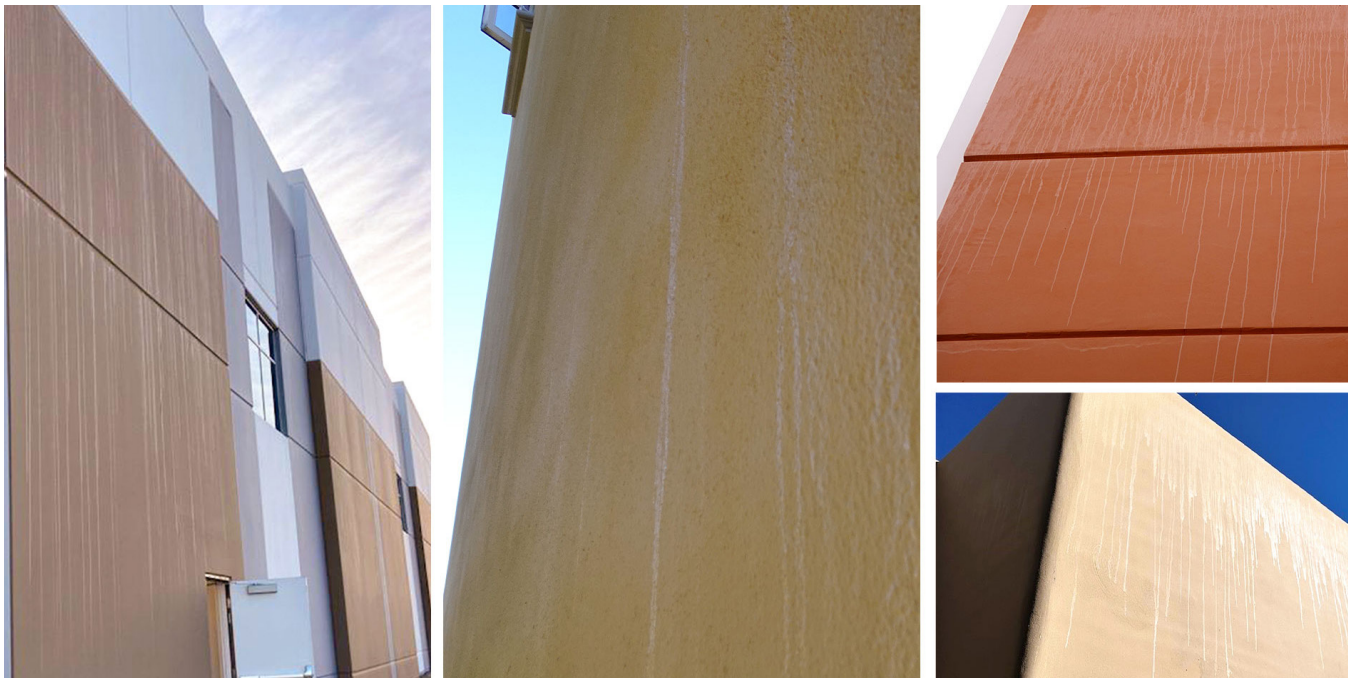
TECHNICAL BULLETIN

SURFACTANT LEACHING

What is Surfactant Leaching?

The phenomenon known as surfactant leaching is described by several names: streaking, surfactant staining, exudation and weeping. These stains (glossy, tan, brown, or white) can occur with any exterior water-based paint when certain environmental conditions exist, or occasionally with interior water-based paint exposed to intermittent (e.g., bathroom) or continuous (e.g., saunas) high moisture and/ or high humidity.

Surfactant leaching is often described as a change of appearance that can be visualized by a difference in gloss, color or light-scattering patterns that often resemble vertical lines or streaks, as shown in ***Figures 1 and 2.***



Figures 1 Examples of Surfactant Leaching on exterior surfaces.

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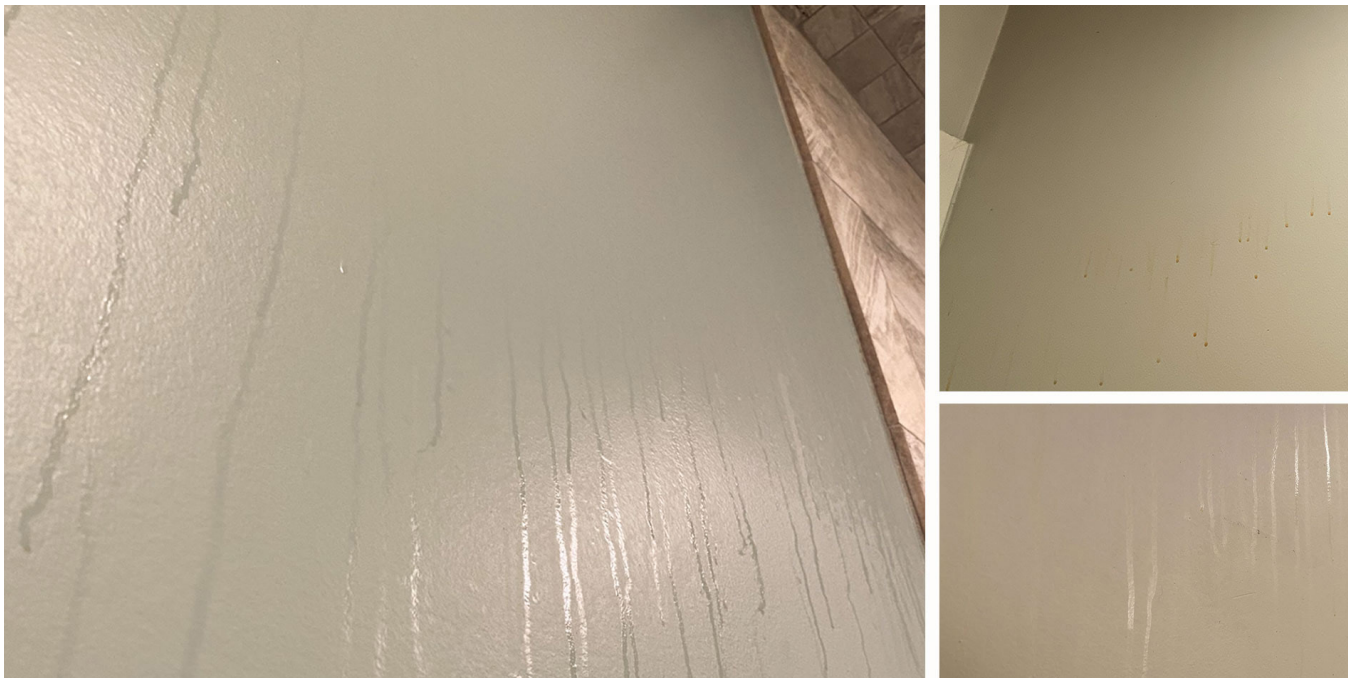

Figures 2 Examples of Surfactant Leaching on interior surfaces.

What are Surfactants?

Surfactants are a necessary ingredient in all water-based paints. They are commonly referred to as specialized soaps. Their purpose is to stabilize the paint so that it will not separate or become too thick to use. They also keep the pigments dispersed and help wet the substrate so the paint won't crawl (move or slide) when it is applied. Surfactants are also an ingredient in colorants. They help to provide compatibility when colorants are added to the paint. This helps ensure that the correct color is developed as well as help prevent the color from changing when different application methods (brush, roll or spray) are employed.

Common perceptions of surfactant leaching are surfactants are the only cause of this visual stain, but in reality, all water-soluble ingredients, such as dispersants, surfactants, wetting agents, and/or thickeners or rheology modifiers can leach out of a coating and stain the surface.

What causes Surfactant Leaching?

Surfactants will slowly migrate to the surface of a paint film during the curing process. The rate and amount of surfactant leaching will depend on the conditions under which a paint is applied and dried. Weather conditions have a direct influence on the proportion of water-soluble ingredients that are brought to the surface as a paint dries, or shortly thereafter. When water-based paints are applied in cool, damp and humid conditions or a freshly painted surface is exposed to dew or light rain, the surfactants are extracted rapidly out of the paint film. Leaching can also occur if paint is applied when the air and/or surface temperatures are below 50° Fahrenheit, followed by dropping temperatures, increased humidity, formation of dew, or the condensation of mist. When these conditions exist, as a paint dries, the surfactants can remain on the surface of the paint film causing discoloration or streaking. Water dissolves the leachate and redistributes

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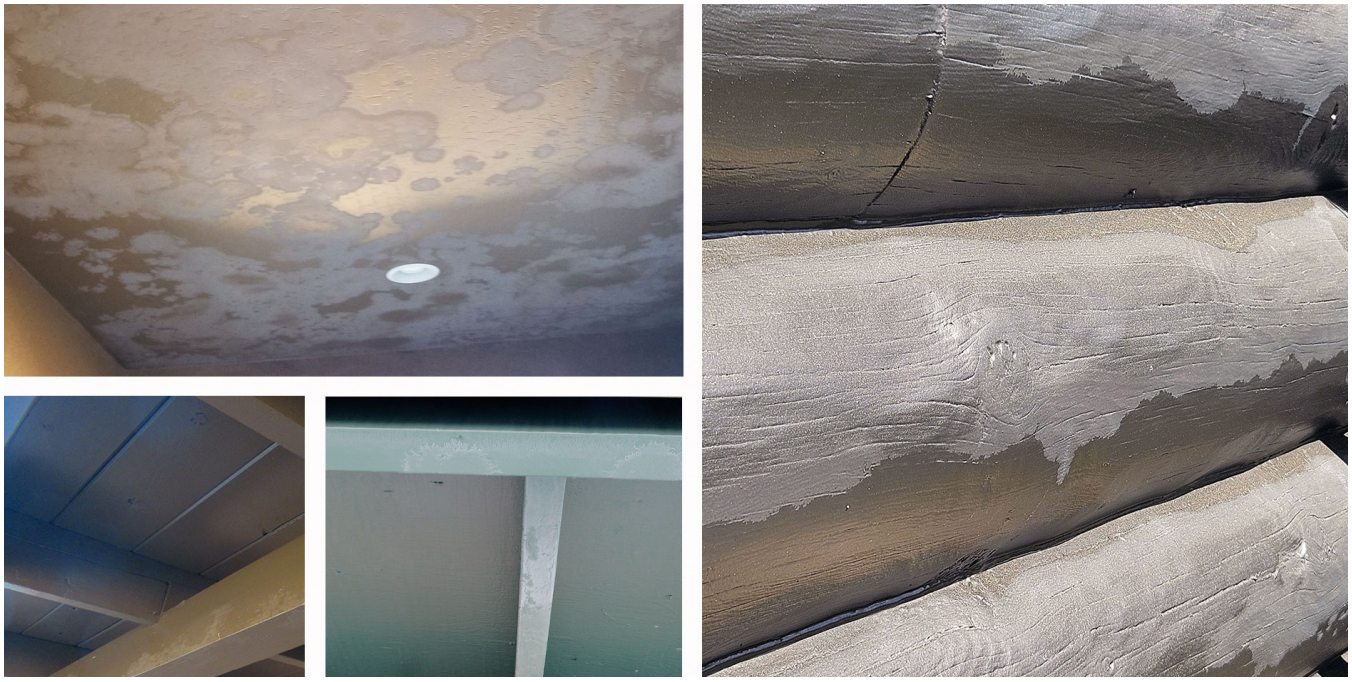
the material into lines (on a vertical surface), often producing shiny streaks. Darker colors, which contain more surfactant as result of the addition of colorant, are more prone to surfactant leaching. Surfactant leaching tends to affect accent colors and dark colors more dramatically than light or pastel colors as an increased loading of colorants means an increase in surfactants.

Paint drying too quickly can also contribute to surfactant leaching, especially in humid environments, as the rapid drying process can trap surfactants near the paint film's surface, causing them to leach out when exposed to moisture or condensation. This is less common than surfactant leaching that occurs due to improper drying conditions like low temperatures or high humidity, which slow the drying process and allow the surfactants to rise to the surface.

The Surfactant Blooming Phenomena

Like surfactant leaching, a surface defect can occur when exterior or interior water-based products are applied in less-than-ideal environmental conditions is what is described as Surfactant Blooming (Figure 3). This can occur when surfactants or other water-soluble ingredients in a paint migrate to the surface after application. When surfactants bloom, they rise to the paint surface over time, often as a result of evaporation, temperature changes (typically temperature drops), increased humidity or dew point, or improper curing conditions. This migration creates a visible layer of residue, often appearing as a greasy or waxy film on the paint surface. Surfactant blooming is different from surfactant leaching because it forms a visible film on protected surfaces.



Figures 3 Examples of Surfactant Blooming on exterior surfaces.

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Surfactant blooming is typically not a performance issue but more of a cosmetic concern. In some cases, it can be removed by wiping the surface with a mild solvent or cleaning agent.

However, if not addressed, it can interfere with a paint's aesthetic appeal and adhesion of subsequent coatings.

Can Surfactant Leaching occur in a fully cured paint?

Paints do an excellent job protecting surfaces, but even a fully cured paint film is still permeable. Water can penetrate a paint film given enough time and volume. Although a paint may be cured, surfactants are present in the film for some time. If surfactants are still at high enough concentration and water penetrates the paint to mobilize them, they may move to the surface and dry. Over time, the surfactants either leave the paint slowly on their own in a way that is not visible or become immobilized by the paint film.

How do I correct and prevent Surfactant Leaching?

If leaching has occurred in the first few days after a paint has been applied, the surfactants can usually be cleaned or rinsed off using a strong stream of water from a garden hose. Care should be taken in trying to remove stains with power washing as the paint film can remain soft until it has thoroughly dried out or cured. On surfaces such as concrete tilt-up and smooth plaster, a soft nylon brush may be used to remove the more difficult stains. Once the surface has been rinsed and cleaned, any remaining surfactants will be removed by weathering. In milder cases of staining, it may be best to allow the stains to self-correct with subsequent rain and weathering. The surfactants pose no threat to the durability or integrity of the paint film.

Leached material on interior surfaces can typically be removed within a week (after the paint film has fully cured and hardened, or longer for dark colors) by gently washing with a mild soapy solution and a soft cloth or sponge, followed by a thorough rinse with clean water. It is important to handle the washing process carefully to avoid damaging the soft or uncured paint. In more severe conditions, surfactant leaching may reoccur once or twice until all the surfactant has been fully eliminated.

To help prevent or minimize the occurrence of surfactant leaching, it is important to follow these guidelines:

1. Do not paint when conditions are cool, damp or humid.
2. Do not paint shortly before or after cool, damp or humid conditions.
3. Do not paint a day before or after a rainfall is forecasted, when the air is moisture-laden.
4. Do not paint late in the day when mist, dew or other moisture may be present on the substrate.
5. Do not paint when the air and/or air surface temperatures are below 50° Fahrenheit.
6. For interior surfaces, allow fresh paint in bathrooms, kitchens and laundry rooms to fully cure and harden before washing or subjecting to steam, condensation, or high humidity.
7. Avoid using the shower for several days until the painted surface is fully dry