



## Peeling: Common Causes

Film-forming, wood-protecting products like paints, solid-color stains, enamels, shellac, polyurethane and epoxy coatings, are the principal coatings involved when peeling problems occur. To a lesser extent, other products like semi-transparent stains, Cabot Semi-Solid® Stains and Cabot Decking Stains can flake and peel from wood siding or deck structures if these products are over-applied. Although they are designed to penetrate, multiple applications or over-application in a relatively short period of time, without the benefit of natural weathering, can cause a film to form on the surface. Eventually, these products can crack, flake and peel.

### What most commonly causes peeling?

One principal factor in the peeling process of a coating from wood is the amount of WATER or MOISTURE that infiltrates the wood siding. Coatings such as paints and stains are applied on various substrates for two reasons – aesthetic and protective. Many environmental factors, such as sunlight, rain (acid), heat, fungus growths, oxygen, wind shear, salt, hail, snow and minor property flooding, have a harmful effect not only on metals, but on wood. In order for wood to survive the “hazards” of our environment, it must be protected from all of the mentioned elements, but most importantly from excessive moisture. Excessive moisture in the wood is the leading cause of paint peeling and other forms of failure like decay.

Through the world of modern chemistry, today’s paints and solid color stains can survive without peeling due to the unique method in which the products are formulated. Modern coatings are more durable, water- and weather-resistant, flexible, environmentally friendly and maintenance-free compared to coatings of a decade or two ago.

### How much is too much?

The normal exterior moisture content in wood varies, depending on its location within the home. It is also dependent on regional climatic variations due to geographical locations like the southwest desert, or the moist, southeast region of the country. However, on average, the moisture content is generally between 9 and 15%. Ambient humidity at any given time will fluctuate, but when it changes, it will affect the moisture content in the wood. Long sieges of either high interior or exterior humidity will increase the wood’s moisture content, and long periods of low humidity will decrease it. Warm, moist air will always seek a lower energy level in order to be at equilibrium with its surroundings. Therefore, atmospheric moisture will pass through a coating as a vapor to reach the wood substrate, and then move back out of the wood when conditions dictate. These changes are normal and, as a general rule, do no harm to the wood or coating.

When the wood’s moisture content increases, the wood swells. When the moisture content decreases, the wood shrinks. Peeling of a coating can occur when the wood actually goes beyond the normal moisture content of 9-15%, up to and including the fiber saturation point of 30-33%. At this point, the wood’s cell walls are completely saturated with water and will most likely be at their maximum expansion. At maximum expansion, if the coating cannot expand, as in the case of old, brittle coatings, it is subject to cracking and peeling. Water blisters may also form between the wood and newer, flexible coatings. One of the nice attributes about properly applied semi-transparent-type coatings is that no coating or film occurs. Therefore any moisture in the wood can pass as a vapor without doing any damage to the stain. Likewise, moisture-permeable latex coatings are less subject to peeling due to their unique, porous, film-forming characteristics.

Expansion of wood due to excessive absorption of moisture and heat buildup creates a tremendous amount of stress in the wood. The wider and thinner the board, the more it will expand and contract. If allowed to get wet often enough, the wood will begin to lose its natural resins. The resin loss will then result in shrinkage. Extreme expansion,

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and then contraction, either due to extreme heat or excessive moisture in the wood, causes eventual separation between the soft earlywood and hard latewood structures of the wood, which is referred to as surface checking. These separations or splits, microscopic at first, cause a surface coating to crack. The cracks that develop in the coating will allow more moisture to enter the wood and propagate further failure.

### How does the moisture enter the wood?

Moisture has two avenues of access - interior and exterior sources. Interior sources include people, humidifiers, showers, hot tubs, cooking, laundry, heaters, steam cleaning rugs, fresh plaster, wet basements and crawl spaces, leaking pipes, plants and animals. Exterior sources include faulty construction, lack of flashing over windows and doors, flashing at roof/siding and roof/chimney interfaces, loose shingles and siding. In addition, there are other sources, which include lack of caulking or caulking that is no longer functional, leaking roofs, winter ice dams, under-applied coatings, lack of gutters and downspouts to direct water away from the siding and house, vegetation too close to the house, landscaping mulch next to the house, siding boards too close to the ground and lawn sprinklers.

Warm interior air can hold more moisture vapor than the cooler in-wall or outside air. Wanting to be at a lower energy state, the warm, moist air migrates through the interior walls, around separations in vapor retarders, then condenses on the back of the sheathing due to the cooler air temperature. Wall insulation may become saturated. Eventually, the moisture will migrate into the siding and cause the wood to swell. As the siding warms, internal pressure (referred to as hydrostatic pressure) is generated which forces moisture toward the lower outside pressure. The moisture may be blocked from reaching the outside due to the paint or coating. The moisture causes some swelling within the coating and definite swelling in the wood. The internal pressure created forces a blister to form, which eventually peels. As a result, homeowners who apply paint or stains in the late summer and fall may see it peel the following spring on the south, west or east walls of the home. This is the "classic" pattern for interior moisture problems.

Exterior sources of moisture can affect peeling in a similar manner by entering behind the wood through cracks, open joints or curled shingles. Wind-driven rain or water running down the siding can find its way behind the siding and trim through the tiniest cracks or holes. Areas particularly prone to peeling problems are the roof/siding interface, railing systems where the balusters meet the bottom rail, the pickets on a stockade-style fence where the pickets are fastened to the top and bottom rails, decks which are too close to the ground, the open-end grain on decking boards, the legs of lawn furniture and gym sets in direct contact with the soil and any other joint openings between two adjacent wooden members.

### What's the next step?

Before applying the new product, consideration must be given to eliminating the sources of moisture infiltration and correcting the areas that are peeling. When the wood is dry, tape-pull tests in areas not apparently affected would be beneficial in determining the full extent of the peeling. Simply press adhesive tape on the painted surface with thumb pressure, then with a jerking motion remove the tape. If the coating(s) is removed with the tape, the peeling is more extensive than just the areas that are obvious. This test should be performed in several locations on the siding, deck or other affected structures.

Assuming the peeling is isolated, the next step is to remove all loose paint or stain. Several methods are available including stripping, scraping and sanding, power washing, etc. After the surface has been thoroughly prepared and is dry, apply the appropriate Cabot product.



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