WHAT CAN BE DONE TO MAKE PAINT MAINTENANCE MORE SUCCESSFUL

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The success of wood as an exterior covering for houses depends upon the success with which a coating of paint can be maintained on the wood. In general the wood is put in place when the house is built and remains there as long as the house is needed whether it is painted or not, but on houses of prideful occupancy the appearance of weatherbeaten wood is rarely desired and decoration with paint is therefore necessary. The life of paint, however, is limited to a few years so that the coating must be maintained by applying more paint from time to time. From five to six times as much house paint is required for renewal of old coatings as is consumed in the initial painting of new woodwork.

Those who make and sell paint are in the habit of thinking of all these paint jobs as separate transactions independent of the jobs that went before or are to come after them. The house owner, to be sure, buys his paint jobs one at a time, but his real interest is in a coating satisfactorily maintained over a long period of years. Much of the misunderstanding and disagreement about paint comes from failure to appreciate that paint maintenance is a long term matter made up of a succession of paint jobs that must fit together into a harmonious whole.

Paint maintenance is successful when it comes up to the owner's reasonable expectations both as to continuance of the chosen decorative effect and as to cost. Owners' expectations, however, vary widely. Some, following tradition of long standing, expect to repaint no more often than intervals of eight or ten years. Others, whose decorative standards may be more exacting, are willing to paint every four or five years. A negligible few may be willing to paint still more often. Practically no one, however, expects ever to be put to the extra expense of completely removing an old coating before applying a new one and any maintenance program that leads to such eventuality may be regarded as unsuccessful. All of the above expectations of different owners can be satisfied with good house paints now on the market, but no one kind of paint is capable of satisfying all of them. It is idle, therefore, to attempt to discuss good paint in general terms -- we must discuss it with reference to the kind of maintenance program for which it is suitable.

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[1] Presented before the Annual Convention of the Southwestern Lumbermen's Association at Kansas City, Mo., Jan. 27, 1938.

What proportion of paint maintenance programs proves unsuccessful no one knows. That the proportion is unduly high, however, can scarcely be denied. The Lumber Products Better Paint Campaign was organized because the seriousness of paint failures is generally recognized by lumbermen. The writer's research is constantly being interrupted by calls to inspect paint jobs that have gone bad, more than 170 cases having been considered by him in 1937. During the past fifteen years he has been consulted about unsatisfactory paint conditions on several percent of the frame dwellings in his home city. That painting has become unreliable enough to impair lumber markets was shown by a recent survey of new building by the Forest Products Laboratory in which nearly half of the new dwellings of medium and low price groups in twenty-five cities were being covered with materials that will not be painted. There can be little doubt that this sharp change in past practice has been stimulated at least in part by the public's discouragement with paint maintenance. An examination of the causes of unsatisfactory paint maintenance and possible ways of correcting the situation is therefore urgent.

In the public mind poor paint and poor lumber are usually held responsible for unsuccessful paint maintenance. This opinion is readily understandable, but is not entirely just to either paint or lumber. The major causes of difficulty are much more intricate. The great majority of paint complaints that come to the writer's attention involve the best woods for painting and the best grades of paint. Moreover the writer's experimental work has shown that even the poorest woods for painting can be kept well painted at reasonable cost, and paints of comparatively low grade can be used successfully, though not necessarily economically, if the nature of the materials is understood and the paint maintenance guided accordingly.

Lumber in Relation to Paint Maintenance

It is true, of course, that some kinds of wood hold paint better than others and that in any species high grade lumber is better than low grade. A classification of lumber from the point of view of painting was published by the Forest Products Laboratory some years ago. Building practices in most parts of the country for a very long time have made use of lumber pretty much in accordance with this classification; that is, for exterior woodwork of buildings on which good paint maintenance is likely to be considered important it has long been customary to use the higher grades of those species that naturally hold paint well. The species with wide bands of summerwood on which paint tends to fail relatively early are used for the most part on less important buildings or buildings of strictly utilitarian purpose. In the Southwest, however, the heavier softwoods are more widely used on the exteriors of dwellings than in most parts of the country because of the ready availability of such woods there.

Maintenance of paint on the heavier softwoods could be very greatly improved by the more general use of aluminum priming paint for the first paint job. For this purpose aluminum priming paint should not be confused with the many other special primers that have appeared on the market in recent years, which are designed for an entirely different purpose. Unfortunately aluminum primer has not received the acceptance it deserves. Paint manufacturers oppose it because they feel that they cannot readily present it as an exclusive proprietary product. When they sell it at all they are inclined to furnish a vehicle that they are making primarily for some other purpose, one intended for aluminum paint on metal, or one with some fancy variation of their own rather than the simple kettle bodied oil vehicle that is best. Lumbermen producing the woods that would be benefited by aluminum priming hesitate to push it because they do not like to admit that their woods need precautions in painting that are not so necessary on other woods. The road to improvement in paint maintenance on the woods in question, however, is plainly marked and can be followed by those who wish to do so.

The Cure for Poor Paint

Although the writer has rarely encountered really inferior paints in the cases of paint complaints he has examined, he is told repeatedly by paint manufacturers and others that much inferior paint is made and sold. The Federal Trade Commission and Better Business Bureaus take action against notoriously bad paint from time to time, but they can deal only with paints so inferior in quality that their sale is a downright fraud. Paints that are merely inferior in quality, but not clearly fraudulent can be dealt with effectively only by clearly defining good paint. When the regional lumber manufacturers were preparing their pamphlets on painting instructions for insertion in bundles of bevel siding they found that there is only one kind of good paint defined in such a way that it can be discussed in general recommendations. That paint is pure white lead, commonly known as lead and oil. Other kinds of good paint are identified for sale by trade brand only, vary widely in composition, but conform to no standards by means of which the various kinds and grades can be recognized by the users.

The Forest Products Laboratory has recently shown that it is perfectly practicable to define good paints of all kinds in such a way that they can be set apart from inferior paints. In fact, it is technically feasible to classify paints in a logical manner. The proposed "grading" rules, though technical in nature, are much simpler than the various grading rules for lumber. While some technologists of the paint industry recognize the desirability of classifying paints the paint industry as a whole is opposed to it. Since the idea is a new one originating outside of the industry, it is by no means surprising that it should be regarded with suspicion, especially since its primary purpose is to provide a clearer basis of mutual understanding of the composition of the product between manufacturer and user in so far as

composition affects the correct use of the product in practice. If there is a better way of accomplishing the latter objective it is to be hoped that someone will soon propose it.

The Forest Products Laboratory's proposed system of classifying house paints was published in detail in the American Paint Journal, issues of October 11 and 18, 1937. Briefly, paints are separated into types according to the nature of their opaque white pigments and the proportions of the two kinds of chemically active white pigments, namely, white lead and zinc oxide. Each type is then marked off into divisions according to the content of total pigments, opaque pigments, and nonvolatile matter (pigments plus drying oils). Where paints contain vehicles other than the customary unbodied drying oils, such as linseed oil, additional classification is provided. In the writer's opinion the proposed system of classification evaluates paints in essentially the same way that any well informed paint technologist would evaluate them but, inasmuch as the various types are merely recognized as differing from one another without inferring that any one is inherently better than another, it does not lend support to any one school of thought about house paints at the expense of contrary opinions. Each may choose whatever type of paint he prefers and reject those he dislikes.

The proposed classification assumes that the system would be administered by the appropriate trade association, just as lumber grading is administered by the regional lumber manufacturer's associations. A commercial paint would then be identified for sale both by the manufacturer's trade brand, which would remain his seal of responsibility for quality of the product, and by the association's symbols of type and division. These symbols would be simple enough to be explained to laymen, in contrast to the complicated formula label that now appears on many paints in conformity with the laws of some states. A typical symbol of type and division might read: "This paint is of TLZ (titanium, lead, zinc) type with medium content of white lead and medium content of zinc oxide, division M, as classified by the ..... Association." With paints so classified there would be no great difficulty in telling the public the difference between good paints and inferior paints. The problem of cheap paint, therefore, can be dealt with effectively just as soon as we really wish to do so.

"Moisture" Failures and Their Cure

Access of moisture behind painted woodwork is the cause of one large class of early paint failures. The moisture may get in through carelessly designed or erected joints in the construction, or by condensation of moisture laden air from inside of the house when it comes in contact with the cold back surfaces of the exterior woodwork. Trouble from condensation has probably increased materially in recent years

because of the greater use of thermal insulation, which makes the back surfaces of exterior woodwork colder by letting less heat escape from inside, and because of provision of air washing and humidification in modern heating plants. Condensation of this kind is more troublesome in the northern parts of the country, but in more southern areas where studs are sometimes covered with drop siding without sheathing and heating is accomplished with inadequately vented open gas burners, condensation on or in the sidewalls or under the roof sometimes occurs as a result of the large amount of moisture formed in the combustion of gas.

Condensation in sidewalls and attics can be prevented by keeping moisture from passing through the walls. This can be accomplished by the correct installation of vapor barriers on the inside of the studs and underside of attic floor joists. In houses already erected two coats of aluminum paint on the interior surfaces of side walls and ceilings under the attic makes an effective vapor barrier over which other wall decoration may be applied. Where moisture arises from open gas burners it should be carried off by means of adequate flues.

Much moisture is evaporated in houses during normal living operations such as cooking, bathing, laundry work, and the breathing of persons and plants. Families undoubtedly vary in their living habits that affect the amount of moisture evaporated and the amount that can subsequently escape when the house is ventilated by opening windows. House owners should be taught that condensation on windows is an indication that the relative humidity indoors is higher than the house can carry safely with the prevailing temperature out of doors and that reduction of relative humidity by opening windows and adjustment of the heating plant is desirable until the condensation is re-evaporated. In northern climates storm windows are necessary, whether or not the windows are weatherstripped, both to save heating expense and to prevent condensation without limiting the house to unreasonably low relative humidity during cold weather.

Fortunately the problems of moisture leakage and condensation are becoming generally appreciated and at least for new houses and some of those already erected, we now have effective means of keeping the woodwork dry. To be sure there remains the serious undertaking of educating those concerned with the erection of houses and the house owners themselves, but there are reasonable grounds for believing that in time moisture as a large cause of unsuccessful paint maintenance can be eliminated.

The Cure for Mistakes in Applying Paint

Much unsuccessful painting comes from faulty technic in applying paint. The most common blunders arise from the painter's very human desire to do the work with the smallest amount of expensive material possible just as the paint manufacturer tries to make his paints with

the smallest practicable proportions of the more expensive ingredients. In most cases in which the bounds of safety are overstepped the painter was not intentionally dishonest, he was merely mistaken in his judgment or unfamiliar with the limitations of the material with which he was working.. It should be remembered that the painter's judgment is necessarily based on insufficient information because, except in the case of lead and oil, he does not have practical knowledge of the composition of the paint he is using and there are no generally accepted standards of correct application. Commercial paints differ in composition far too widely to conform to any general standards of application, and since they are not recognized by classes each paint presents a separate problem in application. Often the painter is asked to apply a paint that came on the market long after he learned his craft and differs seriously as respects application from anything he has been trained to use correctly.

To be sure directions for application are usually printed on the label on paint containers. The painter is often chided for paying little attention to such directions, but when manufacturers' directions are studied carefully in relation to the composition of their products it becomes clear at once that manufacturers' ideas of correct application are just as divergent and illogical as painters' practices. Since directions usually are most explicit about the extent to which the paint should be thinned the conflicting state of opinion about application can be illustrated by considering manufacturers' directions for thinning.

Table 1, which is condensed from a much larger table of data, shows the composition of 18 semipaste paints on the market in relation to the makers' instructions for thinning to make finish-coat paint and the composition of the paints when so thinned. The paints are arranged in the table in order of their content of total pigment by volume, which decreases from 0.58 to 0.30 gallon in 1 gallon of semipaste. The content of opaque pigments, calculated by the methods described in the Forest Products Laboratory's system of classification, ranges from 0.52 to 0.18 gallon per gallon of semipaste. Yet with negligible exceptions the thinning directions call for the addition of a gallon or more of liquid to a gallon of semipaste. This proportion is obviously determined less from consideration of the best way to mix these paints than from the fact that the accepted proportions for mixing lead and oil, namely 3 gallons of oil and 1/2 to 1 pint of drier per 100 pounds of paste lead, is very closely gallon for gallon. That the thinning directions are not guided by any logical relation to the composition of the semipastes is shown by the very wide variations in the composition of the resulting paints after thinning.

Table 2 shows that for prepared paints also there is a lack of logical relation between composition of the paint and directions for thinning. In Table 2 after the composition of the paint there are given the directions for thinning the first, second, and third coats in painting new exterior woodwork of the kinds of wood the paint manufacturer considers best for painting. Sometimes the directions call for variations

Table 1.--Variation in composition of semipaste paints on the market, manufacturers' directions for thinning them for finish coat, and characteristics of the paints when so thinned

Identification number	Composition of semipaste paint			Liquids to be added to 1 gal. of semipaste paint			Characteristics of resulting paint		
	Total pigment	Opaque pigment	Nonvolatile	Total	Linseed oil	Volatile	Total pigment	Opaque pigment	Nonvolatile
	Gals. per gal. of semipaste			Gals. per gal. of semipaste			Percent		
20	0.58	0.34	0.97	1.0	1.0	0	29.0	17.0	98.5
31	.53	.27	.83	1.0	.87	.13	26.5	13.5	85.0
Lead & oil.	.52	.52	.91	1.05	1.00	.05	25.3	25.3	93.3
38	.51	.36	.93	1.03	1.00	.03	25.1	17.7	94.6
26	.50	.28	.87	1.0	1.00	0	25.0	14.0	93.5
19	.50	.25	.97	1.0	1.00	0	25.0	12.5	98.5
27	.45	.38	.69	1.0	1.00	0	22.5	19.0	84.5
18	.44	.34	.72	1.0	1.00	0	22.0	17.0	86.0
23	.44	.26	.86	1.0	1.00	0	22.0	13.0	93.0
3	.43	.43	.82	1.25	1.25	0	19.1	19.1	92.1
4	.42	.37	.91	1.25	1.20	.05	18.7	16.4	96.0
13	.42	.35	.84	1.07	1.07	0	20.3	16.9	97.0
24	.41	.18	.90	1.0	1.00	0	20.5	9.0	95.0
12	.41	.27	.91	1.1	1.10	0	19.5	12.9	95.8
39	.39	.36	.90	.75	.75	0	22.3	20.6	94.5
36	.37	.37	1.00	.87	.75	.12	19.8	19.8	93.6
30	.35	.31	.89	1.04	.87	.17	17.2	15.2	86.3
45[a]	.30	.26	.79	maker gives no directions			--	--	--

[a] Note that semipaste No. 45 contains little more than half as much pigment as semipaste No. 20 and that No. 45 contains little more pigment than prepared paints Nos. 1A and 2A in Table 2.

Table 2—Variation in Composition of Prepared Paints on the Market and in Manufacturers' Directions for Application.

Identification No.[1]	Composition of Prepared Paint			Liquids to Be Added for 1st Coat[3]			Liquids to Be Added for 2nd Coat			Liquids to Be Added for 3rd Coat		
	Total Pigments	Opaque Pigments	Non-volatile	Total	Linseed Oil	Volatile	Total	Linseed Oil	Volatile	Total	Linseed Oil	Volatile
	Gals. per gal. prepared paint			Gals. per gal. prepared paint								
1A	.29	.18	.79	.31	.25	.06	.06	0	.06	.06	.06	0
2A	.29	.27	.88	.50	.25	.25	.25	.125	.125	0	0	0
2B	.28	.13	.88	.50	.25	.25	.25	.125	.125	0	0	0
3A	.28	.18	.92	.50	.37	.13	.25	0	.25	0	0	0
1B	.27	.22	.91	.375	.125	.25	0	0	0	0	0	0
4A	.26	.15	.86	1.00	1.00	0	.125	0	.125	0	0	0
4B	.25	.22	.88	.5	.25	.25	.18	0	.18	0	0	0
3B[2]	.25	.32	.90	1.00	.75	.25	.125	0	.125	0	0	0
6At	.25	.21	.91	1.125	1.00	.125	.375	0	.375	.5	.5	0
7	.25	.25	.90	1.125	1.00	.125	.50	.25	.25	.25	.25	0
6Aw[2]	.25	.29	.91	1.00	.875	.125	.375	0	.375	.25	.25	0
5At[2]	.25	.28	.90	.25	.125	.125	.06	0	.06	.06	.06	0
8[2]	.25	.29	.90	1.00	1.00	0	.25	0	.25	0	0	0
9	.24	.19	.90	.625	.50	.125	.25	.125	.125	.125	.125	0
10	.24	.17	.86	.18	.10	.08	.18	.06	.12	0	0	0
11	.23	.23	.88	.625	.50	.125	.25	.06	.19	0	0	0
12	.22	.22	.90	.5	.25	.25	.25	.125	.125	0	0	0
13	.22	.22	.90	.5	.25	.25	.125	0	.125	.125	.125	0
14A	.21	.17	.93	.5	.375	.125	.125	0	.125	0	0	0
15	.21	.21	.84	.75	.625	.125	.375	.125	.250	.125	.125	0

[1] In the identification no. the numeral stands for a manufacturer and the capital letter to one brand out of two or more made by that manufacturer. Lower case letters t and w distinguish between white and tinted paints of the same brand.

[2] These paints contain very opaque pigments, titanium dioxide or lead titanate, without equivalent dilution with transparent pigments, consequently the opaque pigments calculated by the method described on page 32, American Paint Journal, October 18, 1937, exceed the total pigments.

[3] Where directions differ for different woods, those given for red cedar or white pine are reported.

in thinning the first coat for different woods, in which case it is seldom possible to recognize any reasonable connection between the properties of the woods and the variations in thinning specified. As a matter of fact, the names by which the woods are designated often are not the names under which they are sold in commerce.

An old rule of painting held that the undercoat (the second coat in three-coat work) should always be mixed with more pigment in proportion to oil than the finish coat. This rule is still recognized in directions for thinning lead and oil and many semipaste paints. It does not fit in, however, with the conception of prepared paint as ready for application without further thinning. Consequently it was formerly customary to direct that the paint be thinned only with turpentine for second coat so that the undercoat would contain at least no less pigment when dry than the finish coat. Eight of the twenty paints of Table 2 break with this custom and depart still farther from the old rule of craftsmanship by directing that oil be added to the paint for second coat. Of these eight only three call for addition of oil to the finish coat also so that five of them definitely instruct the painter to violate a rule of craftsmanship to which the older painters were trained.

It is curious that the instructions for eight of the twenty paints in Table 2 direct that the paint be thinned for all three coats, one of them calling for addition of as much as half a gallon of oil per gallon of paint for finish coat. Such a paint ought not to be called a prepared paint, but rather a semiprepared paint. As put up in the can the paint in question is of very respectable quality, but when thinned as directed for finish coat its content of total pigment drops to 16.7 percent, and its content of opaque pigment to 14.0 percent, figures not at all in accord with modern conceptions of high quality in house paints.

Bad technic of application can be cured only by education in correct technic. We cannot teach painters to read and follow directions, however, until the directions are reasonable and are agreed upon by those to whom painters must look for instruction. Where the teachers contradict one another the pupils, being human, hold the teachers' opinions lightly and follow their own judgment, inevitably making many mistakes in so doing. It is the writer's opinion that the present irrationality in directions for applying paint arises less from lack of technical knowledge than from commercial considerations of price competition. Manufacturers' directions are written too much with a view to convincing the painter that the paint will "go farther" than competitive paints and too little with the idea in mind of making sure that the paint will give the best possible performance.

If paints were properly classified according to composition, paint technologists probably would find no great difficulty in agreeing upon sound instructions for applying each of the classes of paint, provided that they were permitted to do so solely from the point of view of performance. With such agreement on standards of correct application

a campaign of education for painters becomes practicable, but until there are such standards there is no way of giving painters adequate instruction.

The cure for bad technic of application, therefore, lies in classification of paints by some such method as that proposed by the Forest Products Laboratory, followed by agreement upon reasonable instructions for applying each class of paint, and then by united and vigorous insistence that painters learn and follow the accepted standards of application.

The Cure for Mistakes in Paint Maintenance

In the writer's experience more complaints about paint jobs are caused by incorrect programs of maintenance than by poor lumber, poor paint, bad application, or moisture. Neither the paint manufacturer nor the painter, as a rule, has much control over maintenance because the house owner generally decides when painting shall be done, how much work he is willing to pay for, and often what brand of paint shall be used. Efforts to attain more successful paint maintenance, therefore, must take into account the necessity of teaching house owners how to space jobs correctly and how to choose the right kinds of paints for their purposes.

Many house owners have no definite plan for spacing paint jobs and merely wait until the old coating goes to pieces before trying to renew it. In this group many have no intention of painting more often than every eight or ten years. Since we have no white paints that can be relied upon to remain durable for such long periods, those who follow such programs are more interested in the ability of the paint to stand neglect well than they are in its durability. They want a soft type of paint that breaks up slowly by crumbling so that it does not look too unkempt during the period of neglect and after neglect can be safely repainted without expensive removal of the old coating. Pure white lead paint, if used exclusively, will behave in this way, and is largely responsible for the fact that so many owners are accustomed to maintenance programs involving long periods of neglect.

Most of the newer paints, however, are made to provide greater durability and superior appearance, which can be provided only by making harder paints that break up finally by cracking, curling, and flaking, and therefore cannot be neglected safely. Of course, practically all paints are advertised as wearing away slowly by chalking, leaving a fine surface for repainting, and avoiding the defects of cracking and scaling, but such claims are made on the assumption that repainting will be done before the end of the period of durability and before neglect begins; they do not mean that the paint is suitable for those who expect to let their coatings go through periods of neglect.

There are two ways of successfully linking together the maintenance program and the kind of paint for those with unduly long intervals between painting. One way is to convince the house owner that it will be worth his while to change his program to permit him to use paints of harder type satisfactorily. The other way is to sell him the kind of paint that will serve satisfactorily in the program to which he is accustomed. To persuade him to buy a paint unsuited to the program he intends to follow, however, is simply to add one more to the number of those who are dissatisfied with painted woodwork.

A large proportion of paint complaints that come to the writer's attention occur on houses that have been painted at reasonable intervals with good paints well applied on woodwork that remains dry and yet the paint fails far too soon and often in a manner not characteristic of the normal behavior of the paint last used. In all these cases, however, two or more paints of distinctly different composition have been used for successive paint jobs or successive coats in the same paint job. Some of the combinations show up repeatedly in different complaints. Some well known combinations frequently occurring in complaints are white paints over yellow ochre primer or paint, almost any house paint over clear varnish, and white paints over full color paints like deep red, brown, green, or black. Unfortunately technical exposure tests in the past have been confined chiefly to initial paint jobs or repainting with the same kind of paint, but some past records of tests involving combinations of paints differing in type have been discovered, the outcome of which reveals the same abnormalities of behavior found when these combinations of paints are seen on houses.

The evidence that good paints are not all compatible with one another is now conclusive, but there is much difference of opinion about the seriousness of the problem. Some hold that incompatibility occurs only in a few extreme cases such as those named in the preceding paragraph. The writer believes, on the basis of both observations of houses and of technical exposure tests, that the principle of incompatibility is very much more far reaching. Combinations of white paints, differing materially in content of zinc oxide, for example, have been observed to deteriorate more rapidly and in a less satisfactory manner than corresponding coats made up entirely of either one of the paints separately. A great deal of research will be necessary to establish all of the ramifications of the principle of compatibility, but when it has been done many of the present mysteries of house paint maintenance will be cleared up. A large proportion of the Forest Products Laboratory's research on painting is now directed toward this problem.

Until future technical study discloses the extent to which paints may differ in composition and still remain compatible, the conservative practice in maintenance is to start out with a good paint when the woodwork is new and thereafter maintain it at proper intervals with paint of essentially the same composition. Switching from one kind of paint to another is doubtful practice unless the particular combination so produced has been tested or found satisfactory by previous experience.

Certainly those combinations of paints that have frequently led to difficulty should be avoided. At the present time the only white paint that is used consistently by large numbers of house owners is pure white lead because it is the only paint recognized by type as well as by manufacturer's brand. In the writer's opinion the high regard in which white lead paint is held by so many good painters and paint users is due largely to this consistency in its use. When white lead is applied over paints of other kinds it often fails prematurely and in an abnormal manner, indicating that it is just as subject to the requirement of compatibility with previous paints as are paints of other kinds.

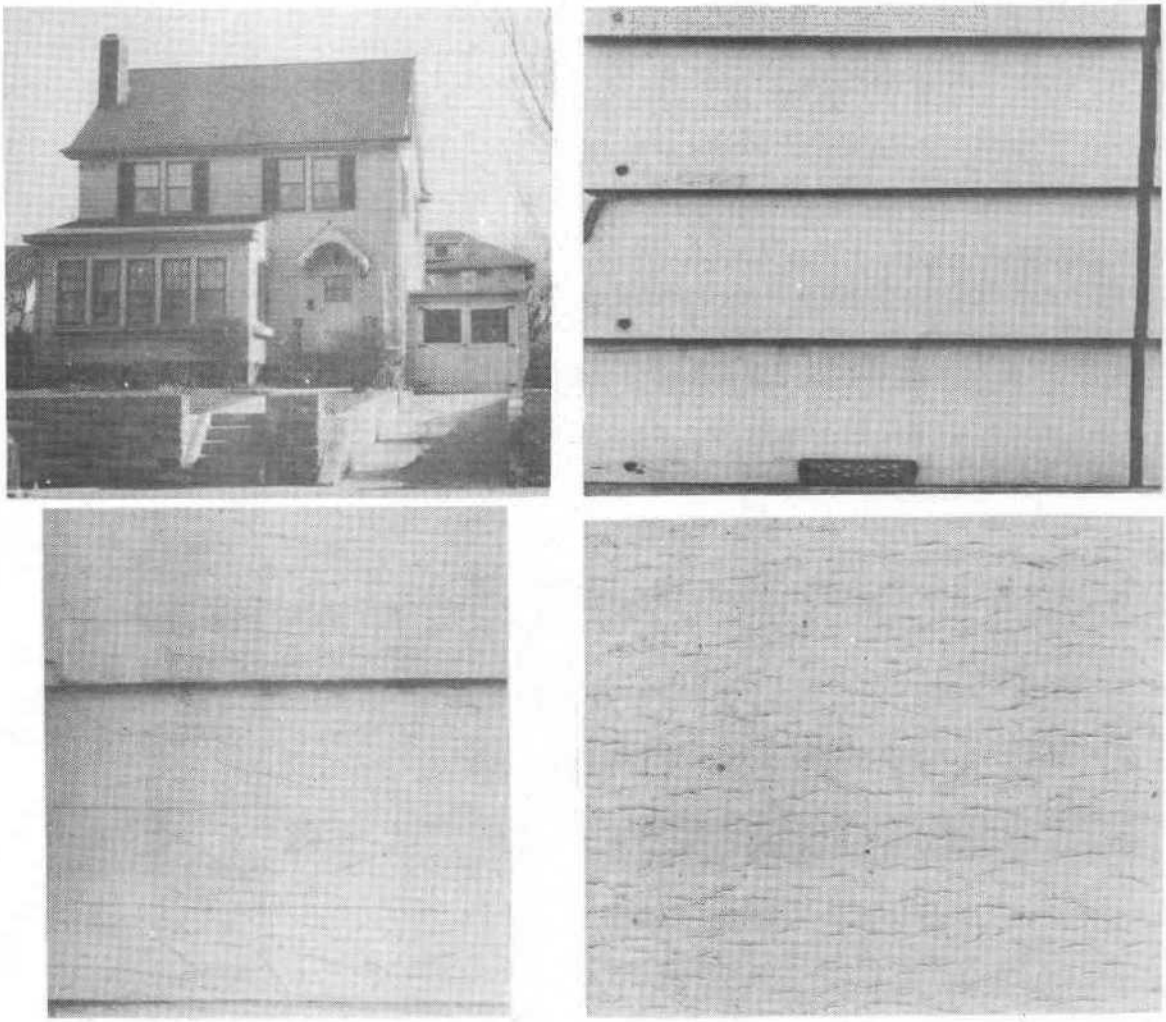
The cure for bad programs of paint maintenance, therefore, lies in a classification of paints that will make it possible to teach house owners how to buy the right kinds of good paint for their purposes and how to get out of the paints they buy the good service of which they are capable.

The Need of Classification of Paints

Consideration of the causes of unsuccessful paint maintenance and consequent loss of public confidence in painted exterior woodwork shows that our most serious troubles have come not so much from jerry building and inferior paint as from efforts to improve building methods and paints that have made the situation more complicated and unduly technical for craftsmen and laymen. Thermal insulation and modern heating plants are distinct improvements over past practices but, unless appropriate precautions are taken to control condensation on cold parts of the structure, they tend to increase the number of houses in which moisture leads to early paint failures and other difficulties. In a similar way modern developments in paint have given us better paints than we ever had before, but there are now so many kinds of good paint on the market and they vary so much in composition, manner of correct application, and compatibility with one another that painters and house owners do not know how to use them all correctly. Merely offering the public good paints that are capable of giving successful service is not enough to re-establish confidence in painted woodwork unless we likewise make it possible for each good paint to be so applied and maintained that it will give the good service of which it is capable. To accomplish that purpose the technical complexities of application and maintenance must be simplified sufficiently to bring them within the comprehension of craftsmen and house owners. Such simplification can be effected by some such classification as the one proposed by the Forest Products Laboratory just as it was accomplished years ago for lumber through species identification and grading.

The working out of a classification of paints together with reliable instructions for application and maintenance is a strictly

technical problem that must be handled by paint technologists, that is to say by the paint manufacturers. Moreover it is a problem of the industry as a whole through group action because there is obviously little or nothing that an individual manufacturer can do about it by himself. Meantime those who deal in paint must continue to sell paint pretty much as they have been doing unless they can give the time and effort to closer technical study of the situation and individual contact with their painter and owner customers to help them avoid the more serious mistakes about which there is now general agreement. There is, however, one suggestion that the writer would like to leave with paint dealers. That suggestion is to make a regular practice of keeping track of a fair sample of paint sales and observing the service obtained by the customers over a period of years. In the smaller cities, at least, this should not be a very heavy burden and it has the highly important advantage of letting the dealer know what sort of service his customers actually receive with the material he sells them. As a rule, the dealer learns only about jobs that turn out badly and lead to complaints. No matter how good his paint there will be some complaints, the real causes of which could be determined to everyone's satisfaction much more successfully if the dealer could point specifically to other houses painted perhaps from the same shipment of paint on which satisfactory service was being obtained. Such comparisons, if made conscientiously, will almost invariably show that the paint was capable of giving good service, but failed to do so for some one or more of the reasons discussed in this article. It will also restore the dealer's confidence in the paint he is selling and make him less inclined to experiment with some new brand that offers no greater prospect of avoiding complaints and may even increase them by bringing about more heterogeneous combinations of different kinds of paint on the houses of his customers.



Paint capable of giving good service sometimes gives bad service in actual practice. The house shown at the left was painted with a high-priced paint about one year before the photographs were taken. The bad cracking that developed has been observed on other houses on which this paint was applied over previous coats of paints of other types. The views at the right show the excellent service given by the brand of paint in question in an exposure test by the Forest Products Laboratory. The test panel consists of one board each of redwood, white pine, Douglas fir, and southern yellow pine, painted with three coats of the paint in question, and exposed at 45° facing south (a very severe condition) for 2¾ years. The square showing fine checking of the paint is an area only 1 inch by 1 inch in actual size.

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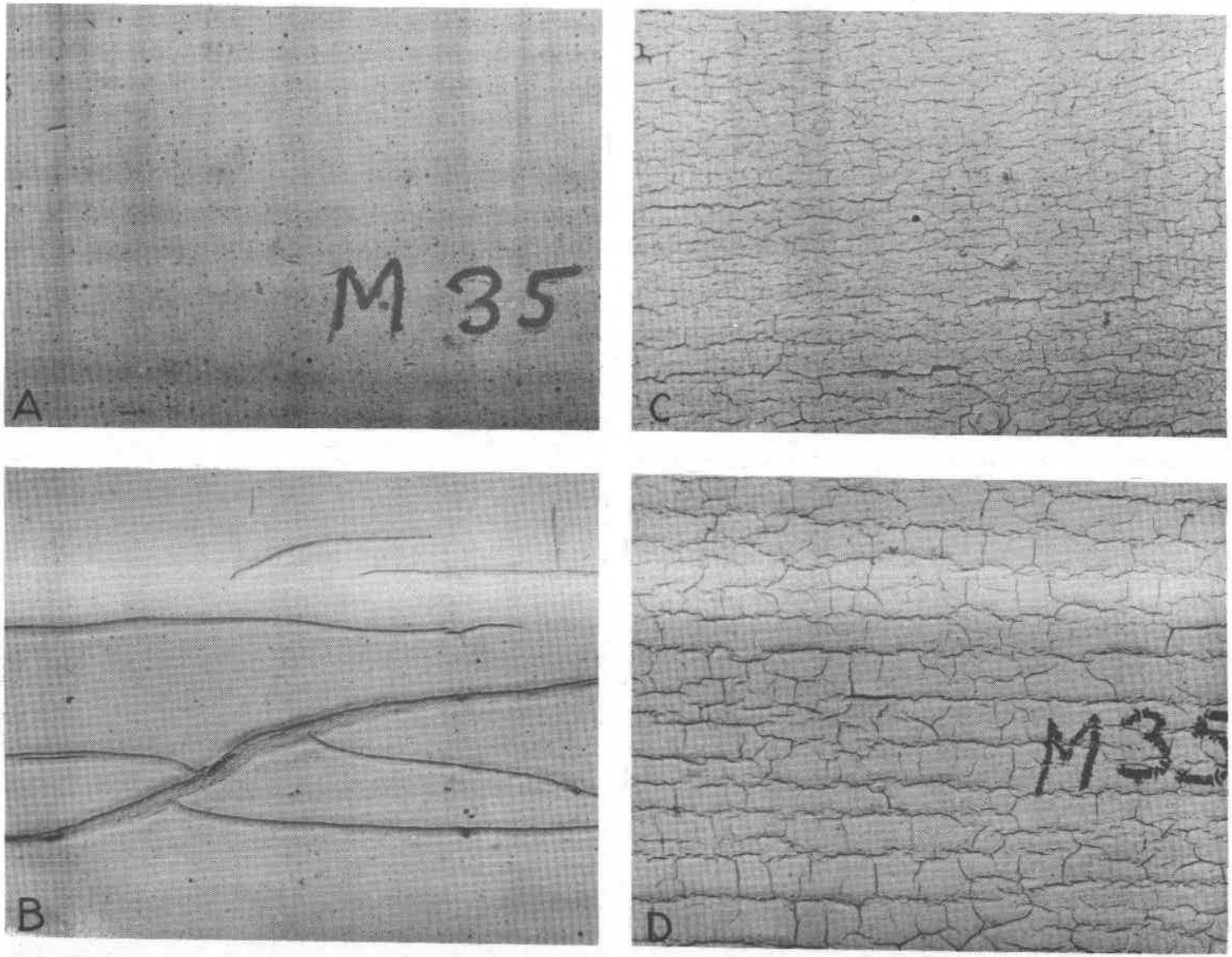

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The behavior of a finish coat depends upon what kind of paint is underneath. The four squares show areas each 1 inch by 1 inch representative of the behavior of the coating on four test areas on the Forest Products Laboratory test fence after two years of exposure at 45° facing south. Area A shows three coats of a commercial brand of titanium-lead-zinc paint. Area B shows two coats of that paint over a commercial zincless primer made by another manufacturer. Area C shows three coats of a high-priced quick drying paint made by the first manufacturer. Area D shows two coats of the paint used on A with a finish coat of the paint used on C.