
THE NATIONAL BUREAU OF STANDARDS
UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON, D. C.

September 28, 1936

PREPARATION OF PAINTS FROM SEMIPASTE PAINTS,
THINNING READY-MIXED PAINTS, AND
PREPARATION OF WATER PAINTS

This is primarily a digest of the sections of Bureau of Standards Circular No. 69 (November 17, 1917), "Paint and Varnish";¹ and Technologic Paper No. 274 (December 15, 1924), "Use of United States Government Specification Paints and Paint Materials",² by P. H. Walker and E. F. Hickson, dealing with preparation of paints from semipaste paints, the thinning of ready-mixed paints, and water paints and their preparation.

The following papers contain additional information relative to paint pigments, oil paints, and water paints:

- TIEM - 30 "Paint Pigments--White"
- TIEM - 31 "Paint Pigments--Black, Red, and Lakes"
- TIEM - 32 "Paint Pigments--Yellow, Brown, Blue, Green, and Bronze"
- TIEM - 33 "Federal Specification Paint Pigments and Mixing Formulas"
- TIEM - 34 "Federal Specification Ready-Mixed Paints, Semi-paste Paints and Mixing Formulas"
- TIEM - 35 "Preparation of Paints from Paste and Dry Pigments"
- TIEM - 43 "Aluminum Paints"

¹Out of print. May be consulted in Government depository libraries.

²Available from Superintendent of Documents, Government Printing Office, Washington, D. C. (Price 10 cents).

Paint is "a mixture of pigment with vehicle, intended to be spread in thin coats on surfaces for decoration or protection, or both."¹

The principal distinction between paint and varnish is that paint contains an appreciable amount of pigment in suspension substantially insoluble in the vehicle; while varnish consists of a liquid in which resins or waxes contained therein are mostly in solution.

Semipaste paints may be poured from the container and are, therefore, easier to break up than paste pigments which are quite stiff. When more than one coat is required and the work is to be done under skilled supervision, it is generally advisable to purchase semipaste paint.

Ready-mixed paints as compounded are intended to be used for final coats, or for one coat repainting work if the previously painted surface is in good condition. High grade ready-mixed paints reduced by a reliable paint manufacturer, if intelligently selected, may be expected to give entire satisfaction. High grade service should not be expected from low value products.

When skilled supervision is not available, it is frequently best to use ready-mixed paint, since the manufacturers' label provides simple directions for reducing such paints for priming and body coats.

Preparation of Paints from Semipaste Paints

Although semipaste paints as compounded are sufficiently thin to pour from the container, they require further breaking up and thinning before they are ready to be applied. In preparing paints from semipaste paints, the semipaste must be thoroughly mixed before adding the thinning liquids which should be done gradually and with constant stirring until the paint is of proper consistency for use. Such paints should be carefully strained before being applied.

Thinning Ready-Mixed Paints for Various Uses

Manufacturer's Directions: For priming (first coat work on unpainted surfaces), and body coat (second coat work) the ready-mixed paint should be thinned according to directions usually provided by the manufacturer. In following these directions it is generally advisable to pour off most of the clear liquid at the top of the container.

¹Quoted from "Standard Definitions of Terms Relating to Paint Specifications", American Society for Testing Materials (1955), pp. 735-739.

The settled pigment and the remaining vehicle should then be thoroughly mixed by stirring with a stout paddle. A little of the remaining liquid should be added and stirred thoroughly, repeating the process until all is added. Should additional liquid be required, it may be added in the same way. Paints should always be mixed and strained before using.

Specific Directions: The following directions are provided to supplement those supplied by the manufacturer:

Priming soft porous wood: Add about one-half gallon raw linseed oil and about one pint of turpentine to each gallon of paint.

Priming hard or resinous wood: Add about one pint raw linseed oil and about one-fourth gallon turpentine to each gallon of paint. However, in recent years, there appears to be a trend toward adding less oil to the finished paint for priming coats. Special priming coat paints for wood have also appeared on the market. These primers are formulated differently from the finish coat paint.

Body coats: Add about one pint turpentine or mineral spirits to one gallon of paint.

Finish coats: Use the paint as it comes from the can.

Caution: Driers should not be added to ready-mixed paints.

Water Paints and Their Preparation - Whitewash

Lime, the basis of whitewash, provides a very sanitary coating which is usually preferred for cellars and the interiors of out-buildings. It is the least expensive of all paints and, for certain purposes, is the best.

Use of an insufficient amount of water produces "scorched" lime which is generally lumpy and transparent. Too much water retards the slaking process by lowering the temperature.

Numerous substances, such as flour, skimmed milk, glue, molasses, soap, alum, and sodium silicate are sometimes added to whitewash to increase its adhesion.

When organic substances, such as flour, milk, glue, molasses, etc., are added to whitewash, it is advisable to add some preservative to prevent putrefaction. The most commonly used preservatives for this purpose are sodium chloride (common salt), zinc sulphate, alum, and formaldehyde.

Caution: Whitewash containing organic matter should not be used in damp interiors, even though preservatives are added.

Preparation of Ordinary Whitewash: Ordinary whitewash is made by slaking about ten pounds of quicklime with two gallons of water. The lime should be placed in a pail and the water poured over it. The pail should then be covered with an old piece of carpet or cloth and the whitewash allowed to stand for at least an hour. Before using, sufficient water should be added to the mixture to bring to brushing consistency.

Bureau of Lighthouses Formulas: The following old formulas for whitewash issued by the Bureau of Lighthouses U. S. Department of Commerce is claimed to be satisfactory for outside exposures, although better formulas may be found in Bulletin 304-C described later herein.

"Slake half a bushel of unslaked lime with boiling water, keeping it covered during the process. Strain it and add a peck of salt dissolved in warm water, three pounds of ground rice put in boiling water and boiled to a thin paste, one-half pound of powdered Spanish whiting, and a pound of clear glue dissolved in warm water. Mix these well together and let the mixture stand for several days. Keep the wash thus prepared in a kettle or portable furnace, and when used, put it on as hot as possible with painter's or whitewash brushes."

A simple formula now given in Lighthouse Service instructions is "to ten parts of best freshly slaked lime, add one part of best portland cement, mix well with salt water and apply quite thin."

Miscellaneous Information and Formulas: For more practical information about whitewash and its application the Bureau of Lighthouses suggests National Lime Association Bulletin 304-C "Whitewash and Cold-Water Paints."¹ The Paint Laboratory, National Bureau of Standards, is of the opinion that this information is the best on the subject that has come to its attention.

Cement Wash

For certain purposes, especially on exposed places, a wash made of hydraulic cement is preferable to whitewash.

Preparation: Cement wash is made by mixing three parts of portland cement and one part of fine sand, with any desired coloring (e.g. Venetian red), and adding sufficient water to produce as thick a mixture as can be readily applied with a whitewash brush.

¹ Available from the National Lime Association, 927 - 15th St., N. W., Washington, D. C. (Free).

Proprietary Brands: Excellent proprietary brands of cement water paints, in dry powder form, are available in white and about twelve tints. The powder is generally mixed with water in equal parts by weight, one pound powder to one pint water. These powders in general are mixtures of white portland cement, with or without hydrated lime; and contain small amounts of moisture retaining materials, such as calcium chloride; waterproofing agents, such as calcium stearate; small amounts of titanium pigment; and lime-proof tinting colors, properly ground and blended by the manufacturer.

Calcimine

Cold-water paints or calcimines have as their basis whiting or carbonate of lime instead of caustic lime, as in whitewash. This material itself does not adhere, and it is necessary to use a binder of some kind, generally glue or casein.

Preparation of Ordinary White Calcimines: Ordinary white calcimine may be made by mixing sixteen pounds dry whiting with one gallon water until free from lumps, and adding a solution of one-half pound glue in one pint water. The glue may be dissolved by soaking for several hours in cold water, and heating on a water bath (glue pot) until completely dissolved. The addition of sodium phosphate to calcimine has also been recommended.

Tinting White Calcimines: The tinting of white calcimines should be done with colors that are not affected by lime, namely, yellow ocher, siennas, umbers, Venetian red, para-red, maroon oxide, ultramarine blue, ultramarine green chromium oxide, bone black, etc. If lamp-black is used for tinting, it should be stirred in hot water containing a little soap, or in cold water containing a small amount of borax.

Proprietary Brands: Excellent proprietary brands of calcimines, cold-water calcimines and hot-water calcimines, are available in white and about twenty beautiful, soft tints. They dry rapidly and do not give off objectionable odors. These coating materials are properly ground and blended by the manufacturer who usually provides complete mixing directions on the package. In the absence of such directions, cold-water calcimines are generally mixed in the ratio of five pounds of powder to three and one-half pints of water, and hot-water calcimines in the ratio of five pounds of powder to five pints of water. All calcimines should be strained before using.

Typical Casein Calcimine Formulas: Casein is marketed in two forms, soluble and insoluble. Since the insoluble form, pure casein, is the one usually employed in calcimines, it is necessary to add some alkaline substance, such as soda ash (sodium carbonate), borax, or ammonia to render it soluble. It is also necessary to add some preservative

as carbolic acid (phenol), chromealum, thymol, or formaldehyde when casein is used in calcimines.

Interior Use: To prepare casein calcimines for interior use, thoroughly mix in the dry state eight pounds pure casein, one pound soda ash (58 percent), sixty pounds "gilders' bolted whiting", and twelve pounds plaster of Paris. The mixture should then be treated with water to produce the desired brushing consistency and let stand for a short time to allow casein to dissolve.

Exterior Use: Casein calcimines for exterior use may be prepared by dry mixing eight pounds pure casein, ten pounds air-slaked lime, and one pound pulverized borax with sixty pounds of "gilders' bolted whiting". This dry mixture should be kept in sealed packages until needed, at which time it should be mixed with water as for interior use.

Water-resistant Calcimine: This type may be made by heating one pound casein with one pint cold water, diluting with three quarts cold water, and adding eight fluid ounces ammonia. Stir this solution until a smooth jelly is produced, after which, one-fourth fluid ounce formaldehyde (40 percent) should be added. This mixture acts as a binder into which whiting or any other pigment, white or colored, not affected by alkali, may be stirred until a moderately thick paste is obtained. The paste is then diluted with water, alcohol, turpentine, or linseed oil, as desired, until of proper brushing consistency.

Federal Specification: See TT-P-23 "Paint; Cold-Water, Casein-Binder, Light Tints and White",¹ covering two grades (whiting grade, dry powder; and zinc sulphide, titanium oxide grade), and two types (dry powder, and paste). This modern decorative material is available in black, as well as white and a variety of soft, delicate tints. Its popularity has increased enormously during the past two years, and excellent proprietary brands of casein paints both in powder and paste forms are now available and recommended instead of those mixed by hand.

Casein cold-water paints are not as durable as oil paints, especially for exterior application. Although sometimes used for temporary exterior work, they are applied chiefly for decorating plaster and other dry interior masonry surfaces. Before using cold-water paint, all iron and steel, such as nail heads, etc., should be coated with oil paint to prevent rust stains. Some cold-water paints when applied on masonry subject to dampness, such as cellar walls,

¹Available from Superintendent of Documents, Government Printing Office, Washington, D. C. (Price 5 cents).

may turn black through the formation of mildew. Such paints should always be used the same day as mixed. On most unpainted surfaces, and particularly on wood, it is advisable to use a priming coat prior to applying the cold-water paint. Generally speaking, cold-water paints should not be scrubbed with strong soap and water. When cleaning is necessary the paint may be washed rather gently with mild white floating soap and water.