A B C's OF PAINTING

A. Allow plenty of time for drying between coats.
B. Brush paint out to a uniform thickness of paint film.
C. Clean all surfaces properly before applying paint.
D. Don't pay for large amounts of "sand" and "water" in paint.
E. Establish a systematic painting program.
F. Follow painting directions carefully.
G. Gather information on paints and painting from authentic sources.
H. Hire skilled painters to do the larger, more difficult paint jobs.
I. Investigate the formula on the can of paint before buying.
J. Judge paints by their durability.
K. Keep paints tightly covered when not in use.
L. Let the whole family help with the painting program.
M. Mix paints thoroughly and make some of your own painting equipment.
N. Never put a used brush away without first cleaning it thoroughly.
O. Open paint cans carefully to avoid waste and so covers can be replaced tightly.
P. Provide the necessary equipment and high quality materials to do the job properly.
Q. Question doubtful paint formulas.
R. Repair before painting.
S. Save money by intelligent selection of paint. Cheap paints may be expensive.
T. Take time to do each paint job well.
U. Underlay finish coats with well-anchored foundation priming coats.
V. Visit your neighbor and observe his paint successes and failures.
W. Wait for satisfactory painting weather.
X. Y. Z. The X Y Z of successful painting depends largely on the paint selected and skill of the person who applies it.

PAINTING FARM BUILDINGS AND EQUIPMENT

SELECTION AND APPLICATION OF PAINTS SUITABLE FOR EXTERIOR AND INTERIOR SURFACES

By

W. A. ROSS, *Subject-Matter Specialist*
Agricultural Education Service, U. S. Office of Education
Federal Security Agency

and

DON CRITCHFIELD, *Manager*
Agricultural Service Division, Lead Industries Association

Prepared and Published by Lead Industries Association with the U. S. Office of Education, Federal Security

A sure sign of a progressive farmer—well painted buildings in attractive and well-kept surroundings.

FOREWORD

The importance of making the farm home grounds and surroundings more attractive and useful can hardly be overemphasized. Unpainted or poorly painted buildings certainly detract from the appearance of any farmstead, regardless of its setting.

In rural areas one finds evidence on every hand of the need for assistance in connection with satisfactory farm painting programs. The need for systematic instruction on the selection and application of paints suitable for the exterior and interior surfaces is also apparent. Where time and thought have been given to such matters by those concerned, the appearance of the farmstead and the farm home is not only more pleasing but the value of the farm is enhanced. In addition, farmers who establish and maintain neat and pleasant surroundings are likely to be more contented and progressive.

Just as the skills of farm blacksmithing and carpentry are taught with the use of the raw materials—iron, steel, and lumber—so may the fundamentals of farm painting be taught to the youth in vocational agriculture and to adult farmers by instructing them how to make home-mixed paint with the basic materials, and how to judge factory-prepared paints. Linseed oil from our flax crop and gum turpentine from the live slash pine trees of the south are both products of the farm. It is appropriate, therefore, that students become familiar with their use in paints for farm buildings.

This publication is designed to provide teachers of vocational agriculture and farm people in general with reliable subject-matter. It is organized in a usable form, including jobs dealing with painting farm buildings and equipment. Many new ideas and considerable hitherto unpublished material have been included. Farmers, teachers, and householders should, therefore, welcome such a publication since much practical assistance can be derived from its pages.

Grateful acknowledgment is made to the United States Office of Education for the splendid cooperation and assistance given which made this publication possible. In addition to providing

the time of a staff member, necessary working materials and stenographic service, there was also a valuable contribution in guidance in terms of the entire undertaking.

Special thanks are due to Dr. F. L. Browne, Senior Chemist, U. S. Forest Products Laboratory, Madison, Wis., who offered many helpful suggestions and provided illustrations showing paint failures.

Valuable assistance was secured from experienced painters and decorators located in various parts of the country; from specialists in the U. S. Bureau of Standards; from representatives of the lumber manufacturers' associations; from government publications; and from supervisors and teachers of vocational agriculture.

PAINTING FARM BUILDINGS AND EQUIPMENT

Selection and Application of Paints Suitable for Exterior and Interior Surfaces

INTRODUCTION

A knowledge of painting procedures and materials is of considerable value to the average person who intends either to do painting or have it done. This is especially true on farms and in rural areas, where expert painters are not always available. Unfortunately, there are inferior paints on the market which give very unsatisfactory results. They are often cheap as to initial cost per gallon but will not stand up well over a long period under average weather conditions. Flaking and peeling, for example, often take place within a few months after application. Cheap paints may also contain reinforcing oils and pigments that crack and scale to such an extent that they hasten the destruction rather than protect the materials they are designed to protect. Moreover the old paint must be removed in order to get a smooth and permanent repaint job.

Paints of various kinds have been used for purposes of decoration and protection for centuries. The history of paints and painting is a story involving many discoveries of new methods and new materials. White lead, which is still the most widely used single white pigment for exterior painting when white or light colors are desired, was known to the ancients, and such Latin writers as Pliny told of its use. Some twenty-five hundred years ago, history tells us that the Egyptians used a paint that probably contained certain pigments mixed in a solution of glue. Earth pigments, such as the umbers, the siennas, and the oxides of iron have been in use since those early days; yellow ochre was also used by the ancients. Other colored pigments came into use during the Middle Ages, and their use has expanded on down through the centuries.

Figure 1.—An unsatisfactory paint job is costly and detracts from the appearance of the entire farmstead.

Many improvements have been made in paints in the past quarter century. The leading paint manufacturers, as well as certain governmental agencies, have well-equipped laboratories where men experiment constantly with various materials and develop reliable information from which color pigments have been made clearer and more resistant to light. This is particularly true of the blues, chrome greens, and chrome yellow. An outstanding blue pigment known as phthalocyanogen blue, is a recent addition. This is a light-fast organic pigment and is not affected by heat, alkali, and acids. It is used in high-grade paints, enamels, and printing inks. The newer types of titanium pigments have remarkable opacity and whiteness. White lead in combination with zinc oxide and titanium pigments is used in many of the extra white factory-prepared paints of today.

Linseed oil, known and used for centuries, is still the most satisfactory and widely used vehicle for exterior paint. In recent years, small proportions of china wood oil have been used in conjunction with linseed oil in house paint primers, trim and trellis paints, porch and deck paints.

Factory-prepared flat wall paints for interior use usually include lithopone or titanium pigments in treated oil or varnish vehicles. Enamels for interior woodwork consist mainly of lithopone or titanium pigments in synthetic resin varnish vehicles. There is, of course, a great variation in quality in these synthetic enamels. When factory-prepared paints are desired, the consumers' best guide is always to purchase products made by a reputable manufacturer, and to tell the dealer from whom the purchase is made the specific use for which the material is intended.

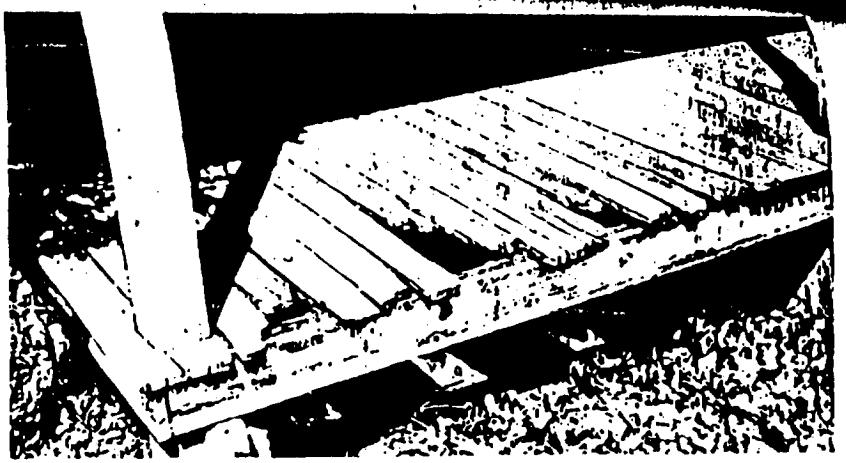


Figure 2.—Porch floors deteriorate when not properly painted.

Before buying exterior paint it is advisable for the consumer to find out about its composition. Although many paints are plainly labelled with the formula of the contents, the names of some of the transparent pigments used as fillers and extenders are sometimes misleading. Extenders add bulk and weight to the paint in a can, but have little hiding power, and shorten the durability of the paint film. A list of extenders follows:

1. Calcium carbonate (also known as whiting, chalk, or pulverized limestone.)
2. Silica (also called silicious matter, quartz or sand.)
3. Calcium sulfate.
4. Barium sulfate (Barytes.)
5. Magnesium silicate (talc, china clay, or soapstone.)

The most important ingredients used in the manufacture of high quality exterior white and tinted paints are white lead and linseed oil or white lead, zinc oxide, and titanium dioxide with linseed oil. Gum turpentine is used as the thinner for most high grade paints and varnishes.

In studying or analyzing the formula of any paint, it is important to note the proportion of pigments to vehicle. A good formula for exterior white or tinted paint will usually contain not

less than 65% pigment to 35% liquid, by weight*. Among the unidentified vehicles or liquids in the formulas of low-grade paints are:

1. Fish oil.
2. Oriental oil.
3. "Paint Oil."
4. "Boiled oil" (other than linseed.)
5. Vegetable oils.
6. Volatile thinner.
7. Water.

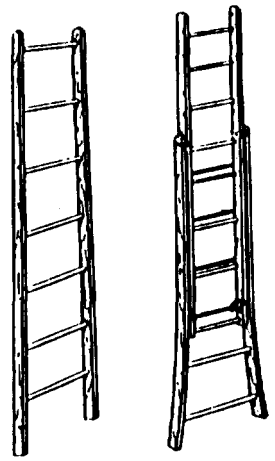
Low grade exterior paints sometimes contain as much as 35% water, designated by such terms as "emulsified solution," "colloidal solution," "solution," "aqueous body agent," or occasionally as just plain water. Durable exterior paints should not contain more moisture than the trace of water which is present in certain of the dry pigments used.

* Federal specifications for lead and zinc type and titanium, lead, zinc type paints Fed. Spec. TTP 86a Class 1 and TTP 101a Type A call for formulas with a minimum of 68% pigment and 32% liquid.

PAINTING EXTERIORS OF WOOD BUILDINGS

PROVIDING EQUIPMENT FOR EXTERIOR PAINTING

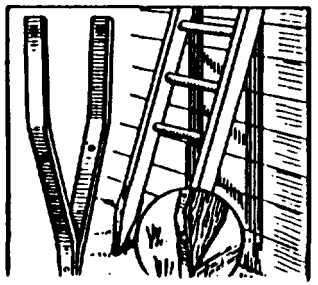
LADDERS AND SCAFFOLDING



For exterior painting of buildings up to 18 feet in height, one 16-foot ladder, one 12-foot ladder and a five-foot ladder will be required to reach the surfaces. This will avoid working under ladders, which is not only inconvenient, but causes considerable loss of time, and may be hazardous. For painting a two-story building up to 30 feet in height, a thirty-two foot extension ladder should be substituted for the 16-foot ladder. Every additional ten feet in height of a building will require a like increase in ladder length to reach the highest point.

To make ladders safe and to keep them from slipping on platforms or hard surfaces, it is advisable to place "ladder shoes" on the lower ends of the side rails.

Window brackets or window seats are handy for painting exteriors of window frames and sash. Such equipment allows the full use of both hands, provides a place for the paint bucket and painting is less tiring than from a ladder.



Where two ladders are available the use of ladder jacks and planks will facilitate the work. In the staining or painting of roofs, roof brackets or ridge hooks and planks are essential to do the work in a safe and satisfactory manner.

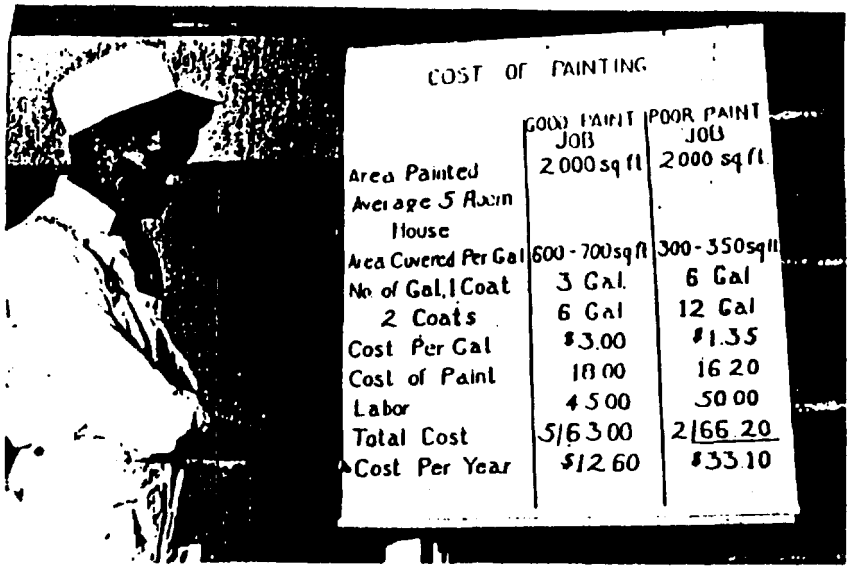


Figure 15.—Student comparing the service of paint jobs on an annual cost basis.

others interested for the purpose of comparing the durability of various paints.

To judge the selling prices of paint, the average cost of the pigments and oils used in its manufacture may be used as a basis. (See page 31.). The cost of packaging, manufacturing, selling and shipping remains somewhat the same with all paints. So if the amount of each ingredient and percentage of it in relation to the other ingredients is stated on the label and comparative costs of the raw materials are known, the value of the paint in the container can be judged fairly. (See Formula Survey blank page 29.)

5. Bulking Value of Pigments.

In comparing pigments there is another very important factor. Each pigment has a "bulking" value when mixed with the paint liquids. Just as starch or flour fills up a measure or bulks more per pound than sand or rock, paint pigments have similar bulking characteristics. This is the main reason why such substitutes and fillers as calcium carbonate (limestone), silica (sand), magnesium silicate, and other inexpensive raw materials are introduced in paint formulation, replacing the more durable and valuable heavy metallic pigments such as white lead and zinc oxide. This should reduce the cost to the buyer when temporary paints are desired. To judge the bulking values of the pigments, see page 30.

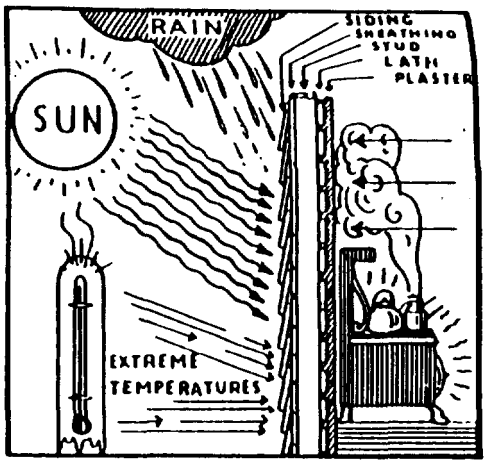


Figure 16.—What a paint film on an exterior wall of a house must withstand.

6. Kind of Repaint Surface.

Regardless of the kind of exterior paint used, all are affected by exposure to the sun, rain, air and other elements.

The important question to be considered is what kind of surface will be left to repaint. Shall it be easily repaintable after from four to 10 years' exposure? Can the paint film be abused by postponing repainting if financial reverses prevent prompt repainting? Will the paint film fail by cracking, scaling, alligatoring, or peeling? Will the owner be obliged to burn off old cracked and scaling paint before repainting?

JUDGING FORMULAS

Certain paint pigments are known as "active" pigments and others are known as "inert" pigments. The active pigments most generally used in the manufacture of paint include white lead, zinc oxide, red lead and blue lead. When these pigments are mixed with linseed oil a chemical reaction takes place through which the particles of pigment "bloom out" and form a combination with the oil. White lead and linseed oil form a tough, pliable film whereas zinc oxide and linseed oil form a hard, more brittle film. These characteristics of the active pigments have much to do with the durability of exterior paints. (See Figure 17.)

The "inert" pigments consist of silica, calcium carbonate (limestone), magnesium silicate, barytes, china clay, calcium sulfate, and similar pigments all of which have practically no affinity for linseed oil and do not react with it. This lack of chemical change in the pigments when mixed with linseed oil is responsible for their designation as "inerts."

Exterior white and tinted paints containing more than 10 per cent of extenders such as calcium carbonate, silica, kaolin, aluminum silicate, magnesium silicate, barium sulfate (barytes), and lithopone are not usually graded as first quality exterior paints. If large amounts of these cheaper extender pigments are indicated on the formula label, the selling price should be correspondingly lower in proportion than when the paint is made of the higher priced basic lead and zinc pigments. Less durability in cheaply formulated paints is also to be expected. The quality and durability of exterior white and tinted paints can be judged somewhat by the weight per gallon and the costs of the pigments used in formulating the paints. (See pages 26 and 27 for weights.)

The more durable house paints usually contain not less than 65 per cent pigments and not more than 35% liquid by weight. This is the basis used by the Government and painting contractors in specifying formulas for paints described on pages 26 and 27.

Recommendations found in Consumers Guide Vol. 5, No. 17, of the Agricultural Adjustment Administration Division of the United States Department of Agriculture describes Type "L" (lead) paint as designated by the United States Forest Products Laboratory, as follows:

> "Type 'L' Paint: The pigment consists entirely of white lead except for the additions of colored pigments to make the tinted paints. This paint, if used exclusively, remains the best choice for house owners who wish to allow very long intervals, longer than the durability of any other white or tinted paint, to elapse between paint jobs. When worn out, a coating consisting wholly of white lead, on woods that hold paint well, will still go through a long period of neglect during which it looks shabby but not unkempt. After such neglect, a white lead surface can easily be repainted without undue expense. Paint of type 'L' is recommended also for houses in which moisture at times collects behind the painted woodwork. The coating will blister as readily as other paints, but if the coating consists entirely of white lead paint, the blisters usually disappear when the wood dries out without leading to a subsequent peeling and scaling." (See TT-P-156, page 26.)

The single pigment white lead paint is available in ready-to-use form by the gallon as well as in soft paste form. If a factory-prepared multiple pigment paint is to be used, careful investigation of the formula should be made and the pigments and oils

(1) As viewed through a high powered microscope (X 1,000).

(2) Microscopic view (X 1,000) showing how the white lead particles "bloom out" in linseed oil.

(3) The final stage, showing result of the physical and chemical reaction of lead pigments (the white feathery spots) and linseed oil (dark field of picture) magnified 6,000 times.

Figure 17.—The particle size of white lead pigment has been ground to such fineness that it will pass through a 27,000 mesh screen (27,000 holes per

in it should come within the limitations of Federal Specifications TT-P-156, TT-P-36a, Class 1 and TT-P-101a, Type A, if the most durability is desired.

"TT-P-156 for pure white lead paint is as follows:

PIGMENT	NOT MORE THAN	NOT LESS THAN
White Lead		98%
Tinting Pigments	2%	

The liquid shall contain not less than 87% of linseed oil, the balance to be drier and thinner. The weight per gallon shall not be less than 19½ pounds."

"TT-P-36a, Class 1, Federal Specification for lead and zinc base outside paint is as follows:

PIGMENT	MAXIMUM PER CENT	MINIMUM PER CENT
White Lead	--	70
Zinc Oxide	20	15
Tinting colors and white siliceous mineral pigments containing no lead or zinc compounds	10	—
Matter soluble in water	0.8	—

In factory-prepared paint the liquid shall contain not less than 87 per cent linseed oil, the balance to be combined drier and thinner. The thinner shall be turpentine, volatile mineral spirits, or any mixture thereof. The weight per gallon shall be not less than 17½ pounds."

TT-P-101a, Type A, Federal Specification for outside titanium-zinc-lead factory-prepared paints is as follows:

PIGMENT	MAXIMUM PER CENT	MINIMUM PER CENT
Titanium Dioxide (TiO_2)	—	7.0
Zinc Oxide	25.0	—
White Lead	—	58.0
Extenders (white silicate pigments, barium sulfate or mixture thereof)	10.0	—
Matter soluble in water	.8	—

The liquid shall contain not less than 85 per cent of linseed oil, the balance to be drier and thinner. The weight per gallon shall be not less than 17 pounds."

Composition of White-Lead Paint
(Ready to use)

Per cent compositions, by weight and by volume, of white-lead paints used on exterior wood. (See formulas page 154.)

FORMULA	MATERIAL	% BY WEIGHT	% BY VOLUME
	White-lead	68.0	22.2
No. 1	Linseed Oil	18.7	44.2
(First Coat, Repainting)	Turpentine	12.6	31.9
	Drier	.7	1.7
Per cent pigment in non-volatile portion		78.4	33.4
	White-lead	70.6	24.8
No. 2	Linseed Oil	27.1	68.9
(Finish Coat, Repainting and New Wood)	Turpentine	1.6	4.3
	Drier	.7	2.0
Per cent pigment in non-volatile portion		72.3	26.5
	White-lead	60.8	17.3
No. 5	Linseed Oil	27.4	56.4
(Priming Coat, New Wood)	Turpentine	11.2	24.9
	Drier	.6	1.4
Per cent pigment in non-volatile portion		69.0	23.6

MAKING A SURVEY OF PAINT FORMULAS

The purpose of making a survey of paint formulas in a community is to help determine the value of the pigments and liquids that have been ground together, and by this method learn how to judge the comparative value per gallon.

As about 80% of all exterior house paint bought by the consumer is white or tinted paint, exterior white paint should be used as the standard for comparison. To make the survey use the following procedure:

(1) Provide a supply of survey sheets as shown on page 29.

(2) Notice on the paper formula label that is pasted around the can, the formula showing the composition of the paint. The word "formula" means the recipe that was used by the paint manufacturer when he mixed together the different ingredients. Sometimes formula labels are glued to the top or bottom of paint cans. Formula labels are required by law in some states and not in others but all reliable paint manufacturers place the formula label on the can in plain view.

It will be found, usually, that the formula is divided into two headings. One will be "Pigments," under which will be listed the percentages of solid or mineral portion of the paint. The other heading will be "Liquid" or "Vehicle." The word "Vehicle" means, in the paint industry, the oils that are placed in the paint to hold the pigments together, or in other words, to "carry" the pigments. Note the proportion of pigment in relation to the total liquid stated on the label and copy this to the survey sheet.

(3) Observe that some formulas may have the ingredients listed "By Weight" and some "By Volume," so copy down the figures showing the percentage of the pigments and liquids, placing these figures in the proper column, "By Volume" or "By Weight." In all cases the column of figures will add up to 100%, which is the total at the bottom of the columns on the survey blanks. If there are pigments or liquids named other than those on the survey sheet, fill these extra names in on the blank lines at the lower part of the list of pigments or liquids.

(4) At the lower section of the survey sheet is a space for remarks or footnotes. Copy off the footnotes from the label.

(5) In order to complete the proper study of formula labels, carefully read the sections in this bulletin relating to Selecting Paints, Comparison of pigment costs and "Bulking Value of Pigments." (See pages 30 and 31.) After the survey sheets have been filled in from formula labels on the different kinds of paint being compared, check the proportions and values of pigments and oils in relation to the facts found in the literature studied.

Near the top of the survey sheet fill in how the paint salesman regards the paint being surveyed as to grade and quality. Then at the bottom of the sheet write in the opinion of the person making the survey.

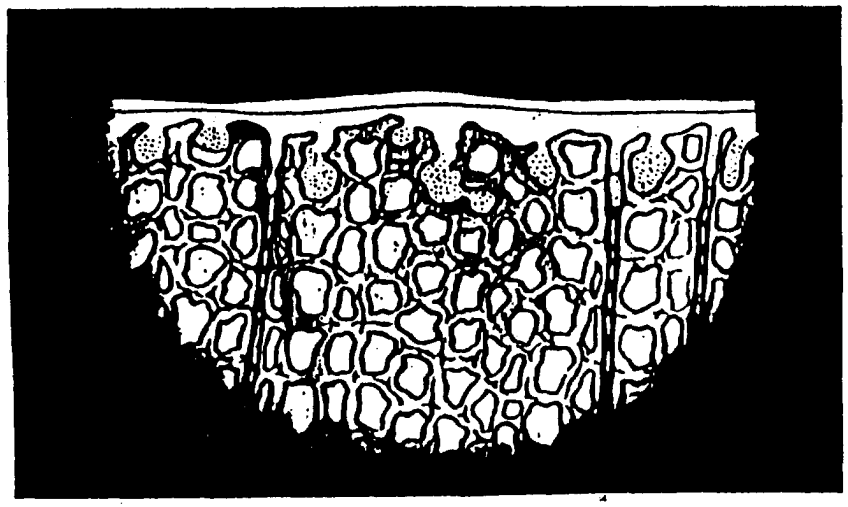


Figure 18.—Cross section (greatly magnified) of white lead paint film on wood after being exposed to the weather 5 years. Part of the surface coats have gradually chalked away, leaving the original priming coat anchored to the wood and providing an even surface for repainting.

PAINTING FARM BUILDINGS AND EQUIPMENT

PAINT FORMULA SURVEY SHEET
(Exterior White Paint)

Name of Manufacturer.....

Brand Name of Paint.....Price Per Gallon $.....

The Paint Store sells it as their *(Check)*

First quality.....Second quality.....Third quality.....paint.

Is there a formula label on the can?.....Where located?.....

Pigments	Percentage of By Wt.	Percentage of By Vol.	Liquid (*Vehicle*)	Percentage of By Wt.	Percentage of By Vol.
Carbonate of lead			Linseed Oil		
Zinc Oxide			Gum Turpentine		
Leaded Zinc			Tung Oil		
Basic Sulfate of White Lead			Soya Oil		
			Processed Oils		
Titanium Dioxide			Mineral Spirits		
Titanium Magnesium Silicate			Driers		
			Thinners		
Zinc Sulfide			Water		
Magnesium Silicate (Asbestine)			Resins		
			Vegetable Oils		
Barium Sulfate (Barytes)			Turpentine Sub.		
			Volatile Thinners		
Lithopone					
Calcium Carbonate					
Silicates					
Aluminum Silicate					
Titanium Pigment					
TOTAL	100%	100%	TOTAL	100%	100%

Percentage Pigments of Total.....By Weight.....% By Volume.....%

Percentage Liquid of Total.....By Weight.....% By Volume.....%

100% 100%

I think the quality of this paint is *(Check which)* { Poor..... Fair..... Good.....

Why .....

.....

.....

.....

Student Making Survey.....

FACTS ABOUT PAINT PIGMENTS THAT SHOULD BE TAKEN INTO ACCOUNT WHEN COMPARING FORMULAS

The following tables show comparisons with bar graphs how one pound of each pigment *fills up the can* or "bulks." For example, when a pound of calcium carbonate, magnesium silicate, or silica is in a paint formula, these pigments fluff up in the gallon about 2½ times what heavy pigments like white lead will bulk. The bulking property of pigments creates the temptation for unreliable paint manufacturers to make paint with cheap high bulking pigments of low opacity and durability. As paint is bought to cover up or decorate a surface it is a waste of money to apply paint containing excessive amounts of such fillers and extenders.

Paint Pigments	Bulking Value of One Pound	Wgt. per Gal.	Hiding Ability	Av. Cost per Lb.
Basic Carbonate White Lead	.0176	56.73	Good	0.75
Basic Sulfate White Lead	.0187	53.40	Good	.066
Zinc Oxide	.0212	47.15	Good	.072
Titanium Dioxide	.0305	32.82	Very Good	.145
Lithopone	.0279	35.82	Good	.042
Zinc sulfide	.0300	33.32	Good	.082
Magnesium Silicate	.0421	23.74	Poor	.01
Calcium Carbonate	.0443	22.57	Poor	.01
Barium Sulfate	.0270	37.07	None	.012
Silica	.0453	22.07	None	.01
Iron Oxide	.0233	42.90	Very Good	0.68

Since pigments vary in their ability to "bulk" or fill up the "paint gallon" and there is a wide range in their cost, the unit of 1 quart in volume has been selected for the purpose of comparing the relative cost of pigments listed in the table on the following page.

COMPARISON OF PAINT PIGMENT COSTS BY VOLUME

Dry Pigment	Chemical Formula	Estimated Average Wholesale Cost Per Dry Quart
White Lead (Basic Carbonate)	$2PbCO_3.Pb(OH)_2$	$1.00
White Lead (Basic Sulfate)	$2PbSO_4.PbO$	.845
Red Lead	Pb_3O_4	1.46
Leaded Zinc Oxide (65% Zinc Oxide) (35% Lead Sulfate)	ZnO $2PbSO_4.PbO$	.75
Zinc Oxide	ZnO	.76
Lithopone (30% Zinc Sulfide) (70% Barium Sulfate)	ZnS $BaSO_4$	.33
Titanium Barium Pigment (Titanox C) (30% Titanium Dioxide) (70% Barium Sulfate)	TiO_2 $BaSO_4$	.47
Titanium Calcium Pigment (Titanox C) (30% Titanium Dioxide) (70% Calcium Sulfate)	TiO_2 $CaSO_4$	.33
Titanium Magnesium Pigment (Titanox M) (30% Titanium Dioxide) (70% Magnesium Silicate)	TiO_2 $Mg\ SiO_3$	.345
Titanium Dioxide (Titanox A)	TiO_2	1.16
Lead Titanate (Titanox L)	$PbTiO_3$	1.55
Zinc Sulfide	ZnS	.635
Calcium Sulfate (Gypsum)	$CaSO_4.2H_2O$	.04
Magnesium Silicate (sometimes listed as asbestine on labels)	Approximately $Mg\ SiO_3$	.045
Barytes (Barium Sulfate)	$BaSO_4$	.10
Aluminum Silicate (China Clay)	Approximately $Al\ SiO_5$	.0275
Whiting Commercial (Chalk) (Calcium Carbonate)	$CaCO_3$	.045
Calcium Carbonate (Limestone)	$CaCO_3$	.03
Silica (Sand)	SiO_2	.05
Iron Oxide (Ferric Oxide)	Fe_2O_3	.85
Siliceous matter (including any or all magnesium silicate, china clay, silica, celite, mica) approximate average cost		.03

paint. This volume is part of the resulting total gallons of paint. The prices used are representative of the respective material costs in normal times. Adjustments to meet the current prices prevailing for such materials will be necessary to arrive at the total cost per gallon of paint.

HOW TO FIGURE COSTS OF EXTERIOR PAINT

Total amount of material to purchase for applying a two-coat repaint job.

To paint square feet of surfaces	Pounds of paste white lead required		Gallons boiled linseed oil required	Gallons of turpentine required	Total gallons of paint resulting	Approximate cost per gallon of paint ready to apply
	lbs.	(gals.)				
12500	500	(16¼)	12½	5	33¾	$2.16
5000	200	(6½)	5	2	13½	2.16
3700	150	(5)	3¾	1½	10⅛	2.16
2500**	100	(3¼)	2½	1	6¾	2.16
1900	75	(2½)	1⅞	¾	5⅛	2.16
1250	50	(1⅗)	1¼	½	3⅜	2.16
625	25	(⅞)	⅝	¼	1¾	2.16

Figure 20.

** *Example*:—If enough paint to cover 2,400 square feet is needed, purchase 100-lb. pail of white lead, 2½ gallons of linseed oil and 1 gallon of gum turpentine, as shown in the above table to cover 2,500 square feet of surface on a two coat repainting job.

	Basic Cost
Soft Paste White Lead—3¼ gallons (100 lbs.)	$12.00
Pure Linseed Oil—2½ gallons @ 80 cents	2.00
Pure Gum Turpentine—1 gallon @ 60 cents	.60
TOTAL COST	$14.60

$14.60 divided by 6¾ gallons, the total volume of the paint ready to apply, makes a cost of $2.16 per gallon.

dry but water has soaked into the siding material, [illegible] painted before this excess water has evaporated, paint failures may result.

On previously painted surfaces, a careful study of all sides of the building should be made to determine where old paint has been failing on account of water getting back of the paint. Be sure to look under eaves, beneath porches and in other shaded places for paint failures. Any peeling, scaling, or cracking paint should be scraped or sandpapered so all loose scales are removed. (See pages 11, 12 and 19.)

Check any causes of condensation of moisture in the walls of a building and ventilate walls to stop water from getting back of paint causing peeling.

PREPARING, MIXING AND TINTING EXTERIOR PAINT

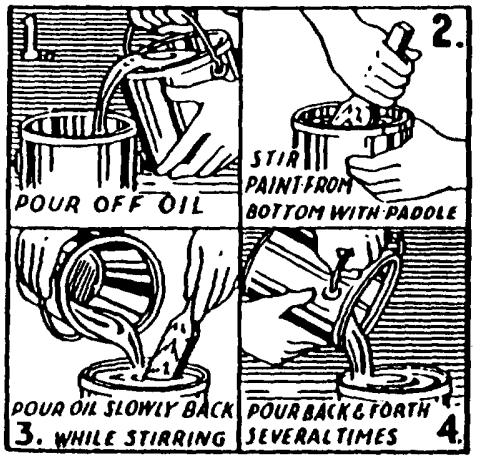


Figure 21.—Thoroughly mix factory-prepared paint before applying it.

Mixing Factory-Prepared Paints.

When factory-prepared paints are used, it is important that they be thoroughly mixed before applying. The pigments in some prepared paints settle hard in the bottom of the can, especially when the paint has been on the dealer's shelves or in warehouses for some time.

To mix the paint, pour off part of the liquid and stir the remaining liquid and paste until it is uniform and free from lumps.

(See Figure 21.) Then add the balance of the liquid slowly and stir until all the ingredients are evenly dissolved. Strain the paint through a piece of fly screen as it is poured into the paint bucket for brushing. Follow the manufacturer's thinning directions found on the can label if the paint is to be used as a priming coat.

Manufactured paints also come in heavy paste form which requires thinning and thorough mixing before using.

Mixing Basic Paint Materials on the Job.

When paste white lead is to be thinned into paint it is more economical to purchase it in 50 or 100 pound kegs. Measure out what is needed for the immediate paint work and cover the remaining paste lead with a small amount of raw linseed oil or water; replace the lid tightly. The paste does not deteriorate and can be used for various kinds of interior and exterior painting as the need develops.

Of course, the water used to protect the soft paste lead during storage should be removed before thinning down into paint.

To complete the preparation of white lead paint dip or pour the quantity of paste lead to be used into a clean mixing tub or can and thoroughly stir in the linseed oil and gum turpentine as specified in the formulas shown on pages 154 and 155 according to the surfaces being painted. (See Figure 22.)

Tinting.

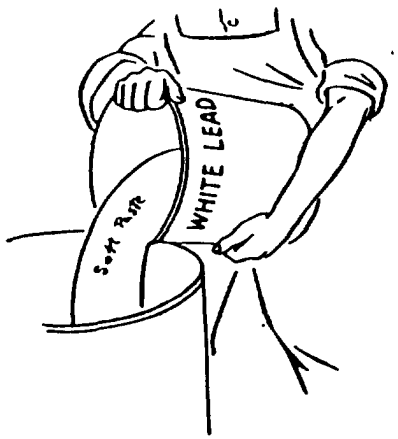
Attractive individual colors and tints are easily made by adding one or more tinting pigments to white lead paint. The quantity required depends on the depth of color desired and the tinting power of the color in oil used.

If heavy paste colors-in-oil are used, thin the paste with gum turpentine before stirring color into the white paint. To prevent streaking always tint and strain the white paint after it has been made ready for application so that the color pigments are more easily and thoroughly dispersed throughout the paint.

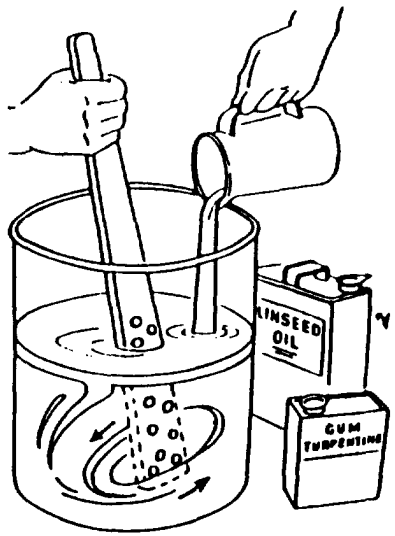
It is always advisable, when following a color formula, to add small quantities of color at a time and mix thoroughly. Otherwise a deeper tint than desired may be obtained, leaving no alternative but to add more white paint to reduce the color strength.

In tinting paints, it is best to keep a wet sample or small amount of the tinted paint in a tightly sealed fruit jar or small can in order easily to duplicate the tint if a later batch is desired.

HOW TO THIN DOWN PASTE WHITE LEAD TO MAKE HOME-MIXED PAINT



(A) Pour the paste white lead in a dry mixing tub or pail that is about one-third larger than the total gallons of paint you intend to make.



(B) Add about one-third of the oil and stir until the mixture becomes a thin paste. Then add balance of oil.

(C) Stir the paint thoroughly and strain it into the paint buckets through a piece of fly screen.

Figure 22.—Steps in mixing white lead paint.

Tinting Priming Coat.

Even when the finish coat is to be white, the adding of a little raw umber to the priming coat shows up any "skips" and helps in the hiding as well as providing a more uniform thickness of the finish coat.

Use about two level teaspoonfuls of raw umber in oil to each gallon or one tube (⅛ pint) to five gallons for tinting the priming coat.

Tinting Formulas for Home-Mixed Exterior Paints.

The following are formulas for producing the most popular tints. Only full strength high quality colors-in-oil should be used. The quantities of colors-in-oil indicated will tint 100 pounds of paste white lead and should be adjusted accordingly if a smaller or greater amount of white lead is to be tinted. (See page 69, for measure reducing table.) If paste white lead has already been thinned down ready to apply, use approximately one-seventh of the amount specified below of each color to tint each gallon of ready-to-use white paint.

FOR EXTERIOR BODY COLORS

(Per 100 lbs. of Soft Paste White Lead)

Ivory
1/16 pint medium chrome yellow

Cream
½ pint raw sienna

Lemon Yellow
¼ pint lemon chrome yellow

Colonial Yellow
½ pint medium chrome yellow

Light Buff
1 pint raw sienna

Light Tan
½ pint burnt turkey umber

Russet Brown
3½ quarts burnt turkey umber
1½ quarts Venetian red

Leather Brown
1½ gallons burnt turkey umber
1 quart Indian red

Light Gray
⅛ pint lampblack

Medium Gray
¼ pint lampblack

Warm Gray
1 pint raw turkey umber

Olive Drab
1 quart burnt turkey umber
1 pint light chrome green

Light Green
1 quart of medium chrome green

Foliage Green
1 gallon chromium oxide green

Light Blue
¼ pint C. P. Prussian blue
¼ pint burnt turkey umber

Shutter Blue
3 quarts cobalt blue
1 quart raw turkey umber

TRIM COLORS

The following formulas produce dark-colored paints which are often required for the painting of trim, sash, blinds, and the like. These paints contain no white lead. They are prepared by reducing colors in oil to painting consistency according to the formulas specified.

These paints are for use as finishing coats only. The regular procedure for exterior painting should be followed in the case of undercoats. A satisfactory ground for these dark colored paints may be produced by tinting the white lead undercoat to a medium shade of the finishing color.

For quick set and good thorough drying of dark paints, it is suggested that about three ounces of powdered litharge be stirred into each gallon of finishing coat paint. Paints containing litharge should be used within two or three days after preparation. If boiled linseed oil or litharge is used, add only half the amount of drier specified.

India Red
Yield: 2 gallons

½ gal. English venetian red
½ gal. Indian red
2½ qts. raw linseed oil
1 qt. outside spar varnish
½ pt. liquid drier

Bright Green
Yield: 2⅜ gallons

1 gal. C. P. chrome green light
1¼ gals. raw linseed oil
2 quarts outside spar varnish
1 pint liquid drier

Medium Green
Yield 3¼ gallons

1 gal. C. P. chrome green medium
1½ gal. raw linseed oil
2½ qts. outside spar varnish
1 pint liquid drier

Dark Green
Yield: 2⅜ gallons

1 gal. C. P. chrome green dark
1¼ gals. raw linseed oil
2 qts. outside spar varnish
1 pint liquid drier

Crescent Red
Yield: 2 gallons

1 gal. C. P. bulletin red
1 pint Indian red
3 qts. raw linseed oil
1 qt. outside spar varnish
½ pint liquid drier

Chromium Oxide Green
Yield: 2 gallons

1 gal. C. P. chromium oxide green
2½ qts. raw linseed oil
1 qt. outside spar varnish
½ pint liquid drier

Prussian Blue
Yield: 2 gallons

1 gal. Prussian Blue
2½ qts. raw linseed oil
1 qt. outside spar varnish
½ pint liquid drier

It is quite common practice to dip shingles before they are applied to a building. Of course, this refers only to the priming coat. Shingles can be dipped after delivery to the job by using a vat or tub and placing them in a trough after dipping so the excess stain or paint drains back into the tub. (See Figure 31.)

Spraying.

Spray painting is economical from the standpoint of labor, especially in the application of paint on concrete, stucco, brick, wood shingles, or rough lumber such as fences, barns and outbuildings where there are few windows. The type of equipment used and skill in handling the spray gun are important. To secure a more uniform thickness of the paint film, two men are often used, one to operate the spray and one to smooth the paint with a brush.

The following points should be observed to insure efficiency with spraying equipment:

1. The equipment should be carefully selected and purchased from a reputable manufacturer.
2. It should be carefully adjusted and operated.
3. The gun and paint hose should be thoroughly cleaned after using, before any paint has had time to dry in the parts.

The correct air pressure required and the consistency of the paint should determine the type of equipment to be used. Generally speaking, an air pressure of 45 to 55 pounds will prove satisfactory. The gun should be adjusted to spray the paint as specified without extra thinning, as the addition of thinners in excess of that stated in the formulas will not produce the full thickness in the paint film.

In spraying, the gun should be handled in slow, sweeping strokes, approximately eight to ten inches from the work. Too close spraying results in sags and runs. The work will be facilitated if the areas difficult to reach are sprayed first, and the broad surfaces last.

The spray gun parts should be cleaned at the end of each working day and whenever the material to be sprayed is changed. This cleaning can be done by spraying the correct solvent, usually painter's naphtha, through the gun and finally blowing the parts clean with compressed air. Then the nozzle should be removed and cleaned. This operation should always be done before

Figure 24.—Spray painting saves labor when one color is used on large wall surfaces where there are few windows and doors.

the paint material used in the gun has had a chance to dry. However, if the gun is to be used again in an hour or so, remove the spray nozzle and set it in a can of solvent. This will keep it ready for use.

All paint should be strained through a piece of rayon stocking before using it in spray equipment.

Correct Amount per Square Foot.

Whether brushing, dipping or spraying, the most important thing to keep in mind is to apply the correct amount of paint per *square foot.*

When using home-mixed or factory-mixed paint, the paint film of the finished job should be of the thickness specified by the formulas which are based on certain areas of spread per gallon. (See formulas pages 147, 154 and 156.) Otherwise the paint film is too thin and will not wear as long as it should.

To determine how thickly any paint should be applied, measure out one quart and apply it to a measured area. If the quart of paint does not reach, it has been applied too thickly. If some paint is left over, it has been spread out too thin. To remedy this adjust the brushing, dipping, or spraying accordingly.

When to Paint.

Outside painting should be done during fair weather. (See Figure 25.) Avoid painting during periods of high humidity. The surface should be dry and the temperature should be above 50°F. Paint will brush on easier when the weather is warm. An

PAINTING INTERIORS OF BUILDINGS

PROVIDING EQUIPMENT FOR INTERIOR PAINTING

No elaborate set of equipment for interior painting is necessary, but to produce a good decorating or painting job with the least work a few items are essential.

To paint ceilings and sidewalls two stepladders with an adjustable trestle or plank that will rest on the steps and reach between the ladders should be provided. Benches or sawhorses, if of proper height, and a solid plank of the right length can usually be used if stepladders and trestles are not available.

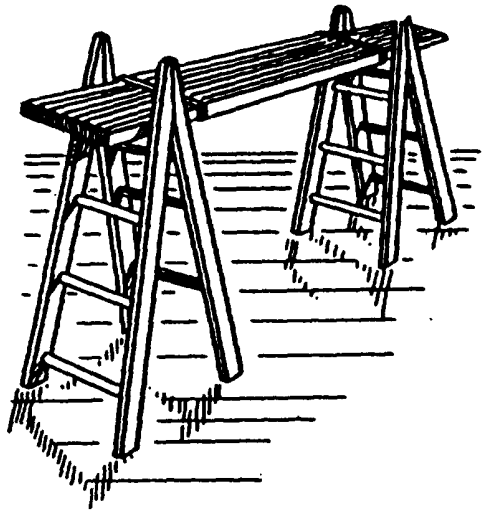


Figure 33.—Type of adjustable trestle used by painters to reach interior surfaces.

An old tarpaulin makes a good drop cloth to cover the floors or furniture. If no cloth is handy, use several layers of newspapers so no wash water or paint gets to the floors.

A putty knife, broad scraping knife, wood scraper, sandpaper, steel wool, washing compound, rags, bucket for washing mixture, paint buckets, paddles, paint remover and paint brushes make up the average list of items that should be provided if painting is to be done on both walls and woodwork of a room.

INSPECTING INTERIOR SURFACES TO BE PAINTED

After deciding on a plan for repainting and decorating, one should take a notebook and make a survey of each room in the house. Begin in the attic and the upstairs rooms. This is the

and dirt into the rooms while the painting is under way. If the work is begun on the upper floors, the rooms can be closed off keeping the dust out until the paints or varnishes are dry. In surveying the attic, note what should be done to stop air circulation through the ceilings of the second floor bedrooms. This causes deposits of dust on ceilings that, in time, show the design of the lath. This can usually be remedied by laying building paper or insulation between the ceiling joists on which the laths are nailed. The insulation will also save considerable loss of heat in winter and make the upper rooms cooler in summer. Technical laboratories have found that 40% of heat lost is through the ceilings.

Look for roof leaks and have these repaired because rain water will stain the ceilings or walls of rooms after they have been redecorated. If a roof leak occurs in rooms where casein or calcimine paints have been used, water stain spots will repeatedly "burn through" repaint jobs done with such paints and spoil the appearance of the surface. Moisture will not stain oil paint but may cause it to peel so roof leaks should be repaired before painting.

It is important to note what preparation is necessary for the walls and woodwork before refinishing. Examine surfaces to see if sanding of the woodwork and doors will provide a smooth surface for the new paint or varnish; also whether one or two coats of paint will be sufficient. Do the door locks, sash cord, putty or window glass need repairing? Is there need for scraping window sills? The time to do repair work like this is before repainting.

What should be done about the floors? Are there water stains under the windows or worn spots in the doorways? Will sanding or scraping off the old paint or varnish eliminate the spots? Have the cracks between the floor boards opened up so that crack filler should be used to make a smooth floor? If floors and walls need repairing, should not visible electric wiring now be concealed in the walls and floors?

Should the old wall-paper be removed from walls and ceilings? Are there plaster cracks that need patching? Has the plaster on ceilings broken loose from the lath? Are the plaster ceilings or walls so badly in need of repair that excessive patching with new wet plaster will delay the decorating? Will special shellacking or wall sizing be necessary to prevent suction spots in the surface of the new paint job? Shall the plastered surfaces be covered with plywood to hold paint more permanently

Shall repairing of leaking radiators, or defective plumbing, be made to stop water from staining the ceiling? Possibly a joint around the chimney needs caulking or new flashing is required where the chimney joins the roof. Gutters or valley tin may also need repairing.

These are things that should be investigated when making an inspection tour of the second floor rooms.

On the way down to the main floor, the condition of balusters and hand rail on the stairs should be noted. Is the varnish or paint work worn off the stair treads? Shall the color of the balusters and hand rail be changed to conform with a change in decoration of the lower entrance hall or living room where the stairs land?

Such a survey should continue through all the rooms of the first floor—notes being made concerning each room. A page set aside in the notebook for writing up the preparatory work to be done, as well as the colors and quantity of the paints to be used will help in planning the painting program.

If this method is followed, even though all the rooms are not repainted and decorated at one time, there will be a well-planned, harmonizing treatment brought about in each of the rooms as the work progresses. Such a decorating plan may require a year or two before it is completed. Just as the construction of a well-designed home results when an experienced architect is consulted, so the whole family can help plan and carry out the redecorating job with great pride and satisfaction.

SELECTING INTERIOR PAINT

How to Select.

Selecting interior paints for quality and durability is more difficult than selecting exterior paints. Some interior paints such as flat wall paints, enamels, and calcimines are patented products with secret formulas and no label appears on the package or can to indicate the pigments and liquids that have been used in their manufacture. Factory-prepared paints are available in white and in many tints and shades, in original containers. These carry a label on the can giving complete directions for thinning each coat either for new surfaces or repainting work. *It is important that the manufacturer's directions be carefully followed.* The price per gallon cannot always be taken as a guide to quality or durability. Some paints, though made of low grade pigments with oils and other vehicles of doubtful

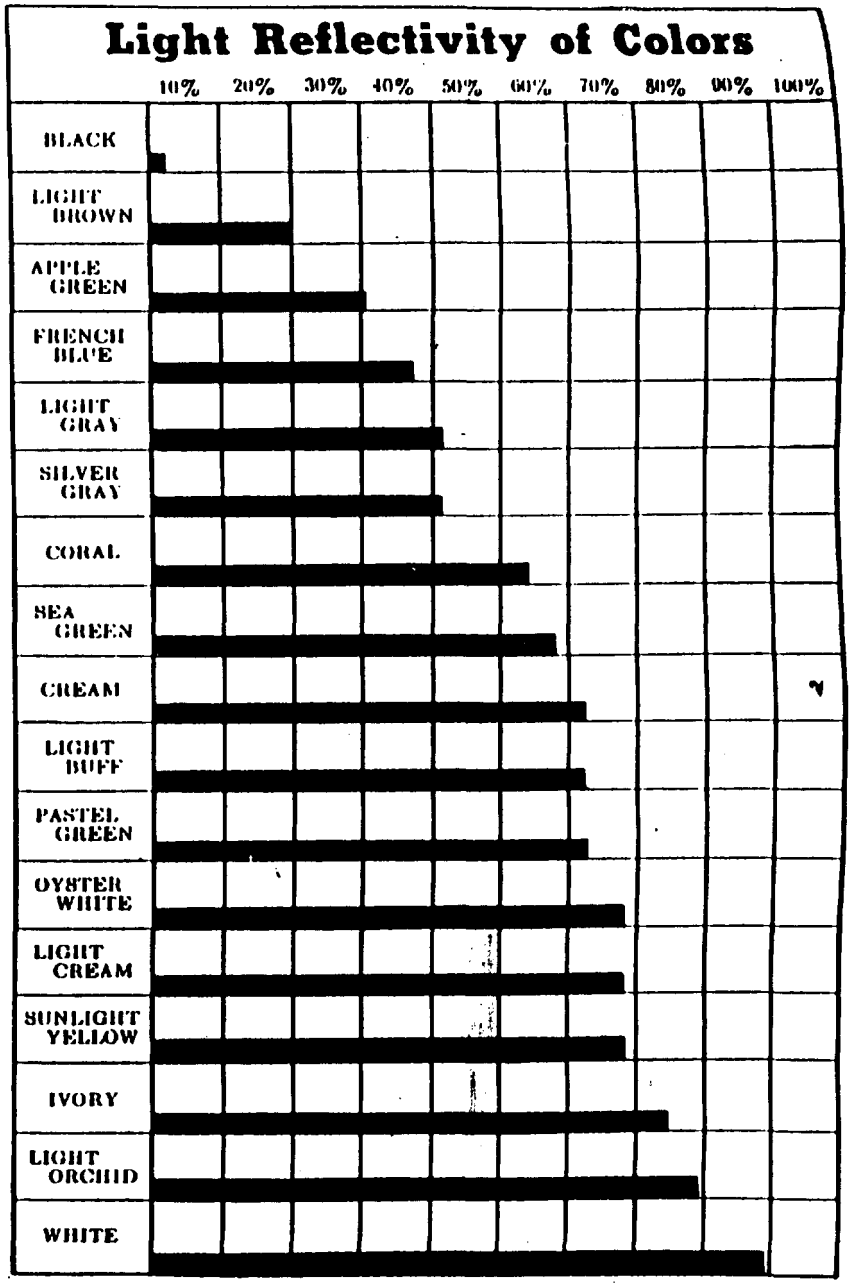


Figure 31.—Light reflectivity of colors should be considered when painting interior walls.

durability are sold at a high price. They may fail on walls or woodwork that must be washed. It is important that all interior paints be selected to withstand repeated washing if paint maintenance cost is to be kept at a minimum.

Skilled painters estimate that about two-thirds of the cost of a paint job is the labor necessary to prepare the surface and apply the paint. Washable paints, therefore, save time and labor as it is much easier to wash walls, ceilings, and woodwork than it is to repaint them. With exterior paints, the weather exposure to sunshine, rain, and air, gradually wears down the paint film by a gradual chalking process. On interior surfaces there is no such weather wear but if too many coats of unwashable paints are piled up in an effort to maintain clean walls there is every possibility that the weight of the paint will cause it to lose its adhesion and leave the surface resulting in a rough patchy appearance even when repainted. The best practice is to use washable paints that can be cleaned without unduly affecting the paint film. Therefore, in selecting interior paints, for economy as well as for good appearance, one should choose a paint that has demonstrated its ability to withstand the use it will probably get in the different rooms.

Types of Interior Paints.

Interior paints are divided into two main types—those that are for woodwork and those to be used on walls and ceilings. The interior wall surfaces of a home usually are constructed of plaster, wood or insulation board. Each type of wall material requires a priming coat adjusted to the surface of the material painted. However, with washable paints the body and finish coats can be used on any of the surfaces after the proper priming coat has been applied. Some grades of enamel can be used on woodwork or plaster where high gloss is desired. If home-mixed white lead paint or paint formulated and tinted on the job is to be used, the formula specified with the basic paste pigments and oils can be adjusted to suit either the wall surfaces or woodwork, and to give a gloss, flat, or stipple finish.

Cold Water Paints.

Casein and calcimine paints are widely used for painting bedrooms, offices, and ceilings where high light reflectivity without gloss is desired. They dry rapidly, as soon as the water has evaporated; this is usually within one to two hours. They have a fair spreading rate and good hiding power and are usually lower in price per gallon than oil paints. Their use is limited

in that they are not "scrubbable" paints and, therefore, should not be used on walls exposed to finger marks, grease or grime, such as kitchens and bathrooms. Ordinarily they should be removed if oil paints or enamels are to be used in repainting; otherwise they may cause scaling of all paint from the surface. Casein paint should not be used on walls that may become damp such as in basements, cellars, milk houses or unventilated damp rooms because the casein mildews and causes an odor somewhat like old cheese. The adhesion of such paint depends on the glue properties of the casein or skimmed milk material from which it is manufactured.

Calcimine is a mixture of glue, water and tinted dry powder usually consisting of whiting (calcium carbonate), silica or similar inert pigments and should be used for painting rooms where a temporary finish may be desired. It cannot be washed and must be removed if oil paints are later to be applied. Both casein and calcimine are usually applied with a wide calcimine brush.

Directions for application as found on the packages should be followed.

Flat and Semi-Gloss Paints.

High grade flat and semi-gloss paints are usually washable and very satisfactory. Their formulas contain heat treated oils as the vehicle in combination with white lead and other high quality pigments. Some interior flat and semi-gloss wall paints contain large percentages of lithopone, silica and calcium carbonate. These dry with a non-gloss or flat finish that cannot be washed successfully as repeated washing dissolves out the pigment, leaving a splotchy wall. To renew the decoration in rooms where this type of paint has been used, it is best to repaint rather than to wash them. Due to the fact that cheaper pigments are used, their value per gallon is about one-half or one-third that of high grade exterior house paint or of home-mixed white lead paint.

Interior Enamels and Gloss Paints.

The use of enamels and high gloss paints on woodwork or walls is primarily to obtain a finished surface that will withstand hard usage and clean more easily than flat painted surfaces. Aside from these qualities such paints are not particularly desirable on interior surfaces. In fact, on large areas the glare of reflected light from high gloss paint creates very tiring and disagreeable surroundings in which to work or live. The mirror-like surfaces emphasize patched plaster cracks and uneven

Figure 35.—High quality paint materials properly applied to interior wood work provide a washable and durable finish.

walls. In school rooms, glossy surface walls are objectionable because of eye-strain resulting from the reflection of light in irregular and wavy sections of the walls.

Flat and Semi-Gloss Home-Mixed Paints.

High quality flat and semi-gloss paints provide a non-glare, permanent finish that can be washed repeatedly with common soap and washing compounds and yet retains its original color and flat finish. If desired this type of paint can be prepared by mixing it on the job from the basic materials of white lead and oil generally used by painters or it can be purchased as a factory-prepared product. By adjusting the amount of oil, the paints can be used on any interior surface, including woodwork, plaster or other types of wall material. Formulas recommended and used by interior decorators who prepare the paint on the job will be found on page 155. The lead mixing or reducing oil is made especially for thinning paste white lead and provides a tough waterproof paint film when combined with the white lead. This seals the wall surface and helps prevent condensation of moisture in the walls.

Home mixing of these paints has the advantage of reducing

may be used for painting the interiors or exterior of a concrete wall, milk house, or other surface where a durable waterproof white or tinted paint is desired.

Tints for Various Rooms.

In selecting the color of paints for the ceilings, walls, and woodwork, each room should be considered separately, as rooms vary in their use and amount of lighting necessary. For example, in the basement there may be a heating plant using coal as the fuel. Dust accumulates on the walls which may be of concrete, cement block, or brick with rough surfaces, making thorough cleaning a problem. (See Figure 34.)

To brighten up the basement, a white or light colored paint is the most practical since the usual small windows admit only a limited amount of light. If the walls and ceiling of the basement are painted in light colors, the basement rooms will be more satisfactory for the laundry work, ironing, fruit storage, and in some climates, for kitchen and dining room use during the hot summer months.

Occasionally the store room is in a basement or in a cave where windows are lacking. In such a place moldy odors can be reduced and the rooms rendered more useful by spraying the walls and ceilings with calcimine, or white wash. If a more permanent paint job is planned, home-mixed paint can be prepared at a comparatively low cost and brushed or sprayed on walls or ceilings. A common hand pump fruit spray outfit can sometimes be used for applying whitewash.

The effect of color in the kitchen is very important. White shows dirt very quickly so it is usually desirable to have the walls tinted. Under average conditions the walls of the kitchen are finished in light colors with a flat or semi-flat paint. If small children are in the home, the lower part of the walls, possibly up to three or four feet from the floor, can be painted with a darker color. This will help to eliminate finger and chair marks. The paint used should be of the most durable and washable quality. The lower wainscot section, or dado, as the painter calls it, around the room might be decorated with stripes or diamond shape design in two or more shades of darker color. The upper part of the walls and the ceiling, if painted in light color, will make a pleasing combination. If there is a limited amount of window space, or possibly one electric light fixture in the kitchen, the room will appear lighter when a very light tint of yellow is used for the ceiling and upper side walls. Kitchens call for the most durable and washable paint.

In the living, dining room and bedrooms the walls should have tints that harmonize with the furniture and rugs. Light tinted ceilings will reflect artificial illumination, as well as sunshine and daylight, into the different parts of the rooms. (See Figure 34.) The colors of paint for the walls should be selected according to the exposure of the windows. If windows face north, the warm colors, such as cream, yellow and coral, help to make such rooms more cheerful and overcome the lack of sunshine. If rooms have south, east, or west exposure, cool colors, such as blue, blue-green, and gray are desirable.

Bathroom walls should be painted white or light tints, with flat or semi-flat paint that can be repeatedly washed without injury to the paint film. For a further study of color harmony see color wheel in Figure 40, page 23.

ESTIMATING THE AMOUNTS OF INTERIOR PAINT NEEDED

To determine the amount of paint required, it is necessary to find the area of the walls and ceilings. To do this, measure the distance around the room and multiply by the height of the wall. Deduct from this number of square feet of surface the area of windows and doors and you will have the net amount of square feet of sidewall surface. The ceiling surface can be calculated by multiplying the length of the room by its width. Add this to the surface of sidewalls.

To determine the gallons of paint required, divide the total square feet of surface by the number of square feet that one gallon of paint will cover. The covering rate of one coat of home-mixed paint is approximately 800 square feet per gallon over old paint or properly primed surfaces. If factory-prepared paint is to be used, follow the manufacturer's directions for estimating.

HOW TO FIGURE COST OF HOME-MIXED INTERIOR WHITE LEAD PAINT

The table below gives the total amount of basic paint materials to purchase for a typical *three-coat* paint job on *new plaster* including all the material specified in formulas for priming new plaster, second coat and flat finish coat, as indicated on page 155.

To Paint Square Feet Of Surface 3 Coats	Pounds of Paste White Lead Required		Gallons of Lead Mixing or Reducing Oil Required (a)	Total Gallons of Paint Resulting	Approximate Average Cost Per Gallon of Paint Ready to Apply*
	Pounds	*Gallons			
8000	400	(13)	16	29	$2.53
4000	200	(6½)	8	14½	2.53
2000**	100	*(3¼)	4	7¼	2.53
1000	50	(1⅝)	2	3⅝	2.53
500	25	(⅞)	1	1⅞	2.53

The accompanying table is a purchasing guide and not the mixing directions. See page 155 for proper formula for each of the three coats included in this material list.

(a) This oil should be of a grade and quality made by white lead manufacturers for thinning paste white lead to provide washable finishes.

* There are 3¼ gallons by measure in 100 pounds of white lead. This volume is used in arriving at the total gallons of paint produced. In estimating the cost per gallon ready to apply, average base prices are used as follows: $1.60 per gallon for (a) lead mixing or reducing oil, and $12.00 per 100 pounds for soft paste white lead. Adjusting these prices of raw materials according to current prices prevailing in different localities will give the total cost per gallon of the paint. The square feet of surfaces have been computed to agree approximately with the covering capacity of standard packages of white lead as purchased by painters. (25 lb., 50 lb., 100 lb.)

** Example. If enough paint to cover approximately 2000 square feet of surface is needed, purchase a 100 pound pail of white lead and four gallons of lead mixing or reducing oil as shown in the above table. This will total enough material to complete

a typical three-coat decorative job when mixed according to the formulas for priming, second and third coat flat finish on new plaster.

			Basic Coat	*Total*
Soft Paste White Lead 100 lbs.	(3¼ gals.)	..	$12.00	$12.00
(a) Lead Mixing or Reducing Oil	4 gals.	*60*	1.60	6.40
	7¼ gals.			$18.40

$18.40 divided by 7¼ gallons, the total volume of paint ready to apply, makes an average cost of $2.53 per gallon.

PREPARING SURFACES FOR INTERIOR PAINTING

New Plaster Walls.

Examine the plaster closely. Remove any lumps or high spots with a wide putty knife and sandpaper smooth. Notice whether there are any openings around door jambs, base-board, window sills, casings, and picture mould. Patching plaster should be forced into noticeable crevices and cracks.

Eliminating "Hot Spots" from Walls.

Plaster walls that have aged for six months or more do not usually require any special treatment before painting as exposure to the air usually neutralizes whatever free lime the plaster originally contained. Plaster that has not had this time for aging should be treated with a solution of Zinc Sulphate or at least tested for hot spots (free lime) before painting. To test plaster surfaces not previously painted and to avoid "hot spots" developing, the following procedure should be employed:

> Dissolve about 5c worth of Phenolphthalein crystals, available at a drug store, in about a spoonful of alcohol. Mix this in one-half cup of water. Apply the solution with a small swab or brush to spots in different sections of the wall or ceiling that is being tested. If places where the liquid has been applied turn to a deep pink or orchid, it indicates that the plaster has "hot spots" and should be given special treatment to neutralize the excessive lime.

To neutralize hot spots, dissolve two pounds of zinc sulphate in a gallon of water. Apply this liquid freely over the entire

lime dust that has come to the surface and the plaster is ready for priming with paint.

Washing Plaster Walls.

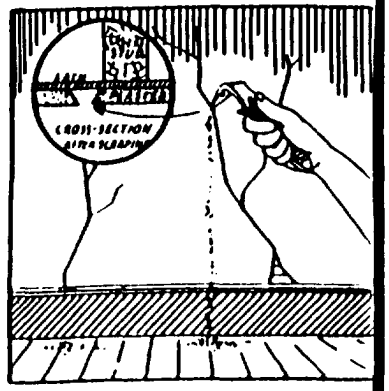
New paint will not adhere well to greasy walls; loose dirt tends to make uneven spots in the finish. Washing helps to remove gloss remaining from the old paint or enamel. If this does not remove the gloss it should be sanded off so that new paints will have better adhesion.

Repairing Cracks in Plaster Walls.

Before painting plaster walls and ceilings, all cracks and damaged plaster should be repaired. Undercut the plaster along the cracks so that patching plaster or crack filler will be securely retained. Force this patching material in with putty knife and smooth it to match the original surface. The patching plaster strips on smooth finish plaster walls must be primed and allowed to dry before applying the first coat of wall paint.

When patching plaster is used to repair rough sand finish or plastic designed surfaces of old plaster, the surface of the patched sections must be patted with a rough tool, piece of old carpet, scrub brush, or sponge that will make the wet plaster match the wall surface surrounding it.

For repairing cracks in previously painted walls, dip a small amount of thick paint from the bottom of can of paint which is to be used for repainting work. This can be done best before stirring in the free oil that usually is found on top of a newly opened can of paint. In this paste paint stir in some dry whiting until the mixture can be kneaded like putty. The resulting repair material will be practically the same color as the paint which is to be applied.



To produce commonly used tints add, to the gallons of ready-to-use white paint indicated the measures of paste colors-in-oil shown below:

To Produce Tints of	For 1 Gal.	For 2 Gal.	For 3 Gal.	For 5 Gal.
LIGHT YELLOW				
Med. Chrome Yellow	1¾ Teas.	3½ Teas.	5¼ Teas.	3 Tbls.
OYSTER WHITE				
Raw Turkey Umber	1 Teas.	1¾ Teas	2½ Teas.	4¼ Teas.
PUTTY COLOR				
Raw Turkey Umber	3½ Teas.	2½ Tbls.	3½ Tbls.	6 Tbls.
LIGHT IVORY				
Raw Italian Sienna	2¾ Teas.	5¼ Teas.	2⅔ Tbls.	4⅓ Tbls.
CORNSTALK YELLOW				
Raw Italian Sienna	3½ Teas.	2½ Tbls.	3½ Tbls.	6 Tbls.
Raw Turkey Umber	1 Teas.	1¾ Teas.	2½ Teas.	4¼ Teas.
PEACH				
C. P. Orange				
Chrome Yellow	1¾ Teas	3½ Teas.	5¼ Teas.	3 Tbls.
LILAC				
Rose Lake	1¾ Teas.	3½ Teas.	5¼ Teas.	3 Tbls.
SHELL PINK				
English Venetian Red	1¾ Teas.	3½ Teas.	5¼ Teas.	3 Tbls.
TURQUOISE				
C. P. Dark Chrome Green	1¾ Teas.	3½ Teas.	5¼ Teas.	3 Tbls.
LIGHT GREEN				
C. P. Medium				
Chrome Green	1¾ Teas.	3½ Teas.	5¼ Teas.	3 Tbls.
PISTACHIO				
C. P. Light Chrome Green	1¾ Teas.	3½ Teas.	5¼ Teas.	3 Tbls.
SILVER GRAY				
Lampblack	1 Teas.	1¾ Teas.	2½ Teas.	4¼ Teas.
DULL ROSE				
English Venetian Red	5 Teas.	3½ Tbls.	5 Tbls.	8⅓ Tbls.
Burnt Turkey Umber	3½ Teas.	2½ Tbls.	3 Tbls.	6 Tbls.
ARTICHOKE GREEN				
C. P. Dark Chrome Green	3½ Teas.	2½ Tbls.	3½ Tbls.	6 Tbls.
Raw Turkey Umber	6 Tbls.	12 Tbls.	½ pint	⅞ pint
POWDER BLUE				
Lampblack	3½ Teas.	2½ Tbls.	3½ Tbls.	6 Tbls.
Prussian Blue	1 Teas	1¾ Teas.	2½ Teas.	4¼ Teas.
DULL WINE				
Indian Red	¼ pint	½ pint	¾ pint	1¼ pint
English Venetian Red	3½ Tbls.	7 Tbls.	10½ Tbls.	½ pint
REDDISH GRAY				
English Venetian Red	2¼ Tbls.	4½ Tbls.	7 Tbls.	11½ Tbls.
Lampblack	4 Teas.	2⅔ Tbls.	4 Tbls.	6⅔ Tbls.

If stipple finishes are being tinted increase the amount of color-in-oil slightly

COMPARISON OF KITCHEN LIQUID MEASURING UTENSILS

	Ounces	Cups	Tablespoon	Teaspoon
1 Pint equals	16	2	32	96
½ Pint equals	8	1	16	48
¼ Pint equals	4	½	8	24
⅛ Pint equals	2	¼	4	12
1/16 Pint equals	1	⅛	2	6

APPLYING INTERIOR PAINT

Painting A Room.

Prepare to paint the room selected by removing as much furniture as possible. Place drop cloths on floors and over the remaining furniture, or cover with newspapers.

Set stepladders or sawhorses and scaffold planking so the ceiling surfaces can be easily reached. By placing such planking across the short way of the room the possibility of having laps is avoided because each stretch can be completed more quickly and the next one started before the paint has a chance to set. When painting a room proceed as follows:

1. Prime or first coat:
   a. Woodwork
   b. Ceiling
   c. Wall
2. Apply finish coats to:
   a. Ceilings
   b. Walls
   c. Woodwork

In painting ceilings and wall surfaces always work away from the windows or other source of light. This offers the painter a better lighted view of the section being painted and helps to avoid leaving missed spots or other imperfections in the finished job.

On ceilings the paint should be applied freely with a sweeping semi-circular movement ending in the direction of the surface already painted. On sidewalls where casings and other woodwork interfere with free brushing, the brush marks are easily overcome with light vertical strokes of the brush, allowing only the tip of the bristles to touch the wall surface. (See Figure 71 page 124.)

The proper type of brush is an essential in wall painting, and the best for the purpose are long bristled flat brushes, 3 or 4 inches in width.

The woodwork should be painted last when applying finish coats so that woodwork paint covers any spots of wall paint that may have been left along the edges where wood meets wall

Figure 53.—This dairy barn is repainted every 5 years as part of a regular painting program. Such a practice is followed by many successful farmers.

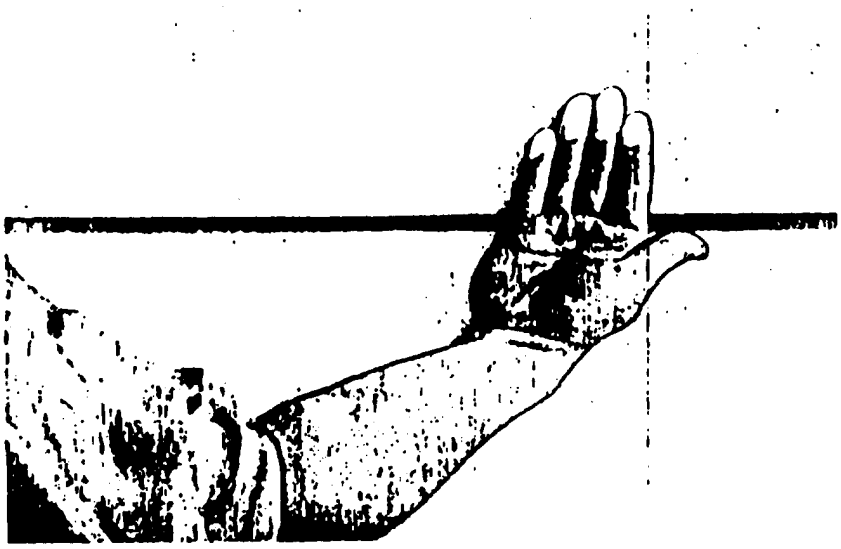


Figure 54.—Testing a painted surface to determine the rate of chalking. Gradual chalking is the normal wearing away of a paint film and excessive chalking indicates poor paint.

Job 1.—Establishing and M

AN

Steps (Operations)	
1. Provide permanent paint record materials.	Secu ach sev Inc rec tur Secu to
2. Inspect buildings.	Start tio pro Study the Walk tio fail or pag und Ex hin bui tha Ma eac Deter sho late List p wor moi die
3. Secure history of previous paint jobs.	If a kep able pai buil pai If pr the pai
4. Investigate formulas of new paints to be applied.	If fact a su able Copy bra may pag Compa of t

Steps (Operations)	How to Perform (Standard Approved or Accepted Practices)
	Compare the price asked for each grade of paint surveyed.
	If home-mixed paint is to be made with paste white lead, linseed oil and gum turpentine, these formulas are always the same since they have been standardized by government agencies and painting contractors. Comparing prices to be paid for the raw materials is all that is necessary.
5. Select and purchase paints.	Note location of trees and shrubbery so the color of paint to be selected will contrast and fit into the landscaping.
	Discuss with other members of the family the colors to be selected for the body of the building and the trim colors.
	If the building is to be painted white, decide whether a durable paint that will withstand possible postponed repainting is to be used or, an extra-white paint which requires repainting more often is the kind desired.
	If the paint job is sizeable, a saving can be made by purchasing paint materials in large quantities and large size containers.
6. Paint buildings.	Decide which building should be painted first according to need for protection or paint failures that are developing. Apply the paint.
7. Record painting information for future use.	In the paint record book, list month and year that painting is done and about what year each building should be repainted.
	Record the exact formulas, grade, and brand of paint used, weather conditions during the painting process and the approximate drying time allowed between coats.
	Record the cost of the paint used, the number of man hours required to apply it and what preparation of the old surface was necessary.
8. Repaint regularly.	Carry out the painting program which has now been established, using standard approved painting practices.

INTERPRETIVE SCIENCE AND RELATED INFORMATION

Why investigate the history of previous paintings?

Many paint failures are caused by piling up widely different formulations of paints. (See pages 18 and 19).

If the present surface to be painted is in good condition for repainting and no paint failures have shown up in the known history of the old applications the same formula of paint should be used again. This, however, may be difficult as there have been many manipulations of paint formulas to meet competition in paint selling during recent years, and the paint made according to the original formula may not be available.

Why keep a permanent cumulative record of painting?

This should be done so that future paints to be applied can be purchased on specified formulas that will be less liable to fail on account of incompatibility of the paint films.

If the past history shows that white lead has been used exclusively for example, there is no need of a formula record as the paint contains only one pigment and the formulas would be compatible. The record of when the painting was done, weather conditions, preparation of surface and such items should be made so that in case any paint failures occur in the future their cause can be traced back to either improper application if not improper formulation of the paints used.

Why inspect buildings once a year?

This should be done to discover paint failures that may be developing in order that the cause may be remedied before the paint gets into a condition that might require complete removal.

Why investigate formulas?

This is the best way to buy paint. All large property owners buy on formula rather than by brand name. There are frequent changes in formulas in certain factory-prepared paints on account of the varying cost of pigments and oils. Some changes in formulas are made because paints tried out in certain sections of the country fail and must be re-formulated. Usually these paints have not been properly tested on buildings before being placed on the market.

What kind of exterior paint is best—a hard type or soft type paint?

For painting farm buildings the soft type, such as white lead paint, has been proven the most durable over many years of exposure. If not wholly made of white lead, it has been found that the higher the white lead content the greater the durability where mixed pigment paints are used. This applies to both white and tinted paints. (See page 24, Type I. paint.)

Why repaint regularly?

Good white paint when exposed to the weather for about 5 years under average conditions wears down approximately one-half. To keep a paint film of somewhat uniform thickness on the building, repainting must be done. The best thickness of a paint film seems to be about 1/200 of an inch.

Two coats of new paint applied at regular intervals will keep the paint film to the proper thickness and protect the wood. (See Figures 18 and 26.)

The period between paintings should be determined by the location of the building, exposure to sunlight, climatic conditions, the kind of wood painted, and quality of paint used.

Steps (Operations)	How to Perform (Standard Approved or Accepted Practices)
	If home-prepared red lead paint is to be used, mix it as follows: To make 1 quart, slowly stir 5 pounds (approximately 4 cups) of dry red lead in 1 cup of raw linseed oil. Let this paste stand over night. Thin to brushing consistency with 1 cup raw linseed oil, ½ cup gum turpentime, 1/3 cup drier. (See page 158.)
	If blue lead metal primer is to be mixed on the job, use 3 cups of dry blue lead instead of 4 cups and thin as indicated with red lead.
	If factory-prepared metal primer is to be used, select one which shows in the formula label a high percent of red lead, preferably 100% red lead as the pigment portion.
	For the finish coats on metal work, prepare the same kind of paint that is being used for other parts of the building such as exterior walls or trim. The metal priming paints provide the proper foundation for the succeeding coats of house paints.
	Mix the paints thoroughly according to the formulas selected. Strain through a piece of wire screen to eliminate lumps.
4. Apply paint.	Brush on the paint thoroughly and of even thickness so that the priming coat will protect every crevice in the metal against rust creeping back under the paint film. Apply two coats of metal primer on all sections that have been rusting.
	After metal priming paint is dry, apply finishing coats of house paint by the same method as when painting exterior woodwork, allowing ample time between coats for drying.
	Keep lids tight on paint cans when not in use. Some metal priming paints dry rapidly or set hard in cans if exposed to the air too long at a time and are thus wasted as they cannot be re-thinned for painting.

INTERPRETIVE SCIENCE AND RELATED INFORMATION

What is galvanized metal?

Galvanized metal is coated evenly with a thin layer of zinc, usually by dipping sheet iron in molten zinc. As long as the coating of zinc remains uniform it will gradually corrode away and the iron is protected for a long time from rusting. If breaks occur in the coating of zinc, however, rust begins to attack the iron below at these spots.

Galvanized iron does not hold exterior house paint very well because the zinc corrodes under common house paint, forming salts of zinc that are soluble in water, and thereby takes the zinc out from under the paint, leaving the paint with nothing to stick to. Good primers for galvanized iron contain basic pigments that neutralize acids and thereby stop the corrosion of the zinc. Red lead, blue lead, or zinc dust-zinc oxide primer (80% metallic zinc, 20% zinc oxide) is very suitable for priming galvanized iron. House paints may then be applied over such a primer and if of high quality will not scale or peel off from the metal priming under coat.

What does acid do to galvanized metal?

Treating galvanized metal with acid solution etches it or eats into the surface and roughens it so that the metal priming paint has better anchorage. Also, if there is any oil on the metal, left there during the manufacturing process, this oil will be eaten off by the acid treatment. In this way the paint will hold better to the metal surface.

Why let the acid dry over night?

Allowing the acid to dry or eat into the zinc coating at least over night gives it time enough to react on the zinc and roughen it up more so paint will hold better.

Why brush off the accumulated powder?

Brushing off the powder is to avoid having it mixed up with the paint to be applied later, as well as to allow the paint to get directly to the metal and make the brushing easier.

What does weathering do to galvanized metal that makes acid treatment unnecessary?

During the few months' exposure, the oxygen and gases of the air, rain water, and sunshine destroy any possible oil on the surface of new galvanized iron. Weather exposure starts corroding or rusting of the zinc and after about 6 months' time this creates a rough surface similar to the effect secured in a few hours by treating with acid.

Is paint needed on other metals?

If sheet lead or alloys of lead are used for down spouts, gutters, hips, valleys, and flashing, they last indefinitely and need no acid treatment or paint except to decorate them to harmonize with the colors of the building.

Copper needs no paint as far as protecting it from rusting or corroding; however, water-soluble compounds form on copper exposed to the weather which, during rains, results in a copper solution that runs down over painted surfaces and discolors the paints.

Copper staining usually is found below windows having copper screen. This staining can be prevented if the copper is varnished with a good spar varnish about every two years.

Copper discoloration washes off white lead paint easily and does not form a permanent stain effect.

How do red lead, blue lead, or other metal priming paints prevent rust?

Red lead is an oxide of metallic lead. It is made by melting lead in large pots to a cherry red color of molten liquid and then blowing air over its surface. This forms a gray or yellowish film which is one form of lead oxide known as litharge. (PbO.) This film is easily seen when a small amount of lead is melted in a spoon or ladle, which experiment can be performed in a high school laboratory or work shop.

Litharge (PbO), when reburned, takes up more oxygen and becomes another lead oxide with the chemical symbol Pb_3O_4. This material in powder form when mixed with linseed oil "blooms" out by a physical and chemical reaction (see illustration page 25) just as carbonate of lead does when mixed with linseed oil.

Painting new steel or iron work with red lead before rusting has started coats the surface with an oxide of lead (commonly called red lead) which seems to amalgamate itself to the iron and inhibits or prevents oxygen of the air getting to the iron and rusting it.

Practically all steel work used in constructing buildings, oil storage tanks, bridges, battleships, and other such structures are kept well painted with red lead as the priming coats over which paints of other colors may be applied for decoration.

A few weeks after red lead paint is applied its bright orange color gradually changes to a yellowish gray. Close inspection will show that a white powder has formed on the surface of the red lead paint. The oxygen and other gases in the air have turned some of the lead oxide Pb.0, to basic lead carbonate [(white lead) (2PbCO,.Pb(OH),] which is a white paint pigment and appears gray over the red lead paint. This conversion of red lead to white lead does not affect the durability of the paint.

Metallic lead is almost indestructible and its oxides change their color and atomic composition which all seem to be useful in protecting the oxidation of other metals. Some of these phenomena, although difficult to explain scientifically, may have something to do with the fact that up to the present time no paint treatment for prevention of rusting of iron has been found that appears to excel the use of lead oxides when cost and durability are the main factors and they can easily be prepared at home for painting metal by the simple addition of linseed oil and gum turpentine.

Blue lead is another lead pigment that has practically the same rust inhibitive properties as red lead.

Such metal primers as described can be used on iron or steel machinery after old rust has been thoroughly wire brushed off.

What are most factory-prepared metal primers made of?

Factory-prepared metal primers usually contain red lead, blue lead, or other similar pigments along with varnish or linseed oil.

How do good metal primers provide foundation for house paint?

Good metal primers provide a suitable foundation for house paint because the lead oxide pigments and oils dry hard and hold to the metal without alligatoring or peeling as common house paints are liable to do when applied directly to metal.

Why thin down paste and strain metal priming paints?

All paste paint must be thinned down to brush and spread it to a uniform film thickness on the metal surfaces. It should be strained to remove any "skins" or lumps of paste in order that thick and thin spots do not result when brushing.

Why apply uniformly?

If paint films are not applied with uniform thickness, the thin spots will wear through too soon and the whole building will require repainting more often than otherwise.

Too much paint piled up on any surface, wood or metal, may result in alligatoring, cracking, or peeling. The total paint film should be kept as nearly as possible to about 1/200th of an inch (about the thickness of 2 sheets of bond paper) which by properly spacing periods between repaintings and application of the proper amount of paint per square foot can be maintained. (See Figure 26.)

Figure 70.—Priming a steel sash with red lead paint to prevent rust.

Figure 71.—Sealing lower edge of windows prevents moisture from entering sash and causing decay or paint peeling.

Figure 72.—Good materials and skilled brush work are necessary to secure clean-cut enamel jobs. The brush is especially important. It must be small, the bristles close-packed and flexible.

Job VII.—Painting New Interior Woodwork

ANALYSIS

Steps (Operations)	How to Perform (Standard Approved or Accepted Practices)
1. Secure equipment and supplies.	Provide the following: Stepladders — Drop cloths Rags — Paint buckets Putty knife — Sandpaper (No. 00) Steel wool — White lead putty Paint brushes — Dusting brush Strainer cloth (old silk stocking) — Mixing tub Paddles — Tint mixing cups
2. Prepare surface.	Clean or scrape all dirt, plaster or grease from the new woodwork. If any oil from oiling hinges or other causes is on wood, wipe the spots with a cleaning fluid. Remove splinters and smooth off edges of woodwork that may seem too sharp for proper painting. Sand with No. 00 sandpaper any fuzzy or rough edges of doors, window frames, base boards, moldings, and the like. Sand down any raised grain appearing on wood surfaces. Shellac knots with a thin coat of white shellac. Dust off all woodwork. If hardware is in place, remove lock plates, door knobs, switch plates and other fixtures. This will save time in "cutting around" them when painting. If walls have already been painted, run masking tape along the woodwork to save time and possible paint streaks. *Never use masking tape on wall-paper.*
3. Secure paint.	If factory-prepared paint is used, follow manufacturer's directions as to application. If white lead paint is to be mixed and tinted on the job, prepare it by following the formulas for priming coat, body coats, and *finish coat.* (*See pages* 155 *and* 156.) Tint to color desired. (See pages 40, 55, 67 and 68.)
4. Apply paint.	Apply priming coat mixed to formula. Brush it in well and allow ample time for drying. Fill all holes and cracks with white lead putty after the priming coat. Strain all paint through a piece of fine cheese cloth, silk or rayon stocking. Keep it well stirred.

Steps (Operations)	How to Perform (Standard Approved or Accepted Practices)
	When applying interior paint use a 2-inch or 3-inch high quality flat brush and a sash brush. As paint or enamel for interior woodwork contains oils or varnishes that level out more easily than exterior linseed oil paints, such finish material should be "flowed on" with the brush and allowed to level itself without too much brushing. A uniformly thick coating should be applied, based on the correct spreading rates found in mixing formulas (pages 155 and 156) or in the manufacturer's instructions.
	Apply priming and undercoats to seal the surfaces and build up the necessary foundation for finish coats which are subjected to the wear. Be sure the tops and bottoms of all sash and doors receive at least one coat of paint to prevent the entrance of moisture.
	Finish painting the casings around one door or window at a time. This prevents laps and uneven surfaces. In general, the finishing strokes of the brush should be with the grain of the wood. (See Figure 72.)
	Sand to smooth surface between coats with No. 00 sandpaper and be sure to dust or wipe off surfaces before applying the next coat so loose sand does not get mixed with new wet paint.
	Allow enough time between coats for paint to dry so that the paint does not gum up the sandpaper.
	Avoid dust circulation in the room by covering the floors with drop cloths. Windows may be kept open if screens prevent the entrance of insects and the weather is not rainy or windy.
	Soon after finishing the job, move each window sash up and down several times so that they do not get stuck to window stops by hardened paint.
	Clean off paint spots as painting proceeds. These can be easily removed while fresh with a rag wet with gum turpentine. If allowed to harden they require scraping off with a razor blade or the use of liquid remover.
	If new wood, such as Southern Pine (Yellow Pine), Douglas Fir, or Ponderosa Pine, is to be painted, apply a thin coat of shellac to such surfaces, *after* they have been primed and holes have been puttied, to get a smooth and uniform surface. (Cut the regular grade of shellac with equal parts of wood alcohol to make thin enough for this use.) Sand off smooth with No. 00 sandpaper and dust. Apply necessary coats of paint as when painting other woods.

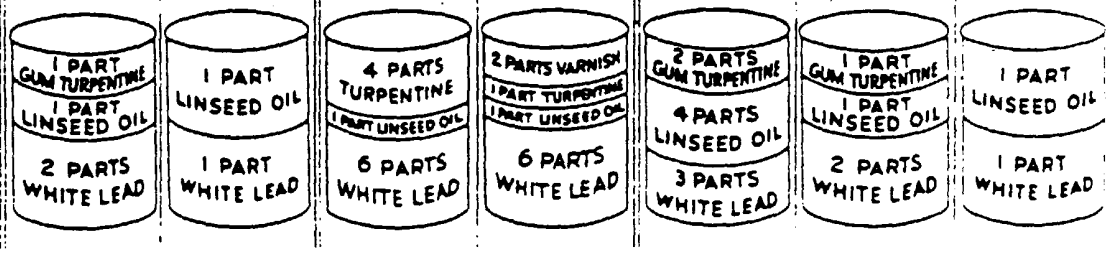
Job VIII.—Repainting Interior Woodwork

ANALYSIS

Steps (Operations)	How to Perform (Standard Approved or Accepted Practices)
1. Secure equipment and supplies.	Provide the following: Stepladders — Mixing tub Dusting brush — Paddles Paint scraper — Tint mixing cups Sandpaper — Drop cloths Steel Wool — Wiping rags Paint buckets — Paint brushes Cheese cloth or old silk stockings for strainers.
2. Prepare the surface.	Wash all woodwork to be repainted with water and a suitable washing or cleaning compound to remove grease and dirt. If the old paint has a high gloss, or varnished surfaces are to be painted, eliminate this gloss with steel wool, sandpaper, or washing compound made of sal soda and water (⅛ lb. sal soda to a gallon of water.) Remove switch plates, door knobs, escutcheons, hinges, and curtain fixtures to save time of painting around them, and having to remove paint spots from such fixtures. Putty the cracks, holes, or mars in woodwork, using a white lead putty which will not later discolor the paint. (See putty formula page 96.) Putty should have several days to dry before it is painted over.
3. Select and secure paint.	If factory-prepared paint is used, follow manufacturer's directions as to application. Select paint or enamel according to color and type of finish desired, flat, semi-gloss, or gloss. If the paint is to be made with white lead tinted and mixed on the job, use formulas on pages 155 and 156 and tinting formulas on pages 40, 55, 67 and 68.
4. Apply paint.	Use a 2-inch or 3-inch flat brush of good quality. Strain all paint into paint buckets through fine cheese cloth or a piece of silk or rayon stocking. As paint for interior woodwork contains oils or varnishes that level out more easily than exterior linseed oil paints, interior paint or enamel should be "flowed on" with the brush and allowed to level itself out without too much brushing. A uniformly thick film of paint should be applied, based on the correct spreading rates found in mixing formulas (pages 155 and [illegible]) or in the manufacturer's instruct[illegible]

Formulas For Making Home-Mixed Exterior Paint

	REPAINTING EXTERIOR WOOD OVER OLD PAINT				PAINTING NEW EXTERIOR WOODWORK		
	SIDEWALLS		PORCH FLOORS				
FORMULA →	No. 1	No. 2	No. 3	No. 4	No. 5	No. 1	No. 2
	FIRST COAT	FINISH COAT	FIRST COAT	FINISH COAT	FIRST COAT Priming	BODY COAT	FINISH COAT Except porch floors
Soft Paste White Lead	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)	100 lbs. 3¼ gal.	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)
Raw Linseed Oil*	1⅝ gal.	3¼ gal.	½ gal.	¾ gal.	4 gal.	1⅝ gal.	3¼ gal.
Gum Turpentine	1⅝ gal.		2¼ gal.	¾ gal.	2 gal.	1⅝ gal.	
Spar Varnish				1¼ gal.			
Liquid Drier*	1 Pint	1 Pint	½ Pint	½ Pint	1 Pint	1 Pint	1 Pint
Gallons of Paint Produced	6⅝	6⅝	6	6	9⅜	6⅝	6⅝
Total Square feet will cover	4850	4850	4200	4200	5600	4850	4850



These simplified volume mixing charts may be used for making larger or smaller amounts of paint. Any size measuring can may be used if the proper proportions of ingredients are measured and mixed

IF BOILED LINSEED OIL IS USED OMIT DRIER.

Formulas For Making Home - Mixed Interior Paint

	REPAINTING INTERIOR WOODWORK AND OLD PLASTER		PAINTING NEW INTERIOR WOODWORK			PAINTING NEW PLASTER	
FORMULA →	No. 6	No. 6	No. 7	No. 6	No. 6	No. 8	No. 6
	FIRST COAT	FLAT FINISH COAT	FIRST COAT (PRIMING)	SECOND COAT	FLAT FINISH COAT	FIRST COAT (PRIMING)	SECOND AND FINISH COATS
Soft Paste White Lead	100 lbs. 3¼ gal.	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)	100 lbs. 3¼ gal.	100 lbs. 3¼ gal.
Raw Linseed Oil*			3 gal *				
Gum Turpentine			2 gal.				
Lead Mixing or Reducing Oil**	3¼ gal.	3¼ gal.		3¼ gal.	3¼ gal.	4½ gal.	3¼ gal.
Liquid Drier*			1 Pint				
Gallons of Paint Produced	6½ gal.	6½ gal.	8½ gal.	6½ gal.	6½ gal.	7¾ gal.	6½ gal.
Total Square feet will cover	5200	5200	6000	5200	5200	6200	5200

These simplified volume mixing charts may be used for making larger or smaller amounts of paint. Any size measuring can may be used if the proper proportions of ingredients are measured and mixed.

Alternate Formulas For Making Home - Mixed Interior Paint

(These formulas may be used if Lead Mixing or Reducing Oil specified in formulas on page 155 is not available)

	REPAINTING INTERIOR WOODWORK AND OLD PLASTER		PAINTING NEW INTERIOR WOODWORK AND PLASTER		
FORMULA →	No. 6A	No. 6B	No. 7A	No. 6A	No. 6B
	FIRST COAT	FINISH COAT	FIRST COAT (PRIMING)	SECOND COAT	FINISH COAT
Soft Paste White Lead	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)	100 lbs. (3¼ gal.)
Linseed Oil*			3 gal.		
Gum Turpentine	1½ gal.	1⅜ gal.	1¼ gal.	1½ gal.	1¾ gal.
Floor Varnish (Best grade)	¾ gal.	1 pint	2 gal.	¾ gal.	1 pint
Liquid Drier	½ pint	½ pint	1 pint	½ pint	½ pint
Total Gallons of Paint produced	5½ gal.	5⅛ gal.	9⅝ gal.	5½ gal.	5⅛ gal.
Coverage per gallon (square feet)	800	800	600	800	800

* IF BOILED LINSEED OIL IS USED OMIT DRIER.

NOTE—If the finish coats on plaster are to be stippled reduce the amount of liquid so the paint will be of thicker consistency. This will give depth and sharpness to the stipple design.

SPECIAL FORMULAS FOR TWO-COAT WORK ON NEW EXTERIOR WOOD

The formulas below are for use when it is desired to apply two coats on new wood, replacing the usual priming coat in the three-coat paint job by adding some spar varnish in the first coat to keep the wood from soaking up the oil. Better results will be obtained with special priming paints of this kind whether they are factory-prepared or home made if they are applied with a full brush and then brushed out moderately to get uniform coverage. Such brushing is essential to produce good hiding. Many painters prefer applying the usual three-coat job on new wood instead of trying to apply the proper thickness of paint film in two coats.

For very porous old wood surfaces where previous paint has worn off and the siding has checked, the varnish in the first coat of these two-coat mixing formulas will seal the porous wood surface and make a very satisfactory primer for such conditions. It is also a good priming coat for cedar shingles, for roofs or sidewalls.

FORMULA		Coverage Sq. Ft. Per Gallon of Paint Produced
No. 9—PRIMING COAT	100 lbs. soft paste White Lead	700
	1⅛ gals. linseed oil	
	⅜ gal. exterior spar varnish	
	¼ gal. pure gum turpentine	
	1 pint liquid drier	
	¼ pint raw umber in oil	
No. 10—FINISH COAT	100 lbs. soft paste White Lead	600
	2⅝ gals. linseed oil	
	3 pints pure gum turpentine	
	1 pint liquid drier	

(Note—The small amount of raw umber in the priming coat is specified because an off-white first coat hides bare lumber better, especially on woods like Douglas Fir and Southern Pine that show strong contrasting colors in the grain formation. Off-white primer also shows up skips or "holidays" when the next coat is applied because of the slight difference in color between the two coats.

How to Make Home-Mixed Red Lead Paint with Dry Red Lead

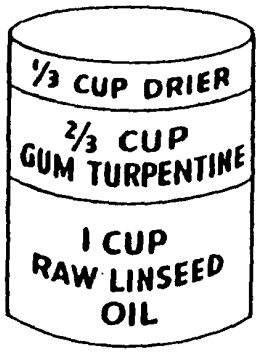
To make 1 Quart of Red Lead Paint proceed as follows:

First Step

Stir 4 cups (5 lbs.) of dry red lead into 1 cup of raw linseed oil to form a paste. (See volume mixing chart). Let this mixture stand a few hours, or over night to allow the red lead to become thoroughly wet with the oil.

Second Step

Thin the paste red lead into a paint of brushing consistency by adding 1 cup of raw linseed oil, 2/3 cup of gum turpentine and 1/3 cup liquid drier. Stir well and keep tightly covered when not in use. If boiled linseed oil is used, omit the drier.



NOTE: If larger amounts of red lead paint are to be made, increase the quantities of dry red lead and other ingredients proportionately, and follow the volume mixing charts above.

FOR EXAMPLE: 20 lbs. of dry red lead, stirred in 4 cups of raw linseed oil will make paste enough to be thinned to one gallon of red lead paint when 4 times the quart formula illustrated is mixed together.

CAUTION: As homemade red lead paste or paint soon gets hard in the can after mixing it with oil make only what paint will be used for immediate painting. Dry red lead keeps indefinitely.

BLUE LEAD METAL PAINT—If a quart of blue lead metal primer is to be made [illegible] cups of dry red lead and add liquids

DEFINITIONS OF PAINTING TERMS

Actinic Rays.—The sun's light rays which cause deterioration and break down of paint films. These are also called ultra-violet light rays.

Active Pigment.—Pigments in paint that react chemically when mixed with linseed oil. White lead, red lead, blue lead, and zinc oxide are the principal, so-called active pigments.

Adhesion.—The property a paint film has of sticking to a surface.

Adulteration.—The substitution of inferior materials for those accepted as standard.

Air Brush (air gun).—An atomizer for spray painting.

Alkali.—A substance that neutralizes acids, such as lye, soda, lime, etc. Alkalis or strong alkaline solutions are very destructive to oil paint films.

Alligatoring.—A form of paint failure in which the top coat breaks into wide cracks due to a top coat drying harder than the undercoat, over which it has been applied.

Aluminum Silicate (silicate of alumina, china clay, kaolin, pipe clay).—A rather fluffy extender pigment with no hiding power and chemically inert.

Anchorage.—The mechanical effect of paint "keying" itself into the surface of wood or other materials to which it has been applied. This effect is similar to the "clinch" of plaster anchoring between lath.

Barium Sulfate (barite, barytes, sulfate of barium, blanc fixe).—A heavy white crystalline extender pigment, sometimes substituted for more expensive heavy pigments.

Basic Carbonate White Lead.—See white lead.

Basic Lead Sulfate (basic sulfate white lead).—A white opaque pigment made by subliming lead sulfide, which is oxidized to the basic sulfate.

Benzine (mineral spirits, petroleum spirits).—A very light gravity petroleum distillate, less volatile than gasoline but more so than kerosene.

Benzol.—A by-product of the distillation of coal tar. It has great solvent properties for many of the materials used in paint, varnish and lacquer. For this reason it is used extensively in paint and varnish remover. Because of its toxic effect on many workers, benzol has been replaced by toluol and xylol in the manufacture of lacquers.

Binder.—The non-volatile vegetable oil portion of the paint vehicle, generally linseed oil in good paints.

Bleeding.—A term applied when describing the action of such substances as creosote or aniline dyes that may have been used in stains applied to wood. Later they may dissolve in the paint film and show through

Peeling.—A term applied to paint failure when the paint film loses its adhesion to the underneath surface and comes off in sizable pieces. Usually caused by moisture back of the paint film, improper formulation of the paint, or painting over greasy surfaces. (See page 12.)

Pigment.—The solid, finely divided particles of paint such as white lead, zinc oxide, titanium, etc.

Plastic Paints.—A thick, plaster like paint usually made by mixing whiting in either factory-prepared or white lead paint made on the job. The mixture is usually thick enough to trowel on the wall instead of being brushed on as is the usual method for applying paint.

Primary Color.—A primary color is a color which cannot be produced by mixing any other two colors. The three true primary colors are red, yellow, and blue. From the standpoint of paint making, black and white may also be considered as primary colors since they cannot be made by mixtures of any other colors. Technically, however, black is the absence of all color and white is the presence of all colors. (See color wheel, page 40.)

Priming Coat.—The coat of paint applied to surfaces which serves as a foundation for the succeeding coats. It helps to seal pores and anchor the paint to the surface of the building material.

Prussian Blue (Chinese blue).—A pigment composed of ferric ferrocyanide. Prussian blue is easily affected by alkali but not by acid. Available in colors-in-oil for tinting paints.

Putty.—A stiff plastic mixture of whiting and linseed oil with or without white lead used for filling cracks or holes and for holding window glass in the sash.

Raw Oil.—Linseed oil in its natural state is called raw oil.

Raw Sienna.—One of the brown earth pigments found in France, Italy, England, and America. It contains from 60 to 70 percent hydrated ferric oxide, the rest being alumina and silica. The color naturally varies according to the exact chemical composition, the deposit from which it is secured, and the method of preparation. Available in colors-in-oil or in Japan.

Raw Umber.—One of the brown earth pigments, consisting essentially of hydrated ferric oxide but differing from raw sienna because it contains in addition to alumina and silica, 10 percent or more of manganese. The color varies according to the locality from which it is obtained and the method of preparation. Umber is obtained from deposits in Italy, France, and England and also from the Island of Cyprus. Available in colors-in-oil or Japan.

Red Lead.—A bright orange red oxide of lead which is used most extensively as a pigment in paint for priming structural steel and other metal surfaces.

Runs.—Defects in a finish due to an excess of finishing material being applied which did not "stay put" but flowed down in a curtained or ragged effect. Usually caused by painting over a greasy surface or using a paint containing too much oil in proportion to the pigment. (See page

Sags. Irregularities in finished surfaces due to improper brushing uneven flow. Whenever an excess of material is applied by any metho on horizontal or upright work, sags are likely to form. (See page 14

Sal Soda. Crystallized sodium carbonate. It is used for making cleani solutions to remove grease and grime from old painted surfaces.

Sap-Wood.—The portion of a tree just beneath the bark and extending fro about one-fifth to approximately one-third toward the center of t tree. Usually distinguished by its lighter color when compared wi the heart-wood that forms the darker colored center portion of t trunk of a tree. When the tree is cut into lumber, the sap-wood, used where there is too much moisture, may easily decay, while t heart-wood, on account of the wood oils that cause the darker color, w resist decay.

Satin Finish.—When a dried paint film does not have a full luster, but h one resembling the luster of satin, it is said to have a satin finish.

Scaling.—An evidence of paint failure which is the last stage of crackin Rain moisture entering the cracks in the paint film destroy its adhesi property, and results in the breaking or scaling of paint. (See page 1

Semi-Gloss. A material is said to have a semi-gloss luster when it dr out to a sheen about half way between full gloss and a dead flat finis

Shellac. It is available as a brownish yellow liquid called orange shell or as a transparent white shellac. It seals wood, dries quickly, a leaves a very hard but somewhat brittle finish desirable for sandi down as a smooth foundation for finish coats.

Silica (silex).—A natural extender pigment composed of silicon dioxi It is chemically inert and has practically no hiding power.

Size.—A solution of gelatinous material, such as glue, starch, resin, varnish, which is used to seal or fill the pores of a surface and con quently hold succeeding coats of finishing materials.

Skins.—The films of dried paint that form on the surface of a can of pa when left exposed to air. Formation is due to partial oxidation of t oil in the paint and to the action of driers present.

Skips.—Places where the painter has failed to cover with paint or the bru has been too dry to apply the proper thickness of film.

Soft Paste White Lead.—A paste consisting of 89% carbonate of l (white lead) 9% raw linseed oil and 2% turpentine that is usua made for painters and large users of paint to save packaging a factory costs of mixing by thinning down the paste white lead on job with additional linseed oil and gum turpentine.

Solvents.—Volatile liquids, usually of low boiling points, used in paints similar materials to dissolve the various compounds of the vehi Some of them are used to dissolve the nitro-cellulose used in mak lacquer.

Soy-Bean Oil. A semi-drying vegetable oil obtained from soy-beans whi when properly processed, can be used in manufacturing paints a varnishes.

Spirit Varnish. A varnish, such as shellac, which is made by dissolv resins in a very volatile liquid such as denatured alcohol, mine

spirits, or a similar volatile. When dry this kind of varnish leaves a very thin film of the original resins or gums that have been dissolved in the spirits.

Starch Solution.—A solution made with water and starch used by painters for soaking off wall paper or for starching newly painted walls so that they can be more easily washed.

Stencil.—A piece of tough paper or card board from which cut-out designs have been made. By holding the stencil against a wall, the pattern or designs can be made on the surface by applying paint in the cut-out portions in the stencil material. (See page 136.)

Stippling.—A finish made by using a stippling brush or roller stippler on a newly painted surface before the paint is dry. This is done by tapping the surface with the bristle ends of a brush or by rotating a roller stippler over the wet paint thus leaving an orange-peel, roughened design. (See page 72.)

Stretch.—A term used to describe the width of a section of a wall that is painted before moving the ladders or scaffolding.

Sublimed White Lead.—See basic sulfate white lead.

Thinner.—A liquid that can be added to paint, varnish, or lacquer to reduce its consistency. Usually thinners are highly volatile, such as turpentine, mineral spirits and wood alcohol.

Tint.—Is a color produced by mixing a white pigment or paint with a small amount of a colored pigment or paint. When used as a verb, the word "tint" indicates the act of adding small quantities of color, as for example, a white paint is tinted to an ivory shade by adding a small quantity of yellow.

Tinting Colors.—Pure concentrated colored pigments ground in oil or a neutral varnish used for adding to white or colored paints to produce other shades.

Titanium Dioxide.—An inert white pigment with very good hiding power.

Titanium Pigments.—These include the pure titanium dioxide, lead titanate and the composite pigments in which titanium dioxide is co-precipitated or mechanically mixed with blanc fixe, (barium sulfate) calcium sulfate, or magnesium silicate.

Tooth.—A term sometimes used by painters when describing the characteristics a paint has for providing good anchorage or adhesion for the succeeding coats. They say it gives "tooth" to the surface.

Touch-Up Colors.—Paint made and tinted to match old painted surfaces. Used for touching up mended cracks and holes that have been repaired with patching plaster.

Transparent Pigments.—Having no hiding or covering power. Not opaque. Examples are: Silica, calcium carbonate, magnesium silicate, and calcium sulfate.

Turpentine.—(See gum turpentine.)

Tung Oil (Chinawood oil).—An oil extracted from the nut of the tung tree. It has rapid drying qualities and is used largely in the manufacture of [illegible] properties and makes up part of

Tuscan Red. A red pigment made from a mixture of iron oxide and a alizarine dye. A typical analysis is: Alizarine, 20%; barium sulfat 43%; ferric oxide, 33%; and silica and silicates, 4%. Available colors-in-oil.

Ultramarine Blue. One of the blue pigments made by heating defini mixtures of china clay, sodium carbonate, sulphur, and carbon. It easily affected by acids but not by alkalis. Available as colors-in- for tinting.

Undercoats.—The coats of paint that are applied and sanded down to smooth finish before applying the final coat.

Undercutting.—The preparation of plaster cracks before filling them wi patching plaster. The crack in the old plaster is cleaned out and ma wider at the bottom of the crack than it is near the surface so th the patched plaster will clinch or hook in under the side walls of t crack. (See pages 63 and 130.)

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Varnish.—A solution of certain gums or resins in drying oils which, wh applied to surfaces, produces a transparent film.

Vehicle.—The liquid portion of a paint or finishing material consisting the oil, varnish and volatile thinners. The liquid carries the pigm and holds it in the paint film.

Venetian Red.—A bright red pigment composed of iron oxide and calci sulfate. Available in dry powder form or as color-in-oil.

Washing.—A type of failure whereby exterior paints after a few mont if composed of certain pigments and liquids, soften and rapidly wa or streak down over the sidewall surfaces of a building sometimes positing the paint pigments on the foundation or lower sections of t walls.

Washing Compounds.—Chemicals that, when dissolved in water, make alkali liquid similar to lye solution which will react on grease a grime when used for washing old painted surfaces. These soluti can be made strong enough to dissolve and remove some kinds of pai

White Lead (basic carbonate of lead).—A white pigment made by corrodi metallic lead. According to historical records, has been in continuc use for over 2000 years. It is the only white pigment that, when u alone with linseed oil, makes a durable paint. It has good hidi power, chalks gradually, and usually leaves a surface that is good repainting. It is used as the principal pigment in high-grade exte factory-prepared white and tinted paints in combination with z oxide and titanium pigments. (See page 26.)

Whiting (calcium carbonate, chalk).—A soft white, grayish white, or y lowish white rock which is composed largely of the remains of min marine organisms. Cliffstone whiting ground with linseed oil is co monly used for making putty. Whiting is also used as a low-c inert extender in manufacturing paints. The best whiting comes fr

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Wood Turpentine.—Turpentine that has been made by steam distilling Southern pine chips and stumps rather than distilling the pure gum gathered from live trees.

Wood Fillers.—Fillers are of two kinds—paste and liquid.

Paste fillers are something like a very thick paint and are composed of some solid powdered substance, usually silica or powdered quartz, mixed with linseed oil or varnish thinned with turpentine or benzine. They are applied to the dry surface of the wood with a stiff short bristle brush or put on with a cloth and rubbed well into the pores of the wood. After half an hour or so the surface of the wood is wiped off and after further drying sanding is done before finish coats are applied.

The word "filler" is sometimes used synonymously with extender.

Wood Stain.—Stains that penetrate and change the color of the cellular structure of wood. They usually form no film on the surface of the wood.

Spirit stains made with alcohol or oil stains, composed of linseed oil and color pigments do not raise the grain of the wood and water stains composed of water and coloring matter are used on close grain woods where the grain is not easily raised by moisture.

Wrinkling.—A defect in paint films usually caused by applying too thick a coat which partially dries first on the surface; later drying and shrinking of the paint underneath wrinkles the surface. (See page 16.)

Zinc Oxide.—A white pigment composed of the oxide of zinc and made by burning metallic zinc. Used largely in factory-prepared paints, enamels, and lacquers in combination with other pigments.