

Glossary of Pressure Sensitive Tape Terms

Abrasion Resistance — The ability of a tape to withstand abrasion (rubbing, scraping, etc.) without losing its function or harming the surface under the tape.

Accelerated Aging — A method of stimulating in a brief time span the changes in tape properties over longer periods of time. *Accelerated aging* is most commonly used to reproduce any deterioration in the anchorage of the tape to the desired surface to which it has been applied when the tape is expected to remain on the surface for extended periods, or permanently. **Accelerated Weathering** simulates aging with the additional aspects of humidity and ultraviolet light to determine performance when the tape is exposed to outdoor conditions.

Adhesion — The bond produced by contact between an **adhesive** and a surface. Different characteristics of this bond are defined using a variety of terms, most of which are quantifiable using standardized test measures:

Peel — The force required to break the bond between the tape and the surface to which it has been applied. There are two types of peel measurements, 90⁰ (where the tape is peeled from the surface at a 90⁰ angle), and 180⁰ (where the peel is at a 180⁰ angle). *Peel* is usually expressed in ounces per inch, or grams per inch.

Quick Stick — The bond produced between an adhesive and a surface immediately after application. This can be thought of as the initial adhesion, or anchorage, upon contact with the surface that it is being applied to. Depending on several variables, the bond could increase, decrease or stay the same over time. See also **Cold Flow and Adhesive Mass**.

Shear — The force required to break the bond between the tape and the surface to which it has been applied when the force is applied across the surface, rather than an action of pulling the tape away from the surface. It is easiest to understand this term by using an example. Coat hooks can be purchased today that have a double-coated foam tape on the back for easy wall mounting. If one day the hook is on the floor instead of the wall, it was likely a *shear* failure; the weight of the coat did not pull the tape away from the wall (peel), but the weight of the coat exerted a force along the wall's surface causing the adhesive to *slide* until it failed. This failure frequently is the result of cohesion failure.

Tack — The bond produced by contact between a tape and a surface prior to the application of pressure. The word *tack* is often used to refer to the inherent *stickiness* of the adhesive.

Thumb test — The feeling of *stickiness* of an adhesive when touched by a finger. This is a very common practice by customers, but the *Thumb Test* is usually misleading and tells little about actual performance of the adhesive. Decisions should never be made about the suitability of a tape for a specific application based on the feel of the stickiness.

Adhesion To Backing — The degree of anchorage in a pressure sensitive tape between the adhesive and the tape's backing. This bond between the adhesive and its backing is important for several reasons. Rolls of tape are either *self-wound* (wound into rolls without any release liner to separate the exposed adhesive from the backside of the tape backing), or *lined* (wound into rolls with an intermediary film or paper liner that separates the exposed adhesive from the backside of the tape's backing). This liner would be stripped off by the end-user to expose the adhesive for application. The adhesive anchorage on a self-wound roll must be greater on the side that the adhesive is coated onto (called the *face side*) than to the backside of the backing. Otherwise the roll would **block**, or the adhesive would **delaminate** when trying to unwind the roll. To prevent this problem, either the face side of the backing is treated to increase anchorage to the face versus the backside, or the backside of the backing is coated with a *release coating* to reduce the anchorage value of the backside versus the face side. On a lined roll of tape, the *adhesion to backing* must be greater than the anchorage to the release liner. Otherwise, the adhesive would partially or totally transfer when the end-user tried to strip the liner off for application of the tape. This potential problem is eliminated by coating a release coating onto the face side of the release liner.

Adhesion To Steel — The measure of various adhesion values of tape to a steel panel with a specific finish proscribed by the standardized test methodologies of the Pressure Sensitive Tape Council (PSTC). Although test values are not always analogous with adhesion to other surfaces, the standardization on a specific steel panel for testing provides a common language within the industry — material suppliers, tape manufacturers and tape users.

Adhesive — A broad category of materials used to join together similar or dissimilar surfaces through a mechanical process. *Pressure sensitive adhesives* are elastomeric, relatively soft materials with some inherent tack that will bond (or anchor) to a surface when pressure is applied. Generally, pressure sensitive adhesives are based on acrylic, natural rubber, synthetic rubber, silicone, or a combination of these materials. The material's inherent **tack** and other bonding-related properties can be increased or decreased by the addition of a variety, of other chemicals and/or the process conditions used to manufacture the adhesive.

Adhesive Mass — The amount of **adhesive** applied to the tape substrate.

Although the quantity of adhesive is an important variable in the tape's performance, it alone will not determine the degree of bonding — its **peel** force. Also referred to as *dry coat weight*. See also **Cold Flow** and **Three Keys To Adhesion**.

Adhesive Transfer — The pulling off of some or all of the **adhesive** from the tape backing and depositing onto the surface to which the tape has been applied, or onto the backside of the tape backing in a self-wound roll. The adhesive transfer may be the result of a **cohesion** failure, or a problem with **adhesion to backing**.

Blocking — The inability of a roll of tape to unwind due to the adhesive's bonding to the backside of the tape backing.

Burst Strength — The measure of the strength of a tape to resist a breakthrough when force is applied from directly above and through the tape backing.

Cohesion — The internal strength of the adhesive itself, or the ability of the adhesive to remain intact under stress. Often problems with **adhesive transfer** or partial **delamination** are the result of a failure in *cohesion* — the adhesive itself splits apart or breaks down, resulting in **adhesive mass** both on the tape backing and on the surface to which the tape has been applied. The measure of *cohesion* is referred to as *cohesive strength*.

Cohesive — Different than **cohesion**, this term refers to a category of adhesives that bond only to themselves and not to any other surface. These materials are used widely in packaging applications to make pouches for automotive and electrical parts, and to make shipping envelopes for books, VCR tapes, CDs, etc.

Cold Flow — The tendency of an adhesive to migrate (flow) at room temperature. This natural slow movement could lead to sticky edges on rolls of tape, or after application to an increase in **adhesion**. As the adhesive flows into the valleys and crevices of the surface to which it has been applied, any entrapped air is forced out, giving more complete coverage on the surface and thus increasing the adhesive's anchorage. See **Three Keys To Adhesion**.

Conformability - The degree to which a tape can take the shape of the surface to which it has been applied. It is a function of the relative stiffness and elasticity of the tape's backing, and elasticity of the adhesive component. Stiffer films, foams, and papers are less *conformable*, pliable tape backings are more *conformable*. The ability to *conform* affects **adhesion** since the completeness of surface contact increases bonding potential.

Contaminants — Any dirt, liquids or other particles on the surface to which

the tape is being applied, in the adhesive of the tape, or in the environment where the end-user is applying the tape. The presence of *contaminants* will affect the performance of the adhesive — either increasing adhesion or decreasing **adhesion** to the point of failure, depending on the nature of the contaminant and its interaction with the particular adhesive system being used. In general, any foreign material that would tend to soften the adhesive would increase the bond. Other materials could act as a barrier to adequate surface contact, and would decrease the bond. See also **Flagging** and **Plasticizers**.

Delamination — The splitting apart of two surfaces that had been laminated together. In pressure sensitive tape terms, it usually refers to the splitting apart of the adhesive from the tape backing. The term *total delamination* refers to a situation where the adhesive completely pulls away from its backing and **transfers** to the applied surface or to the backside of the roll. This is usually a failure of **adhesion to backing**. The term *partial delamination* describes a situation where some of the adhesive transfers to the applied surface or to the backside of the roll, and some of the adhesive stays intact. This is usually a failure in cohesion.

Edge Curl — The curling, or buckling, of tape at the edge either on the roll or after application. *Edge curl* is usually due to roll winding or application under too much tension, causing **elongation** and consequent **elastic memory** that leads to a pulling away as the film relaxes. Edge curl may also be due to the presence of elevated temperature during the end-user's application process. See also **Flagging** and **Heat Resistance**.

Elastic Memory — The tendency of films to return to their relaxed state after **elongation**. Film tapes, when stretched in production or during application, seek their original relaxed state if the tension is not eliminated prior to production of the finished roll during manufacturing, or prior to lamination onto the surface to which they are being applied by the end-user. The built-in tension may lead to **flagging**, **delamination**, **edge curl** or an increase in the tape's width once the film is unwound from the roll.

Elongation — The length to which a tape will stretch before it breaks. Although the adhesive may have some impact on the tape's *elongation* properties, the tape backing is the primary factor. This property is expressed as a percent. Elongation is usually measured along the length of the tape (**machine direction**), but may be measured along its width (**cross direction**).

Flagging — Tape failure seen as the lifting of the edges, or total lifting of the tape from the surface to which it had been applied. *Flagging* is a failure of the adhesive system due to either the adhesive itself, tension on the tape from tape

stretch built in during application, extreme cold or hot temperature during and after application, plasticizer migration from the applied surface (with some adhesive systems), presence of oils, degreasers, water or dirt on the surface or in the environment during application, or some other factor. See also **edge curl**, **contaminants**, **elastic memory** and **heat resistance**.

Gauge — Thickness. *Gauge* is used in reference to the thickness of the tape backing, the thickness of the adhesive coating after production, or to the total construction's thickness. In the U. S. the thickness is usually expressed in **mils**; outside the U. S thickness is measured in **microns**.

Ghosting — A residual hazy appearance left on the surface after removing a tape with a **removable adhesive system**. The haze could be due to a slight adhesive **transfer** with some adhesive left on the surface, or the effect of oxidation from some entrapped air, which takes the appearance of the pattern of the adhesive on the tape (but there is no actual adhesive on the surface). If the *ghosting* is the result of an adhesive pattern, but no actual adhesive, a tape with a smoother adhesive coating will usually eliminate the problem in future applications. If the ghosting is the result of residual adhesive, the failure may be due to the presence of **contaminants**, to an adhesive failure or to the selection of the wrong adhesive system for that specific application surface.

Haze – The term “haze” is interchangeable with “ghosting”, directly above.

Heat Resistance - AKA **Temperature Resistance**. The ability of a tape to withstand elevated temperatures during or after the end-user's application process. Some end-users run their materials through ovens after applying tape as part of their manufacturing process. Others apply tape while their material is still hot. Certain adhesives and tape backings will not withstand high temperatures without deforming or being destroyed. Tapes designed to withstand elevated temperatures need to be employed in these applications. It is critical to determine both the maximum temperature the tape will be exposed to *and* the length of time of exposure to the high temperature.

Lifting – This term is interchangeable with **flagging**, a failure of the adhesive system due to either the adhesive itself, tension on the tape from tape stretch built in during application, extreme cold or hot temperature during and after application, **plasticizer migration** from the applied surface (with some adhesive systems), presence of oils, degreasers, water or dirt on the surface or in the environment during application, or some other factor. See also edge curl, contaminants, elastic memory and heat resistance.

Micron — A metric unit of measure for tape **gauge** equal to 1/1000 of a millimeter or .03937 mils. Example: A 50- *micron* tape equals approximately 2

mils.

Migration — The movement of an ingredient from one surface to another while the two are in contact. *Migration* may be between the adhesive and its backing, or between the adhesive and the surface to which the tape has been applied.

Mils — A unit of measure for tape **gauge** equal to 1/1000 of an inch, or 25.4 **microns**. Example: A 3 *mil* tape equals approximately 76 microns.

Permanent Adhesive — An adhesive designed to remain permanently on the surface to which it has been applied. Removal usually results in adhesive **transfer**, total **delamination** or destruction of the surface that the tape was applied to. These adhesives are used for joining, bonding, mounting or wrapping/sealing applications. The adhesive systems are usually acrylic, silicone or phenolic based, and may be pressure sensitive, thermosetting or liquid (epoxies, cements, etc.). They are **solvent** based.

Plasticity — A measure of an adhesive's resistance to flow. The lower the *plasticity*, the lower the firmness and the greater the degree of flow. The higher the *plasticity*, the higher the firmness and the lower the degree of flow.

Plasticizer — Chemical additives incorporated into materials to increase their flexibility, softness and conformability. *Plasticizers* may be used in various tape backings, and in plastics to which the tape may be applied.

Plasticizer Migration — Plasticizers incorporated into tape film backings or into the films to which tape is being applied have a tendency to leach (migrate) to the surface of the materials they are in. Pressure sensitive adhesive properties may change when exposed to **plasticizers**. They will generally soften the adhesive. This often causes an increase in **adhesion** to the applied surface, but in some cases the adhesive softens to the point of adhesion failure. Plasticizers commonly found in **PVC** tend to increase adhesion of the tape to the PVC surface. A top coat, which acts as a barrier, should be applied to the PVC surface and allowed to adequately cure prior to tape application, if the tape is to be removed at a later time. *Plasticizer migration* may also be referred to as *leaching* or *blooming*.

Polyethylene — A tough, elastic film belonging to the polyolefin group of plastics. These films are relatively inexpensive, making them good candidates for commodity tapes. *Polyethylenes* can be made to incorporate a wide range of properties related to **elongation**, stiffness and overall toughness based on resin

density. Lower density resins produce films that have higher elongation and higher **conformability**. Higher density resins produce films that are tougher and stiffer. They do not have good **heat resistance**.

Polyester — Strong, relatively expensive films with good chemical, heat and other environmental resistance properties. They are tough films that are stiff with low **elongation** and conformability properties.

Polypropylene — A tough, relatively inelastic film in the polyolefin group of plastics. Their performance characteristics are closer to **polyesters** than to **polyethylenes**, and are priced about midway between the two *polypropylenes* are available in two forms, based on the degree to which they are stretched during their manufacture. Monoaxially Oriented Polypropylene (MOPP) has been stretched in only one direction. Biaxially Oriented Polypropylene (BOPP) has been stretched in both directions of width and length, and as a result are less expensive with lesser properties. BOPP films are common for carton sealing tapes.

PVC (Abbreviation for **Polyvinyl Chloride**) — AKA *Vinyl. PVC tape* has become a generic term for film protective tapes, particularly in the metals industry, although the use of PVC as the tape backing has largely been replaced by polyethylene due to PVC's higher cost. PVC film tape is still used in some specialty applications. *PVC film* is also a common substrate to which protective tape is applied. It is commonly used as a laminate to wood, metals, etc. in furniture and other applications; or as the facing in automobile interiors.

Release Coating — A liquid compound, usually silicone, applied to the backside of the tape backing on a self-wound roll so that the tape can be unwound smoothly and easily without any **adhesive transfer** or **blocking**. The coating gives the backing a differential release, so that the adhesive will remain to the non-release coated side, and not anchor to the *release coated* side.

Release Liner — A film or paper laminated to the exposed side of a pressure sensitive tape prior to its being wound into roll form. Certain adhesive systems do not lend themselves to being a self-wound tape, and require an intervening layer that is easy to release. The liner will be stripped off and discarded by the end-user during his application process. Release liners are often also used as the *casting liner* for **transfer tapes** and double-coated tapes (a tape that has adhesive on both sides with a film, tissue, or paper in the center to support the two adhesive layers — often used to bond two surfaces together). In these applications, a differential in release is needed so that the tape can be easily wound and unwound without **adhesive transfer** or **blocking** problems. Often the backside of the liner will have a **release coat** to lower the release on that side.

Removable Adhesive — Adhesive systems, usually acrylic or natural rubber-based, that are designed to remove cleanly and easily from the surface to which they have been applied at some future date after application. They may be **solvent-based** or **water-based** emulsions. The primary application is masking — protection of a surface from dirt, contamination, scratching, scuffing or paint. Creped paper is commonly used as the tape backing for paint masking applications. Polyethylene, PVC, polyester and paper are commonly used for protection of metals, furniture, decorative trim, glass and plastic materials. *Removable adhesives* are also employed for temporary bonding of two surfaces and certain material transfer applications. See **Transfer Tapes**.

Roll Hardness — A measure of the proper winding of a roll of tape. A balance is required when winding rolls of tape. If the roll is wound too tightly, the internal pressure can cause the adhesive to flow out to the edges, or it could be **adhesive transfer**. If the roll is wound too loosely, the soft roll could be subject to **telescoping**, or the roll could be more easily damaged during handling. Of equal importance is that the roll hardness be uniform across the width to avoid a variety of deformities, and that the tension is controlled to compensate for greater inherent tension at the beginning of the roll (nearest to the core), than at the end of the roll (the outermost layers). See also **Elastic Memory**.

Stain — Discoloration of a surface created by an adhesive and seen after tape removal. This is a problem when **removable adhesive** tapes are expected to remove cleanly and not damage the surface, yet leave this discoloration.

Stain Resistance — The ability of a tape to be applied and subsequently removed from a surface without discoloring the surface.

Tear Propagation — A measure of the force required to tear a tape, or tape backing, after the edge has already been nicked.

Tear Strength — A measure of the force required to tear a tape, or tape backing, with no nick at the edge.

Telescoping — A deformity in a roll of tape usually caused by too loose a wind, and characterized by the ability of each layer to slide back and forth from the core (like the opening and closing of a telescope), giving the appearance of bowed edges. Rolls that have been wound too tightly may also have edges that are bowed from the core out — called **dished** — but the tape layers cannot slide back and forth. In both cases, one edge will be concave and the other

edge convex. Add Picture

Tensile Strength — A measure of the force required to break the tape, or the tape backing, by pulling on both ends in opposite directions.

Thermoplastic — Adhesives that become soften when exposed to elevated temperatures. Upon cooling, the adhesives typically return to their original state.

Thermosetting — Adhesives that are activated and take a set when exposed to elevated temperatures. They remain set after cooling and if subjected to added heat cycles. Also may be called *Thermoactivating Adhesives*.

Three Keys To Adhesion — Adhesive bonding is primarily a mechanical process of attaining complete surface-to-surface contact by eliminating any residual air. Complete surface-to-surface contact sets up a permanent or near-permanent bond. Adhesives are viscoelastic, allowing for some movement to displace pockets of air in the crevices and irregularities of any surface, and to take the shape of the surfaces they have been joined to. To create and control the degree of bonding between a surface and an adhesive, or between two surfaces with the adhesive and the intermediary layer, three factors are essential:

- Smoothness of the application surface and the adhesive coating.
- Hardness and **cold flow** characteristics of the adhesive.
- Adhesive mass** (coat weight).

These three keys control the bonding characteristics of the adhesive to the surface that the tape will be applied to. All three must be understood to make the correct determination of the most appropriate adhesive recommendation for the desired application.

Transfer- The act of moving an adhesive from one surface to another. This could be the desired action (see **Transfer Tape**), or and undesired action (see **Adhesive Transfer and Delamination**).

Transfer Tape – This term is used in two different contexts. It can mean:

A pressure sensitive adhesive, without a backing that has been cast onto a release liner. The adhesive film can be transferred to another surface, and the release liner stripped off. This construction is also called a *free film* since it was not originally permanently anchored to a backing. Main Tape does not currently manufacture this type of product.

-or-

Pressure Sensitive Tape Terms

A pressure sensitive tape (adhesive and backing) that is used to transfer material from one surface to another. The *transfer tape* itself stays intact. Main Tape's *Perfectear* products are an example of this kind of application. Our *GXP* product is used to transfer vinyl letters and images from their original liner to the sign medium. The transfer tape is then discarded.

Water Absorption – The measure of the amount of water that a pressure sensitive tape will absorb and hold.

Water Penetration – The measure of a tape's ability to prevent water from penetrating through the backside of the tape's backing through the adhesive itself.

Water Vapor Transmission – The measure of the tape's ability to prevent water vapor (water in the gaseous state) from penetrating through the backside of the tape's backing through to the adhesive itself. The rate of water vapor penetration is called the *moisture vapor transfer rate*.