TECHNICAL NOTE #2

Delamination of Coatings: Causes and Notes for Epoxy, Polyaspartic and Urethane Systems

Delamination of coatings can occur either between the coating and the substrate or within the layers of the coating itself. This issue can arise due to several factors, including contamination, insufficient surface preparation, applying a recoat beyond the recommended timeframe, or compatibility issues. Moreover, delamination may be caused by a combination of these factors.

Possible causes of coating delamination

1. Inadequate surface preparation of substrate
2. Poor surface preparation of previously painted surfaces
3. Non-removal of existing coated surface with invisible underlying issues
4. Re-coating beyond the recommended re-coat window
5. Surface contamination
6. Incompatibility
7. Surface Temperatures

1. Inadequate surface preparation of substrate

To ensure optimal surface preparation of the substrate and an ideal adhesion for longevity, it is strongly advised to employ proper concrete grinding.
All new or old concrete surfaces should be prepared by mechanical grinding, abrasive blasting, blast tracking, or any other suitable preparation methods. Once prepared, the surface should be at a minimum of Concrete Surface Profile 3 (CSP3). An unprepared or insufficiently prepared surface can significantly impact the adherence of the coating to the surface, potentially resulting in poor adhesion or adhesion failure altogether. A Concrete Surface Profile (CSP), is a standardized measure for the 'roughness' of a surface that is defined by the International Concrete Repair Institute (ICRI). A very rough surface will have a high CSP number, like CSP 9, while a very smooth surface with minimal preparation will be a CSP 1.

2. Poor surface preparation of previously painted surfaces

When overcoating fully cured painted surfaces, establishing a mechanical bond between old and new coatings is crucial. Proper surface preparation ensures the new paint adheres securely to the existing coating. Effective bonding requires thorough sanding followed by vacuuming. Use 120-150 grit sandpaper/screenback for optimal results, ensuring the sanded surface appears uniformly dull. If the preparation is lacking or uneven, this is indicative of insufficient sanding and may lead to delamination between coatings layers.

3. Non-removal of old existing coatings with possible underlying issues

When applying a new coating over old, fully cured, pre-painted surfaces, there is always the risk of underlying issues in the existing coating that may have not been visible during preparation. These issues could include poor adhesion to the substrate due to factors like age, external impacts, moisture, or internal stresses such as substrate movement or deterioration. Even if the surface preparation for the new coating is done correctly and the new coat adheres well to the old one, the old existing coating may begin to detach from the substrate, leading to overall adhesion failure. Therefore, it is always recommended to remove the old coating completely to eliminate this potential risk and to ensure optimal adhesion and durability of the new coating system.

4. Re-coating beyond the recommended re-coat window

Once cured, two-pack epoxy, polyaspartic, and polyurethane products form a hard film that is challenging to adhere to, making it complicated for subsequent coats to bond effectively. It is crucial to adhere to the manufacturer's technical data sheet when applying additional coats and to avoid exceeding the recommended re-coat window. The re-coat window is the period during which the previous film has not fully cured, allowing for a strong chemical bond between coats. Missing this window means the film has cured too hard, requiring sanding of the previous coat to create a suitable surface for the next coat to adhere to. Additionally, the thickness of the film influences curing times, with thinner films curing faster than thicker ones.

Recommended re-coat times serve as a guideline and may vary significantly under different conditions. Factors such as high product and/or room temperature, increased humidity, high airflow, or prolonged mixing will accelerate the curing process. Sanding between coats becomes necessary, especially under accelerated conditions, to improve adhesion.

Accelerating conditions can reduce the re-coat window for epoxy from 4-24 hours to 2 hours, for polyaspartic from 6-16 hours to 1 hour, and for polyurethanes from 4-24 hours to 2 hours.

Failure to observe these factors can lead to significant issues during re-coating, likely resulting in delamination problems between coats.

5. Surface contamination

Contaminants can be present on new or old surfaces such as, but are not limited to, loose material, dirt, debris, mildew, oil, grease, old coatings, curing compounds, release agents, laitance, and dust.

There are various surface contaminants to be wary of during the surface preparation process that may also be introduced onto surfaces through sanding, application equipment, or washing between coats. These can stem from various sources such as dirt, aerosol sprays, construction silicones, paints, brake fluids, oils, and cleaning materials.

Another factor to consider, and is often underestimated, is possible contamination between applying coats. This can be caused by surrounding environmental influences, other work being performed in close proximity, any contact made on the unfinished surface, automatic aerosol sprays etc. Though sometimes the time gap between coatings is only several hours, it is crucial to ensure that the surface continuously remains contaminant-free between coating layers.

6. Incompatibility

Mixing different brands is not recommended. Products from different brands may have components that are not compatible or even different technologies, which may lead to coating adhesion failure or overall coating failure.

7. Surface Temperatures

Surface temperatures play a crucial role during coating application. If the surface is too hot, the coating may dry too quickly, weakening the bond between the substrate and the coating, causing adhesion issues. Conversely, if the surface is too cold, condensation can impact the coating when the surface and/or ambient temperature are <3°C above the dew point, leaving it sticky and partially uncured. Additionally, lower temperatures will affect the proper leveling of the coating. It's important to always follow the product's application guidelines to prevent these issues from arising.

The drying times of epoxy, polyaspartic, single-pack polyurethane, and two-pack polyurethane coatings typically depend on factors such as air circulation, temperature, humidity, film thickness, and application methods.

Bear in mind that the physical substrate temperature can be significantly lower or higher than the surrounding air temperature. It is advisable to check the surface temperature prior to coating application, especially in summer and winter times. The recommended temperatures for coating application are between 10°C and 30°C, with an optimum of 18 - 25°C.

DISCLAIMER

Do not apply this product if there is uncertainty about its application or surface preparation.

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