

**TROUBLESHOOTING
REFINISH
PROBLEMS**

**Cause, Repair &
Prevention**

PROBLEM INDEX

PROBLEM

ALTERNATE TERM

1. Air Entrapment	Craters
2. Bleeding	Discoloration
3. Blistering	Pimples, Bubbles, Bumps
4. Blushing	Milkiness
5. Chalking	Fading, Oxidation, Weathering
6. Chemical Staining/Etching	Acid Rain, Spotting, Discoloration
7. Chipping	Nicks, Stone Pecks, Chips, Bruises
8. Color Mismatch	Off Color, Off Shade
9. Cracking	Checking, Crazing, Splitting, Alligatoring, Crowsfeet
10. Dust Contamination	Dirt in Finish
11. Edge Mapping	Edge Ringing, Featheredge Lifting
12. Fisheyes	Silicon Contamination, Cratering
13. Lifting	Shriving, Swelling, Raising Alligatoring, Wrinkling
14. Loss of Gloss	Hazing Dulling, Dieback, Matting, Weathering
15. Mottling	Streaking, Tiger/Zebra Stripes, Floating, Flooding
16. Orange Peel	Poor Flow, Texture
17. Peeling	Delamination, Flaking
18. Pinholing in Body Filler	Bubbles, Air Pockets
19. Rail Dust	
20. Runs/Sags	Hangers, Curtains, Signatures
21. Sanding Marks	Streaked Finish, Sandscratches
22. Sandscratches	Swelling, Sinking, Shrinkage
23. Seediness	Gritty, Dirty, Grainy, Speckled
24. Shrinkage	Bulleyes, Ringing, Edge Mapping
25. Soft Film	Slow Dry
26. Solvent Popping	Boiling, Blowing, Gassing
27. Staining/Plastic Bleed Through	Discoloration
28. Tape Tracking	Tracks
29. Transparency	Poor Hiding, Poor Coverage, Translucent
30. Water Spotting	Water Marking
31. Wrinkling	Crinkling, Puckering, Shriving

AIR ENTRAPMENT

(Craters)

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:

- (A) Spray gun travel too slow
- (B) Spray gun distance too close
- (C) Air pressure too low
- (D) Improper spray gun setup

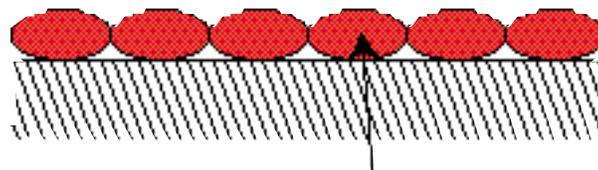
REPAIR

- (1) Sand with 1200 or finer grit sand paper, then compound and polish to restore gloss.
- (2) Or, sand smooth and refinish.

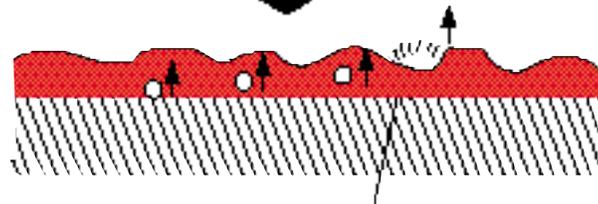
PREVENTION

- (A) Maintain correct spray gun speed.
- (B) Maintain correct spray gun distance.
- (C) Use the recommended air pressure.
- (D) 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 center of the crater.



“Large” wet droplets



Air rises from film leaving a small crater

BLEEDING

(Discoloration)

A Red or Yellow discoloration in the topcoat color.

CAUSE

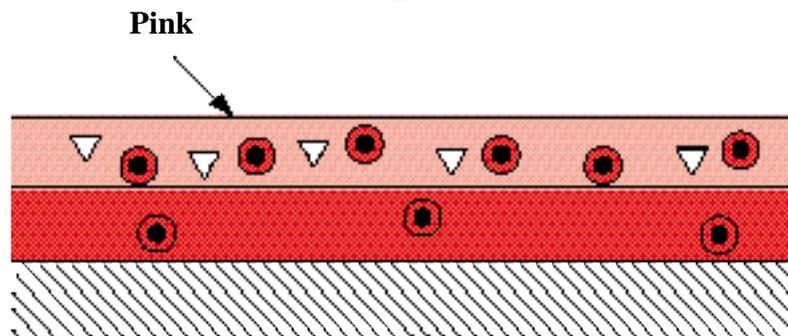
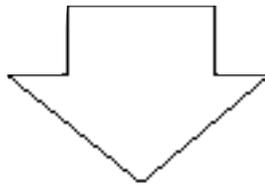
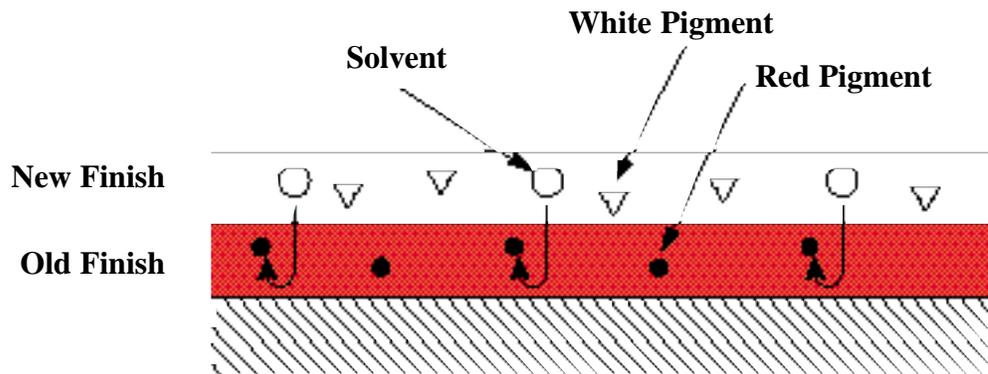
- (A) Solvent in the new topcoat dissolves soluble dyes or pigments in the original finish, allowing them to seep into and discolor the new topcoat.

REPAIR

- (1) Allow color to cure, isolate with two component undercoat(s) and refinish.
- (2) Or, remove original paint film and refinish.

PREVENTION

- (A) Isolate suspected bleeding finish by applying a two component surfacer and/or sealer. Allow to cure following product recommendations, then apply desired topcoat.



Old pigment dissolves into new finish.

BLISTERING

(Pimples, Bubbles, Bumps)

Swelled areas appearing as pimples or bubbles in the topcoat film, often months after application.

CAUSE

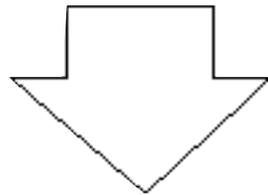
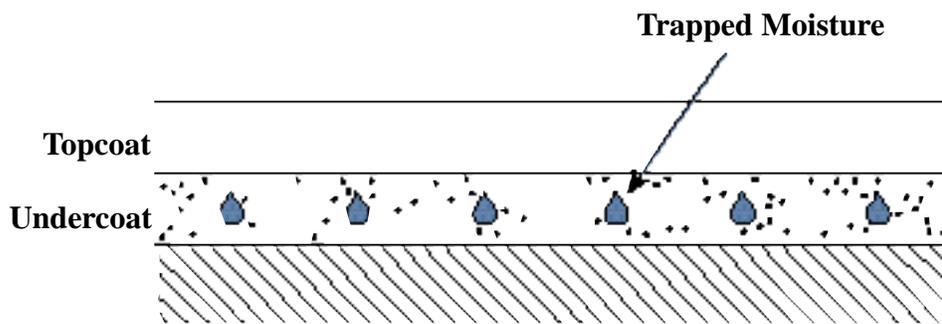
- (A) Moisture trapped beneath the paint film due to:
 - 1) Improper dry time after wet sanding;
 - 2) Contaminated air lines;
 - 3) Spraying in extreme high humidity conditions.
- (B) Using a poor grade and/or too fast evaporating thinner/reducer for spray conditions.
- (C) Trapped solvents from applying wet heavy coats with insufficient flash time between coats.
- (D) Improper dry time of undercoats before topcoating.
- (E) Painting over grease, oil or rust.

REPAIR

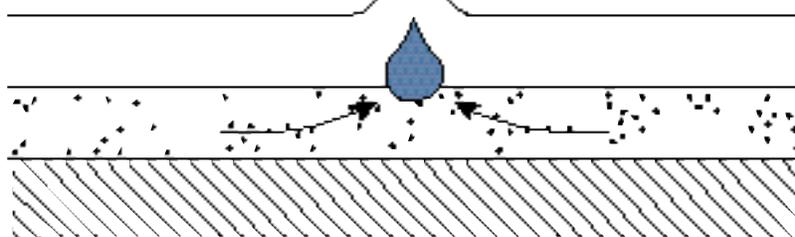
- (1) Remove affected area and refinish.
- (2) Extreme cases must be stripped to bare substrate before refinishing.

PREVENTION

- (A) If wet sanding is preferred, allow sufficient time for moisture to evaporate. *Avoid wet sanding lacquer type primer surfacer when possible. Drain moisture from compressor and air lines regularly. Allow additional flash time between coats and/or add retarder when spraying in humid conditions, or spray at times of low humidity when possible.*
- (B) Select proper thinner/reducer for spray conditions.
- (C) Apply materials according to product recommendations, allowing sufficient flash time between coats.
- (D) Allow undercoats to thoroughly dry/cure before topcoating.
- (E) Clean and prep substrate using recommended products and procedures.



Moisture accumulates and expands, pushing up paint film.



BLUSHING

(Milkiess)

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

CAUSE

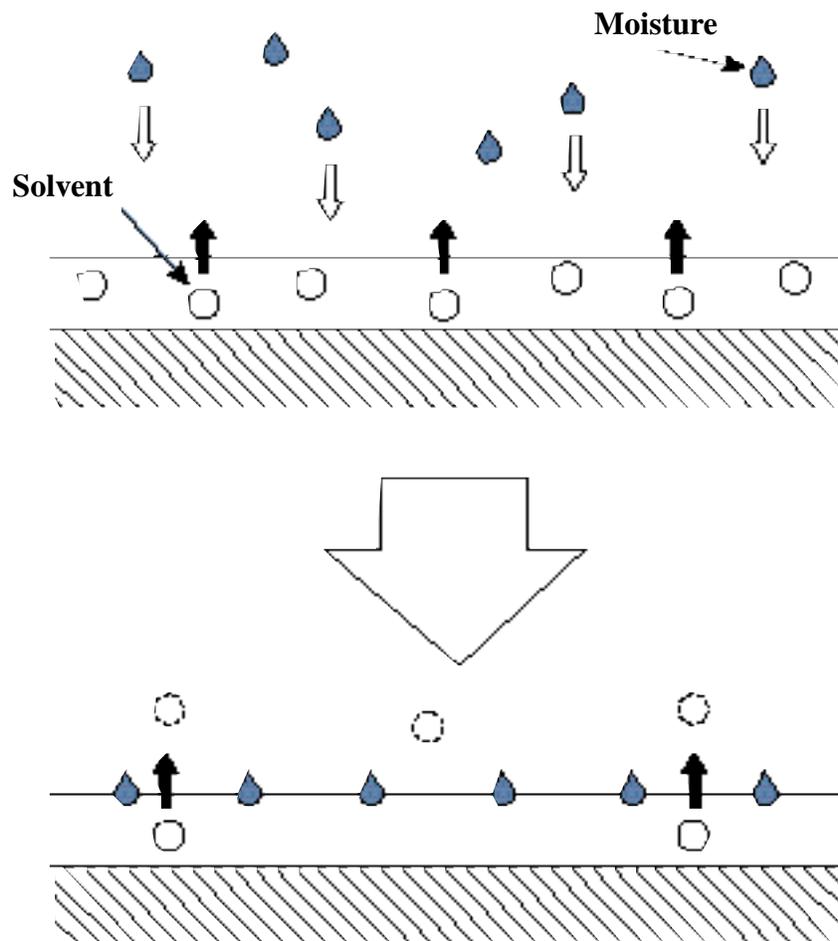
- (A) When spraying during humid conditions, air from the spray gun and solvent evaporation lowers the substrate temperature below the dew point, causing moisture in the air to condense in or on the paint film. The condition is aggravated when too fast drying or unbalanced thinner/reducer is used.

REPAIR

- (1) Should blushing occur during application: (a) apply heat to the affected area, or (b) add retarder and apply additional coats.
- (2) If the finish has dried, minor blushing may be corrected by compounding or polishing, however, severe blushing will require sanding and refinishing.

PREVENTION

- (A) Always use good quality solvent and thin/reduce material according to label directions.
- (B) Select proper thinner/reducer for spray condition.
- (C) Add the recommended amount of retarder when spraying in humid conditions.
- (D) Apply heat after application to evaporate moisture.



As thinner evaporates, moisture in the air condenses in the paint film.

CHALKING

(Fading, Oxidation, Weathering)

A chalky white appearance on the surface of the paint film

CAUSE

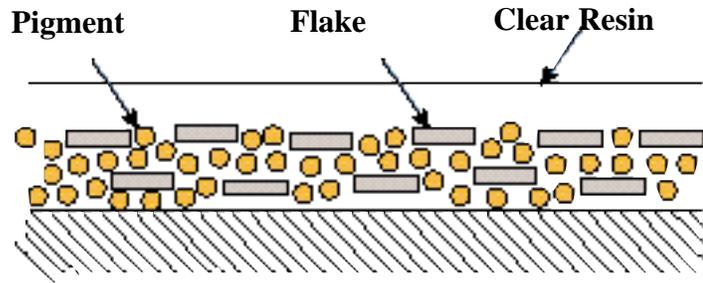
- (A) Pigment is no longer held and protected by resin, resulting in a powder-like surface and lack of gloss due to:
 - (1) Natural weathering of the paint film;
 - (2) Improper application of paint material;
 - (3) Using generic thinner/reducer and/or hardener in the paint material;
 - (4) Excessive use of mist/fog coats when applying single stage metallic finishes.

REPAIR

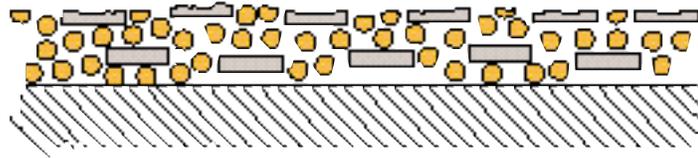
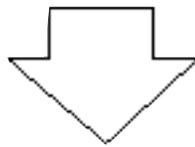
- (1) Compound to remove oxidation and polish to restore gloss.
- (2) Or, sand to remove "weathered" paint film and refinish.

PREVENTION

- (A) Weekly washing and occasional polishing or waxing will remove oxidation from the finish.
- (B) Thoroughly stir, shake or agitate all paint materials.
- (C) Use the recommended thinner/reducer, hardener, and measure accurately.
- (D) When spraying single stage metallic finishes, apply mist/fog coats panel by panel while finish is still wet.



Pigment and Flake protected by clear resin.



When clear resin wears away, pigment and flake are exposed to the environment and deteriorate rapidly.

CHEMICAL STAINING/ETCHING

(Spotting, Acid Rain, Discoloration)

Irregular shaped pitting, etching or discoloration on the paint film.

CAUSE

A chemical change occurs when harmful environmental contaminants, such as acid rain, tree sap, bird droppings, road tar, etc. remain on the surface for an extended period of time.

REPAIR

- (1) Wash the vehicle with soap and hot water, rinse and dry.
- (2) Solvent clean with appropriate surface cleaner.
- (3) Wash with baking soda solution and rinse thoroughly. (One tablespoon baking soda per one quart water.)
- (4) Compound damaged surface and polish to restore gloss.
- (5) If polishing does not remove the damage, wet sand with 1500-2000 grit sandpaper, then compound and polish to restore gloss.*
- (6) If refinishing is necessary, sand to remove damaged area with appropriate grit sandpaper, wash with a baking soda solution, then refinish. In severe cases, the finish must be removed to bare metal.

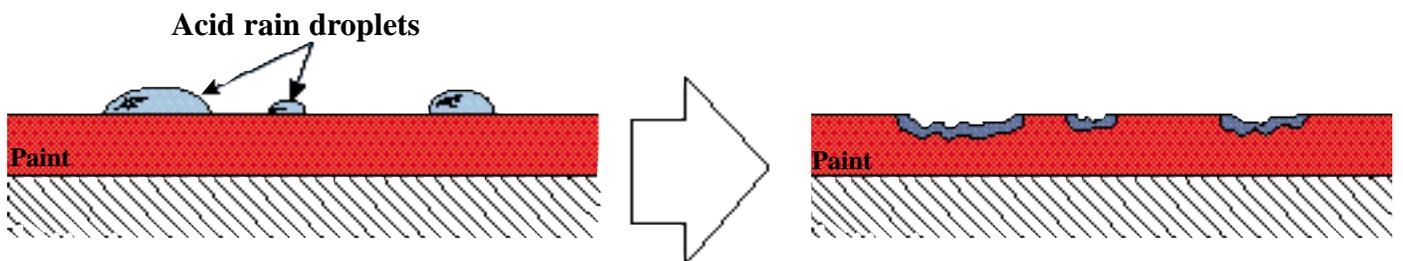
PREVENTION

- (A) Remove harmful water soluble contaminants by regularly washing with detergent and clear water.
- (B) Polish or wax periodically.
- (C) Avoid parking under trees or near factories that produce chemical fallout.
- (D) Refinish with an acrylic urethane basecoat/clearcoat system to provide the maximum protection.

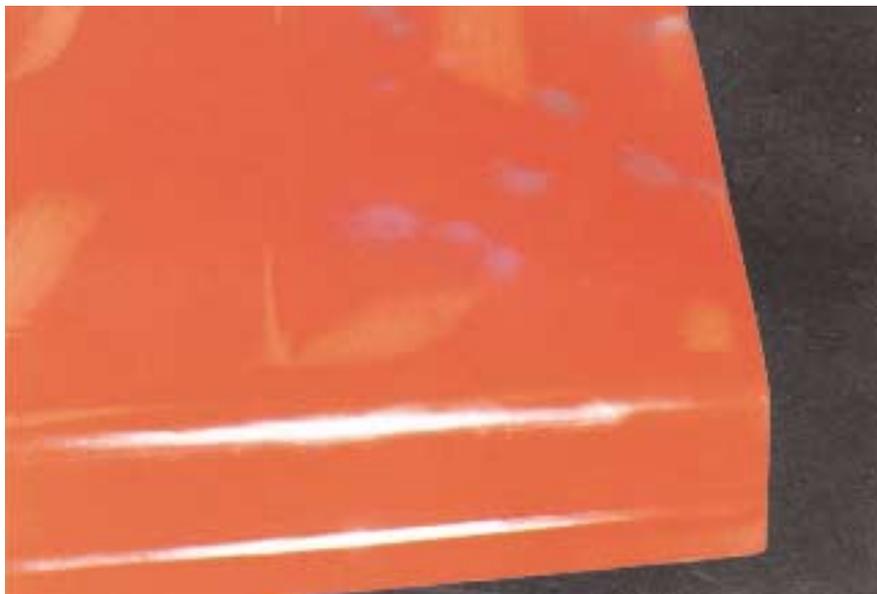
**** When sanding and buffing a basecoat/clearcoat finish, a minimum film thickness of the clearcoat (2 mils) is required to maintain adequate ultraviolet protection. If correcting the damage will result in removing more than .5 mils, refinishing is recommended.***



Chemical Staining



Damage caused by acid rain.



CHIPPING

(Nicks, Stone Pecks, Chips, Bruises)

Small areas of damage to the paint film leaving a nick, notch or void in the finish.

CAUSE

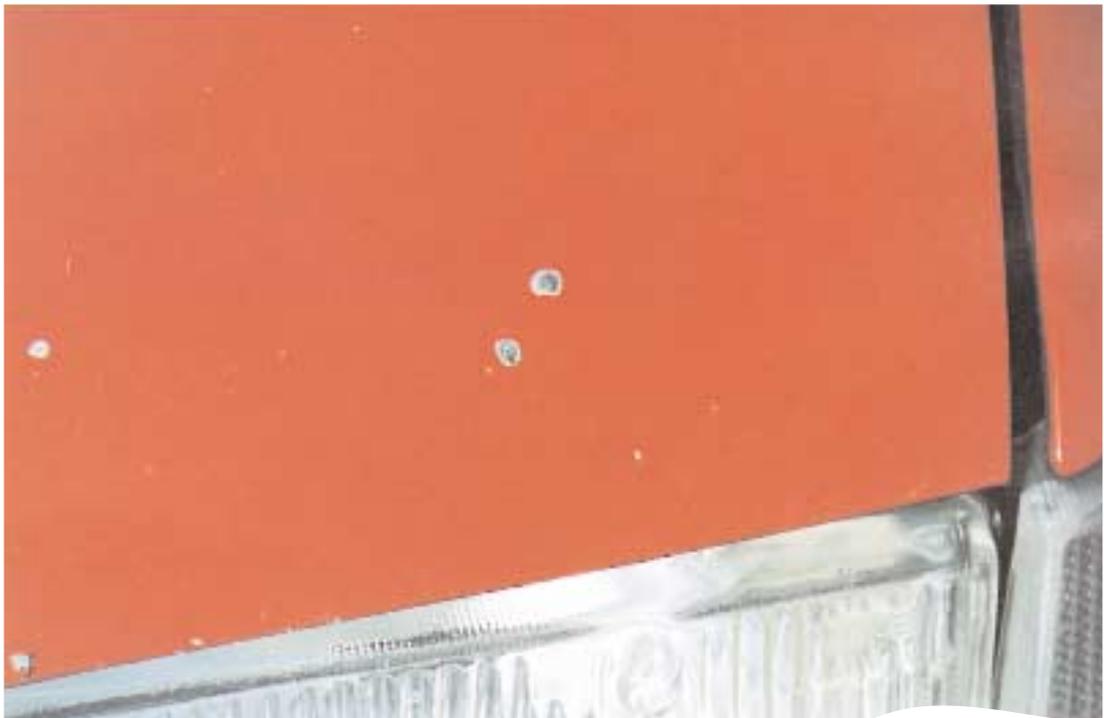
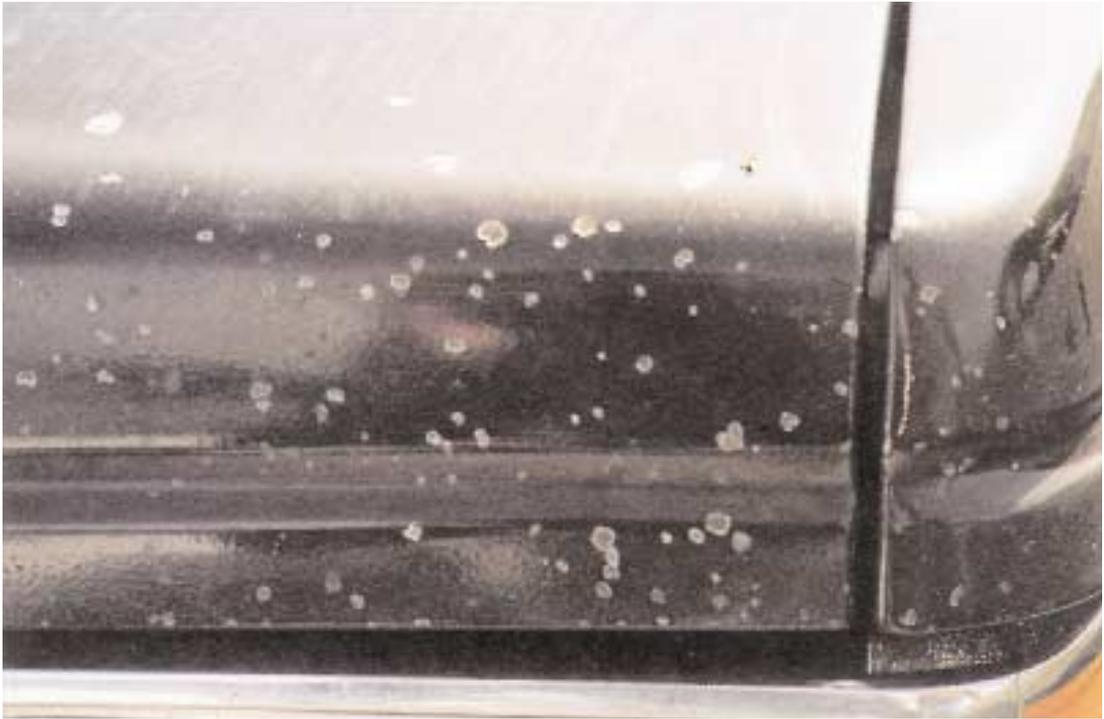
- (A) Loss of adhesion of the paint film to the substrate caused by an impact from stones or other hard objects.

REPAIR

- (1) Sand and featheredge damaged areas to remove chips, then refinish.

PREVENTION

- (A) Use premium two component undercoat and topcoat system.
- (B) Use a flex agent in undercoat and/or topcoat system in areas that are prone to chipping.



COLOR MISMATCH

(Off Shade, Off Color)

The original finish and repair exhibit a noticeable difference in color when viewed under the same lighting conditions.

CAUSE

- (A) Original finish has "drifted" from manufacturer's standard.
- (B) Old finish weathered and oxidized.
- (C) Color over or under reduced.
- (D) Improper spray procedures.
- (E) Color not properly stirred or shaken.
- (F) Improper spray gun set up.
- (G) Inaccurate mixing of the color formula.
- (H) "Panel" painting instead of blending.
- (I) Evaluating color under a light source other than "color corrected" lighting or natural light.
- (J) Adjusting a color before it has been sprayed, or adjusting a basecoat before applying clearcoat.

REPAIR

- (1) If color is close enough to blend: (1) prepare adjacent panel(s) for blending, then (2) blend color into adjacent panels.
- (2) If color must be tinted: (1) tint the color for a blendable match, (2) prepare adjacent panel(s) for blending, then (3) respray the repair, blending into the adjacent panel(s).

PREVENTION

- (A) Check alternate color selector for variances. Choose the alternate that provides a blendable match.
- (B) All color must be viewed under equal gloss; compound or polish the area to be matched.
- (C) Thin/reduce according to label direction.
- (D) Follow label directions for proper application of color coat.
- (E) Stir or shake materials thoroughly to be sure all pigments and metallics are in solution and suspension.
- (F) Refer to product label or data sheet for spray gun, fluid nozzle, and air cap recommendations.
- (G) Recheck color code, formula number, formula weights before mixing colors.
- (H) Spray a test panel prior to application to determine if blending or tinting is necessary.
- (I) Always use natural daylight or color corrected lights to make color matching decisions.
- (J) All color must be sprayed out for an accurate evaluation. Basecoats must have clearcoat applied. Check color from all angles, face (90 degrees) and side tone (20-60 degrees).



CRACKING

(Checking, Crazing, Spitting, Alligating, Crowsfeet)

Cracks or lines of various lengths and widths in the topcoat finish often resembling the cracking of dried mud.

CAUSE

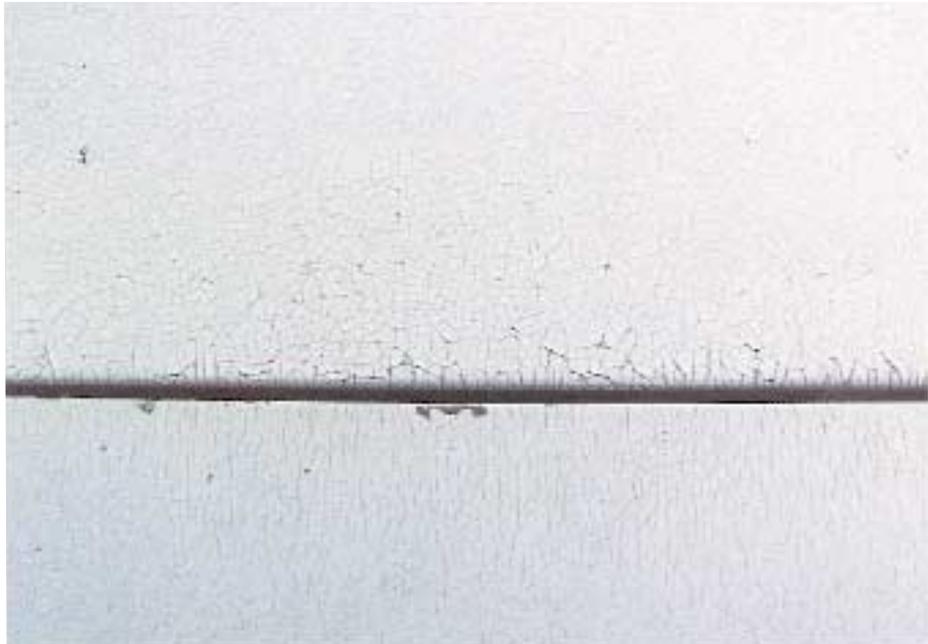
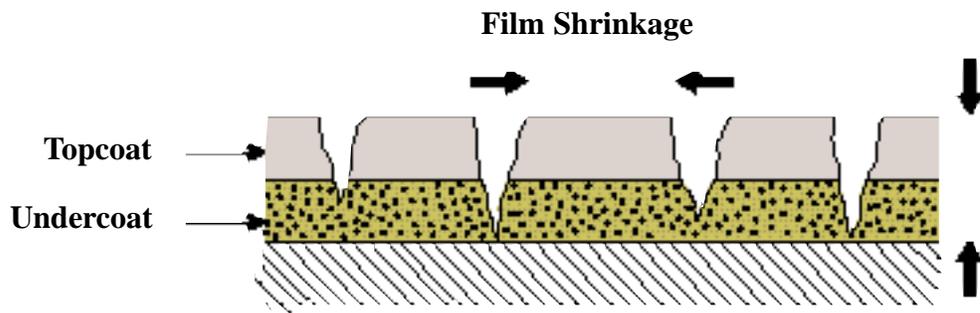
- (A) Excessive film thickness of the undercoat and/or topcoat.
- (B) Refinishing over a previously crazed/cracked surface.
- (C) Insufficient flash time between coats and/or force drying undercoats using air from the spray gun.
- (D) Mixing incorrectly or using too much hardener.
- (E) Paint ingredients not thoroughly stirred or agitated.
- (F) Breakdown of finish due to prolonged exposure to sunlight, moisture, and extreme temperature changes.
- (G) Using generic reducers and/or hardeners.

REPAIR

- (1) Remove all cracked paint film and refinish..

PREVENTION

- (A) Apply all materials following label direction.
- (B) Completely remove crazed/cracked finishes before refinishing.
- (C) Do not force dry undercoats by fanning with spray gun air.
- (D) Mix ingredients thoroughly using the recommended additives. Add each component in proper sequence following the recommended mixing ratio.
- (E) Stir or agitate materials thoroughly before use to ensure all ingredients are in solution.
- (F) Use premium two component undercoat and topcoat system to provide maximum gloss and durability.
- (G) Use the recommended thinner/reducer and hardener, and then measure accurately.



DUST CONTAMINATION

(Dirt in finish)

Foreign particles embedded in paint film.

CAUSE

- (A) Inadequate cleaning of the surface to be painted.
- (B) Dirty spraying environment.
- (C) Inadequate air filtration or unfiltered air entering the booth.
- (D) Dirty or unsuitable work clothes that contain dust, lint, or fibers.
- (E) Particles from deteriorated air supply lines.
- (F) Using a poor grade masking paper.
- (G) Dirty spray gun.
- (H) Removing the vehicle from the spray booth before the finish is "dust free".

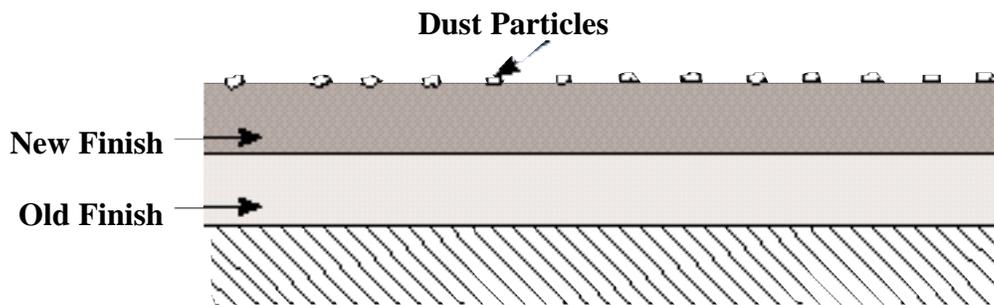
REPAIR

- (1) Sand with 1200 or finer grit sandpaper, then compound and polish to restore gloss.
- (2) Or, sand smooth and refinish.

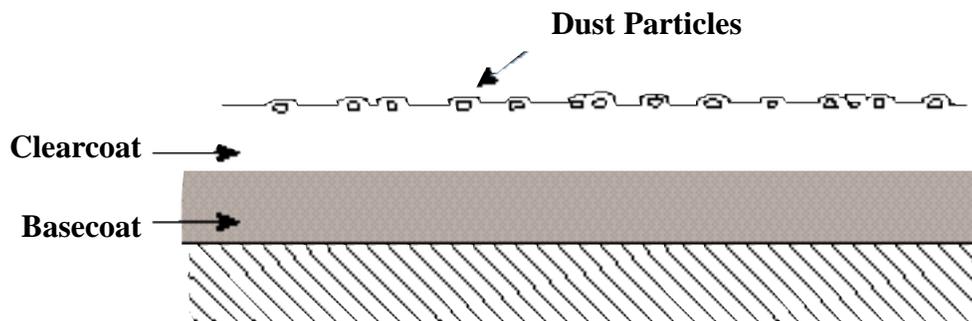
PREVENTION

- (A) Thoroughly blow off around windows, doors, jambs, hood, trunk, moldings, engine compartment, and wheel openings. Wipe the surface to be painted and the masking paper with the tack rag.
- (B) Maintain a clean working area.
- (C) Install proper air filters. *Never use residential-type furnace filters in the spray booth.* Repair any leakage found in the spray booth due to poor fitting doors, gaskets, seams or filters.
- (D) Wear a lint free paint suit during the spray application.
- (E) Use quality masking materials. *"Wicks" found on newspaper can break away and blow into the wet paint.*
- (F) Repair or replace defective air lines.
- (G) Properly clean and maintain spray equipment.
- (H) Vehicle should be kept in a clean environment until finish is "dust free"

NOTE: Fine dust particles that fall on a tacky surface can be encapsulated by the finish, creating an appearance almost identical to solvent pop. This "solvent pop" appearance usually occurs on vehicles that are removed from the booth in a 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 sanding.



1 Dust particles adhere to a wet or tacky finish.



2 Dust particles become encapsulated by a wet or tacky clearcoat.

EDGE MAPPING

(Edge Ringing, Featheredge Lifting)

Raised or lifted edges in the wet or dry paint film that outline sand throughs or featheredges.

CAUSE

- (A) Solvent from the new topcoat penetrates a solvent sensitive substrate causing a lifting or wrinkling that outlines the featheredge.

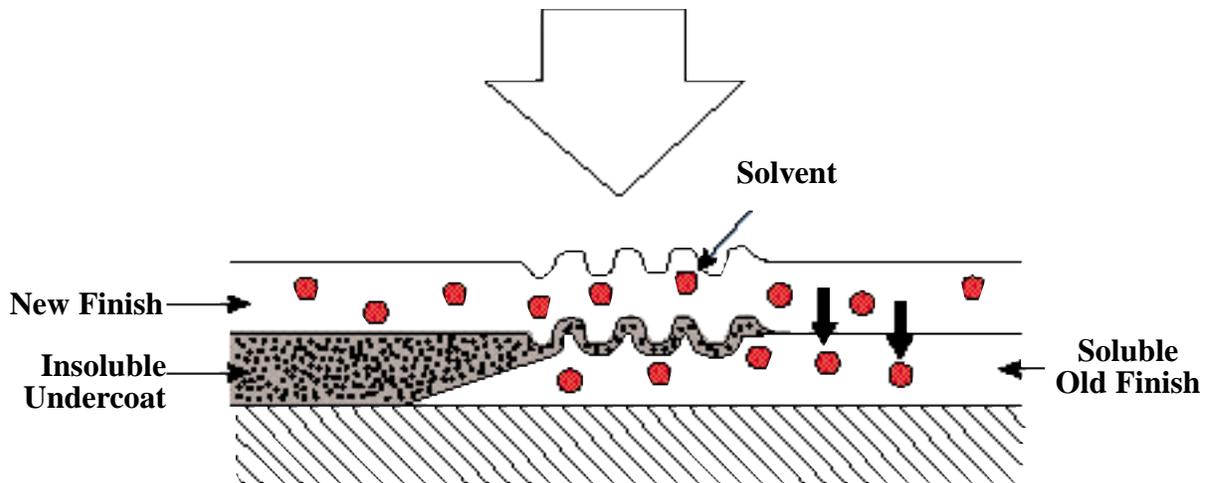
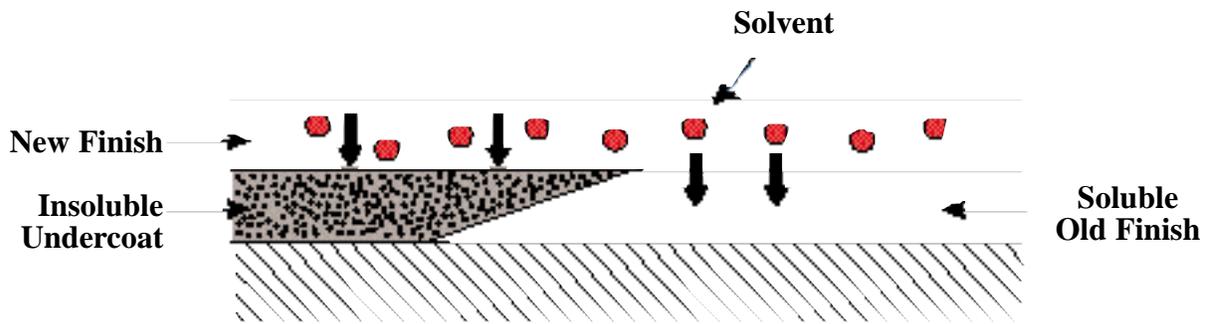
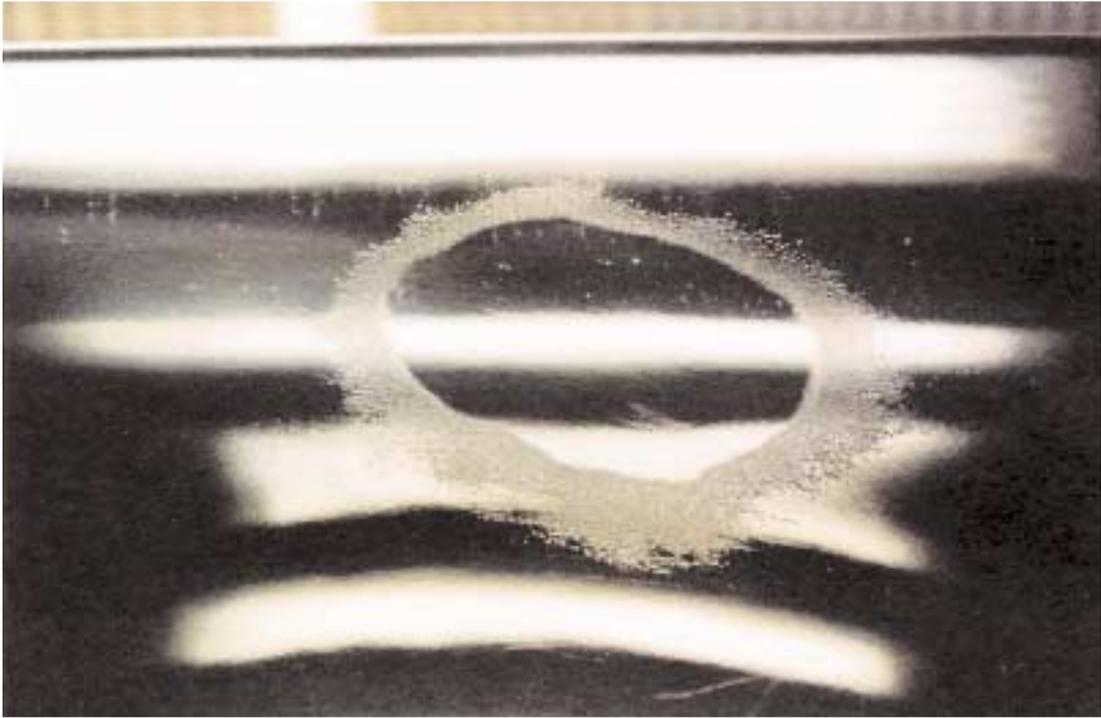
REPAIR

- (1) Sand smooth or remove the affected area. (*Final sand with 400 or finer grit sandpaper.*)
- (2) Isolate affected area with two component primer surfacer and refinish.
- (3) Or, apply water borne primer surfacer, sand smooth and refinish.
- (4) Or, apply acrylic lacquer primer surfacer thinned with non-penetrating thinner, sand smooth and refinish.

PREVENTION

Check questionable finishes by rubbing a small inconspicuous area with a shop towel saturated with lacquer thinner. Finishes susceptible to lifting will soften, wrinkle or shrivel as lacquer thinner is applied. If any of these reactions occur, the following recommendations should be considered.

- (A) Use acrylic urethane primer surfacer, water borne primer surfacer, or an acrylic lacquer primer surfacer thinned with non-penetrating thinner over sensitive substrates.
- (B) Use 400 or finer grit sandpaper when featheredging.
- (C) Avoid sanding through insoluble topcoat color or clear, exposing solvent sensitive or soluble finishes.



Edge lifting caused by swelling of a soluble finish underneath an insoluble undercoat.

FISHEYES

(Silicone Contamination, Cratering)

Small circular, crater-like openings that appear during or shortly after the spray application.

CAUSE

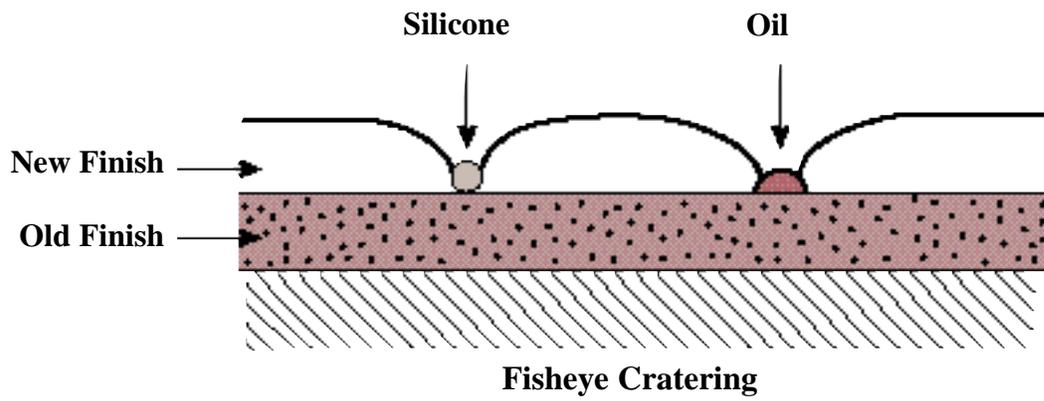
- (A) Spraying over surfaces contaminated with oil, wax, silicone, grease, etc.
- (B) Use of thinner/reducer in place of a solvent cleaner.
- (C) Spraying over previously repaired areas containing "fisheye eliminator" additive.

REPAIR

- (1) Remove wet paint film with solvent, clean and refinish.
- (2) Add the recommended fisheye eliminator and respray the affected area.
- (3) If fisheyes appear in a basecoat, allow the color to flash then spray a mist coat over affected area. Do not use fisheye eliminator in undercoats or basecoat color.
- (4) If the paint has dried, sand to a smooth finish below the fisheye cratering and refinish.

PREVENTION

- (A) Thoroughly clean the surface to be painted with detergent and hot water, followed by the recommended solvent cleaner. Wipe dry with clean rags.
- (B) Use fisheye eliminator that is specifically recommended for the topcoat.
- (C) Install an air filtering system that removes and prevents oil and moisture contamination.
- (D) Maintain air supply by draining, cleaning and changing filter(s) on a routine basis.



LIFTING

(Wrinkling, Raising, Alligatoring, Shriveling, Swelling)

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

CAUSE

- (A) Solvents in a newly applied product attack the previous finish causing wrinkling, raising, or puckering of the paint film due to:
 - (1) Recoating enamels or urethanes that are not fully cured;
 - (2) Exceeding maximum flash or recoat times during application;
 - (3) Recoating a basecoat/clearcoat finish, where existing clearcoat has insufficient film build.

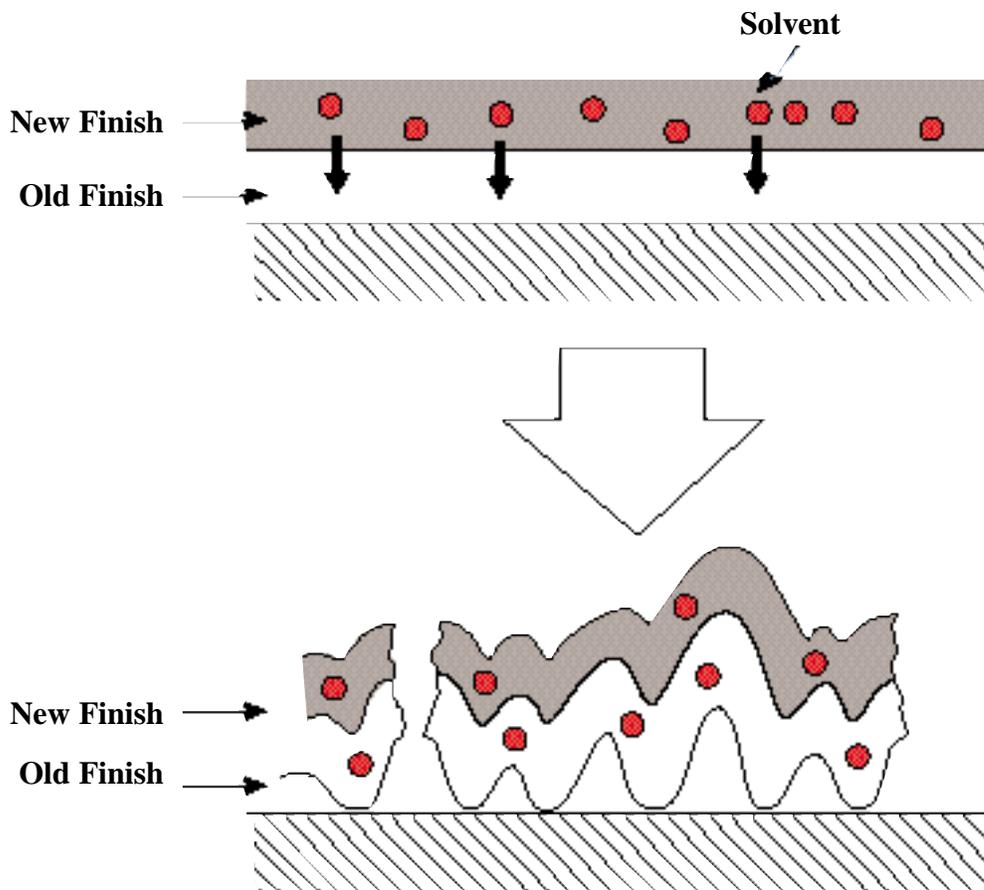
REPAIR

- (1) Remove lifted areas and refinish.

PREVENTION

Check questionable finishes by rubbing a small inconspicuous area with a shop towel saturated with lacquer thinner. Finishes susceptible to lifting will soften, swell or shrivel as lacquer thinner is applied. If any of these reactions occur, the following recommendations should be considered.

- (A) Do not exceed a product's maximum recoat time during or after application.
- (B) Allow enamels or urethanes to thoroughly cure before recoating or attempting a repair.
- (C) Avoid applying undercoats or topcoats excessively wet.
- (D) Avoid the use of lacquer products over an air dried enamel finish.
- (E) When insoluble material (enamel/urethane) has been applied over a soluble material (lacquer): (1) avoid sanding through and exposing areas of the soluble material. (2) apply two component primer surfacer and/or sealer as a barrier between the new and the old finish. *When applying two component undercoats over soluble finishes, the complete panel must be coated.*
- (F) Use water borne undercoats to repair extremely sensitive finishes.



Solvent penetration causes lifting of improperly cured finishes.

LOSS OF GLOSS

(Hazing, Dulling, Dieback, Matting, Weathering)

A dulling of the gloss as the film dries or ages.

CAUSE

- (A) Topcoat applied in heavy, wet coats.
- (B) Inadequate flash time between coats.
- (C) Insufficient film thickness of topcoat color or clearcoat.
- (D) Insufficient drying/curling of undercoats before applying topcoats.
- (E) Using a poor grade and/or too fast evaporating thinner/reducer for spray conditions.
- (F) Improper cleaning of the substrate.
- (G) Insufficient air movement during and after application.
- (H) Spraying over a deteriorated or solvent sensitive substrate finish without proper priming or sealing procedures.
- (I) Natural weathering of the finish.

REPAIR

- (1) *Allow finish to cure thoroughly*, compound or polish to restore gloss.
- (2) Or, sand and refinish.

PREVENTION

- (A) Apply the topcoat according to product label directions using the recommended gun set-up and air pressure.
- (B) Allow all coatings sufficient flash between coats.
- (C) Apply sufficient number of coats to achieve recommended proper film thickness.
Check with film thickness gauge if possible.
- (D) Allow undercoats to thoroughly dry/cure before topcoating.
- (E) Select recommended thinner/reducer based on temperature, humidity, air movement, and size of repair.
- (F) Clean substrate thoroughly before and after sanding.
- (G) For air dry situations: (1) allow exhaust fan to run 40 minutes or longer after spraying; (2) open booth doors after finish is dust free; and (3) maintain a shop temperature of 60 degrees fahrenheit or above, especially when drying overnight.
- (H) For maximum holdout, use a premium two component undercoat system.
- (I) Properly wash and care for the finish on a regular basis.
- (J) Using premium topcoat color or clearcoat system will provide maximum gloss and durability.



MOTTLING

(Streaking, Tiger/Zebra Stripes, Floating, Flooding)

A streaked spotty, or striped appearance in a metallic color.

CAUSE

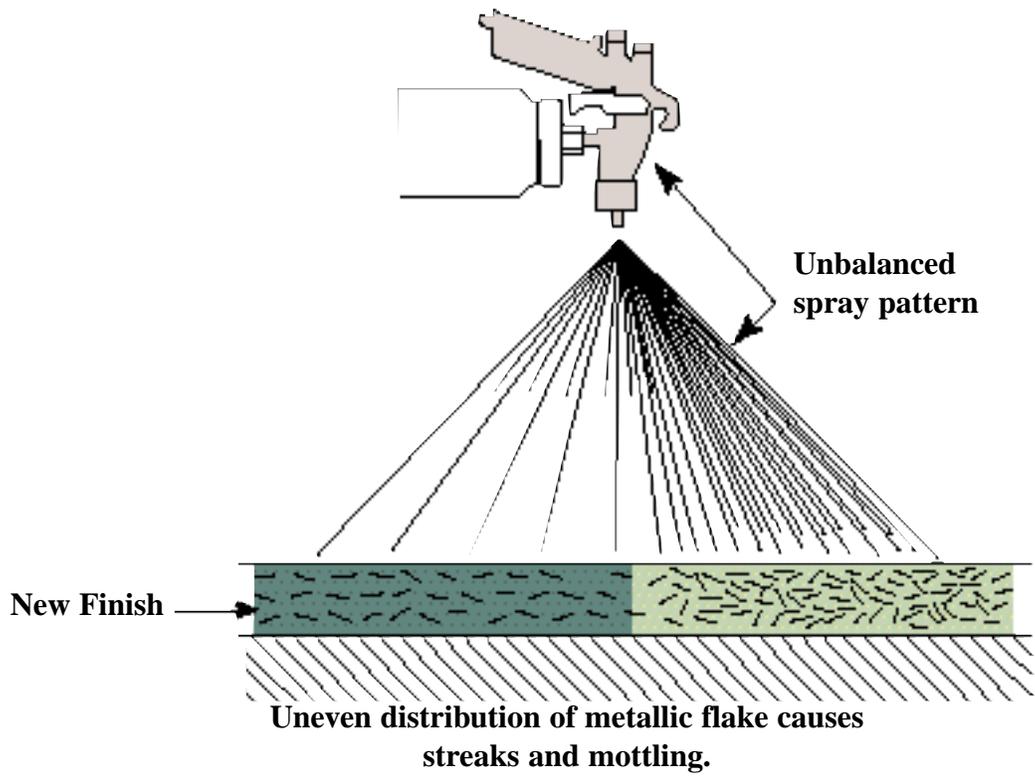
- (A) An uneven distribution of metallic flake caused by:
 - (1) Using a spray gun that gives an unbalanced spray pattern;
 - (2) Improper application technique such as tilting the spray gun during application, causing the spray pattern to become heavy at the top or bottom.
 - (3) Holding the gun too close to the surface (flooding);
 - (4) Uneven spray pattern overlap;
 - (5) Omitting/Improper use of mist coats.
- (B) Too much thinner/reducer. Color over thinned/reduced.
- (C) Applying clearcoat to a basecoat that has not thoroughly flashed/dried.
- (D) Improper application of basecoat (e.g. failure to apply or an improper use of a low pressure mist coat, wet basecoat application).

REPAIR

- (1) To uniform single stage metallic finishes, apply a higher pressure mist coat, panel by panel, while previous coat is still wet.
- (2) Or, allow basecoat color to flash, then apply a low pressure mist coat.
- (3) Finishes that have dried must be sanded and refinished. *Caution: Large areas of basecoat must have clearcoat applied before sanding. However, small nibs or lint may be removed from basecoat by wet sanding, concentrating only on the defect. Apply additional basecoat to the sanded area before clearcoating.*

PREVENTION

- (A) Use recommended spray gun, including fluid tip and air cap for the material being sprayed. *Always adjust the gun for best atomization and balanced spray pattern before paint application.*
- (B) Use the correct ratio of thinner/reducer.
- (C) Allow basecoat proper flash/dry time before clearcoating.
- (D) Follow basecoat application procedures.



ORANGE PEEL

(Poor Flow, Texture)

Paint film having an uneven texture that resembles the skin of an orange.

CAUSE

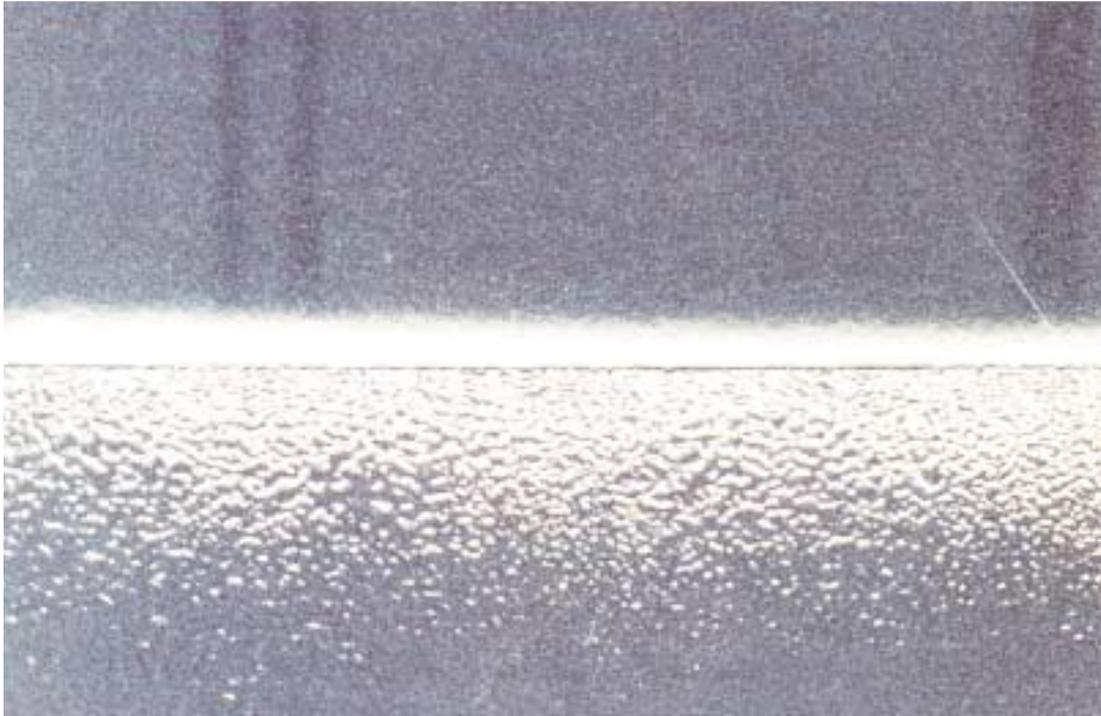
- (A) Under reduction and/or air pressure too low.
- (B) Thinner/reducer evaporates too fast for spray conditions.
- (C) Excessive film thickness or piling on of heavy wet coats.
- (D) Improper spray gun set-up.
- (E) Improper painting technique.

REPAIR

- (1) Compound or polish to reduce surface texture.
- (2) Or, sand smooth with 1200 or finer grit sandpaper, compound and polish to restore gloss.
- (3) Or, sand smooth and refinish.

PREVENTION

- (A) Use proper reduction ratio and spray at recommended air pressure.
- (B) Select recommended thinner/reducer based on temperature, humidity, air movement, and size of repair.
- (C) Avoid heavy coats and excessive film thickness.
- (D) Use recommended spray gun, fluid tip and air cap for the material being sprayed. *Always adjust the gun for best atomization and balanced spray pattern before paint application.*
- (E) 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.



PEELING

(Flaking, Delamination)

A loss of adhesion or separation of the paint film from the substrate.

CAUSE

- (A) Improper preparation of the substrate (sanding and cleaning).
- (B) Omitting or applying an incompatible undercoat to a specific substrate (e.g. aluminum, galvanized, plastics, etc.).
- (C) Insufficient flash/dry time or exceeding the product's maximum recoat time.
- (D) Insufficient film thickness of undercoat, or topcoat.
- (E) Clearcoat finishes: (1) Insufficient film thickness of clearcoat. (2) Solvent cleaning basecoat before clearcoating, (3) Sanding basecoat before applying additional basecoat or clearcoat. (4) Basecoat applied too dry. (5) Clearcoat applied too dry. (6) Baking basecoat before applying clearcoat. (7) Using fisheye eliminator in basecoat. (8) Incompatible clearcoat. (9) Use of incompatible "adhesion promoter". (10) Excessive basecoat film thickness. (11) Over reduction, under reduction, or incompatible reducer used in basecoat.

REPAIR

- (1) Remove the finish in the affected area, featheredge, and refinish.
- (2) Or, strip to bare substrate and refinish.

PREVENTION

- (A) Clean and prepare all substrates according to product recommendations.
- (B) Use the recommended undercoat (primer) for the substrate being finished. *Plastic parts may require use of special primer and flex additive for maximum performance.*
- (C) Recoat all products within their recommended minimum and maximum recoat time.
- (D) Apply a sufficient number of coats to obtain the recommended film thickness.
- (E) Follow basecoat/clearcoat application procedures using only recommended/compatible products.
- (F) "Adhesion promoter" should only be used when specifically recommended.



PINHOLING IN BODY FILLER

(Bubbles, Air Pockets)

Small holes or bubbles located in or on top of putties or body fillers.

CAUSE

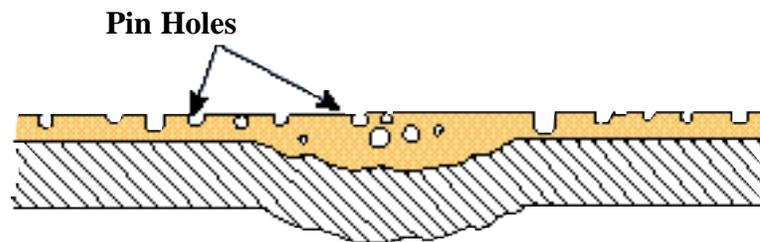
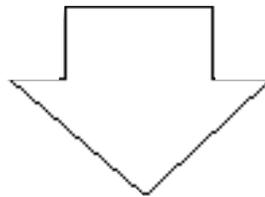
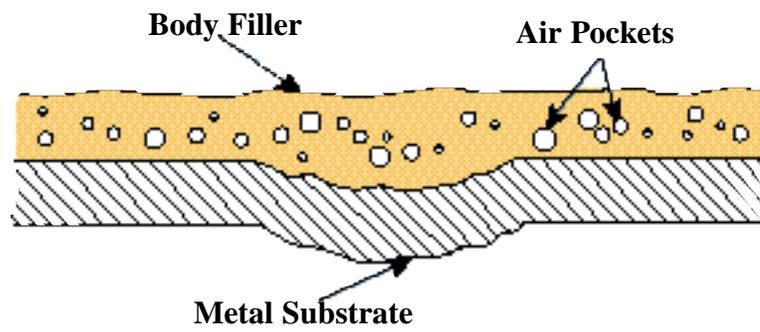
- (A) Air or gas bubbles become trapped inside putty or filler during mixing or product application. These bubbles are exposed during the sanding process, creating small holes or craters in the surface. Air or gas is trapped when:
- (1) Filler and hardener are mixed together using a "whipping" motion (fast circular motion);
 - (2) Adding too much hardener;
 - (3) Applying heavy thick coats produces excessive heat, causing gas bubbles to form inside the product as it cures.

REPAIR

- (1) Apply a thin layer of polyester glazing putty (properly catalyzed and mixed), sand smooth and continue the repair process.

PREVENTION

- (A) Mix putty/filler components by folding together and pressing down to eliminate air pockets.
- (B) Apply putty/filler in thin coats. *Do not exceed manufacturer's recommended total film thickness.*
- (C) Follow manufacturer's recommendation of correct ratio of putty/filler to hardener.



Sanding body filler exposes air pockets.

RAIL DUST

Small rust colored bumps or specks in the surface of the paint film.

CAUSE

- (A) When vehicles are transported from the manufacturer by rail, iron dust particles created by friction between train wheels and the track settle on the finish. When exposed to oxygen and moisture, this dust corrodes and become embedded in the finish.

REPAIR

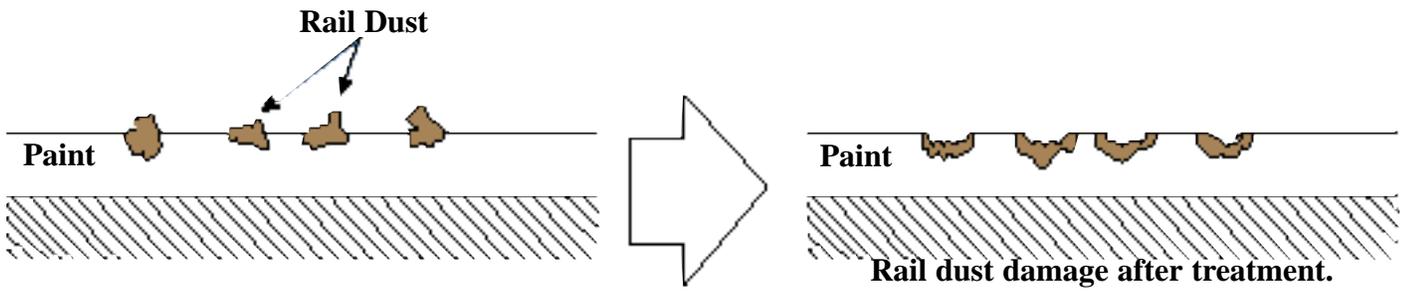
Use a 30x magnifying glass to verify the presence of rail dust damage. Use caution when accessing damage to prevent scratching the paint surface.

- (1) Wash the vehicle with soap and water, rinse and dry.
- (2) Solvent clean with appropriate surface cleaner.
- (3) Use an acid based rail dust remover following manufacturer's directions.
- (4) Rinse with cold water then inspect the affected area to see if all particles have been removed. Repeat step #3 if necessary.
- (5) If the finish is pitted, sand with 1200 or finer grit sandpaper to remove damage, then compound and polish to restore gloss.*
- (6) Or, sand and refinish.

PREVENTION

Unfortunately, since this type of damage usually occurs during shipment or storage, little can be done to prevent its occurrence.

****When sanding and buffing a basecoat/clearcoat finish, a minimum film thickness of the clearcoat (2 mils) is required to maintain adequate ultraviolet protection. If correcting the damage will result in removing more than .5 mils, refinishing is recommended.***



RUNS/SAGS

(Hangers, Curtains, Signatures)

Coatings that fail to adhere uniformly, causing beads, droplets, or slippage of the total film.

CAUSE

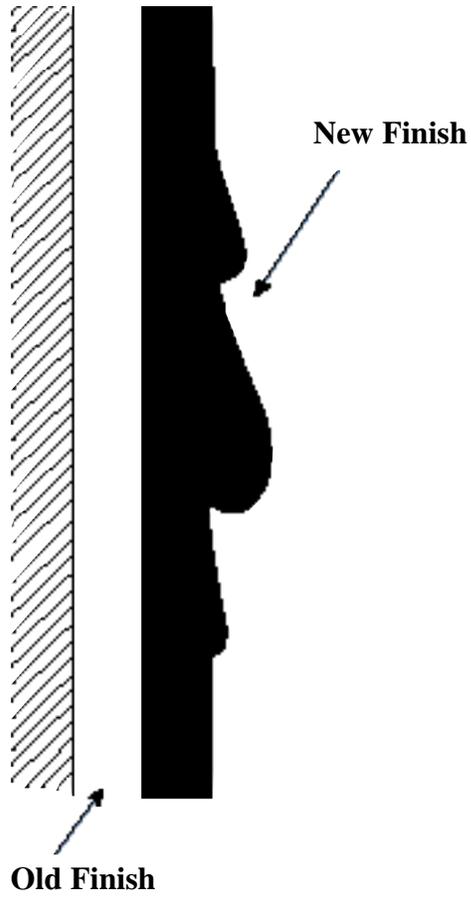
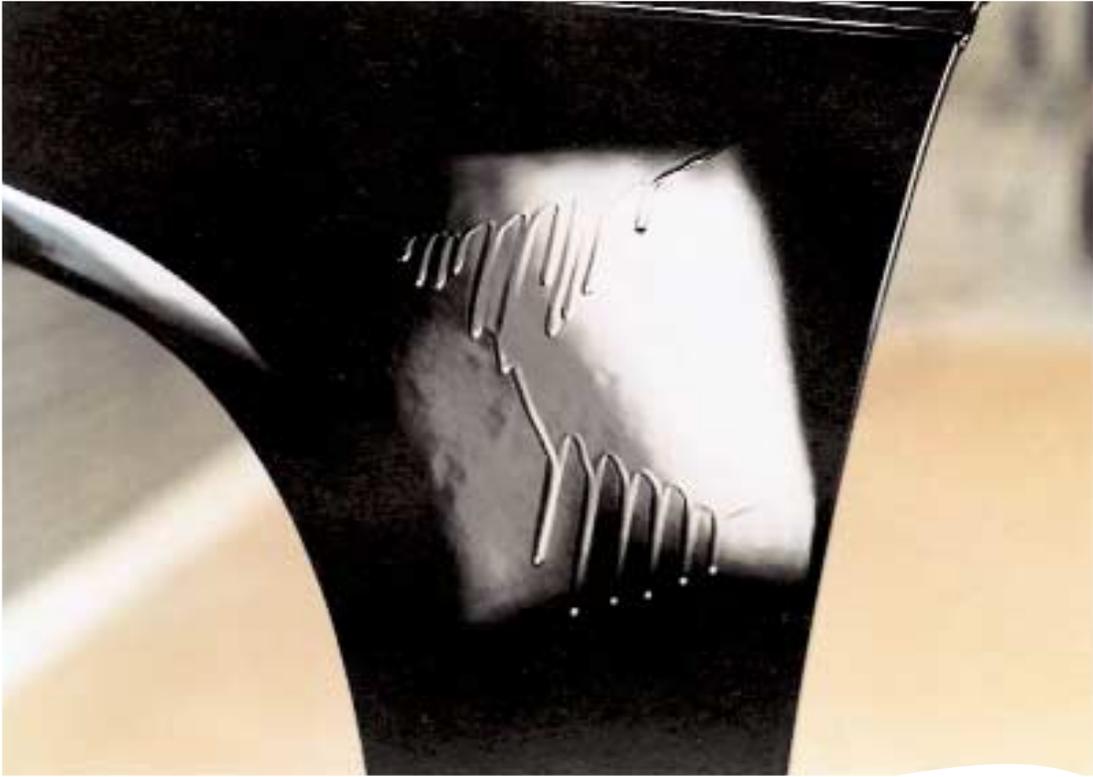
- (A) Over reduction and/or too slow evaporating thinner/reducer.
- (B) Applying paint materials without proper flash time between coats.
- (C) Applying excessive wet coats due to:
 - (1) Holding the gun too close to the surface;
 - (2) Slow gun speed;
 - (3) Double coating.
- (D) Air pressure too low during spray application.
- (E) Improper spray gun set-up or an unbalanced spray pattern.
- (F) Material and/or substrate temperature too cold.

REPAIR

- (1) Remove the wet paint film with solvent, clean and refinish.
- (2) Or, after finish is completely dry. remove excess paint by block sanding with 1200 or finer grit sandpaper, compound and polish to restore gloss.
- (3) Or, block sand smooth and refinish.

PREVENTION

- (A) Mix according to product directions. Select recommended solvent for spray conditions based on temperature, humidity, air movement, size of repair.
- (B) Spray medium wet coats and allow sufficient flash time between coats.
- (C) Adjust the spray gun for the best atomization and balanced spray pattern before paint application. Hold the spray gun perpendicular and parallel to the panel. Adjust speed of pass, pattern overlap, and distance from the panel until the desired results are achieved.
- (D) Set air pressure at the gun according to product recommendations.
- (E) Use recommended spray gun, including fluid tip and air cap combination.
- (F) Allow the paint material and substrate to reach room temperature before application.



SANDING MARKS

(Streaked Finish, Sand Scratches)

Dark and/or streaked marks that resemble sand scratches in the paint film.

CAUSE

- (A) Scratching or distorting metallic/mica flakes close to the surface of the paint film due to:
 - (1) Sanding single stage or basecoat metallic finishes prior to clearcoating.
 - (2) Sanding single stage metallic finishes prior to buffing.

REPAIR

- (1) Allow finish to dry, sand and refinish.

PREVENTION

- (A) Avoid sanding basecoat finishes before clearcoating. If sanding is necessary apply additional color following label direction.
- (B) When sanding single stage finishes confine the sanding to minor imperfections (nib sanding rather than entire panels). *For best results use 1200 or finer grit sandpaper.*



10X

SAND SCRATCHES

(Swelling, Sinking, Shrinkage)

Visible lines or marks in the paint film that follow the direction of the sanding process.

CAUSE

- (A) Sanding the substrate with too coarse grit sandpaper.
- (B) Insufficient dry/cure of undercoats before sanding and topcoating.
- (C) Refinishing over soft, soluble substrates (e.g., lacquers, uncured OEM).
- (D) Using a poor grade and/or too fast evaporating thinners/reducers for spray conditions causing:
 - (1) Primer surfacer to "bridge" over sand scratches;
 - (2) Topcoat to "skin over," trapping solvent which swells sensitive substrates.
- (E) Using a solvent cleaner that is too strong for the substrate or using thinner/reducer as a surface cleaner after sanding.

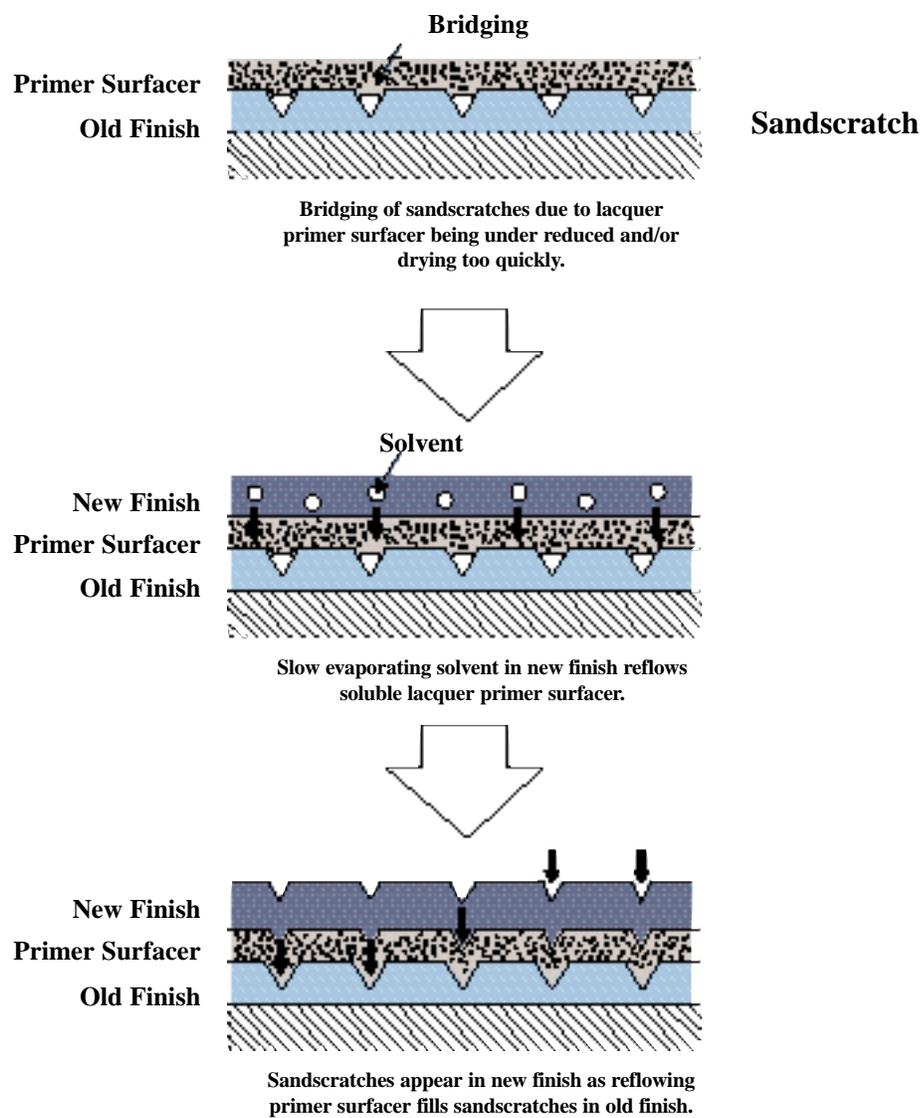
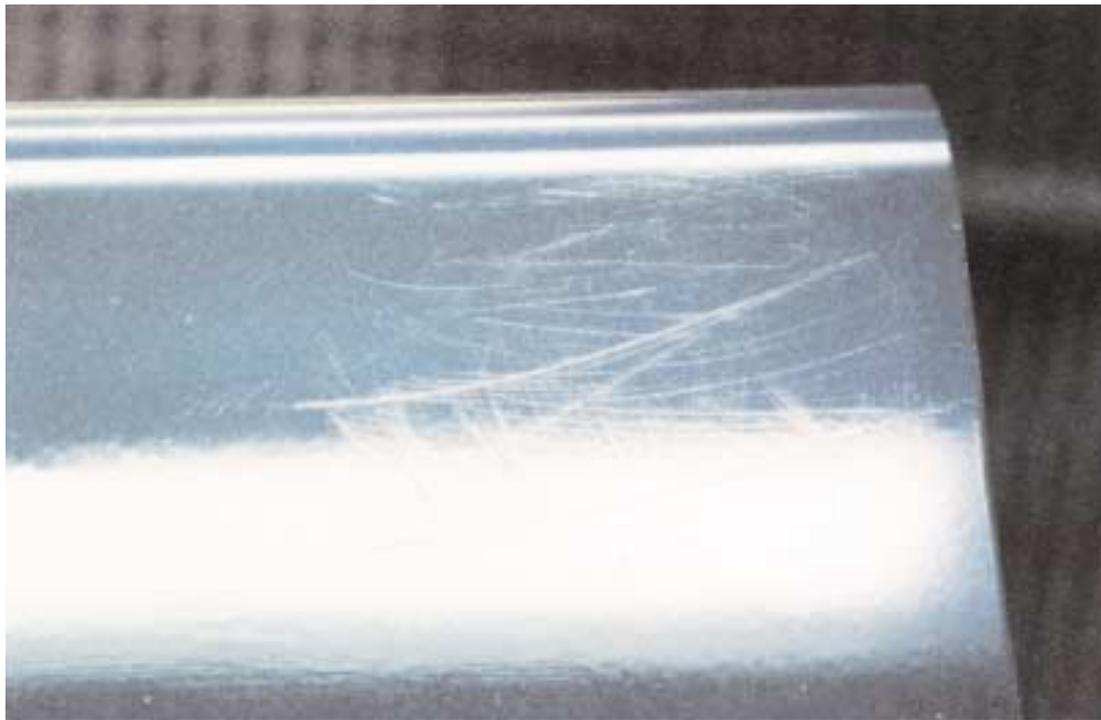
REPAIR

- (1) Allow finish to dry/cure, sand smooth, compound or polish to restore gloss.
- (2) Or, sand and refinish.

PREVENTION

- (A) Sand with recommended grit sandpaper.
- (B) Allow undercoats to thoroughly dry/cure before sanding and topcoating.
- (C) Rub a small area of the old finish with a shop towel saturated with lacquer thinner. If the old finish is soluble or undercured, apply appropriate sealer.
- (D) Select recommended thinner/reducer based on temperature, humidity, air movement, and size of repair. *Avoid "bridging" existing scratches by applying primer surfacer in thin wet coats, allowing adequate flash time between each coat.**
- (E) Use solvent cleaner designated for either lacquer (soluble) or cured enamel/urethane (insoluble) substrates.

****For best results, use the premium two component undercoat system.***



SEEDINESS

(Gritty, Dirty, Grainy. Speckled)

Solid particles of various shapes and sizes embedded evenly throughout the paint film.

CAUSE

- (A) Material not properly stirred or agitated.
- (B) Failure to strain material.
- (C) Using material exceeding its shelf life.
- (D) Using generic reducers and/or hardeners.
- (E) Using materials beyond their specified pot life.
- (F) Using contaminated thinner/reducer or hardener.
- (G) Using contaminated water borne products.

REPAIR

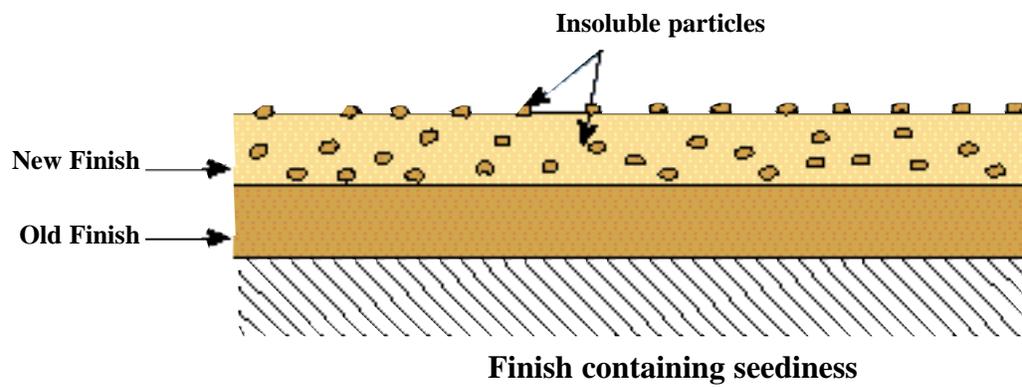
- (1) Remove the wet paint film with solvent, clean and refinish.
- (2) Or, sand smooth and refinish.

PREVENTION

- (A) Stir or shake materials thoroughly to be sure all pigment/resin is in solution.
- (B) Strain all undercoats and topcoats.
- (C) Do not use material that cannot be stirred or strained. *Caution: Repeated straining will not completely remove seediness.*
- (D) Use the recommended thinner/reducer and hardener, and then measure accurately.
- (E) Mix only enough material that can be used within specified pot life.
- (F) Use material as soon as possible, close and tighten container lids immediately after use.
- (G) Do not allow thinner/reducer to come into contact with water borne products.



20X



SHRINKAGE

(Bullseyes, Ringing, Edge Mapping)

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

CAUSE

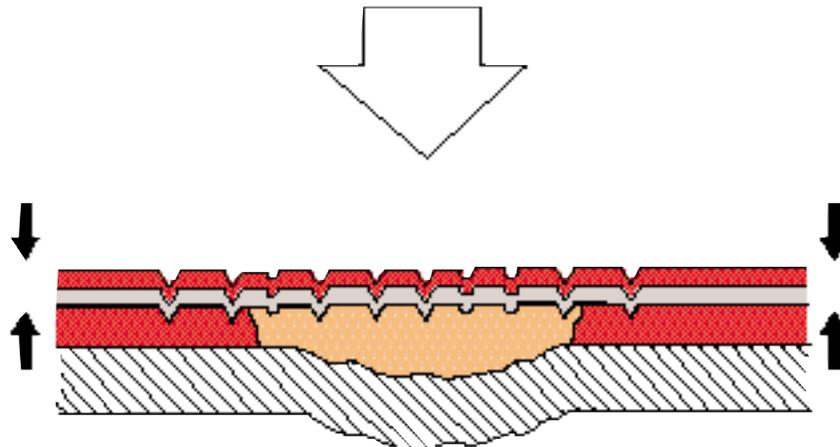
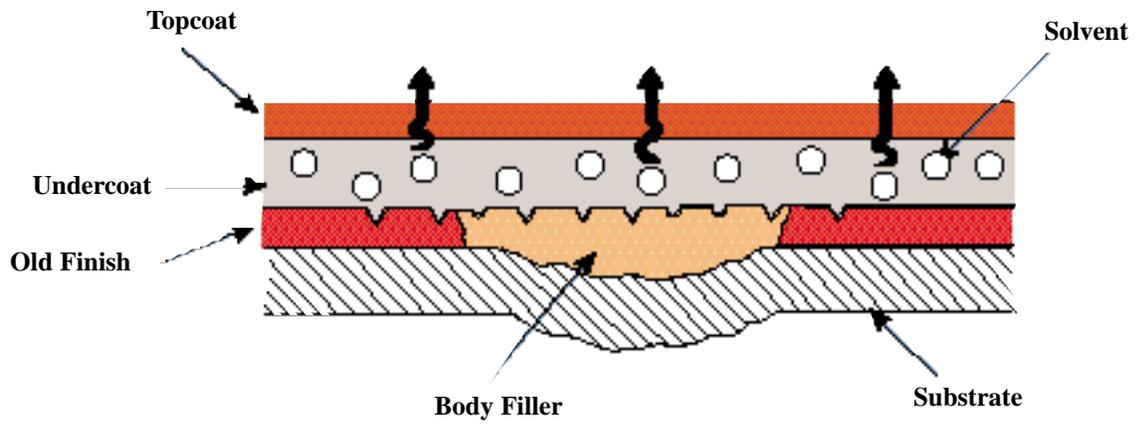
- (A) Topcoating before undercoats have thoroughly dried/cured.
- (B) Undercoats applied excessively wet with inadequate flash time between coats.
- (C) Undercoats under reduced.
- (D) Using a poor grade and/or too fast evaporating thinner/reducer for spray conditions.
- (E) Finishing over body filler that has not thoroughly cured.
- (F) Using too strong solvent cleaner or using thinner/reducer as a surface cleaner.

REPAIR

- (1) Allow the affected area to thoroughly dry/cure, sand and refinish.
- (2) If additional filling is necessary, apply a primer surfacer, sand smooth and refinish.

PREVENTION

- (A) Allow undercoats to thoroughly dry/cure before sanding and/or topcoating.
- (B) Thin or reduce undercoats according to product label directions. Apply in thin wet coats allowing adequate flash time between coats to avoid "bridging" scratches.
- (C) Select recommended thinner/reducer based on temperature, humidity, air movement, and size of repair.
- (D) Follow body filler manufacturer's recommended cure time.
- (E) Use solvent cleaner designated for either lacquer soluble or cured enamel/urethane insoluble substrate.



Film shrinks as solvent evaporates

SOFT FILM

(Slow Dry)

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

CAUSE

- (A) Applying undercoat and/or topcoat excessively wet.
- (B) Insufficient dry time between coats.
- (C) Improper shop ventilation or heating.
- (D) Adding too much or too little hardener to the paint material.
- (E) Using the incorrect thinner/reducer for spray conditions.
- (F) Omission of drier in enamel/urethane topcoats.

REPAIR

- (1) Allow additional dry time, maintaining a shop temperature of 70 degrees fahrenheit or above.
- (2) Or, force dry following temperature and time recommendations.
- (3) Or, remove soft paint film and refinish.

PREVENTION

- (A) 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.*
- (B) Allow sufficient flash time between coats.
- (C) Maintain shop temperature at 70 degrees fahrenheit or above for proper dry/cure.
- (D) Use the recommended hardener and measure accurately.
- (E) Select 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.*
- (F) Add the correct amount of drier that is specifically listed in the color formulation.



SOLVENT POPPING

(Boiling, Blowing)

Small bubbles, pinholes or crater-like openings in or on the paint film.

CAUSE

- (A) 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:
- (1) Thinner/reducer evaporating too fast for spraying conditions;
 - (2) Inadequate flash time between coats;
 - (3) Excessive film thickness or "piling on" of heavy/wet coats;
 - (4) Too much air movement causing surface to "skin over" before solvents evaporate;
 - (5) Excessive purge/flash time before force drying.

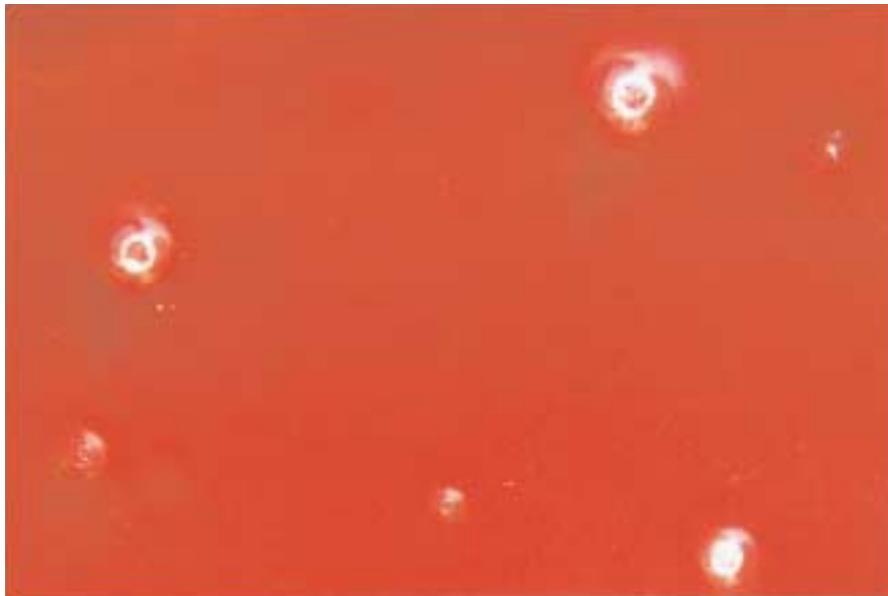
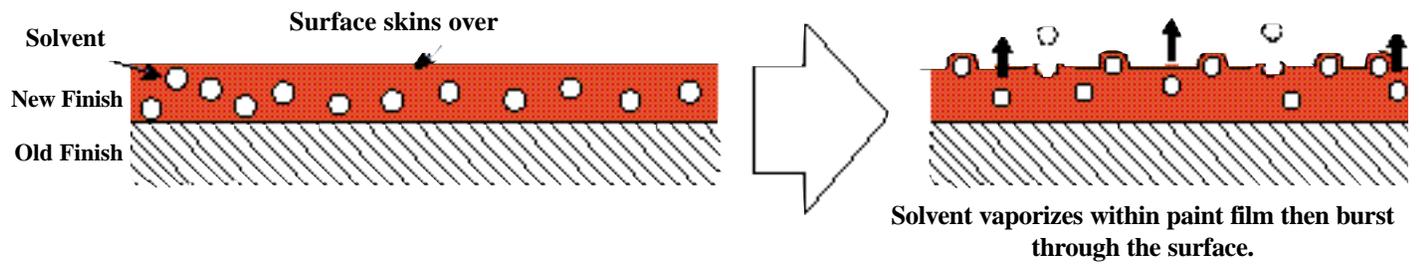
REPAIR

- (1) Allow finish to thoroughly dry/cure, sand smooth and refinish. *Inspect surface carefully to ensure all craters have been removed.*
- (2) *Severe popping will require removal of the affected film. Prime, seal and recoat, as necessary.*

PREVENTION

- (A) Select recommended thinner/reducer based on temperature, humidity, air movement and size of repair;
- (B) Allow for proper flash time between coats.
- (C) Avoid "piling on" or double wet coats.
- (D) Restrict air movement over the surface being painted.
- (E) Avoid extended purge/flash time before force drying.

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 vehicles 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.



STAINING/PLASTIC BLEED-THROUGH

(Discoloration)

A yellow-brown discoloration appears in the topcoat over areas repaired with polyester body filler or glazing putty.

CAUSE

- (A) Using too much or too little hardener in the putty/filler
- (B) Insufficient mixing of putty/filler components.
- (C) Applying a surfacer, sealer and/or topcoat before putty/filler has thoroughly cured.
- (D) Applying undercoats and/or topcoats excessively wet.
- (E) Clearcoating a white or light color without using a stain-free body filler.

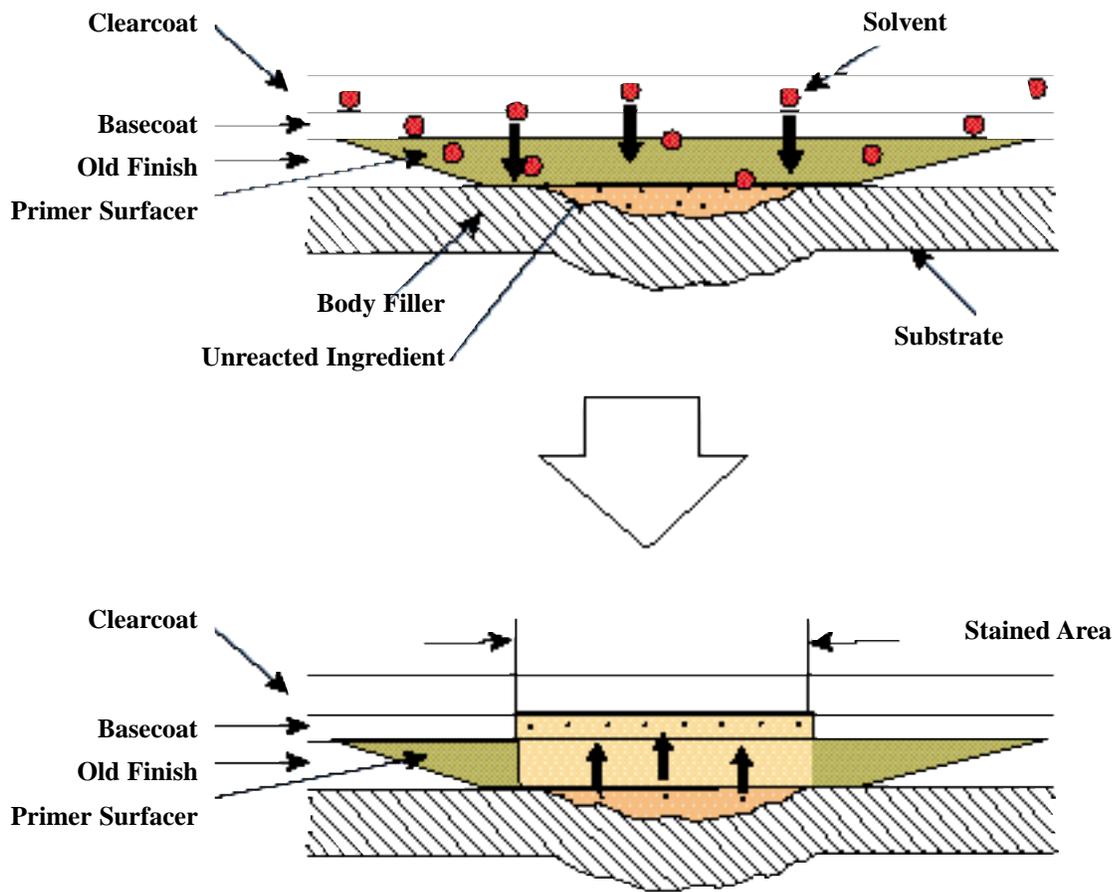
REPAIR

- (1) Allow topcoat to thoroughly cure.
- (2) Sand affected area, isolate with two component undercoats and refinish.

PREVENTION

- (A) Use correct amount of body filler hardener.
- (B) Mix components thoroughly.
- (C) Allow putty/filler to cure thoroughly before topcoating.
- (D) Apply undercoats and/or topcoats in medium-wet to wet coats; always allowing proper flash time between coats.
- (E) Use non-staining body filler, especially when clearcoating light colors.
- (F) Isolate suspected staining filler by applying a two-component surfacer and sealer.* Allow to cure, following product recommendations, then apply desired topcoat.

* Two component acrylic urethane primer surfacer and acrylic urethane sealer may be used to top a majority of body filler staining problems. Both are required and must be allowed to fully cure for maximum stain resistance. However, for 100% assurance against body filler staining, use a non-staining body filler according to manufacturer's recommendations.



Clearcoat is stained when reacted ingredients migrate through primer surfacer and basecoat color.

TAPE TRACKING

(Tracks)

An imprinted line or texture in the dried paint film following the use of masking tape.

CAUSE

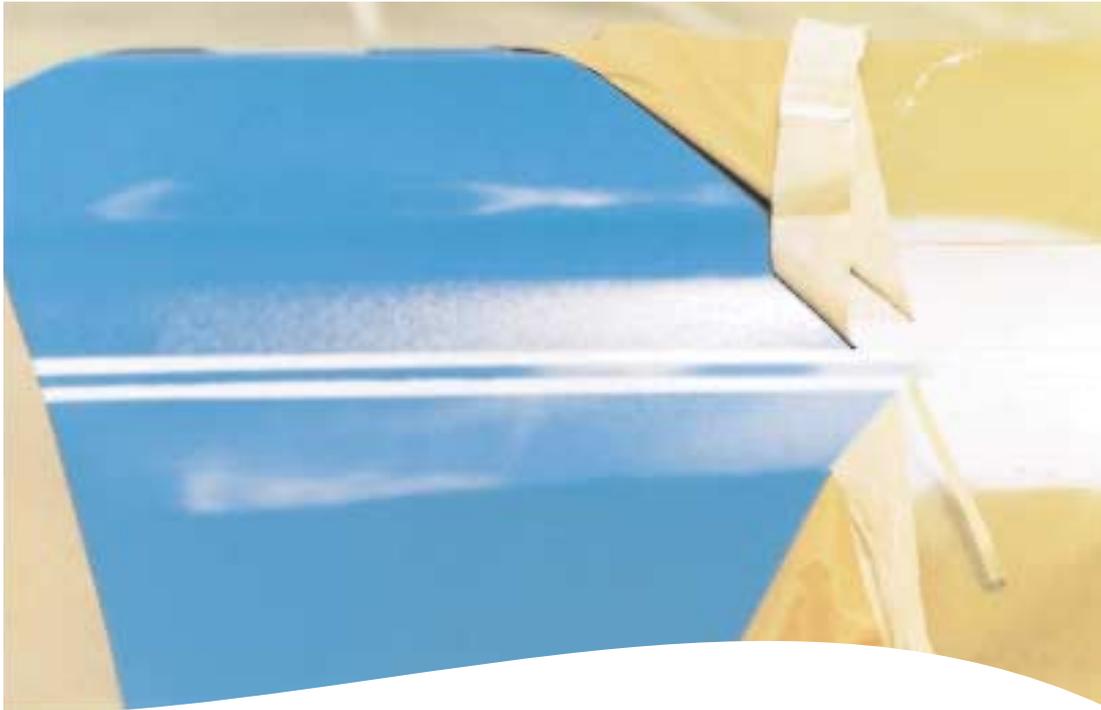
- (A) Finish not dry before taping, causing solvent entrapment between finish and tape.
- (B) Using a non-automotive tape for multi-color finishes. *Solvents from additional color soak through the tape and into the previous color.*

REPAIR

- (1) Compound and polish to remove texture.
- (2) Or, sand with 1500-2000 grit sandpaper, compound and polish to restore gloss.
- (3) Or, sand and refinish.

PREVENTION

- (A) Allow the finish to thoroughly dry before masking.
- (B) Use only high quality automotive masking tape.
- (C) Determine if it is safe to tape on freshly painted surfaces by applying a small piece of tape to the surface for 10-15 minutes; remove and check for imprinting.
- (D) De-tack the tape before applying by pulling the adhesive side of the tape over your pant leg or between your fingers.
- (E) Remove the tape as quickly as possible after applying additional color(s).



TRANSPARENCY

(Poor Hiding, Poor Coverage, Translucent)

The original finish or undercoat is visible through the topcoat.

CAUSE

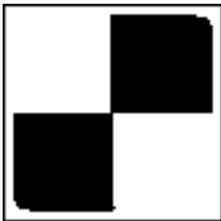
- (A) Color not thoroughly stirred/agitated.
- (B) Color over-thinned/reduced.
- (C) Substrate not uniform in color.
- (D) Wrong color undercoat used.
- (E) Insufficient number of color coats applied.

REPAIR

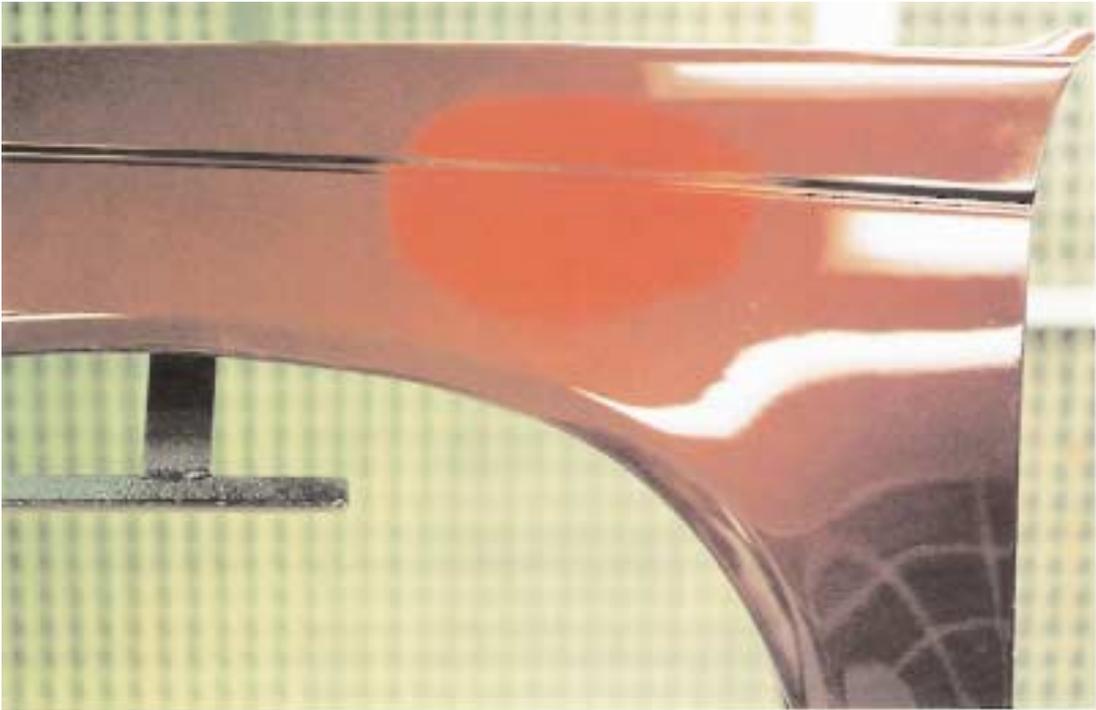
- (1) Apply additional coats of color until hiding is achieved.
- (2) Or, sand and apply similar colored undercoat/ground coat and refinish.

PREVENTION

- (A) Stir or shake paint material thoroughly, making sure all pigment is in solution/suspension.
- (B) Thin/reduce according to product label directions.
- (C) Use a sealer or ground coat to provide a uniform color before topcoating.
- (D) Use an undercoat that is similar in color to the topcoat.
- (E) Spray until hiding is achieved.



NOTE: SPRAY MONITORS (hiding power labels, opacity charts) provide a contrasting feature by which to observe the hiding power or transparency of topcoat color during spray application. When black and white can no longer be seen through the color, complete coverage is achieved.



WATER SPOTTING

(Water Marking)

Circles with raised edges or whitish spots resembling the various shapes of water droplets appear on the surface of the paint film.

CAUSE

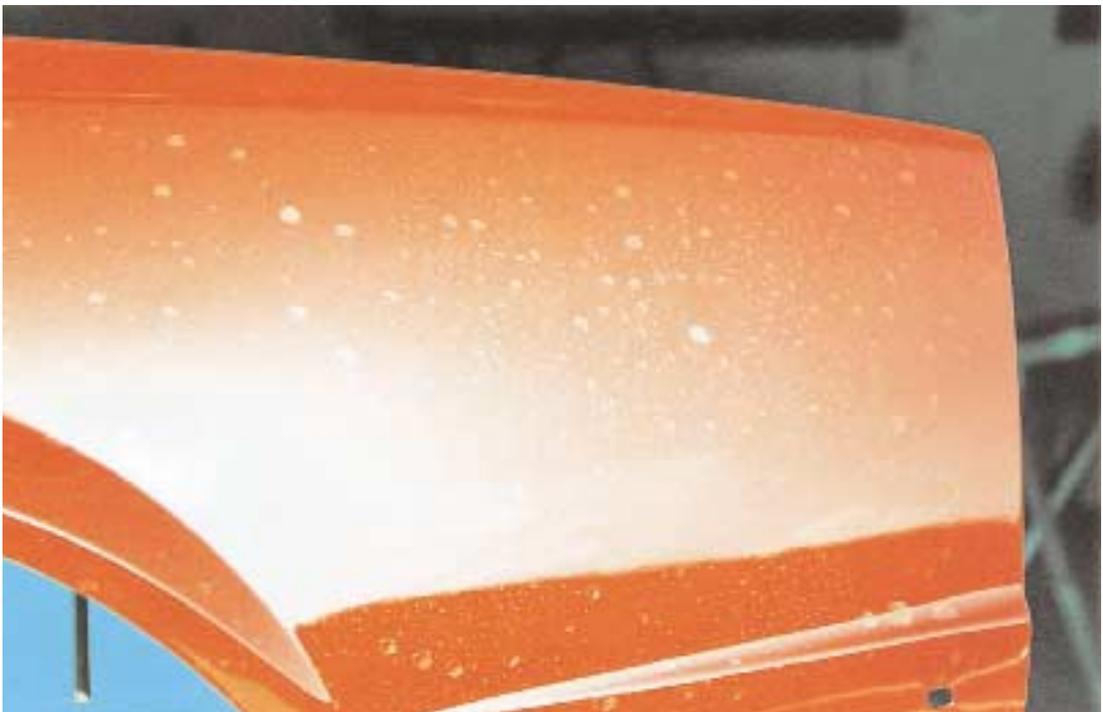
- (A) Allowing water to come into contact with a finish that is not thoroughly dried/cured.
- (B) Washing finish in direct sunlight.

REPAIR

- (1) Wipe with a damp cloth, then polish.
- (2) Or, compound and polish.
- (3) Or, sand smooth with 1500-2000 grit sandpaper, compound and polish to restore gloss.
- (4) Or, sand and refinish.

PREVENTION

- (A) Do not allow water to come into contact with newly painted finish
- (B) If a new finish does get wet, dry immediately with a soft cloth.
- (C) Wash new finishes in the shade and wipe dry.



WRINKLING

(Crinkling, Puckering, Shriveling)

The surface of the paint contains irregular grooves or ridges resembling the skin of a prune.

CAUSE

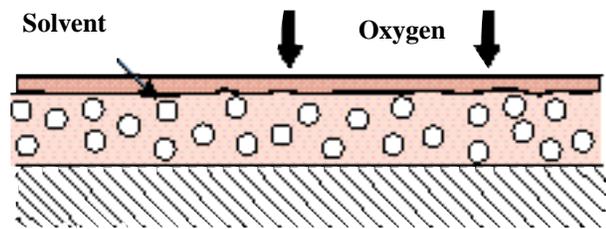
- (A) Excessive film thickness or "piling on" of heavy wet coats.
- (B) Placing a newly painted finish in hot sun too soon after spraying.
- (C) Using lacquer thinner to reduce synthetic enamel.
- (D) Spraying in extreme hot, humid weather conditions.
- (E) Under reduced and/or too fast evaporating thinner/reducer for spray conditions.
- (F) Air pressure too low during spray application.
- (G) Force drying of air-dry enamels without the recommended additives.

REPAIR

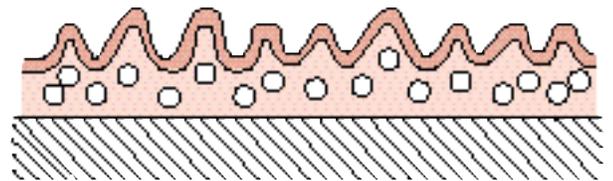
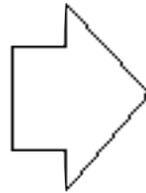
- (1) If defects are minor; Sand the top surface smooth, allow to cure and refinish.
- (2) If defects are severe; Remove the affected area and refinish.

PREVENTION

- (A) Avoid excessive film thickness and heavy coats. *Always allow for sufficient flash times.*
- (B) Keep newly painted finish away from direct sunlight until finish has dried/cured.
- (C) Use reducer that is specifically recommended for the topcoat.
- (D) Use the recommended reducer, additive, and/or retarder when spraying in hot humid weather.
- (E) Select recommend thinner/reducer based on temperature, humidity, air movement, and size of repair.
- (F) Use the proper reduction ratio and spray at recommended air pressure.
- (G) Select the recommended additives to suit drying conditions. *Follow force dry temperatures and time recommendations.*



Lower wet coats are not able to release their solvents when the surface layer "skins over" too quickly.



Surface layer shrinks while underlying material remains fluid.

