

Coating Failures

Organic Coating Failures	Failure Appearance	Cause of Failure	Problem Prevention
1. Chalking	Surface soft & powdery. Easily wiped away.	UV degradation of resin. Improper pigmentation.	Use UV-resistant resins and non-chalking pigments.
2. Erosion	Similar to chalking. High spot removal & brush marks.	Chalking & surface weathering.	Use chalk-resistant coating with good flow.
3. Checking	Uneven, small, non-continuous coating fissures.	Surface stresses caused by shrinkage.	Use weather-resistant resins and inert pigments.
4. Alligatoring	Large macro-cracking and cross-hatching.	Internal stresses with greater surface shrinkage.	Apply thin coats and thoroughly dry before reapplication.
5. Cracking	Small breaks in coating to substrate of various geometries.	Stresses due to continued polymerization/oxidation.	Use non-reactive resins and pigments.
6. Mud Cracking	Large macrocracking and curling.	Rapid drying of highly filled coatings.	Use coatings with strong adhesion and proper drying conditions.
7. Wrinkling	Furrows and ridges in coating surface.	Surface dries more quickly than underlying coating.	Use coatings with even, thorough drying characteristics.
8. Biological Failure	Softening or slime reaction. Blotchy brown or black spots.	Bacterial or fungal degradation.	Use permanent fungicides or bactericides in coating.
9. Discoloration	Yellowing, graying, or darkening.	Weathering or chemical reaction.	Use color stable resins and pigments.
Inorganic (Zinc) Coating Failures	Failure Appearance	Cause of Failure	Problem Prevention
1. Checking	Fine visible or microscopic checks that do not penetrate to substrate.	High zinc pigment/binder ratio. Rapid drying conditions.	Use reinforcing pigments, thin layer application and proper drying.
2. Mud Cracking	Fine to large segments flaking from surface.	Too thick application. Too rapid drying.	Use recommended thickness and proper drying method.
3. Pinpoint Rusting	Pinpoint spots of corrosion. early failure can be catastrophic.	Improper zinc/binder ratio. Uneven coating thickness.	Remove and reapply more satisfactory coating at first indication.

Coating Failure	Failure Appearance	Cause of Failure	Problem Prevention
1. Previously Used Steel	Blistering, rust, tubercles, loss of adhesion.	Retention of minute amounts of corrosion product; even after abrasive blast.	Wash blasted surface with water or dilute phosphoric acid and re-blast. Use anti-corrosive primer with strong adhesion.
2. Galvanized or Metallic Zinc Surface	White zinc corrosion product forming under coating or breaking through.	Formation of zinc salts underneath coating.	Brush blast zinc surface or use commercial zinc treatment. Use anti-corrosive primer with strong adhesion.
3. Aluminum	White corrosion product, loss of adhesion, possible blistering.	Smooth aluminum oxide surface. No physical adhesion.	Light blast aluminum surface or use aluminum treatment. Use anti-corrosive primer with strong adhesion.
4. Copper	Grey-green corrosion product, loss of adhesion.	Smooth copper oxide surface. No physical adhesion.	Brush blast copper surface or use copper treatment. Use anti-corrosive primer with strong adhesion.
5. Wood	Checking, cracking, and flaking of coating. Blistering from trapped Moisture in wood.	Expansion and contraction of wood due to varying temperatures and humidity.	Start with clean newly sanded surface. Use elastic, highly penetrating paint with high moisture permeability.
6. Concrete	Blistering, peeling, or loss of adhesion. Formation of calcium salts under coating.	Chemical reactivity, moisture content and porosity of concrete.	Concrete surface should be clean and dry. Acid etch or light blast. Use elastic, highly penetrating paint with alkali resistance (epoxy).

Defect Failure	Failure Appearance	Cause of Failure	Problem Solution
1. Blisters	Dome-like raised area containing moisture or other liquids.	Contamination on surface prior to painting or coating. Moisture in wood substrate.	Clean surface prior to painting. Other means of moisture escape for wood substrates.
2. Bubbles and craters	Bubble: dome-like raised area containing vapor. Crater: concave area once covered by bubble.	Solvent or moisture entrapment during drying or baking.	Application of coating in thin layers. Sufficient flash time before baking.
3. Color mismatch	Color deviations from one area/part to another.	Variations of film wetness and build, substrate, thickness, application and agitation.	Consistency required in film wetness, build, thickness, application and agitation.
4. Dirt	Any contaminants found in paint or on painted surfaces.	Inadequate facilities, poor housekeeping, poor painting practices.	Improved housekeeping and attention to painting practices and procedures.
5. Fisheyes	Small depression with a central mound.	Caused by residual oil or grease, especially silicone types.	Keep painting area free of silicone products. Use fisheve eliminators.
6. Gloss variations	Gloss deficient patches of paint film.	Basecoat wet spots, improper oven conditions, insufficient film build.	Control bake oven conditions, proper application, consistent film thickness.
7. Mottle	Metallic paint; color pigments separate from metallic flake.	Application of paint too thick or excessively wet.	Do not apply the paint too wet.
8. Orange peel	Repetitive bumps and valleys similar to an orange surface.	Freshly applied paint film does not flow out smoothly.	Proper paint spray atomizing pressure, paint viscosity, and film thickness.
9. Runs, sags and curtains	Downward flow of paints prior to film hardening.	Application of coating too thick or too wet.	Proper spray gun cleanliness and operation. Correct solvent amounts.
10. Paint adhesion loss	Premature separation of paint film from substrate.	Contaminants, excessive bake time, condensed moisture.	Cleanliness, correct bake parameters, prevent condensed moisture.
11. Soft paint films	Coatings cured to hardness below a designated specification.	Improper oven/cure parameters, softening contaminants, excessive solvents and film builds.	Correct bake parameters, avoid softening agents, proper solvent amount and film build.
12. Solvent popping, boiling and pinholes	Tiny surface craters on paint films. Small versions of bubbles and craters.	Overly rapid solvent loss from the wet paint, escaping as "bursts."	Avoid pigment clusters, controlling solvent evaporation rates and oven temperatures.
13. Solvent wash	Paint voids or areas with thin paint due to solvent condensation.	Excessive solvent evaporation on entry area of oven, condensation on cool area of part.	Sufficient flash time before painted parts enter an oven.