Textbook

Surface Preparation and Masking (REF02e)

I-CAR®

Version: 4.2

REF02e-STMAN1-E

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Contents

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Module 1 - Finish Identification

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Finishes And Refinish Materials

Learning objectives for this module include:

- identifying the types of personal protection required for refinishing.
- identifying the types of refinish primers.
- identifying the types of OEM finishes.

Wearing the proper personal protection equipment prevents hazardous materials from entering the body.

Working with refinish materials requires particular attention to personal safety. Refinish materials contain chemicals, that when handled during mixing or atomized through the application process, become a personal safety issue. Whether inhaled or spilled on the skin, hazardous materials can enter the body and cause serious health issues.

For this reason, personal protection equipment (PPE) is required when working with refinishing materials. This includes:

- eye protection. To protect eyes, wear safety goggles or a supplied-air respirator when refinishing. It is also important to know the location of the eye wash station in case of an emergency.
- hand protection, such as chemical-resistant gloves. Wear gloves made of butyl rubber, neoprene, or nitrile rubber for the best protection from refinish materials.
- clothing (paint suit). Paint suits are designed to prevent exposure to material overspray or isocyanates. There are a variety of materials that paint suits are made of that prevent exposure to refinish materials. These suits may be made of cotton, nylon, or a paper material. Paint suits are designed to be disposable and may have a limited effective life.
- air-purifiying respirator or supplied-air respirator. If using a cartridge respirator, be sure to change out the cartridges on a scheduled basis and that the proper cartridges are being used for the material being sprayed.

These are examples of primers, basecoats, and clearcoats that are made by Glasurit.

Types of materials used for refinishing include:

- additives, such as adhesion promoters or blending additives. Adhesion promoters are typically used on plastic to help the adhesion of refinish materials. A blending additive is used before refinishing a spot repair that requires blending into the panel.
- corrosion-resistant primers. In addition to providing corrosion resistance, these primers may also be used to aid in material adhesion.
- primer-surfacers, which are used to fill very minor scratches and aid in leveling a surface.
- primer-sealers, which are used to aid in adhesion of the topcoat to the primer-surfacer and help with color hold-out.
- basecoat and clearcoat. Some vehicle maker finishes include a translucent pearl or translucent colored midcoat. This is called a tri-coat finish. Some custom finishes include multiple layers of tinted clearcoat, however, for the purposes of this course, the topics will remain related to factory finishes.

These are examples of metal cleaner and conversion coating used for bare metal corrosion protection.

Metal cleaners and conversion coatings are used on exposed metal. The metal cleaner is:

- a phosphoric acid-based cleaner.
- used to deep clean a metal surface.

Following the application of the cleaner, a phosphoric acid-based conditioner is used. This places an even layer of zinc phosphate on either galvanized or bare steel surfaces. Galvanizing is the process of applying a zinc coating to sheet steel during the steel manufacturing process.

Using these preparation steps and materials helps replace the corrosion protection material that may be lost by removal of the galvanized coating. Conversion coatings:

- chemically adhere to the base material.
- aid in corrosion protection.

Using metal cleaner and conversion coating is a process most often done on restorations projects rather than in production repair facilities.

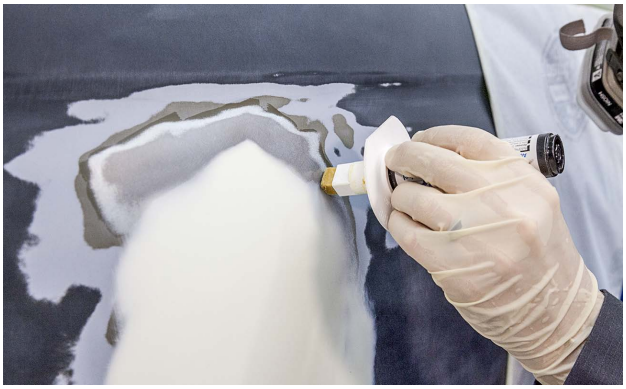
There are several product makers for expoxy primer.

This epoxy primer is being applied over body filler.

An epoxy primer:

- may be a one- or two-part material. Two-part primers use a catalyst to cure rather than evaporation of solvent. One-part epoxy primers, or epoxy esters, are not prominent in the collision industry.
- may be a two-part aerosol. Two-part aerosols have a limited shelf life once tapped.
- may require that a metal conditioner and conversion coating be applied first.
- may adhere best to nongalvanized metal.
- may be recommended under plastic body filler by some vehicle makers. Toyota recommends this practice. This is because when fillers are applied over the type of zinc coating process used by Toyota, the filler material will not adhere adequately. Blistering or peeling may result.
- is not intended for filling minor surface imperfections.

These are examples of self-etching primers made by several different manufacturers



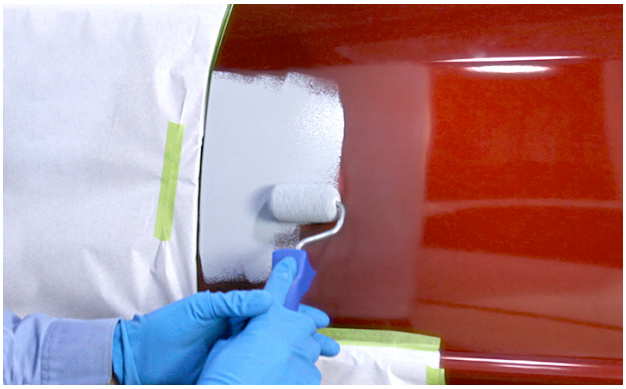
This application stick allows self-etching primer to be applied to bare metal only.

Self-etching primers:

- which contain acid, are designed to chemically etch into the bare metal surface they are applied to.
- offer a good corrosion-resistant surface.
- can provide good topcoat adhesion.

Wash primers are a form of self-etching primer that are even thinner than self-etching primers when applied.

A spray gun with a plastic or lined paint cup is recommended when using self-etching primers. This will prevent a metal cup from becoming etched and damaged from the acid in the primer.



Axalta offers a primer-surfacer which can be applied with a roller.

Primer-surfacer:

- has high-build characteristics, allowing it to be used to level out the surface.
- requires sanding after application.
- helps hide contour mapping. Contour mapping is the outlining of body filler that has not been properly prepared or the inadequate hiding of surface defects, such as a hard tape line or a poorly prepared featheredge that has shrunk or swelled.
- can be waterborne. PPG has a waterborne primer-surfacer, EPW115 and P950-5505, that requires no etch primer and can be applied over bare metal. They are also one part, so there are no pot life issues. Waterborne direct-to-metal contains corrosion inhibitors, which are required for waterborne products to be applied directly to bare metal.

Sherwin-Williams has a direct-to-metal primer-surfacer, but only for use on a spot repair that is 5" in diameter or smaller. A

repair greater than that diameter must first have self-etching primer applied before the primer-surfacer.

This sealer is being applied over a scuffed hood.

Sealers:

- are applied over primer, primer-surfacer, properly prepared E-coat, or sanded basecoat / clearcoat. Sealer is applied before the color or basecoat.
- provide adhesion for the basecoat and protect the primer from basecoat solvents. Sealer application can reduce the risk of sandscratch swelling, shrinkage, and solvent absorption.
- have limited film-build characteristics and are not designed to fill surface imperfections.
- are generally not sanded, but nibs or imperfections can be scuffed and another coat of sealer applied. Sanding is required if sealer is not topcoated for an extended period of time. Check the paint maker specifications for recommendations.
- may be tinted or tintable for better hiding. A variety of shades may be available to reduce the number of topcoats that are required.
- provide color holdout to prevent primer spots from showing through and for overall hiding and uniformity.

The difference between a sealer and a primer-sealer is that a primer-sealer can be applied over bare metal. Sealer are not designed for bare metal but will protect minor scratches that go through to bare metal.

Some products, such as these, are waterborne primer-surfacers that offer corrosion protection over bare steel.

Direct-to-metal primers:

- are a two-part material that can be applied directly to a bare metal surface.
- work similar to a self-etching or epoxy primer.

Some may be used as a sealer or a surfacer, depending on how it is reduced. There is no need to apply a separate primer and sealer because it works as both.

The following paint makers have a primer that may either be applied to a bare metal surface or to an E-coated surface:

- Axalta
- PPG
- Sherwin Williams
- Akzo Nobel
- Glasurit

All of the products are referred to as direct-to-metal primers.

This adhesion promoter is being applied to bare plastic before priming.

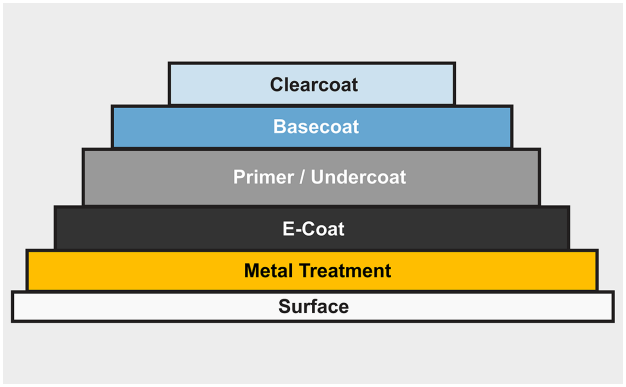
Adhesion promoters are generally:

- used on bare, sanded plastic parts.
- required on polyolefin plastic.

OEM finishes can be made up of multiple layers.

The different types of OEM finishes that may be used on a vehicle include:

- single-stage, which is rarely used in vehicle production anymore.
- basecoat / clearcoat. This is the most common finish offered by vehicle makers.
- tri-coat, which includes a midcoat between the basecoat and clearcoat.



A basecoat / clearcoat finish is built over the top of metal treatment, E-coat, and primer.

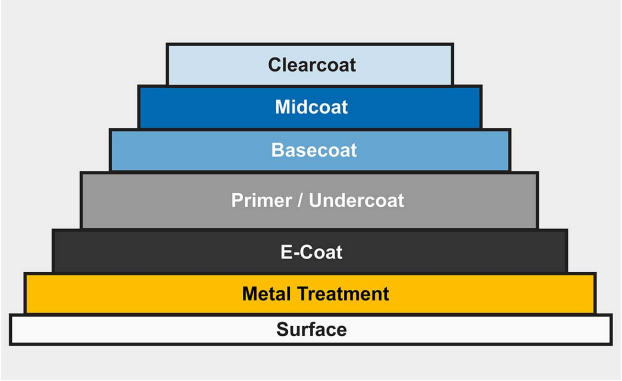
Basecoats are:

- the color coat.

- not designed to provide a gloss appearance.
- followed by an application of clearcoat.
- either a solid color, metallic, or mica.

Clearcoats are used to:

- provide basecoat protection against the sun's ultraviolet (UV) rays. This protection keeps the basecoat from delaminating, peeling, and turning hazy.
- protect against abrasions and damage to the basecoat.
- enhance the appearance and color of the basecoat.



A tri-coat finish has a midcoat sandwiched between the basecoat and the clearcoat that may consist of micas or pearls.

A tri-coat is the addition of a midcoat between the basecoat and the clearcoat. Midcoats are applied to help accent the color appearance of a finish. The midcoat may consist of a translucent-colored basecoat, which typically contains mica. Mica is the additive used to create pearl coatings. It adds a metallic sheen to the appearance of a finish.

Developing A Refinishing Plan

The paint code for this vehicle is located on the door shell.

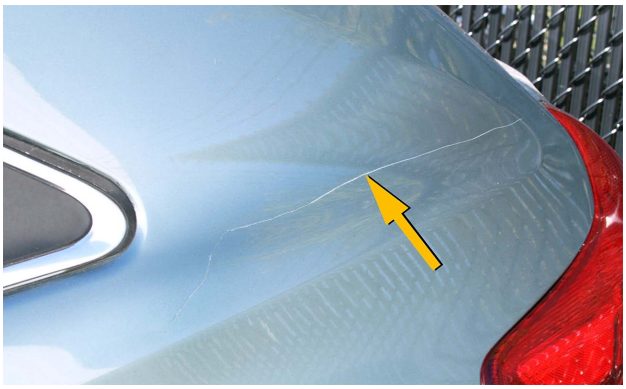
When determining the type of finish system used on a vehicle, the paint code needs to be located. Finish identification needs to be understood to allow for a proper color match.

Paint code labels may be located:

- on door pillars.
- on the radiator core support.
- on strut towers.
- on the floor pan.
- under the passenger or driver seat.
- inside the trunk.
- inside the glove box.
- inside the center console.

Depending on the refinish system used, some paint makers publish books that show an image of the paint label and where the paint code is located. Some paint makers list, per vehicle, where the paint code label might be located and displays a variety of paint chips with the

OEM paint code listed. This allows the refinisher to compare colors and also have the paint code.

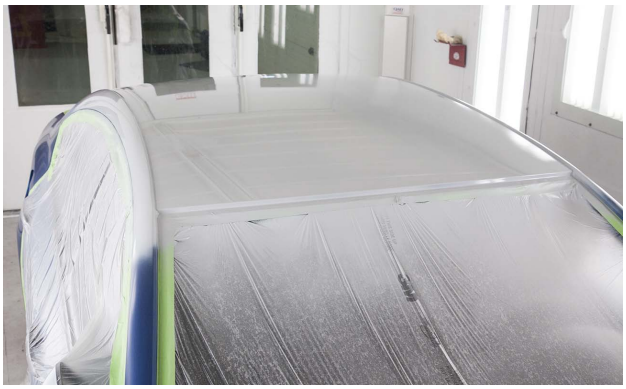


It needs to be determined if this scratch requires light sanding for prep, or if it needs to be sanded to bare metal.

Before refinishing can begin, there needs to be a plan developed about how the refinishing will be performed. The refinishing plan should include:

- the type and size of damage that occurred.
- determining whether or not the damage can be corrected by detailing or if refinishing is needed.
- if the existing finish will need to be removed partially or completely.
- whether panel edging will be needed.
- determining whether or not the adjacent panels need to be blended.

As a refinishing plan is developed, there must be a decision made regarding whether parts of a vehicle should be removed or masked. Is it best to remove trim or glass or is masking the areas the best decision? Sometimes there may be paint maker or OEM warranty concerns that mandate how a vehicle part is protected.



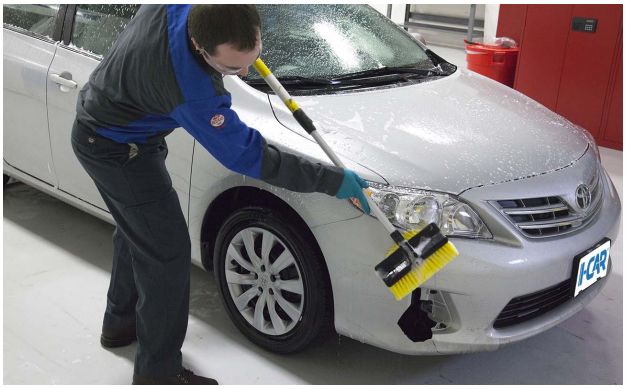
This sealer was applied over an E-coated replacement part.

When developing a refinishing plan, it is also important to identify the substrate. Substrates are any surface that offers a sound foundation for the application of refinish materials. Examples include:

- the original OEM finish.
- E-coat.
- primer.
- a refinish.

Substrates can also be base material such as:

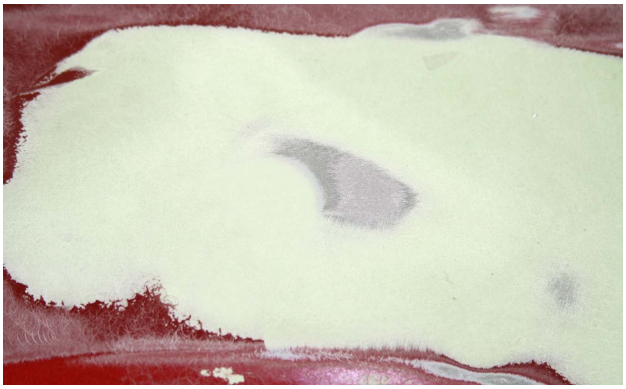
- steel.
- aluminum.
- plastic, both rigid and flexible.



Cleaning with soap and water first helps remove surface contaminants.

When cleaning a surface for inspection, always start with mild water-based products and work into stronger solvent-based products that will not affect the base material or substrate.

As surface cleaning begins, keep the surface wet. This allows the debris to float to the surface and not be re-embedded into the finish. Use one towel for washing the surface and a separate towel for wiping off the surface.



Inspecting a featheredge will reveal the number of finish coats applied to an area.

Featheredging is done to ensure a smooth transition from the repair area to the undamaged area. When inspecting the featheredge, look for:

- whether the finish is basecoat / clearcoat or a tri-coat system.
- the amount and number of finish coats applied.
- whether there is good finish adhesion.
- if there is acceptable film thickness.

A film thickness reading of 3.82 mils should allow additional coatings to be applied without any problems.

Paint makers have limits as to the maximum amount of refinish material that should be applied. This thickness is the total amount of material on a surface after all coatings have been applied.

If a vehicle or panel is to be refinished, the technician needs to identify the total film build on the surface of the part. OEM paint film thickness is generally about 4 to 6 mils. Some vehicle areas may have chip-resistant coatings that, when measured, will reveal a thicker film build.

If the film thickness is 11 mils and an additional 5 mils are required to achieve proper refinishing, the original

11 mil surface thickness needs to be removed down to about 5 or 6 mils before refinishing can begin.

These are examples of film thickness gauges that work on ferrous metals.

Film thickness gauges are used to measure refinish material film thickness. Depending on the type of film thickness gauge, it may be able to measure film thickness on a variety of surfaces. This is because the gauge may be designed to operate on any metal or just steel (ferrous). Depending on the gauge, it may be electronic or magnetic.

Film thickness gauges measure film thicknesses in mils or microns. One mil is 0.025 mm or 1/1000 of one inch. One micron is 1/1000 of one millimeter.

It may be necessary to remove refinish coatings if they are too thick.

When determining if the finish is original or not, identify how much of the total finish is basecoat / clearcoat. This will help determine if there is body filler used or if the surface was previously refinished.

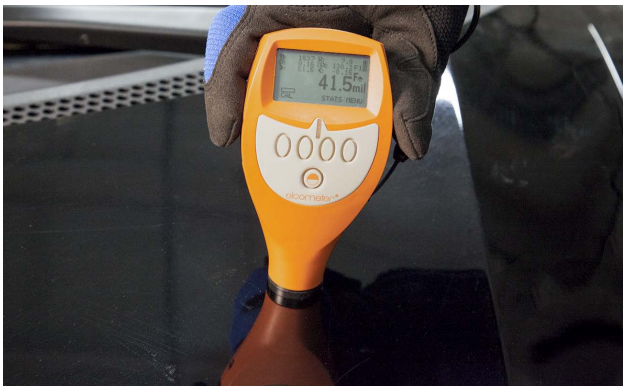
There may be instances when the vehicle has never been in a collision, but the film thickness shows that the panel has been refinished. This happens due to damage that occurred at the factory. Even though the vehicle is refinished, it still may be considered an OEM finish.

Paint makers may require stripping areas that have unidentifiable refinish materials. Removing surfaces with unidentifiable materials can aid in starting with a good foundation at which topcoats can be applied.

The poor color match on this vehicle is an indicator that it has been refinished.

Signs that a vehicle has been refinished include:

- overspray.
- different colors on inner panel areas.
- a poor color match.
- tape lines.
- a different surface texture.



Extreme film thickness, as shown here, is a good indicator of filler material below the finish.

Fillers are identified in the refinishing area using a film thickness gauge. Note that when applying body filler over the top of a painted surface, the filler may expand and contract. This will cause contour mapping around the filler area. Contour mapping is when the filler area is visible through the refinished area.

If it is determined that the refinish must be removed over the area of filler, special care must be taken to not gouge the surface of the filler.

KPI Improvement Tip

Identifying the process for filler application ahead of time will help ensure that the filler does not show through the finish after the owner takes the vehicle home. This will result in rework and lower CSI.

This shows a soft area of the uncured finish that easily peeled from the pinchweld.

The need to identify uncured finishes is important. An uncured finish will be weak and will not be resilient to abuse. An uncured finish:

- may feel soft and pliable, almost rubbery.
- will not hold up to abuse. The finish may chip or scratch easily.

- featheredge, if used, may have poor adhesion and may lift off during sanding.
- may cause lifting to occur during refinish applications.

This shows a clearcoat with adhesion problems.

From the OEM or after a complete refinish procedure, there is the possibility that the coating materials will not adhere to the substrate. This may be caused by contaminants in the coatings or on the surface. Adhesion problems may be identified when:

- the finish or refinish can be removed easily.
- the finish or refinish can be removed in sheets or in whole intact sections.
- there are areas of the featheredge that lift and separate from each other.

This mild corrosion issue must be repaired before a refinish is applied.

Before any coatings can be applied, any surface defects and / or corrosion must be identified and corrected. If the defects are not corrected, a poor finish may occur. Defects cannot be buried with additional coatings. They must be removed before moving forward.

When working over or near corrosion, the proper tools, products, and techniques must be followed to obtain a quality refinish.

Module Wrap Up

Topics discussed in this module included types of:

- personal protection required for refinishing.
- refinish primers.
- OEM finishes.

Module 2 - Finish Protection And Removal

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Masking Or Removing Parts

Learning objectives for this module include:

- determining when to mask or remove a part.
- identifying different types of masking equipment and materials.
- understanding the various types of masking techniques.
- explaining how to mask for primer or basecoat / clearcoat.
- determining when finish coatings should be removed.
- explaining the various techniques used for coating removal.

Proper masking ensures overspray does not damage the finish or parts away from the repair area.

Except for the area to be refinished and any blending areas, the vehicle should be covered and protected from overspray.

Inadequate overspray protection can extend the amount of time needed by the detailer. When protecting adjacent areas from overspray:

- completely cover all of the wheels.
- ensure that the trunk and engine compartment are covered completely.
- use aperture tape to prevent overspray from entering panel gaps.

Overspray that contacts adjacent panels, parts, or enters panel gaps needs to be removed to provide a repair that is as close to undetectable as possible.

KPI Improvement Tip

Making sure overspray is limited or prevented will reduce touch time and cycle time.

Door handle removal rather than masking may be recommended when refinishing a door skin.

There are no clear guidelines for when a part should be masked or removed. When deciding whether to mask or remove a part, consider:

- vehicle maker or paint maker warranties.
- part location.

- part access for removal or for masking. The design of a vehicle door handle, molding, or emblem may determine what should be done.
- if the parts or hardware are reusable. For example, some moldings, trim, and clips may require replacement if removed.
- the ability to properly sand the surface adjacent to the part. Proper sanding affects overall refinish material adhesion, either chemical or mechanical. A part that is difficult to sand around may also be difficult to clean and mask.

KPI Improvement Tip

When determining whether to mask or remove a part, it is important to note customer expectations with regard to the finish. This can affect CSI.

Improper masking led to improper refinish coverage.

Improper masking may require:

- refinishing or touching-up areas that were not supposed to be refinished but now require it because they were incorrectly masked.
- removing overspray from areas that were insufficiently masked. Overspray that contacts adjacent panels, parts, or enters panel gaps should be removed to provide a repair that is as close to undetectable as possible. The process of removing overspray extends the amount of time needed by the detailer and may extend refinishing time when severe.
- replacing moldings or weatherstripping that were permanently damaged by the overspray.

KPI Improvement Tip

Performing rework and part replacement to compensate for overspray or bad tape lines increases touch time and decreases cycle time as well as create additional part costs.

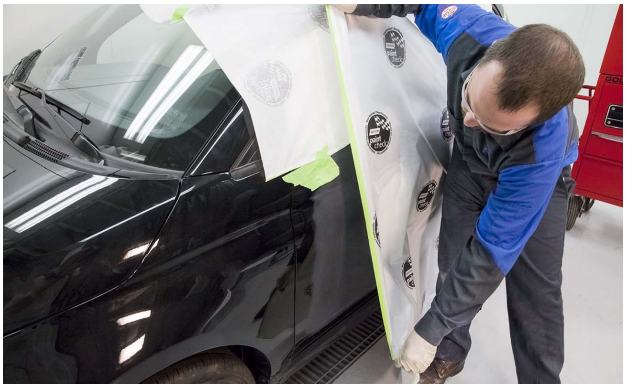
Refer to the Video: Masking With Plastic in the presentation. This video demonstrates how to apply plastic

sheeting to the vehicle to prevent overspray.

Plastic masking is unfolded over the vehicle.

Plastic masking materials:

- should be resistant to the chemicals and solvents contained within refinish materials.
- is often used to cover larger areas, such as the body of the vehicle away from the area being refinished.
- range from 12" to 16' in width.



Paper masking is often used in the area adjacent to the panel being refinished.

There are special types of solvent-resistant paper used to mask off a vehicle. A quality masking paper:

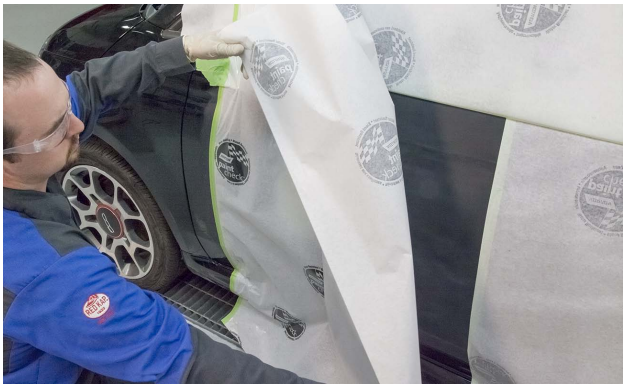
- should hold up well to water when wet sanding. Traditional masking products may not work with waterborne refinish materials because of high-water content.
- should not have loose fibers that can get trapped in the refinish.
- should be heat resistant when exposed to a spraybooth baking cycle.
- may be a special type that is solvent resistant.

These papers can range in sizes from 3" to 36".

When masking a vehicle or part with masking paper and tape:

- the paper and tape should lie flat on the surface of the vehicle.
- hard paint lines may result if this is done on the wrong area of the vehicle. Typically, this type of taping is done away from the refinish area where refinish materials will not be applied.

Refer to the Video: Reverse Masking in the presentation. This video demonstrates the proper technique for applying reverse masking to a vehicle.



Reverse masking requires folder the masking paper back against itself.

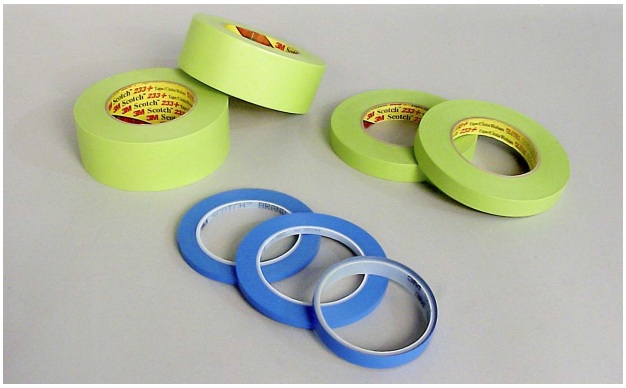
Reverse masking helps eliminate a hard tape line.

Reverse masking helps eliminate a hard tape line.

Notice the curved edge of the masking. This provides the soft edge for refinishing.

A technique called reverse masking can be used to avoid hard spray lines. Reverse masking:

- aids in a soft transition to the masking paper.
- is done by taping the masking paper over the repair area and folding the masking paper backwards. This creates an arch in the paper, allowing a soft, invisible tape line.
- is used when masking along bodylines or other natural breaks when only part of a panel is to be refinished or blended. It can also be used when masking jambs.



A variety of masking tape thicknesses are used for the masking process.

Automotive grade masking tape:

- differs from household tape.
- is available in a variety of widths and colors.
- often has a special treatment to allow for solvent and moisture resistance that minimizes bleed through.

Width sizes for automotive masking include:

- 1/4 - 1/2".
- 3/4 - 1-1/2".
- 2 - 3".

There are specialty tapes used for covering trim, outlining door handles, covering door locks, and around light assemblies. These tapes come in widths of:

- 1/16 - 3/32".
- 1/8 - 3/16".
- 1/4 - 3/8".
- 1/2 - 3/4".

Different types and brands of masking tape may be listed in product books as both metric and standard measurements.

Refer to the Video: Back Masking in the presentation. This video demonstrates the proper technique for applying back masking to a vehicle.

Back masking is often used on the fuel filler area.

Back masking:

- prevents overspray from getting behind panels.
- is used for holes in panels, openings, and around edges of panels. For example, back

masking is used around a wheel opening, fuel filler cap opening, door opening, trunk opening, window openings where the glass has been removed, and door handle and lock cylinder holes.

- is applying masking tape to the underside edge of the opening so that half of the tape hangs over the edge. The masking tape should be visible along the entire edge of the opening.
- is applying masking paper to the adhesive side of the masking tape that is exposed in the opening. If the opening is small enough, masking tape may be used to fill the opening and masking paper may not be required.

These are examples of tape types used for fine line masking.

Fine line masking is used when masking a flush-mounted part. For example, a part that is tight to a panel and has a small rubber grommet around it may require fine line masking. When fine line or flush-mounted masking:

- mask up to 3 mm of the edge of the part.
- use 6 mm fine line tape and mask up to the edge of the part.
- leave a “tail” or tab on the end of the masking tape to make removal easier.
- remove the fine line tape while the clearcoat is still wet.

Fine line masking tape may also be used when two-tone painting and custom painting.

Refer to the Video: Foam Tape Masking in the presentation. This video demonstrates how to apply foam tape in body apertures to prevent overspray.

These are examples of different types of aperture tape that are available, with different widths and thicknesses.

Aperture tape is being applied to the door opening.

Aperture tape is applied around the entire door opening, along the dog leg area and outer rocker panel.

Aperture tape, or jamb masking, is a soft, foam-type material used to prevent unwanted overspray. It also provides a soft edge to prevent tape lines in the jamb areas. Aperture tape is frequently applied in between:

- door gaps.
- deck lid to quarter panel gaps.
- the hood to fender gaps.
- fuel door gaps.

Refer to the Video: Lift Tape Masking in the presentation. This video demonstrates how to use lift tape to hold the trim away from the vehicle surface for refinishing.

This shows the various thicknesses and types of lifting tape that are available.

Lifting tape is being applied to quarter glass molding.

Relief cuts in the lifting tape are used to help mask the corner of the quarter glass.

Lifting tape is applied around the entire quarter glass to pull the molding away from the refinish area.

Lifting tape, or trim masking tape:

- is used around trim and moldings, including flush-mounted windshields, side glass, and backglass moldings.
- holds the trim or molding up and away from the surface so that refinish materials can be applied to the surface beneath the trim or molding.
- may have a plastic edge, adhesive, or be a plastic rope-like material that is inserted under the trim or molding to lift the trim or molding off of the surface.

Refer to the Video: Masking For Primer in the presentation. This video demonstrates how to mask for primer application.

This area is being masked for primer application.

When masking before applying primers:

- spray lines should be soft. Do not make a hard spray line.
- mask off the jambs from overspray.
- keep the area as small as possible. The entire panel may not need to be primed.

When masking for a blend area, use masking techniques designed for blend areas such as reverse masking.

This masking machine is designed to hold multiple sizes and various types of masking materials.

Masking machines:

- are used to hold paper, plastic, and tape rolls.
- are mobile carts. A technician can use a masking machine to take a variety of masking materials to the area where masking is to be performed.
- apply the tape to the paper when dispensed.

The masking tape is pulled back against itself during removal.

When removing masking materials:

- the tape should be pulled off so that it is flat against itself.
- the tape should be removed when the vehicle temperature is above 60°F. At lower temperatures, the adhesive may separate from the tape.
- the tape should not be left on the vehicle any longer than necessary. Water and sunlight can deteriorate the materials if they are exposed for an extended period of time.
- consider leaving the masking materials on until after the vehicle has been detailed. Masking keeps buffing compound out of hard-to-reach areas. Masking can help reduce the amount of time required to clean the vehicle after refinishing and buffing.
- dispose of it, do not throw it on the floor. Masking materials on the floor results in clutter and creates personal safety concerns.

Liquid masking is available in one gallon jugs, as well as larger sizes.

Spray Masking is sprayed away from the area being refinished, such as the windshield on this vehicle.

Spray masking can also be applied to tires.

Spray masking is used to help protect surfaces from overspray. This water-based product is applied using a spray gun and allowed to dry.

When applying the spray masking, be sure to cover the repair area. This prevents the spray masking from contaminating the area to be refinished. After the masking material has been applied:

- remove the overspray with a damp sponge if any overspray has contacted the area to be refinished.
- do not expose spray-masked areas to direct sunlight.

Some materials may “cobweb” when sprayed. This may occur from material that is too thick or from ambient temperatures being too high.

To remove spray masking:

- rinse off the vehicle with water and allow the material to dissolve.
- wash the vehicle using soap and water.

Finish Removal

A thickness of 14.5 mils means that some of the finish must be removed before refinishing.

Paint film thickness must be measured before application of a refinish. As discussed earlier, if the coating thickness will be over 11 mils, some finish removal is required. This can be accomplished by:

- sanding the finish down to a level that is acceptable to begin refinishing again.
- completely removing the coatings. When a finish is completely removed, all coatings are removed down to the bare substrate.

Hand sanding can be used to reduce the thickness of a finish.

When removing or altering the film thickness, sanding:

- effectively removes texture.
- levels the surface of minor imperfections.
- will remove more material than scuffing.

Performing the sanding process can be done by hand using various types of sanding blocks, or done using a machine. There are many types of sanding grits available, ranging from P36 to P1200, depending on the system used.

A variety of grits are used to reduce the thickness of a finish.

Reducing the finish to a proper thickness or removing the finish altogether allows for a solid foundation to apply refinish materials. Methods used to partially remove a finish include:

- sanding as necessary using the recommended grit.
- using coarse grit materials and working to finer grit. A general rule is to not step more than 100 grit when using sandpaper between 36 and 500 grit. A 200-grit step can be made when using sandpaper between 600 and 1000 grit.

The paint makers may provide recommendations for grit type.

(Left to right) Sand, corn, or walnut media can be used for media blasting a finish.

Plastic, such as this, can also be used for media blasting.

Media blasting is the process of throwing high-velocity particles at a substrate to strip away finish coatings. This type of coating removal process is generally reserved for restoration jobs, but can be used for collision repair.

There are many different types of materials that may be used for media blasting finishes and corrosion. These materials include:

- plastic.
- aluminum oxide.
- glass.
- walnut shells.
- peach pits.
- corn cob material.
- wheat hulls.
- sand.

Personal Safety

Media blasting with silica sand may cause lung infections and disease, such as silicosis, tuberculosis, and pneumonia. Silicosis is an irreversible scarring of the inner lung tissue. This happens when the silica dust is inhaled and the lung tissue creates scars from attempting to repair the damage caused by the sand irritation. For this reason, sand is rarely used as there are a variety of safer alternatives for media blasting.

The use of other media may not pose the same health threat, although the by-product of the surface being blasted may be just as harmful. Harmful irritants may be found in the stripped material.

Portable media blasters can be used to remove a finish.

Some concerns and problems that may be encountered with media blasting may include:

- excessive heat that may warp parts. Some media generates less heat than others. For example, aluminum oxide creates more heat than walnut shells.
- excessive abrasion and aggression with finish removal. This can be addressed with different media types. Soda blasting is much less aggressive and is good for removing finishes on softer substrates such as plastic. However, it is not a good option for removing heavy rust or body filler.
- difficulty cleaning media out of tight areas and pivot points.
- conflicts with the weather, which may restrict outdoor use.

Heavyweight tape can protect glass and trim from damage.

When using blasting media to remove a finish from a vehicle, the appropriate heavyweight protective masking and tape needs to be applied to protect:

- glass.
- bright metal.
- plastic trim.
- adjacent panels.

There are a number of masking vendors that offer thicker material that can withstand media blasting.

Module Wrap Up

Topics discussed in this module included:

- when to mask or remove a part.
- different types of masking equipment and materials.
- the various types of masking techniques.
- how to mask for primer or basecoat / clearcoat.
- when finish coatings should be removed.
- the various techniques used for coating removal.

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Module 3 - Spray Gun Technique

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Spray Gun Setup

Learning objectives for this module include:

- listing steps for setting up the spray gun.
- identifying causes and listing corrective action for incorrect spray patterns.
- determining proper travel speed and overlap for best finish application.
- determining proper distance to the panel and proper triggering technique.
- identifying steps for spraying difficult areas.

This is an example of an air pressure gauge on a spray gun.

When setting up a high-volume, low-pressure (HVLP) spray gun:

- adjust the inlet pressure. The spray gun maker will recommend a specific inlet pressure at the base of the spray gun.
- measure the air cap pressure and adjust as necessary for proper airflow. Too much or too little airflow can cause problems when applying material.
- a special gauge / cap can be used for monitoring air pressure at the air cap. There are two gauges on some air pressure caps. These gauges measure air pressure at the air cap horn and near the fluid nozzle.

KPI Improvement Tip

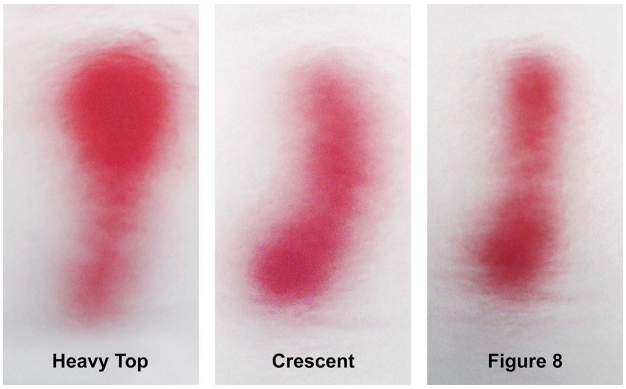
Proper settings on the paint gun will ensure that there are fewer defects in the finish while controlling the amount of material deposited on the panel.

Setting the proper air pressure ensures the refinish material is applied most efficiently.

When adjusting air pressure at the inlet of the spray gun, keep in mind that:

- spray gun makers will state a specific inlet pressure.
- the proper inlet air pressure will give 10 psi at the air cap with the fan control wide open.
- as the fan control is closed, the air cap pressure increases.

- air regulators adjust the air supply to pressures required by the spray gun maker and for other power tools. Begin adjusting the air pressure at the regulator and allow for pressure drops if long air hoses are being used. Ultimately, the pressure valve at the spray gun should be used to measure inlet pressure. An air regulator maintains a constant air pressure and air volume. A cheater valve restricts airflow and creates an unstable air pressure and air volume. Cheater valves should not be used with spray equipment.



These spray test patterns illustrate problems with the spray gun.

A test spray pattern is used to ensure the gun is applying an even coat to the panel. A test spray pattern should be sprayed:

- before applying any refinish material to the vehicle. That way any problems can be corrected.
- on masking paper, not on the spraybooth walls.
- by holding the spray gun about 8 - 10" from the surface.
- by pulling the trigger and releasing it quickly.

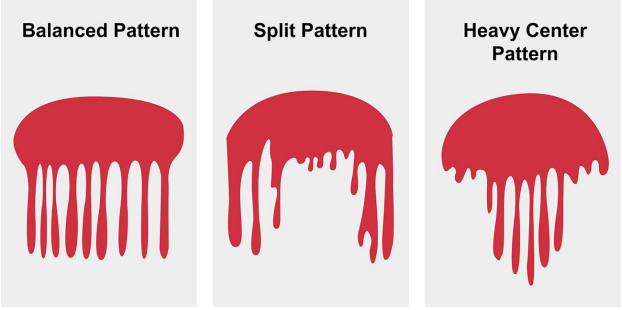
The spray pattern should be a slender, vertical oval, with even coverage. An improper spray pattern may appear fluttery, like a crescent moon, or have an irregular pattern, wide center pattern, or a constricted center pattern.

Clogs in any of these orifices can cause application issues.

To perform a quality refinish, the spray pattern needs to be uniform and equal. If the pattern is not uniform with the amount of material that is deposited, the finish will have a poor appearance. A balanced spray pattern has an equal amount of material deposited in the spray pattern.

Improper patterns will show heavy or light spots in the pattern. A pattern that is depositing heavy on the top or the bottom indicates that material has dried around the outside of the air cap. The air cap will need to be removed, cleaned, and a new test pattern sprayed. Two other types of spray pattern problems are:

- crescent-shaped patterns, caused by restrictions in the air passage at the air cap horn.
- figure 8 patterns, caused by atomizing air pressure that is too high for the viscosity of the material being sprayed.



Proper distribution is shown by an even drip across the spray pattern.

When testing for proper distribution:

- rotate the air cap so that the ears, or air horns, are straight up and down. This will produce a horizontal spray pattern.
- hold the spray gun 8 - 10" from the surface.
- pull the trigger until the refinish material begins to run.
- the runs will be about the same length if all adjustments are correct. If the center sags more, there is not enough pattern air. Either turn out the pattern control knob, turn in the fluid control knob, or increase the air pressure. If the sides sag more, the air pressure is too high or the pattern control knob is set too wide.

Checking a spray gun setup chart helps ensure proper coverage.

Both spray gun and paint makers compile a list of information for the refinish technician. This information helps eliminate the guesswork for what fluid needle, fluid nozzle, and air cap should be used for specific materials being sprayed.

This chart offers a starting point for the technician when setting up a spray gun. Paint makers post the required fluid needle and nozzle size for optimum spray results. Refer to their spray gun specifications for which fluid needle and nozzle will work the best.

Spray Gun Application Techniques

Proper spray gun use ensures a smooth, even finish.

To properly use a spray gun:

- hold the spray gun the proper distance from the panel.
- hold the spray gun level and perpendicular to the panel. Keep the spray gun perpendicular to the surface at all times, following the angles and curves of the vehicle with a wrist motion.
- begin moving before pulling the trigger. This should occur before nearing a refinish panel. Refinish material application should start just before reaching the edge of the panel.
- move the spray gun in a steady, even motion.
- release the trigger before stopping movement of the spray gun.
- do not fan the spray gun. Fanning is permitted only when spraying a small spot repair area.

This shows the adjustment for spray gun air pressure.

This shows the location for the spray gun fan adjustment.

This shows the adjustment location for the fluid needle.

When adjusting a spray gun, the refinish technician needs to be aware of what adjustments are needed. Adjustments options on the spray gun include:

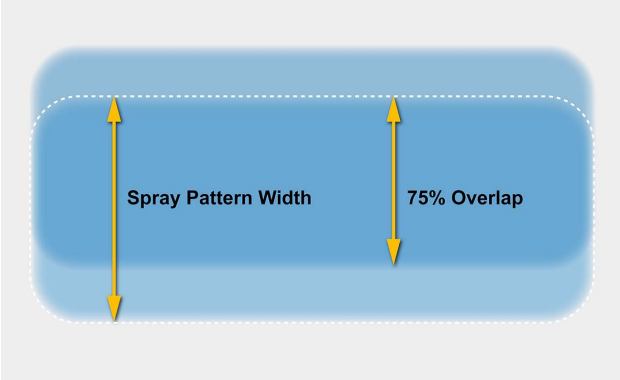
- fan width, which can be adjusted from a small diameter circle to a large oblong pattern. The fan width adjustment knob is generally on the top of the spray gun body. Turn the control knob all the way in to create a small, round pattern with dense coverage. Turn the control knob gradually out to form a vertical, elongated pattern with lighter

coverage. If turned too far, the pattern will be too heavy on the ends and too light in the middle.
- the amount of paint deposited, or fluid adjustment. It can be adjusted to a lighter deposition by turning the adjustment in, and a heavier deposition by backing the adjustment out. The fluid control adjustment knob is generally located below the fan width adjustment knob on the spray gun body.
- air pressure. Air pressure at the gun inlet is often provided by the spray gun maker. The proper inlet air pressure will give a reduced pressure at the air cap with the fan control wide open. The air pressure at the cap for an HVLP spray gun is 10 psi.

Improper travel speed can cause drips or poor coverage.

The travel speed is the rate that the spray gun is moved along the panel surface. The travel speed of a spray gun can affect finish appearance. It should be steady and even. If the travel speed is too:

- slow, the material may sag and run. This type of finish is unacceptable, and will need to be sanded down and possibly reapplied.
- fast, the material lays down dry with a rough texture. This finish will not present an acceptable appearance.



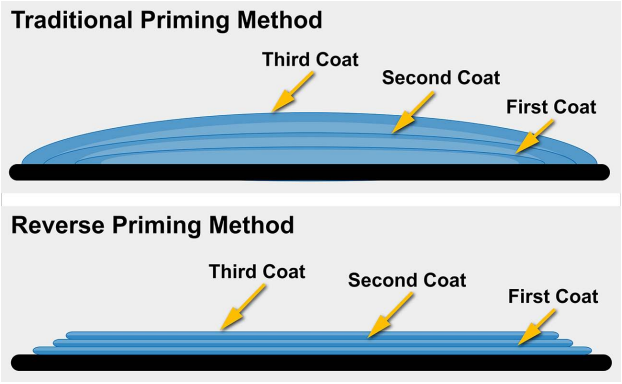
A 75% overlap helps ensure adequate coverage.

When spraying refinish materials, an adequate and sufficient overlapping of the material is required. Most paint makers and spray gun makers are recommending an overlap of 75% to get complete coverage and hiding of the material being sprayed. If proper overlap is not achieved, extra material and steps may be required to obtain the desired results. To obtain proper overlap when completely refinishing a panel:

- start with the first pass on the top of the panel or on the bottom depending on personal preference.
- spray each alternate pass in the opposite direction. For example, the first pass is made from left to

right, and the second pass is made from right to left.
- always blend the next pass into the wet edge of a previously sprayed panel. Improper overlap can result in uneven film thickness, contrasting color hues, and sags or runs. Careful triggering and spray gun control will help reduce the sags and runs in overlapped areas.

When spraying metallics or pearls, a control coat is often recommended to ensure proper flake orientation. A control coat has an overlap of 85 - 90%. But this is done with air pressure reduced by 40%.



Reverse priming is done by laying down smaller consecutive coats.

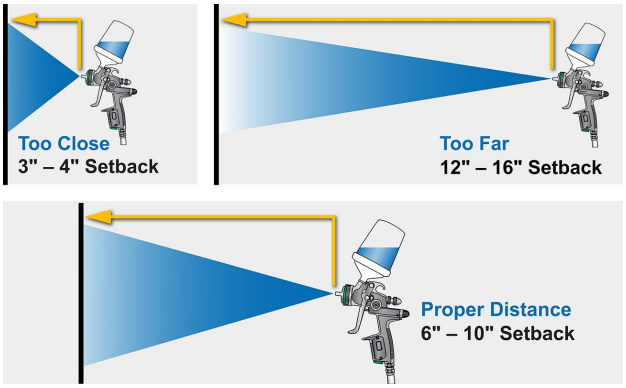
Reverse priming is the process of applying a larger of coating of primer first, followed by progressively smaller applications.

Reverse priming is used to:

- ensure a smoother surface.
- allow for easier sanding.
- reduce the amount of overspray edges when spot priming.

Advantages of reverse priming include:

- less overspray on the edges of each coat (less texture and better adhesion).
- less potential for trapped solvent to cause die back or solvent popping.
- edges being left open, allowing solvent to escape, which decreases the dry time.
- an edge that is easier to feather into the surrounding existing finish.



Proper distance to the panel ensure adequate coverage while minimizing the potential for sags or runs.

The distance that a spray gun is held relative to the panel surface (also called setback) can have effects similar to that of travel speed.

A spray gun that is too:

- close will deposit too much refinish material on the panel, potentially causing runs and sags.

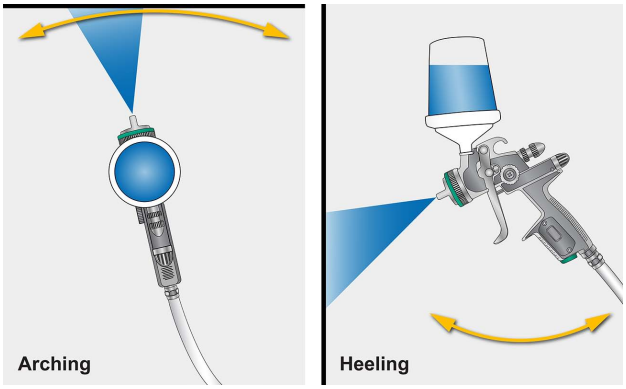
These defects will need to be removed.

- far back can have a dry, rough, or poor coverage effect. This can also lead to excessive overspray, causing wasted material and time.

Proper trigger technique can help create better transfer efficiency.

Triggering the spray gun on at the beginning of a spray stroke and off at the end of a spray stroke:

- allows for less use of paint and materials.
- reduces the amount of material deposited at the edge of the panels. Failure to trigger exactly over the edge of the panel can result in excessive film build.



Arching and heeling techniques can help create a solid finish with good transfer efficiency.

Heeling is allowing the spray gun to tilt. Arching or fanning is failure to keep the spray gun parallel to the surface. Both heeling and arching can result in uneven film thickness, orange peel, dry spray, and excessive overspray.

Spraying the wheelhouse requires good technique to avoid paint defects.

Difficult areas to spray may include corners and edges of panels. When spraying difficult areas:

- it may be best to spray these areas first.
- the pattern size and air pressure may need to be reduced.
- it may be best to hold the spray gun closer than normal, for

example, 1 - 2" away from the panel.
- it may help to aim directly at the center of the problem area.

Refer to the Video: Proper Spray Technique in the presentation. This video discusses concepts of proper spray technique and how it ensures a quality finish.

Module Wrap Up

Topics discussed in this module included:

- steps for setting up the spray gun.
- causes and listing corrective action for incorrect spray patterns.
- proper travel speed and overlap for best finish application.
- proper distance to the panel and proper triggering technique.
- steps for spraying difficult areas.

Module 4 - Substrate Preparation

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Preparing Substrates

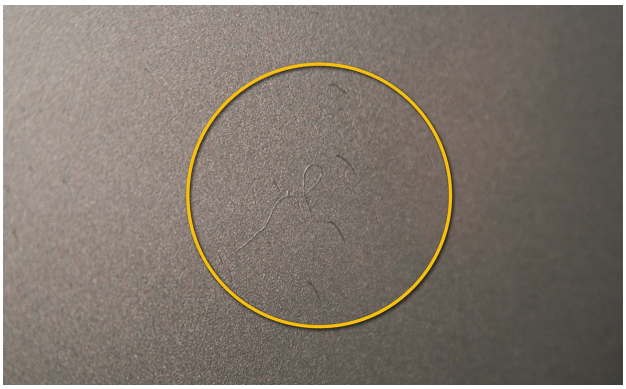
Learning objectives for this module include:

- describing how to prepare an OEM finish for topcoats.
- describing what steps should be performed to prepare E-coated parts for refinishing.
- identifying refinish considerations for plastic, steel, and aluminum.
- listing the importance of sprayout panels.
- identifying specialty spray areas and refinish considerations.

Featheredging out the OEM finish helps eliminate a noticeable repair area.

Before refinishing, an OEM finish:

- may only need to be cleaned and scuffed or sanded.
- often provides a sound substrate foundation.
- generally does not need to be partially or completely removed in preparation of a refinish.



Sometimes minor defects, such as this hair, can come from the factory and may require repair.

Before refinishing an OEM finish, the finish should be checked and inspected for soundness. Some OEM finishes might have:

- problems originating from the factory.
- excessive or inadequate film build areas.
- lack of adhesion.

When working on an OEM finish, proper steps need to be followed to create a proper repair.

Scuffing the surface of a finish adjacent to the repair area will allow good topcoat adhesion.

Scuffing is a form of surface preparation that:

- is the least aggressive.
- is used to degloss the clearcoat. Scuffing is not aggressive enough to remove orange peel or reduce film thickness.
- aids in adhesion for new parts that require light abrasion.
- may be done using a scuff pad, wet or dry sanding with fine grit sandpaper, or a paste-type sanding material.
- should be done without creating scratches or breaking into the undercoat.
- is done using moderate pressure.
- may be done after surface reconditioning to remove nibs and dust specks on primers and sealers.

Like sandpaper, scuff pads come in a variety of grits.

Scuffing pads:

- are made of a nylon-type material or a woven plastic abrasive.
- typically do not have a grit number listed, but will be color-coded, or labeled as, coarse to ultra-fine.
- may be used with sanding paste to degloss an area for refinishing.
- may be used to prepare areas for blending.
- are used in areas where a DA sander cannot adequately access.
- may be used as a final sand to ensure that areas that were missed in the earlier preparation stages are properly prepared for refinishing.

This previously refinished area has adhesion problems.

Some surfaces requiring refinishing may have been previously refinished at an earlier time. Previously refinished areas may:

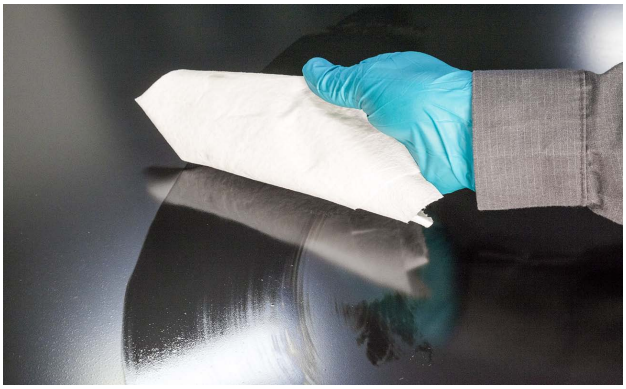
- have multiple layers of material built up.
- be dry, but not completely cured.
- have poor adhesion qualities.
- require partial finish removal because of excessive film

thickness or improper material application.
- have an acceptable film thickness that will allow topcoat application.

When refinishing a panel that was previously refinished, it may be helpful to know what paint system was used, if possible.

Inspecting the E-coated part upon delivery can help identify potential refinish problems.

Some parts come shipped with E-coat already applied. When working with parts that shipped with E-coat, perform a solvent test, if needed. This verifies that E-coat is sound and is not just a shipping coating. Solvent testing is performed to identify if a substrate will hold up to the reducing agents that will be applied to the refinish area.



No coating transfer to the cloth generally means the part has E-coat applied.

A solvent test is easy to perform, and should always be performed if there is any question as to the quality of the E-coat. To perform a solvent test:

- dampen a cloth with reducer or thinner.
- rub the dampened cloth on the panel surface.

If the material transfers to the cloth, it is unstable and needs to be removed.

KPI Imrovement Tip

A solid foundation is key for ensuring a quality finish that is appealing to the customer. This ensures no chipping or delamination after the vehicle leaves the repair facility.

Wiping an E-coated panel with solvent helps prepare it for basecoats.

If the E-coat is sound, the E-coated surface must be prepared for topcoat application by:

- cleaning using soap and water.
- cleaning using a wax and grease remover.
- scuffing the surface of the E-coat to help aid in adhesion of the topcoats.
- blowing and tacking off the surface with clean compressed air and a tack cloth.
- applying sealer. Some refinish systems allow a sealer to be applied directly to the E-coat without scuffing or sanding. This allows the scuffing and priming step to be bypassed.

Featheredging is a standard repair technique used to smooth out the repair area.

Featheredging is used to gradually taper out the repair area so there is a smooth area with no lines that can show through a finish. This ensures there is no disruption to the appearance of the refinish coatings. If body filler is used in a featheredged area, the filler should not contact the finish area.

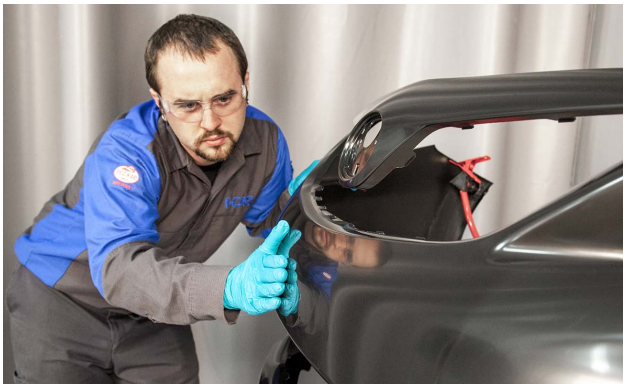
When creating a featheredge, the surface:

- should be sanded with P180 grit as a start. As a featheredge is worked out into the blend area, sanding media can be increased in steps of up to 100 grit at a time, up to 500 grit. This allows for the previous grit sandscratches to be removed quickly and effectively. When using sanding material above 500 grit, there can be a jump of up to 200 grit at a time, up to 1,000 grit. A 500 grit jump between materials can be used with 1,000 grit and above.
- needs to be leveled with a primer-surfacer and then block-sanded smooth. Areas that will not be

covered with primer-surfacer should only be scuffed or sanded using P500 grit sanding material.

Refer to the Video: Preparing A Part For Primer in the presentation. This video demonstrates sanding techniques commonly used to prepare a part for primer application.

Plastics



The plastic bumper cover is being checked for any surface defects.

When refinishing plastic parts, considerations include:

- identifying the type of plastic material used. Categories include rigid vs. flexible.
- paint maker recommendations for plastic cleaners or other preparation steps.
- determining if an adhesion promoter must be applied to the surface before coating application. Adhesion promoters are typically required on polyolefin plastics.

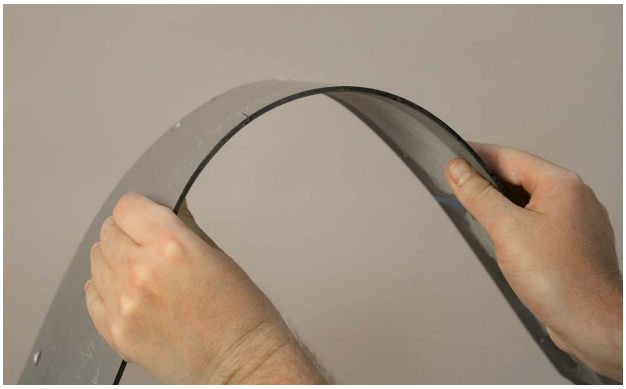
Rigid plastics are difficult to bend.

Rigid plastic parts may include:

- sheet-molded compounds (SMC).
- fiberglass.
- polycarbonate.

Before refinishing plastic, the refinish technician should:

- determine if the refinish material will require the use of a flex additive.
- understand that the part may contain fibers that can wick cleaners and solvent into the surface and not be released.



Flexible plastics, commonly found in bumper covers, are easy to bend.

Flexible plastic parts may include:

- polyamide.
- polyurethane.
- thermo-polyurethane.

Some common parts include bumper covers and body trim.

Before any work or refinishing of these products can begin, determine:

- if the refinish material will require flex additive.
- the preparation steps. An interior part may get prepared differently from an exterior part.

Refer to the Video: Preparing Bare Plastic Parts in the presentation. This video discusses concepts on preparing plastic parts for refinishing.

Bare And Repaired Steel

The bare steel will need a specific primer, such as self-etching primer, before a primer-surfacer is applied.

When working with bare steel parts, the refinish technician must determine if the part:

- is galvanized.
- requires a metal cleaner and conversion coating.
- requires a self-etching primer.
- requires sanding or scuffing.

Epoxy primer may be used over bare steel.

Refinishing products that can be applied to bare metal substrates include:

- metal preparation / conversion coatings. These coatings may be used before epoxy primer, but are generally not used with self-etching primer or over body filler.
- zinc chromate / phosphate primers, which cover the substrate but do not etch into the surface.
- direct-to-metal or etching primers.
- epoxy primers.
- urethane and 2K primers that are easy to sand, provide high build, and have minimal shrinkage. A sealer may not be required.

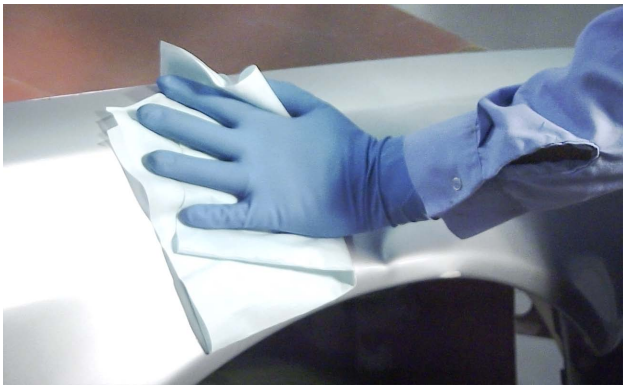
Refer to the Video: Preparing Bare And Repaired Steel in the presentation. This video discusses concepts on preparing bare metal and repaired steel parts.

Bare And Repaired Aluminum Parts

Scuffing the surface of an aluminum hood is recommended before applying the recommended primer.

When working with aluminum:

- do not use grits coarser than P80. Aluminum scratches very easily and can be difficult to mask due to the softness of aluminum.
- clean bare metal surfaces with soap and water. This will remove any water-soluble contaminants. Follow this with the use of wax and grease remover. These two steps will ensure a clean part with no contaminants.
- apply a metal cleaner and conversion coating made specifically for aluminum, if required.



Cleaning an aluminum part is critical for refinish adhesion.

When preparing aluminum parts for refinishing:

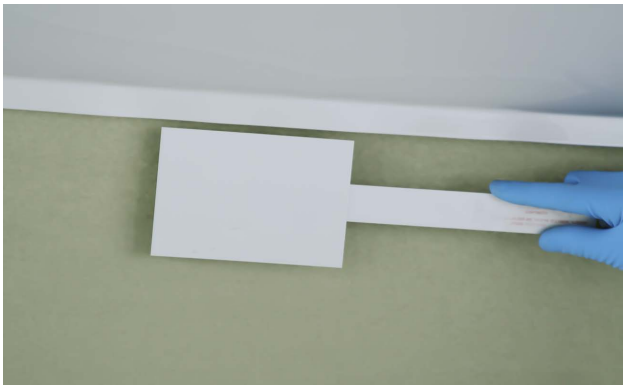
- remove the oxide by sanding or abrading the surface.
- uncoated aluminum needs to be recleaned. The rate that aluminum oxidizes varies depending on temperature and humidity levels. After being left uncoated for an extended period of time, the aluminum creates an aluminum oxide coating that needs to be removed.

Dedicated tools for aluminum only should be used when working on aluminum panels.

The preparation steps for a bare or repaired aluminum part are similar to bare and repaired steel.

Do not use the refinish tools and sanding materials interchangeably for steel and aluminum. Cross contamination from steel particles into the aluminum will cause galvanic corrosion to occur. This will cause premature metal damage and paint failure.

Making A Sprayout Panel



Always compare a sprayout panel to the vehicle color.

When creating sprayout panels, these panels should be made to:

- show how the color will appear for single-stage, basecoat / clearcoat, or multi-stage finishes.
- duplicate actual spraying conditions.
- show the effects of the refinish technician's spraying technique.
- aid in the development of color samples.

It may be beneficial to make the sprayout panel when edging parts to allow any

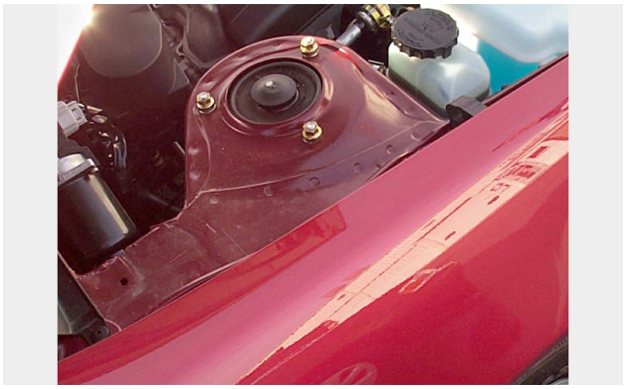
color adjustments to be made before the vehicle is ready for exterior refinishing.

Sprayout panels are used to determine color match.

The refinish technician needs to keep in mind that:

- most paint makers have specially coated paper test panels with black and white colors that are used to determine when hiding is obtained.
- the panel may require the use of a primer that matches the color primer used on the vehicle.
- the applied color coats need to match the vehicle's finish.
- the proper flash time needs to be allowed between application of refinish coats.
- clearcoat needs to be applied to the panel to show the enhancement of the color.
- the proper dry time must be allowed between coats and before evaluating the color against the vehicle finish.

Specialty Spray Areas



Underhood colors can be a different color than the exterior of the vehicle.

Underhood and doorjamb colors may be a similar or completely different color than the outside color of the vehicle. These colors may be called specialty spray areas. Specialty spray areas may be a:

- single-stage color used with a clear binder. The clear binder offers a medium- or low-gloss effect. This is used only where UV cannot contact the color. Clearcoat may not be applied to a trunk or underhood color.
- different paint code that may or may not be listed on the vehicle's label.

When identifying underhood or doorjamb color, the information may be located on a paint code label, in a repair manual, or in a color chip book. Computerized paint systems may also supply the specialty colors.

When refinishing jambs or trunks, it may be easier to mask a label rather than remove it and order another.

When preparing to refinish doorjambs and trunks:

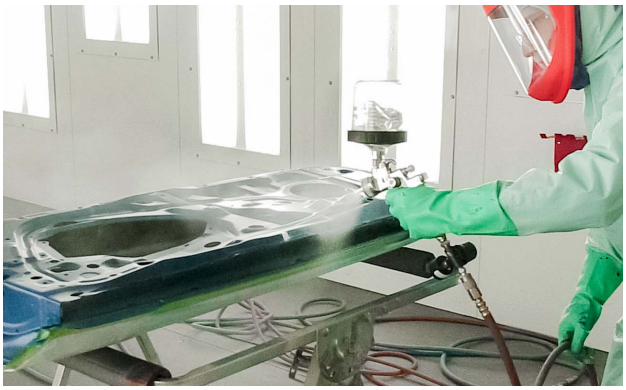
- properly mask around the area being sprayed. This will aid in reducing or eliminating the amount of overspray that may get into the vehicle.
- make the decision as to either mask or remove and replace the information labels that are located at various positions around the vehicle.
- replace sound-deadening pads with materials that are very close to the OEM pad color, size, and shape installed at the factory.

Interior trim, if not available in the proper color, may require refinishing.

Interior trim typically comes color-matched to the original part. Some parts, however, may not be colored and may need to be refinished. If refinishing is required, the part should be prepared with a nongloss finish. Interior parts with a high gloss finish can cause driving problems with reflectivity and glare.

Interior color codes can be found on the vehicle's accessory labels. As with painting exterior plastic parts, adhesion promoters may be needed when painting interior trim.

Do not refinish airbag modules.



Applying a finish to the edges of a part allows these surfaces to be coated before it is installed.

The edges and backside of the panels are refinished to restore the appearance of the vehicle before the repairs. This task is generally performed before the new or repaired parts are installed on a vehicle. The reason this is done before installing the parts is to aid in complete coverage of areas that cannot be easily accessed or protected after installation. Parts that need to be welded into place may require partial refinishing before they are installed due to lack of access after installation.

Some paint makers recommend mixing clearcoat with the basecoat and using it for edging. This ensures that some of the clearcoat is applied and that the durability to abrasion and UV protection is enhanced.

Module Wrap Up

Topics discussed in this module included:

- how to prepare an OEM finish for refinishing.
- what steps should be performed to prepare E-coated parts for refinishing.
- refinish considerations for plastic, steel, and aluminum.
- the importance of sprayout panels.
- specialty spray areas and refinish considerations.

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