

ELEMENTARY PAINT GLOSSARY

ELEMENTARY PAINT GLOSSARY*

Many definitions and descriptions given here emphasize the use of lay language for the benefit of the nontechnically trained reader. Accordingly, they are not intended to replace or be substituted for more scientifically precise and complete definitions to be found in standard professional references. Self-explanatory terms such as anti-skinning agent, blend, formula, gallon weight, mix-in, production rate, etc., are not included. Neither are product names such as Ti-Pure[®], Mcnastrals[®], Krolor[®], etc., nor names of lab equipment, mills, and most chemicals. These are discussed in detail in the various training lectures.

Acknowledgement is given to Jeffrey R. Stewart, Chemical Engineer of the Department of the Navy, for those definitions (some of which have been modified) obtained from "Stewart's Scientific Dictionary," Fourth Edition, 1953; and to Roy C. Martin for those obtained from his 1937 "Glossary of Paint, Varnish, Lacquer and Allied Terms."

-A-

Acicular: A term used to describe the crystal form or shape of a pigment, and denoting needle-shaped crystal structure. To be acicular, a pigment must be at least three times as long as it is wide.

Acid Number: also known as the acid value or neutralization number. It is the number of milligrams of potassium hydroxide (KOH) required to neutralize the total acidity in one gram of fat, oil, free fatty acids, etc.

Agglomerate: A group of two or more individual pigment particles that are so firmly held together by the force of adhesion that they tend to remain as an intact unit. The stronger the force of adhesion, the higher the milling energy required in paint manufacture to break them down.

Aggregate: A group of two or more individual pigment particles that are cemented together such that higher energy levels are required to separate them than needed for agglomerates. In some cases, paint grinding equipment may not break them down.

Aliphatic: The name usually applied to petroleum products from a paraffin base crude oil and sometimes called "straight chain hydrocarbons." Among the typical aliphatic hydrocarbons are mineral spirits, naphtha, and kerosene.

Alkali Resistance: Ability of a paint film to resist softening, blistering or other physical deformation when subjected to high pH materials such as NH_4OH , NaOH , lime, etc. Also the ability of a colored pigment to resist color change when subjected to alkalis.

* See addendum, commencing on p. 16, for additional definitions

Alkyd: A synthetic resin which is a condensation product involving a polybasic acid, such as phthalic, maleic, or succinic and a polyhydric alcohol, such as glycerine, the glycols, and pentaerythritol, usually with addition of a modifying agent.

Anatase: Tetragonal crystal form of titanium dioxide with a refractive index of 2.55.

Aromatic: The name given to solvents characterized by the presence of the benzene nucleus. Among the typical aromatic hydrocarbons are benzene, toluene, and xylol. Aromatic hydrocarbons usually have higher solvent power than aliphatic hydrocarbons.

Asbestos: A natural fibrous (acicular) magnesium silicate inert pigment or extender. Manufactured by International Talc.

ASTM: The official abbreviation for the American Society of Testing Materials under whose auspices specifications and methods of test are developed.

Attrition: The act of breaking down by rubbing together.

-B-

Barytes: Natural occurring barium sulfate (BaSO_4). An extremely inert extender which has poor hiding power and is therefore never used alone in paint.

Binder: As applied to the Protective Coatings Industry, a binder is not the same as a

vehicle. It is the non-volatile portion (only) of the vehicle, or the film forming ingredient. The binder portion of the vehicle is used to bind the pigment particles together.

Blanc Fixe: Synthetic barytes (BaSO_4) prepared by either treating a solution of a barium salt with sodium sulfate or as a by-product in the manufacture of hydrogen peroxide.

Bleed Resistance: When the color of a pigment in an undercoat passes through the topcoat and produces an undesirable appearance, it is said to be "bleeding." It usually occurs as a result of using a pigment that is soluble in the vehicle or solvent portion of the applied topcoat. The less soluble a colored pigment is, the greater is its bleed resistance.

Blocking: A term used to denote undesired adhesion between touching layers of materials such as occurs under moderate pressure during storage.

Body: A practical term which is rapidly becoming obsolete and whose meaning is more correctly expressed by the word "consistency" or "viscosity."

Bodying Agent: Any material added to a paint to increase the consistency or viscosity of the vehicle.

Brightness: As applied to illuminated objects, rather than lights, brightness is usually the ratio of amount of diffusely reflected light from an object or material to the amount of white light illumin-

ating the object or material. Any loss (by absorption or transmission) will lower brightness. For best correlation with the normal human eye, instrumental brightness measurements are usually made using a light source, filter, and receptor which (in total) corresponds to what the average observer sees in average daylight. In the paper industry, somewhat shorter wavelength (bluer) energy bands are weighted more heavily.

Build: The relative thickness of dry film resulting from a single application of a coating. High solids, high viscosity, thixotropy, and low penetration contribute to high build.

Bulking Value: The volume, in gallons, occupied by one pound of material such as pigment, oil, etc. To obtain bulking value, use the following formula: Bulking value (gal/lb) =

$$\frac{1}{\text{specific gravity} \times 8.33}$$

* of material.

-C-

Calcination: Same as roasting. The process of calcination involves the subjection of a substance to high temperature to drive off volatile material. The term also signifies the formation of oxides by heating oxyalts.

Catalyst: A substance which usually accelerates or changes the speed of a chemical reaction by taking part in the reaction, and which may be recovered

practically unchanged at the end of the reaction. Driers, for example, act as catalysts in the oxidation of vegetable and marine animal oils.

CBU: Carbon black undertone. This is the subdued color which results from varying the particle size of TiO_2 in a gray paint. Smaller particle size TiO_2 produces a bluer gray while larger particle size TiO_2 produces a yellower gray.

Chalking: The presence at, or just below, the surface of a coating of loose pigment formed from the film itself. It is usually detected by rubbing the film with the fingertip.

Checking: The presence in coatings of slight breaks in the surface of a paint film. These breaks are called "cracks" if the underlying surface is visible.

Chroma: Color intensity or purity of tone. The degree of freedom from grayness. Chroma is sometimes referred to as "saturation."

Clay: A mineral aggregate consisting essentially of aluminum silicate. It is a popular extender in water-based paints.

Color: A generic term referring inclusively to all colors of the spectrum, white and black, and all the tints, shades, and hues which may be produced by their admixture. A color is often described in terms of Hue, Value (or lightness), and Chroma (or saturation).

Color Uniformity: A measure of degree of color difference seen in an opaque colored paint film applied over adjacent surfaces of different porosity.

Consistency: The property of a material or composition (such as a paint) which is evidenced by its resistance to flow. While "consistency" is an accepted rheological term, it has qualitative meaning only, and is used with a qualifying adjective such as "buttery," "thin," "thick," etc.

Contrast Ratio: A numerical value (not greater than 1.00 or 100%) which is a measure of a paint film's ability to prevent light from passing through it. It is determined by dividing the reflectance of a paint film applied on a black surface by the reflectance of the same film applied on a white surface.

Cracking: That phenomenon manifest in surface coatings by a break extending through the coating to the substrate. Cracking is an advanced stage of "checking."

Croaking: The removal of color or pigment from a film as a result of abrasion or rubbing. If the color is removed by a wet cloth, the term "wet croaking" is used. If by a dry cloth, it is called "dry croaking."

Cure: This term is used in the paint industry to indicate toughening or hardening of a protective coating as a result of elevated temperatures, particularly baking enamels.

Diatomaceous Silica: Same as diatomaceous earth, fossil flour, and diatomite. It is a light colored material composed of the skeletons of diatoms. As an inert extender in paints, its chief function is as a flattening agent.

Diffuse Reflection: The scattering of light rays so that they travel in different cross directions rather than in parallel or radiating lines.

Dispersing Agent: A substance, compatible with the solvent or liquid, which aids in holding very finely divided matter in a dispersed state in the solvent. In the paint industry, most of the agents are soluble in water. As a rule, those agents used for dispersion can also be used for wetting.

Dispersion: This term is used loosely in many ways with special meanings which are often implied but not defined. For example, in paint technology a "good" dispersion usually means a pigment is finely divided and deflocculated in the vehicle. Where aggregates are present in the disperse phase, the material is considered without exception a "poor" dispersion regardless of the state of flocculation. Where the pigment particles are finely divided but flocculated, the material has been called variously a "good" and a "poor" dispersion.

Drier: Any catalytic material which when added to a drying or semi-drying paint vehicle, accelerates the drying or hardening of the film.

Drying Oil: Any liquid or oily material, always of an organic nature, which, when applied as a thin film, will readily absorb oxygen from the air and usually dry or harden to a tough, elastic film within forty-eight hours with or without the required amount of drier. Examples include linseed oil and soybean oil.

-E-

Efflorescence: A deposit of water-soluble salts on the surface of masonry or plaster caused by the dissolving of salts present in the masonry, migration of the solution to the surface, and depositing of the salts when the water evaporates.

Egg-Shell: A term used to describe the appearance of a protective coating which has little or no gloss. It is also sometimes used to describe an off-white color.

Emulsion: In the paint industry, an emulsion may be defined as a suspension of fine polymer particles in a liquid as opposed to the classical definition (the product of the dispersion of one liquid in another, the dispersed phase particles being larger than colloidal size).

Enamel Holdout: A property of a paint which influences the gloss of an enamel applied over it and varies inversely with its porosity.

Extender: The name given to low refractive index, low cost, inert pigments. Examples include magnesium silicate (talc), aluminum silicate (slay), and calcium carbonate (whiting). Extenders are used to increase the bulk of a paint, lower its unit cost, or provide some unusual film property. The use of an extender in a paint does not mean that the resultant product will be inferior.

-F-

Fade-Ometer: The trade name for a self-contained apparatus for reproducing in the laboratory the effect of exposure to sunlight on any material including paints. The source of light is a carbon arc.

Fading: The loss of color by the destruction of the coloring matter in a paint through exposure to light, heat, or other agents. Fading is sometimes misinterpreted as "chalking."

Filler: An inert, or extender pigment such as clay, barytes, whiting; etc.

Film Integrity: A term used to describe the continuity of an organic protective film. For trade sales flat wall paints, film integrity is often measured by its resistance to scrubbing and/or by its ability to resist staining.

Fineness: One of several methods by which oversize pigment particles (or vehicle gel particles) in a paint are measured. Gauges we use include Hegman, PC, and

NPINI. In some cases fineness can be measured by washing the paint through a specified screen (e.g. 325 mesh) and weighing the quantity of residue after drying.

Flat Hiding: The hiding power resulting from pigment/air interfaces: it is greater than that generated at pigment/resin interfaces.

Flatting Agent: As applied to pigmented finishes, a flatting agent is any material which is added to reduce the gloss of the dried film.

Floating: When pigment particles differing in size, shape, and density are present in a dry paint film, one type of particle may have a higher or lower concentration in the surface than in the body of the film. This is particularly true if the pigments are of different colors. If the distribution in the surface of the film causes a streaked, mottled, or otherwise non-uniform appearance, the phenomenon is called "floating."

Flocculation: The formation of loose (grape-like) clusters of pigment particles in a fluid suspension (e.g., a wet paint) caused by the force of their mutual attraction being greater than the forces which would tend to keep them dispersed. Increasing the dispersive force (e.g., stirring or shaking) will deflocculate the particles, but they will reflocculate when the added force is removed. Flocculation lowers hiding power of white pigments and tinting strength of colored pigments.

Flooding: When pigment particles differing in size, shape, and density are present in a dry paint film, one type of particle may have a higher or lower concentration in the surface than in the body of the film. This is particularly true if the pigments are of different colors. If the distribution in the surface of the film, although different from that in the body of the film, is sufficiently uniform to be unobservable with the naked eye, the phenomena is called "flooding."

Gloss: The shiny appearance of a paint due to the amount of light reflected specularly (similar to a mirror reflection). If a surface clearly and plainly reflects an image, it has a high gloss. Values are usually obtained at 60° or 20° on a gloss-meter.

Gloss Retention: The amount of gloss retained by a paint film after interior or exterior exposure. The closer the exposed gloss value is to the original gloss, the better is the gloss retention.

Grind: When used as a verb, grind means to incorporate a pigment or pigments into a liquid by any of the mechanical processes used in paint making. In these processes the aggregates or agglomerates of particles are broken up by shear, impact, attrition, etc. Such grinding rarely alters the individual particle size of the pigments.

When used as a noun, it is the paste consisting of pigment and vehicle produced by the grinding process. The noun is also used to describe the relative freedom of any film forming material from aggregates. In such a case, a paint is frequently referred to as having a good "grind."

Gypsum: A hydrous, crystalline calcium sulfate ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$). When the water of crystallization is removed by calcining, the product is often referred to as anhydrite (CaSO_4).

-H-

Haze: The dullness of a surface finish removable by burnishing. It usually results from faulty solvent balance or incompatibility of ingredients.

Hiding Power: A measure of the ability of a paint to cover another paint or surface of a different color.

Holidays: A term often used to indicate a skipped or missed portion unintentionally left uncoated with paint. Sometimes called "vacations."

Holdout: The ability of a paint to resist penetration into its substratum. The greater the penetration, the poorer the holdout. Also used to describe the ability of a flat paint to resist the penetration of enamels or semi-glosses applied over it.

Hue: The characteristic by which one color is distinguished from another such as red, blue, green.

Hydrophilic: Having an affinity for water, but not for oil.

Hydrophobic: Having an affinity for oil, but not for water. The term "lipophilic" is also frequently used.

-I-

Ilmenite: An iron-black mineral, iron titanate, which is a compound of iron, titanium, and oxygen. It is used extensively in the manufacture of titanium pigments. It occurs principally as a type of beach sand which is found in India, Florida, etc., and as massive rock deposits in the United States, Canada, and Norway.

Immiscible: Any liquid which will not mix with another specified liquid, in which case it forms two separate layers or exhibits cloudiness or turbidity.

Incompatible: This term is usually applied to solids in the same way that "immiscible" is applied to liquids.

Industrial Finishes: Paints that are usually applied at the factory to a finished product such as a refrigerator, beer can, metal siding, etc. A majority of these finishes are dried in baking ovens after application by spraying, dipping, roller coating, etc.

Inert: The term sometimes applied to the various extender pigments such as magnesium silicate, barytes, silica, mica, talc, calcium carbonate, etc.

Intumescence: To swell, bubble up, foam, or both as a result of heat. Certain fire-retardant materials used in paint intumescence when exposed to heat.

Ion: The name given to an atom possessing either a positive or negative charge, e.g., sodium ion Na⁺, chloride ion Cl⁻, etc.

-J-

-K-

Kaolin: Also known as China clay, terra alba, porcelain clay, etc. Its chief constituent is aluminum silicate.

Kauri-Butanol Value: The most popular method used for measuring the solvent power of petroleum thinners. The test is based on the precipitation or clouding method.

Krebs Units (KU): The unit of measurement for the consistency of a paint as determined by the Krebs Stormer Viscosimeter. It is an arbitrary value and is a measure of consistency and not viscosity.

-L-

Lake: A special type of pigment consisting essentially of an organic-soluble coloring matter combined more or less definitely with an inorganic base or carrier.

Lake Color: Pigments which are made by precipitating a soluble dye on a reactive or absorptive

base or substratum such as alumina hydrate. Toners are organic pigments which do not contain a substratum. Extended pigments are ones in which a toner has been let down with an extender such as alumina hydrate, clay, whiting, barytes, etc. In the case of lake colors, the color cannot be isolated from the substratum.

Lap: The area on a painted surface that results when the paint being applied to an unpainted area overlaps onto an already painted area that is either dry or partially dry.

Latex: Originally, this was a term used to designate the aqueous suspension of rubber obtained from the tree. However, this term is now applied to a wide variety of aqueous emulsions of synthetic resins or rubbers. In our laboratory we prefer to use "emulsion paints" rather than "latex paints."

Leafing: The ability of aluminum or bronze paint to form an apparently continuous, brilliant, metallic film on the surface. The flat pigment particles appear to align themselves more or less parallel with the coated surface.

Lecithin: A combination of esters of oleic, stearic, palmitic, and/or other fatty acids with glycerophosphoric acid and choline. Lecithins form perfectly homogeneous milky emulsions with water. Lecithins are also used as wetting agents for pigments to facilitate grinding and also help pigment suspension in alkyd paints. They are effective to a small degree as anti-floating agents. Both water soluble and oil soluble types are available.

Let-Down: Same as reduction. The materials such as solvents, driers, binders, and some additives, etc., which are added after the pigment dispersion, or grind, has been made.

Leveling: The ability of a paint film to flow to a smooth uniform surface free of applicator (brush or roller) marks and yet not sag or run.

Light Fastness: The ability of a color to withstand exposure to radiant energy without change from its original color and/or condition.

Lipophilic: Having an affinity for oil. Same as hydrophobic.

Litharge: A lead monoxide which is light yellow to brick red in color.

Lithopone: A white hiding pigment produced by mixing solutions of barium sulfide and zinc sulfate to form a co-precipitate of zinc sulfide and barium sulfate.

Livering: The progressive, irreversible increase in consistency of a pigment-vehicle combination which exemplifies itself as a rubbery or coagulated mass.

Long Oil Alkyd: An alkyd resin containing more than 60 per cent oil by weight as a modifying agent.

-M-

Medium: Also called "vehicle" or "binder." The liquid that is usually used to disperse a pigment in the production of paints.

Mica: A complex, hydrated aluminum silicate. The micas are recognized by their ability to split to practically molecular thickness along basal cleavage lines. This property permits the production of flexible flakes having a high diameter to thickness ratio. It makes mica an ideal reinforcing pigment since the particles tend to "leaf."

Micron: The standard unit of size used in the measurement of particle size of pigments. It is equal to one thousandth of a millimeter or approximately $1/25,000$ in. (0.00004 in.). There are 25 microns to one mil (one thousandth of an inch).

Mil: One thousandth of an inch.

Mineral Spirits: A refined petroleum distillate with volatility, flash point, and other properties that make it suitable as a thinner and solvent in paints. An aliphatic hydrocarbon.

-N-

Newtonian Flow: A type of flow characterized by rate of shear which is directly proportional to the shearing force. Newtonian flow can occur, at least ideally, under the influence of an infinitesimally small force. Oils, at sufficiently low rates of shear, exhibit Newtonian flow.

Nodular: Meaning spherical in shape. A term frequently used to indicate the shape of pigment particles as contrasted with the acicular type.

Non-Drying Oil: An oil which does not, of itself, possess to a perceptible degree, the power to take up oxygen from the air. It consequently does not form a tough surface film on standing exposed in thin layers to the atmosphere. Examples include castor oil, peanut oil, and coconut oil.

Non-Volatile Vehicle: The liquid portion of a paint that is not volatile. Specifically, the non-volatile matter is that which remains after the material has been placed in a ventilated oven at a temperature of 105° to 110° C. for a period of one hour. The non-volatile matter in a vehicle usually consists of oils, resins, driers, plasticisers, etc.

-0-

Oil Absorption: Quantity of oil required to just wet a definite weight of pigment when mechanically mixed. Oil absorption is usually expressed in pounds of oil per hundred pounds of pigment and is a measure of the void spaces between pigment particles.

Oil Length: The amount of oil, expressed in gallons, which is cooked with 100 pounds of resin. The greater the oil length, the more flexible is the vehicle. Oil length of alkyds is frequently expressed in weight per cent.

Opacity: The opacity of a material is the degree to which it prevents light from passing through it. The opacity of a paint is usually measured by contrast ratio.

Orange Peel: A term used to describe the surface of a sprayed film in which the droplets from the spray gun have not flowed completely together during drying to form a smooth, level surface. The appearance resembles the surface of the skin of an orange.

Oxidise: In a narrow sense, oxidation means the chemical addition of oxygen to a substance. More broadly it means to change from a lower valence to a higher valence with regards to the positive valence.

-P-

Pastel: A light tint. A mass-tone to which white has been added, or a white to which small amounts of color have been added.

pH Value: The pH value is simply a number denoting the degree of acidity or alkalinity of a solution. The numerical expression also describes the hydrogen ion concentration. A pH value below 7.0 is considered acidic and any value higher than 7.0 is considered alkaline or basic in its characteristics. A unit change in pH value corresponds to a tenfold change in acidity.

Pigment/Binder Ratios: The binder solids are usually expressed as unity and the pigment ratio as calculated. A P/B ratio of 0.5 means the paint contains 0.5 part pigment for every 1.0 part of binder solids by weight.

Pigment Volume Concentration (PVC): This is the ratio, by volume, of the total pigment in a paint to the total non-volatile material. It is calculated as follows: $\% \text{ PVC} = (\text{Pigment Vol.} + \text{Binder Solids}) \times 100$. Since a paint film is three dimensional, it is logical to relate its components on a volume basis.

Plasticizer: These are organic chemicals, which may be liquids or solids, and are incorporated into cellulose derivatives, natural and synthetic resins, and related substances to develop such properties as elongation, toughness, and flexibility.

Polar Groups: Polar groups are those carrying an ionic charge.

Polarized Light: Light which vibrates or travels in one plane or direction only. Ordinary light is propagated by transverse wave motion, with vibrations in all possible directions perpendicular to the direction of propagation.

Polymer: A polymer is a compound formed by the interaction of simple molecules having functional groups that permit their combination to proceed to high molecular weights under suitable conditions.

Porosity: Presence of numerous voids or air spaces in a paint film.

Primary Colors: In pigments they are known as yellow, crimson-red, and blue; also referred to as subtractive or minus colors. If all three are

superimposed, as in three-color printing, the theoretical result is black.

In the spectrum, the primary colors are known as scarlet-red, green, and violet; these are referred to as the additive or plus colors. If all three are superimposed, as in theatrical lighting, the theoretical result is white.

Purity: The specific quality of color distinguishing it from neutralized or dulled color. The term is sometimes used as one of the attributes of color. Often referred to as chroma, saturation, or intensity.

-Q-

Quick Drying: A material with a drying time of four hours or less.

-R-

Reduction: In a paint formula, the reduction consists of materials such as solvents, driers, binders and some additives, etc. which are added after the pigment dispersion, or grind, has been made.

Refractive Index: A measure of the deviation from normal that a beam of light undergoes upon passing through a given substance or the ratio of the velocity of light in a given medium compared with its velocity in air.

Relative Refractive Index: The ratio of the velocity of light in the first of two media to its velocity in the second media as it passes from one to the other. The higher the refractive index of a pigment (relative to the binder in which it is dispersed), the higher is the hiding power of the pigment.

Resin: A solid or semi-solid organic or amorphous material either of vegetable or synthetic origin and having little or no tendency to crystallize. The color is usually yellow or amber to dark brown, but some are water-white. Most resins are usually transparent or translucent.

Rheology: The science of the flow of viscous liquids.

Roller Coating: The method of applying paint to a substrate by means of hard rubber, steel, or gelatin rolls.

Rutile: Tetragonal crystal form of titanium dioxide with a refractive index of 2.71. The rutile type is characterized by higher opacity and density compared to the anatase type. Also the name of a natural titanium - bearing ore.

-S-

Scrubability: The ability of a paint film to resist erosion by scrubbing (usually with a brush, water, and a cleanser or soap).

Seeds: A term used to describe small undesirable particles in dried paint films or in the wet paint itself. The particles may

be soaps resulting from the reaction of an alkaline pigment (such as zinc oxide) with the vehicle acids to form these soaps. They also may be undissolved resin particles or resin that has precipitated out.

Set Time: The time required for a paint film to lose its fluidity -- become tacky. Fast set times are undesirable for brush or roller coat applications.

Shear/Strength Uniformity: A measure of the ability of a paint to maintain the same color regardless of the shear rate used to apply it (e.g., brush, roll, dip, spray, pour, or drawdown). Pigment flocculation and/or flooding contribute to poor shear/strength uniformity.

Sheen: The degree of shine or gloss produced by a low gloss finish at low angles of viewing -- usually about 5° above the plane of the film surface (85° gloss).

Short Oil Alkyd: An alkyd resin usually containing less than 45% oil as a modifier based on weight.

Solids: Solids denotes the percentage by weight of the non-volatile ingredients in a paint.

Solvency Power: A measure of the strength of the dissolving power of a solvent. It is usually expressed in terms of kauri-butanol value. The higher the K-B value, the greater the solvent power.

Solvent: This term is applied to products which dissolve or disperse paint film-forming constituents. They usually volatilize during drying and, therefore, do not become a part of the film itself. They are also used to control paint consistency.

Solvent Release: A term applied to the drying of lacquers.

Specific Gravity: The ratio of the weight of any volume of a substance to an equal volume of some other substance taken as the standard at stated temperatures. The usual standard for liquids and solids is water.

Spreading Rate: The area of substrate over which a unit volume of paint is spread, usually expressed in square feet per gallon.

Stabilizer: A substance that counteracts the effect of a vigorous accelerator and preserves chemical equilibrium. Many substances added to paints (particularly some of the newer industrial finishes) to make them more stable are also considered as stabilizers.

Stain Removal: A test which measures the ease with which common stains can be removed from a paint film. The test tends to measure porosity and surface smoothness of the film.

Substrate: A material upon the surface of which a paint is spread for any purpose. In the case of paints, the substrate may be: wood, steel, aluminum, plaster, lacquered paper, etc.

Surface Tension: The property existing in the surface film of all liquids which tends to contract the volume into a form with the least surface area. Water forming droplets on an oily surface is an example. The addition of a surfactant, which reduces the surface tension of the water, permits the water to wet the oily surface more uniformly.

Surfactant: A coined word which means "surface active agent." A material which can modify the surfaces and inter-surface forces between liquids and solids. Surfactant is a broadly descriptive term which includes soluble detergents in a liquid medium, dispersing agents, emulsifying agents, defoaming agents, penetrating agents, and wetting agents.

-T-

Talc: A natural, fully hydrated magnesium silicate used as an extender in paint systems.

Texture: The general physical appearance of the surface of a coating, (roughness or smoothness).

Thermoplastic: The group of synthetic resins that are permanently softened by heat and hardened by cooling. Many automobile finishes, particularly General Motors, are made with thermoplastic acrylic lacquers.

Thermosetting: A term used to describe plastic materials which become hard and infusible when heated and cannot be resoftened. Many phenolic, melamine, and urea resins, as well as some of the acrylics, are thermosetting. Chrysler, Ford, and American Motors car finishes have been made with thermosetting acrylic paints.

Thinner: Commonly used to describe paint solvents such as mineral spirits, petroleum spirits etc.

Thixotropic: A thixotropic fluid is one whose apparent viscosity decreases with time to some constant value at any constant rate of shear; i.e., its apparent viscosity can be gradually decreased to that limit by stirring. When stirring is discontinued, the apparent viscosity increases gradually back to the original value.

Tinting Strength: The tinting strength of a white or colored pigment is its ability to change the color of a paint having a different color than that of the material being tested. Colored pigments are usually tested for their ability to tint white, and white pigments are usually tested for their ability to tint a color.

Toner: An organic pigment which does not employ an inorganic carrying base. It is unreduced or unextended and is often a heavy metal salt of a water soluble dye.

Tooth: That condition of a flat or non-glossy surface which allows a succeeding paint film to adhere readily.

Trade Sales Finishes: Usually paints that are applied by brush or roller and are air dried. These include the paints that the home owner purchases for decorative or protective purposes.

-U-

Undertone: This is the subdued color which results from varying the particle size of TiO_2 in a colored paint. Smaller particle size TiO_2 produces a bluer undertone while larger particle size TiO_2 produces a yellower undertone.

Value: The "value" attribute of a color is simply designated as "light" or "dark." Value is sometimes referred to as "lightness."

Vehicle: The film forming and liquid portion of a paint before the paint has been applied and allowed to dry or harden. A vehicle is usually divided into two parts: (1) the non-volatile vehicle which may consist of oils, resins, plasticizers, etc., and (2) the volatile portion of the vehicle which may consist of solvents, diluents, etc.

Viscosity: A property of fluids which may be briefly described as a resistance to flow.

Viscosity, Apparent: Paints are non-Newtonian and the term "apparent viscosity" is applied only to non-Newtonian materials. It is not a constant for a given material, because its value depends on the rate of shear selected in making the measurements. "Apparent viscosity" is obtained by one-point methods.

V.M. & P. Naphtha: The abbreviation for Varnish Makers' and Painters' Naphtha. A straight-run petroleum spirits possessing an evaporation rate similar to xylene. Used as a thinner for paints. V.M. & P. is an aliphatic hydrocarbon.

-W-

Washability: A property of a paint film related to the ease with which it can be cleaned and resist film deterioration when washed.

Water Spotting: An imperfection in a dried film manifested by spotty changes in color or gloss. Water spotting may be caused by various factors such as emulsification or the solution of water soluble components.

Wavelength: The distance between corresponding points on two adjacent curves. The unit of measure used to be the millimicron, which is equivalent to one millionth of a meter. Wavelength has also been expressed in the Angstrom unit which is one tenth of a millimicron. More recently, however, wavelengths are being expressed in "nanometers" rather than millimicrons. A nanometer is one billionth part of a meter.

Weather-Ometer: Trade name for a self-contained apparatus for reproducing, in the laboratory, the effect of long periods of outdoor weathering on protective and decorative coatings. It operates on the principle that a light source, whose total radiation approximates noon June sunlight, is played on the surface of a test specimen under controlled temperature conditions and is periodically followed by a water spray of known temperature, pressure, and volume. The material thus exposed will take on surface and color characteristics similar to those produced by outdoor exposure. Carbon arcs are employed as the light source.

Wettability: The ease or ability that a pigment has for becoming wetted or coated with a vehicle. Wettability is one of the factors governing the ease of grinding of a pigment.

Wetting Agents: Surface active agents. A name given to chemical compounds having both hydrophilic (water soluble) and hydrophobic (water repelling or oil soluble) groups. Most of these compounds lower the surface tension of water.

Whiting: An inert, white, crystalline pigment composed principally of calcium carbonate. It is used extensively as an extender in paints.

-X-

Xylene: An aromatic hydrocarbon used as a solvent in paints. Also known as xylo.

Xylol: See xylene

-Y-

Yield: Normally the amount of mill base recovered after a paint grinding operation such as 3: roll milling, sand grinding, pebble milling, etc.

Yield Value: The initial pressure required to cause a plastic paint to flow.

FAL:mal
4/27/71

ADDENDUM

-A-

Acrylic Resins: Synthetic resins polymerized from acrylic acid and methacrylic acid. The more important resins are polymers of the methyl and ethyl esters of these acids or copolymers of mixtures of these monomers. These resins are characterized by their water-white color, resistance to discoloration, and perfect transparency. They may be thermoplastic or thermosetting.

-B-

Blister: A common type of paint failure usually caused by the application of a paint on a surface containing an excessive amount of water or other volatile material. Blistering is caused by the escaping volatile materials.

Blooming: Blooming may be caused by the deposition of a thin film of foreign material such as smoke, dust, or oil. The result is often a bluish fluorescent cast. Some organic coatings containing bleeding pigments like toluidine red will, under certain conditions, develop a colored "chalk" on the surface of the film immediately upon curing or sometime thereafter. This phenomenon is also called "blooming". The two phenomena can best be distinguished by the fact that rubbing the former with a cloth shows no color pick up, whereas rubbing the latter will stain the cloth the color of the finish.

Blushing: Blushing is a term usually applied to clear finishes (lacquers, for example) when they become partially opaque, cloudy, or translucent upon application or drying. There are two main causes: first, when solid ingredients become partially or wholly precipitated as a result of condensed moisture, and second, because of an improper solvent balance. In the latter, the solvents evaporate faster than the diluents, thus leaving the solid ingredients in a precipitated state which appears like a clouded finish.

Bronzing: See "Blooming"

-C-

Cold Checking: One of the most important requisites of finishes as applied to furniture. Also referred to as "temperature checking". It is a film rupture at an angle to the run of the grain.

Color Retention: When a protective coating exposed to the elements shows no signs of changing its color it is said to have excellent color retention.

Crystal Growth Stability: The tendency of a pigment particle to maintain its size in the presence of solvents, binders, and plastic matrices (sometimes called crystal stability).

Crystal Phase Stability: The tendency of a pigment particle to maintain its crystal habit and resist conversion to another, more stable form.

-D-

Dirty: When speaking of colored coatings, the term means the color is not clean or bright but is a muddy color.

Distinctness of Image Gloss: The sharpness with which image outlines are reflected by the surface of an object - particularly by a surface coating.

-E-

Flushed Colors: These are chemically precipitated colors which are dispersed in a vehicle by a flushing machine. The filter presscake is taken directly from the filter press and mixed with the desired vehicle. Since the pigment has a greater affinity for the water, the color is preferentially wet by the former. The water separates to the top of the flushing machine after which most of it is poured off.

Fungus: Any of the group of thallophytic plants comprising molds, mildew, smuts, etc., which produce an undesirable dark coating on paint films. See also "Mildew".

-H-

Heat Resistance: The tendency of a finish to maintain optical, physical, and/or chemical properties (e.g., gloss, flexibility, adhesion, attack by reagents) after exposure to thermal energy.

Humidity Resistance: The ability of a finish to retain gloss, color, and/or adhesion when immersed in water or exposed to condensing water vapor.

-I-

Intensity: See purity

-L-

Lacquer: The term "lacquer" usually indicates that the material dries by evaporation and forms a film from the non-volatile constituents as opposed to cross-linking or oxidizing. The best known is nitrocellulose lacquer, while the newest are the thermoplastic acrylic lacquers.

Luster: The gloss, shine, or brightness of a finished surface is spoken of as its luster.

-M-

Metallic Finish: Any of the industrial baking finishes to which aluminum or other metal flake has been added to provide flamboyancy. Typical are the finishes used on bicycles and automobiles.

Mildew: A superficial growth produced by mold or fungus. Two types are common: 1) The spore type which resembles caviar and 2) the filament type. A microscope is necessary to differentiate the spore type from dirt collection. Dirt can frequently be removed by washing, but mildew will remain in the film as a dark stain.

Milkiness: A term used to describe the appearance of a protective coating which has a white appearance, such as when moisture becomes mixed with

lacquers. Also describes the flooding or floating of white pigment on the surface of a colored coating.

Mold: See Mildew

-O-

Oleoresinous: A generic term used to define an orthodox type of material which is a combination of oils, resins, thinners, driers, etc. An alkyd enamel may be called an oleoresinous finish.

Oxidizing Alkyd: This term normally applies to the oil modifier which polymerizes and ultimately dries as a result of oxygen acceptance. Drying oil modifiers of this type include soybean, china-wood, linseed, citicita, and fish oils. The nonoxidizing types contain nondrying modifiers such as cottonseed oil, coconut oil, rosin, stearic acid, etc.

-P-

Paint: A paint is a pigmented liquid composition which is converted to an opaque solid film after application as a thin layer.

Pigment: As a noun, this is a solid in a state of subdivision which is fine enough for incorporation in a vehicle to make paint. Some important classes of pigments are:

1. **Opaque pigments** which impart opacity or hiding power to a paint.
2. **Colored pigments** which impart color to a paint.
3. **White pigments** which impart opacity without color.

4. **Low opacity pigments** which impart little opacity or color.
5. **Extenders** which supply pigment bulk, desirable variety in shape, size, and size distribution of particles, usually at relatively low cost (e.g., calcium carbonate).
6. **Chemically active pigments** which react with the ingredients of the paint vehicle (e.g., red lead).
7. **Flake pigments** which have flat, plate-like particles that tend to align themselves parallel to the coating (e.g., aluminum flakes).
8. **Prime pigments** which are the opaque pigments required in significant proportions in coatings (e.g., TiO_2).
9. **Composite pigments** which are mixtures of two or more manufactured pigments (e.g., chrome green).

The above classes of pigments are not mutually exclusive. That is, a pigment may have the characteristic of more than one class; thus red lead is an opaque pigment, a colored pigment, a chemically active pigment, and is the prime pigment in red lead paint.

Pinholing: Pinholing is just what the name implies -- the appearance on the finished surface of tiny holes, usually not much larger than a pin point. Pinholing is caused by escaping gases of some sort breaking through the finished film after it has set sufficiently to lose its flow properties, but before it has lost its plastic nature.

If the surface once becomes thoroughly dry without pin holes, they will never appear.

Polar Solvents: Solvents such as alcohols and ketones that contain hydroxyl or carbonyl groups, have high dielectric constants, and show strong polarity.

Primer: The paint used for a first or priming coat. The primer may be the same paint to be used subsequently for the finish coat, except perhaps for the addition of oil or thinner by the painter, in which case it is a self-primer. If the primer is a paint made for use only in priming, it is a special primer.

-R-

Repair Finish: The name given to an automotive finish used to repair scratches and other marred areas that occur during the manufacture of the car. It is similar to the original finish except that a catalyst has been added to permit the use of lower baking temperatures than those used with the original finish. Not to be confused with a refinish paint which is used to repaint damaged areas after the car has been sold. Refinish paints require very low bake temperatures or may be air dried.

-S-

Sagging: A term which describes the tendency of a wet film to flow downward and therefore become thicker in one area than another when the coating is applied to vertical surfaces.

In pronounced cases, the phenomenon is sometimes called "curtaining" although sagging is the more generally used expression.

Saturation: The attribute of any color possessing a hue that determines the degree of its difference from the grey of the same lightness.

Skin: A tough layer of skin formed on the surface of a paint or varnish caused by exposure to air which produces oxidation or polymerization of the vehicle at the surface of the coating.

Stain: A solution or suspension of coloring matter in a vehicle, designed primarily to be applied to the surface of articles to impart color effects rather than to form a protective coating. One of the more common uses for stain is its application to wood, thereby deepening or altering the color while preserving the natural texture or markings.

Strength: (See Tinting Strength)

-T-

Tint: A color produced by the mixture of white material in a predominating amount with a colored material. The tint of a color is, therefore, much lighter and much less saturated than the color itself. The term "tint" is sometimes used to describe the undertone of a color.

-U-

Ultraviolet Light: The name of the light rays which are outside of the visible spectrum at its violet end and which deviate from a straight path more readily than violet rays. The ultraviolet rays range from 120 to 4000 Angstrom units and are largely responsible for many types of failure of protective coatings due to their interaction with the organic binders and subsequent degradation of the latter.

-V-

Varnish: Any homogenous, transparent, or translucent liquid which, when applied as a thin film, dries on exposure to air to a continuous film, giving a decorative and protective coating to the surface to which it is applied.