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**Air Entrainment Craters**

**Description**

→ Small crater like openings in or on the paint film

**CAUSE**

→ Trapped or buried air pockets in the wet paint film that rise to the surface and "burst", causing small craters. Lack of atomization, is the cause of air entrapment and may be due to one or more of the following:
- Spray gun travel too slow
- Spray gun distance too close
- Air pressure too low
- Improper spray gun setup

**REPAIR**

→ Sand with 1200 to 2000 grit discs, then compound and polish to restore gloss.
→ Or, sand smooth and refinish.

**PREVENTION**

→ Maintain correct spray gun speed.
→ Maintain correct spray gun distance.
→ Use the recommended air pressure.
→ Use the correct air cap/nozzle/needle recommended for clear coats.

**NOTE:** Some cases of air entrapment may have an appearance very similar to solvent pop or dust contamination. However, air entrapment normally occurs when the film is still wet and can be removed with compounding procedures. On the other hand, solvent pop will appear after the film is "skinned over" and when sanded will have pinholes. Dust contamination will appear while the film is drying but, still "tacky". These craters, under close examination, will have a speck of dirt in the centre of the crater.
Bleeding (Discolouration)

Description
→ A red or yellow discolouration in the topcoat colour

CAUSE
→ Solvent in the new topcoat dissolves soluble dyes or pigments in the original finish, allowing them to seep into and discolour the new topcoat.

REPAIR
→ Allow colour to cure, isolate with two pack undercoat(s) and then topcoat.
→ Or, remove original paint film and refinish.

PREVENTION
→ Isolate suspected bleeding finish by applying a two pack primer and/or sealer. Allow to cure following product recommendations, then apply desired topcoat.
Blistering
(Pimples, Bubbles, Bumps)

Description
>
Swelled areas appearing as pimples or bubbles in or under the finish (0.5 to 1.5 mm).
>
May follow the shape of a repair spot.
>
Most common on horizontal surfaces.
>
May contain a vapor or a liquid.

CAUSE
>
Excessive moisture in air supply while priming/top coating.
>
Applying a topcoat before undercoats have dried thoroughly.
>
Improperly cured 2-part polyester body filler.
>
Topcoat immersed in water for extended periods of time.
>
Applying too thick a coating of paint onto the surface.
>
Spraying in extreme high humidity conditions.
>
Painting over grease, oil or rust.

REPAIR
>
Remove affected area.
>
Check for moisture damage.
>
Use recommended epoxy fillers.
>
Apply primer/sealer.
>
Repaint.

PREVENTION
>
If wet sanding is preferred, allow sufficient time for moisture to evaporate.
>
Allow sufficient drying times.
>
Select proper thinner for spray conditions
>
Clean and prepare substrate using recommended products and procedures.
Blushing
(Milkiness)

**Description**

→ A milky grey cloud appears on the surface of the paint film immediately, or shortly after application.

**CAUSE**

→ When spraying during humid conditions, air from the spray gun and solvent evaporation lowers the substrate temperature below the dew point, causing moisture in the air to condense in or on the paint film.

→ The condition is aggravated when too fast drying or unbalanced thinner/reducer is used.

**REPAIR**

→ Should blushing occur during application:
   a) Apply heat to the affected area, or
   b) Add retarder thinners and apply additional coats.

→ If the finish has dried, minor blushing may be corrected by compounding or polishing, however, severe blushing will require sanding and refinishing.

**PREVENTION**

→ Always use good quality solvent and thin/reduce material according to label directions.

→ Select proper thinner/reducer for spray condition.

→ Add the recommended amount of retarder thinners when spraying in humid conditions.

→ Apply heat after application to evaporate moisture.
Chalking (Fading, Oxidation, Weathering)

Description
→ A chalky white appearance on the surface of the paint film.
→ Especially found when using Epoxies

CAUSE
→ Pigment is no longer held and protected by resin, resulting in a powder-like surface and lack of gloss due to:

  a) Improper application of paint material.
  b) Excessive use of mist or fog coats when applying single stage finishes.
  c) Natural weathering of the paint film.
  d) Using generic thinner or hardener in the paint material.

REPAIR
→ Sand to remove weathered paint film and refinish.
→ Or, compound to remove oxidation and polish to restore gloss.

PREVENTION
→ Thoroughly stir and shake all paint materials.
→ Use the recommended hardener, thinner/reducer and measure accurately.

Description
→ A chalky white appearance on the surface of the paint film.
→ Especially found when using Epoxies
Chemical Staining/Etching
(Acid Rain, Spotting, Discolouration)

Description
- Irregular shaped pitting, etching or discolouration on the paint film.

CAUSE
- A chemical change happens when harmful environmental contaminants, such as tree sap, road tar, acid rain, bird droppings etc. remain on the surface for a long period of time.

REPAIR
- Wash with hot water and soap, rinse and dry.
- Solvent clean with appropriate surface cleaner.
- Compound damaged surface and polish to restore gloss.
- If refinishing is necessary, sand to remove damaged area, then refinish. In severe cases, the finish must be removed to bare metal.

PREVENTION
- Remove harmful water soluble contaminants by regularly washing with clear water and detergent.
Chipping
(Nicks, Stone Pecks, Chips, Bruises)

**Description**
- Small piece of paint film that breaks away, leaving a nick, notch or void in the finish.
- Often seen on leading edges, but may be exposing an underlying layer.

**CAUSE**
- Loss of adhesion of the paint film to the substrate caused by an impact from stones or other hard objects.

**REPAIR**
- Large areas of chipping should be blended with a primer.
- Small areas of chipping can be filled with 2-part polyester stopper/body filler.

**PREVENTION**
- Use premium two pack undercoat and topcoat system.
- Use a flex agent in undercoat and/or topcoat system in areas that are prone to chipping.

Small piece of paint film that breaks away, leaving a nick, notch or void in the finish. Oftentimes seen on leading edges, but may be exposing an underlying layer.
Cracking

Description
- Splitting throughout the paint film thickness.
- Series of straight lines – various lengths and widths
- Primer or substrate may be visible

CAUSE
- Excessive film thickness of the undercoat and/or topcoat.
- Refinishing over a previously cracked or unstable surface.
- Substrate not at room temperature.
- Component “A” and Component “B” not uniformly mixed.

REPAIR
- Remove finish from affected area.
- Apply primer/sealer.
- Repaint.

PREVENTION
- Remove cracked/unstable finishes.
- Check current film thickness before starting. Excessive paint should be removed before refinishing.
- Mix Component “A” and Component “B” thoroughly and follow the recommended mixing ratio.
- Use the recommended thinner and hardener, and then measure accurately.
- Follow recommended film thickness.
- Follow recommended flash-off and drying time between coats.
- Do not force dry undercoats by fanning with spray gun air.
Delamination
(Peeling, Flaking)

Description
→ A loss of adhesion or separation of the paint film from the substrate.
→ Usually occurs around edges, trim or hardware.

CAUSE
→ Insufficient flash/dry time or exceeding the product’s maximum recoat time.
→ Omitting or applying an incompatible undercoat to a specific substrate such as aluminium, plastics or galvanized.
→ Improper preparation of the substrate e.g. sanding or cleaning.
→ Insufficient film thickness of undercoat or topcoat.

REPAIR
→ Strip to bare substrate and refinish.
→ Or, remove the finish in the affected area, featheredge and refinish.

PREVENTION
→ Clean and prepare all substrate according to product recommendations.
→ Use the recommended undercoat for the substrate being finished.
→ Recoat all products within their recommended minimum and maximum recoat time.
→ Apply a sufficient number of coats to obtain the recommended film thickness.
→ Follow paint application procedures using only recommended or compatible products.
**Fisheyes**
(Cratering, Silicone Contamination)

**Description**
→ Small circular, crater-like openings or round depressions that appear during or immediately after the spray application.

**CAUSE**
→ Contamination of surfaces.
  a) Handprints.
  b) Grease, oil or diesel fuel.
  c) Silicone or wax based protective coatings or polishes.
→ Using thinner/reducer in place of a solvent cleaner.
→ Contaminate booth air intake.
→ Insufficiently dried surface contaminated in shop/drying area.

**REPAIR**
→ Remove wet paint film with solvent, clean, then refinish.
→ If fisheyes appear in the first coat, allow the colour to flash then spray a mist coat over affected area.
→ If the paint has dried, sand to a smooth finish below the fisheye cratering and refinish.

**PREVENTION**
→ Thoroughly clean the surface to be painted with detergent and hot water, followed by the recommended solvent cleaner. Then wipe dry with clean rags.
→ Install an air filtering system that removes and prevents oil and moisture contamination.
→ Maintain air supply by draining, cleaning and changing filter on a routine basis.
→ Wear clean protective equipment including latex or nitrile gloves.
Lifting
(Shrivelling, Swelling, Raising, Alligatoring, Wrinkling)

Description
➔ The existing paint film, wrinkles, swells or shrivels during new finish application or drying.

CAUSE
➔ Solvents in a newly applied product attack the previous finish causing wrinkling, raising or puckering of the paint film due to:
   a) Exceeding maximum flash or recoat time during application.
   b) Recoating enamels or urethanes that are not fully cured.

REPAIR
➔ Remove lifted areas and refinish.

PREVENTION
➔ Check questionable finishes by rubbing a small inconspicuous area with a shop towel saturated with thinners. Finishes susceptible to lifting will swell, shrivel or soften as thinners are applied. If any of these reactions occur, the following should be considered.
   a) Do not exceed a product’s maximum recoat time during or after application.
   b) Avoid the use of lacquer products over an air dried enamel finish.
   c) Allow enamels or urethanes to thoroughly cure before recoating or attempting a repair.
   d) Avoid applying undercoats or topcoats excessively wet.
   e) Use water borne undercoats to repair extremely sensitive finishes.
Loss of Gloss
(Hazing, Dulling, Dieback, Matting, Weathering)

CAUSE
- Topcoat applied in heavy, wet coats.
- Inadequate flash time between coats.
- Insufficient film thickness of topcoat colour or clearcoat.
- Insufficient drying/curing of undercoats before applying topcoats.
- Using a poor grade and/or too fast evaporating thinner/reducer for spray conditions.
- Improper cleaning of the substrate.
- Insufficient air movement during and after application.
- Spraying over a deteriorated or solvent sensitive substrate finish without proper priming or sealing procedures.
- Natural weathering of the finish.

REPAIR
- Allow finish to cure thoroughly, compound or polish to restore gloss.
- Or, sand and refinish.

PREVENTION
- Apply the topcoat according to product label directions using the recommended gun set-up and air-pressure.
- Allow all coatings sufficient flash between coats.
- Apply sufficient number of coats to achieve recommended proper film thickness. Check with a film thickness gauge if possible.
- Allow undercoats to thoroughly dry/cure before top coating.
- Select recommended thinner/reducer based on temperature, humidity, air movement, and size of repair.
- Clean substrate thoroughly before and after sanding.
- For maximum holdout use a premium two pack paint system.

Description
- A dulling of the gloss as the film dries or ages.
**Orange Peel**
(Poor Flow, Texture)

**Description**
→ Dry paint film has a dimpled surface – it looks like the peel of an orange

**CAUSE**
→ Under reduction and/or air pressure too low (causing lack of atomization).
→ Viscosity too high.
→ Wrong thinner/reducer and/or quantity incorrect – not enough.
→ Primer or sealer applied not smooth.
→ Incorrect spray technique:
  • Holding gun too far from surface.
  • Wide fan patterns.
→ Improper spray gun set-up.
→ Thinner/reducer evaporates too fast for spray conditions.
→ Poor quality sanding.
→ Excessive film thickness or piling on of heavy wet coats.

**REPAIR**
→ Sand smooth.
→ Repaint topcoat.

**PREVENTION**
→ Proper surface preparation: carefully sand smooth.
→ Select recommended thinner/reducer based on temperature, humidity, air movement, and size of repair.
→ Check viscosity of products.
→ Adjust gun set up:
  • Use smaller size fluid tip.
  • Use air cap that increases paint atomization.
→ Use recommended solvent.
→ Avoid heavy coats and excessive film thickness.
→ Use recommended spray gun, fluid tip and air cap for the material being used.
→ During paint application, hold the gun perpendicular and parallel to the surface. Adjust speed of pass, pattern overlap, and distance from the panel to achieve the desired appearance.
Runs or Sags  
(Hangers, Curtains, Signatures)

Description
→ Coatings that fail to adhere uniformly, causing beads, droplets, or slippage of the total film.
→ Usually occurs on vertical surfaces. A heavy paint film collects and moves downward, setting in ripples.

CAUSE
→ Incorrect solvent for conditions.
→ Wrong amount of thinner/reducer used – too much.
→ Applying paint materials without proper flash time between coats.
→ Applying excessive wet coats due to:
   • Holding gun too close to surface.
   • Slow gun speed.
   • Double coating.
→ Air pressure too low during spray application.
→ Improper equipment set-up.
→ Material and/or substrate temperature too low.
→ Insufficient lighting in the spray booth.

REPAIR
→ Remove the wet paint film with solvent, clean and refinish.
→ Or, after finish is completely dry. Remove excess paint by block sanding with 1200 to 2000 sanding discs, compound and polish to restore gloss.

PREVENTION
→ Maintain a suitable, consistent shop temperature and airflow.
→ Mix according to product directions. Select recommended solvent for spray conditions based on temperature, humidity, air movement, size of repair. Fast solvents for cold conditions.
→ Allow the paint material and substrate to reach room temperature before application.
→ Provide good lighting for spraying.
→ Use recommended spray gun.
→ Use proper gun settings and air pressure
   • Smaller size fluid tip.
   • Increase gun air pressure/increase atomization.
   • Decrease pot pressure.
→ Allow sufficient flash-off and drying time between coats.
**Shrinkage** (Bulleyes, Ringing, Edge Mapping)

**Description**

→ The repaired area, featheredge, or sand scratches become visible within hours, days or weeks after the repair is completed.

**CAUSE**

→ Top coating before undercoats have completely dried/cured.

→ Finishing over body filler that has not thoroughly cured.

→ Undercoats applied excessively wet with inadequate flash time between coats.

→ Using a poor grade and/or too fast evaporating thinner/reducer for spray conditions.

→ Using too strong solvent cleaner or using thinner/reducer as a surface cleaner.

**REPAIR**

→ Let the affected area totally dry/cure, sand and refinish.

→ If additional filling is necessary, apply a primer, sand smooth and refinish.

**PREVENTION**

→ Allow undercoats to completely dry/cure before sanding and/or top coating.

→ Thin or reduce undercoats according to product label directions. Apply in thin wet coats allowing adequate flash time between coats to avoid “bridging” scratches.

→ Choose recommended thinner/reducer based on temperature, humidity, air movement, and size of repair.

→ Follow body filler manufacturer’s recommended cure time.
Soft Film
(Slow Dry)

Description
→ The paint film is soft to the touch, and will fingerprint or waterspot within hours/days after application.

CAUSE
→ Applying undercoat and/or topcoat excessively wet.
→ Unsuitable shop ventilation or heating.
→ Inadequate dry time between coats.
→ Adding too much or too little hardener to the paint material.
→ Using the improper thinner/reducer for spray conditions.
→ Omission of drier in enamel/urethane topcoats.

REPAIR
→ Allow additional drying time.
→ Or, force dry following temperature and time recommendations.
→ Or, remove soft paint film and refinish.

PREVENTION
→ Allow adequate flash time between coats.
→ Use recommended spray gun, fluid tip and air cap for the material being sprayed. Always adjust the gun for best atomization and balance spray pattern before paint application.
→ Use the recommended hardener and measure accurately.
→ Choose appropriate thinner/reducer based on temperature, humidity, air movement, and size of repair. Allow additional flash time when spraying in high temperature/high humidity or low temperature/high humidity conditions.
Slow Drying

Description
→ Coating does not cure within the usual time frame.

CAUSE
→ Wrong amount of "B" component used – too little or too much.
→ Poor drying conditions: drying area too cool.
→ Inadequate flash-off time between coats.
→ Solvent too slow.
→ Incorrect spray technique: application too heavy.

REPAIR
→ Drying area should be well ventilated and warm.
→ Drying may be accelerated by increasing booth temperature after spraying.

PREVENTION
→ Use correct amount of Component "B".
→ Go by film thickness recommendations.
→ Use recommended thinner.
→ Use catalyst as recommended.
→ Use a faster solvent system.
→ Allow sufficient flash-off time.
→ Increase booth temperature after an adequate flash-off period.
Solvent Popping
(Boiling, Blowing, Gassing)

**CAUSE**
- Liquid solvent (thinners/reducers) becomes “trapped” in the paint film when the surface layer skins over too quickly, preventing their evaporation into the atmosphere. Solvents that vaporize within the paint film leave bubbles, pinholes or craters as they push through and “pop” the surface. Solvents can be trapped due to:
  - Thinner/reducer evaporating too fast for spraying conditions;
  - Inadequate flash time between coats;
  - Too much air movement causing surface to “skin over” before solvents evaporate;
  - Excessive film thickness or “piling on” of heavy/wet coats;
  - Excessive purge/flash time before force drying.

**REPAIR**
- Minor problem: Allow finish to thoroughly dry/cure, sand smooth and refinish. Inspect surface carefully to ensure all craters have been removed.
- Major problem: Remove affected film. Prime, seal and recoat, as necessary.

**PREVENTION**
- Select recommended thinner/reducer based on temperature, humidity, air movement and size of repair.
- Ensure polyester type fillers are fully cured before priming.
- Completely seal porous substrates.
- Avoid “piling on” or double wet coats.
- Don’t extend purge/flash time before force drying.
- Allow for proper flash time between coats.
- Restrict air movement over the surface being painted.

**Description**
- Tiny open blisters or bumps that appear in the paint film very shortly after application.
- Usually occurring on horizontal surfaces.

**Note:** Fine dust particles that fall on a tacky surface can be encapsulated by the wet film, creating an appearance almost identical to solvent pop. This “solvent pop” appearance usually occurs on items that are removed from the booth in a somewhat tacky condition and placed in another location to dry. Fine dust contamination can be removed by sanding and polishing. However, if the condition is solvent pop, the finish will contain pinholes or small craters after being sanded.
Transparency
(Poor Hiding, Poor Coverage, Translucent)

Description
→ The original finish or undercoat is visible through the topcoat

CAUSE
→ Colour not thoroughly stirred/agitated.
→ Substrate not uniform in colour.
→ Colour over-thinned/reduced.
→ Insufficient number of colour coats applied.
→ Wrong colour undercoat used.

REPAIR
→ Apply additional coats of colour until hiding is achieved.
→ Or, sand and apply similar coloured undercoat/primer and refinish.

PREVENTION
→ Stir or shake paint material thoroughly, making sure all pigment is in solution/suspension.
→ Thin/reduce according to product label directions.
→ Use a sealer or ground coat to provide a uniform colour before top coating.
→ Use an undercoat that is similar in colour to the topcoat.
→ Spray until hiding is achieved.
Water Spotting
(Poor Hiding, Poor Coverage, Translucent)

Description
→ Circles with raised edges or whitish spots resembling the various shapes of water droplets appear on the surface of the paint film. Patchy areas may be: slightly indented; dull, not glossy; cloudy, whitish.

CAUSE
→ Coating exposed to moisture in the first 24 hours after painting.
→ Allowing water to contact a finish before it is cured.
→ Washing finish in direct sunlight.

REPAIR
→ Minor problem – polish.
→ Major problem – sand smooth, repaint.

PREVENTION
→ Follow recommended cure times before washing or exposing to rain.
→ Increase spray booth temperature.
→ Use two pack paint system.
Wrinkling

Description
→ The film surface skins over and then swells, forming irregular ridges and creases.
→ The film surface appears thick and leathery, and resembles the skin of a prune.

CAUSE
→ Solvent sensitive enamel under topcoat or primer.
→ Wrong amount of “B” component used – too little.
→ Incorrect spray technique: Application of topcoat too heavy.
→ Primer or sealer not cured thoroughly.
→ Placing a newly painted finish in hot sun too soon after spraying.
→ Excessive film thickness or “piling on” of heavy wet coats.
→ Spraying in extreme hot, humid weather conditions.
→ Air pressure too low during spray application.

REPAIR
→ If defects are minor; sand the top surface smooth, allow to cure and refinish.
→ If defects are severe; Remove finish, apply primer/sealer and repaint.

PREVENTION
→ Check solvent sensitivity – perform a solvent rub test on existing finishers.
→ Use primer/sealers where appropriate.
→ Use correct amount of Component “B”. Follow force dry temperatures and time recommendations.
→ Avoid excessive film thickness and heavy coats. Allow sufficient flash-off times between coats.
→ Keep newly painted finish away from direct sunlight until finish has dried/cured.
→ Use the proper thinner reduction ratio and spray at recommended air pressure.