

Two Part Epoxy Paint / Epoxy Coating Problems

What can go wrong when using two part epoxy paints and resin systems. Problems and answers.

SNOPSIS:

What can go wrong - (epoxy failures and problems) when applying and work with 2 part epoxy paint and resin system. Epoxy Bubbles, surface contamination, epoxy not hardening, etc.

Keywords: epoxy, epoxy failure, epoxy not curing, epoxy paint



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Two-Component Coating Problems

The most common problems/errors that can occur and have been experienced in the application of Two-Component, Solvent Free, Floor Coating Systems are covered in this guide. Always read the Product Application Instructions before applying.

1. Bubbles in the Cured Coating - Bubbles (or craters from bubbles) that appear as small as a pinhead, or up to 1" (2.5 cm) in diameter. They can appear throughout the coated floor area or in honey comb clusters. In most cases, the bubbles are caused by one of the following forms of air entrapment. (Note: See repair method A).
 - 1.1 Outgassing - Bubbles may appear in the coating surface after a 100% solids coating is applied to a porous concrete surface. This condition is created when the coating begins its exotherm, or curing action. The coating increases in temperature causing the trapped air in the concrete to also heat up and expand, thereby creating bubbles.
 - 1.1.1 To avoid the "out gassing" problem, seal or prime the porous concrete with a primer/sealer.
 - 1.2 Improper Mixing - Too aggressive a mixing action (using a drill speed of over 600 rpm) will cause air to be entrapped in the coating.
 - 1.2.1 Use a 300 - 500 rpm slow-speed drill, with a spiral mixing blade or Jiffy mixer. Move the mixing blade in circles around the inside edge of the pail from bottom to top.
 - 1.3 Roller Covers - Inexpensive, too short, too long or foam roller covers have been known to cause air to be generated into the coating, thus causing bubbles.
 - 1.3.1 Use a high-quality, "lint-free", short nap roller sleeve and gently roll the 100% solids coating into place after squeegeeing. Vigorous rolling could also create bubbles.
2. Soft to "Goosey" Two-Component Coating After a 24-Hour Cure - When, after sufficient cure time has elapsed, the coating has not realized either uniformly or in spots, the hardness, durability or tack-free gloss that is expected. (Note: See repair method B.)
 - 2.1 A "Goosey" Mess - No catalyst. This occurs when the mixing person completely forgets to add the Part A or the Part B prior to mixing.
 - 2.1.1 These are two component materials. When there are absolutely no signs of the coating hardening, count the A's and B's used - there will be a discrepancy.
 - 2.2 Tacky or Sticky Spots (in an otherwise cured coating) -
 - 2.2.1 Insufficient mixing. Part A and B are not mixed according to prescribed methods or ratios.
 - 2.2.2 This can also take place when a mixing pail is placed upside down onto a floor surface, allowing it to completely empty. Never allow this procedure to happen as there may be unmixed resins remaining on the bottom, or sides of the pail.
 - 2.3 Soft, But Uniform Surface - Normally the result of a cold temperature application or an improper ratio of Part A to B.
 - 2.3.1 Elevate the temperature of the floor surface, the air, or the material prior to application.
 - 2.3.2 Double check for proper mixing ratio, if not mixing as packaged.
3. Fish-Eyes (Circles, separations, non-uniform surface finish) - Imperfections in the coating surface that resemble the "eyes of fish", or similar looking flaws. Note: See repair method C.
 - 3.1 Silicone Contaminants - Any residual silicon deposited onto the floor surface resulting from a manufacturing process can cause the problems listed above.
 - 3.1.1 To avoid this problem, be familiar with in-plant operations and when in doubt, test areas (see section 3.3 below) prior to a coating application.

Two-Component Coating Problems

- 3.1.2. Prepare the floor surface by removing the silicone contaminant with the recommended chemical solvent or stripping agent. Shot-blasting will not completely remove surface contaminants.
- 3.2 Oil/Grease Contaminants - Any petroleum-based lubricant/product can cause a coating to have the above flaws and be improperly bonded.
- 3.2.1 Thoroughly remove all petroleum-based contaminants with a solvent degreaser and/or a caustic/alkaline cleaner, preferably followed by a light acid etching for neutralization, followed by a neutral pH detergent.
- 3.3 Animal Fats, Vegetable Oils and/or All Food Products or By-Product Spillages - All of these contaminants will cause surface problems.
- 3.3.1 Where food products and/or by-products come in contact with the concrete floor surface, it is highly advisable to further prepare the concrete floor surface using the method recommended in section 3.2.1. above.
- 3.3.2. NOTE: Following a thorough chemical cleaning with caustic, acid and detergent, test the concrete surface for contamination from an oily substance by sprinkling with water. If the water beads up, steam clean or use a propane flame torch to bring the contaminant to the surface, and chemically clean again. Using a hot water pressure washer for flushing before and after each separate cleaning process will speed up and improve the job.
4. Delamination (Peeling, flaking and/or Lack of Adhesion) - When the coating separates from the substrate, whether it be the concrete base, or a previously applied coating layer, in either large or small areas. Note: See repair method D.
- 4.1 Inadequate Cleaning/Preparation of the Surface to Which the Coating Was Applied - No coating will adhere to a contaminated surface - no matter how expensive the coating is.
- 4.1.1. Beyond providing a suitable profile for adhesion (shot-blasting or acid etching), test for remaining contaminants, especially if they were present prior to the creation of the surface profile. (See section 3.3.2 above.)
- 4.2 When a Primer is Not Used - Loss of adhesion can occur.
- 4.2.1 Use a primer.
- 4.3 Improper or Inadequate Acid Etching - As previously discussed an adequate profile (i.e. concrete with the uniform feel of medium to coarse sandpaper) is required. Without the porosity created by an adequate profile, a mechanical bond of the coating cannot be achieved.
- 4.3.1. If acid is used, a hydrochloric (HCL)/(muriatic) acid solution is advised. Uniformly spread the acid so that no one area is etched deeper than another. In food and exposed steel facilities, we commend the use of phosphoric acid because it produces less fumes. All acid etched areas should be thoroughly flushed with clean, clear water, followed by an additional thorough flushing with water and dry vacuuming. Note: An acid film, not flushed and neutralized, will also cause definite adhesion problems. Blend acid at the rate of 2 parts clean water to 1 part commercial grade acid. Other safer acids are also available.
- 4.4 Excessive Moisture in or on the Surface of the Concrete - This will cause loss of adhesion.
- 4.4.1 If moisture is in the concrete and it is sealed with a non-breathing coating (i.e. 100% solids), warmer temperatures will bring it (the moisture) to the surface beneath the coating, where it vaporizes, causing pressure against, and therefore blisters in the surface coating. Often times these blisters will "grow" as the moisture and the vapors tend to accumulate beneath the surface of the coating. This condition can be verified by simply breaking a blister to determine if moisture is trapped beneath it. (NOTE: 100% solids coatings should only be applied to on-grade or below-grade concrete floors that have a heavy plastic "moisture barrier" beneath them.
- 4.4.2 Use a moisture meter to test for moisture content prior to application, or tape down several 3 ft. by 3 ft. square areas of 4-6 mil clear plastic for 72 hours, periodically checking for moisture accumulation on the underside of the taped down plastic. If moisture does form on the plastic, do not coat with a 100% solids material.

- 4.5 Inter-Coat Adhesion - Improperly prepared previously applied coatings will definitely lead to inter-coat delamination. Always test for compatibility/adhesion.
 - 4.5.1 Although acid cannot be used to etch or initially prepare an old coating surface, it must be used for neutralization if a liquid caustic cleaning process is employed, followed by a neutral pH detergent wash and flush.
 - 4.5.2 Should there be any gloss whatsoever exhibited by the surface to be coated, it should be thoroughly abraded with a medium to coarse sanding, the dust completely removed, and the surface "tack-ragged" or wiped with a strong solvent solution, i.e. xylene, prior to the application of a new coating. An alternative to sanding would be a "brush blast" with a shot-blasting machine.
 - 4.5.3 "Open" re-coat times of the same epoxy coating begin when the initial coat has set hard enough to walk on, and ends following a maximum 36 hour window.
5. Wrinkling of the Surface Film - In rare instances, strange wrinkles will appear in a 100% solids coating. (Note: See repair method E.)
 - 5.1 Excess Thinner - If solvent is added to the coating, and the coating is applied too thick, this may cause wrinkling, or, at the very least, a dull or soft film surface.
 - 5.1.1 When applying a thick coating for the purpose of achieving greater mil thickness and/or filling spalls, voids or rough areas, use minimal or, preferably, no solvent thinner.
 - 5.2 Solvent-Thinned Epoxy Over An Unknown Previous Paint - Solvent thinner may attack the base paint, causing it to lift and thereby wrinkling the top surface.
 - 5.2.1 Always check for compatibility and use the least amount of solvent thinner possible.
 - 5.3 Cold Concrete Surface Temperatures - This can cause a 100% solids coating to wrinkle or contract during the curing cycle.
 - 5.3.1 When the concrete floor surface is below 50°F, do not coat it.
6. Excessive Wear, Erosion of a Coating Surface Beyond Expectations - Premature wear or abrasion of a coating beyond the normal "marring" that is inherent with a 100% solids coating.
 - 6.1 Improper Mixing Ratios or Insufficient Blending of parts A and B - This will cause a soft coating throughout that will result in premature wear.
 - 6.1.1 Be sure that your ratios are correct (if not using prepackaged units) and that the Parts A and B are thoroughly blended together, as previously recommended.
 - 6.2 Improper Maintenance - Poor floor care can cause premature wearing of the coating, especially in warehouse or production areas where there is the dragging of wood pallets with nails protruding.
 - 6.2.1 Set up a proper maintenance program, including the training of fork lift or pallet jack operators.
 - 6.3 Sub-Standard or Soft Concrete - This condition can cause poor performance at best, or complete loss of adhesion.
 - 6.3.1 Check for concrete softness with a penknife. If you are able to carve your initials by hand with a penknife, you have bad/soft concrete and potential problems.
7. Small Bumps (Lumps) In the Cured Epoxy Coating - A rough finish with 1/64" to 1/4" diameter solid "lumps," "bumps," or "globs" of 100% solids epoxy can result from one or a combination of the following. (Note: See repair method A.)
 - 7.1 Lint From a Roller Sleeve - Improve the quality of your roller.
 - 7.2 Dust, Dirt or Blasting Shot Not Removed From the Floor Surface Before Coating.
 - 7.3 Poorly Mixed Dry Additive - i.e., aggregate.
 - 7.4 Dirty Equipment Used in Mixing, or Applying.
 - 7.5 Product Beyond Shelf Life and/or Poorly Mixed.
 - 7.6 Unblended Product Having Been Frozen in Shipment or Storage.
 - 7.6.1 Thaw out at a minimum 85°F for 72 hours; thoroughly blend each component separately before mixing together.

IMPORTANT - Don't neglect to review the MSDS (Material Safety Data Sheet) supplied with each order.

REPAIR METHODS - TWO COMPONENT COATINGS

Repair Methods

For Cured Two-Component Coating Problems

A. Bubbles in Cured 100% Solids Coatings

1. Thoroughly abrade bubbled floor area with medium grit sandpaper on a rotary disc scrubber (or medium to coarse stones on a terrazzo grinder); completely remove all dust; "tack-rag" or wipe the sanded surface with Xylene/Xylol; and recoat at a maximum rate of 150 square feet per gallon.
2. Large bubbles may require hand grinding before sanding - always feather edge all imperfections.
3. Large areas may also require a tightly applied "self-leveling" re-prime application of Clear 100% solids seal coat.

B. Soft to "Goosey" Two-Component Coatings

1. If floor surface is "goosey" and it is determined that a Part A was not added, use long handled drywall scraper knives or a "Scrape-Away" tool on a rotary scrubber to remove all uncured coating.
2. Follow scraper removal of "goosey" epoxy with a strong solvent scrub (i.e., Xylene/Xylol, etc.) vacuum up residue, shot blast the area again or chemically clean to bare concrete.
3. If uncured coating is only tacky or sticky in spots, identify all locations and mark them. You only want to repair once. Diamond hand grind and/or scrape and solvent clean as above; patch apply the coating on the spots. Remember that patches will never blend in and, therefore, it may be best to completely recoat the entire floor.
4. If the floor surface exhibits signs of having partially cured uniformly, but is still soft, it is probably not cured - allow additional time.

C. Fish-Eyes and Imperfections in a Cured Coating

1. Thoroughly sand/grind coated floor surface as recommended above in Section A; vacuum/clean and "tack-rag" prior to recoating. Only apply one Unit to monitor results; backroll as late as possible to minimize a repeat of the "fish-eye" occurrence.

D. Delaminations (i.e. Peeling, Flaking, etc.)

If these problems are evident throughout the entire floor, shot blast to bare concrete - follow original specifications.

1. If in isolated areas, key the perimeter with a sharp knife or portable saw at 1/16", remove all coating in the interior of the key to bare concrete; repair by following the original specifications.

E. Wrinkling of Surface Film

1. Thoroughly sand and/or grind to a completely smooth surface; vacuum/clean and remove all dust; "tack-rag" with strong solvent (i.e. Xylene/Xylol, etc.), elevate surface temperature to acceptability and recoat.

NOTE: If there is moisture vapor from within the concrete, forcing the coating to "blister", it is usually caused by a lack of moisture barrier beneath the concrete slab. Check the "blisters" for moisture content. If this is the case, (and there is moisture), there is NO proven method to eliminate the problem.

We recommend removing all of the coating to bare concrete and sealing with one coat of Agua-Rock primer/sealer.

When cleaning or preparing a floor surface using liquid caustic soda, acids, strong industrial detergents or solvents, always wear safety goggles, rubber gloves and impervious clothing, including rubber boots. When using chemicals that create work-place respiratory exposure levels above permissible levels, wear NIOSH/MSHA approved respirators, and any specified personal protective equipment in accordance with the Material Safety Data Sheets supplied by the Distributor.

Dispose of chemical waste in accordance with all Federal, State and Local regulations as indicated by the Material Safety Data Sheet on the specific chemical used.

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