

# Detailing (REF04)

Textbook



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REF04-STMAN1-E

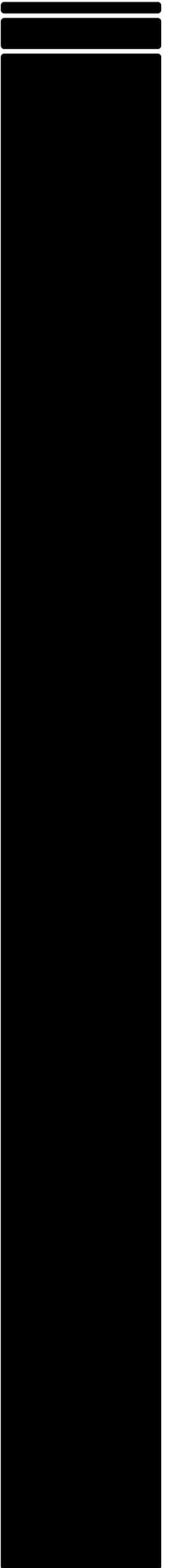
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# *Introduction*



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## Obligations To The Customer And Liability



The collision repair industry has an obligation to correctly repair the customer's vehicle. Collision repairs must be performed using:

- recommended or tested procedures from vehicle makers, I-CAR, and other research and testing organizations.
- quality replacement parts and materials.
- repair processes and parts as written and agreed upon in the repair order. If items on the repair agreement are not consistent with the repair order, it can be considered fraud.

Performing proper collision repairs requires using parts and procedures that keep remaining warranties intact.

Collision repairs must restore:

- safety.
- structural integrity.
- durability.
- performance.

- fit.
- finish.

Throughout the damage analysis and repair process the repairer and insurer must:

- communicate with each other.
- maintain constant communication with the customer.
- be in agreement with each other and the customer on how repairs will be performed.
- inform the customer of any changes in the repair plan from the original repair agreement, and explain the changes and why they have to be made.



To reduce liability:

- make sure that all repairs are performed thoroughly, correctly and as listed in the damage report.
- follow proper procedures.
- have documentation of required repairs with detailed record keeping available for customers.

Technicians are considered the experts and are expected to be knowledgeable on how to perform a quality repair.

Liability insurance that covers the repair facility may not always cover all damages. For example:

- the policy may not cover faulty repairs, leaving liability responsibility completely on the facility.
- a shop owner may find that repair facility liability coverage may not cover the full amount awarded in a lawsuit. The shop owner would have to pay the difference.



It is difficult to reduce the risk of liability exposure. The part that the repairer can control is the chance of being found at fault. Chances can be minimized by:

- using recommended or tested procedures from the vehicle makers, I-CAR, or other research and testing organizations.
- using quality replacement parts and materials that restore fit,

finish, durability, and perform at least as well as the original.

- keeping thorough records.



Keeping thorough records includes more than recording the date, mileage, and pre-existing damage. Record keeping also includes:

- making sure all notes are legible.
- verifying the repairs that were made or not made.
- having the customer sign a waiver for repairs that they do not want performed. Repairers must determine their liability on not repairing safety systems such as restraint and anti-lock brake systems.
- keeping computer printouts or worksheets on file showing wheel alignment readings or vehicle dimensions before and after repairs.
- keeping scan tool printouts and records of computer codes for airbag, anti-lock brake, emission, and powertrain control module (PCM) systems.

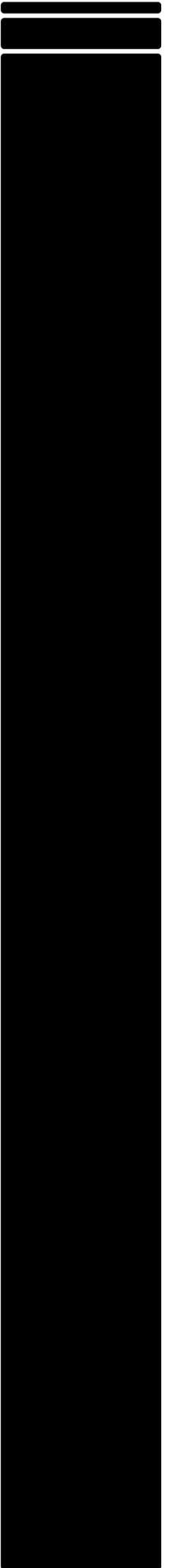
- attaching the OEM or other tested procedure printout to the vehicle repair order.
- keeping receipts for all sublet work performed.



*Refer to "Video: Topics Off Limits" in the presentation. This video identifies topics that should not be brought up in class.*

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# *Module 1 - Inspecting The Finish*



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## Cleaning For Inspection

Learning objectives for this module include:

- how to use masking materials to reduce clean-up steps.
- identifying tools that can be used for inspecting a finish.
- identifying types of finish damage.
- detailing chemistry.



*Spray-on masking is rinsed off the vehicle with plain water.*

When detailing a vehicle after refinishing, do not remove the masking from adjacent moldings and trim pieces. It is difficult to remove dried polish from these parts during final detailing.

Spray-on masking:

- needs to be rinsed off, usually with just plain water.
- removal may be easier if the water is allowed to soak for a few minutes before performing a final rinse.

- can be left on until almost all detailing is completed, to make cleanup easier.



*Use one bucket for wash water, and another bucket for rinse water.*



*Start at the top and work down.*



*A wash mitt or sponge may be used for washing.*



Rinse using a hose without a nozzle.

Washing the vehicle with soap and water is done before and after collision repairs. When washing exterior surfaces:

- use a liquid car wash soap and soft or deionized water. Powdered soap may not completely dissolve. Grains of undissolved powder under a sponge or wash mitt can scratch a finish. Do NOT use dishwasher or laundry detergent, which are too harsh and can dull a finish.
- use two buckets, one with the soapy water and the other with clear water for rinsing the sponge or wash mitt. Using just one bucket will likely recycle dirt back onto the finish.
- start at the top of the vehicle and work down.
- rinse using a hose without the nozzle. The soap and water does the cleaning, not pressure from a hose or pressure washer.
- the rinse water should sheet off the surface, not bead. Beads will leave water spotting.

Store the wash mitt in a sealed plastic bag to keep it free of dirt.

Cover the metal hose end with tape to make sure it does not scratch the surface if it accidentally touches the vehicle. If a sponge wash mitt has a cuff, tuck the cuff in to prevent scratching the surface.



A preferred method of drying is to lay the towel or chamois down flat and drag it across the surface.



Shown are chamois and towel examples.

Do not let the water dry on the surface, which could cause water spotting. Dry by dragging a towel or chamois across the surface. Do not scrub, which is not productive and may leave marks. Dry using a:

- synthetic chamois. Do not use a natural chamois, which has an uneven nap and is not easily cleaned. Also, a natural chamois becomes abrasive as it ages.
- thick, natural 100% cotton terry towel. Synthetic materials do not absorb as well. The thick nap will absorb the quickest, and also capture and hold any remaining dirt particles. Loops in a terry towel prevent static from building, which attracts dirt to the surface.
- microfiber towel as a final wipe. These are commonly called detailing cloths. They can be used for not only dry wiping, but for applying dressings and other materials for interior and exterior final detailing.

A squeegee can be used for initial drying. When using a squeegee, avoid scratching by only allowing the rubber to contact the surface. Pull the water off in broad, even strokes.

### Inspection Tools



*A low-power magnifier will reveal the depth of surface defects.*



*Shown are examples of magnifiers.*

When inspecting the vehicle surface, whether it has just been refinished or not, use a magnifier. A magnifier allows better depth of vision, to determine:

- how deep a scratch is.
- whether a defect has etched into the surface or is just sitting on top.

Knowing the depth of a defect will determine the detailing that must be done, or if refinishing is needed.

### Vehicle Protection

Ensure that tools that come in contact with the finish, such as a magnifier, do not have rough or sharp edges that might scratch the finish. Creating scratches will result in additional detailing work.



A digital film thickness gauge is necessary for the small readings that must be taken during detailing.

### Film thickness gauges:

- measure finish film thickness on metal in mils or microns. One mil is 0.025 mm or 1/1000 inch. One micron is 1/1000 of one millimeter. Using mils as a measurement is most common in North America, and will be used in this course.
- are available as electronic with a digital display, or mechanical using a permanent magnet. The electronic type is the only option for detailing, since the finish must be measured in tenths of one mil. A magnetic gauge cannot measure with that accuracy.
- are available for measuring a finish on ferrous metal (steel), or nonferrous metal, such as aluminum. Some gauges can be set for use on both ferrous and nonferrous metals.

Conventional finish film thickness gauges do not work on plastic parts. Determine if the part has been previously refinished. If the part has been refinished, repair

technicians should plan to remove a portion of or all of the coatings to prevent excessive film thickness.

### Types Of Finish Defects



If possible, look at the vehicle while it's still in the spraybooth.

Do the initial inspection of a refinished vehicle in the spraybooth, if possible. This ensures that any defects found that cannot be removed by detailing can be repaired before the vehicle leaves the spraybooth.

Ask the refinish technician how much clearcoat was applied, to help determine the available thickness margin for detailing.



Most runs and sags can be removed by detailing if the color is not affected.

The types of defects that might be able to be removed by detailing, without refinishing, include:

- minor runs and sags that did not change the color.
- overspray.
- dirt or dust particles.
- inconsistent orange peel.
- sandscratch swelling.



*Defects such as fisheyes in the final topcoat cannot be removed by detailing.*

Defects that cannot be removed by detailing and must be refinished include:

- fisheyes.
- pinholes.
- wrinkling or lifting.
- solvent popping.
- any defect that affects the finish color.



*Light scratches can be removed, but if it can be felt with a fingernail it is too deep to be removed by detailing.*

Other defects that cannot be removed by detailing include:

- a scratch that can be felt by drawing a fingernail across the surface.
- a color mismatch.
- bleeding of another color into the topcoat.
- insufficient hiding.



*These spots are from industrial overspray, which usually can be removed through the detailing process.*

When inspecting an existing finish, the defects can be from sources outside of the spraybooth. These include:

- industrial fallout.
- chemical spotting.
- hard water spotting.
- acid rain.
- rail dust.
- scratches.



*Bird droppings can be easily removed, but the sooner the better.*

Other existing finish damage includes:

- bird droppings.
- salt spray.
- tree sap or leaf residue.
- insect residue.
- clearcoat degradation.
- single-stage color oxidation.

## Matte Finish Considerations



*Matte finish on a vehicle has a flat appearance.*

A matte finish uses a type of coating that diffuses light, providing a flat finish appearance. Special care is required when detailing a vehicle with a matte finish. Damage may require refinishing. Considerations for detailing matte finishes include that:

- damage to a matte coating, such as scratches or wear from aggressive cleaning, cannot be polished or buffed out.
- it is not possible to remove dust inclusions by polishing because polishing changes the gloss level.
- it is important to work very carefully during cleaning. This will help to avoid damaging the finish.



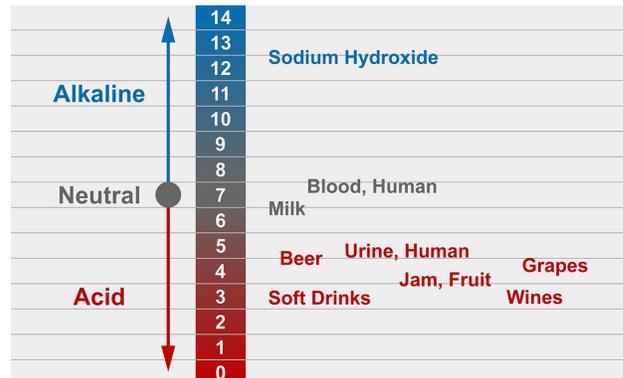
Special care is necessary to maintain a matte finish appearance.

It may be a good idea to provide some maintenance tips regarding the care of a matte finish to the customer. Some of these include to:

- avoid fuel spillage on the finish.
- avoid polishes.
- avoid automated car washes.
- remove insect and bird residue immediately.
- use a gentle spray on / wipe off technique when cleaning. Never apply pressure or rub the matte finish.

Special products are available for matte finish cleaning and protection.

## Detailing Chemistry



The pH scale represents the range of acids and alkalis of water solutions.

When assessing damage not only on exterior surfaces, but also interior surfaces, a basic understanding of acids and alkalis is necessary. The difference between the two can most easily be seen by using a pH scale. On the pH scale:

- the numbers 0 - 14 refer to concentration of hydrogen (H) and hydroxyl (OH) ions in a water solution.
- number 7 is neutral. Pure water, such as distilled water, has a pH of 7.
- numbers below 7 are acidic. The lower the number, the more acidic the solution is. Common acids are carbonated drinks, vinegar, and battery acid.
- numbers above 7 are alkaline. The higher the number, the more alkaline the solution is. Common alkalies are ammonia, baking soda, and lye soap.
- the numbers increase by a factor of 10 for every whole number progression. For example, a chemical with a pH of 9 is

100 times more alkaline than a chemical with a pH of 8. A chemical with a pH of 10 is 1000 times more alkaline than a chemical with a pH of 9.

The pH scale is useful when treating finish problems, or stubborn stains on fabrics. Applying a solution that has nearly the opposite pH can neutralize a spot or stain. Once a spot or stain is neutralized (pH of 7), it can be washed away and will not return. An acid rain spot, for example, that is not neutralized will continue to come back.



*A common cleaning material for detailing is a solution of all-purpose cleaner.*



*All-purpose cleaner may be used in various concentrations. Be sure to label them properly.*

All-purpose cleaner is a common cleaning material, available from most detailing material suppliers. All-purpose cleaner:

- is alkaline (above 7 on the pH scale). Most stains and environmental finish defects are acidic, so all-purpose cleaner neutralizes the defects.
- requires diluting with water for different purposes. Follow the product maker dilution recommendations. A stronger solution is not always a better cleaner. The best way to keep the solutions separate is to store them in spray bottles, properly labeled for the specific uses. Use pH neutral water so the alkalinity of the recommended solution is not affected.

Despite the name, all-purpose cleaners are usually not the most effective cleaners for all surfaces. Cleaners for specific surfaces usually work better than an all-purpose cleaner. And there are tasks that all-purpose cleaner should not be used for. For example, all-purpose cleaners should not be used as a:

- car wash soap.
- leather cleaner.
- wheel cleaner for removing brake dust.



Every workplace label requires the product name and any hazard warnings from the original label or SDS.

Most all-purpose cleaners are concentrates that are diluted and dispensed from a spray bottle. A workplace label must be applied to the spray bottle containing an all-purpose cleaner solution to properly identify the contents. Requirements for a workplace label are:

- the product name, as stated on the SDS.
- any hazardous warnings from the original label.

These are minimum requirements. A workplace label can contain more information, such as the purpose for the different all-purpose cleaner solutions. If the label information washes off, it is the responsibility of the repair facility to replace the label information or the label as soon as possible.

### Module Wrap Up

Topics discussed in this module included:

- using masking materials to reduce clean-up steps.
- tools that can be used for inspecting a finish.
- types of finish damage.
- detailing chemistry.

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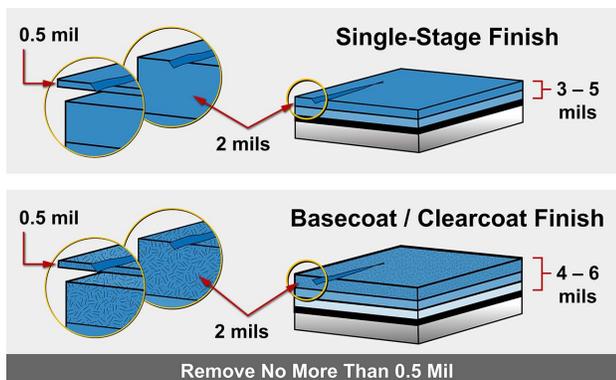
***Module 2 - Finish***  
***Defect Removal***

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## Film Thickness

Learning objectives for this module include:

- determining how to monitor film thickness and what to keep in mind on original finish and refinish.
- using clay and nib sanders for small defect removal.
- explaining why starting with the least aggressive method is important.
- using sanding equipment and techniques for removing finish defects.
- using buffing equipment and techniques for removing finish defects and restoring gloss.



*The general recommendation with an original OEM finish is to not remove more than one-half mil of topcoat when detailing.*

OEM basecoat / clearcoat and multi-stage finishes are usually about 4.0 - 6.0 mils thick. The clearcoat averages 2.0 mils thick. Single-stage finishes are 3.0 - 5.0 mils thick. Whenever removing a defect from an original OEM finish, the general recommendation is to remove no

more than 0.5 mil of topcoat. Removing excessive film thickness may cause:

- hazing.
- discoloring.
- peeling.
- finish failure.



*Monitor the film thickness to make sure you don't remove too much topcoat when detailing.*

On a refinished surface, how much topcoat can be removed depends on how much was applied. This is why it is important to ask the refinish technician how much clearcoat or single-stage color was applied. It is also important to know how much minimum clearcoat thickness the paint maker recommends that should remain after detailing to maintain proper UV protection and warranty preservation. The average is about 2.0 mils.

Some examples of paint maker recommendations for minimum clearcoat thickness that should remain after detailing to maintain proper UV protection and warranty preservation include:

- Akzo Nobel: 2.0 mils. The total film thickness on a new OEM

replacement part should be about 5.0 - 6.0 mils.

- Axalta: 1.8 or 2.0 mils, depending on the clearcoat.
- PPG: 2.0 mils.
- Sherwin-Williams: 2.0 - 3.0 mils.
- BASF: "2.0 mils of dry film clearcoat must remain over basecoat. If extensive sanding is anticipated, apply one additional coat of clearcoat."



To determine the film thickness before detailing, take several readings and average them.

Start the detailing repair plan by recording an initial film thickness reading. Monitor the film thickness frequently throughout the detailing steps, especially when sanding or buffing. When making the initial film thickness reading:

- take several readings. Film thickness may differ from panel to panel, and even across one panel. Average the readings to use as a starting point for buffing or sanding.
- a variable of more than 0.5 mil on one panel usually indicates a previous repair.

- an extreme change from fender-to-door or door-to-quarter panel may indicate a previous repair.
- an extreme change across one panel may mean body filler is present.
- the film build is usually less on vertical side panels than on horizontal panels.

All vehicles have an original, factory-applied E-coat of about 0.9 mil. Zinc-coated panels will measure about 0.5 mil thicker than panels without zinc coating.



Most paint makers have at least a minimum wait time before a freshly refinished surface can be sanded or buffed.

Defect removal from a fresh refinish is best done within a time window.

Detailing a new refinish:

- before the time window starts can damage the finish because it is too soft.
- after the time window ends could result in a finish that is too hard, making defect removal difficult.

The time window varies between 4 - 48 hours after the refinish topcoats have been applied. The length of this time window depends on:

- the method used to cure the finish, either air- or force-drying.
- the type of refinish material.
- the paint maker's recommendations.
- ambient conditions such as temperature and humidity.

Know the time window for the refinish material that was applied.

Specified time windows from some paint makers include:

- Akzo Nobel: Follow the recommended force-dry or bake guidelines and then allow repair to cool for 1 1/2 hours before detailing. There is no maximum limit.
- BASF: Wait 24 hours if air-dry or when cool after force-dry. There is no maximum limit.
- Axalta: Sand and polish within 2 - 12 hours after cool-down if force-dry. There is no maximum limit.
- PPG: Sand and polish when hard, typically 8 hours after air-dry. There is no maximum limit.
- Sherwin-Williams: Wait 1 1/2 - 2 hours after air-dry, or 20 minutes if force-dry after cool-down. There is no maximum limit.

## Overspray Removal Methods



Professional clay for removing defects is available. Do not use modeling clay.

Overspray is a common defect on a refinished vehicle. One of the most effective methods of removing overspray is the use of a clay bar. Several defects can be removed using clay. Clay is a nonaggressive material that:

- is specially formulated for defect removal. Modeling clay is NOT a substitute.
- works on any hard surface. Clay will not work on soft, porous trim or moldings, especially if contaminants have penetrated the surface.
- is effective for removing overspray because the overspray is on a surface that is not prepared for it. There is no chemical or mechanical bond, so the material sticks to the clay when it is rubbed across the surface.
- can reach where buffing or sanding may not, or where solvents may be damaging.



*Always keep the surface and the clay wet with the recommended lubricant, usually just a car wash soap and water solution.*

When using clay:

- always use the recommended lubricant, usually a car wash soap and water solution. Clay should not be used dry.
- contaminants will be loosened and captured in the clay, but all the residue will not. The area must be wiped with a thick-napped towel to capture the remaining loose contaminants.
- occasionally fold the clay to form a patty that exposes a new surface. Eventually, the clay bar should be replaced.
- discard if it is dropped. Clay will pick up any dirt or dust it falls on, which would likely scratch a surface.

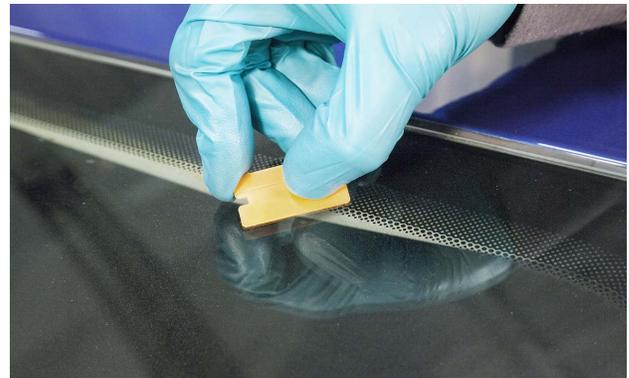
Ensure that the wiping cloth is lint free. Some clay comes with its own wiping cloth as part of the kit.

Ensure that the spray bottle containing the lubricant, even if it's car wash soap and

water, is properly labeled to identify the contents.



*Refer to Module 2, "Video: Using Clay" for a video showing clay being used to remove overspray.*



*Scraping with a plastic razor blade is another recommended overspray removal method.*



*Shown is one example of plastic razor blades.*

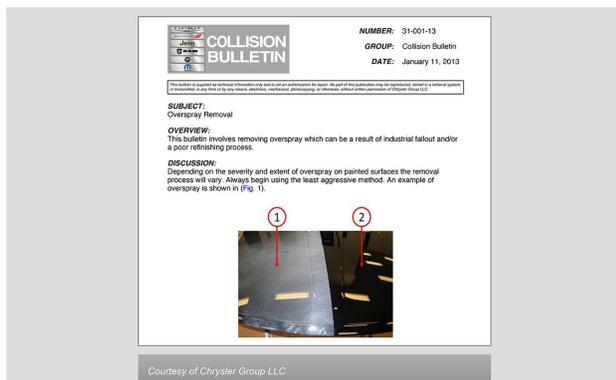
Besides clay, other methods for removing overspray include:

- scraping on glass with a plastic razor blade. Metal razor blades can easily scratch glass.
- applying a solvent from a spray bottle and wiping off the overspray.
- using a sponge pad and an adhesive cleaner on fresh overspray, or a mild buffing compound on dried overspray.
- sanding, followed by buffing. This is performed in extreme cases.

Do not use steel wool, which is too aggressive, and also leaves metal fibers in crevices that will corrode.

### KPI Improvement Tip

Proper removal of overspray will enhance customer satisfaction.



*Chrysler has a bulletin providing certain overspray removal procedures.*

Chrysler bulletin number 31-001-13 includes procedures for removing overspray resulting from:

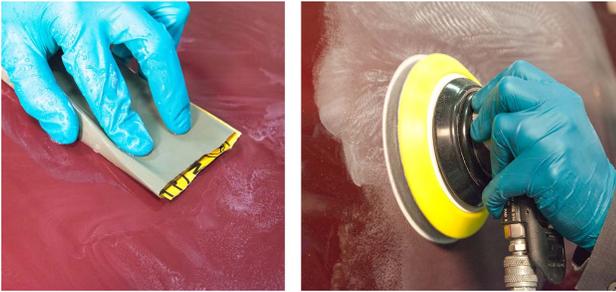
- industrial fallout.
- poor refinishing processes.

Depending on the severity and extent of the overspray, the removal process will vary. Always begin by using the least aggressive method. Some of the options include:

- washing with soap and water.
- using a detail spray and a microfiber cloth.
- using clay.
- using a rotary buffer with a foam pad along with buffing / polishing compound.
- wet sanding.

Measure the film thickness before and after buffing and sanding. Do not remove too much of the clearcoat. The bulletin states to not remove more than 0.2 mils of clearcoat when polishing, and not more than 0.5 mils when wet sanding.

## Sanding Process



Sanding processes include hand wet sanding and machine sanding. Wet sanding can be done by hand or machine. Dry sanding can be done by machine only.

The sanding process:

- is like planing the surface. The defect, such as excessive orange peel, is brought down to the level of the surrounding surface.
- keeps the correction area flat and in a small area.
- includes nib sanding, hand wet sanding, and machine dry and wet sanding. What process and tools to use depends on the size of the repair area, the tools available, and personal preference.
- requires starting with the sanding grit that will remove the defect, then progressing to finer grits to remove the previous grit scratches. It is not necessary to step through each grit. One grit can be skipped. As an example, the progression of grits in one system is P1000, P1200, P1500, P2000, and P3000. If starting with P1200, skip one grit and follow up with P2000. Do not skip two grits and go right to P3000. That would not be productive.



Nib removal tools remove one small defect at a time, by rubbing over the defect in a small circular motion.



Shown here is one example of a denibbing sanding machine.



Shown here is a self-contained abrasive block for nib sanding.



Shown here are various nib sanding tools.

Nib removal sanding tools are for removing small defects in a small area, such as dirt nibs, small runs, etc. These tools may be small sanding blocks or pads, or an electric denibbing tool.

The blocks come in five grits ranging from P400 to P3000. The mid-range grit, P1500 is good to start with for most defects. If this grit is not productive, start with a more aggressive grit. After the defect is removed, switch to wet sanding with the next finest grit to remove the scratches. Progress to finer grits until all scratches are gone, then finish with buffing the area to restore the gloss. The sanding pads accept specially sized, adhesive-backed sandpaper, also in progressively fine grits. Use the pads similar to the blocks, following with wet sanding and buffing. Generally, when using nib removal tools:

- keep the surface wet with a spray water bottle.
- move in a small, circular motion with little pressure.
- check the progress of the repair often.

One example of an electric denibbing tool is part of the 3M Perfect-It™ denibbing system. This system includes a 3-speed machine with 1000 grit and 1500 grit abrasive bits. The abrasive is attached to a small circular foam pad at the end of the bits. Machine polishing equipment is also part of this denibbing system.

Using the appropriate bit and denibbing machine speed setting, sanding is done using a light pressure, trying to not collapse the foam and keeping the abrasive moving. Using water may be necessary when denibbing some clearcoats. The machine speed settings include:

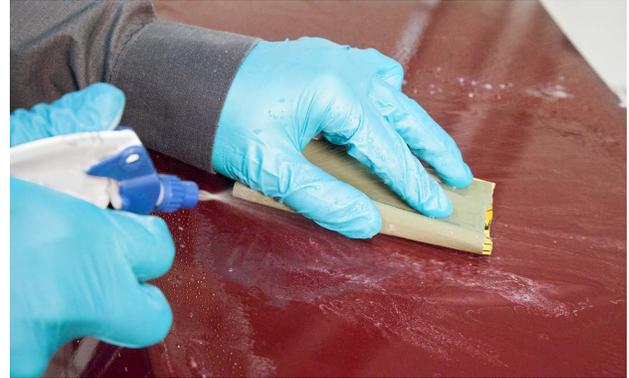
- slow, for soft / uncured surfaces.
- fast for hard / cured surfaces.
- medium. Medium speed is recommended as a starting point.



Refer to Module 2, "Video: Nib Sanding" for a video showing methods for nib sanding using nib sanding tools.



Hand wet sanding slowly and steadily planes the surface to remove the defects and bring the surrounding area level.



Listen and feel for dirt between the pad and the surface when wet sanding.



Shown here are examples of hand wet sanding sponges.

Wet sanding by hand is done using wet/dry sandpaper on a sponge-backing pad. The sandpaper may need presoaking.

When hand wet sanding, keep the surface wet with a water spray bottle or a running hose. Do not use a sponge dipped in a bucket, which makes it too easy to recycle the sanding sludge back onto the surface.

When hand wet sanding:

- listen and feel for dirt between the pad and the surface. One speck of dirt can scratch a surface beyond a detailing repair.
- generally, start with P1500. If there is no progress, start with the next aggressive grit, P1200. When the defect is removed, switch to a finer grit to remove the previous grit scratches, not skipping more than one grit. Cross the previous grit scratches diagonally with the finer grit, ending with the finest grit along body lines. It is easier to remove cross sandscratches than all parallel scratches.

After wet sanding with the finest grit, follow with buffing to remove sandscratches and restore the gloss.



Refer to Module 2, "Video: Wet Sanding" for a video showing methods for wet sanding.



Machine sanding can be wet or dry, and is done with a finishing sander.



Shown are examples of machine finish sanding materials.

The machine finish sanding process:

- includes dry sanding only, and dry or wet sanding, depending on the system used.
- uses a finishing sander. A finishing sander has a shorter stroke, and is therefore less aggressive, than a regular dual-action (DA) sander.
- usually uses a soft interface pad to make the process even more less aggressive than sanding with a regular DA.
- for grit selection, varies with the system being used. With some dry systems, the most aggressive starting grit is P800, which is equivalent to P1200 when hand wet sanding.

One example of a machine finish sanding system is the 3M Trizact™ system. This is a machine wet sanding system using a special P3000 grit disc, with or without an interface pad. The Trizact™ spot repair procedure begins by sanding with P1500 grit wet or dry, followed by machine wet sanding with the P3000 Trizact™ disc, followed by buffing with a special machine glaze. There is no need for buffing with a compound with spot repairs.



Refer to Module 2, "Video: Machine Finish Sanding" for a video on machine finish sanding techniques.

## Buffing



Compounds remove defects, polishes restore gloss and remove minor defects, and waxes provide protection.



Shown are various buffing products.

Three basic types of buffing materials are referenced in this Program for detailing. They include:

- compounds, for removing defects.
- polishes, for restoring gloss and removing very minor defects.
- waxes and sealants, for extended protection.

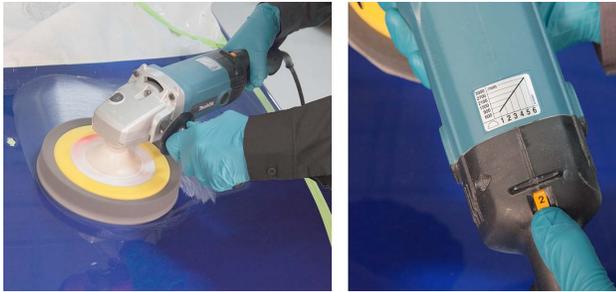
Product makers use different names to describe these materials. For example, compounds may be called a polishing, finishing, or rubbing compound, or a heavy-cut cleaner. Look at the recommended use and ingredients of the material, not the name.



The only way to ensure that buffing materials will work properly is to start and stay with one system of materials throughout the process.

When detailing, and especially with the buffing process, stay with one system of materials and equipment. This ensures that the:

- materials are compatible.
- proper steps are used in the right order.
- proper application tools and materials are used.



*It is necessary to become skilled with a professional rotary buffer for the best detailing.*

Machine compounds and polishes are best applied with a rotary buffer. Rotary buffers:

- are either electric or pneumatic.
- may be variable or at two fixed levels. Variable speed at the trigger with a range of 0 - 1,800 rpm is best. The speed should never exceed 2,000 rpm. Slower buffer speeds are recommended on bumper covers and other flexible plastic parts to minimize the generated heat.

Start a rotary buffer when it is on the panel. The speed is higher when the buffer is freewheeling off the panel. The more speed, the harder the buffer is to control and the more heat is generated from friction. Allow the weight of the buffer to do the work. Do not apply excess pressure, or too much heat will be generated.



*Wool or foam depends on the product maker recommendations and in some cases personal preference.*

Buffing pads are available in wool or foam. Foam buffing pads:

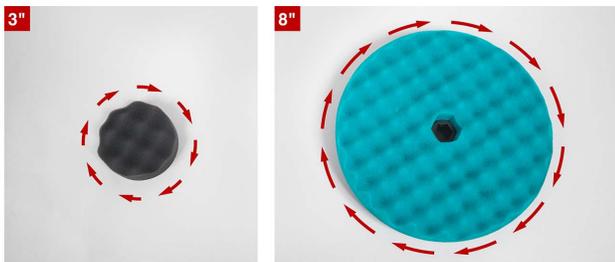
- do not give off lint.
- generate more heat than wool because there is more contact with the surface.

Wool buffing pads are:

- usually a wool / synthetic blend.
- naturally more aggressive than foam. For this reason, wool pads are more likely to leave swirl marks.

Wool pads, for both compounding and polishing, may have twisted or untwisted strands. Generally, twisted strand pads are more aggressive. This may require more skill to prevent swirl marks, especially with pads designed for use with compound. Two advantages of a twisted wool pad are that there is slower product buildup, and there is less lint released.

Whether to use wool or foam, and what type of wool or foam, is based mostly on the product maker's recommendation. The decision is also based on the condition of the surface, how fresh the refinish, the skill level of the technician, and personal preference.



Pad Size	3"	8"
Circumference	9.5"	25"
Edge Travel Per Minute At 1000 rpm	10,000"	25,000"

Study the chart. Smaller pads are less aggressive and easier to control because the edges are turning at a slower rate.

Buffing pads are available in different sizes, both in diameter and thickness. Generally, the smaller the pad, the:

- lower the edge speed. The outer edge of any pad, whether it is large or small, does most of the work, and therefore dries quicker. A slower edge speed will allow the material to stay wet longer than a faster edge speed on larger diameter pads.
- easier to control.
- easier to follow panel contours.



Always start with a clean pad and keep control of the buffer.



Shown are examples of buffing pad cleaners.

Generally, when using a power rotary buffer:

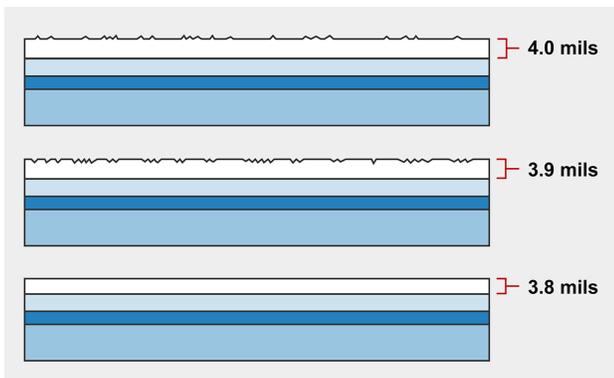
- always use a clean pad. Clean the pad before and during buffing to minimize swirl marks.
- change pads when switching to a different material. This applies to not only when switching between a compound and a polish, but also between compounds and between polishes. Most product makers have at least a two-step compound process, and different grades of polishes. Each of these products may require a different type of pad.

- buff away from a raised body line rather than into it. The finish is thinner along body lines. One option is to avoid body lines when machine buffing, or apply a strip of masking tape on the body line, to avoid cutting through. Later, work the body line by hand.
- if there are different contours on a panel, buff from a high to a low area. Do not buff from a low to a high area, such as between a hood and a fender. This may put too much pressure on the high area.

### KPI Improvement Tip

Using the proper buffing materials and methods will ensure a timely delivery and reduce rework.

### Other Existing Refinish Damage



*The only way to remove a scratch is to bring the surrounding surface down to the deepest level of the scratch.*

### Scratches in a finish:

- includes swirl marks and sandscratches.

- requires bringing the surrounding finish to the deepest depth of the scratch.
- requires sanding, buffing, or both, depending on the depth of the scratch.

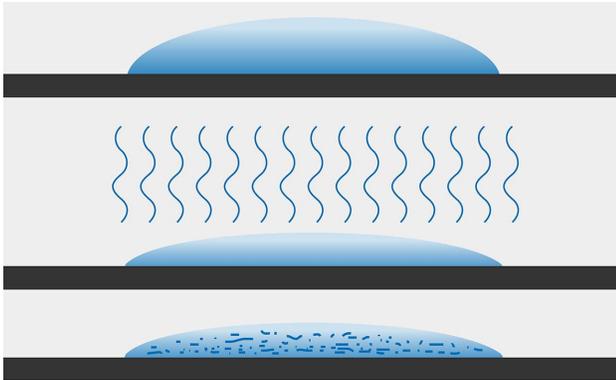


*If you can feel the scratch with your fingernail, it's too deep to be removed by detailing.*

Generally, if a scratch can be felt when drawing a fingernail backwards across it, it is at least 2 mils deep and cannot be removed by detailing. A scratch can also not be removed if:

- the primer is visible.
- it requires removing too much topcoat.

Use a low-power magnifier or magnifying glass to determine the depth of a scratch that cannot be felt.



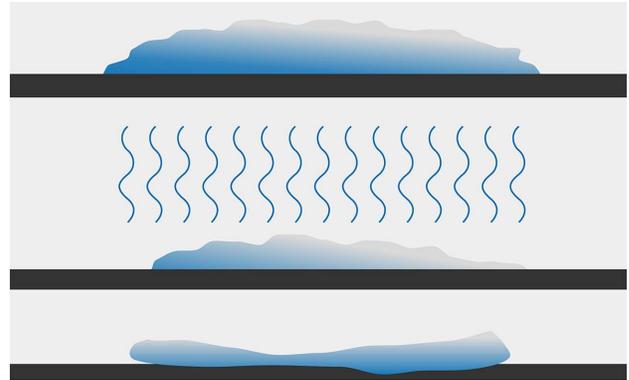
Water drops on the alkaline side of the pH scale contain minerals that can cause spotting after the water evaporates.

Hard water spotting, also called alkaline rain, can be caused by:

- evaporation of hard water, leaving mineral deposits on the finish.
- lime deposits from drops off fresh concrete.

Hard water spotting is usually just on the top of the surface, removable by a good car washing. If the problem is more severe, try a clay bar. As a last resort, use an acid solution of vinegar and water (one part white vinegar to two parts water), followed by a clean water rinse. This cannot be done on a fresh refinish.

Problems with hard water spotting evaporation is why one of the best times to wash a vehicle is after a light rain or heavy dew. Washing with car wash soap and water and drying will remove the drops before they have a chance to dry on the surface.



Water drops that are on the acid side of the pH scale become a problem when the water evaporates and the acid etches into the finish.

Acid rain:

- is rain contaminated with pollutants in the atmosphere.
- is weak when it first falls, but becomes more active when the water evaporates, because the acid is less diluted.
- can etch into or dull a finish. Finish color has no effect on how much acid rain will etch into a finish.



Repeated washings will remove most acid rain problems.

Treat acid rain damage by:

- assessing the damage. Determine whether the drops have etched into the finish.
- neutralizing the acid by washing and repeatedly rinsing. Use car wash soap or a slightly alkaline solution of all-purpose cleaner.
- polishing to restore the gloss, if needed.

If the damage is deep enough to be felt, it may require sanding to level the defect and possibly refinishing. It is still necessary, however, to first neutralize the acid or the problem will reappear.

If acid rain spots reappear after repeated rinses, apply a baking soda solution. Dilute 16 milliliters of baking soda per liter of water (one tablespoon per quart). Apply the solution with a spray bottle and rinse after no more than a few minutes.



*A severe case of industrial fallout like this requires clay.*

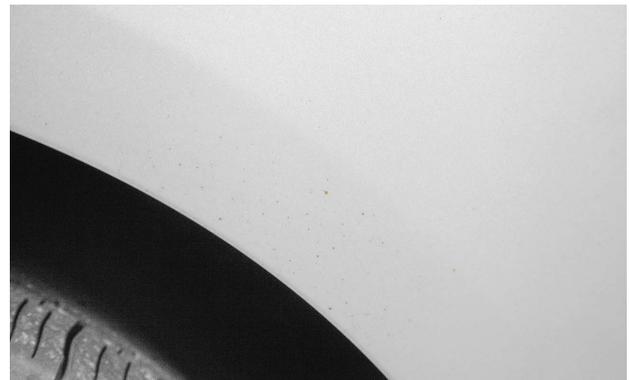
Industrial fallout is anything man-made that falls from the air. This includes:

- tiny particles from smokestacks.
- splatter from fresh asphalt roads.

- jet fuel contamination.

The fallout can be identified by a rough finish texture. Correcting the problem may require:

- a direct application of all-purpose cleaner, if the defects are just on the surface.
- a clay bar, if there are particles or an overspray of a material.
- buffing, if the defects remain after removing the fallout material.



*The corroded rail dust on this white panel is caused by worn metallic brake pads spitting out hot iron filings.*

Rail or metal dust is iron particles that settle into finished surfaces. Rail dust can come from several sources, including:

- railroad tracks. This fallout usually occurs when vehicles are being transported on rail from the vehicle maker. Most, if not all, of this rail dust is removed during the predelivery inspection process.

- iron filings from semimetallic brake pads as the brakes and rotors wear down.
- fallout from manufacturing plants that use steel such as foundries, fabrication shops, and stamping plants.
- metal grinding or welding sparks, especially when the finish is fresh.

Inspect for rail dust by:

- feeling for a rough finish. On dark colors, the particles may be more easily felt than seen.
- lightly rubbing with a cotton cloth. The imbedded particles may snag some lint off the cloth, which is easily seen.
- using a magnifier to look for small, sharp-edged, dark spots sticking up from the surface. There may be staining around the particles as corrosion forms, blue on dark colors and orange on light colors.



*Clay might work to remove rail dust, or a more aggressive acid solution might be needed.*

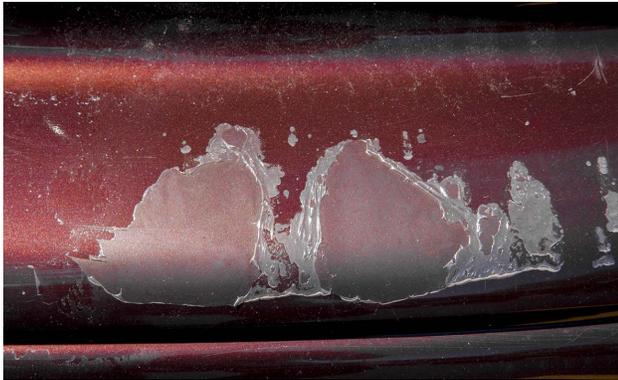
To remove rail dust, Do not sand or buff. The particles will likely break off at the top and scratch the surface beyond a detailing repair.

Assess the problem and remove by starting with the least aggressive method. Try a clay bar first. A clay bar will usually work, especially on brake dust. If clay does not work, there are at least three acid solution systems available, including a three-step system.

Oxalic acid, in gel or liquid form, should only be used as a last resort. When using oxalic acid, lay a wet towel on the vehicle surface for a few minutes to loosen the rail dust particles. A terry cloth towel should be used that has enough nap to allow the particles to embed in the napping.

Some examples of OEM rail dust removal recommendations include:

- Chrysler: clay only.
- Ford, Nissan, Mazda: The ValuGard A-B-C system. This is a three-step solution of acid neutralizer, alkaline neutralizer, and neutral surface conditioner.
- GM: clay first, then oxalic acid gel if there is still rail dust remaining.



*This vehicle has obvious clearcoat degradation.*

Clearcoat degradation is the result of a clearcoat being exposed to the ultraviolet (UV) rays of the sun for a long time. On single-stage finishes, the result is oxidation. Clearcoat degradation:

- is most severe on dark colors exposed to heat.
- looks dull, or whitish.
- can usually be corrected by buffing with a polish to restore the gloss.
- in extreme cases, requires refinishing.



*Bird droppings and insect residue are usually acidic and may over time etch into the surface just like acid rain.*

Organic fallout is contamination from natural sources. The fallout is almost all mildly acidic, which can etch a finish if the contaminant is not removed in a short time. Types of organic fallout include:

- insect residue. This is most easily removed with a clay bar.
- tree sap, which is usually water soluble. Terpenes from some pine trees will etch a finish. Use turpentine to remove tree sap that will not wash off with car wash soap and water.
- bird droppings, which are usually acidic but may be alkaline depending on the bird's diet. The easiest repair is to remove the droppings as soon as possible.
- salt spray, which can get behind moldings and trim and speed up the corrosion process. Rinsing with a pressure washer may be needed to force water into hidden areas. It may be necessary to remove trim pieces to make sure the salt is rinsed off.

After removing organic fallout, buffing with a polish or even a compound may be necessary to remove shallow craters and restore the gloss.

### Module Wrap Up

Topics discussed in this module included:

- monitoring film thickness and what to keep in mind on original finish and refinishing.

- using clay and nib sanders for small defect removal.
- starting with the least aggressive method.
- sanding equipment and techniques for removing finish defects.
- buffing equipment and techniques for removing finish defects and restoring gloss.

***Module 3 - Final  
Detailing***

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## Interior Detailing

Learning objectives for this module include:

- defining a detailer's checklist and why a checklist is important.
- defining materials for final exterior and interior detailing.
- removing a stain using the pH scale.
- removing odors.
- defining the final exterior touch-up steps.



*Using a checklist when detailing makes the job more efficient and consistent.*

The best way to ensure a final detail is done right is to use a checklist. A checklist:

- ensures that all steps are done, without repetition.
- ensures that the steps are done in the proper order.
- keeps the detailing process consistent from one vehicle to the next, and one detailing technician to the next.

- can be signed and given to the vehicle owner.

Download the I-CAR Detailing Checklist handout in PDF format. This handout presents a step-by-step checklist for the detailing process.



*Remove any loose dirt on interiors first by vacuuming.*



*Shown are examples of detailing brushes.*

Begin the interior detailing by vacuuming:

- vents and other tight areas. A soft detailing brush, ahead of the vacuum nozzle, will help work dirt off the surface. A simple detailing brush can be made for this purpose by cutting off a

- paintbrush. Tape the metal band to protect surfaces.
- carpets and seats using a stiff bristle brush to pick up the nap and work the dirt or salt out of the fabric.



*The goal of shampooing fabric surfaces is to remove dirt that vacuuming could not.*

After vacuuming, the next step is to shampoo the carpet and upholstery. When shampooing fabric carpet and upholstery:

- test if colorfast in a hidden area. If the color does not come off when blotting with a cloth soaked in the shampoo, it is colorfast.
- use a soft-bristled brush or coarse sponge to gently work the shampoo. A bristle brush will pick up the nap on fabric carpets and upholstery. Allow the material to do the work.
- clean the surface. Do not try and work the cleaner into the backing.
- use as little water as possible. If water soaks into the seat or carpet, it may cause flame-retardant material to come to the surface. It

- may also cause mildew. Consider a wet / dry vacuum to remove excess water.
- consider an extractor as an option. An extractor applies the water and shampoo and removes the solution in one step.

Only use a mild shampoo, close to pH 7, on seat belt fabric. Avoid chemical cleaners, especially petroleum-based cleaners, which will deteriorate the webbing.

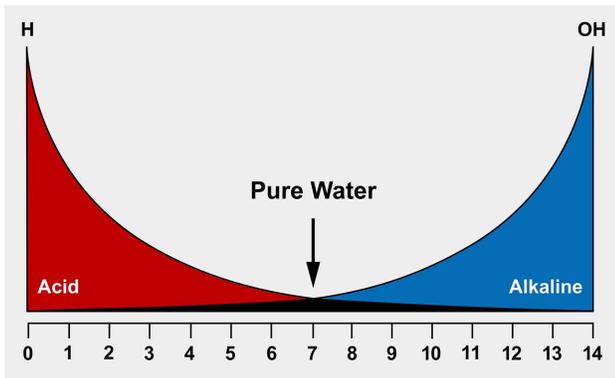


*Be gentle when cleaning headliners, wiping in one direction with a damp cloth.*

Fabric headliners are more delicate than seat fabric. To clean fabric headliners:

- use a slightly damp, folded towel, such as a microfiber towel. Wet the towel with all-purpose cleaner and wring it out.
- move in one direction, front to back, to keep the nap looking the same. Clean fabric sun visors the same way.
- Do not vacuum, scrub, or brush heavily.

## Stain Removal



Most interior stains are acidic.

Common stains in carpets and seats:

- are mostly acidic, or below 7 on the pH scale.
- can be neutralized with an alkaline solution, such as all-purpose cleaner. Alkaline stains, such as fresh eggs or water spots, can be neutralized with a mild acid solution, such as vinegar and water.
- enter in a liquid, which then evaporates leaving only the pigments. The stain must be made into a liquid again so it can be easily removed.

There may be traces of sodium hydroxide powder left after an airbag deployment. If mixed with water, sodium hydroxide becomes a strong alkaline. This is why it is very important to vacuum all traces of powder left after an airbag deployment, before the powder comes in contact with water.



A clean cloth, dull knife for scraping off solids, and a few cleaning solutions are all that's usually necessary for stain removal.

Materials and tools for removing stains include:

- a clean, absorbent cloth.
- a dull knife, for scraping up solid materials.
- cleaning solutions. Different strengths of all-purpose cleaner works for removing most stains.
- a spray bottle with clean water for rinsing.



The word to remember with stain removal is "blot," instead of the natural tendency to rub.

The best way to remove a stain is by applying the cleaning solution around the stain. This allows the solution to wick into the stain. If the solution is applied directly to the stain, the stain could spread.

Then use a clean, dry cloth and blot the stain. Follow with a water rinse and blot again. If the stain does not come out, repeat the process.



Refer to Module 3, "Video: Removing A Stain" for a video on stain removal techniques.

### Odor Removal



The first step when removing an odor is to find and remove the source.

Most odors are a by-product of bacteria. The first step in removing odors is to identify and remove the source. If the source is spilled food, for example, the first step is removing any remains of the spill, then cleaning the area.

A musty odor from the air conditioning (A/C) system, most noticeable when starting the vehicle, is usually from bacteria growing on the A/C evaporator core. This odor may be beyond a detailing repair. Depending on the air conditioning system, removing the source of that odor could mean:

- turning the defroster on and spraying an odor eliminator in the air intake vent.
- replacing an air filter.
- disassembling part of the system, cleaning out any debris on the evaporator core, and applying a disinfectant.

### KPI Improvement Tip

Customers will be more satisfied with the repair if there is no evidence of the odor in the vehicle. Bacteria as well as chemical products leave odors and have to be removed in order to eliminate the odor. This will enhance the customer satisfaction experience.



If it is necessary to apply a chemical, it should have no smell, but be designed to neutralize existing smells.

After removing the odor source, spray a chemical neutralizer or an odor remover, if this is needed. Do not spray or hang a deodorizer, which only masks an odor.

### Interior Treatments



Conditioners provide moisture to porous materials to prevent fading, drying, and cracking.

Conditioners or dressings:

- help prevent fading and drying.
- should be silicone-free for collision repair facilities. Silicone-free materials work just as well as materials that contain silicone.
- if high gloss, usually have another material in the product line that is low gloss for the tops of instrument panels.
- should not be applied on pedals or the steering wheel, because conditioners may make surfaces slippery.

### KPI Improvement Tip

Use of silicone products on any part of the vehicle causes significant refinish issues, such as fisheyes, and can be a source

of rework that will lengthen the repair process.



When cleaning and conditioning leather, only use cleaning and conditioning materials designed for use on leather.

Leather interior surfaces:

- may be natural or artificial hide.
- must be cleaned with a cleaner designed for leather, not vinyl.
- must be conditioned with a leather dressing or oil.

To avoid possible discoloration, test cleaners and dressings in a hidden area first.



Use specialized applicators and brushes or a regular cotton swab for hard-to-reach interior surfaces.

Treatments for some other interior surfaces include:

- using a cotton swab dipped in all-purpose cleaner for dirt on vents, radio controls, etc.
- removing window tinting film or decal remnants on glass with a plastic razor blade.

## Final Exterior Detailing



Condition weatherstripping with a dressing designed for exterior vinyl.



Shown is one example of dried polish remover.

The checklist for final exterior detailing includes:

- conditioning weatherstripping and other rubber and plastic.
- applying touch-up paint to nicks, if the vehicle was refinished and

there is a sample bottle of the exact finish available.

- removing masking from moldings that was left on for polishing.
- reapplying trim that was removed for polishing.
- using products that will remove compounds and polishes from grain textures.



When cleaning glass, make sure to clean the top edge of the door glass, which is often missed.

When cleaning glass:

- use a glass cleaner that does not contain ammonia on applied window tinting. Ammonia-based cleaners can damage applied tinting.
- make sure to clean the top edge of the door glass. This means lowering door glass or opening the door after cleaning the rest of the glass.
- wipe in only one direction, either just horizontally or just vertically. When wiping the other side of the glass, go the opposite direction. This makes it easy to see what side

of the glass a missed spot or streak is on.



*Wax is usually applied by hand, with a circular motion, and then wiped off after the surface glazes.*

#### Waxes and sealants:

- form a thin barrier coating, and help protect the finish from UV rays, acid rain, bird droppings, and minor abrasions.
- enhance finish gloss.
- may be considered a sacrificial coating.

Follow the paint maker's recommendation for when to apply wax on refinishes. Some paint makers say to wait up to 120 days. Other paint makers say if the vehicle can be buffed with polish, it can be waxed.

Only use waxes in a collision repair facility that Do not contain silicone.

Some examples of waiting time after refinishing before waxing include:

- Akzo Nobel requires no waiting time after refinishing before waxing. Their position is if the refinish can be buffed, it can be waxed.
- BASF requires waiting 30 days before applying wax to a refinished surface that was forced-dried, and 90 days before applying wax to a refinished surface that was air-dried.
- Axalta requires waiting 120 days before applying wax to a refinished surface.
- PPG recommends waiting 60–90 days before applying wax to a refinished surface.
- Sherwin-Williams requires a one week waiting time.

#### Final Check And Delivery



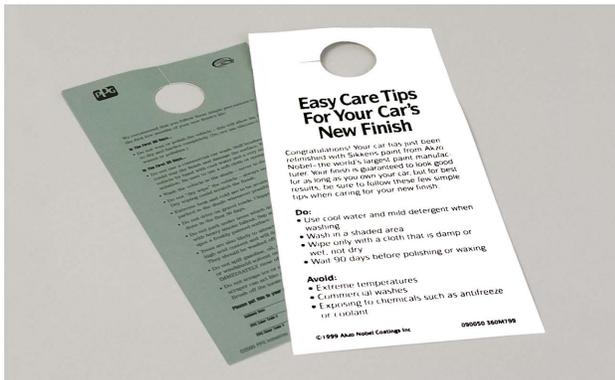
*During final exterior detailing, look under and in small areas for remaining polish or other buffing materials.*

When doing a final exterior check, look for excess polish or wax in hidden areas such as:

- around jambs.

- behind moldings.
- in emblems.
- in key holes.
- along the edges of graphics or pinstriping.

Remove the polish or wax with a small brush. A clay bar may work on trim and moldings. A microfiber towel may also work.



Paint makers usually have care tip sheets available to inform the vehicle owner how to take care of a newly refinished surface.

The checklist can be signed and given to the customer along with a care tip sheet. A care tip sheet explains how to take care of a newly refinished and detailed vehicle. For example:

- polish occasionally to protect the finish, (waiting time is only needed before waxing). The more routinely this is done, the least amount of work is involved.
- clean off bird droppings and tree sap quickly. These are acidic and can damage the finish.
- Do not allow rain drops to dry on the surface. One of the best times to wash a vehicle is after a light

rain or heavy dew. Be aware that some commercial car washes may damage a fresh refinish.

- Do not wash the vehicle in direct sunlight.

Care tip sheets are available for vehicle owners from paint makers as part of a lifetime warranty program.

### Detailing Extras



Vinyl tops are porous and may be textured, so use a circular cleaning motion to ensure all the dirt is removed.

Cleaning vinyl tops requires special procedures. Vinyl top surfaces:

- are especially porous and attract dirt into the pores and between the textured grains.
- may require brushing to work the cleaner into the surface. Brush or wipe in a circular pattern, occasionally reversing direction. The brush should not leave scratches when rubbed on skin.
- must be treated equally for the entire area to obtain a match. If only one area is cleaned, it will be obvious.

- are best cleaned by washing one side at a time, followed by a water rinse.



*Plastic windows and other clear or translucent plastic surfaces should be cleaned with materials designed for this purpose.*

Convertible windows are usually clear plastic. Do not use glass cleaners on clear plastic. There are special clear plastic cleaners and polishes available. These materials:

- remove fine scratches and swirls from clear plastic.
- can also be used on tail lamp lenses, instrument gauge lenses, and other clear plastic surfaces.



*A mild cleaning solution is all that's usually needed for cleaning wheels.*



*Using a too aggressive wheel cleaner can affect the wheel finish.*

Wheels are the most often damaged part on a vehicle when detailing. The damage usually results from using too aggressive of a wheel cleaner, or scratching the surface with a wheel brush. When cleaning wheels:

- use the least aggressive method that will do the job. Painted or clearcoated wheels may only require a mild all-purpose cleaner solution.
- wait until the wheel is cool. Washing wheels when the wheels are hot from driving affects chemical reactions of the cleaner being used. This may cause streaks or spots on the wheels that cannot be removed.

- clean one wheel at a time. This assures the cleaner will not dry on the surface, which lessens the cleaning action and makes it difficult to rinse clean. Follow the wheel cleaner maker's recommendations for the amount of time that the cleaner should be allowed to soak before rinsing.

Some wheels may not come clean. Brake dust or corrosion may be imbedded into the surface. If unreparable damage is suspected, try applying a small amount of aggressive buffing compound to a hidden spot on the wheel with a cloth. If the brake dust or corrosion does not come off, even an acid cleaner will likely not remove it.

If there is an acid wheel cleaner available in the product line the facility is using, use extreme care when using it. Acid wheel cleaners:

- may contain hydrofluoric acid, which can damage a wheel quickly and be hazardous to the technician.
- are designed to remove imbedded brake dust on aluminum or wire wheels. The cleaners are not designed for clearcoated, painted, or polished wheels.
- should only be applied to the wheels and not on any other surface. Also make sure the cleaner is only in contact with the wheels for the time recommended by the product maker.

- are hazardous. Wear acid-resistant (neoprene) gloves, safety glasses, and a respirator, as required by the product maker.



*Use a dressing designed for tires, but if the application is in a collision repair facility, stay away from silicone-containing dressings.*

After washing the wheels and tires, apply a tire dressing that is specifically made for external rubber surfaces. Tire dressings:

- give tires a new-like black appearance.
- may also be used on unpainted black bumper surfaces.
- should be silicone-free if used in a collision repair facility.



A degreaser solution can be applied to the engine compartment.

If engine cleaning will be part of the detailing steps, it should be done first because the engine is often the dirtiest part of the vehicle. To clean the engine:

- park the vehicle in a wet bay where there is a drain and access to water.
- check for exposed electrical terminals that shouldn't get wet. Plastic wrap or bags may be used to wrap around the electrical terminals and the terminal side of computer modules. Tape can be used to keep the plastic in place during the cleaning. Many terminals are watertight and don't need protection. Other terminals are vulnerable to water or degreaser penetration, especially those that face up or to the front where the water will be directed. Water or degreaser can easily short out a computer module. The saying, better safe than sorry, really applies here.
- apply a mild degreaser solution using a spray bottle to the entire engine compartment. Use a brush to work the degreaser where the

dirt or grease is built up. Most degreasers work best if allowed to sit for a few minutes.

A water hose without a nozzle can be used to rinse off the degreaser solution. Rinse off the engine from the top down. Allow the engine a few minutes to dry, then remove the plastic coverings. A silicone-free dressing can be applied to complete the cleaning process.

### Module Wrap Up

Topics discussed in this module included:

- a detailer's checklist and why a checklist is important.
- materials for final exterior and interior detailing.
- removing a stain using the pH scale.
- removing odors.
- final exterior touch-up steps.

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