



Paint Problems on Exterior Wood

Paint on outside wood normally erodes away gradually due to the action of sun, wind, and rain. The frequency of repainting depends on such factors as characteristics of the wood, surface treatment before painting, paint quality, number of coats applied, application techniques, and severity of exposure.

A good paint job can be expected to last eight to 10 years when all factors are favorable. But repainting often is needed in much less time. In general, repaint only as often as necessary to maintain good appearance and protect the wood.

Early or abnormal paint failure may result from excessive water penetration and absorption, from inadequate surface preparation or an improper primer, from very thick paint films, from migration of extractives to the surface, or from action of microorganisms. Other factors also may come into play.

This publication provides information designed to help you: (1) recognize the types of problems that may occur on painted wood; (2) determine the cause of abnormal paint failures or discolorations; and (3) prevent or correct these problems.

Moisture Blistering and Peeling

Paint may blister and peel when excessive moisture gets into wood that has been painted (figure 1). The first step in solving a moisture problem is to locate the source of the water causing the damage. The possible sources of troublesome water that can affect paint life on

exterior wood surfaces are: (1) outside water penetrating the wood; (2) inside liquid water soaking through the wood; and (3) inside water vapor passing through walls, condensing, and soaking the wood.

Outside water, such as rain, can penetrate into or behind painted wood. Exposed end grain and open joints can allow water to penetrate and be absorbed. Leaks in the roof and formation of ice dams can cause water to migrate under shingles and enter exterior wall cavities. Inadequately maintained exterior glazing around window panes also can cause problems. Absence of metal flashing around dormers and over doors and windows can promote water penetration. Very narrow roof overhangs and leaky or plugged eaves troughs and down spouts can contribute to moisture problems.

To minimize problems caused by outside water, treat exposed end grain and joints with a water repellent or water-repellent preservative. Fill open joints, cracks,

and holes with a high quality, paintable latex caulking compound. Maintain exterior glazing, metal flashing, eaves troughs, and down spouts. Reduce ice dam formation by providing adequate attic insulation and ventilation.

Outside water damage can be recognized by several characteristics. Peeling is generally concentrated around joints and end grain of wood (figure 2 on page 2). Damage appears after spring rains and throughout the summer months. Paint failure is most severe on sides of buildings facing the prevailing winds and rains. Deterioration of paint may occur on both heated and unheated buildings.

Water inside a building attacks the paint film on the outside of the building by soaking through the wood. Plumbing leaks, overflow of sinks or bathtubs, or shower spray on improperly sealed walls are examples of sources of inside water. Such damage is not seasonal and occurs when the faulty condition

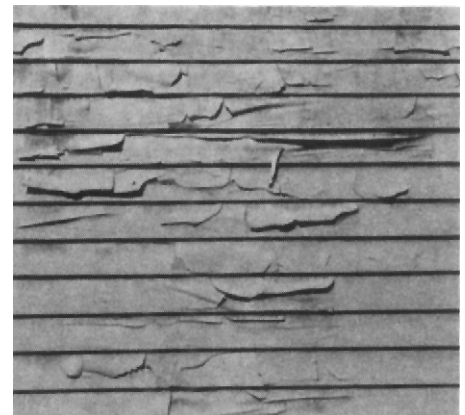


Figure 1. Moisture blistering and peeling.

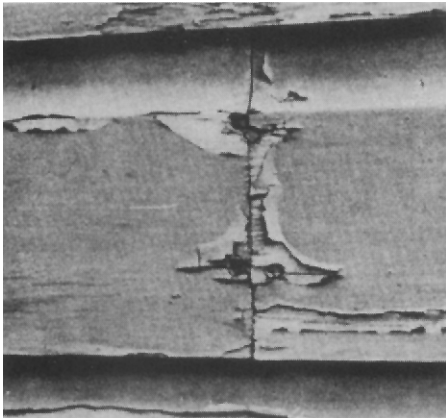


Figure 2. Paint failure around joints and end-grain of wood.

develops. Paint deterioration occurs on the outside surface in the area of the leak.

Inside water vapor is generated inside a heated building during winter months from cooking, dish washing, bathing, clothes washing, unvented gas and kerosene heaters, and other moisture-related activities. Water vapor moves naturally toward the outside and can penetrate into walls and ceilings. If a warm water vapor encounters a cold surface in the wall or attic space, condensation can occur. This frost or ice can melt when the sun warms the surface, and liquid, condensed water can soak into the wood causing paint blistering and peeling.

Reduce water vapor arising within heated buildings from migrating into wall and roof spaces by installing a continuous vapor retarder on the inner or warm side of exterior walls and ceilings. In new construction, a 6-mil polyethylene plastic sheet is commonly applied immediately beneath interior finishing materials. In older houses or other heated buildings without vapor barriers, a vapor barrier paint may be used. Vinyl wallpaper or plastic-faced hardboard also may be installed. If new interior finishing materials are to be installed, place a 6-mil polyethylene plastic film on exterior wall surfaces before installing the gypsum wallboard or paneling. The vapor barrier always should be tightly fitted around doors and windows and around electrical

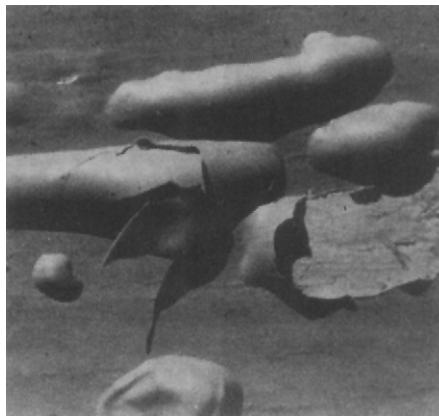


Figure 3. "Temperature blistering" of oil-base paint.

outlets. Seal cracks or holes to prevent moisture penetration.

Cover bare soil in crawl spaces with polyethylene plastic to prevent moisture from moving out of the soil into wood members above. Remove excess water vapor produced by cooking, dish washing, bathing, clothes washing, and other moisture-producing activities with exhaust fans vented directly outside. Ventilate unheated attics by providing openings in the end walls or roof peak and by vents beneath the eaves (1 square foot of rough vent opening for every 100 feet of attic floor area).

Blistering and peeling of paint films caused by cold water condensation may be recognized by several characteristics. Damage occurs mainly on heated buildings. Peeling is most common on outside walls of rooms having high humidity and is most severe on the coldest sides of a building. Blisters appear early in the spring before rains. Failure occurs on protected areas as well as on wood exposed to rain.

Remove loose, peeling paint films before refinishing. Treat joints and bare wood areas with a water repellent or water-repellent preservative. Caulk open joints, cracks, and holes. Spot prime bare wood areas and apply at least one topcoat of high quality latex or oil-base paint. The prime coat can be eliminated when finishing woods free of colored extractives. Exterior penetrating stains or other finishes also could be used instead of paint

where excessive moisture problems exist. Iowa State University Extension pamphlet Pm-362, *Finishing Exterior Wood Surfaces*, provides detailed information on other finishing alternatives for exterior wood.

Failure to eliminate the moisture sources causing exterior paint failures can lead to even more serious problems such as wood decay. Iowa State University Extension pamphlet Pm-882, *Minimizing Moisture Problems During House Construction*, provides useful guidelines for building construction.

Temperature Blistering

Temperature blisters are bubble-like swellings that occur on the surface of the paint film as early as a few hours or as long as one or two days after painting (figure 3). Temperature blisters may be formed when liquid thinners in fresh paint change to vapors after a thin, dry skin has formed on the outer surface of the film. Usually, only oil-base paints blister in this way. Dark paints absorb more heat and are more prone to temperature blistering than white paints. Thick coats of paint are more likely to exhibit this type of blistering than thin coats.

Avoid temperature blistering by following the sun around a building when painting. Paint the north and east sides in the morning after the surface has been warmed and the south and west sides in the afternoon. Do not apply an oil-base paint on a cool surface that will soon be heated by the sun.

The only remedy for temperature blistering is to let the paint dry for a few days, scrape off the blisters, smooth the edges with sandpaper, and repaint the affected area.

Intercoat Peeling

Intercoat peeling is the peeling of paint between coats rather than down to bare wood (figure 4). It may develop shortly after the paint is applied or as much as a year later. This peeling indicates a weak bond between the old and new paint film.

This defect usually results from inadequate cleaning of the weathered paint and usually occurs within one year of repainting. Intercoat peeling also can result from allowing too much time between the primer coat and the top coat in a new paint job. Always thoroughly clean a weathered paint surface before applying a new paint film. If more than two weeks have elapsed between priming and the first topcoat, scrub the surface. Do not prime a wood surface in the fall and then apply the topcoat in the spring.

A simple test can be conducted to determine if the new paint coat is likely to peel. First, clean the old paint surface. Next, repaint a small area with the new paint and allow it to dry for at least two days. Then, firmly press one end of a "band-aid" type adhesive bandage onto the painted surface. Jerk it off with a snapping action. If the tape is free of paint, the new paint is well bonded to the old surface. If the new paint adheres to the tape, the old surface is too chalky and needs more cleaning or the use of an oil-base primer.

Cross-Grain Cracking

Paints applied with a brush have a grain that runs in the direction of the last brush strokes. Cross-grain cracks run across the grain of the paint and lead to unsightly scaling (figure 5). This defect results from paint coatings that are too thick. Excessively thick paint films usually result from too frequent or too heavy paint applications.

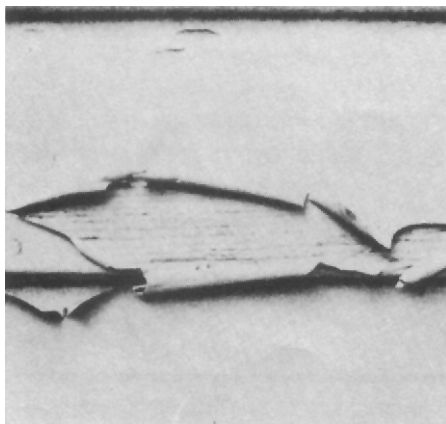


Figure 4. Failure between coats of paint is called "intercoat peeling."

To prevent cross-grain cracking, follow the manufacturer's recommendations for spread rates. Do not repaint unweathered, protected surfaces such as porch ceilings and roof overhangs as often as the rest of the house. If possible, repaint these areas only as they weather and require a new coat.

Once cross-grain cracking has developed, the only remedy is to completely remove the old paint and apply a new finishing system.

Mildew Discoloration

Mildew is probably the most common cause of house/paint discoloration (figure 6). Mildew is caused by forms of stain fungi; the most common species are black, but some are red, green, and other colors. It grows most extensively in warm, humid climates but also is found in cold northern states. Mildew may be found anywhere on a building, but it is most common on walls behind trees or shrubs where air movement is restricted. The occurrence of mildew also may be associated with the dew pattern of the house. Dew will form on those parts of the house that are not heated and will cool rapidly, such as eaves and the ceilings of porches and carports. This dew then provides a source of moisture for mildew.

Mildew fungi can be distinguished from dirt and other discolorations by examination under a high-power magnifying glass. But a simple test for the presence of mildew on paint can be made by applying

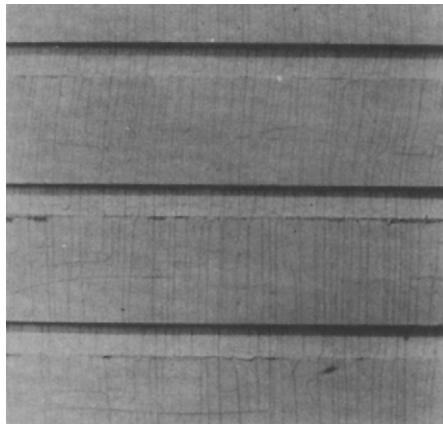


Figure 5. General view of "cross-grain cracking."

a drop or two of fresh household bleach solution (5 percent sodium hypochlorite) to the stain. Mildew usually will bleach out in one or two minutes; stain that does not bleach out is probably some other type of discoloration.

Some exterior paints are more vulnerable than others to attack by mildew fungi. Zinc oxide, a common paint pigment in topcoat formulations, inhibits the growth of mildew. Titanium dioxide, another common paint pigment, has very little inhibiting effect on mildew growth. Considering oil-base paints, mildew progresses more readily on exterior flat house paint than on exterior enamel. Paints containing linseed oil are very susceptible to mildew. Of the available water-base paints, acrylic latex is the most mildew resistant. Porous latex paints applied over a primer coat with linseed oil will develop severe mildew in warm, damp climates.

Mildewcides, poisons for mildew fungi, may be added to paints to inhibit growth. Paints containing mildewcides, when properly applied over clean surfaces, should prevent mildew problems for some time. On new wood surfaces in warm, damp climates, use a paint containing zinc oxide and a mildewcide for topcoats over a primer coat that also contains a mildewcide. For modest mildew hazards, use a paint containing a mildewcide.

Before repainting a surface infected with mildew, the mildew fungi must



Figure 6. Mildew discoloration on house siding.

be killed or it will grow through the new paint coat. To kill mildew and to clean an area for repainting, use a bristle brush or sponge to scrub the surface with the following solution: 1/3 cup household detergent; 1 quart (5 percent) sodium hypochlorite or household bleach; and 3 quarts warm water. **WARNING: Do not mix bleach with ammonia or with any detergents or cleansers containing ammonia. Toxic fumes are created by mixing ammonia and sodium hypochlorite.**

When the surface is clean, rinse it thoroughly with fresh water from a hose. Avoid splashing the solution on yourself or on shrubbery or grass because it may have harmful effects. Before the cleaned surface can become contaminated, repaint it with a paint containing a mildewcide.

Extractive Discolorations

Water-soluble extractives that occur naturally in the heartwood of redwood and western red cedar can discolor painted surfaces, and moisture usually is the culprit. The extractives are dissolved and leached from the wood by water.

The water then moves to the paint surface, evaporates, and leaves the extractives behind as a reddish-brown stain.

Diffused discoloration from wood extractives is caused by water that comes from rain or dew and penetrates a porous or thin paint film (figure 7). It also may be caused by rain and dew that penetrate joints in the siding or by water from faulty roof drainage.

Diffused extractive discoloration is best prevented by following good painting procedures as outlined in the section on "Moisture Blistering and Peeling." If the wood is already painted, clean the surface, apply an oil-based or latex stain-resistant primer, and then top coat.

Streaked discolorations from extractives may occur when water-soluble extractives are present. This discoloration problem results when the back of the siding is wetted, the extractives are dissolved, and then water runs down the face of the painted boards from the lap joint (figure 8).

Streaked discoloration from extractives can be prevented by reducing condensation in the exterior wall cavity. Appropriate preventive measures were previously covered in some detail.

Remove the discoloration from protected areas by scrubbing with a mild detergent. More severe stain may be removed with a paint cleaner. In areas exposed to the rain and sun, discolorations usually will weather away in a few months.

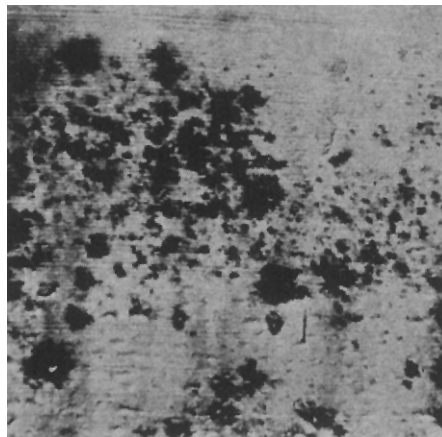


Figure 7. Diffuse-type extractive discoloration on paint.

Iron Stain

Rust is one type of staining problem associated with iron. When standard ferrous nails are used on exterior wood and then painted, a red-brown discoloration may occur through the paint and immediate vicinity of the nail head (figure 9).

To prevent rust stains, use corrosion-resistant nails for fastening wood exposed to the weather or other source of moisture. High quality galvanized, stainless steel, and aluminum nails are the appropriate choices. If rust is a serious problem on a painted surface, the nails should be countersunk, caulked, spot primed, and then top coated.

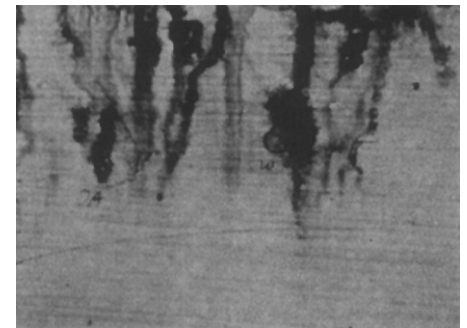


Figure 8. Streaky-type of extractive discoloration on paint.

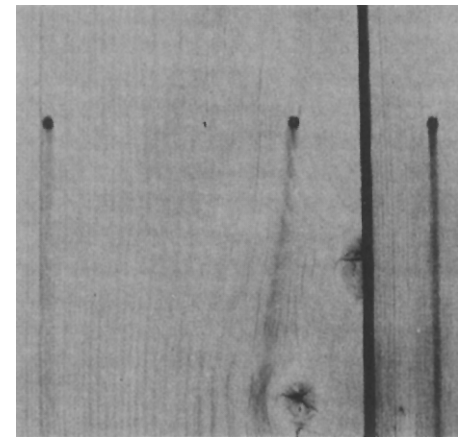


Figure 9. Rust discoloration from nails.