all important items are considered in establishing design requirements.

2.94 Design Reviews — A proactive process to prevent problems and misunderstandings.

2.95 Design Validation — Testing to ensure that product conforms to defined user needs and/or requirements. Design validation follows successful design verification and is normally performed on the final product under defined operating conditions. Multiple validations may be performed if there are different intended uses.

2.96 Die Cutting — When parts are cut into individual pieces using a steel rule die. Sharp steel rule dies are formed to desired shape in a wooden carrier for cutting labels. A die may be one or more "up" (one cavity or more). A single cavity die is an individual unit's die.

2.97 Die Guide — A guide around a label that assists with positioning of die and/or keeping art to edge tolerances.

2.98 Die Impression — A piece of material that has been cut with a die, but not cut all the way through.

2.99 Dielectric Strength — The measure of a product's ability to resist passage of a disruptive discharge produced by an electric stress; the voltage that an insulating material can withstand before breakdown occurs.

2.100 Discs — Flat, round saucer shaped pieces made from rubber or plastic.

2.101 Disperse — To cause particles or molecules of matter to separate and become uniformly scattered throughout a medium. In a rubber compound, the particles of compounding ingredients are dispersed in the rubber. In latex, rubber globules are dispersed in an aqueous medium.

2.102 Distributor Seals — Sealing rings used to seal in oil and seal out dust, dirt or trash on an automobile engine electric spark distributor.

2.103 DN (Nominal Size) — An alphanumeric designation of size for components of a pipework system, which is used for reference purposes. It comprises the letters DN followed by a dimensionless whole number which is indirectly related to the physical size, in millimetres, of the bore or outside diameter of the end connections.

NOTES

1 The number following the letters DN does not represent a measurable value and should not be used for calculation purposes except where specified in the relevant standard.

2 In those standards which use the DN designation system, any relationship between DN and component dimensions should be given, for example, DN/OD or DN/ID where OD (outside diameter), ID (inside diameter).

2.104 Dovetail Joints — A joint formed by one or more tapered projections on one piece which interlock with corresponding notches or recesses in another. These can be used for large diameter gaskets.

2.105 Drinking Water Safe — This term ensures the item when in contact with drinking or potable water does not contaminate the water in extended period of contact. The testing is done for harmful carcinogenic including nitrosamines and chemicals that are not safe for human consumption etc.

2.106 Ductility — The ability to permit change of shape without fracture. In flat rolled steel, ductility is usually measured by hardness or mechanical properties in a tensile test.

2.107 Dumbbell (Test Piece) — In the physical testing of rubber, a strip test-piece is used that is shaped like a dumb-bell, that is, constricted in the middle and flaring out at the ends, as distinguished from circular or ring test-piece. The dumb-bell is the most used form for a test-piece.

2.108 Durability — The probability that an item will continue to function at customer expectation levels, at the useful life without requiring overhaul or rebuild due to wear out.

2.109 Durometer — The most common Durometer. Type A or A-2 is an instrument for determining the hardness or rubber by measuring its resistance to the penetration (without puncturing) of a blunt indent or point impressed on the rubber surface against the action of a spring; a hand and special scale indicate the resistance to penetration 01. “Hardness”. The scale reads from zero (0) to 100, zero (0) being very soft and (100) being very hard. The Type D durometer has a sharp indent or point and is used to measure varying degrees of hard rubber up to ebonite.

2.110 Dust Seals — Seals used to exclude dust from a machine or device.

2.111 Effective Sealing Width — This part of the actual width of a gasket considered to contribute to the performance of the gasket.

2.112 Elastic Interaction — Partial relaxation of bolt load on tightening adjacent bolts, creating non-uniform loading.

2.113 Elastic Modulus — The value of the load (in pounds per square inch of original cross-section) required to give an intermediate elongation, is usually called the modulus at that elongation. The expression used is "modulus at 300 percent elongation". Tensile-stress observations of this sort arc exceedingly useful in characterizing a particular compound, since by indicating the position and shape of the stress-curve. They show the relative toughness of the vulcanization.

2.114 Elasticity (a) — Property of a body to recover its original size and shape immediately after removal of the external forces which cause it to deform.

2.115 Elasticity (b) — The property of an article which tends to return to its original shape after deformation.

2.116 Elastomer (a) — Generally long chain polymer molecules, which show elastic properties.

2.117 Elastomer (b) — A macromolecular material which, in the vulcanised state, at room temperature can be stretched repeatedly to at least twice its original length and which, upon release of the stress, will immediately return to approximately its original length.

2.118 Elongation — In the physical testing of rubber, the increase in length of a test-piece when stretched, usually expressed as a percentage of the original length.

2.119 Elongation at Break — The elongation of a test-piece at the moment of rupture, usually expressed as percentage of the original length.

2.120 Embossed Sheet — An embossed sheet is one having a prominent, impressed texture or pattern on its surface(s). If the defined texture is applied to essentially on surface only, it is most properly termed a coined surface. If the texture or pattern carries through the entire body of the sheet and appears on both surfaces it is a true embossed surface.

2.121 Embrittlement — A rubber compound becoming brittle during low or high temperature exposure or in the process or ageing.

2.122 Envelope Gasket — A gasket design in which the gasket material is enclosed within an outer cover (typically PTFE) to minimise chemical degradation by the sealed fluid.

2.123 Engineering Plastic — A term given to various thermoplastic materials that can be moulded or shaped into various components for sealing or similar applications.

2.124 EPDM — EPDM is a synthetic rubber used to manufacture gaskets. EPDM gaskets are suitable for use with water, a grade for use with drinking water is also available. EPDM is suitable for use up to 120 degrees centigrade (°C).

2.125 Etching — To produce a pattern or design on a hard material by eating into the material's surface.

2.126 Excluder — Also called wipers or scrapers used in a hydraulic or pneumatic cylinder to exclude and scrape the rod clean.

2.127 Expanded Graphite — Expanded graphite consists of exfoliated graphite flakes with a layered structure. This is usually in a sheet or roll form. Produced by treating graphite flakes with intercalation agents then rapidly heating to expand the layers. This material is soft and pliable and have higher density than carbon fiber. They have a temperature limit of 450 °C post which oxidation may start depending upon the purity. Generally recommended for steam applications due to their ability to not absorb water.

2.128 Expanded Rubber — Cellular rubber having closed cells made from a solid rubber compound.

2.129 Extrusion

a) Distortion, under pressure, of portion of seal into clearance between mating metal parts; and
b) Material, under pressure, which is forced through the opening of a die in order to obtain a desired cross sectional shape.

2.130 Eyelet — Stainless steel metallic cover around inner periphery of gasket material, to minimise chemical degradation by the sealed fluid. It greatly improves sealability and blowout resistance of the overall gasket.

2.131 Failure Mode Analysis (FMA) — A formal, structured procedure used to analyse failure mode data from both current and prior processes to prevent occurrence of those failure modes in the future.

2.132 Fatigue — The weakening or deterioration of a material caused by cyclic or continual application of stress.

2.133 Feasibility — A determination that a process, design, procedure, or plan can be successfully accomplished in the required time frame.

2.134 Fibre Seal Rings — A gasket that is die cut, waterjet cut or CNC cut or formed ring used to seal between two surfaces.

2.135 Filler (a) — Strip form sealing material wound between the metallic strip in a spiral-wound gasket.

2.136 Filler (b) — Any compounding material, usually in powder form, added to rubber or CNAF Sheets in a substantial volume to improve quality or lower cost. The most important

reinforcing filler in Rubber is carbon black. The most important inert filler, diluent or extender is whiting.

2.137 Finished Mould — The quality or appearance of the machined surface of mould.

2.138 Finite Element Analysis — A technique for modelling a complex structure. When the mathematical model is subjected to known loads, the displacement of the structure may be determined.

2.139 Fire Safe — In case of fire a valve or flange joint must withstand the fire for a short time. The time to extinguish most fires in the chemical and petrochemical industry is less than 30 min. Therefore, 30 minutes are the accepted duration for fire-safe tests.

2.140 FKM — FKM is a synthetic rubber used to manufacture gaskets. FKM can withstand temperatures up to 250 °C and is a very inert. FKM gaskets are typically used in extreme environments, in the presence of acids and corrosives.

2.141 Flange — Basic component of a gasketed joint assembly, incorporating a substantially radially extending collar for the purpose of joining two or more items of process equipment.

2.142 Flange Packing — A pipe flange gasket.

2.143 Flange Rotation — Deformation of a flange caused imposed forces.

2.144 Flange Seal — A seal used on the bolt-up flange on a hydraulic system usually on the hose fitting or pipe flanges.

2.145 Flash — Excess rubber on a moulded product resulting from cavity overflow at the parting lines where the mould sections are separated.

2.146 Flat Face Flange — A flange where the entire mating faces are flat.

2.147 Flatness — Flatness is a measure of a cut length sheet's ability to conform to a flat horizontal surface. Maximum deviation from that surface is the degree to which the sheet is out of flat. Flatness is often expressed quantitatively in either steepness or I-units.

2.148 Flex Cracking — A cracking condition of the surface of rubber articles such as tires and footwear, resulting from constantly repeated bending or flexing in service.

2.149 Flexibility — Ability of a body to deform or yield due to the action of external forces.

2.150 Flow Marks — Surface imperfections due to improper flow and failure of stock to knit or blend with itself during the moulding operation.

2.151 Fluid Resistance, Chemical Compatibility — Measure of the ability of the material to resist chemical attack.

2.152 Foam — Foam, or sponge, is rubber that has been formed into an air-filled matrix structure. It is typically used to manufacture environmental, and dust, seals for equipment.

2.153 Full-face Gasket — A gasket which covers the entire flange surface extending beyond the bolt holes.

2.154 Gap Seal — A seal ring used to seal between the gaps of metal or plastic.

2.155 Gasket — Deformable material (or combination of materials) intended to be clamped between flanges to prevent leakage of contained fluid.

2.156 Gasket Load Reaction — Point at which the load on a gasket can be considered to react for moment calculation purposes.

2.157 Gasket Pressure/Gasket Stress — Effective compressive load per unit of gasket area.

2.158 Gasket Parameters (a, Gb, Gs) — Gasket parameters derived from the ROTT test.

2.159 Gasketed Joint, Flanged Joint — The assembly of components (for example, flanges, bolts, gaskets) required to join two or more items of process equipment and to prevent leakage.

2.160 Gland Bearing Rings — Also called guide rings or wear rings used as a bearing surface for the rod of a hydraulic ram or cylinder.

2.161 Gland Seals — Seals or packings used as the main sealing device in a ram or cylinder.

2.162 Gland Packing — They are used in equipment with dynamic sealing is required. These are braided ropes or braided material from different fibers that allow stem sealing on valves or pumps or other rotary equipment. This is available in spool form.

2.163 Glass Temperature — The temperature at which a rubber becomes glass-like. A more recent name for second order transition point.

2.164 Glass Transition Point — Temperature at which a material loses its glass-like properties and becomes a semi-liquid.

2.165 Globe Valve Discs — Engineering plastics or semi metallic or metallic rings used to seal in a globe valve.

2.166 Gloss — The property of a surface related to its ability to reflect light. The most common type of gloss of interest to appearance attributes is specular gloss. The parameters which must be specified for the determination of this property are the angles of incidence of the light source, the angle of viewing of the gloss, and the angular dispersions of the measuring beams.

2.167 Grain — The unidirectional orientation of rubber or filler particles occurring during processing (extrusion, milling, calendaring) resulting in anisotropy of a rubber vulcanisation.

2.168 Grain Direction — The arrangement of a pattern on the material.

2.169 Graphite — Graphite is a gasket material commonly used with steam and is a derivative of Carbon. It has extremely expandable property making its attractive as a sealing

agent. It must be used in conjunction with an anti-oxidation agent and anti-corrosion inhibitor for usage in high temperatures applications.

2.170 Grease Seals — Also called oil seals, rotary seals or shaft seals. Made of rubber to seal grease in a housing with a rotating shaft.

2.171 Green Strength

a) The resistance to deformation of a rubber stock in the uncured state; and
b) Uncured adhesion between plied or spliced surfaces.

2.172 Grip Length — Distance on a bolt between the inner face of a nut and the inner face of the bolt head.

2.173 Guide Ring — An extension of a gasket for the purpose of locating it centrally on a flange.

2.174 Guiding Elements — Wear rings, guide rings, guiding rings, and bearing rings for hydraulic cylinder rods.

2.175 Hard and Soft Gasket Materials — Differentiation between predominantly hard, metal-based gaskets (example, spiral wound) and softer or fibre-reinforced materials. Both can be interchangeably used based on application parameters and available surface stress.

2.176 Hardness

a) The relative resistance of rubber to the penetration (without puncturing) of a blunt point impressed on its surface; and

b) Resistance of metal to penetration of the surface.

2.177 Heat History — The accumulated amount of heat a rubber stock has been subjected to during processing operations, usually after incorporation of the vulcanizing agents. Incipient cure or scorch can take place if heat history has been excessive.

2.178 Hot Creep During Service — Percentage reduction in thickness under constant compressive pressure at elevated temperature.

2.179 Hot Rolled Products — Flat rolled products for which the required final thickness has been obtained by rolling at elevated temperature based on the material.

2.180 Hydrostatic End Thrust — Relieving force caused by the pressure of the retained fluid, resulting in a reduction in gasket pressure and an increase in bolt load.

2.181 Hysteresis

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

b) Hysteresis or energy loss is the difference between the work input and the work output as measured under the curves or extension and retraction (stress and elongation curves). The difference becomes heat build-up.

2.182 Initial Preload at the start of a Test Procedure — The load under which the initial gasket thickness is determined during laboratory test.

2.183 Inner Bolt Circle (I.B.C) — I.B.C. gaskets, or joints, fix within the diameter of the bolt circle. Otherwise known as raised face joints (R.F.), they are contrasted with full faced gaskets (F.F.) which cover the face of the flange and have bolt holes.

2.184 Inner Diameter (I.D) — The inner diameter specifies the inner dimension or bore size of the gasket.

2.185 Inside Bolt Circle, (IBC) Gasket — A gasket lying wholly within a ring of bolts. This is usually also know as Ring Gasket.

2.186 Internal pressure — Fluid pressure applied to the joint.

2.187 International Rubber Hardness (IRHD) — Hardness scale chosen so that "0" represents the hardness of a material having young's modulus of zero and "100" represents the hardness of a material of infinite young's modulus.

NOTE — The following conditions are fulfilled over most of the normal range of hardness:

a) One international rubber hardness degree always represents approximately the same proportional difference in young's modulus; and

b) For highly elastic rubbers, the IRHD and Shore A scales are comparable.

2.188 Jacketed Gasket — A gasket design in which the gasket material is enclosed totally within an outer metal cover.

2.189 Kammprofile Gasket — Metal gaskets with special grooved faces usually with a soft resilient sealing layer on both surfaces. Usually offer high stability, performance, and integrity when dealing with large diameters. They are preferred over spiral wound gaskets for diameters above 24 inch or heat exchangers. In some cases kammprofile gaskets can be reused by the end user after refurbishment.

2.190 Leakage Rate — Quantity of fluid passing through the body and/or over the faces of a gasket per unit periphery of the gasket over a specified time.

2.191 Load Compression Characteristic — Reduction of thickness under specified load and temperature conditions.

2.192 Maintenance or Gasket Factor 'm' — Defined as the factor which provides additional load on the gasket, in order to ensure adequate sealing pressure when internal pressure is applied. This is used for calculating bolt load.

2.193 Maximum Gasket Pressure under Operating Conditions — Maximum allowable pressure under operating conditions to prevent unacceptable creep relaxation or failure of the gasket material.

2.194 Maximum Assembly Pressure — Maximum allowable pressure during assembly to prevent unacceptable creep or failure of the gasket material under operating conditions.

2.195 Metallic Eyelet — A stainless steel eyelet is an 'envelope' or covering of stainless steel designed to line the bore of a pipe gasket and be in contact with the media. The eyelet tries to emulate the Inner ring of the Spiral wound gasket in terms of application. The metallic eyelet is usually in SS-304 or SS-316 only.

2.196 Metallic Reinforcement — This primarily means addition of a metallic component in form of wire or sheet that is added to rubber or CNAF material to increase its strength and durability.

2.197 Minimum Seating Pressure 'Y'- Factor (Yield Factor) — Defined as the pressure over the contact area of the gasket required to provide a sealed joint, with no internal pressure in the joint at room temperature. The seating stress may be different at elevated temperature.

2.198 Minimum Gasket Pressure under Operating Condition — Minimum pressure required on gasket to remain within leakage class under operating condition of the application.

2.199 Minimum Assembly Pressure — Minimum pressure required on assembling the gasket in the flange to achieve the desired level of sealing under operating conditions.

2.200 Nominal Pipe Size (NPS/DN) — An alpha numeric designation of size for components of a pipework system**.**

2.201 Non-asbestos or Asbestos Free — Non-asbestos materials or asbestos free that do not contain any asbestos in any form or amount. These alternate materials typically have a ceramic, aramid, glass, graphite, mineral wool, PTFE, carbon, etc.

2.202 Ring — A seal (often referred to as a packing or moulded ring) usually elastomeric or hollow metal, of circular cross-section, confined in a groove.

2.203 Off-loading — Reduction of gasket load after assembly caused by for example bending moments or hydrostatic end thrust.

2.204 Oil Resistance — This is an attribute of the gasket that checks the absorption of oil or change in thickness or swelling of the gasket material In an extended period of time when completely submerged in the fluid. Lower the oil resistance percent better is the resistance of the gasket material in oil-based application.

2.205 Operational Gasket Pressure — Pressure retained on the gasket under operating conditions (the situation after initial tightening when the flange has been pressurized, is at operational temperature, and creep and other relaxation mechanisms have occurred).

2.206 Outer Diameter (O.D) — The outer diameter specifies the outer diameter of the gasket.

2.207 Oxygen Service — Materials and equipment, which is used in oxygen service must meet stringent requirements. They must offer high ignition temperatures and no reactivity with oxygen under service conditions. No reaction with oxygen (burning) of the gasket or parts of the gasket within the flange connection must be assured to prevent the escape of process media

because of gasket damage. As liquid oxygen is cryogenic, this has also to be considered in service duties of materials and equipment.

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

2.209 P/T Rating — The rating of a flange manufactured from a specified material, indicating the allowable pressure (non-shock) at which it may operate at a specific temperature.

2.210 Paper — Gasket paper, otherwise known as cellulose paper or oil paper jointing, is a paper impregnated with chemicals to make it resistant to oils, fuels, and solvents.

2.211 Permanent Set — The amount by which an elastic material fails to return to its original form after a deformation. In the case of elongation, the difference between the length after retraction and the original length, expressed as a percentage of the original length, is called the permanent set. Permanent set is dependent on quality and type of rubber, degree and type of filler loading, state of vulcanization, and amount of deformation.

2.212 Permeability — A measure of the ease with which a fluid can pass through a gasket material. This factor determines the maximum fluid passage through the body of a gasket only as opposed to total leakage which will include the interfacial leakage. This parameter is more significant in the case of gaseous rather than liquid fluids. When a gasket shows low permeability, it has a low level of fluid loss through the body of the gasket material over time. This is not necessarily equivalent to good sealability, or low leakage rate.

2.213 Pipe Gasket — Pipe gaskets are those which fit the standard range of pipes, and are specified by their bore size, thickness, table/class, and whether they are full faced or raised face joints (I.B.C.).

2.214 Pipe Schedules — Tables defining pipe thickness in relation to nominal bore and process pressure, according to IS standard or any prominent piping standard.

2.215 Pitch Circle Diameter (P.C.D) — The circle passing through the centre of the bolt holes (typically four holes equally spaced on a 150 mm P.C.D.).

2.216 Plunger Seals — Sealing rings used on a plunger.

2.217 PN — Alpha-numeric designation related to mechanical and dimensional characteristics of a component of a pipework system. It comprises of the letters ‘PN’, followed by a number. Used to identify ranges of related components in a number of standards.

2.218 Polychloroprene — Polychloroprene is a synthetic rubber used to manufacture gaskets. These gaskets are commonly used for exposed environment applications, such as those involving sea water.

2.219 Porosity — Difference between the theoretical and actual density of a material (as a result of small voids or interstices within the material matrix).

2.220 Pressure — Load per unit area on a body.

2.221 Principal Forces on a Flanged Joint — When a gasket is placed in a flange and the bolts are tightened a surface pressure is created on the gasket due to the stretching of the bolts during the tightening operation. As soon as the tightening operation is completed then various factors, some more important than others, lead to the reduction of that surface pressure. In order to create a seal that in service will have a leakage rate below a required level then the gasket surface pressure at the end of the bolt tightening process, the assembly pressure (a) must be sufficiently greater than the minimum assembly pressure to ensure that after all of the gasket surface pressure loss mechanisms have occurred that the operational surface pressure (b) on the gasket (also known as the residual surface pressure) remains above the required minimum gasket pressure under operating conditions (c).

2.222 Proof Load — The maximum, safe, static, tensile load which can be placed on a fastener without causing it to yield. It is an absolute value, sometimes defined as force (N), or pressure (MPa).

2.223 PT Valve — Numerical value resulting from the multiplication of the internal pressure by the temperature of the fluid being sealed.

2.224 PTFE — PTFE or Polytetrafluoroethylene is a thermos plastic used for making sealing and gaskets. PTFE is extremely chemically inert, and as such is resistant to chemicals and corrosives. PTFE also has a low co-efficient friction. PTFE however has high cold flow and mechanical creep. PTFE is available in multiple types such as virgin PTFE, re-processed PTFE, modified PTFE, filled or reinforced PTFE and expanded PTFE.

2.225 PTFE Envelope — A PTFE envelope is an ‘envelope’ or covering of PTFE designed to line the bore of a pipe gasket and be in contact with the media. PTFE is an extremely inert material. Having a PTFE envelope is therefore a way of gaining the chemical resistance of PTFE. Such envelopes can be fitted to rubber, or non-asbestos gaskets.

2.226 Radial Shaft Seal — Also called grease seals, rotary seals or shaft seals. Made of rubber to seal grease in housing with a rotating shaft.

2.227 Raised Face Flange — A flange that makes contact with its mating joint member only in the region where the gasket is located. The faces of the flange do not make contact with each other at the bolt circle.

2.228 Raised Face Joint — A raised face joint, otherwise known as an I.B.C. (inner bolt circle) gasket, is a ring that sits within the diameter of the bolts holding the flanges together. It is contrasted with a full-faced (F.F.) gasket which covers the face of the flange and has bolt holes.

2.229 Recovery — Increase of thickness over the compressed thickness, once the compressive load has been removed.

2.230 Residual Stress — Residual stress is defined as stress remaining in a gasket after service for a given time.

2.231 Reinforcement — Material (such as fibre or metal) imparts increased strength or other desirable properties.

2.232 Residual Stress — Surface pressure remaining on a gasket after service for a given time.

2.233 Ring Joint/Ring Type Joint — This is a metal ring of oval or octagonal section, usually made of soft iron or stainless steel or other metals as per requirement.

2.234 Ring Type Joint Flange — A flange system in which both flanges are grooved to accept a ring-joint gasket.

2.235 Ring Type Joint Gasket — A gasket machined from metal (usually oval or octagonal in cross-section) and used in conjunction with ring-joint flanges.

2.236 Room Temperature Operational Tightness Test (ROTT) — This is a special test used to test the Gasket at Room Temperature with Methane or Helium for identifying leakage rates.

2.237 Rubber — An elastic material that comes in natural and synthetic forms.

2.238 Sealability — Ability of a gasket material to prevent flow of fluid through its body and between the gasket flange interfaces.

2.239 Secant or Unloading Modulus of Elasticity — Ratio between stress and strain during unloading, a parameter used in current flange calculations.

2.240 Self-energising Gasket — Gasket design which uses internal fluid pressure to create or increase the contact pressure.

2.241 Shore — Shore A, Shore D or Shore C (otherwise known as durometer), specifies the hardness of material (for example, 60 SH).

2.242 Silicone — Silicone is a synthetic rubber used to manufacture gaskets. Silicone can withstand 200 °C, and is chemically inert, which gives it application in the food processing industry.

2.243 Spiral Wound Gasket — A gasket design which is formed by winding spring-like metal, usually V-shaped, and a suitable filler material into a spiral. They may be affixed additionally with an outer solid ring, inner solid ring or can be without.

2.244 Sponge Rubber — Cellular structure produced by adding gasifying substance to rubber compound, expanding, and curing in heated mould. Cells may be open (interconnecting) or closed.

2.245 Spring Constant — The ‘stiffness’ of a bolt, defined as the load generated, divided by its elongation after tensioning.

2.246 Stainless Steel — It is a steel alloy resistant to corrosion.

2.247 Stiffness — Ability of a body to resist deformation due to the action of external forces. Reciprocal of elasticity.

2.248 Strain — Change in dimensions or shape of a body due to applied force or stress.

2.249 Stress — Load per unit area on a body.

2.250 Stress Corrosion Cracking — A common form of cracking in which an electrolyte encourages cracking the growth of a crack in a bolt under stress.

2.251 Stress Relaxation — Loss of stress at a constant gasket thickness as a function of time, after application of a specified compressive load at a specified rate, at constant temperature. This is not to be confused with residual stress.

2.252 Stud — Fastener which is threaded at both ends.

2.253 Surface Roughness — Fine irregularities of the flange surface finish. Surface roughness is often represented by the symbol R_a, although it is not the sole criterion for defining a suitable surface. Irregularities in the flange surfaces will affect the capacity of a gasket to conform to the flange surface profile and close leak-paths. They will also affect the friction values necessary to keep the gasket in position.

2.254 Swelling — The property of raw or unvulcanised rubber absorbing organic liquids such as benzene, gasoline, etc., arid swelling too many times its original volume. In a general sense, it may be any increase in volume of a solid substance caused by the absorption of a liquid.

2.255 Table/Flange Dimension — These define gaskets to fit particular flanges.

2.256 Tear Resistant — Resistance to tearing, measured as the force required to tear completely across a specially designed nicked rubber test piece or right-angled test piece by elongating it at a specified rate. Express in lbs. per inch of thickness of specimen.

2.257 Tensile Strength — Breaking tensile force divided by the original cross-sectional area.

2.258 Thickness — The thickness of the gasket. It is best to go for the thinnest gasket possible given your application, as the pressure on the gasket will increase in proportion to its thickness.

2.259 Tightness Class — The tightness class is a specific value within the overall concept being defined based on acceptable leakage rates.

2.260 Tightness Parameter T_P — Mathematical relationship between the measured specific leakage rate and the internal fluid pressure.

2.261 Tongue and Groove Flange — A flange system in which one flange is provided with an annular tongue and the other with a complimentary groove to accept it.

2.262 Valve Seats — An engineering plastic or semi metallic or metallic disc or ring used on a valve as a seat to provide positive sealing when shut off.

2.263 Valve Stem Packing — Braided packing used in the stuffing box of a valve stem to make a positive seal. This can be in combination or set of rings.

2.264 Vulcanisation — Cross-linking reaction of elastomer with sulphur or other agents, creating a matrix of greater stability.

2.265 Weld Gasket — Gasket design which consists of two metal rings welded first to the flanges and then to each other.