Film Definitions

COMMON FILM DEFINITIONS

Polyethylene (PE). First produced after World War II, polyethylene is the largest selling transparent packaging material in use today. More than 50% of all film used in packaging is in fact polyethylene. On a yield basis, it is the lowest cost alternative of any of the packaging grade films. It is very common to find polyethylene used in industrial and food environments.

Polyethylene is found in three basic configurations or densities. Low Density is used in manufacturing of bags. Medium density is used in machine overwrapping applications where quick heat sealing qualities are desirable. High Density polyethylene, on the other hand, is used in specialized applications. It is very stiff and heat resistant.

All polyethylene films are virtually chemically inert, resistant to acids, alkalis, and other caustic compounds.

Cellophane. Cellophane is the oldest of the generally used packaging films. Cellophane has been a major food packaging film for many years. Its usage is on a down slide due to its particular cost and yield factor. The majority of the cellophane applications are now being converted to other types of films.

Vinyl Films (PVC). Polyvinylchloride films rank as the third most popular used film. Because they are compounded with a wide choice of plasticizers and are produced by a variety of techniques, they have a uniquely wide range of properties. They can be soft, tacky, hard, or slippery. Shrink packaging in vinyl is widely used for canned goods and toys. Probably the largest single use for vinyl is in-store packaging of fresh meat and produce. Its appearance, strength, and high oxygen transmission all make it ideal for these applications. Grades meeting the requirements of the FDA for these specific purposes are utilized in this packaging. Both hand and machine stretch and shrink wrap methods are employed by food stores.

Polypropylene (PPP). The first commercial use of polypropylene was in 1961. Since then it has become one of the most widely used films in its two forms, cast and oriented. It is the lowest density commercial film. The optical characteristics of both types of polypropylene films are outstanding. Some of the characteristics of the oriented polypropylene films are the high impact strength, strength retention at low temperatures and it has higher barrier properties and greater stiffness than the cast product. It is normally used in thicknesses of one mil or less. Most of the polypropylene products will be found used in the food industries wherein polyproylene has a tendency to duplicate the properties of cellophane and is found to replace cellophane in many applications.

Polyester Films. Polyester film has the highest tensile and impact strength of all plastic films. It retains good physical and mechanical properties over a wide temperature range, from minus 70˚C to 205˚C. Resistant to moisture, resistant to solvent and chemical attack and is nontoxic. In most cases it complies with the FDA requirements. Polyester film is therefore found to be used in many food applications. A new concept in packaging is metallization of polyester for esthetic considerations and improved barrier properties. Institutional coffee pouches, for instance, are one application of metallized polyester. Polyester film is used in many laminations to improve barrier properties, moisture transmission rates and other necessary requirements of a particular application.

Butyrate. Cellulose acetate butyrate resembles cellulose acetate in its general properties. However, it has lower moisture absorption, higher stretch and greater toughness than acetate. Acetate butyrate also has superior weathering resistance in special outdoor formulations and may be post-formed over a wider temperature range than most acetate sheets. These characteristics make it particularly good for blister packaging and thermal forming applications. Most applications for butyrate use a thick film, from .005" to .015", and it comes in rolls up to 44" in width. Butyrate, like vinyls are often used in the manufacture of carded display packaging.

Tables & Formulas

Tables and useful information about polyethylene film. Yield of Film/lb.

Thick. Mil	In.² Lb.
.4	75000
.5	60000
.6	50000
.75	40000
1	30000
1.25	24000
1.5	20000
1.75	17143
2	15000
2.25	13333
2.5	12000
2.75	10909
3	10000
3.5	8571
4	7500
4.5	6667
5	6000
6	5000
7	4286
8	3750
9	3333
10	3000

Formulas for Finding Roll Footages & Diameters

Weight of Roll = Diameter Weight ConstantT x Width of Roll (in).
Weight per roll: Example — 10" dia. roll 50" wide wound weight 2.25 x 50" = 112.5 lb. per roll

Feet per roll = Diameter Weight Constant ÷ Gauge Constant
x 1000 (for tubing, DW sheeting, J sheeting & CF)
x 2000 (for Single Wound sheeting), ÷ 2 (for gusseted tubing)

Feet per Roll Single Wound Sheeting:
Example — 10" diameter roll 1 mil thick (.001) 22.51 = .8 x 2000 ÷ 5625 ft. per roll

Gauge	Gauge Constant /In. Width	Gauge	Gauge Constant /In. Width	Gauge	Gauge Constant /In. Width
.0005	4.0	.00375	3.0	.007	5.6
.00075	6.0	.004	3.2	.00725	5.8
.001	8.0	.00425	3.4	.0075	6.0
.00125	1.0	.0045	3.6	.00775	6.2
.0015	1.2	.00475	3.8	.008	6.4
.00175	1.4	.005	4.0	.00825	6.6
.002	1.6	.00525	4.2	.0085	6.8
.00225	1.8	.0055	4.4	.00875	7.0
.0025	2.0	.00575	4.6	.009	7.2
.00275	2.2	.006	4.8	.00925	7.4
.003	2.4	.00625	5.0	.0095	7.6
.00325	2.6	.0065	5.2	.00975	7.8
.0035	2.8	.00675	5.4	.010	8.0

Film Definitions

PLASTIC FILM TERMINOLOGY

For PVC and polyolefins. Many of these terms are unique to the industry, and may have other more general meanings than those listed here.

Air Evacuation — A hole or series of holes placed in the film to allow the excess air in the bag to escape during shrinkage.

Antifog Film — A film containing a wetting agent which reduces the surface tension on the film to allow water to wet the surface rather than form water droplets, which causes a cloudy appearance.

Ballooning — The lifting action of the film away from the product caused by the pressurizing of the excess air in the bag during the shrink process.

Bead Seal — A heat seal formed when two pieces of plastic film are joined by melting the film with an electrically heated wire. The seal is bead-like in appearance and is made on an impulse "L-Sealer." (See HEAT SEAL)

Biaxial Orientation — A film that has been stretched under certain temperature conditions equally in both the machine and transverse directions.

Blister Film — Used in blister packaging. The film is rigid, clear plastic that is pre-formed and often heat-sealed to a coated paperboard. Other blister styles include fold over, clam shell, and slide designs.

Blocking — A condition where a plastic film tends to stick to an adjacent surface, either film or some other substance.

Blown Film — Film produced by extruding resin into a tube which is expanded by air pressure.

Bubble — The inflated tube of film in the blown film extrusion process.

Burnthrough — A weakening of the film where the heat of the tunnel exceeded the heat resistance of film. Typically, it will appear as a hole or a very cloudy area.

Cast Film — Film extruded through a flat die into a quench system.

Centerfolded Film — Film folded in half in the machine direction and then wound into roll form.

Centerfolder — A device used to produce centerfolded film from flat film.

Clarity — Degree of transparency.

Coefficient of Friction — In plastics films, indicates the ease with which a film surface is slid against like film or adjacent surface. A low value (near zero) indicates a slippery; a high value (7 or more) indicates a tacky film which will stick to itself. (See CLING, SLIP and TACKINESS)

Coextrusion — Two or more different materials simultaneously extruded into a composite film.

Copolymer — This is more than one gas polymerized together at the same time.

Core — A paper tube used as a base for forming a roll of film.

Crows Feet — The residual wrinkles that can be left in a poorly shrunk sample. They are normally associated with the excess film in the corners of the pouch.

Dancer Roll — A mechanical device used to control the tension of the film between the film unwind and fhe film sealing area.

Density — Weight per unit volume. Films with a low density offer more coverage per weight of film.

Dog Ears — The excessive film at the corners of the pouch formed by placing a three-dimensional item in a flat pouch. Excessive "dog ears" normally indicate poor shrink technique.

Electronic Hole Burner — A device that uses an electrical spark to burn a round hole in the film for air evacuation during shrinkage.

Electrostatic Seal — An electrostatic discharge is applied to the overlap of two ends of the film. This keeps the edge aligned until film blocks together in the shrink tunnel.

Elmendorf Tear Resistance — A measure of the resistance to tear after the film has been cut.

Elongation — The percentage a film will deform or stretch prior to breaking.

Extrusion — Technique for producing film. A mixture of resin and plasticizer is fed through a heated barrel where it is made plastic by heat and pressure by a continuously moving screw. The plastic mixture is forced out through a circular die, blown into a bubble, then wound onto a roll at the end of the bubble.

Film — A general term for plastics having a thickness of 0.010 inches or less.

Fish Eye — An unrefined or unmelted mass in a transparent plastic film which has not blended completely into the surrounding material, giving somewhat the appearance of a fish eye. Also called gel.

Fogging — A buildup of water droplets on the surface of a film.

Forming Head (Plow) — A mechanical device used to shape flat wound film into the desired bag shape needed for a particular package.

Gas Transmission Rate (GTR) — A measure of the permeability of a packaging film to gases. Expressed in cc/100sq. in./24 hrs./mil.

Gauge — Thickness of a plastic film (1/1000"=.001"=100gauge) (See THICKNESS)

Gloss — The amount of light reflected from a film at a given angle in ratio to the total light striking the sample. The more light a film reflects, the higher the gloss of the film.

Haze — The proportion of light which scatters in passing through a plastic film. Measured in percentage (the lower the percentage, the clearer the film), haze distorts colors and imparts a dusty, cloudy appearance to the film.

Heat Sealing — Joining plastic films by controlled application of heat and pressure to the area to be sealed (See also LAP SEAL, BEAD SEAL, and IMPULSE SEALING)

Hole Burner — A device that uses a hot wire formed in a circular shape to burn a round hole in the film for air evacuation during shrinkage.

Hole Punch — A device to punch a round hole in the film for air evacuation during shrinkage.

Impact Resistance — The resistance to impact of a film.

Impulse Sealing — A heat sealing technique in which a pulse of intense thermal energy is applied to the sealing area for a very short time, followed immediately by cooling. (See HEAT SEALING)

Initial Tear Resistance — A measure of the force needed to begin a tear in a film.

Inverting Head — A mechanical device used to separate and invert centerfolded film as the film is transferred into the sealing device of the wrapper.

Irradiation — A process that uses high-energy electrons to cross-link a film.

Lap Seal — A method of sealing, plastic films where the two pieces to be sealed are over-lapped, then heated to form a seal. (See HEAT SEALING)

L-Sealer (L-Bar Sealer) — A hot wire impulse sealing machine, mounted in an I-shape, used for sealing plastic films.

Low Temperature Flexibility — The lowest temperature at which film can withstand a flexing test without cracking.

Machine Direction (MD) — The direction parallel to that taken by the majority of molecules in a plastic film, or the direction of the film web as it moves through the film-making machine. Also called Longitudinal Direction.

Film Definitions

Migration — The transmission of a material from within a plastic film to its surface or to another contacting material. Also called Bleed or Exudation.

Mil — Measure of the thickness of a film. (.001"=1mil) (See THICKNESS)

Modulus — A measure of the film stiffness.

Moisture Vapor Transmission Rate (MVTR) — The rate moisture vapor will pass through film.

Monomer — A comparatively simple organic compound which can under certain conditions, react to form a polymer. (See POLYMER)

Orange Peel — A surface distortion of a plastic film which looks like the skin of an orange.

Orientation — Mechanical stretching of a plastic film to produce a parallel arrangement of its molecules. Films may be stretched unixially (in one direction, called preferential) or biaxially (in two directions).

Orientation Release Stress — The force exerted per square inch of film cross sectional area, when that film is shrunk by heat at a given temperature. Also called shrink force.

Plastic — A synthetic resin which
(a) generally has a high molecular weight;
(b) is made up of at least two atoms;
(c) is sold in its unprocessed and processed states but in between, while it is being processed into finished items, is softened enough through the combined application heat, pressure, and mechanical working to be formed into various shapes.

Plasticizer — A substance blended into a plastic to improve flexibility or softness.

Polyethylene — A resin made from ethylene gas which produces tough transparent film.

Polymer — A chain-like compound of high molecular weight formed by the linking together of simple molecules under suitable conditions. When two or more monomers are involved, the product is called a copolymer. (See MONOMER)

Polypropylene — A resin made from propylene gas which produces lightweight, highly transparent, stiff film.

Pseudo Shrink — Material (such as polyethylene film) that expands upon heating and shrinks as it cools.

PVC — (POLYVINYL CHLORIDE) — A thermo plastic material composed of polymers of vinyl chloride; a colorless solid with outstanding resistance to water, alcohols, and concentrated acids and alkalis. Compounded with plasticizers, PVC yields a flexible film, widely used in the manufacture of clothing and packaging films.

Resin — A solid or semi-solid organic material which has an indefinite and often high molecular weight; it exhibits a tendency to flow when subjected to stress and usually has a distinct softening or melting temperature range.

Sealing Wire — A nichrome wire which is heated by its resistance to electrical current. It is used for stealing and cutting shrink film.

Sheet — A general term for plastic having a thickness of 0.010" or more.

Shrink Film — A plastic film which meets all of the following criteria:
(a) A flexible film of gauge less than three mills.
(b) A film which can be redily sealed by the simple application of heat, pressure, and/or solvent.
(c) A film which will shrink (reduce a linear dimension) a minimu of 20% in at least one direction when subjected to heat.
(d) A film which exerts a shrink tension of 100 psi or more.

Shrink Force - The force exerted on the product by the film during the shrink process.

Shrinkage/Percent Shrink — The decrease in dimension of a film when it is subjected to heat.

Single Wound Film — Flat film wound on a core.

Skin Film — Used in skin packaging, this is heated and vacuum-sealed to a coated board over the product to be packaged.

Slip — A low coefficient of friction. (See COEFFICIENT OF FRICTION)

Slip Agent (Slip Additive) — An internal lubricant added to the formulation of PVC film which increases the slip (decreases the coefficient of friction) on the surface of the film.

Static — An electric charge generated by film moving across itself (unwinding from the roll) or any other surface.

Stretch Film — Used in packaging and unitizing, this film can be applied by hand or by machine for product protection and stabilization. In shipping and storage applications, stretch film is used to wrap or bundle skids of boxes or other packages together to prevent slippage and damage during transportation.

Surlyn — A trademarked film product from DuPont® used in skin packaging. Used in conjunction with a board stock, this film is used most often for retail packaging due to its high quality optics and excellent formability.

Tack — A high coefficient of friction. (See COEFFICIENT OF FRICTION)

Tear Strength — Elmendorf tear is a measure of the force required to continue a tear already started in the film sample. Results are reported in grams of force per mil thickness of film.

Tensile Strength — The force required to break a film.

Tension — A force exerted on the film from external sources.

Thermoplastic — A plastic which may be repeatedly softened by the application of heat.

Thermosetting — A plastic which, once cooled, may not be softened again by the application of heat.

Transverse Direction (TD) — The direction at right angles to that taken by the majority of molecules in a plastic film or the direction at right anles to that taken by the film web as it moves through the film-making machine.

Trim — The edges of film which are cut from a package formed on an L-sealer or side sealer when the seal is made.

Uniaxially Oriented Film (Preferential Shrink Film) — A film that will shink in only one direction.

Water Vapor Transmission Rate (WVTR) The penetration of water vapor through a packaging film or other barrier, expresses as grams/100square inches/24 hours at 100˚F and 90% relative humidity. WVTR is preferred over MTVR although both terms are synonymous with the same units.

Yield (Area Factor) — Area of material per pound of with, expressed a square inches per pound of square yards per pound.

Complete Information Available on Request.

PLASTIC INFORMATION

Extrusion Products

POR & Tubing: Lay flat width 12-1/2" to 60". Gusseted width 20" to 63". Length 15" to 240". Side weld length 12" to 240". A wind, B wind and reverse wind. Gauge .00035" to .004". Roll dia. 7" to 35". Boxed, cradled, gaylords and palletized.

Sheeting: Width 9" to 63". Roll outside dia. 7" to 35". Single or double edge trim. A and B winds. Gauge .00035" to .004". Single wound, double wound, J sheeting, M sheeting, perfed sheeting, centerfold sheeting, center-slit and center-slit guesseted sheeting. Boxed, cradled, gaylords and palletizing.
Films: Standard. HD. Differential slip. Shrink bundling. High heat/autoclave. Inserter bags.

Additives: All color. UVI. Flame retardent. Slip. Anti-block. Apple scent. Scented.

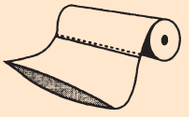
Film Definitions

Starfold: All standard sizes and packs for institutional liners. Guage 6 microns to 31 microns. Width 17" to 52". All colors. Individually folded in a dispenser case. Coreless rolls. Starfold on cored rolls with dispenser box. Retail packs. Biohazard bags. Custom sizes.

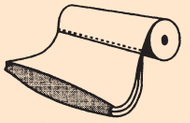
IC Bags: Lay flat width 12" to 56'. Length 18" to 48". Gauge .0006" to .004". Lay flat, individually folded and gang folded.

PLASTIC BAGS

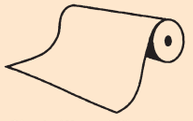
Ultimate
3-Ply Film Types
Custom Product Configurations



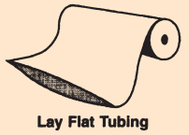
Tubular Bags



Gusseted Bags



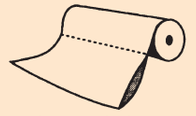
Single Wound Sheeting



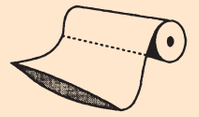
Lay Flat Tubing

Center Fold Sheeting

Perforated Sheeting

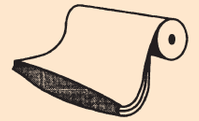


Center Fold Bags



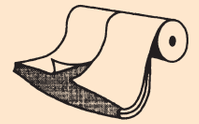
Sleeves

Double Wound Sheeting



Gusseted Tubing

Center-Slit Film



Center-Slit Gusseted

Standard grade. Clarity grade. Differential slip with low slip exterior, high slip interior. Three layers of high density material.

Product Applications. Bags-on-rolls. Box and drum liners. Shrink bundling film. Random printed bags. Foam-in-place sheeting. Lard bags. Poultry bags. Interleaving. Inserter bags. Breathable film for produce.

Custom Product Capabilites. Bags from 20" to 62" lay flat width. Gusseted bags opening to 62". Sheeting from 10" to 65" lay flat width. Gauge .0003" to .004". Slit tubing opening to 124". All colors. Printing one color, one side. Regular or butterfly venting. Treat one or two sides. Variety of roll diameters. Anti-stat. Flame retardant, slip/anti-block, UVI.

Note: Due to the unique process of 3-ply manufacturing, all combinations of sizes, film types and packaging may not be possible. A minimum of 2000lbs. is required on custom orders. Please consult with your representative.

POLY BAGS

How to Measure Weight of 1M Poly Bags

Polyethylene bags are purchased in raw material state and finished product state by the pound.

Convert bag dimensions to a flat size, i.e., 10"x3"x18" would be the same as 13"x18". Once the flat size of the poly bag is determined, multiply the weight by the height by mil thickness and divide by 15.

(wxhx mil thickness / 15 = weight M bags)

A 13"x18", 2mil bag would be 13x18=234x2=468 / 15=31.2 pounds /M bags. If paying $26.52/M bags, (26.52/31.2) cost is $.85/pound. Use slight variation of formula if bag thickness is less than 1 mil. In such case place a decimal before the mil thickness to ascertain weight/M bags. For a 13x18 bag: 13x18=234x.7/16=11.7 pounds/M.

Polyethylene Bags

Three constructions available: (1) side weld or side seal bags with seal on each bag side and folded film bottom; (2) bottom seal bags with folded film sides and seal on bottom; (3) form-and-fill bags with heat sealed back and bottom. Expansion gussets may appear on either of first two constructions.

Reusable. Varied constructions facilitate loading, closing, and carrying. Special features include extended lip, pressure sensitive tape, drawstrings, flip closures, die-cut handles, reinforcing patch handles, molded rigid handles, zipper-style closures, snaps and grommets.

Polyethylne bags fill a majority of packaging requirements for food processors, industrial manufacturers, apparel manufacturers, medical supply producers and retail stores.

Advantages include: bag transparency, excellent printability, protective water barrier properties, good tensile and impact strength.