TAPE 101

a comprehensive guide to adhesive tape properties and selection

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Pressure Sensitive Tape Basics

What is a Pressure Sensitive Tape?

The Pressure Sensitive Tape Council (PSTC) defines Pressure Sensitive Tape as a continuous flexible strip of cloth, paper, metal or plastic coated on one or both sides with a permanently tacky adhesive at room temperature which will adhere to a variety of surfaces with light pressure (finger pressure) with no phase change (liquid to solid) and usually on a roll.

The key point that differentiates a pressure sensitive tape from other types of adhesives is that no activation by water, solvent, or heat is necessary to exert a strong adhesive force towards diverse materials such as paper, glass, wood, plastic, or metal.

PRESSURE SENSITIVE ADHESIVES
polymeric materials in an elastomeric state of matter that have significant time and temperature dependencies (viscoelasticity). They are inherently tacky and have peel and load bearing properties.

POLYMER
a large molecule consisting of many (poly) atoms linked in a repeating, chainlike fashion (macromolecule).

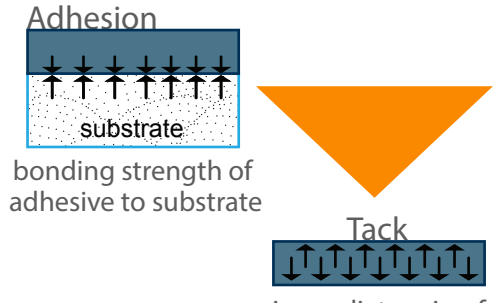
VISCOELASTICITY
refers to the state of having the characteristics of both a liquid and a solid.

Pressure sensitive adhesives function as a result of three separate properties:

Adhesion, **Cohesion**, and **Tack**.

These three properties balance one another, meaning that it is impossible to have a tape with 100% of each.

THE ELEMENTS OF A PRESSURE SENSITIVE ADHESIVE



The Science of Adhesion

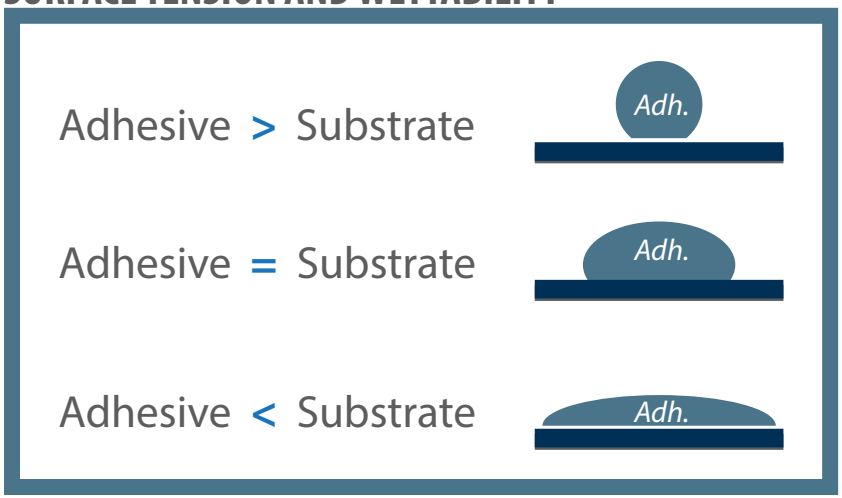
Adhesion science is a multidisciplinary science pulling elements from Physics, Chemistry, and Mechanics.

The Physics of adhesion science involve **SURFACE ENERGY**, also called **POLARITY**, and the **WET-OUT** of adhesives to the surface to which they are applied.

The Mechanics of adhesion science involve Surface Roughness and Rheological Theory, or the flow of matter under an applied stress.

The Chemistry of adhesion science involves the understanding and properties of several important polymers, including Polyester, Polypropylene, Polyethylene, Polyurethane, and more. It also involves several copolymers and compounds, including Natural Rubber, Styrene Butadiene, Butyl Rubber, Silicones, and Acrylics.

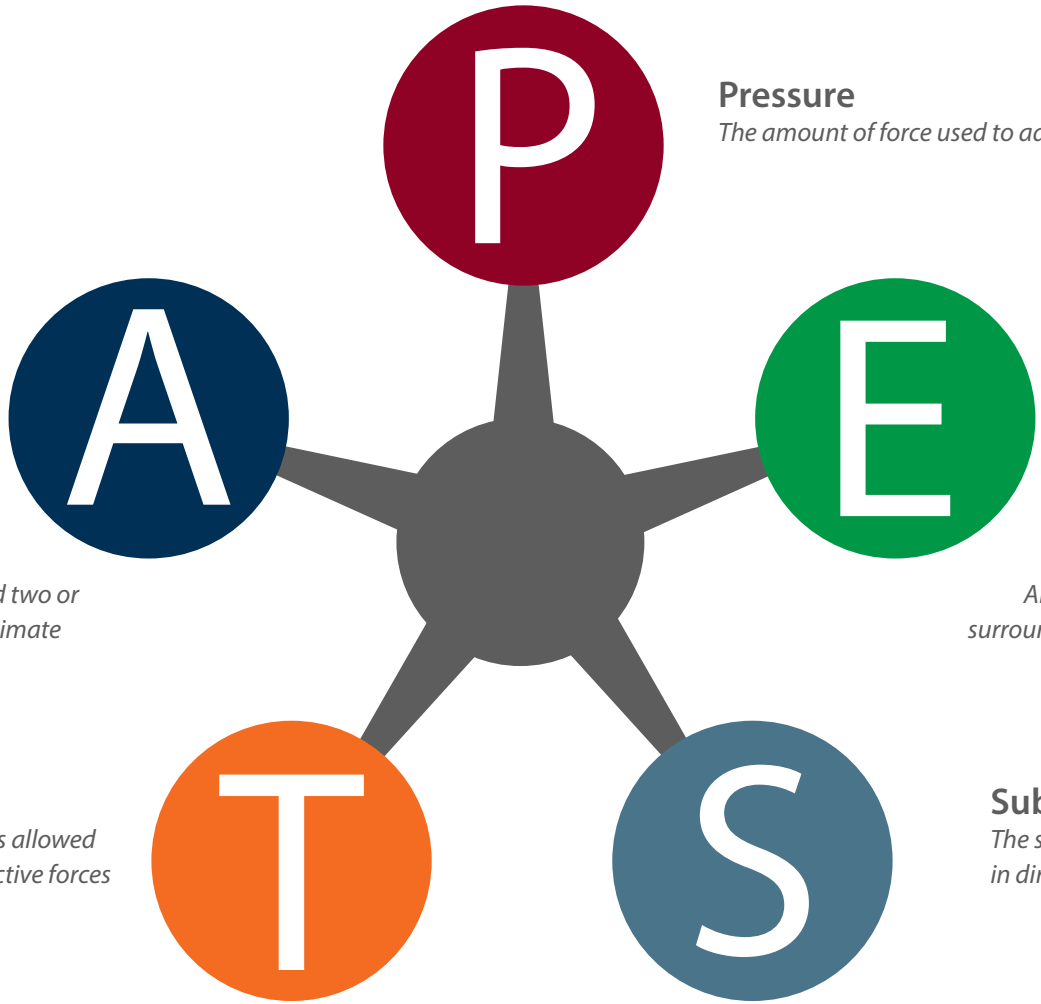
SURFACE TENSION AND WETTABILITY



T.A.P.E.S.

The 5 Factors of Adhesion

TAPES - The 5 Factors of Adhesion



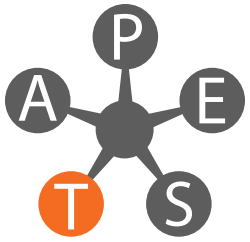
Pressure
The amount of force used to adhere the tape

Adhesive
Any material that will usefully hold two or more objects together solely by intimate surface contact

Environment
All conditions of the substrate and the surrounding environmental impacts on the adhesive bond

Time
The amount of time the adhesive is allowed to dwell on the surface before effective forces are applied

Substrate
The surface with which the adhesive will be in direct contact



TIME

All In The Timing

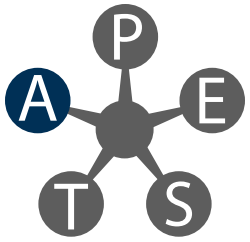
Full bond strength between the adhesive and substrate can take up to 72 hours.

The strength of the bond builds gradually over time and varies based on the tape you are using

15-150%

Increase in bond strength during first few days of application

RUBBER ADHESIVE bonds grow quickly, but **ACRYLIC** ADHESION may take up to 72 hours to reach full strength. A very general rule is 50% total adhesion in 20 minutes, 80% within 24 hours, and 100% within 72 hours.



ADHESIVE

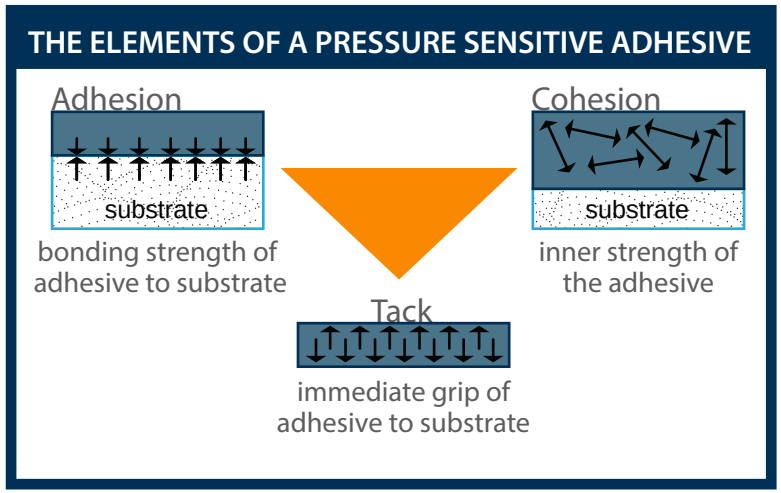
FACTORS: Type of Adhesive, Coating Weight, Hardness of Adhesive

SOFT Adhesives

Low Cohesion (Inner Strength)
Flows easily on irregular surfaces
Limited temperature resistance
Adhesive tears easily under parallel stress
Lower final Bond

HARD Adhesives

High Cohesion (Inner Strength)
Lower tack (less flow on rough surfaces)
Higher temperature resistance
Higher final bond, better resistance to parallel stress
Lower initial adhesion requires higher pressure or temperature

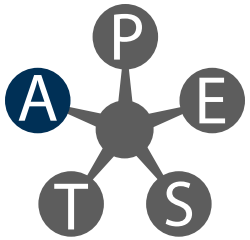


PSAs behave like liquids and solids at the same time - they are *viscoelastic*

High Coat Weight = Better flow on uneven surfaces
Low Coat Weight = Good flow on smooth surfaces

LIQUID ADHESIVES

Liquid adhesives allow for fast wetting to create molecular contact. They can set in one of three ways: evaporation of a solvent, curing/cooling, or chemical cross-linking



ADHESIVE - ADHESION

The most important element in determining the proper Adhesive for your application is the Adhesion of the Adhesive - or how well it will stick to the exact surface to which you will be applying the tape.

Every tape has a different adhesion depending on the substrate, and it is most important to keep this in mind when choosing at tape!

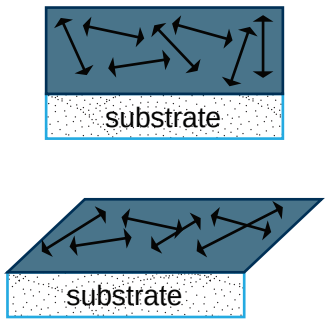
ADHESION IS:

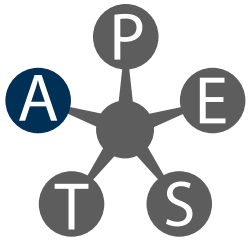
- Attraction between adhesive and substrate
- Most important parameter in every application
- Usually increases during the first few days
- Must not be confused with tack

ADHESIVE - COHESION

When considering the delicate balance for the effectiveness of a PSA, a major element is an adhesive's cohesive factors. Cohesion refers to the inner strength of the adhesive, and directly helps create and influence surface energy, both for the adhesive itself, and how it interacts with the substrate to which it's being applied. Some key points to keep in mind about cohesion:

- Relevant for forces parallel to the bonding area
- High cohesion goes together with
    - Higher temperature resistance
    - Lower tack
    - Higher holding power





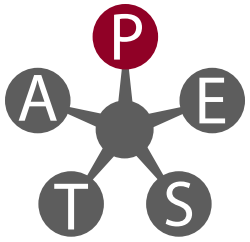
ADHESIVE - TACK

Tack is the property of a pressure sensitive adhesive that allows it to adhere to a surface under very slight pressure. It is determined by the ability of the adhesives to quickly wet the surface it contacts.

When measuring tack, the bond formation is recorded after less than one second at low pressure, and debonded in less than 0.01 seconds.

These are adhesion tests, and are generally measured in one of two ways:

- Rolling ball tack is measured when a stainless steel ball is released onto a strip of tape at a 30° angle. The distance the ball travels is measured, generally in inches or centimeters.
- Loop tack is where a piece of tape is looped, adhesive side out, and quickly dipped onto a substrate and removed. This is generally measured in oz/in.



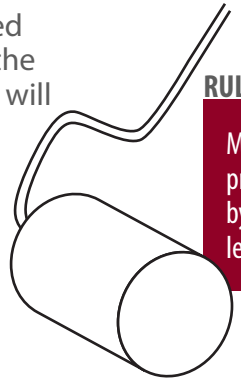
PRESSURE

FACTORS: Application Weight

Pressure Sensitive Adhesives got their name because they will not form a full bond unless pressure is applied to fully wet-out the adhesive on the substrate.

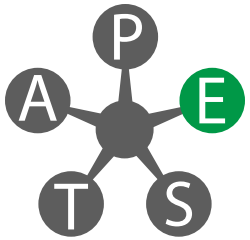
Wet-Out: The condition of being completely covered, and filled, with a resin - devoid of air bubbles or other occlusions preventing the adhesive to fully bond with the substrate.

The more pressure that is applied during application of the tape, the better the bond. Ideal adhesion will have 100% wet-out, but many pressure sensitive adhesives achieve high bond strength with as little as 70% wet-out.



RULE OF THUMB

Most pressure sensitive adhesives take around 15lbs of pressure to achieve a strong bond. You can achieve this by applying heavy pressure with your thumb along the length or by using a J-Roller or other pressure system.



ENVIRONMENT

FACTORS: Air, Light, Humidity, Temperature and their Interactions

The environment is a major factor when it comes to adhesion. All adhesive and backing combinations respond differently to the same environmental conditions. Too high of a temperature and the adhesive can break down - too low and it becomes brittle. Humid climates or exposure to UV light can cause adhesive failure. Chemical or solvent exposure can completely destroy a bond with some adhesives.

It's important to know all the environmental factors when deciding on the ideal tape. Some of these include:

- **Interior or Exterior Application**
- **Service Temperature**
- **Exposure to moisture or UV**
- **Chemical, solvent, or outgassing reactions**

It is important to remember that most tapes insulate against heat and may take many hours to reach room temperature. If a tape gets too warm, it may become soft, and the adhesive could begin to run. Conversely, if an adhesive is too cold, it can become brittle and glass-like, shattering under pressure or losing tack and adhesion.

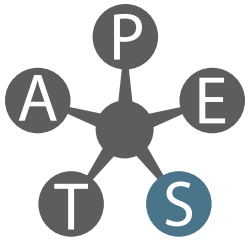
≥50° F

Ideal temperature for applying many pressure sensitive tapes

If the environmental temperature is difficult to regulate, you can generally follow these guidelines when trying to select the ideal adhesive:

20°F to 150°F -> Rubber Adhesive
0°F to 400°F -> Acrylic Adhesive
-20°F to 500°F -> Silicone Adhesive

* Note: Many rubber-based adhesives (found in many masking and other tapes) are formulated for higher tempertures, and blended acrylics offer a wide range of temperature resistance.



SUBSTRATE

FACTORS: Surface Energy, Surface Conditions

High Surface Energy (POLAR)

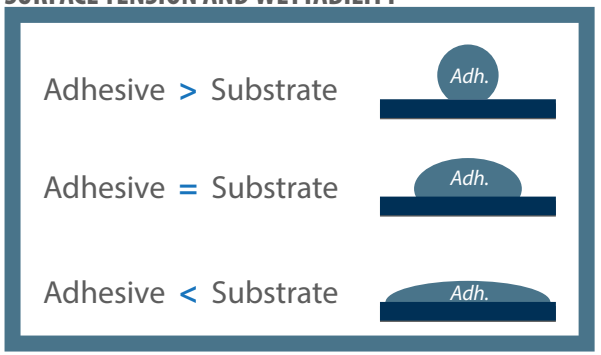
Steel
Aluminum
Copper
Zinc
Polycarbonate
ABS (Acrylonitrile-Butadiene-Styrene)
PVC (Polyvinyl chloride)

Low Surface Energy (NON-POLAR)

Rubber
Polyethylene (PE)
Polypropylene (PP)
Powder Coatings
Silicone
Teflon

Other terms that refer to *surface energy* are surface tension and polarity

SURFACE TENSION AND WETTABILITY



POLAR substrates are easy to bond while **NON-POLAR** substrates present a challenge

Another factor of the substrate to consider is the contour of the surface. An ideal surface will be flat, but sometimes you may find yourself battling the stresses associated with bonding along corners, convex curves, or concave angles. These stresses can cause tape to delaminate from the surface, so it is very important to take them into consideration when choosing the appropriate adhesive.

Further, the presence of surface contaminants can interrupt the bond between the adhesive and the substrate. It is important to have a clean, dry surface free from contaminants such as plasticizers, dirt, oils, chemicals, and water.

The Big 3:
Components, Formats, and Adhesives

The Big Three: Components, Formats, and Adhesives

When breaking tape down into its components you are given **three** categories, the **ADHESIVE**, the **CARRIER** (or backing), and the **RELEASE LINER**. Not all tapes will feature all the components.

There are also **three** common formats of tape, the **ADHESIVE TRANSFER**, the **SINGLE COATED** tape (or label stock), and the **DOUBLE COATED** tape.

ADHESIVE TRANSFERS consist of a release liner carrying an unsupported adhesive. The release liner is generally a paper that has been coated on both sides with a silicone release agent. Adhesive transfers are often an acrylic adhesive, but can be made from any type of adhesive.

Examples of adhesive transfers include tapes for envelope or bag sealing, graphic attachment, and splicing.

SINGLE COATED tapes feature an adhesive applied to only one side of a carrier/backing. The carrier may be almost any flexible material, including paper, polymeric film, foil, nonwoven or high thread count woven cloth. The construction of single coated tapes typically has a backing most often 1-10mils thick and an adhesive thickness of 2-5 mils - though there are exceptions. The tape may be self wound with a release coating applied to the backing, or it can be lined with a paper or film release liner. Some single-coated tapes, such as filament tape and duct tape, also feature reinforcements of woven cloth or glass strands, and typically are paired with rubber based adhesive systems.

Examples of single coated tapes are electrical tape, masking tape, carton sealing tape and most medical tapes.

DOUBLE COATED tapes are created when an adhesive is coated onto both sides of a carrier material. The tape is then wound with a release liner, commonly paper that has been coated on both sides with a silicone release agent. The carrier is typically a polymeric film, and the adhesive (acrylic, rubber, or silicone) may be the same or different on either side of the carrier, as well as offering different coating thicknesses.

Some examples of double coated tapes are bonding and mounting tapes and membranes.

Finally, there are **three** main types of adhesives, **RUBBER**, **ACRYLIC**, and **SILICONE** - which will be addressed in the following section.

ADHESIVE TYPES - Rubber

Rubber adhesive systems are typically used for indoor applications with low stress requirements. They generally adhere well to low surface energy substrates, and can be formulated for excellent removability. Rubber adhesives are generally found on masking tapes, carton sealing tapes, duct tapes, and filament tapes. Rubber adhesives are not tacky by nature, so it is necessary to add tackifier resins to create the adhesive.

There are two main categories of rubber adhesives:

NATURAL RUBBER - These adhesives generally have a high molecular weight with *long* polymer chains. They typically adhere to LSE substrates and exhibit clean removability and good shear, but poor temperature resistance and ageing properties.

SYNTHETIC RUBBER - Often referred to as "Hot Melt" adhesive, synthetic rubber adhesives are thermoplastics with low molecular weight, or *short* polymer chains. They are more customizable than natural rubber adhesives for greater LSE adhesion with more tack and some temperature/UV ageing resistance.

PROPERTY	RUBBER ADHESIVE
initial bond	++
firm	+
LSE/HSE	++/++
temperature	up to 180˚F
chemical resistance	-
UV resistance	-
ageing	-
removability	++
solvent resistance	-

Note: Many removable masking tapes are formulated with rubber adhesives that can withstand up to 350˚F.

ADHESIVE TYPES - Acrylic

Acrylic adhesive systems are typically used for either indoor or outdoor applications with more critical permanent long-term bonding requirements. Although acrylic adhesives are tacky by nature, often times a tackifier is added to enhance its quick-stick properties. This is a benefit of acrylic adhesives - their polymers can be precisely adjusted during their industrial manufacturing process to improve the overall performance of the adhesive.

There are two main categories of acrylic adhesives:

SOLVENT ACRYLIC - These adhesives get their name due to the fact that their polymer grains dissolve in solvent. Typically these adhesives do not adhere well to LSE substrates, but do exhibit better property retention than rubber under a number of circumstances.

EMULSION ACRYLIC - These water-based adhesives consist of spherical particles surrounded by a **SURFACTANT** in a water carrier. They are generally less expensive and more environmentally friendly than solvent acrylic adhesives, but due to the water-based properties they do not offer good moisture resistance, leading to solvent acrylics being preferred for critical applications.

PROPERTY	SOLVENT ACRYLIC	EMULSION ACRYLIC
initial bond	+	++
firm	++	--
LSE/HSE	--/++	+/+
temperature	up to 450˚F	up to 300˚F
chemical resistance	+++	++
UV resistance	+++	+
ageing	+++	+
removability	--	varies
solvent resistance	+++	+

SURFACTANT

Compounds that help to lower a liquid's surface energy, the interfacial tension between two surfaces, or between a liquid and a solid.

ADHESIVE TYPES - Silicone

Silicone adhesives are generally the most expensive type of adhesive. They exhibit a very high temperature resistance and are able to handle extreme environmental conditions. Despite their bonding strength, often silicone adhesives are incorrectly perceived to have very low sticking power due to their low initial bond strength.

Tapes with silicone adhesive systems are typically used for critical applications where the tapes are exposed to extremely high temperatures and/or harsh environments, or are adhering to other siliconized surfaces, as the best thing to adhere permanently to silicone is silicone.

Silicone adhesives are generally found on silicone release liner splicing tapes, Teflon tapes, and printed circuit board film masking tapes.

PROPERTY	SILICONE
initial bond	+
firm	+++
LSE/HSE	limited
temperature	up to 750˚F
chemical resistance	+++
UV resistance	+++
ageing	+++
removability	++
solvent resistance	+++

Choosing the Right Adhesive

Choosing the Right Adhesive - Comparative Properties and Testing Methods

PEEL ADHESION

Peel adhesion is defined by the PSTC as the force per unit width required to break the bond between a pressure sensitive adhesive tape and the surface to which it has been applied when the tape is peeled back at a controlled angle, at a standard rate and condition. It measures the bond breaking, not the bond formation, and the factors are mitigated by wetting and viscoelastic behavior. This number is generally represented in oz/in.

TACK

Tack is the property of a pressure sensitive adhesive that allows it to adhere to a surface under very slight pressure. It is determined by the ability of the adhesives to quickly wet the surface it contacts. When measuring tack, the bond formation is recorded after less than one second at low pressure, and debonded in less than 0.01 seconds. These are adhesion tests, and are generally measured in one of two ways: Rolling ball tack where a stainless steel ball is released onto a strip of tape at a 30° angle. The distance the ball travels is measured, generally in inches or centimeters. Loop tack is where a piece of tape is looped, adhesive side out, and quickly dipped onto a substrate and removed. This is generally measured in oz/in.

SHEAR

Shear refers to the slow movement of the adhesive or backing under stress - it is sometimes referred to as the holding power of the tape. It is generally measured in two ways, static or dynamic. Static shear is measured with a static load applied to the adhesive pulling it vertically downward from the substrate. Dynamic shear is measured by a horizontal stress on the bond leading to either cohesive or adhesive failure.

TENSILE STRENGTH and ELONGATION

Tensile strength is the measure of the tape's strength relative to its construction, and can be considered the breaking point of the measurement of elongation, which is the increase or decrease in a dimension of the tape expressed as a % change.

PROPERTY	RUBBER	ACRYLIC	SILICONE
cost	++	+	-
tack	++	0	-
permanent adhesion	+	++	+
removability	+	-	0
adhesion to LSE	++	-	++
high temperature perf.	0	+	++
low temperature perf.	-	+	++
UV resistance	--	+	++
solvent resistance	-	+	+
chemical resistance	-	+	++
humidity resistance	--	+	++
plasticizer resistance	--	++	++
ageing	--	+	++
transparency	-	++	+
sound damping	+	0	++
shear strength	0	++	0

Carriers and Backings

Carriers are an essential component of adhesive tapes and can influence adhesive properties and performance. The characteristics of carriers/backings can impact the selection of the proper tape for the application.

MAJOR FACTORS OF CARRIERS/BACKINGS

Thickness and weight
Tensile strength
Elongation
Tearability, both initiation and propagation
Abrasion and moisture resistance
Electrical insulation or conductivity
Thermal insulation
Flame retardance
Flexibility
UV stability
Color and clarity

COMMON FILMIC BACKINGS

Polyester (PET)
Polyolefins (PE, PP)
Polyvinyl Chloride (PVC)

COMMON WOVEN BACKINGS

Cotton
Polyester
Rayon
Nylon
Glass Cloth
Laminates

COMMON NONWOVEN BACKINGS

Polyester
Polyolefin
Rayon
Nylon

COMMON PAPER BACKINGS

Crepe
Flat-back
Kraft

COMMON FOAM BACKINGS

Polyethylene
Polypropylene
Polyvinyl Chloride
Polyurethane
Acrylic
Silicone

COMMON FOIL BACKINGS

Aluminum
Copper
Lead

LAMINATE BACKINGS

Laminate backings can be created by combining various elements such as polyolefin films, aluminum foil, paper, skrims, and/or cloth.

Choosing the Right Carrier

PROPERTY	PET	PE	PP	PVC	WOVEN CLOTH	FLATBACK PAPER	CREPE PAPER	ALUMINUM FOIL	COPPER FOIL	PTFE	GLASS CLOTH	PE FOAM	PVC FOAM	PU FOAM	FOAMED ACRYLIC	SILICONE FOAM	SILICONE SPONGE	NEOPRENE BLEND	EPDM
tensile strength	++	0	+	0	+	0	0	++	+	+	++	-	-	0	+	0	+	+	+
elongation	-	++	0	++	--	--	-	--	--	+	--	+	+	0	+	+	+	++	++
tearability	--	-	-	-	--	++	++	--	-	-	--	+	+	+	-	0	0	--	-
UV stability	++	0	0	+	0	0	-	+	-	0	-	+	0	++	++	+	+	0	++
abrasion resistance	+	0	0	0	0	-	0	++	0	++	++	-	-	+	+	0	0	+	+
moisture resistance	++	+	++	0	-	-	++	++	++	++	--	-	+	0	++	+	-	++	++
electrical insulating	++	+	+	++	-	-	--	--	--	+	++	++	+	+	+	++	++	0	-
temperature resistance	+	-	-	-	0	0	0	++	++	++	++	-	-	-	0	++	++	+	+
flexibility	-	+	0	++	0	--	+	-	+	++	-	+	++	+	+	++	+	+	+
conductivity	-	-	-	--	-	-	-	++	++	--	--	--	--	--	-	-	-	-	-
color availability	+	++	+	++	0	++	++	--	--	-	-	+	-	+	-	-	-	-	-
clarity	++	+	+	+	--	--	--	--	--	-	--	--	--	--	0	-	-	-	-
cost	+	++	++	+	0	++	++	-	--	--	-	+	++	0	--	--	--	0	-
chemical resistance	+	0	0	+	--	0	0	-	-	++	++	-	-	0	-	++	++	++	++
solvent resistance	+	0	0	--	-	0	0	++	++	++	-	-	-	0	+	++	++	++	+

-- Very Poor - Poor 0 Neutral + Good ++ Excellent

Understanding Release Liners

FUNCTIONS OF RELEASE LINERS

Although typically disposable by the end user, release liners are critical components of PSA tapes and adhesive systems.

- Protect the adhesive until it's ready to be used
- Provide stable release and unwind
- Must maintain properties and remain stable over time in varying climates
- Can effect the look and performance of the adhesive system
- Release agents must not migrate into the adhesive
- Adhesive needs to remain with the liner until the tape is applied, then remove cleanly and easily

RELEASE LINER

A release liner is the component of the pressure sensitive tape or label material which functions as a carrier for the pressure sensitive adhesive - the core is generally a paper, film, or polycoated paper with a release coating applied to one or both sides.

Release liner selection is even more critical in specialty converted parts, including kiss cuts, die-cuts, and narrow width slitting, as the release liner directly impacts the ability of an adhesive tape to stand up to each given converting method. If an incorrect liner is used the machinery can destroy the adhesive tape during the converting process.

Release liners are typically found on double coated tapes, single coated label stocks, transfer tapes, single coated HVAC foil tapes, and custom die-cuts. Some foams, such as PVC, are also cast directly onto release liners so they can hold their form until use.

Matching Tape and Application:
Questions to Ask

Matching Tape and Application - Questions to Ask

What materials are being bonded?

Lean toward rubber adhesives for lower surface energy substrates.

Is the bond permanent or temporary?

Some adhesives are made to remove cleanly after use on many diverse substrates.

Is the surface rough or smooth?

Rougher surfaces typically require thicker tapes with heavier adhesive coat weights.

Are there thickness gaps to fill?

If gaps need to be filled, we typically lean toward foam tapes or high bond foamed acrylics.

Will the application be indoors or outdoors?

Acrylic or Silicone adhesives are typically better suited for outdoor adhesives than rubber adhesives that react poorly to UV and moisture.

What are the application and service temperature?

You should always try to apply tape at or above 50°F. As service temperatures in bonding applications exceed 150˚F or 350˚F, choose acrylic or silicone adhesives respectively.

Will there be exposure to moisture, UV, chemicals, solvents, outgassing, etc.?

If so, choose acrylic adhesives - or silicone under extreme conditions!

What load or stress will the tape need to support or resist?

As load & stress increase, move toward solvent acrylic adhesives and use more tape per square inch of bonding surface area. If dynamic forces are involved, select a viscoelastic foamed acrylic tape.

What is the annual usage and budget for the project?

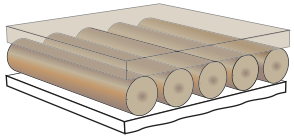
There are literally millions of tapes, so if you are able to narrow the scope of alternatives to fit the customer's specific budget, you will have better luck identifying potential products.

What exactly does the user want the tape to accomplish?

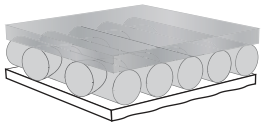
This is the *most important question* to ask about the application as it will dictate almost everything about the adhesive tape you and your customer choose for the application.

Categories & Functions of Adhesive Tapes

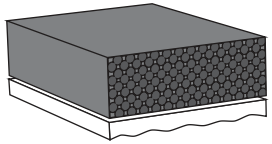
Categories of Adhesive Tapes



Filament Tape (C1S)

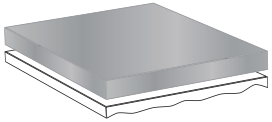


Cloth and Duct (C1S)

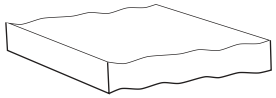


Foam Tape (C1S)

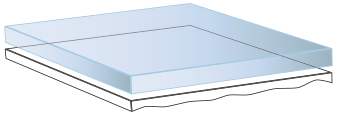
Paper Tape (C1S)



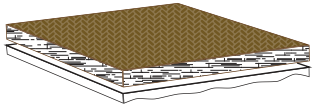
Foil Tape (C1S)



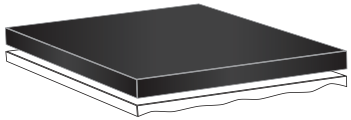
Adhesive Transfer



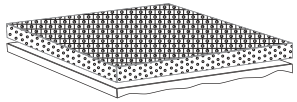
Film Tape (C1S)



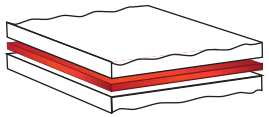
PTFE Tape (C1S)



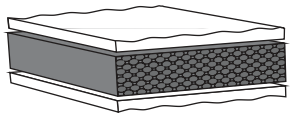
Vinyl Tape (C1S)



Glass Cloth Tape (C1S)



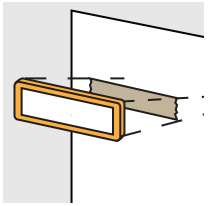
Tape Coated 2 Sides



Foam Tape (C2S)

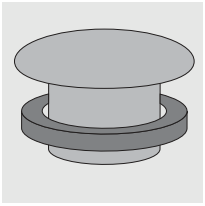
Note: C1S = Adhesive Coated One Side

Functions of Adhesive Tapes



Bonding & Mounting

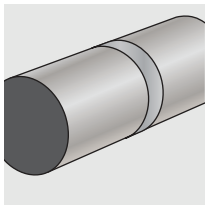
Insulating/ Shielding



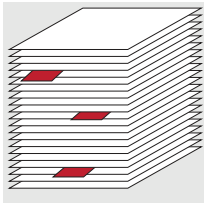
Gasketing

Masking

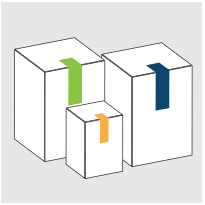
Surface Protection



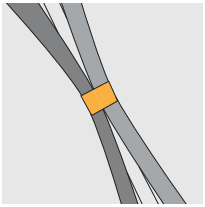
Sealing



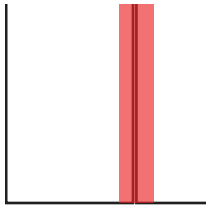
Tabbing



Identifying



Wrapping/ Bundling



Splicing

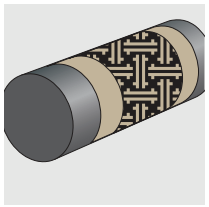
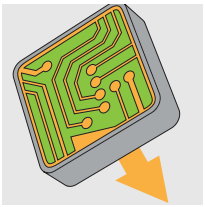


Plate Mounting



Thermal Management

Tape Glossary

A

ABRASION RESISTANCE – The ability of a tape to withstand rubbing and still function satisfactorily.

ACRYLIC – A synthetic polymer with excellent aging characteristics that can be used as either a single component adhesive or a coating or saturant, depending upon composition.

ADHESION – A bond produced between a pressure sensitive adhesive and a surface.

ADHESIVE – Any material that will usefully hold two or more objects together solely by intimate surface contact.

ADHESIVE TRANSFER – The transfer of adhesive from its normal position on the tape to the surface to which the tape was attached, either during unwind or removal.

ANCHORAGE – The specific adhesion of a pressure sensitive adhesive to a face material or an anchor coat.

B

BACKING (CARRIER) – A relatively thin flexible material to which the adhesive is applied. Theoretically, any material that is reasonably flat, relatively thin, and flexible could be used as a tape backing.

BACKSCORING (CRACK & PEEL) – Cutting the bottom release liner in such a way as to aid in the dispensing or applying of the product.

BALONEY (CEVI, LATHE OR LEVER) **SLITTING** – This process utilized standard length log rolls, cutting through both tape and core roll after roll. This method allows for quicker change-over to different tapes and enables the converter to produce smaller quantities of a certain size than rewind slitting.

BI-DIRECTIONAL – Related to strapping tapes, in which the reinforcing material consists of filaments in both the length and the cross directions, usually a woven cloth.

BLEEDING – Penetration through the tape of a coloring liquid (paint, etc.) onto the surface to which the tape is applied.

BURSTING STRENGTH – The ability of a tape to resist damage when a force is applied evenly and perpendicularly to the surface of a tape.

C

CARRIER – Sometime used to refer to the backing material, particularly in double-faced tapes.

COATING WEIGHT – The weight of a coating per unit area.

COHESION (COHESIVE STRENGTH, INTERNAL BOND) – The ability of the adhesive to resist splitting. Good cohesion is necessary for clean removal.

CONVERTER (FABRICATOR) – One who modified products to enhance their value and final usage. Products can be modified primarily by: laminating, die-cutting to custom shape, precision slitting, adding/removing liners & cutting pieces to length.

CORONA TREATMENT – A process that alters the surface of a material or its surface energy by exposing that material to a high voltage electrical discharge treatment. Typically used to raise the surface energy of films such as polyethylene or polypropylene to obtain better adhesion of inks, adhesive and other coatings. High energy surfaces permit better wet-out (contact) of the coating than low energy surfaces.

CREEP – A slow movement of the adhesive or backing under stress.

CREPED – Paper that has small "folds" in it, giving it high stretch.

CROSS-LINKED (CURED) – The development of a three-dimensional structure in an adhesive, which is activated normally by heat. An improvement in shear resistance, high temperature resistance, and oil or solvent resistance will normally result.

CUPPING – A slight U-shaped deformation of the tape (at right angles to the length) which usually appears after unwind tension is relaxed.

CURLING – The tendency of a tape to curl back on itself when unwound from the roll and allowed to hang from the roll.

D

DELAMINATION – A separation of the backing into two distinct layers, separation between laminations of a tape consisting of more than one backing, or the separation between filaments and backing of a filament-reinforced tape.

DIE-CUTTING – Process by which any shape, pattern or design can be cut out of various pressure-sensitive tapes, utilizing customer-made dies.

DOUBLE COATED TAPE – A pressure–sensitive tape consisting of a carrier with adhesive coated on both sides. Typically, a liner is necessary to unwind the roll.

E

EDGE CURL – The peeling back or lifting of the outer edge of a tape after application. See cupping.

ELASTOMER – An elastic, polymeric substance, such as a natural or synthetic rubber.

ELONGATION – The amount a tape is able to stretch without breaking, expressed in a percentage.

EXTENDED LINER (DRY EDGE) – Refers to the liner width extending beyond the actual adhesive tape width, for easy liner removal. Also referred to as finger lift liner.

F

FEATHERING – a jagged, irregular point line frequently characterized by small "feathers" of the top-coat projecting into the masked area.

FILAMENTS – Longitudinal "threads" of glass, polyester, nylon or other high-strength materials.

FILM – Uniform, homogeneous, non-fibrous synthetic webs.

FLAGGED ROLLS – Used to identify a bad spot in the roll for internal processing (or possibly a splice).

FLAGGING – A peeling away from the surface of the end of a length of tape, particularly in a spiral-wrap application.

FLAME RESISTANCE – The ability of a tape to withstand exposure to flame. Fireproof materials will not burn even when exposed to flame. Flame-resistant (fire-retardant, self-extinguishing) materials will burn when exposed to flame but will not continue to burn after the flame is removed.

FLATBACK – Smooth paper backing.

FLUOROCARBON FILMS – A film with very high and low temperature limits, excellent electrical characteristics and very slippery, non-sticking surface. One example is DuPont's Teflon (polytetrafluoroethylene).

FLUTING – Distortion of a roll of tape such that layers no longer form a circle.

FOAM – A soft, cushiony material formed by creating bubbles in the base materials, such as natural or synthetic rubbers, or other elastomeric materials.

G

GAPPING – Opening between layers of tape within a roll.

GLOSS – A light reflection characteristic of tape backings, usually expressed by such terms as glossy, low gloss, matter, etc.

H

HIGH-SPEED UNWIND – Unwinding or dispensing of tapes at a relatively high rate of speed, usually more than 50 feet per minute.

HOT MELT (PRESSURE SENSITIVE ADHESIVE) – a pressure sensitive adhesive, applied to the backing in a hot molten form, that cools to form a conventional pressure sensitive adhesive.

HOLDING POWER (SHEAR ADHESION) – The ability of a tape to resist the static forces applied in the same plane as the backing. Usually expressed in a time required for a given weight to cause a given amount of tape to come loose from a vertical panel.

I

IMPACT RESISTANCE – The ability of a tape to resist sudden impacts, pulls, or shocks as may sometimes be encountered by packages in transit.

INSULATING TAPE – Normally refers to tape used for electrical insulation.

INSULATION RESISTANCE – The ability of tape to prevent the flow of electrical current across its surface, usually measured on the backing.

K

KISS-CUTTING – Die-cutting process by which only the actual usable part remains on the liner; all waste (matrix) around the die-cuts is removed to allow for easy removal.

KRAFT – A sulfate wood pulp paper. See Saturation.

L

LABEL STOCK – Pressure sensitive materials that are usually printed, frequently die-cut, furnished in roll or sheet form with a liner, and intended for use as labels.

LAMINATING – Joining of several layers of varying materials utilizing pressure-sensitive tapes.

LIFTING – A situation where a section of tape has pulled away from the surface to which it has been applied.

M

MATRIX – Scrap material that is left after a die cuts a pattern. Usually removed and thrown away.

METAL FOIL – Thin, flexible sheets of metal, such as aluminum and lead, used as tape backings because of inherent properties such as weather resistance, reflectivity, etc.

MIGRATION – The movement, over a long period of time, of an ingredient from one component to another when the two are in surface contact. May occur between tape components or between a tape and the surface to which it is applied. Some plastic films and foams contain plasticizers which are apt to

migrate into the tape adhesive, causing the adhesive to soften.

N

NON-ORIENTED – A material that has yet to be stretched or expanded to its maximum size.

O

OFF-CORE – Layers of tape are in correct alignment, but tape is displaced sideways on core.

OFFSETTING – Occurs when a printed tape is unwound and some of the printing ink is picked off by the adhesive or migrates into the adhesive. It is, in effect, a delamination of the ink.

OOZING – A "squeezing out" of the adhesive from under the backing. It is occurs when the tape is in roll form, the edges of the roll become tacky.

OUT-GASSING – The release of volatile components under heat or vacuum.

OVER-RUN – A quantity of material in excess of the amount ordered. Trade practices permit +/- 10% tolerance for customer over-runs and under-runs.

P

PANCAKE-WOUND ROLLS – Most typical supply form for pressure-sensitive tapes. Each layer of tape is directly on top of the last one (with or without a liner).

PEAKING – Large singular upheavals in the outer layers of a roll of tape.

PEEL/ADHESION TEST– The measurement of the adhesive or bond strength between two materials, expressed in ounces/inch.

PLAIN CLOTH – Fabric woven from cotton, glass, or other fibers without further treatment.

POLYETHYLENE (PE) – A tough, stretchy film having very good low-temperature characteristics.

POLYESTER – A strong film having good resistance to moisture, solvents, oils, caustics, and many other chemicals. It is usually transparent.

POLYPROPYLENE (PP) – A cousin of polyethylene, with generally similar properties, but stronger and having a higher temperature resistance.

POLYURETHANE FOAM – Closed cell foam with adhesive on two sides, used in permanent bonding applications, to replace mechanical fasteners, epoxies and screws.

PERFORATING – Hole-punching the release liner, usually between kiss-cut parts.

PRESSURE SENSITIVE – A term commonly used to designate a distinct category of adhesive tapes and adhesives, which, in dry (solvent-free) form, are aggressively and permanently tacky at room temperature and firmly adhere to a variety of dissimilar surfaces upon mere contact without the need of more than finger or hand pressure. They require no activation by water, solvent, or heat to exert a strong adhesive holding force toward such material as paper, plastic, glass, wood, cement, and metals. They have a sufficiently cohesive holding and elastic nature so that, despite their aggressive tackiness, they can be handled with the fingers and removed from smooth surfaces without leaving a residue.

PRESSURE SENSITIVE TAPE – A combination of a pressure sensitive adhesive and a backing.

PRIMER – A primer is used to increase the bond of the adhesive to the backing. The use of a primer assists in keeping the adhesive on the backing when a tape is removed.

PRINTABILITY – The ability of a tape to accept and hold a printed legend and especially to resist offset of the printing when rewound into a roll after printing.

R

REINFORCEMENTS – A material added to a tape to provide additional strength.

RELEASE COATING (EASY UNWIND TREATMENT) – A coating applied to the backing on the side opposite the adhesive that provides ease of unwind and prevents delaminating or tearing. Without a release coating, the tape would adhere to its own back and would not unwind.

RELEASE COAT TRANSFER (SILICONE TRANSFER) – Particles of the release coat stick to the adhesive on unwind; the resulting tape will have little or no ability to stick.

RELEASE LINER – Siliconized paper or film coated on one or both sides that protects the adhesive until use. The liner is removed and discarded before application. Most frequently found on double-coated tapes and labels. Fluorosilicone liners are available in special situations that required silicone adhesive to release.

REWIND SLITTING – Preferred method for slitting large volumes of standard sized rolls of pressure-sensitive tape. In this process, large master rolls of jumbos are used to unwind tape and then are rewound layer over layer across a set of pre-spaced cores.

S

SATURATION (IMPREGNATION) – Adding material (saturant) to the backing for improvement of physical properties and resistance to various deleterious environments.

SELF-WOUND ROLL – A roll of tape in which each layer of tape is directly on top of the last one. The roll contains no liner.

SILICONE – A unique polymer system that can be a very effective release coating, or pressure sensitive adhesive capable of functioning effectively at extreme temperatures.

SILICONE ADHESIVE – Adhesive system designed for sticking to silicone surfaces. (i.e.: splicing liners).

SINGLE COATED TAPE – A pressure-sensitive tape consisting of a carrier with adhesive coated only on one side.

SLIP SHEET OR INTERLINER – A treated sheet used to cover the adhesive to facilitate handling.

SPLICE – A point at which two separate lengths of tape are joined together.

SPOOL (TRAVERSE) **WOUND ROLLS** – One layer of tape starts on a side of the core. The next layer overlaps with the first one and then the tape is wound back and forth traversing from one side of the core to the other. This process allows for much longer rolls (up to 33,000yds depending on the width and thickness of product) thus reducing the downtime involved with constant roll changes.

T

TACK – The condition of the adhesive when it feels sticky or highly adhesive. Sometimes used to express the ideas of pressure sensitivity.

TEARING – Breaking or slivering of a tape during unwind.

TEAR RESISTANCE – The ability of a tape to resist tearing after a tear have been started by cutting or nicking of the edge.

TELESCOPING – A sideways sliding of the tape layers, one over the other, such that the roll looks like a funnel or a telescope.

TENSILE STRENGTH (break strength) – The force required to break a piece of tape by pulling on opposite ends of the piece.

> **MACHINE DIRECTION TENSILE** Tensile strength measured parallel to the length of the tape. Unless otherwise specified, tensile strengths are measured in the machine direction.
>
> **CROSS DIRECTION TENSILE** Tensile strength measured at right angles to the length.
>
> **WET TENSILE** Tensile strength of tape that has been kept wet for a specified period of time. Measures ability of tape to function satisfactory when exposed to moisture.

THICKNESS – Distance from one surface of a tape, backing or adhesive to the other, usually expressed in mils or thousandths of an inch. This is usually measured under slight pressure with a special gauge.

TOLERANCE – Maximum allowable variation from agreed-upon or specified dimensions throughout the manufacturing or converting process.

TRANSFER TAPE – An unsupported pressure-sensitive adhesive tape. Transfer tapes generally consist of an adhesive and a coated release liner.

U

UNIFORMITY – The consistency of a single type of tape either within a single roll, from roll to roll, or from lot to lot.

UNPLASTICIZED VINYL (UPVC) – A tough durable plastic film, similar to Plasticized PVC, but lacking the elongation numbers found in PVC due to the lack of plasticizers.

UNWIND OR UNWIND ADHESION (UNROLLING) – The force required to remove tape from the roll

V

VINYL OR PLASTICIZED POLYVINYL CHLORIDE (PVC) – A tough, durable plastic film having excellent resistance to oils, chemicals, and many solvents. It has excellent abrasion resistance, and its high elongation is due to the addition of the plasticizer.

VINYL NITRILE SPONGE RUBBER – Closed cell, single coated adhesive foam that offers good oil resistance and shock absorbency.

VOID – A bare uncoated area on either the adhesive or release-coated side of the tape.

W

WATER PENETRATION RATE – The rate of water transmitted through a controlled area of tape under a specified time and condition.

WEAVING – A poorly wound roll of tape in which the individual layers of tape are not in alignment with one another.

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