MULTIPLE COAT FAILURE

Multiple coat failure occurs when two or more paint layers detach together from a substrate or from an underlying coat. The topcoat often remains bonded to the layer beneath it, so the failure originates in a previously applied coat—or, in more severe cases, at the original substrate (Figure 1).

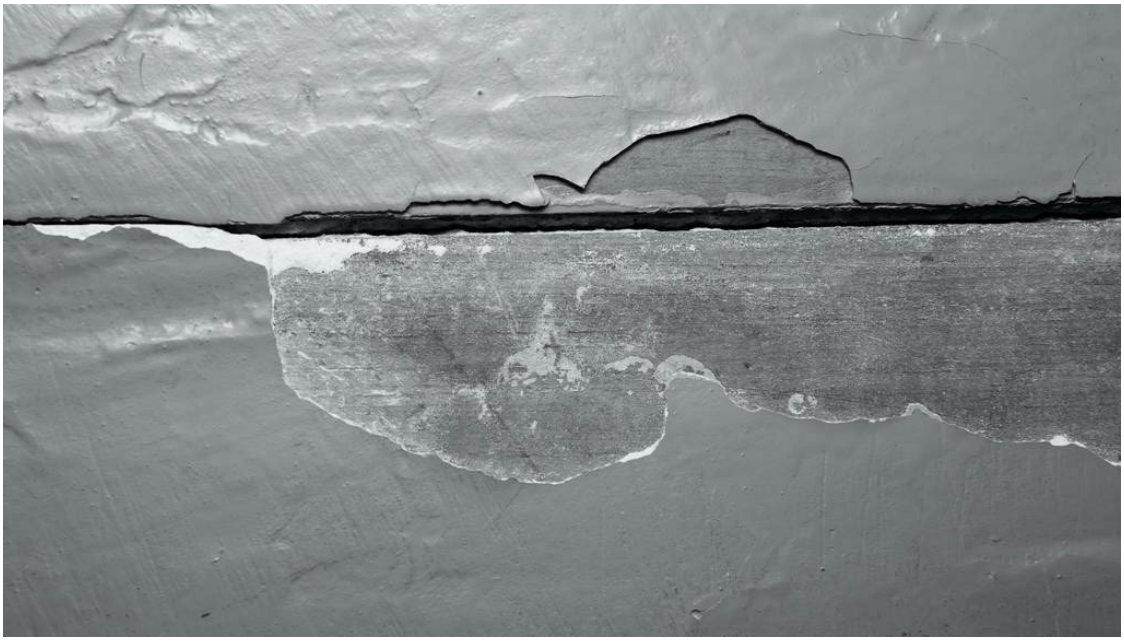

Figure 1

Primary Causes

- ***Excessive paint buildup:*** Thick, multi-layer paint systems increase internal stress. Older, brittle coats often can't accommodate normal substrate movement, so repeated expansion and contraction can cause separation at the weakest interface. Heavy film build can also add weight, increasing mechanical stress on the underlying bond line. Oil-based paint in underlying layers: This issue is often worse when a water-based coating is applied over a previous coat (or intermediate layer) that is oil-based. Oil-based paints cure by oxidation and become less flexible as they age, especially if they were left exposed for extended periods before repainting.
- ***Poor surface preparation of previous coats****:* Dirt, chalk, mildew, grease, or glossy surfaces reduce adhesion. Even when initial adhesion appears acceptable, marginally prepared layers can fail later after additional coats are applied. The underside of peeled paint often shows evidence of the original surface contamination.

- ***Moisture intrusion:*** Moisture trapped behind the paint film forces layers away from the substrate. Sources include surface cracks, leaks, faulty flashing, and unsealed joints. Staining or discoloration on the underside of peeled paint often points to moisture as a contributing factor.
- ***Application of dark colors:*** Dark finishes absorb more solar heat, raising surface temperature and increasing thermal cycling. When paired with heavy film build and borderline adhesion, dark colors can intensify stress on underlying layers and speed up delamination.

When these factors act in combination, the probability of multi-coat delamination increases significantly.

Diagnosis and Field Tests

Examine peeled areas for cracking, checking, blistering, or discoloration, and observe whether the underside of the paint is stained, chalky, or shows multiple layers. Evaluate adhesion using ASTM D3359 Method A or a comparable tape test (see the Technical Bulletin, *Field Evaluation of Coating Adhesion*, for the detailed procedure). Test several representative locations, since acceptable adhesion in one spot does not confirm adhesion across the entire surface.

Surface Preparation and Repair Recommendations

1. Address moisture first by repairing leaks, gutters, flashing, and seal joints; improve ventilation to reduce condensation.
2. Scrape or strip all loose, flaking, or poorly adhered layers back to a sound substrate. Do not simply paint over marginally adhered coatings.
3. Scuff sand glossy or slick areas to create mechanical tooth; use abrasive blasting or chemical stripping where appropriate for metal and masonry.
4. Remove mildew, dirt, chalk and other foreign contaminants with an appropriate cleaner, rinse, and allow complete drying.
5. Spot-prime bare surfaces with the correct primer for the substrate.
6. Observe manufacturer recommendations for temperature, humidity, recoat intervals, and color selection to avoid application-related stress.

Final Note

As a chain is only as strong as its weakest link, a paint system is only as strong as the weakest bond between or within individual coats. Be aware that anything less than complete removal of unsound coatings can shorten the service life of a repaint. Although stripping back to a sound substrate is often time-consuming and costly, it is necessary to achieve reliable adhesion. Adding new coats over marginally adhered layers increases weight and stress, which further weakens the system. Multiple-coat failures are avoidable when contractors thoroughly assess existing coatings, control moisture, remove compromised layers, and limit excessive film buildup. Careful attention to substrate condition and appropriate preparation methods reduces callbacks and results in longer-lasting coating performance.