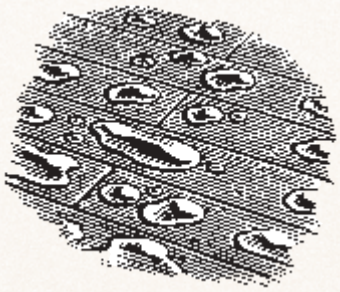
TECHNICAL BULLETIN #7



Controlling Moisture: *Stain (Paint) Problems*

According to the Western Wood Products Association, "Stain (Paint) failures don't just happen." Problems such as peeling, flaking, blistering, tannin bleed and fungus growth are symptoms of excessive moisture which infiltrates wood siding products. Excessive moisture within the wall cavity will deteriorate the adhesion of the stain (paint) film to the substrate and cause peeling and blistering. There are three primary sources of moisture within the wall structure that can affect coatings – exterior leaks, ground moisture and interior moisture-laden air within the home. Successful house designs must consider every possible source of water in every possible form – liquid, solid and vapor.

Exterior Leaks

Rain and snow can enter the wood through openings in the siding. Wind-driven forces behind the water increase the chance of moisture penetration. The Construction Specifier refers to a "driving rain index." Exposures are identified as sheltered, moderate and severe. All unprotected building corners and all buildings within five miles of a sea, large lake or estuary are considered to have severe exposure. Rain water which runs down the walls by gravity will find its way into very small openings. Stains which are under-applied or that have deteriorated over time will allow this moisture to infiltrate through the coating. Moisture, which finds its way into the tiniest openings in the siding, may travel several feet by capillary action, or it will migrate along the back of the siding. This moisture can cause blistering or peeling at areas other than the site of infiltration.

In order to eliminate the moisture problems resulting from exterior leaks, several things can be done. Apply the stain (paint) at the recommended spread rate suggested by the manufacturer. Inspect the building products periodically and restain on a regular maintenance schedule as recommended by the manufacturer. Apply caulk and/or sealant around windows, doors, at corner trim boards, and where the siding meets chimneys. Flashing over windows, doors and at roof/chimney joints will provide water drainage and divert the water from entering the siding and trim. Use gutters to collect roof runoff and divert water away from the house. Maintain the gutters and keep them free of debris. A roof overhang of at least 18 inches is recommended in most areas to protect the siding. Ice dams on the roof eaves will allow water to back up under the roofing material and find its way into wall cavities. Ice dams may damage interior walls as well.

Ground Water

Rain water and snow melt can enter the house via masonry structures, such as the poured foundations, crawl spaces, or the cement slab on which the house is built. Hydrostatic pressure exerted on the cement is one way that moisture can contribute to higher humidity levels throughout the house. Much of this moisture can be eliminated with proper landscaping, a gutter system with downspouts, and proper drainage. Interior drainage of water can be achieved through sump pumps and drainage pipes around the outside perimeter of the foundation. The soil in crawl spaces should be covered with 6 mil polyethylene sheets to help eliminate ground moisture from entering the house. Additionally, proper air circulation and venting of a crawl space is critical. The following formula can be used to determine the air circulation/venting requirements for a crawl space: **T = (6L + A) ÷ 300,** where **T** is the total square footage of vent openings, **L** is the perimeter of the crawl space in linear feet, and **A** is the area of crawl space in square feet.

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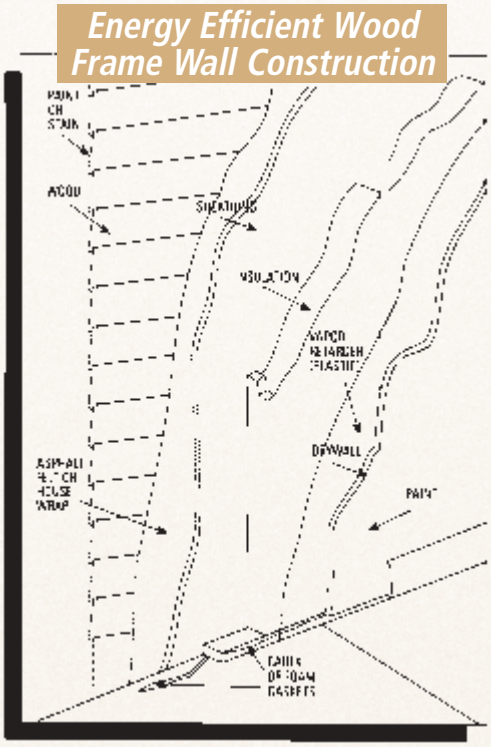
Interior Moisture-Laden Air

The Forest Products Lab in Madison, Wisconsin recognizes that moisture in vapor form is only a problem when it condenses as free water on cold surfaces. The newer homes built during and after the 1970's are tighter and more energy efficient. Condensation problems develop when the temperature of the exterior wall sheathing falls below the dew point of the indoor air. (*The dew point is that temperature at which the moisture vapor begins to condense into the liquid phase.)*



In the winter, temperatures outside of the home can be below the dew point of the inside air. To cite an example, if the temperature outside is 25°F and the inside air temperature is 70°F at 48% humidity, a surface within the wall will be at or below the dew point (49°F). Unless a moisture barrier is established on an inside wall, the moisture will migrate through the drywall or plaster, across the insulation and condense on the colder surfaces. Moisture barriers of 4-6 mil polyethylene sheets should be installed before the drywall is up. The moisture barrier must be continuous to be efficient. Any breaks in the film (electrical outlets, around windows, etc.) will allow interior moisture to enter the wall cavity and contribute to coating failure. If the indoor humidity exceeds 45-50% during cold weather, moisture problems will begin to appear.

The exterior sheathing can become saturated when moisture does escape into the walls. It may even freeze there, build up over time, then melt in the spring when the siding warms up. Peeling and blistering problems in film-forming paints are likely to occur on the south, east and west walls or the sun-exposed sides. The heat from the sun will warm the siding and increase the moisture pressure within the wood. The increased internal pressure will force the moisture to escape to the outside. As the moisture reaches the stain/wood interface, the moisture will swell the wood fibers and cause a loss of adhesion. Blisters can form and will eventually result in peeling.

A good indication that the interior relative humidity is too high is the persistent condensation that forms on the interior of double-glazed windows. It is recommended that the relative humidity within the home be maintained at 40% or lower, but not so low that a health problem may occur. Attic vents allow moisture vapor to escape before it condenses. One type of attic venting is the gable-end vent. Attic vents should provide one square foot of an unobstructed opening for each 150 square feet of floor space. Louvers and screens obstruct the opening by as much as 50%, and this must be accounted for when installing vents.

To summarize this important topic of moisture control within the home and the prevention of stain (paint) problems, the following steps should be taken: 1) proper ventilation of bathrooms and laundries to control indoor humidity; 2) the effective use of interior vapor retarders; 3) ventilation of crawl spaces and attics, and a dehumidifier in damp basements; and 4) regular maintenance of exterior stains, paints, sealants and flashing. Homeowners, builders and painting contractors should become better educated and more familiar with moisture control. In almost all cases, stain (paint) failure can be prevented or rectified by a few simple and basic construction details.

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