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**THE PROGRAM OF PAINT MAINTENANCE
FOR THE FRAME HOUSE**

**Wisely Planned Maintenance Guards
Against Expensive Disappointments**

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THE PROGRAM OF PAINT MAINTENANCE FOR THE FRAME HOUSE¹

Wisely planned maintenance guards against expensive disappointments

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Assuming that a frame house remains serviceable for 50 years before obsolescence leads to its replacement, a good program of paint maintenance for the exterior consists of one initial paint job when the house is erected and 10 or 12 repaint jobs at suitable intervals subsequently. If the program is successful the coating of paint remains substantially intact and of good appearance throughout the life of the house. Between paint jobs the coating wears appreciably thinner by chalking and erosion but it does not break up and fall off in patches. Each new repaint job is applied over what is left of the previous jobs without at any time having to remove all of the old coating to start in again from the bare wood.

Such a program of maintenance is thoroughly reasonable and has been achieved successfully by many property owners. With enough good luck it may be realized without any careful planning on the owner's part but luck, like the weather, is notoriously fickle and likely to prove adverse at embarrassing moments. The property owner who feels that he can dispense with a well planned program merely by hiring a painter whenever he happens to notice that the dear old place could stand another coat runs a grave risk of an expensive disappointment. Those careless owners against whom lady luck has turned will testify that a badly maintained paint coating soon turns into a heartless gold digger.

Since paint maintenance involves separate paint jobs at intervals over a long period of years the small property owner is rarely able to hire anyone to take care of it for him. He can buy single paint jobs but not a maintenance program. Unacquainted with paint though he may be, the maintenance program is a responsibility that he cannot escape. As a rule the owner determines when each painting shall be done, he selects the painter, he often selects the paint, and he may set limitations of cost that profoundly affect the technic of painting. The owner should also be able to give each painter an accurate history of previous paint jobs. Under these circumstances property owners need more technical knowledge about paint than they require for the purchase of almost any other material.

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²Maintained at Madison 5, Wisconsin, in cooperation with the University of Wisconsin.

The property owner's responsibility for his program of maintenance is not properly emphasized in the literature on painting that is commonly brought to his attention. Paint composition is such a fascinatingly complex subject and there has been so much bitter controversy about the rival merits of different paint ingredients and different paint formulas that the importance of the owner's program of maintenance has usually been forgotten. In consequence the layman commonly believes that the secret of successful paint maintenance lies almost wholly in choosing good paint. Good paints are presumed to give good service if properly applied regardless of the nature and age of the paints used previously and conversely unsatisfactory paint service is taken as proof that the paint last used was a poor one. As a matter of fact a paint cannot properly be judged good or bad apart from the maintenance program in which it is to be used. A good paint for one man to use may be bad paint for his neighbor. A mediocre paint wisely and consistently used is safer than a succession of good paints used indiscriminantly. It should never be forgotten that, in repainting, the composition and properties of the renewed coating are not determined solely by the composition of the new paint because the new paint is merely added to what remains of the paints used previously.

In a planned program of paint maintenance the frequency of repainting, the type of paint to be used, and the number of coats to be put on at a time are determined in advance, before the house is erected if practicable. Such planning offers the immediate advantage of a sound basis for budgeting the approximate costs among the expenses of upkeep and, of more importance, it makes it possible to guide the maintenance along lines established by past experience. Above all, a wisely planned program should keep the owner from unwilling experimentation with untried paints and dubious painting procedures with the unexpected expenses to which they may subject him if they turn out badly.

Planned programs of maintenance may be classified according to the frequency at which repainting will be done into: (1) Programs in which more than 4 or 5 years may elapse between paintings; (2) programs in which repainting can be assured at 4 or 5-year intervals; and (3) programs in which repainting may be done at intervals shorter than 4 years. The size of the owner's income and the painting habits of his neighbors, of course, may have much to do with his decision about this part of his maintenance program. In making the decision it is wise to remember that the lifetime of a frame house usually spans one or two serious periods of financial depression during which paint continues to deteriorate with complete indifference to the state of the owner's bank account.

The interval of 4 or 5 years is taken as the line of division between maintenance programs because it marks approximately the maximum period during which good coatings of white or light colored paints can be expected to remain substantially intact on the fully exposed parts of a house, assuming that a consistent program of maintenance is followed and that no moisture collects behind the painted woodwork. Within this period, which may be called the period of durability, inconspicuous

fissures known technically as checking may appear in the coating, chalking and erosion should wear away a substantial portion of the coating, but the coating should not crack conspicuously or break up and become detached at places, revealing bare wood beneath.

Strong sunshine is usually a major factor in deterioration of paint, hence those parts of the house, frequently the south side, that receive most direct sunshine determine the durability of paint jobs. The durability of white paint may be somewhat longer than 4 to 5 years on heavily shaded houses and somewhat shorter in climates that combine much strong sunshine with prolonged periods of either extremely high or extremely low humidity. The nature of the wood painted likewise has a bearing on durability. The cedars, redwood, cypress, and true white pines in the select grades practically free from knots can be expected to hold good paint coatings intact for 4 to 5 years under normal conditions. Edge-grain boards of slowly grown and fairly light weight in ponderosa pine, the spruces and the hemlocks hold paint intact nearly as long but the flat-grain boards of rapid growth or of high density lead to earlier break-up of paint coatings. The strong, heavy softwoods such as Douglas-fir and southern yellow pine ordinarily cannot be relied upon to hold white paints intact beyond 3 or 4 years but by priming them with exterior aluminum priming paint before the first job of white paint is applied the durability of the coating can be raised more nearly to that on the woods of lighter weight.

For programs in which more than 4 or 5 years may elapse between repaintings colored paints of great durability are particularly suitable. Of the very durable paints the reds, browns, and yellows made with iron oxide pigments are probably the most commonly used. In a good iron oxide paint the major part of the pigment should be iron oxide. Unfortunately many red barn paints have degenerated into cheap paints containing very little iron oxide. Other very durable colored paints are those in which a major part of the pigment is chrome yellow, chrome green, chromium oxide, lampblack, or carbon black. Aluminum paint, applied in two or three coats, is very durable. The very durable paints are limited to the deep colors or are metallic in appearance and are therefore unsuitable for the major surfaces of many residences.

When white or light colored paints are used in programs with long intervals between paintings each paint job goes beyond its period of durability and passes through a period of neglect during which the coating breaks up in a manner characteristic of the type of paint. Some paints even after long neglect can be repainted with reasonable assurance that the new job will be just as durable as the last one. Other paints leave an uncertain surface on which a new paint job may break up much too soon. Of course the old paint in the latter case can be removed but paint removal is too expensive to have any place in a program of extreme economy. For such programs white or light colored paint must be chosen rather for its ability to stand neglect well than for its qualities during its normal period of durability.

Pure white lead paint, in which white lead is the only pigment other than necessary tinting colors and linseed oil is the only liquid

except thinners and driers, has long been used successfully in programs involving periods of neglect. Since white lead paint was the only high grade white paint available until comparatively modern times painting traditions in this country are largely based upon its characteristics. Pure white lead paint develops chalking and checking fairly early in its life and it wears down moderately rapidly. It is therefore called a soft paint in contrast to hard paints with opposite qualities. Soft paints stand neglect well because they disintegrate eventually by fine crumbling rather than by cracking, curling, and coarse flaking or scaling. When repainted after a period of neglect soft paints are little more than a porous mass of pigment "chalk"; oil from the new paint thoroughly permeates the old coating and incorporates it with the new. The new job therefore behaves much as the previous one did and has about the same durability.

Programs with 4 or 5 years between paintings are best adapted to the needs of owners who wish to keep their property well maintained at all times without extravagance. For such programs any one of the many types of good house paints may be chosen at the outset but thereafter it is wise to repaint always with the same type of paint. Changing types of paint at successive repaintings opens the program to unnecessary possibility of failure because paints of different type are not always compatible with one another. Too much variation in composition between successive layers of paint apparently increases internal stresses within the coating as it ages and causes it to break up abnormally early or in an objectionable manner.

In conservative programs of this kind the surface should be repainted before the coating begins to break up seriously. It is dangerous to wait until conspicuous cracking, curling, and flaking prove that the durability of the paint has been stretched to its limit. The temporary saving effected by postponing repainting for a few months may shorten the life of all subsequent paint jobs and eventually require expensive removal of the entire coating. When paints that do not stand neglect well are used, repainting should anticipate rather than follow the breaking up of the coating.

Repainting should restore to the surface approximately the amount of paint worn away since the previous painting. If too much paint is put on at a time the coating eventually becomes too thick and may break up so badly that it must be removed. Hard paints wear away less between paintings than soft paints; the harder the paint the less of it should be applied at each repainting. The painter gauges the amount applied partly by the number of coats and partly by the extent to which he brushes each coat out. With soft paints two coats at each repainting may be necessary while with hard paints it may be safer to apply only one coat. For much the same reason different parts of a house may require varying amounts of paint because less paint wears away from those parts more shielded from sunshine.

Programs in which repainting may be done at intervals of less than 4 years are sometimes necessary for commercial buildings but as a rule are inadvisable for residences. On the protected parts of the house particularly the paint does not get time to weather sufficiently to be in

best condition for repainting and it wears away so little that the coating necessarily becomes thicker at each painting. Under these conditions it is especially important that the new paint be as nearly as possible like the previous paint in composition and that paints with great hiding power be chosen so that they may be applied as thinly as possible. If exceptionally good appearance is desired it is often safer to use paint of a hard type that can be washed easily once a year rather than to repaint at short intervals.

To follow a consistent program of maintenance the owner must learn how to identify the type of paint he has decided to use. House paints other than white lead paint are sold by manufacturer's brand, not by type, and the manufacturer reserves the right to change the formula at will. In recent years such changes in formula have been of frequent occurrence. In many brands the white paint and the tinted paints differ markedly in type; in any brand the deeply colored paints necessarily differ greatly from the white and tinted paints. For these reasons the manufacturer's brand does not identify paints by type. Many manufacturers, however, print the formula of the paint on the label. Although adequate interpretation of the formula requires much technical knowledge of paint composition it is a comparatively simple matter to use the formula for selecting paint as similar as possible to that used the last time. Each paint used successively should contain the same principal ingredients in approximately the same proportions.

Attempts to improve upon old fashioned white lead paint for the most part have aimed at retarding chalking, checking, and erosion, and improving opacity and whiteness. All of these objectives have been achieved but the newer paints are necessarily harder in type and cannot be relied upon to stand neglect well. Repeated neglect of hard paints ultimately leads to a condition demanding complete removal before new paint can be relied upon to give satisfactory durability. Such paints are not intended for use in accordance with the old painting traditions based on white lead paint because their manufacturers designed them for more exacting programs of maintenance. Their superior appearance during their period of durability can be utilized safely only if reasonable care is exercised to see that they are always repainted before they begin to break up.

White paints other than white lead paint always contain a mixture of pigments one of which nearly always is zinc oxide. Mixtures of white lead and zinc oxide have long been popular. Zinc oxide is the hardening agent in linseed oil paints; the greater the proportion of zinc oxide in the pigment the harder the paint. Zinc sulfide pigments, such as lithopone, and titanium pigments are more opaque than white lead or zinc oxide and make whiter paints with greater hiding power. The present trend in the industry is to use zinc sulfide pigments in cheaper paints and titanium pigments in high grade exterior paints. Such pigments as silica, magnesium silicate, barium sulfate, calcium carbonate, and calcium sulfate are transparent in linseed oil and are used primarily to reduce cost or to increase the total amount of pigment without increasing the cost. Until recently nearly all high grade house paints were made with linseed oil but attempts are now being made to introduce various resins

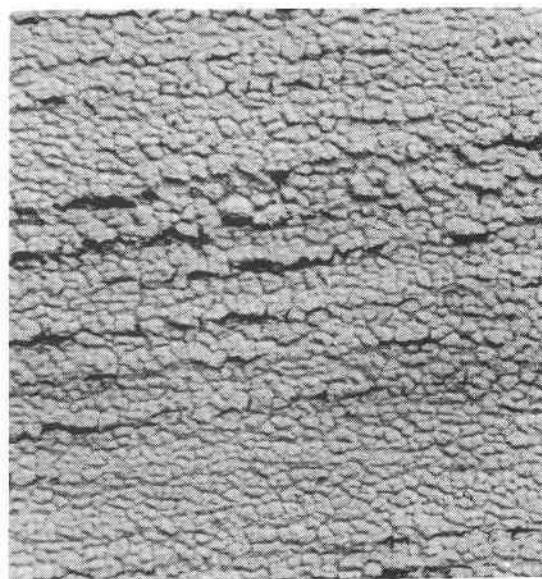
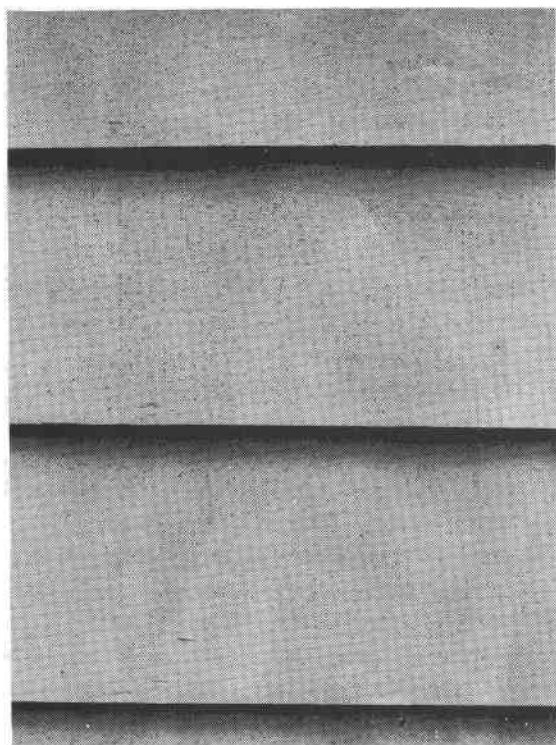
in the form of oil varnishes or synthetic drying oils. Resins harden paint much like zinc oxide so that it is often necessary to reduce or eliminate the zinc oxide as resin is added. The resins likewise tend strongly to make the product an enamel rather than a paint, which makes it less amenable to the common technic of house painting. Enamel characteristics can also be imparted without resins by heat treatment of the linseed oil or a major part of it. Since tung oil must be heat treated for use in paint, substitution of it for a major part of the linseed oil results in an enamelized paint. In enamelized paints free from resins the content of zinc oxide in the pigment is often very high. Substitution of soy bean oil for part of the linseed oil in house paint tends to make a softer product whose use is favored primarily to gain a market for a relatively new domestic farm crop.

The best way for a property owner to select a type of paint for a new house is to observe houses in his neighborhood that were painted with it one, two, three, and four years previously. Such observations are infinitely more revealing than any other source of information. It should be remembered that the appearance of a paint changes at intervals during its life so that coatings of various ages must be seen to learn the whole story. On the other hand the shaded parts of a house and the fully exposed parts show paint at different stages of deterioration at the same time. If some of the neighbors have coatings that are breaking up badly do not attribute it hastily to the quality of the paint last used. First make sure that the past program of maintenance has been consistent and that the paint is giving its normal service. A survey of this kind will show very clearly that after all the particular type of paint chosen is usually much less important than insistence upon a program of paint maintenance to which the paint is properly adapted.

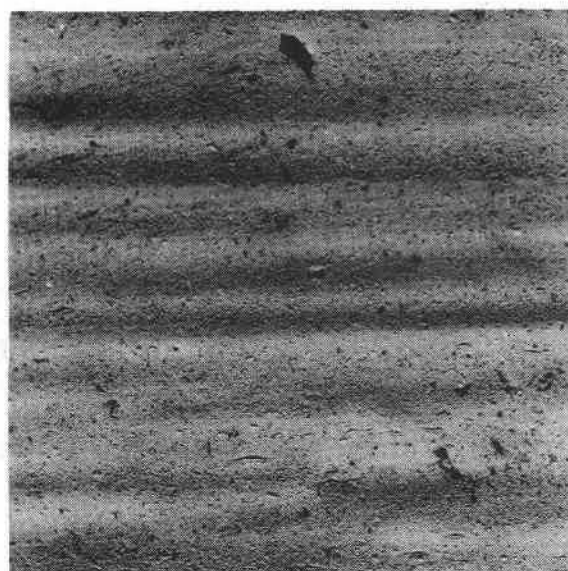
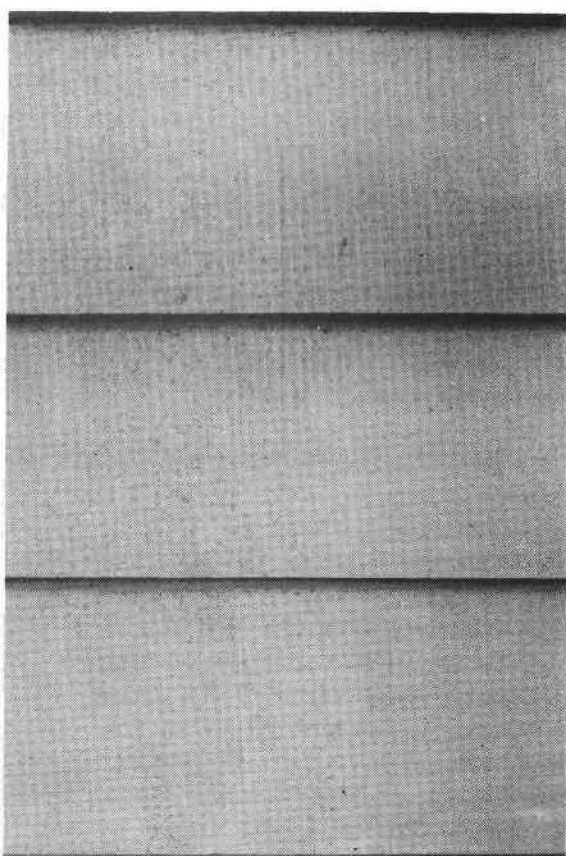
The maintenance programs discussed in this article are based on the assumption that the sidewalls of the house remain dry at all times and that water never gains access to the backs of the painted boards. Unfortunately, there are some houses for which the assumption is unsound. In some of them rain gets behind the painted woodwork through leaks resulting from faulty construction such as omission of necessary flashing around windows, doors, dormers, roof angles, and back of gutters. The more common cause of such difficulty, however, is condensation during times when the interior of the house is heated while it is cold outside. Humidification of the interior at such times aggravates the difficulty. Water behind painted woodwork causes blistering and subsequent scaling of the paint. Such developments may destroy the integrity of the coating within a few months after it is applied. Soft paints resist abnormal moisture conditions more effectively than hard paints while heterogeneous coatings consisting of paints of different types are often exceedingly sensitive to them. The only reliable way of assuring satisfactory paint service on houses subject to abnormal moisture conditions is to find means of keeping the back of painted woodwork dry at all times.

The secret of successful paint maintenance over a long period of years lies in strict adherence to a program that has been proved satisfactory by actual experience in the past. The scientific principles that

govern paint behavior still await discovery and until they are revealed our knowledge of the subject must remain essentially empirical. There is no magic paint formula that can be relied upon to behave satisfactorily over all other paints on the market. The property owner himself should see to it that his program, both with respect to the paints used and the intervals between painting, is so planned that there is past experience to give him reasonable assurance of success, unless he is willing to trust to luck and pay the penalty if it turns out badly.

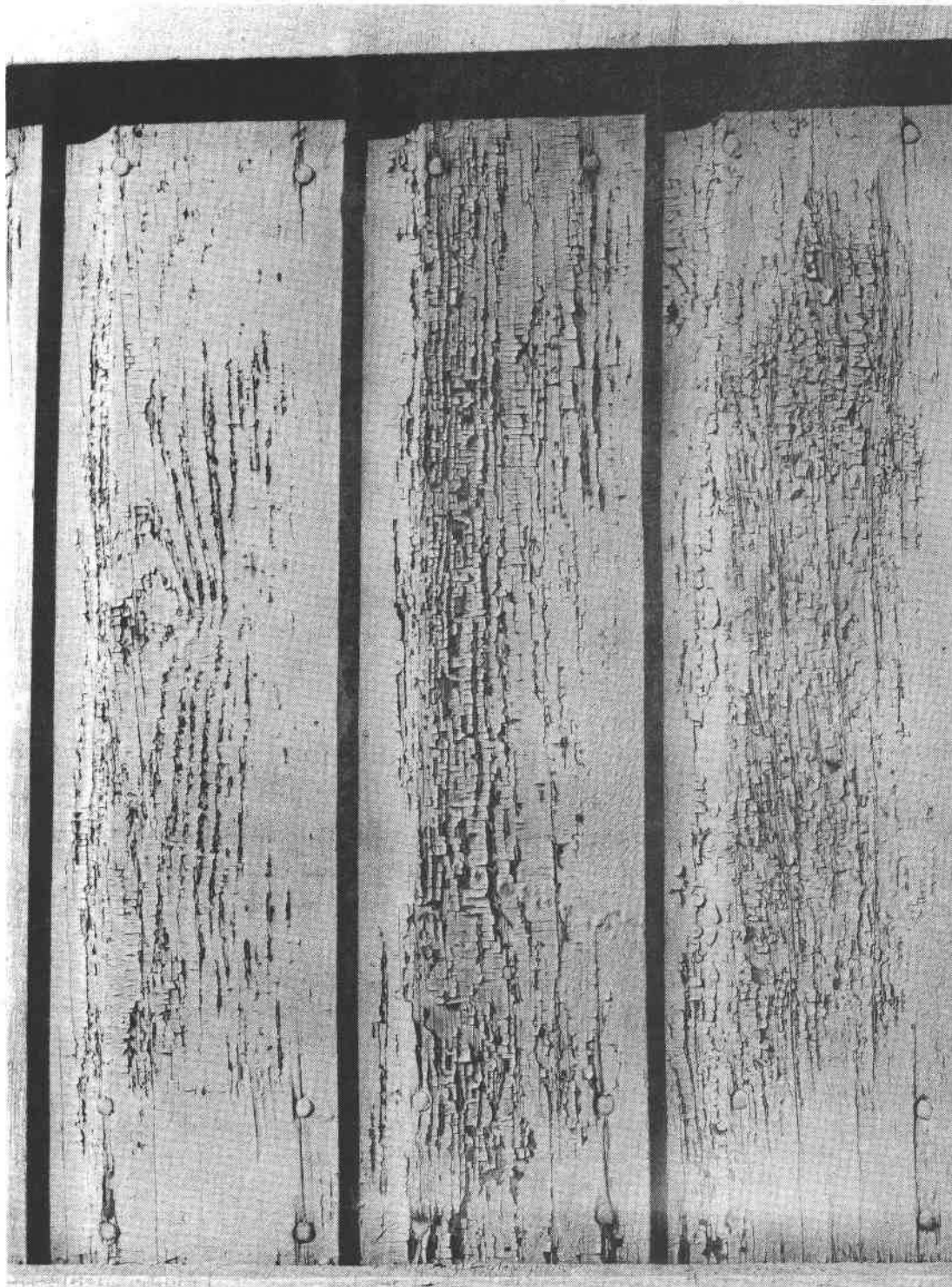


A successful maintenance program in which paint of soft type is used with long intervals between paintings. This house, which is next door to the one shown in the previous illustration, was erected in 1923, repainted in 1931, and has not been painted subsequently. The photograph was taken in 1936.



A successful maintenance program based on applying one coat of paint of fairly hard type every four years. This house was erected in 1923, repainted in 1927, 1931, and 1935. The photographs were taken in 1935 just before the last repainting.

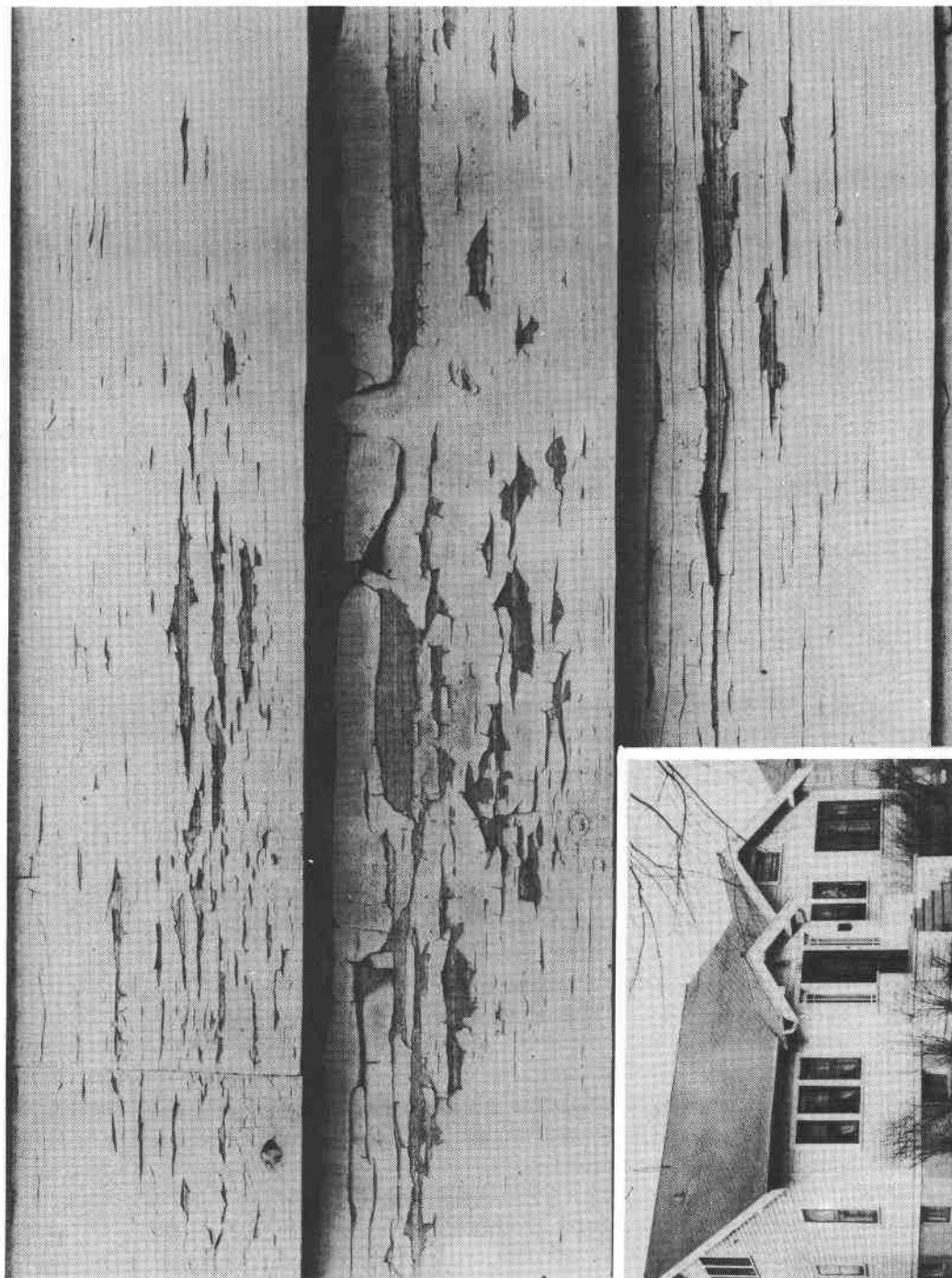
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RESULT OF REPEATED NEGLECT OF PAINTS OF HARD TYPE

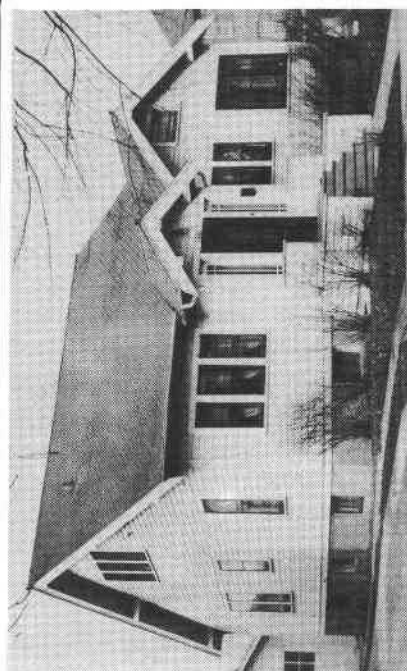
This building has been painted repeatedly with hard types of paint over a long period of years, but each time the owner waited until the old coating was disintegrating badly before putting on new paint. The surface can no longer be painted smoothly or durably unless the old coating is removed completely.

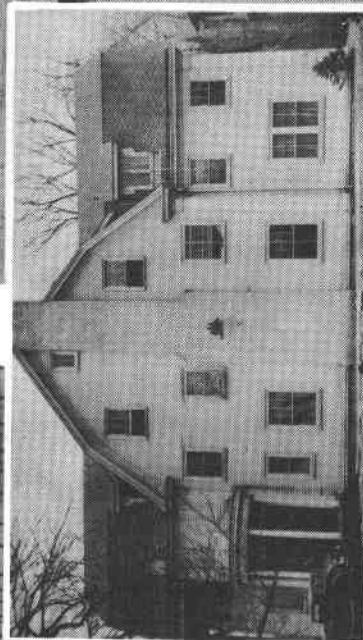
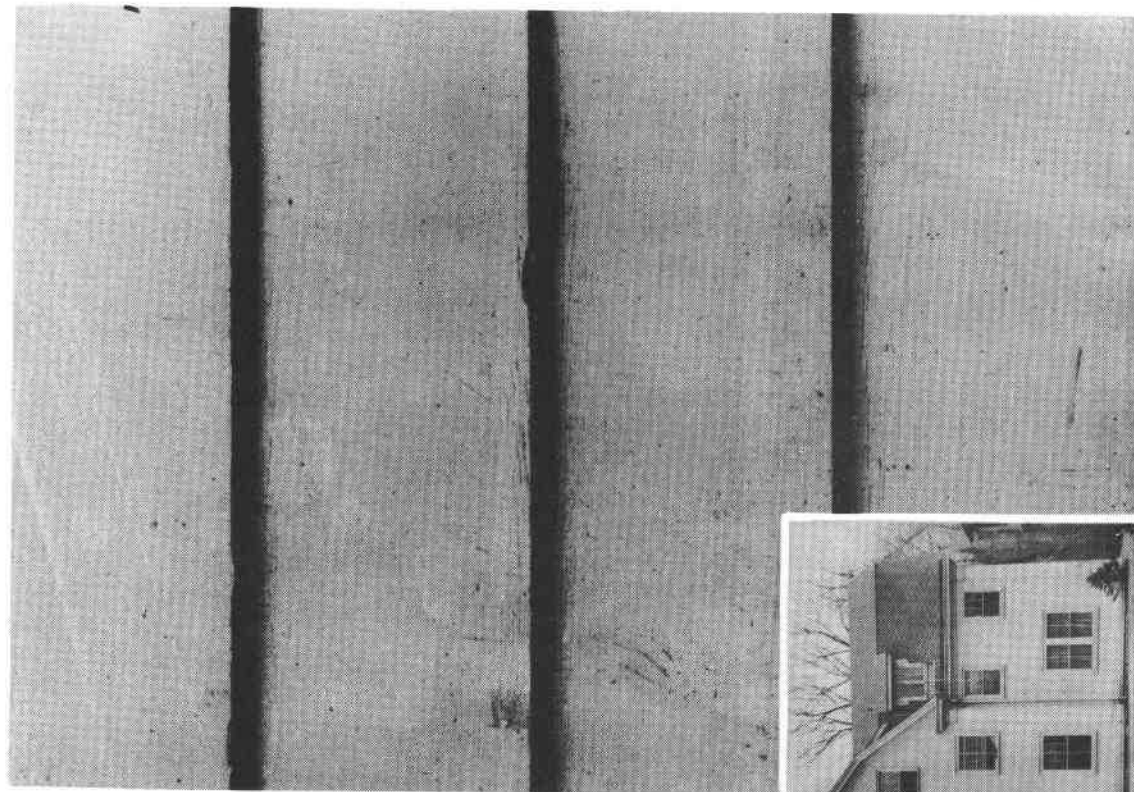
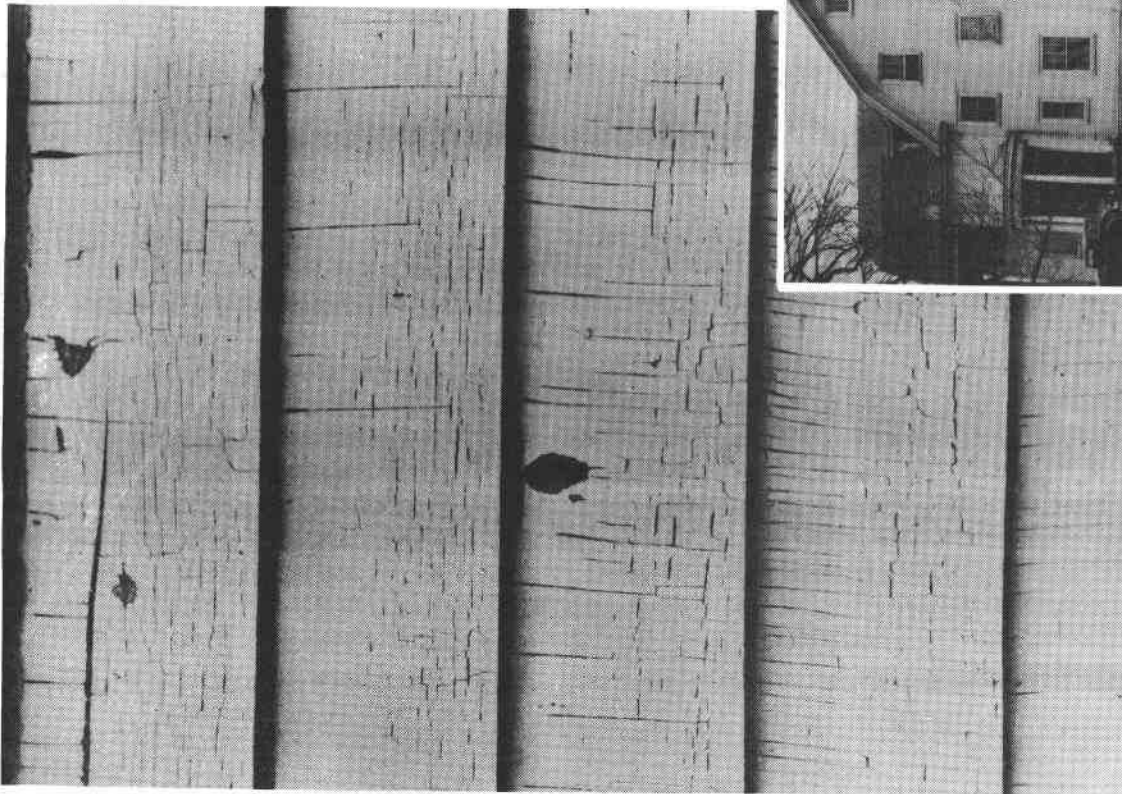
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INCOMPATIBILITY OF SOME WHITE PAINTS

This house was originally painted with a lead and zinc paint and subsequently re-painted with a titanox, lead, and zinc type of paint. The last paint was a very good one, but it is failing in an unsatisfactory manner.





AN EXAMPLE OF INCOMPATIBLE PAINTS

On three sides of this house the paint has cracked and scaled badly as shown at the left. On the fourth side, which is more fully exposed to the weather than the others, the paint gives good service as shown at the right. On the bad sides the wood carries successive coatings of dark brown paint, deep yellow paint, dark gray paint, and at least three jobs of white paint. The good side was rebuilt after a fire some years ago and has only the last three jobs of white paint.

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