Collision Repair

Flexible Instruction Day

Assignment #4

Learning Standard	1.2.11 read and understand essential content. 2.2.11.E recognize the degree of precision needed in calculating a number and environmental health and safety. 3.6.12 science and technology
Task # & Description	702 remove and reinstall moveable glass
	703 describe the removal and replacement of stationary glass

CONTACT INFORMATION/ASSISTANCE

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Instructor E-Mail: petersd@butlertec.us

I will be available by email from 7:40-12, and 12:30-3:10 to answer your questions. Please reach out if you are having difficulty completing your assignments.

INSTRUCTIONS

✓ All work is due on the day we return to school. This is counted towards your attendance **and** as a classroom assignment.

✓ Read supplied materials

✓Complete the glass module quizzes

Name: _____ Session: _____

_____/_____ **points**

Movable And Stationary Glass Program 2

Textbook

I-CAR®

IMPORTANT NOTICE

This material provides general directions for collision damage repair using tested, effective procedures. Following them will help assure the reliability of the repair.

I-CAR cannot accept responsibility for any individual repair, nor can it warrant to the quality of such repair. Anyone who departs from the instructions in this program must first establish that neither personal safety nor the integrity of the repair of the vehicle is compromised by the choice of methods, tools, or supplies.

I-CAR does not endorse or recommend any brands or makes of vehicles, repair equipment and supplies or other products. The appearance of various makes and brand names in any I-CAR material is purely coincidental and is based on the availability of those products at the time of production.

All recommendations presented in this program are based upon research programs or upon tests conducted by laboratories, manufacturers, or selected collision repair facilities. If performed as outlined, these recommendations will provide the basis for a thorough, professional repair.

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Topic A. Role Of Stationary Glass



A-2 This windshield, bonded with urethane adhesive, contributes to the structural strength of the vehicle.

Stationary glass, especially the windshield, that is bonded to the vehicle with urethane adhesive:

- is a structural part of the vehicle.
- contributes to the strength of the roof and pillars.
- provides bracing to make the structure more rigid.
- helps manage collision energy. For example in a frontal collision, a urethane-bonded windshield helps direct energy through the A-pillars and over the roof, away from the passenger compartment.

The glass is bonded to the vehicle on the pinchweld. A pinchweld is formed where two mating flanges are welded together.

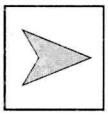
Stationary glass that is not bonded with adhesive is not considered a structural part of the vehicle, but all stationary glass plays a role in maintaining rigidity and strength. For example, bolted-on backlites and quarter glass usually have a frame that adds strength during a collision or rollover.



PINCHWELD
Select the Demonstration Icon found on screen A-2 of your CD-ROM for an example of a pinchweld.

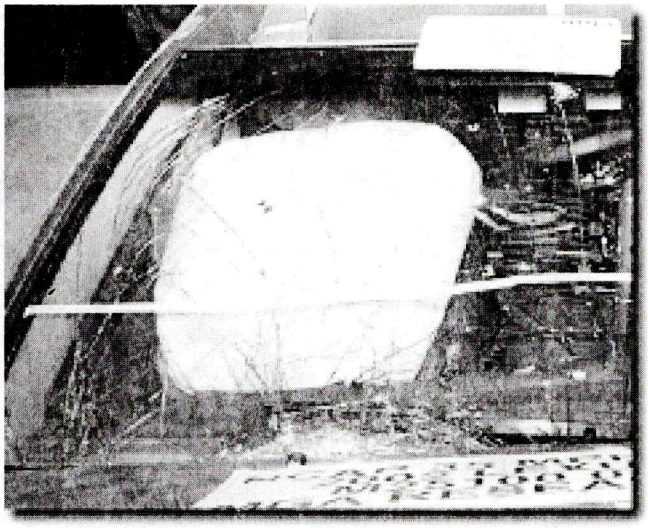


STRUCTURAL STRENGTH
Select the Demonstration Icon found on screen A-2 of your CD-ROM for an example of how stationary glass can reinforce a vehicle structure.



STRUCTURAL ROLE OF STATIONARY GLASS
Refer to screen A-3v of your CD-ROM for a video on how stationary glass, especially the windshield, plays a structural role in the vehicle.

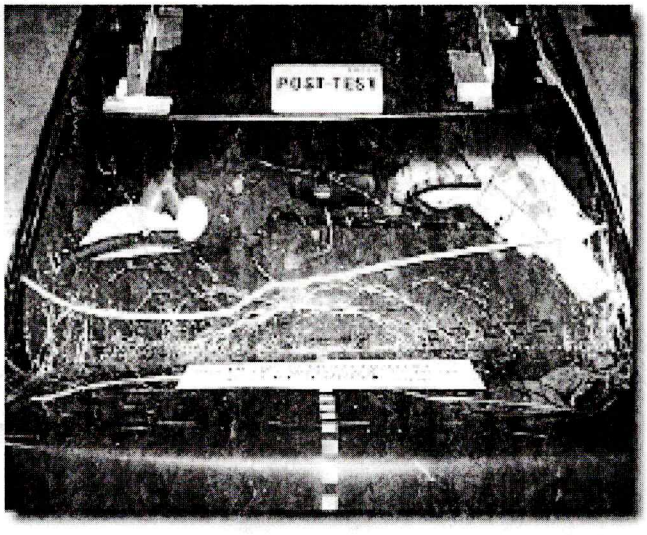
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A-4 Some passenger airbags use the windshield for proper deployment.

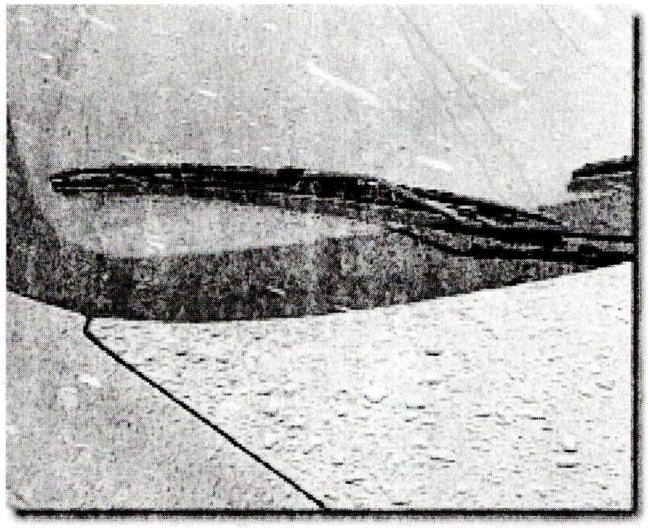
Another role for the windshield is to work with the passenger airbag. A deploying passenger airbag may:

- deflect off the glass.
- use the windshield to deflect the deployment in the proper direction.
- be rendered ineffective by loosening or forcing the windshield out of the opening if it is a poor installation.



A-5 The plastic inner layer of the windshield helps to retain occupants during a collision.

Stationary glass also keeps unrestrained occupants inside. Severe injuries or fatalities can occur when the occupant is ejected from the vehicle.



A-6 One function of the windshield is to keep rain from entering the vehicle.

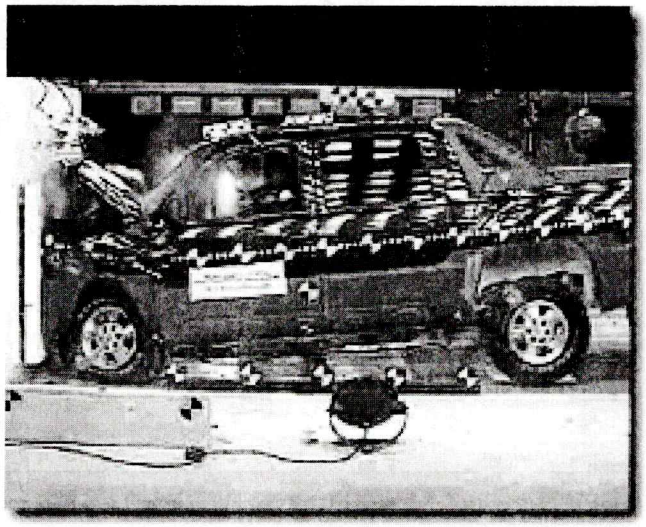
All glass on a vehicle, stationary and movable:

- protects occupants from wind, weather, and debris while driving.
- allows the driver and occupants a view of the road and traffic.

Most consumers believe that this is the only role of stationary glass.

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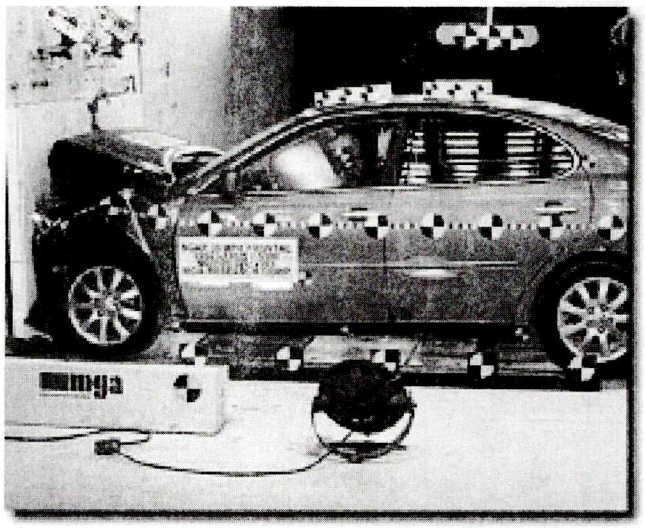
Topic B. Safety Standards



B-1 There are several crash tests done to test the performance of OEM stationary glass, primarily the windshield.

Several Federal Motor Vehicle Safety Standards (FMVSS) issued by the U.S. National Highway Traffic Safety Administration (NHTSA) relate to OEM installations for stationary glass in both the United States and Canada, primarily the windshield. These standards:

- are performance standards. The standards do not refer to how a stationary glass installation is done, or the strength of adhesives or other materials, but how the entire vehicle performs with the glass installed.
- are used to test OEM installations only. There is no testing for aftermarket installations, though adhesive makers and other groups use similar tests to test the performance of aftermarket products.
- are pass/fail only. The vehicle either passes or it does not.
- include FMVSS 212, 208, and 216. Two other standards that relate to glass are FMVSS 205 and FMVSS 219. FMVSS 205 governs the type of glass that can be used for all automotive glass. FMVSS 219 says that no object can enter the vehicle from the outside through the windshield in a 48 km/h (30 mph) collision.



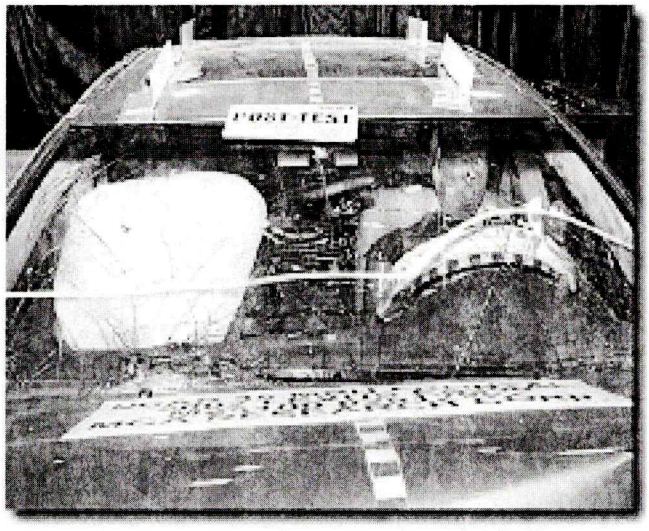
B-2 The windshield retention test requires the windshield to remain bonded to the vehicle during front-end collision into a stationary barrier.

FMVSS 212 tests how the windshield is retained in a collision. This standard requires that:

- the windshield perimeter be retained during a 48 km/h (30 mph) front-end collision into a stationary barrier.
- 50% of the windshield remain intact if the front seat occupants are not wearing a seat belt, or 75% if the front seat occupants are wearing a seat belt. Most vehicle makers require 100% retention.

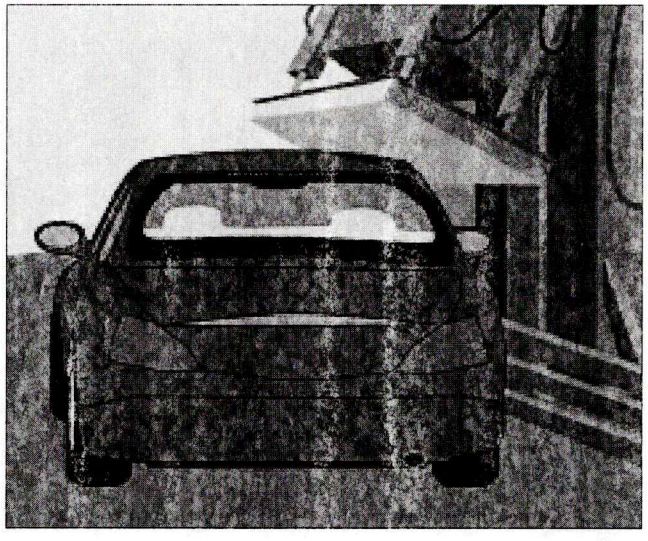
FMVSS 212 was implemented for passenger cars in 1970, three years before urethane adhesive began to be used for stationary glass installations.

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B-3 Airbags must properly deploy to meet the FMVSS 208 standard.

FMVSS 208 is the occupant crash protection standard. Using crash dummies, the vehicle is tested for the proper performance of safety devices such as airbags and seat belts. Since the passenger airbag may use the windshield for proper deployment, if the windshield is improperly installed, this standard may not be met.



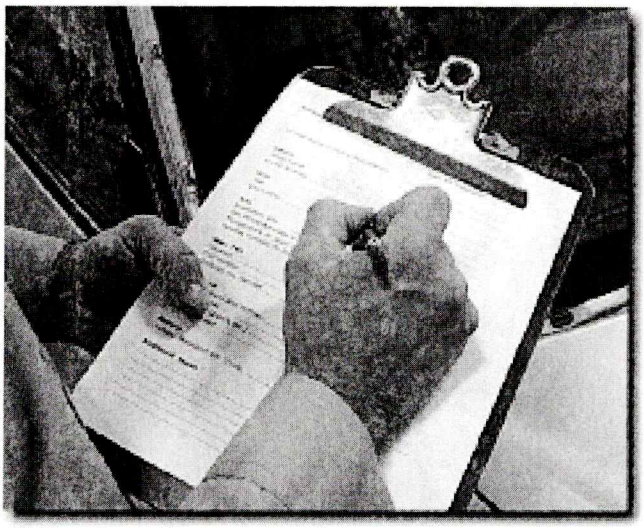
B-4 A steel slab moving downward on the corner of the roof is designed to simulate a rollover for the FMVSS 216 test.

FMVSS 216 is the roof crush resistance standard. This standard:

- tests the resistance of the roof to crushing during a rollover.
- uses a steel slab to apply downward force at the front of the A-pillar. This is used so that the test is repeatable.
- requires that by the time the downward force equals 1½ times the weight of the vehicle, or 2,267 kg (5,000 lb) whichever is less, the test device should not have moved more than 127 mm (5").

Some vehicles, particularly in the 1970s and 1980s, passed the roof crush test without the windshield in the vehicle.

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B-5 When doing a stationary glass installation, keep a record of the products and specific procedures used.

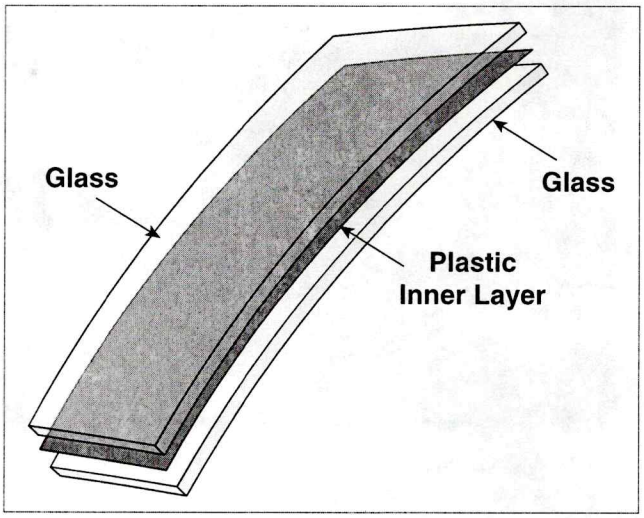
Even though aftermarket installations are not held accountable to the same federal safety standards as OEM installations, stationary glass must be installed correctly. An installer, and the facility that contracted an installer, can be held liable if the glass is improperly installed and a vehicle occupant is injured. To prove that the installation was done correctly, document the installation. Document the:

- glass part that was replaced.
- product maker's procedures used.
- products used, including the adhesive lot number, primers, cleaners, etc. List expiration dates, if applicable.
- ambient conditions at the installation site, including the temperature and humidity, and whether the glass was replaced inside a facility or outside. List the cure time of the adhesive based on these conditions.
- vehicle owner information and vehicle identification number (VIN).
- time when the vehicle was released.

Save the installation record.

Refer to the Installation Record handout and note some of the information that should be recorded for any stationary glass installation.

Topic C. Stationary Glass Construction



C-1 Laminated glass has a plastic inner layer that holds the glass together if it is broken.

Stationary glass can be laminated or tempered. Laminated glass:

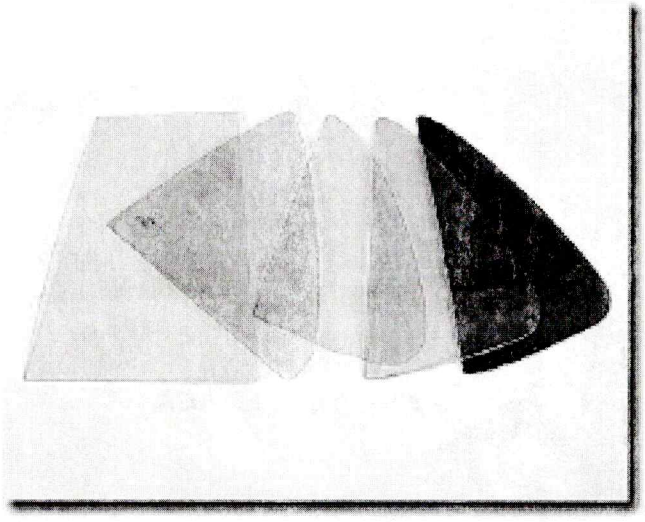
- is made of two sheets of glass with a plastic inner layer.
- holds together when broken due to the inner plastic laminate. This helps retain occupants.
- is used today primarily for windshields, but is starting to be used for some side glass and roof glass applications.
- can be repaired.

Laminated glass slivers are very sharp. Wear protective gloves when handling laminated glass.

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C-2 The label in the corner of the glass often indicates whether the glass is tempered or laminated.



C-4 These are common tint colors for vehicle glass. The glass on the far right is privacy glass.

Tempered glass is:

- a single layer of glass.
- heat treated, to increase impact resistance. The glass is heated to about 590° C (1,100° F), then rapidly cooled.
- brittle, and will shatter if cut, drilled, or ground. The shattered pieces are not as sharp as laminated glass slivers. If previously damaged or stressed, the glass can shatter at a later time.
- used anywhere but the windshield.

BREAKING GLASS

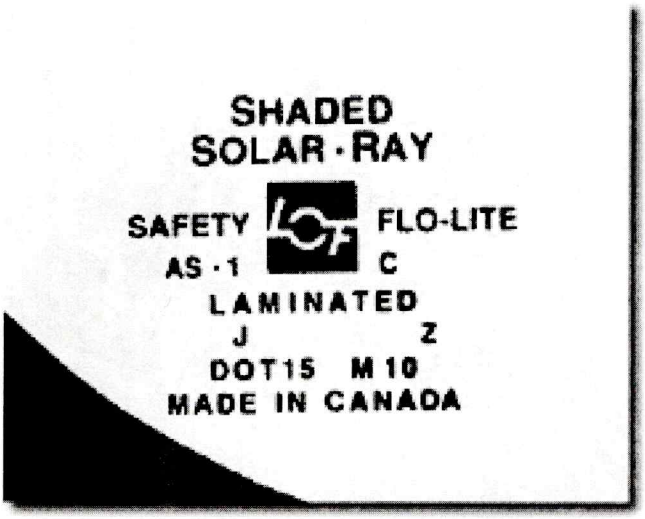
Refer to screen C-3v of your CD-ROM for a video on the difference between breaking laminated and tempered glass.

OEM glass is often tinted. Common tint colors include:

- blue.
- green.
- bronze.
- gray.

Extremely dark tinting that covers the entire glass is called "privacy" glass. Privacy glass can only be used behind the B-pillar because it reduces the driver's vision if used for the windshield or front door glass.

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C-5 The reference to "solar" in the corner label indicates that the coloring of this glass is not tinting.



C-6 Many windshields have shading across the top to help keep the sun out of the driver's eyes.

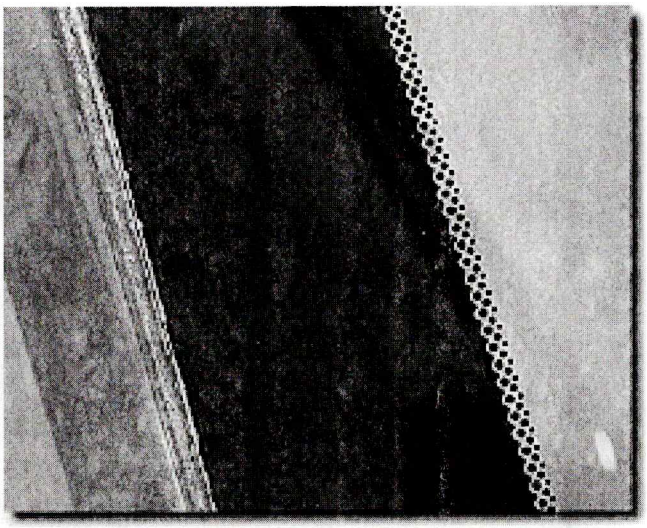
Solar glass, identified by "solar" in the trade name in the lower corner of the glass:

- absorbs and reflects most of the sun's infrared and ultraviolet (UV) rays. UV rays cause interiors to fade and urethane adhesive to break down.
- is more effective than tinting in preventing fading and allowing air conditioning to work more efficiently.
- is made by applying a special metallic coating to the inner side of the outer laminate. It can also be made by changing the chemical makeup of laminated or tempered glass.

Shading on glass is:

- the tinted, horizontal band across the top.
- usually only on windshields.
- made by darkening the plastic inner layer, not the glass.

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C-7 This black band around the edge of most stationary glass, called the frit, is designed primarily to protect the urethane adhesive from deteriorating due to UV ray exposure.



C-8 The "AS1" code indicates a laminated glass windshield, with the proper light transmittance below the arrow. The AS2 code on the right indicates that the glass has the proper light transmittance, but is not for use as a windshield.

The frit is the black band around the perimeter of most stationary glass. The frit:

- helps prevent UV rays from deteriorating the urethane adhesive.
- is made of ink and ground glass. Frits before about 1996 contained lead-based paint, but now the content is more environmentally friendly.
- if lightly scratched, can be covered with black ink or even a black felt-tip marker.

When the frit contained lead, it helped the bond with the urethane. Now that the frit has no lead, applying a pinchweld primer to the glass is even more necessary.

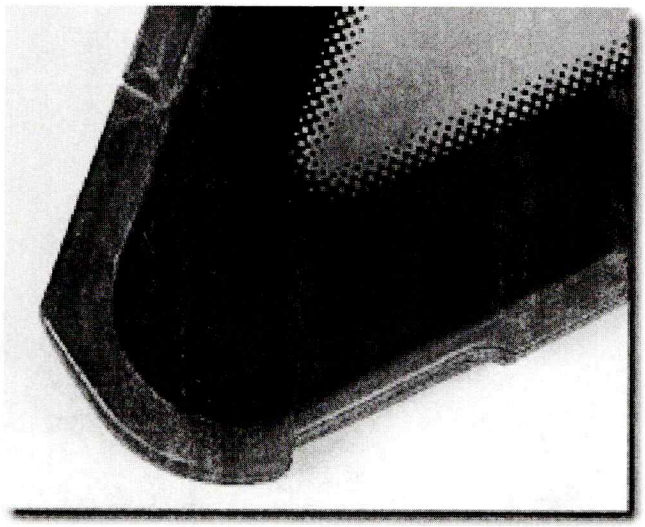


All OEM glass makers (Pilkington (LOF), Guardian, Carlite, Mopar, PPG) have been using non-lead paint for the frit since at least 1997. There are still some non-OEM glass makers that use lead paint for the frit as of 2002. Glass that has a lead-based frit should not be disposed of in a regular landfill. This glass must be disposed of as hazardous waste. There is no definitive way to determine what the frit is made of, other than professional chemical testing.

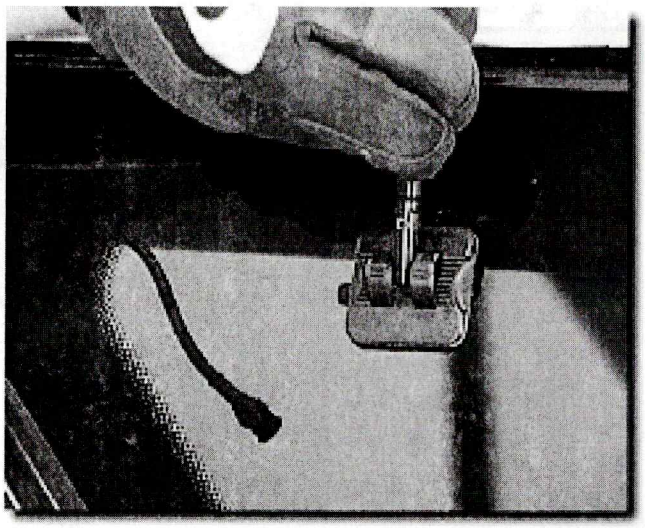
Codes printed on glass indicate that the glass has passed American National Standards (AS). These standards require that the windshield and front seat area allow at least 70% visible light. The codes include:

- AS1 on the windshield. The AS1 code is only for the laminated windshield. Besides the 70% light transmittance requirement, AS1 has additional requirements for certain amounts of distortion and a specified penetration resistance. The code is below the top shading, with an arrow pointing down, indicating that the 70% light transmittance standard is met only below the shading. The code also helps glass makers align the shading on the inner plastic laminate.
- AS2 code on side glass and the backlite. The AS2 code is used for both tempered and laminated glass, anywhere but the windshield.
- AS3 for darkly tinted or privacy glass. AS3 is used for both tempered and laminated glass. If the glass does not meet the 70% light transmission requirement, it is coded AS3.

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C-9 The molding on the edge of this quarter glass is a permanent part of the glass, formed on the glass when the glass was made.



C-10 This mount for a telecommunications antenna comes already attached to the glass.

Encapsulated glass has a plastic molding permanently attached to the edge. The molding is installed when the glass is made. Encapsulated glass:

- is designed to help the automated installation of glass on the assembly line. A robot can simply position the glass in place without a need to install a separate molding.
- can be any glass part. The process is not being used for windshields much anymore, partly due to the higher cost of encapsulated windshields. Also, the installation process for windshields has improved to the point where having the molding part of the glass is no longer needed. There is still a time savings on the assembly line for stationary side glass and backlites.

If it is difficult to determine whether the glass is encapsulated, try pulling the molding off when the glass is out of the vehicle. If the glass is encapsulated, the molding will not come off the glass when pulled. If it does come off, the molding is either bonded on or a separate molding.

ENCAPSULATED GLASS

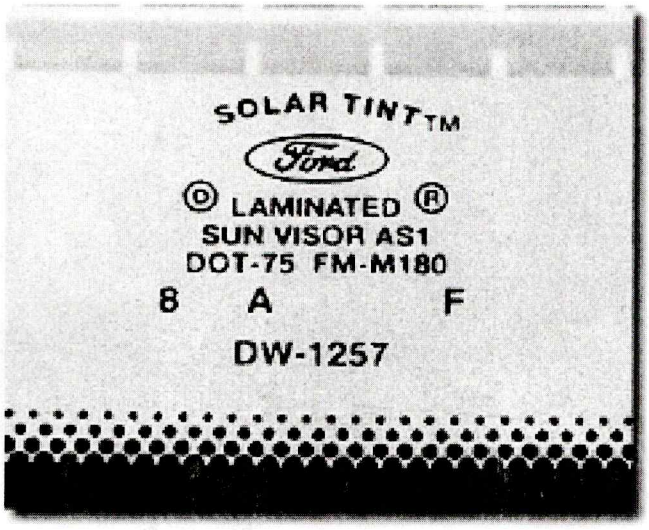
Select the Demonstration Icon found on screen C-9 of your CD-ROM for an example of an encapsulated glass part.

There are conveniences and accessories being added to glass every model year. These accessories may be integrated directly into the glass. These include:

- a telecommunications system antenna. The antenna housing may be separate or part of the glass. If part of the glass, this must be specified when ordering the glass.
- the radio antenna.
- defroster grids on not only the backlite but also the windshield.
- rain sensors. If the sensor is bonded to the original glass, it generally cannot be transferred to a replacement glass. The replacement glass must be ordered with the new sensor attached. If the sensor is mechanically attached to the glass or the rearview mirror, it generally can be transferred to a replacement glass.
- features in the rearview mirror, including the navigation system receiver.

The wiring and connectors for these features must be taken into account when replacing the glass.

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C-11 This "bug" contains the NAGS number, indicating that this glass was replaced.

A stationary glass part can be ordered by calling a parts department at a dealership and asking for the glass part by the vehicle make, model, year, and VIN. Other information that may be needed is:

- if the glass has shading.
- if the glass is tinted, and what color of tint.
- features on the glass, such as an antenna or connecting terminals.
- whether a molding is needed.

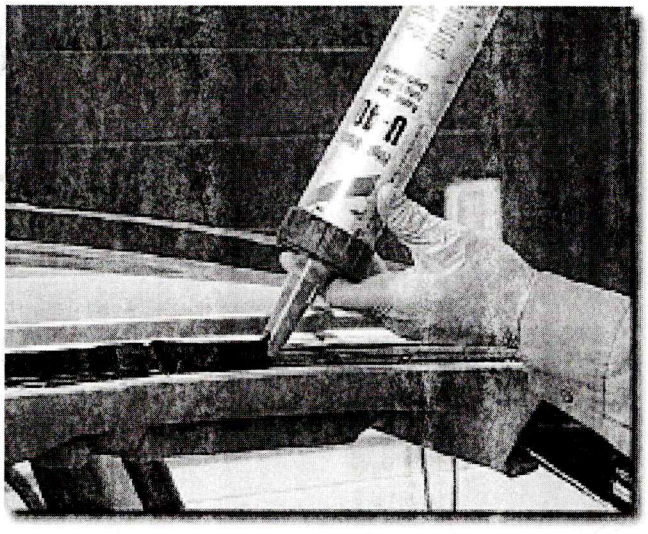
There is also a standard code and numbering system for ordering replacement glass from glass makers. The code and number for each type of glass are created by National Auto Glass Specifications (NAGS), and are copyrights of NAGS. The codes and numbers are listed in NAGS Catalogs, Calculators, and in the NAGS database GLASSMATE®.

The "bug" or label on the lower corner of the glass contains the AS code, may indicate if the glass is tempered or laminated, and may indicate if the glass is solar. These are not requirements of the label, however. There are no codes on the bug on OEM glass that can be used for ordering the glass. The bug on aftermarket glass may contain the NAGS code. Other than that, the bug is mainly for use by glass makers, and is of little value to the repair technician.

NAGS DISC

Select the Demonstration Icon found on screen C-11 of your CD-ROM for an example of a NAGS disc for ordering glass parts.

Topic D. Stationary Glass Adhesive



D-1 When replacing stationary glass, only use urethane adhesive designed specifically for this purpose.

Urethane adhesive specifically made for stationary glass installation:

- helps maintain the structural integrity of the installed glass.
- when pulled laterally (lap shear), has a strength from 500–1,200 psi. This is much stronger than other adhesives and sealants.
- has the consistency of tire rubber.
- has some flex to cushion the glass slightly from bumps in the road. Some vehicles require a stiffer adhesive than others.

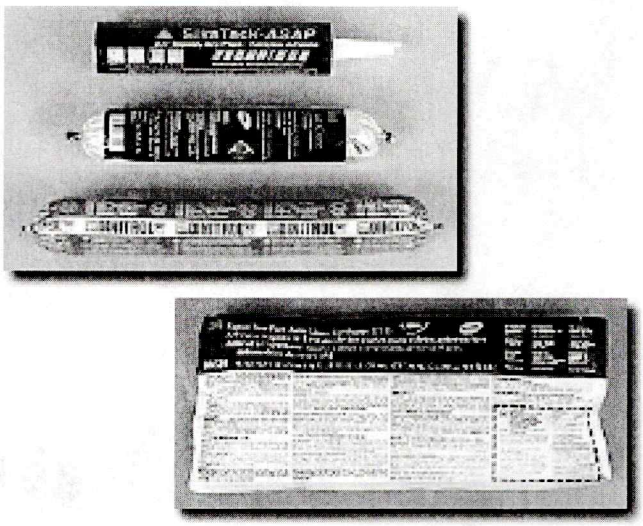
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Stationary glass used to be sealed into the glass opening with butyl tape or bonded with polysulfide, which is a relatively weak adhesive containing sulfur. Once urethane started to be used for bonding, the role of stationary glass in the collision energy management of the vehicle structure became more important.

Wear chemical-resistant gloves, such as nitrile medium-duty gloves, when handling urethane adhesive or any glass primers. These materials are irritants and should not come in contact with skin.

URETHANE SAMPLE

Select the Demonstration Icon found on screen D-1 of your CD-ROM for an example of a cured urethane bead.



D-2 One-part urethane (top) relies more on the temperature and humidity at the time of the installation than two-part urethane (bottom).

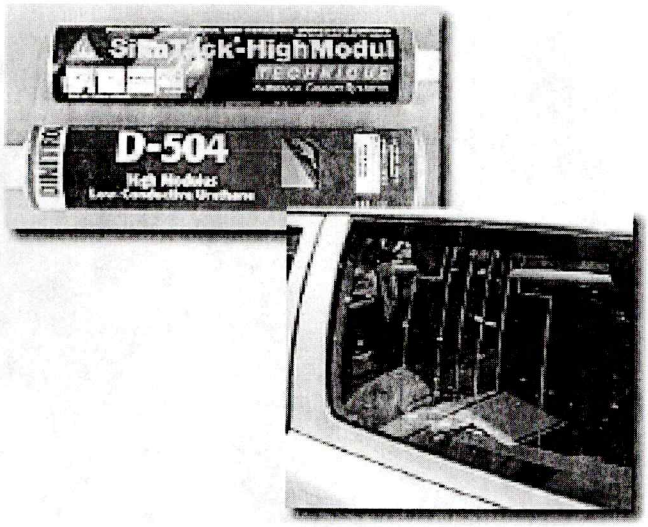
Different types of glass urethane include:

- one part, which relies on the ambient temperature and humidity to cure. The hotter and more humid at the installation site, the quicker the urethane cures. One-part adhesives rely on absorption to cure, and cure from the outside in.
- two part, which generally cures by a chemical reaction but also relies on temperature in that heat regulates how fast a chemical reaction takes place. Some two-part urethanes can be applied in freezing temperatures. The primer must still be applied in a warm temperature, however, usually at least 4.5° C (40° F). Two-part urethanes cure at the same rate throughout the bead, provided that the two parts are properly mixed together.
- primerless, which does not require a primer be applied to the glass. Primer is still required on areas of the pinchweld where there is no existing urethane. Primerless adhesives can be one or two part. Note that non-lead-based frits will not bond as well to urethane without a primer applied.

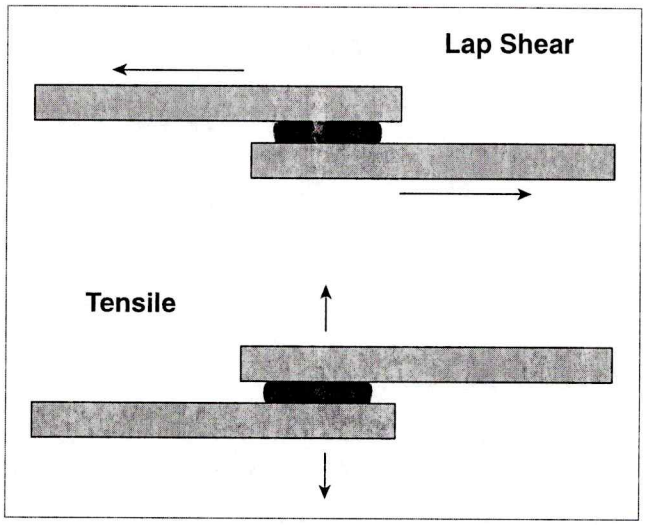
URETHANE TYPES

Select the Demonstration Icon found on screen D-2 of your CD-ROM for examples of different types of urethane adhesive.

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D-3 High modulus and nonconductive are properties that may be separate, or combined into one urethane product. Nonconductive urethane may be recommended for glass that has an antenna grid that extends to the edge.



D-4 To test an adhesive for tensile strength, coupons are pulled apart vertically (top). When testing for lap shear strength, the coupons are pulled apart laterally (bottom).

Two other types of urethane relate to the properties of the cured bead rather than the characteristics of the adhesive when they are applied. These include:

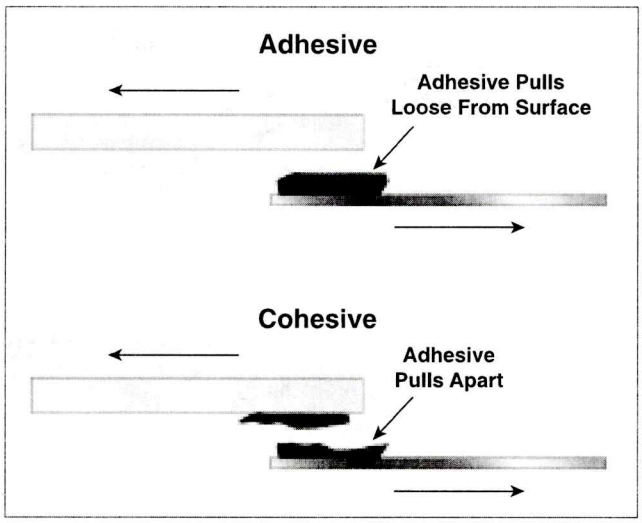
- high modulus, which has an extra rigid cured bead. Some vehicles require this type of adhesive for a quieter ride and stiffer structure.
- low or nonconductive. This is required on some vehicles where there are antenna grids, defroster grids, and other electronic systems integrated into the glass. The bus bars on the side of the glass often contact the urethane which draws power and weakens the signal. This is often the case with aluminum pinchwelds. The conducting current also combines with moisture, causing pits and corrosion in the aluminum.

High modulus and nonconductive characteristics are often combined into the same adhesive material. However the two terms refer to totally different and unrelated properties. The reason why the properties are combined into one adhesive is because most vehicles that require high modulus adhesive also require nonconductive qualities. There are vehicles that require nonconductive urethane that do not require high modulus.

Urethanes are tested for different properties, including:

- tensile and lap shear strength. With both of these tests, two coupons are bonded. Tensile strength testing pulls apart the coupons vertically. Lap shear strength testing pulls apart the two laterally. Lap shear and tensile strengths are used because those are the forces applied to a windshield in a collision. There are forces to both push the glass out (tensile) during the initial impact, and slide upward (lap shear) when the vehicle is collapsing.
- peel strength. The urethane should resist being peeled off easily like tape.
- viscosity, or the thickness of the body of the adhesive when applied. Most urethane adhesives made today are high-viscosity, which helps support the glass at the proper level while curing without the need for a dam.
- shore hardness, or how much it takes to penetrate the skin of a cured bead.
- modulus, or how rigid the adhesive is when cured.
- elasticity, or how much the cured adhesive can stretch and come back to its original shape.
- conductivity, or how much the adhesive conducts electricity.

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D-5 If the adhesive fails by completely pulling off one surface (top) it is adhesive failure. If the adhesive bead breaks in two, leaving part on each surface, it is cohesive failure (bottom).

When an adhesive is put under stress, there are two ways it can fail. Adhesive failure is when the adhesive pulls loose from the surface it is bonded to. Cohesive failure is when the body of the adhesive pulls apart. A cohesive failure is often due to an adhesive being used after its expired shelf life. This can also cause adhesive failure.

During testing, there must be cohesive failure, not adhesive failure.



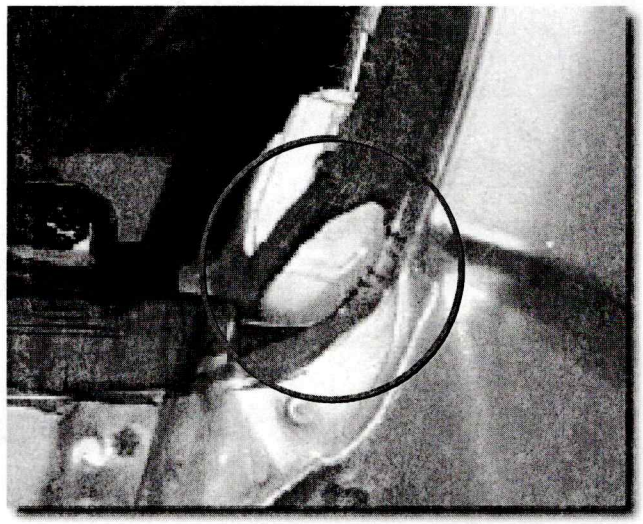
ADHESIVE AND COHESIVE FAILURE

Select the Demonstration Icon found on screen D-5 of your CD-ROM for a demonstration of what is meant by adhesive and cohesive failure.



ADHESIVE AND COHESIVE FAILURE SAMPLES

Select the Demonstration Icon found on screen D-5 of your CD-ROM for examples of test coupons that show adhesive and cohesive failure.

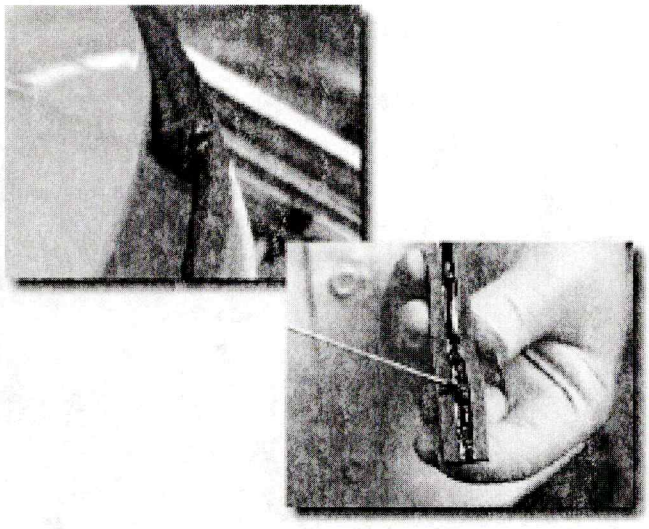


D-6 There are a number of reasons for the adhesive failure on the corner of this pinchweld.

When the adhesive pulls loose from the surface it was bonded to, there could be a number of reasons, including:

- contamination on one of the bonding surfaces.
- corrosion on the pinchweld flange.
- ambient conditions during installation, such as freezing temperatures.
- material incompatibility. All products used should be from the same manufacturer.
- expired products.

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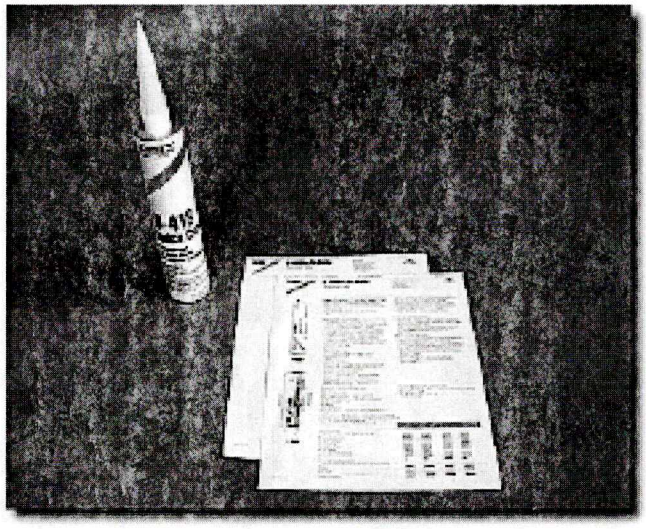
D-7 One-part urethane cures from the outside in. This is evident when a bead is applied to a pinchweld (top), and removed before it is completely cured (bottom).

The cure time of an adhesive:

- is how long it takes for the adhesive to reach full strength.
- for a one-part product, is based on 24° C (75° F) and 50% relative humidity. Lower temperature and humidity requires a longer cure time. The cure time usually requires several hours, and may require days.

Vehicles should NOT be driven until the adhesive is fully cured and it meets or exceeds OEM lap-shear strength requirements. This should be communicated to the customer before and after glass installation.

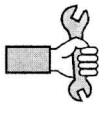
The vehicle must be level with the suspension loaded when curing, or else the glass opening may be twisted slightly. This could result in a built-in stress point, and cause the glass to crack at a later time.



D-8 The Performance Data Sheet, not the label on the tube, describes the properties of the adhesive and how to use the product.

The Performance Data Sheet is the instruction sheet from the adhesive maker explaining how to use the product. The Performance Data Sheet also:

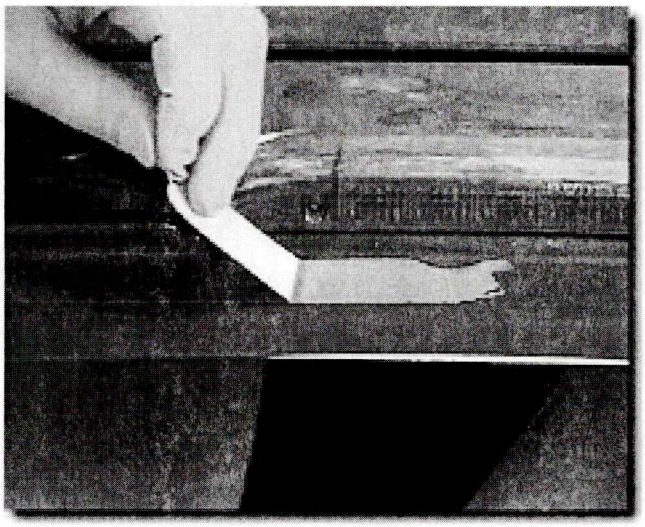
- explains some of the properties of the adhesive, such as strength, shore hardness, elasticity, etc.
- lists the cure time under different temperature and humidity conditions.
- lists precautions for use, including OEM and adhesive-maker requirements.



PERFORMANCE DATA SHEET

Select the Demonstration Icon found on screen D-8 of your CD-ROM for an example of a mockup Performance Data Sheet.

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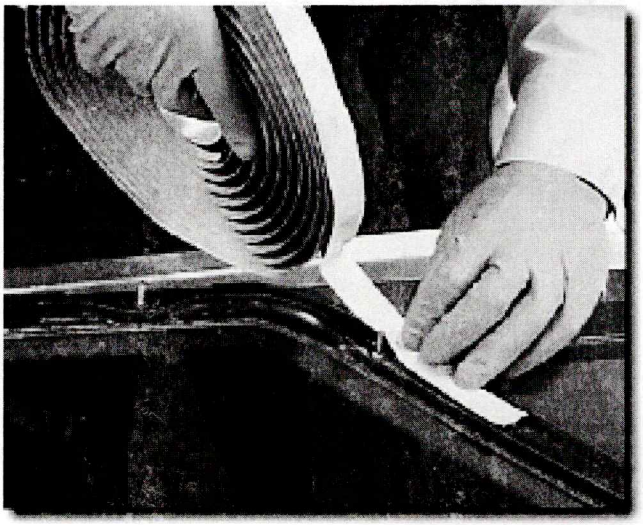


D-9 This pinchweld was covered during the application of topcoats in order to prevent a possible weak link.

The steps performed to bond stationary glass can be thought of as links of a bonding chain. An improper step is a weak link in that chain, which alone could cause the entire bond to fail. To prevent weak links:

- ensure the proper condition of the pinchweld. Avoid dirt, fingerprints, and incompatible chemicals on the pinchweld. If there is corrosion on the pinchweld, completely remove the adhesive and coatings down to bare metal in that area and remove the corrosion.
- stay with one product line. Do not use a primer from one product line and an adhesive from another product line.
- do not generalize information. What might be the proper information for one product maker is not necessarily the same for another. For example, cure times can vary from one primer and adhesive to another.
- follow all of the steps required by the product maker, without skipping any steps.
- follow the proper priming steps as outlined by the adhesive maker.

Topic E. Damming Tapes



E-1 This is the main use for butyl tape today, as a sealer on bolt-on quarter glass.

Butyl tape:

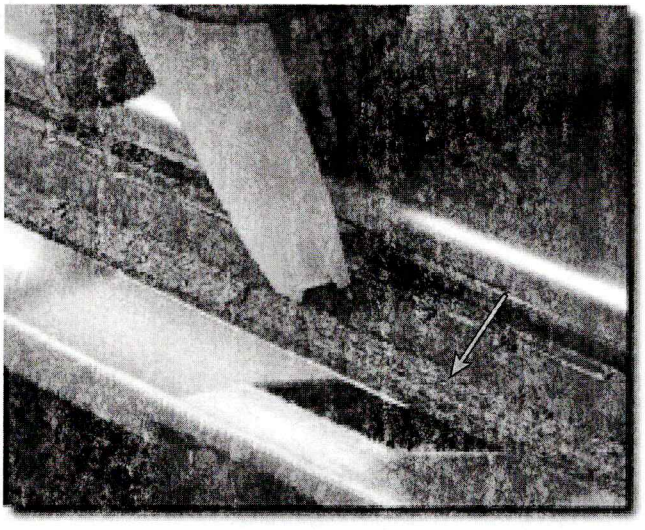
- is used as a sealer for bolt-on stationary glass, such as some door and quarter glass.
- was once used for most OEM installations to seal stationary glass, including windshields and backlites. The glass was not bonded with adhesive. If butyl was used originally, the glass can usually be reinstalled with butyl. One of the reasons for this is that it is very difficult to completely remove butyl from the pinchweld in order to replace it with urethane. Also, with this type of installation the glass is not designed to be a structural part of the vehicle.
- was once used on urethane replacement installations as a dam to keep low-viscosity urethane from spreading. This method of installation is no longer necessary because of the high-viscosity property of urethane. Most urethane adhesives today are high viscosity.

Do not confuse butyl tape with foam-core butyl, which is required by some vehicle makers. Butyl tape, without the foam, is not a substitute for foam-core butyl.

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BUTYL TAPE

Select the Demonstration Icon found on screen E-1 of your CD-ROM for examples of regular butyl tape and foam-core butyl tape.



E-2 The foam strip on the inside of this pinchweld had to be installed before applying the adhesive.

A dam made completely of an open-cell foam:

- should be replaced if it was used in the original installation. Several vehicle makers use a foam dam.
- is primarily for sound deadening. The foam reduces wind noise and vibration around the glass.
- provides the look of a finished installation. From the inside, the clean line of foam is more aesthetic than an uneven bead of urethane.
- allows air and moisture in to help cure one-part urethane.
- helps provide and maintain the proper height of the glass from the pinchweld, and prevents the molding from pushing in too far.

Foam tape is available in two sizes: 6 mm and 7 mm. Follow the vehicle maker's recommendation for the proper size.

FOAM TAPE

Select the Demonstration Icon found on screen E-2 of your CD-ROM for an example of foam tape, which is required as a dam on some stationary glass installations.

Topic F. Review

REVIEW

Refer to screens F-1 through F-2 of your CD-ROM for review questions on stationary glass issues.

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Glass module #1 Quiz

This is a preview of the draft version of the quiz

Started: Nov 8 at 11:17am

Quiz Instructions

Glass module #1 Quiz

Question 1 — 1 pts

solar glass is:

- ○ not used for windshields
- ○ a dark band across the top of windshield
- ○ extremely dark, and not allowed on front door glass
- ○ more effective than tinted glass for blocking UV rays

Question 2 — 1 pts

Encapsulated glass:

- ○ has a molding bonded on with urethane
- ○ has a permitted molding
- ○ is available only for windshields
- ○ usually requires a nonconductive urethane

Question 3 — 1 pts

Which of these makes stationary glass a structural part of the vehicle?

- ○ Encapsulated glass
- ○ laminated glass
- ○ alignment glass
- ○ urethane adhesive

Question 4

1 pts

Technician A says that adhesive failure is when the adhesive pulls off a surface that it was bonded to.

Technician B says that adhesive failure is the type of failure that is required when adhesive is lap shear tested.

WHO IS RIGHT?

- ○ A only
- ○ B only
- ○ Both A and B
- ○ Neither A nor B

Question 5

1 pts

A windshield may be designed to play a part in the deployment of a passenger side air bag by:

- ○ containing an airbag sensor

- ○ deflecting the deploying airbag
- ○ coming out during an airbag deployment
- ○ cracking at predetermined locations

Question 6

1 pts

Technician A says that there are federal motor vehicle safety standards designed to test the performance of an OEM stationary glass installation.

Technician B says that there are federal motor vehicle safety standards designed to test the performance of aftermarket urethane adhesives.

WHO IS RIGHT?

- ○ A only
- ○ B only
- ○ Both A and B
- ○ Neither A nor B

Question 7

1 pts

Tempered glass:

- ○ is usually two layers of glass
- ○ is the same as solar glass
- ○ can be used anywhere but the windshield
- ○ with minor cracks may be able to be repaired

Question 8

1 pts

All of these are true about urethane glass adhesive EXCEPT:

- ○ is flexible to help cushion road bumps
- ○ has the consistency of tire rubber
- ○ may be one or two part
- ○ has a lap shear strenght of about 100 psi

Question 9

1 pts

Technician A says that the viscosity of an adhesive is how rigid the adhesive is when cured.

Technician B says that most urethane glass adhesive made today are high viscosity.

WHO IS RIGHT?

- ○ A only
- ○ B only
- ○ Both A and B
- ○ Neither A nor B

Question 10

1 pts

Butyl tape:

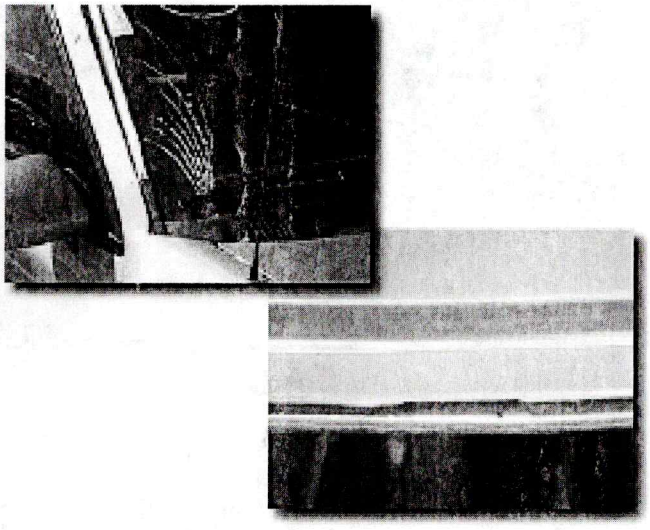
- ○ is an alternative to urethane adhesive on installations other than the windshield

- ◯ is required in combination with urethane adhesive on most stationary glass installations
- ◯ has the consistency of tire rubber
- ◯ is used as a seal on some bolted on side glass

Not saved Submit Quiz

MODULE 2–REMOVING AND INSTALLING A WINDSHIELD

Topic A. Inspection

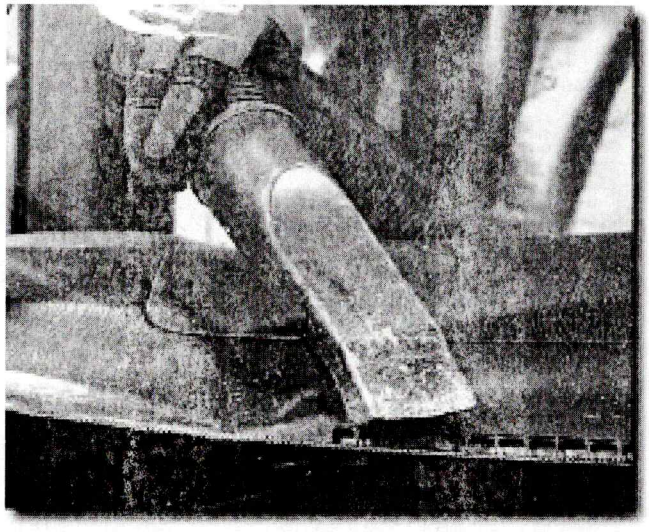


A-2 Different types of replacement procedures include the windshield only (top) and roof replacement where the windshield is removed and reinstalled (bottom).

There are different types of replacement procedures based largely on the condition of the pinchweld. There is either:

- glass damage only and no pinchweld damage, where the windshield is removed and replaced (R&R).
- pinchweld or adjacent part damage but no glass damage, where the windshield is removed, the pinchweld or adjacent part is repaired or replaced, and the same windshield is reinstalled (R&I).
- pinchweld and glass damage, where the windshield is removed, the pinchweld is repaired, and the windshield is replaced (R&R).

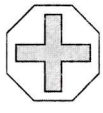
Topic B. Preliminary Steps



B-1 One of the first interior cleaning steps is vacuuming the defroster vent. Make sure the blower is ON.

Before removing the windshield, clean and vacuum the vehicle interior to clean up any broken glass. As part of this process:

- vacuum the defroster vent with the blower ON. This will remove any broken glass from the vent.
- remove loose glass parts and slivers from all interior surfaces.



Wear safety glasses and leather gloves when removing broken glass from the interior. Put on the safety glasses before turning the blower ON.

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B-2 Taping the defroster vent will help prevent glass slivers from falling in the vent holes.

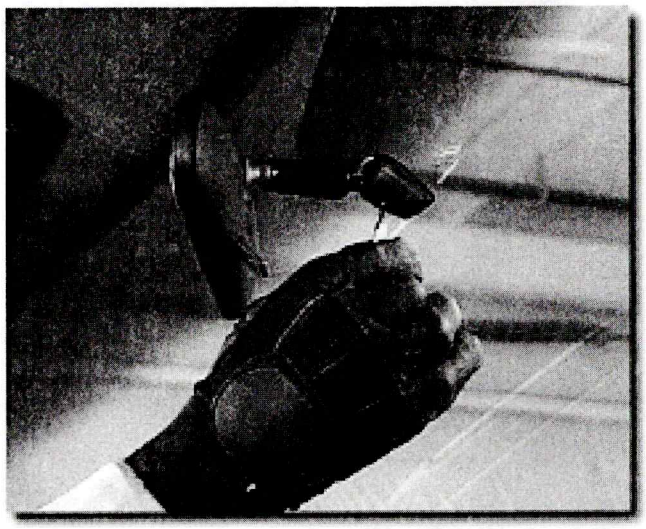
Whenever removing the windshield, take steps to protect the vehicle from glass slivers and the removal tools, including:

- covering the interior upholstery with a blanket or plastic cover.
- taping or covering the defroster vent.
- taping or removing interior and exterior trim.
- covering the hood.



MASKING TAPE

Select the Demonstration Icon found on screen B-2 of your CD-ROM for an example of tape used to cover up moldings.

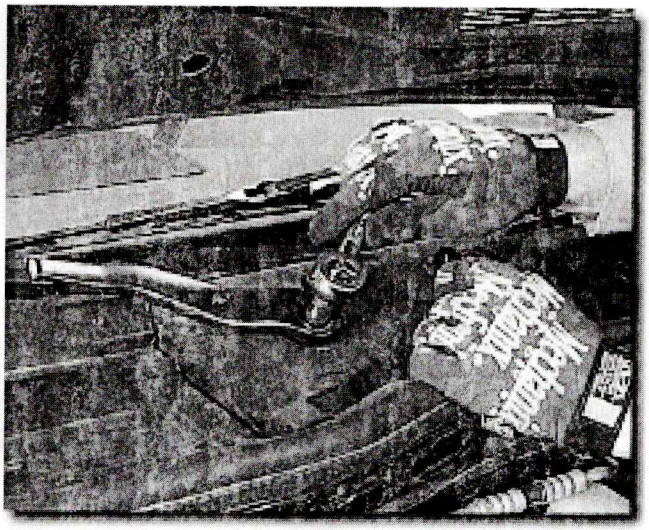


B-3 Loosening the screw on the mirror spade allows this mirror to be removed. A new spade usually comes supplied on the replacement glass.

Begin by removing the parts to access the urethane. Interior parts that may require removal include:

- the rearview mirror. The mirror may be installed on a mounting pad on the windshield interior or come down from the headliner. If mounted on the glass, the mirror usually comes off but the mounting pad, or "spade," remains on the glass.
- A-pillar trim and other necessary trim.
- the sun visors.
- wiring, if there are accessories that connect to the glass or mirror such as a navigation antenna, heating grids, or a radio antenna.
- headliner, which may need to be loosened at the front to access the upper pinchweld.

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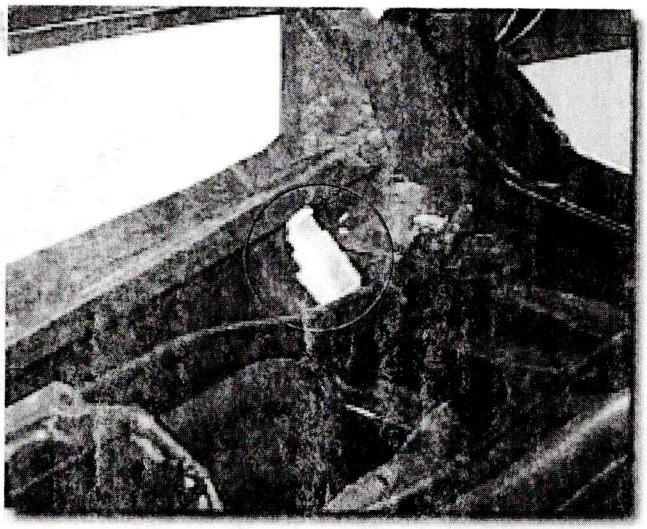


B-4 Windshield removal almost always requires removing the wipers.

Exterior parts that may require removal for access to the urethane include the:

- wipers.
- cowl trim panel.
- other trim, such as exterior A-pillar trim.
- antenna, if it is in the way of properly removing or installing the urethane or glass.

The hood may need to be opened.

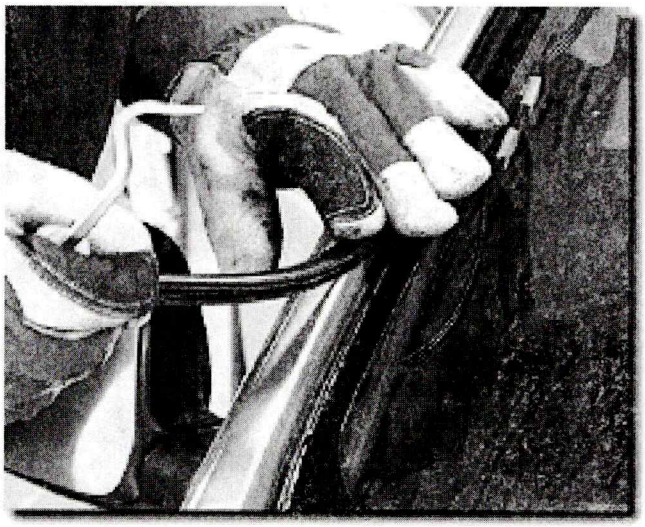


B-5 The stop at the base of this truck windshield should not be damaged when cutting out the glass.

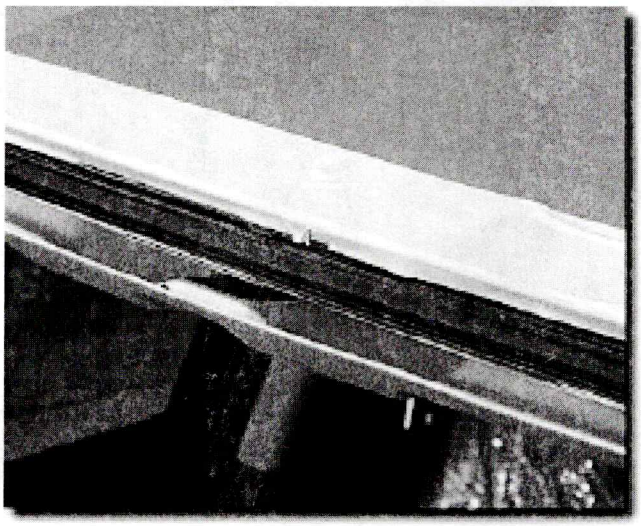
There may be glass stops fastened to the base of the glass opening. These stops:

- are designed to keep the glass at the proper height from the cowl.
- can be seen when the cowl trim panel is removed.
- should not be damaged during glass removal. Mark the position of the stop on the glass with tape or a marker before cutting out the urethane to prevent damage to the stops. If the stops are bolted on, they can be removed and reinstalled before the new installation.
- are also called "gravity stops."

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B-6 This push-in trim molding is not bonded on the glass or the pinchweld and can be removed by pulling.



B-7 The lack of a starting and stopping point in the middle of this urethane is strong evidence of an original installation.

The molding that surrounds the windshield may be:

- T-shaped, sometimes called "push-in molding." This molding is designed to be pushed into the urethane once the urethane is applied. The molding is coated with a release agent, so the urethane does not stick to the plastic. Therefore it can often be reused.
- bonded or wrapped around the glass perimeter. This is installed before the glass is installed.
- bonded to a bolt-on retaining strip. This type of molding is removed first and installed last.

Whether the molding can be reused depends on the type of molding, how carefully it is removed, how brittle it is, and the temperature at the time of removal. Some moldings cannot be reused.



PUSH-IN MOLDING

Select the Demonstration Icon found on screen B-6 of your CD-ROM for an example of a push-in type of molding.

Once the glass is removed, determine whether the installation was original or if the glass was previously replaced. Indications that the installation is original include:

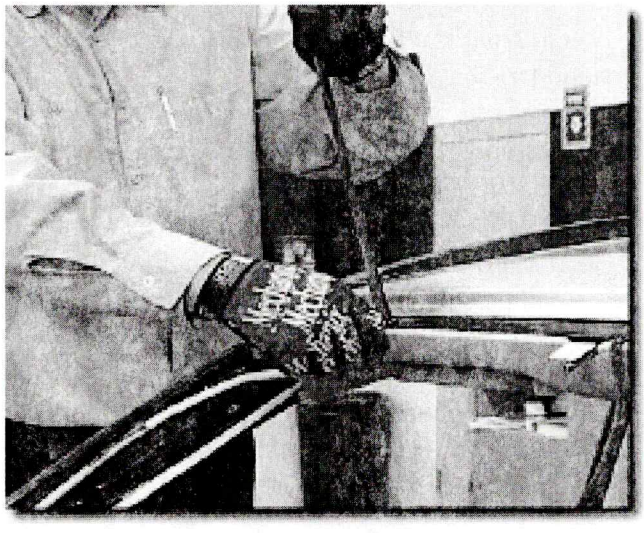
- one starting and stopping point, usually at the bottom in the middle. This is how a robot applies urethane. A technician must stop and start again when adjusting the applicator gun, usually on the corners and in the top middle. These stop and start points will be obvious.
- an even bead of urethane around the entire opening. A technician's applied bead will not be even and straight all around, especially on the corners.
- urethane adhesive. If there is any adhesive other than urethane, the installation is likely not original. The only exception is the use of butyl tape for some older model vehicles.
- an even molding height all around, and the same tight fit, for T-shaped moldings.
- the presence of setting blocks on the glass at the top. These blocks are for robotic installations, so that the glass is positioned at the proper height from the pinchweld. These blocks are on the original glass, and may be provided on OEM glass purchased from a dealership, but will not be on other replacement glass.
- the presence of a foam dam. This is often left out in a reinstallation.

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Also, before removing the glass, look at the "bug" on the lower corner of the glass, which shows where the glass came from.

None of these factors alone are sure indications of an OEM installation. For example the technician may have used a foam dam, and the presence of setting blocks may just mean that the glass was purchased from a dealership. But when many of these indicators are identified, it can be presumed that the installation was original.

Topic C. Removal Procedure



C-1 The second step in a full cutout removal process is stripping the urethane bead down to a height of 1-2 millimeters.

There is only one recommended method for cutting out urethane-set stationary glass, and that is by using the full cutout method, also called "full strip." With this method:

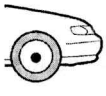
- the cut is made as close to the glass as possible. Then a final trim is made just before installing the glass, removing all but 1-2 mm of existing urethane.
- a full bead of new urethane is applied, assuring that the glass has proper fit despite differences in the curve of replacement glass or irregularities on the pinchweld.

If there is corrosion on the pinchweld, all of the existing adhesive should be removed from that area, the corrosion removed, and the pinchweld primed for corrosion protection. If the existing adhesive is not urethane, all of the existing adhesive should be removed and replaced with urethane. The only exception to this is if the original installation was done with butyl tape, since it is difficult to remove all original butyl tape.

Do NOT use the partial cutout method, sometimes called the "short cut method," which leaves most of the existing urethane and requires only a small bead of new urethane. With this method:

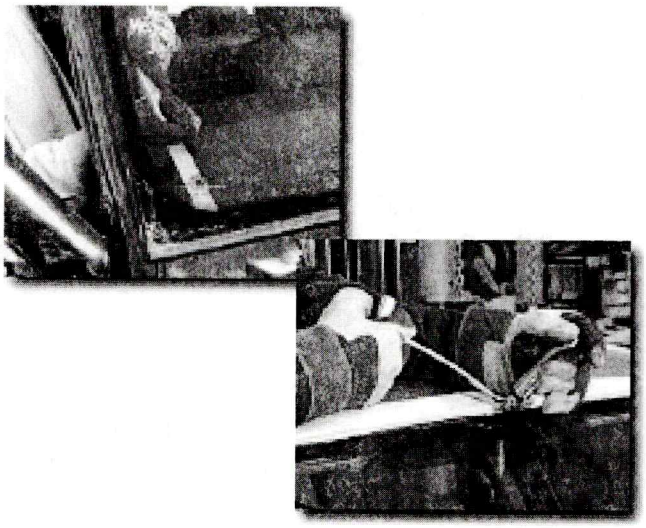
- it is more difficult to prevent the glass and moldings from sitting too high.
- the possibility of incompatible products is increased.
- it is difficult to determine how well the existing adhesive bead is bonded to the pinchweld.

NO vehicle or product maker currently recommends the partial cutout method.



Do NOT use a release agent to help remove the adhesive. The same properties that make a product effective at releasing also makes it incompatible with a later adhesive process.

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C-2 Commonly used hand tools for removing stationary glass include a long knife (top) and a cold knife (bottom).

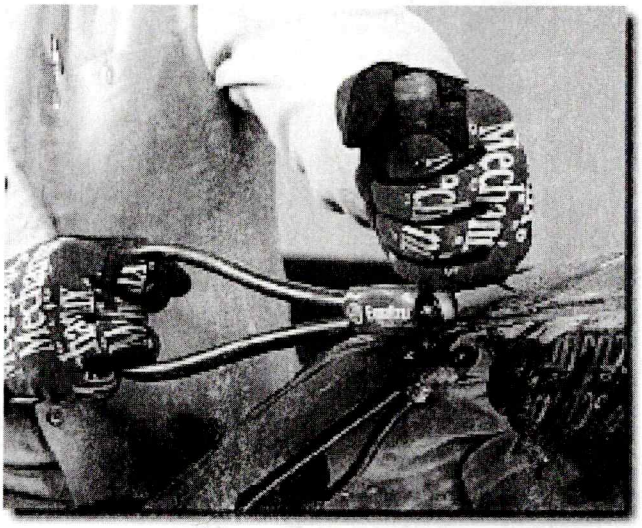
Hand tools used for removing stationary glass include a:

- cold knife.
- utility knife.
- long-handled utility knife.
- wire tool.

HAND CUTOUT KNIVES

Select the Demonstration Icon found on screen C-2 of your CD-ROM for examples of stationary glass hand cutout knives.

Blades for hand cutting tools are extremely sharp. Wear leather gloves when handling these tools.



C-3 This cold knife has a rubber loop for a pull handle.

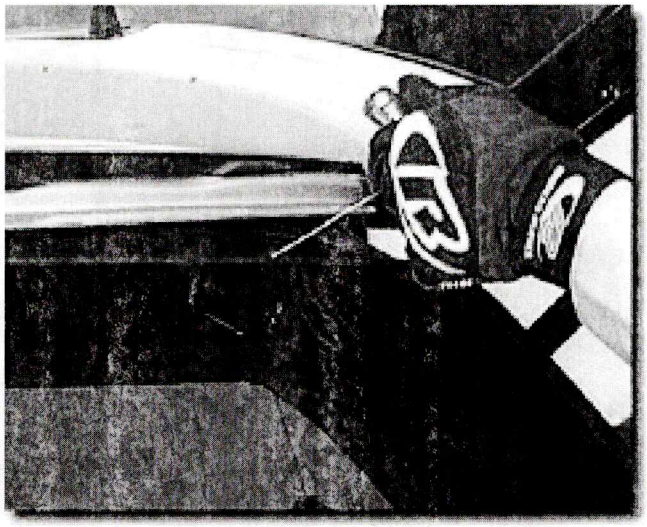
A cold knife is a common hand tool for cutting out stationary glass. A cold knife:

- has an L-shaped blade with a hand grip and an attached pull handle.
- has different lengths of blades available for the desired cutting depth and different pinchweld widths.
- helps prevent pinchweld damage because of its shape. The hand grip helps keep the blade angled parallel to the base of the pinchweld. If the blade is taken out of parallel, it is easy to break the glass.

USING A COLD KNIFE

Refer to screen C-4v of your CD-ROM for a video on how a cold knife is used to remove stationary glass.

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C-5 A wire cutout tool saws through the urethane by pulling the handles back and forth.

A wire tool is a length of wire attached to two handles. There also must be a hollow tube that is pushed into the urethane to feed the wire through. Using a wire tool:

- is recommended if the goal is to save the glass. Using most power cutters will also help prevent the glass from breaking, but requires more experience.
- may require two technicians at some locations. Using two technicians helps prevent damage to interior and exterior trim.
- may require spraying plain water on the urethane as a lubricant if the urethane smokes. This can happen especially when the wire is pulled quickly by two technicians. Burning urethane is toxic. Use plain water from a spray bottle.

Smoke from burning urethane is highly toxic, and contains isocyanates. Do NOT inhale the smoke. If adequate ventilation is not available, wear a combination vapor/particulate respirator.

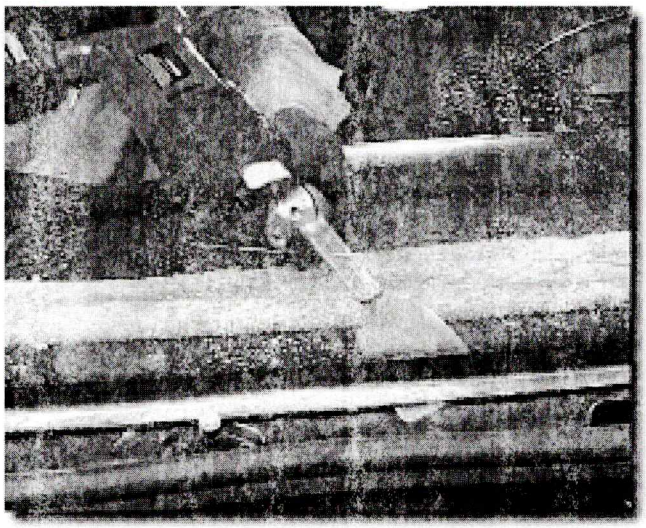
Use a label to identify a clear liquid as "Water." Clear liquids all look the same and must be labeled to distinguish one from the other.

WIRE TOOL

Select the Demonstration Icon found on screen C-5 of your CD-ROM for an example of a wire tool kit used for stationary glass removal.

USING A WIRE TOOL

Refer to screen C-6v of your CD-ROM for a video on how a wire tool is used to remove glass.



C-7 This wide-bladed reciprocating power cutter is handy when cutting the urethane from the base of this windshield.

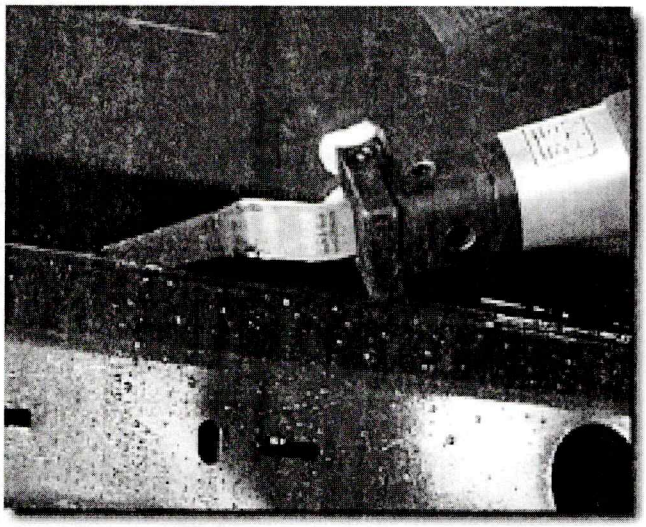
Power cutters for cutting urethane:

- may have an oscillating blade.
- may have a reciprocating blade.
- must be lubricated with water or the urethane will smoke.

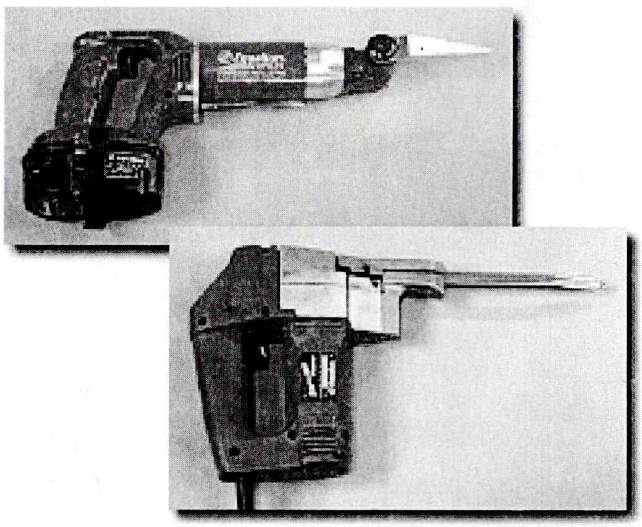
Smoke from burning urethane is highly toxic, and contains isocyanates. Do NOT inhale the smoke. If adequate ventilation is not available, wear a combination vapor/particulate respirator.

Blades for power cutters are extremely sharp. Wear leather gloves when handling power cutter blades and while cutting.

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C-8 The blade on this reciprocating power cutter is angled to allow the urethane bead to be cut close to the glass.



C-9 The oscillating cutter on the top has a rechargeable power supply. The cutter on the bottom is 120-volt electric.

There are different sized blades for power cutters. Depending on the type of cutters, the blades:

- may be mounted inside a sheath for protecting adjacent areas. This is used for reciprocating cutters.
- may have a blade depth adjustment.
- should be started before inserting in the adhesive, and stopped before withdrawing.

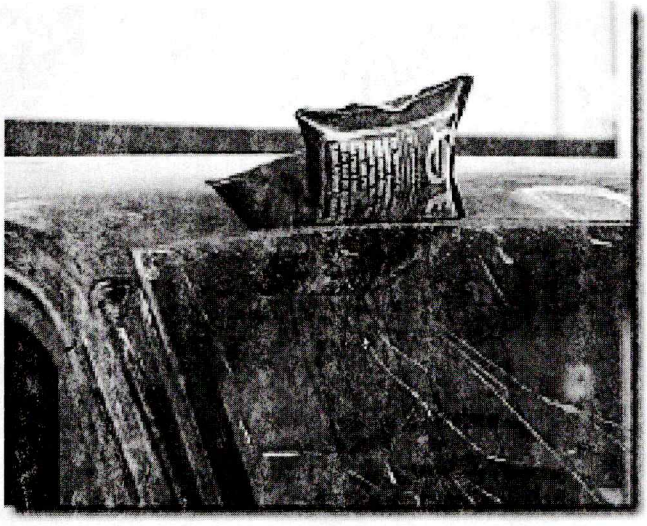


POWER CUTTERS

Select the Demonstration Icon found on screen C-8 of your CD-ROM for examples of power cutters.

Power cutters are rechargeable, pneumatic, or electric. Electric power cutters are available in 12 or 120 volt. 12-volt cutters can be powered from the vehicle battery for mobile use. Pneumatic cutters can be run with a pressurized cylinder for mobile use.

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C-10 This inflatable bag tool is designed especially for pushing out the windshield on top to access the urethane bead from the inside at the bottom.

Aids for helping a technician replace stationary glass include:

- a foam pad or inflatable bag to push the glass out on top when cutting out the bottom with a hand tool. The top must be pushed forward to access the bottom when cutting the bottom strip of urethane from the interior. The tool can be a specially designed inflatable bag or as simple as a foam ball.
- suction cups to get a handle on the glass without having to touch the edges. This is especially handy when installing the glass.
- a glass stand to set the glass flat. These should be covered with foam to protect the glass. This can be used to both clean and prime the replacement glass.

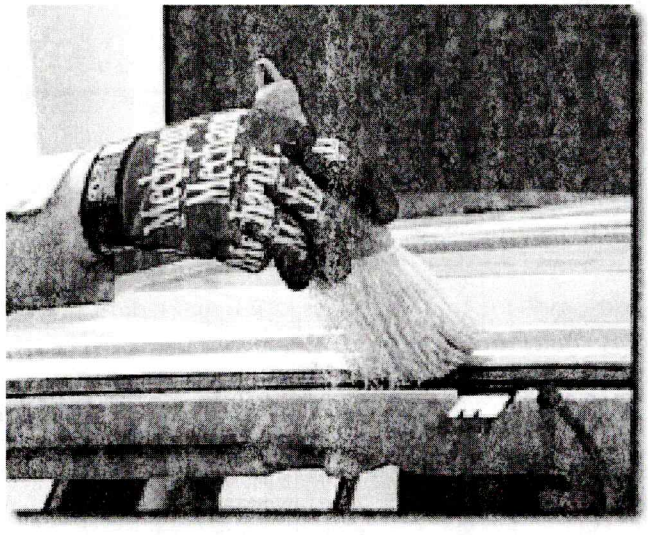
Do NOT use your head to push the top of the glass forward. This can result in head and neck injuries.

A back support will help reduce back injuries when lifting glass.

GLASS CUTOUT ACCESSORIES

Select the Demonstration Icon found on screen C-10 of your CD-ROM for examples of some accessories that can help with stationary glass removal.

Topic D. Pinchweld Preparation

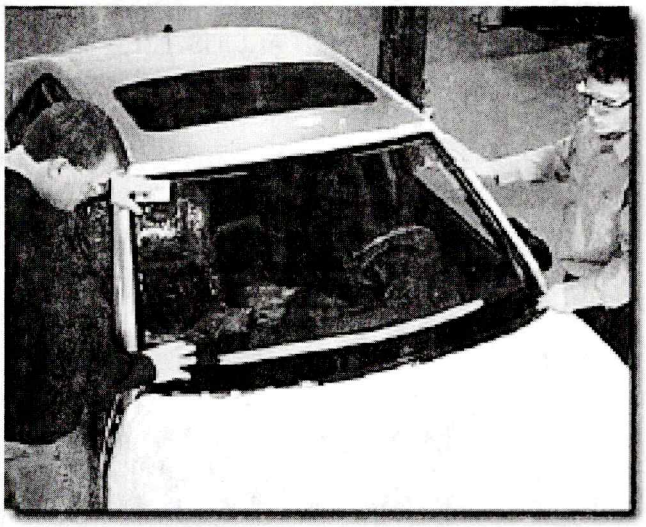


D-1 Brush off contaminants from the pinchweld before trimming the urethane down.

After the glass is out and before final trimming of the urethane:

- use a brush or towel to sweep off any loose dirt or dust from the pinchweld. Use the utility knife to cut off any loose urethane strips.
- remove contaminants from the pinchweld. A solvent-based cleaner can be used now, but not after doing the final trim.
- look for any signs of corrosion on the pinchweld. If there are any signs of corrosion, the adhesive and coatings must be completely removed from that area, the corrosion removed, and the bare metal primed for corrosion protection.

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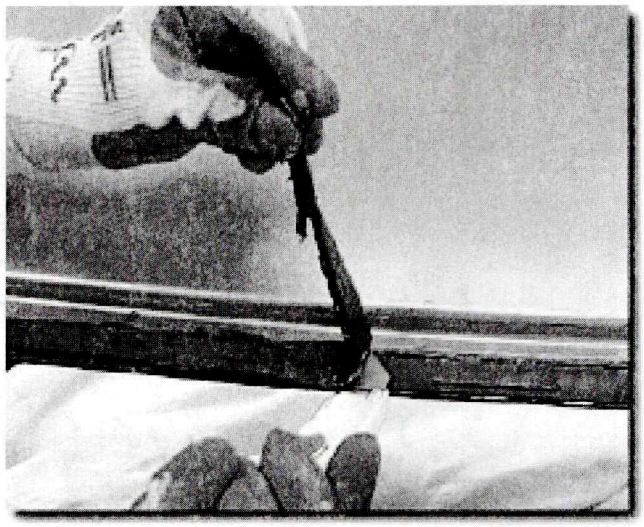


D-2 Position the windshield into the opening before applying the adhesive to check for proper fit.

Dry-set the glass to:

- ensure that the glass opening is dimensionally correct.
- look for even gaps from side-to-side.
- determine if support spacers are needed for proper height.

When the glass is in the proper position, mark the position with tape. Slit the tape so that part is on the glass and part is on the glass opening, marking the position. This will be helpful for alignment during final glass installation.



D-3 Final-trim the urethane just before applying a new bead of adhesive.

Most of the existing urethane remains on the pinch-weld until the glass is ready to be installed. This serves as masking to protect the bonding area from dust, applied coatings, and sunlight. Just before installation, final-trim the urethane by:

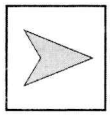
- cutting the bead to a height of 1–2 mm.
- keeping the thin bead as flat and even as possible. Minor differences in the bead height are not a problem.

Clean after the final trim only if necessary, and only with water. Distilled water is best. Do not use tap water. Urethane will absorb any chlorine, which will not evaporate out. Minerals in tap water weaken the bond.



FINAL TRIM

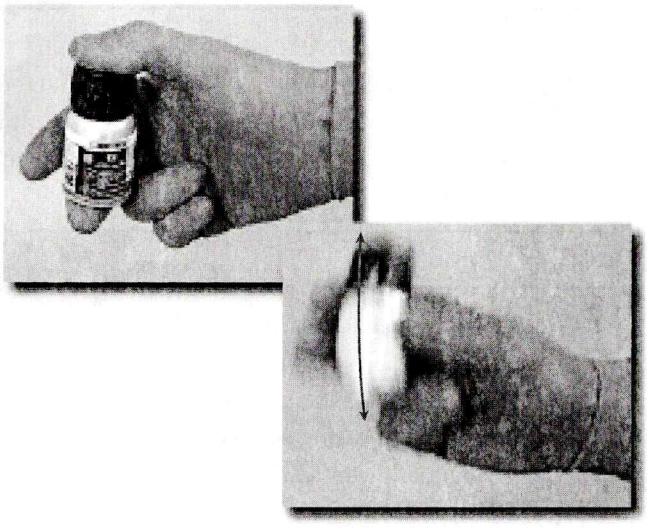
Select the Demonstration Icon found on screen D-3 of your CD-ROM for an example of how the urethane looks before and after it is final trimmed.



URETHANE FINAL TRIM

Refer to screen D-4v of your CD-ROM for a video on methods of trimming the existing urethane to a height of 1–2 mm.

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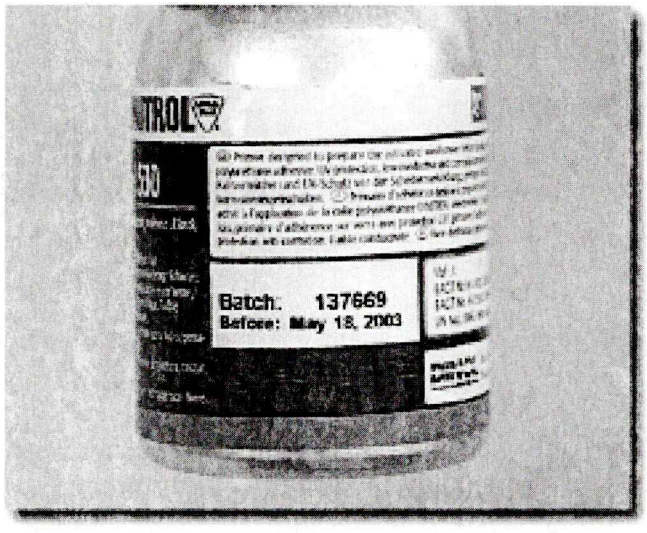
D-5 The bottle of pinchweld primer must be shaken to mix in the solids that may have settled to the bottom.

Pinchweld primers are designed to work with and bond to the adhesive. If a corrosion-resistant primer was applied to a repaired pinchweld, pinchweld primer must be applied over the corrosion-resistant primer to create a strong bond with the adhesive. When using pinchweld primers:

- do not apply the primer to urethane adhesive that remains following glass removal. The best bond is urethane-to-urethane. Pinchweld primer is a paint, which gets brittle when dry and could flake-off the flexible urethane underneath, weakening the bond.
- always shake the container to mix in the solids that may have settled to the bottom and assure even coverage.
- avoid freezing temperatures. If the installation must be performed outside in the cold, apply the primer to the glass ahead of time at room temperature. Most primers can be applied up to 8 hours before the installation. After 8 hours, the primer would have to be reapplied. If pinchweld primer must be applied to the pinchweld, for example after body work has been performed, the installation must be done indoors.



Pinchweld primer contains lung and skin irritants. When applying pinchweld primers, wear chemical-resistant gloves, such as medium-duty nitrile. If working in a confined area without adequate ventilation, wear an air-purifying respirator that absorbs chemical vapors.



D-6 Do not use the pinchweld primer after the expiration date printed on the bottle.

It is important to pay attention to the shelf life for pinchweld primers. Generally:

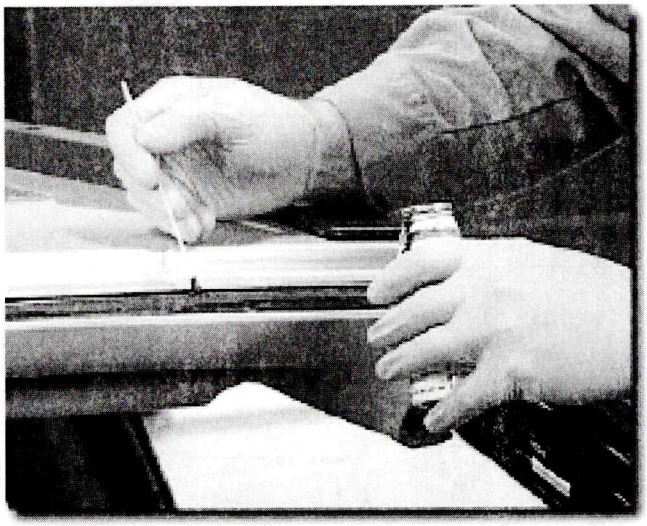
- the shelf life for pinchweld primers is 6–9 months.
- once opened, the pinchweld primer must be used within 7 days whether the bottle is opened again or not.
- one-time applicators must be used in about 3 minutes once opened.



PINCHWELD PRIMER

Select the Demonstration Icon found on screen D-6 of your CD-ROM for an example of pinchweld primer.

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D-7 If there is an existing urethane bead, only apply pinchweld primer to scratches in the urethane bead.

When applying pinchweld primer to the pinchweld:

- generally use a cotton swab on scratches, not the wool dauber that often comes with the pinchweld primer. A dauber can be used when applying pinchweld primer over corrosion-resistant primer, but is too big for scratches. A dauber may get primer on the urethane and exposed paint, and may bridge the scratches rather than coat them. The swab should simply be a cotton ball wound around a small stick. Cotton swabs purchased from a pharmacy usually have glue holding the cotton to the stick, which could contaminate the pinchweld.
- apply in one direction, not back and forth, which can spread contaminants.
- take care to not dip into the primer bottle more than once. This may contaminate the primer.
- apply to scratches up to about 13 millimeters square (½ inch square). A larger area requires an application of corrosion-resistant primer first.

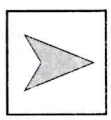


SWAB AND DAUBER

Select the Demonstration Icon found on screen D-7 of your CD-ROM for examples of a cotton swab and wool dauber used for applying pinchweld primer.



Pinchweld primer contains lung and skin irritants. When applying pinchweld primers, wear chemical-resistant gloves, such as medium-duty nitrile. If working in a confined area without adequate ventilation, wear an air-purifying respirator that absorbs chemical vapors.

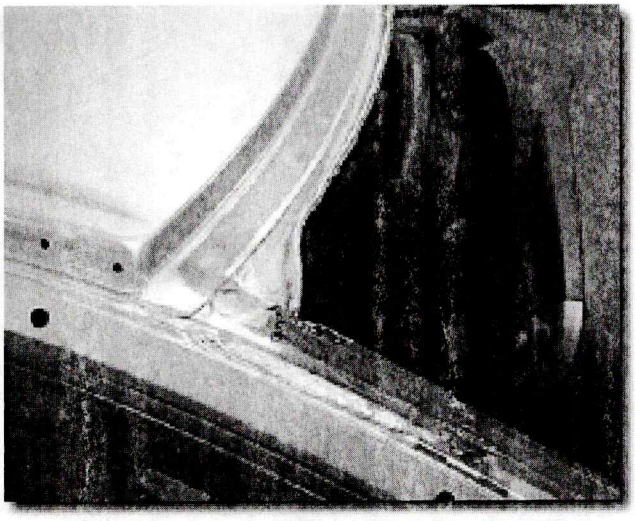


APPLYING PINCHWELD PRIMER

Refer to screen D-8v of your CD-ROM for a video on basic methods of applying pinchweld primer.

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Topic E. Treating A Repaired Pinchweld

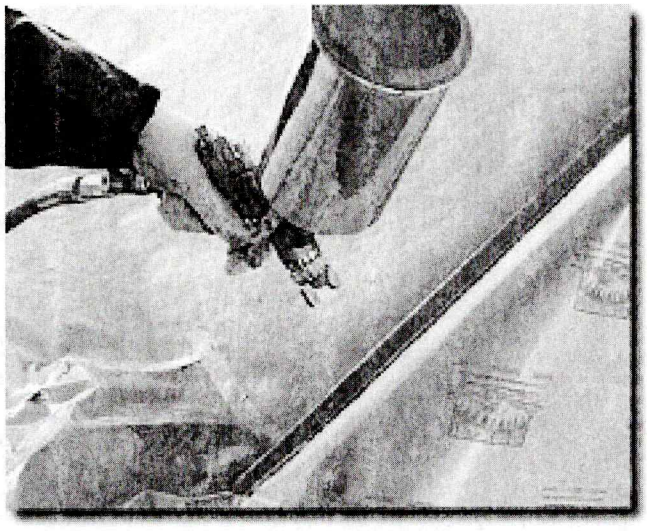


E-1 The roof was replaced on this vehicle, so the pinchweld does not have existing adhesive. This requires extra steps.

The steps are different if there was pinchweld damage or part of the pinchweld was replaced. When preparing a repaired or replaced pinchweld for stationary glass installation, do NOT:

- thin the metal when grinding down welds or removing corrosion.
- use body fillers or seam sealers. This would be a weak link. The body of the urethane adhesive fills in minor irregularities on the pinchweld.

If there is corrosion on the pinchweld, the adhesive and coatings must be removed down to bare metal, and the corrosion removed by sanding.

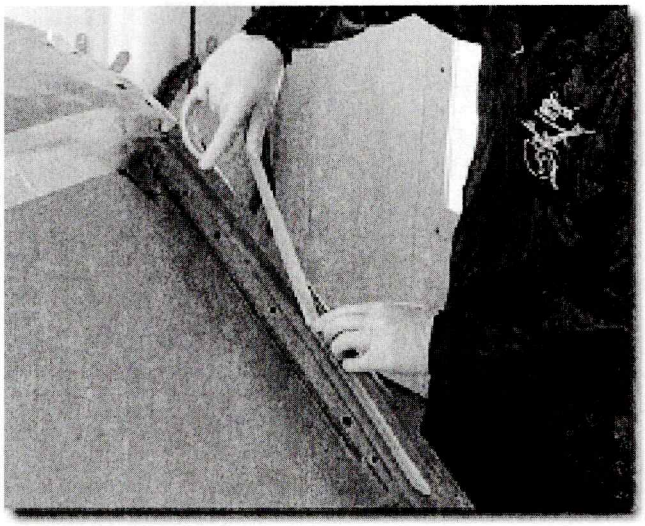


E-2 Corrosion-resistant primer is being applied to the bare metal on this repaired pinchweld.

If there was pinchweld damage:

1. Establish transitions between the undamaged area, where there is existing urethane, and the repaired area. The existing urethane should be tapered down to the bare metal in the repair area. The repair area may be relatively small where a dent was removed, or large where a complete or partial panel was replaced. Bare metal areas will require application of a corrosion-resistant primer. Areas with OEM-applied electrodeposition primer (E-coat) do not require additional primer.
2. Mask off the area to be primed.
3. Apply corrosion-resistant primer to bare metal areas, either epoxy or self-etch primer.

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E-3 On most vehicles, tape is applied to the urethane bonding area before applying topcoats.

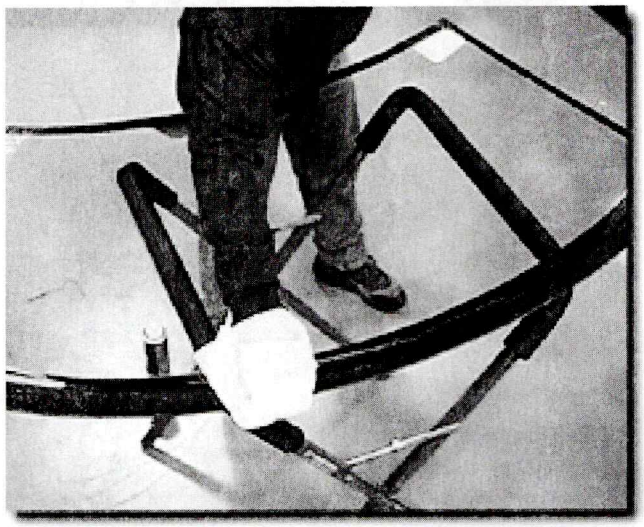
To treat the repaired area:

4. Mask the bonding area on the repaired pinchweld area using 19 mm (¾") masking tape so topcoats will not be applied. This will be the urethane bonding area. Use tape that does not leave a residue. Note that at least one vehicle maker recommends topcoats be applied to pinchweld bonding areas.
5. Apply topcoats to the repaired area outside of the bonding area.
6. Remove the masking and apply pinchweld primer over the corrosion-resistant primer in the bonding area. The E-coat on replacement panels must also be treated with pinchweld primer.

The remainder of the procedure is the same as if the pinchweld was not damaged.

TREATING A REPAIRED PINCHWELD
Refer to screen E-4v of your CD-ROM for a video on one treatment for a straightened A-pillar pinchweld.

Topic F. Preparing The Glass



F-1 Pay extra attention to the edges of the glass when cleaning, where there are often fingerprints from carrying the glass with bare hands.

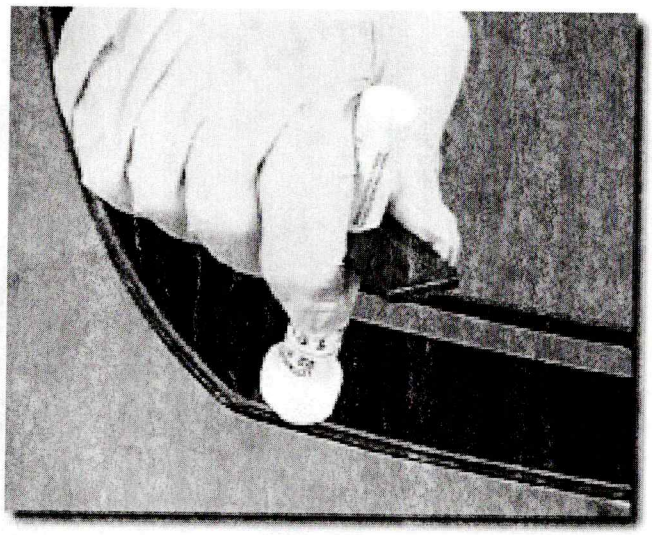
Prepare the glass by cleaning:

- both surfaces. Attempting to clean the interior side of the glass after it is installed could apply enough outward pressure to weaken the bond.
- fingerprints or oil contaminants with a mild solvent cleaner. There may be fingerprints on the edge if the glass was handled without gloves. Fingerprints may lead to leaks, and a solvent cleaner will clean greasy contaminants better than glass cleaner.
- the entire surface with glass cleaner. If possible, use a glass cleaner from the same adhesive maker.

If the glass is being reinstalled, and the existing adhesive is urethane, trim the remaining urethane on the glass down to about 1–2 mm following cleaning. Do NOT apply pinchweld primer to the existing urethane bed.

GLASS CLEANERS
Select the Demonstration Icon found on screen F-1 of your CD-ROM for examples of products used for cleaning the glass.

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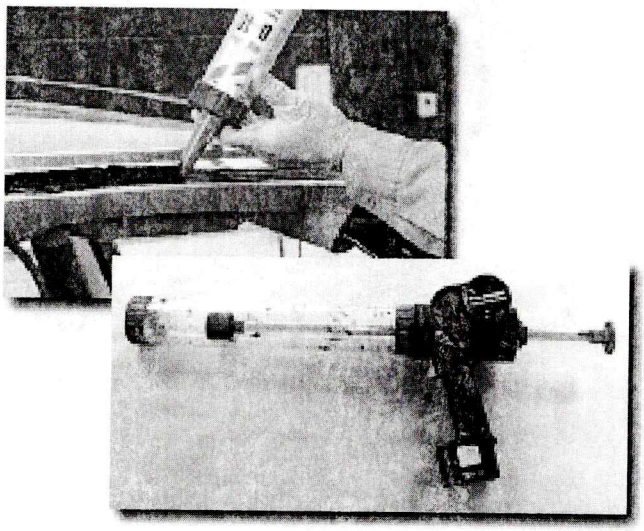
F-2 This one-time applicator is one product maker's primer for the glass edge.

The primer applied to the glass:

- may be the same product as the pinchweld primer.
- may be a two-step process involving two products.
- is applied to the mating surface.
- is not required if using a primerless urethane. Primerless means that primer is not required on the glass.

Pinchweld primer and glass adhesive contains lung and skin irritants. When applying these products, wear chemical-resistant gloves, such as medium-duty nitrile. If working in a confined area without adequate ventilation, wear an air-purifying respirator that absorbs chemical vapors.

Topic G. Applying The Adhesive



G-1 Powered applicators make it easy to apply an even urethane bead.

Applicator guns for applying the urethane may be:

- manually triggered. This type makes it difficult to dispense adhesives, especially high-viscosity adhesives, without fatigue and the potential for developing carpal tunnel syndrome. It is also difficult to control the volume of adhesive being dispensed, and to keep an even bead.
- either rechargeable, pneumatic, or 120 volt electric.
- adhesive-specific. Some adhesives can only be dispensed using a dedicated gun.

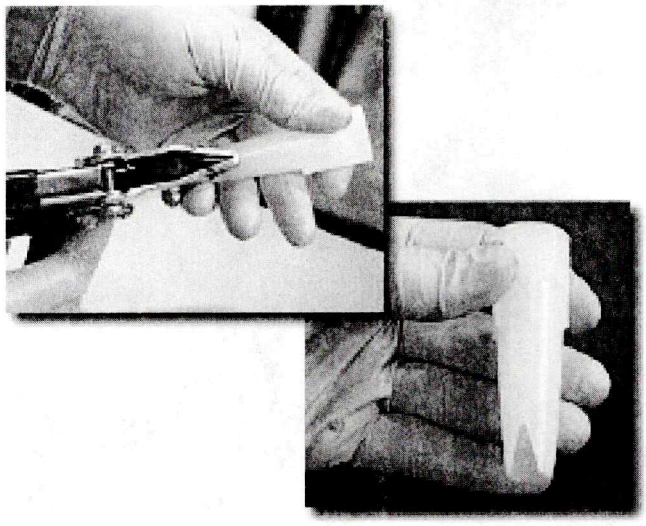
APPLICATOR GUNS

Select the Demonstration Icon found on screen G-1 of your CD-ROM for examples of guns used to apply urethane adhesive.

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G-2 The horizontal cut in the nozzle sets the base width of the urethane bead.



G-3 The V-cut in the nozzle sets the height of the urethane bead. There are special tools that make this cut in one step.

The plastic nozzle that comes with the adhesive cartridge must be specially cut to apply the adhesive properly. To cut the nozzle:

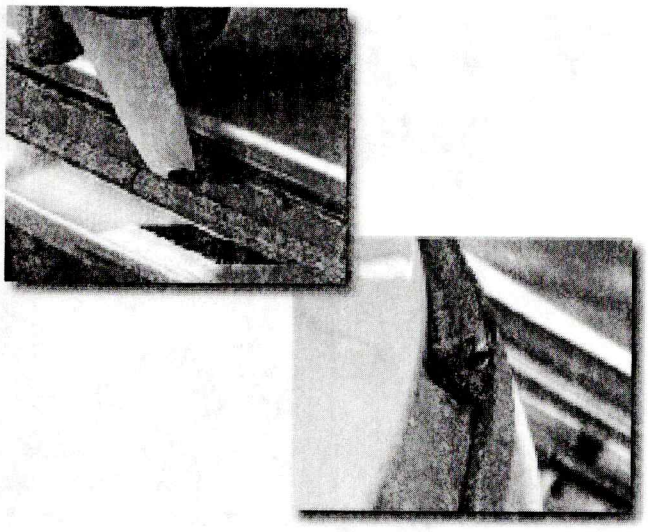
1. Open both sides of the cartridge. The bottom is a "pop top." Screw off the nozzle on the top and use it, or the point of another uncut nozzle, to penetrate the membrane.
2. Attach the applicator tip.
3. Cut the tip off square with a utility knife. This will be the base width of the bead. The diameter should equal the width of the existing urethane bead. If the entire pinchweld was replaced, note the size of the original bead before recycling the parts.
4. Make a V-cut in the nozzle tip using a special tool that makes the cut in one motion. The cut can be also be made with a utility knife. The "V" enables the adhesive to be applied in a triangular shape. The height of the "V," or the top of the triangular bead, should be about as high as the distance the pinchweld flange is inset from the face of the panel (pinchweld wall). This is about 13 mm (½").



CUTTING THE NOZZLE

Select the Demonstration Icon found on screen G-3 of your CD-ROM for an example of how to cut the nozzle on a urethane applicator tube.

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G-4 The V-cut tip applies the urethane bead in a triangular shape that will flatten out when the glass is installed.

Apply the urethane:

- usually to the pinchweld, not the glass. It is often difficult to determine exactly where on the glass the bead contacts the pinchweld, especially on the bottom along the cowl panel.
- with the applicator gun as close to 90° as possible. This helps force the adhesive into irregularities on the surface.
- trying to make the bead as consistent as possible.
- in two passes, if the existing bead width in some areas is too wide for one pass.

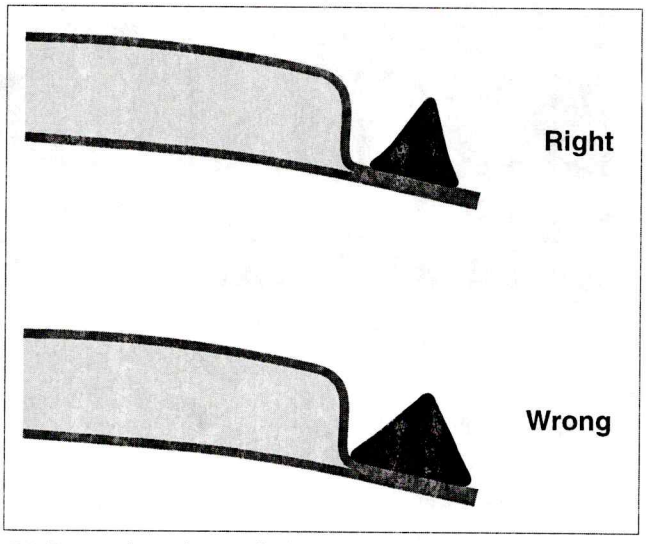
Most pinchwelds require 1½–2 regular-size cartridges.

After the bead is applied, use a paddle spreader to close the seams at the start and stop points.

Glass adhesive contains lung and skin irritants. When applying the adhesive, wear chemical-resistant gloves, such as medium-duty nitrile. If working in a confined area without adequate ventilation, wear an air-purifying respirator that absorbs chemical vapors.

DISPENSING URETHANE ADHESIVE

Refer to screen G-4 of your CD-ROM for an example of dispensed adhesive beads on cardboard and have your Instructor lead you through the Dispensing Urethane Adhesive Activity.



G-5 Too much urethane will block the channel on the inside of the pinchweld, preventing water from draining and leading to corrosion forming.

Applying too much urethane is as bad as applying too little. Applying too much urethane:

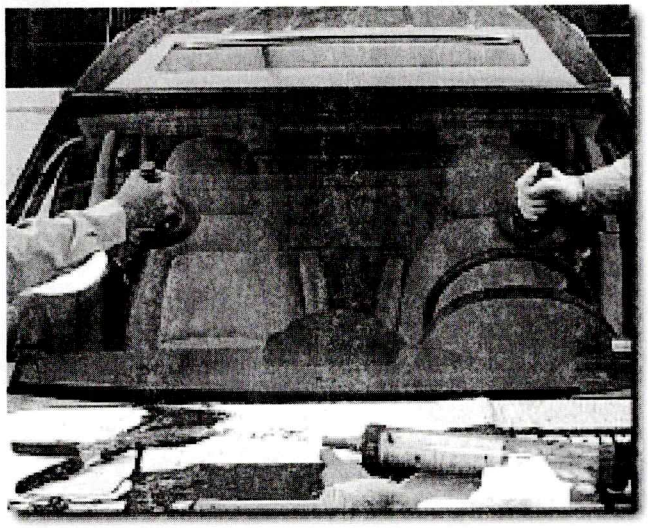
- can block the channel between the bead of urethane and the sidewall of the pinchweld. This channel is necessary for air circulation to assist in curing. The channel also allows excess water to drain from the perimeter of the glass, helping prevent corrosion from forming.
- allows some of the bead to contact an area of the pinchweld that is not primed. This reduces the bond strength.
- slows the curing time.

APPLYING THE URETHANE

Refer to screen G-6v of your CD-ROM for a video on applying the urethane adhesive to the pinchweld.

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Topic H. Glass Installation



H-1 Install the glass in position making sure to not touch the edges of the glass. This is easiest if there are two technicians using suction cups.

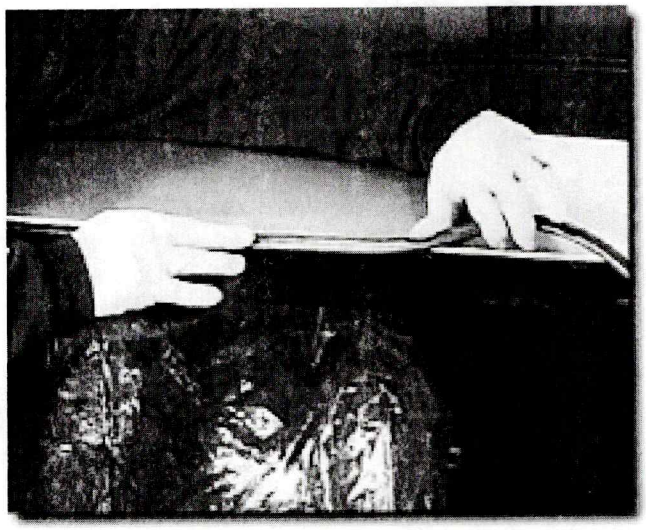
When installing the glass:

- avoid handling the primed area, even with gloves on. Hold the edges, or use suction cups.
- try setting it in the proper position and flat the first time. Removing and repositioning the glass may cause a leak. Use setting blocks and the tape indicators applied earlier to position the glass properly.
- press down to the desired height, trying to level it as evenly as possible. Do not slap on the glass, which may push the glass down too quickly and create air pockets in the adhesive bead.

Also, center the glass so that the molding will fit properly.



A back support will help reduce back injuries when lifting glass.



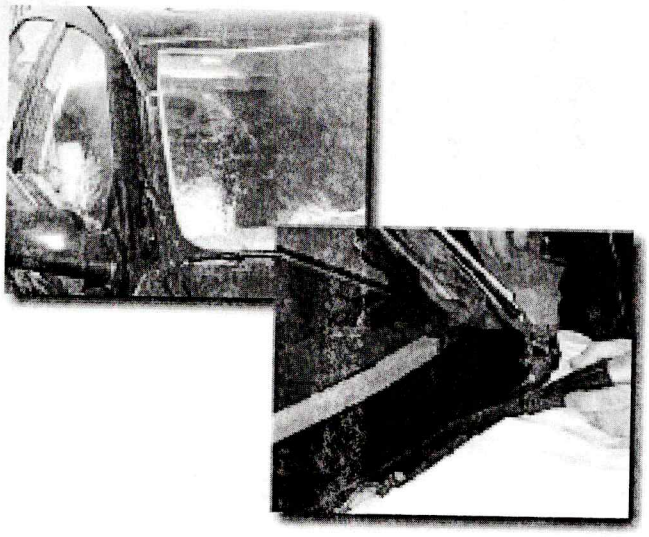
H-2 Push-in molding can be pressed in place after the glass is in position.

If a push-in T-molding has to be applied, push it into the urethane around the edge. Warming the molding with a heat gun will make it easier to form around the edge.

Until the adhesive cures, keep the door glass slightly open. Shutting doors with the door glass shut may cause outward pressure on the stationary glass and weaken the bond.

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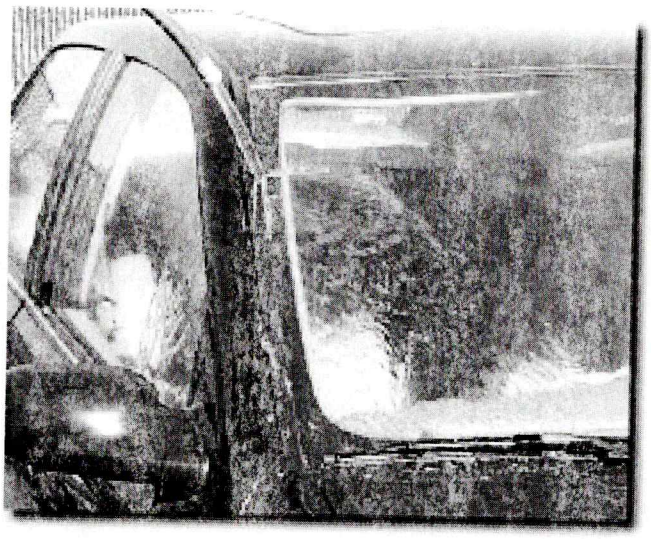
Topic I. Troubleshooting



I-1 Two methods of checking for air or water leaks are using water and an ultrasonic sound tool.

If there are any leaks, right after installing the glass is the best time to discover them. Leak-checking methods include:

- water.
- ultrasonic sound.



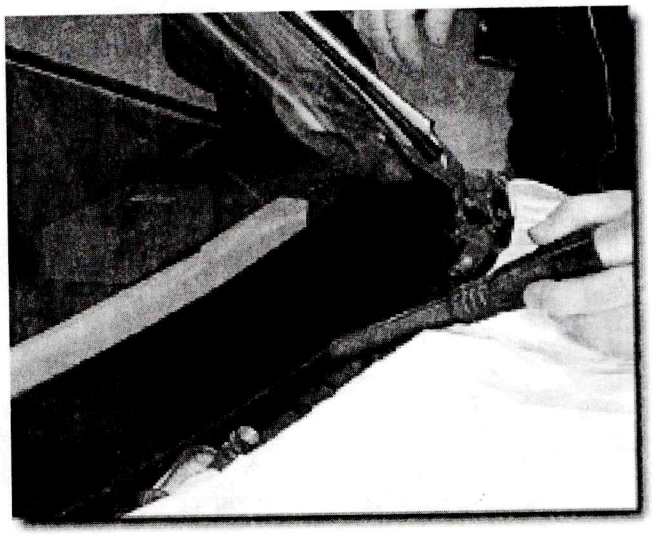
I-2 The water method can be as easy as running water from a hose around the outside perimeter and looking for any signs of water on the inside.

The water method involves:

- applying water around the perimeter of the glass. This can be done with a hose or squirt bottle.
- running a rubber-gloved hand along the inside. The glove will drag where dry, and slip where wet.
- looking to see if there is any sign of water on the inside.

An advantage of using water to check for leaks is that water helps cure one-part urethanes that rely on heat and humidity for proper curing.

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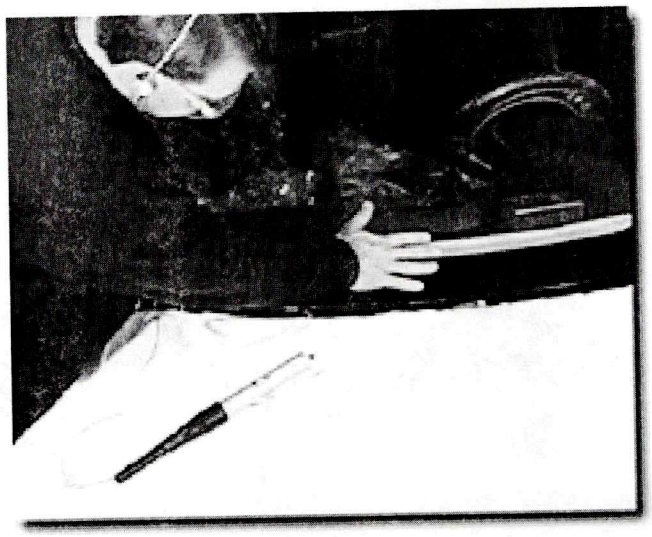
I-3 With the ultrasonic method, a transmitter on the instrument panel sends out a high-pitched beep that can be heard with the probe on the outside where there is even the slightest gap in the urethane bond.

With the ultrasonic sound method, a special tool is used. This tool:

- has a separate ultrasonic sound transmitter, which is positioned in the vehicle.
- uses a microphone receiver to probe around the perimeter on the outside.
- indicates a leak anywhere the sound is heard.

LEAK-CHECKING METHODS

Refer to screen I-4v of your CD-ROM for a video on methods of checking for leaks after a stationary glass installation.



I-5 If a leak is found right after installing the glass, push on the glass in the suspected area and test again.

If a leak is discovered:

- push on the glass from the outside in the area of the leak. Then test again. This will take care of most leaks.
- after pushing down on the area, apply more urethane, if the leak is still there.
- in an installation after the adhesive is cured, there may be more serious problems. The glass should be removed and reinstalled.

PREPARING A REPAIRED PINCHWELD

Select the Activity Icon on screen I-6 of your CD-ROM for an interactive exercise on steps for preparing a repaired pinchweld for stationary glass installation.

Topic J. Review

REVIEW

Refer to screens J-1 through J-3 of your CD-ROM for review questions on replacing a windshield.

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Glass module #2 Quiz

ⓘ This is a preview of the draft version of the quiz

Started: Nov 8 at 11:18am

Quiz Instructions

Glass module #2 Quiz

Question 1 — 1 pts

Technician A says that before replacing a broken windshield, the defroster vent should be vacuumed with the blower on.

Technician B says that the cowl trim panel and windshield wipers usually require removal when replacing a windshield.

WHO IS RIGHT?

- ○ A only
- ○ B only
- ○ Both A and B
- ○ Neither A nor B

Question 2 — 1 pts

All of these are indications of an OEM installed windshield EXCEPT:

- ○ no starting and stopping point of the adhesive bead in the middle
- ○ butyl tape installed as a urethane dam
- ○ setting blocks attached to the glass at the top

- ○ the name of the vehicle make on the bug

Question 3

1 pts

Technician A says that dry setting be done after the existing urethane has been trimmed.

Technician B says that when dry settings, mark the position of the glass with tape and leave part of the tape around the glass opening

WHO IS RIGHT?

- ○ A only
- ○ B only
- ○ Both A and B
- ○ Neither A nor B

Question 4

1 pts

Which of these is recommended to prevent the urethane from smoking when it is being cut with an electric power tool?

- ○ glass cleaner
- ○ plain water
- ○ soapy water
- ○ powdered lubricant

Question 5

1 pts

Technician A says that priming the glass may be a two step process.

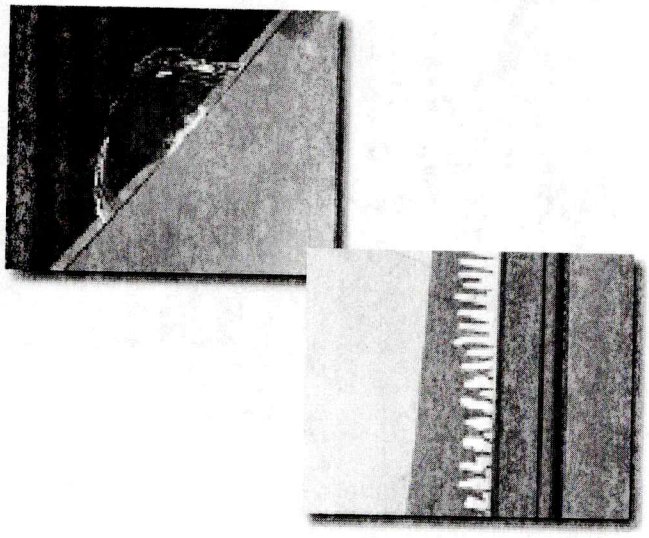
Technician B says that the glass primer may be the same product as the pinchweld primer.

WHO IS RIGHT?

- ○ A only
- ○ B only
- ○ Both A and B
- ○ Neither A nor B

Not saved Submit Quiz

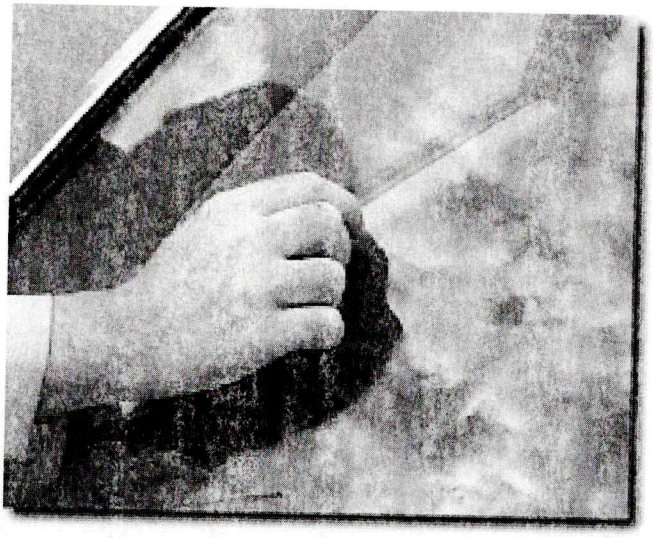
Topic A. Glass Repair



A-2 The edge chip in the top photo may or may not show when the glass is installed. The delamination problem in the bottom photo is within the glass and cannot be repaired.

Defects in stationary glass, usually on the edge of laminated glass, include:

- chips in one of the outer laminates.
- lamination separation, indicated by white streaks or spots.
- burrs, or raised bumps.
- distortion, due to uneven layers.
- dirt or hair between the laminations.
- gaps in a bonded molding.



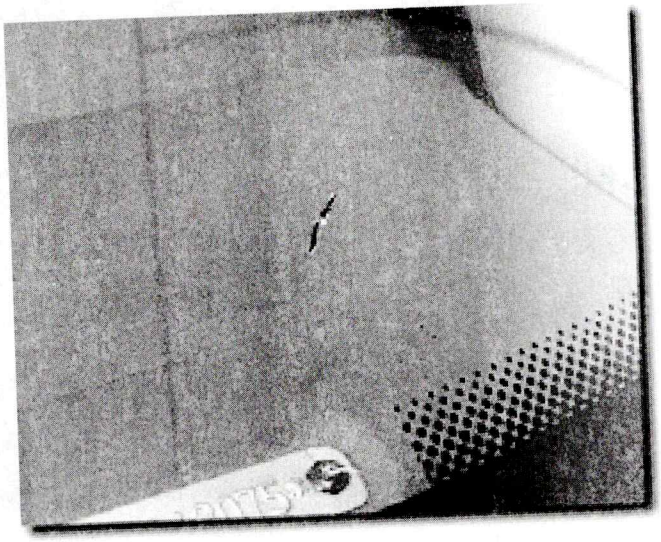
A-3 With most minor repair systems, if a scratch can be felt it is too deep to be removed without distorting the glass.

Some minor defects, such as scratches caused by a windshield wiper blade, can be repaired. For repairing a minor scratch:

- the process is usually to buff the damage with a mild abrasive, such as cerium oxide powder mixed with water. The abrasive levels the surrounding glass to the base of the scratch, thus eliminating the scratch. Scratches can also be filled in with a clear resin.
- with most systems, the scratch should not be able to be felt with a fingernail. Trying to remove a scratch that can be felt may remove too much material and distort the glass.
- there are different repair systems available. At least one system does not use an abrasive.

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Topic B. Repairing Minor Glass Damage

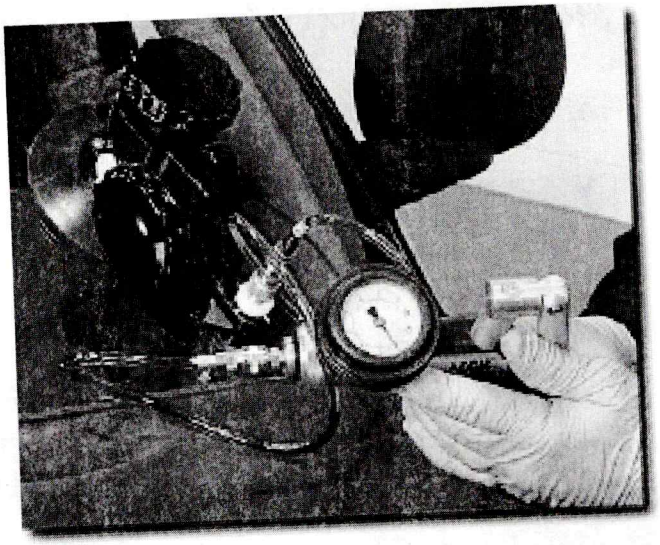


B-1 This star break has only penetrated the outer glass laminate, so it can be repaired.

Only some minor scratches can be repaired on tempered glass. On laminated glass, however, other repairs can be made. These repairs:

- include "bullseyes," "star breaks," and some small cracks. Repair systems vary on how large of a crack can be repaired, if at all.
- are only possible if the damage is contained to the outer laminate.
- cannot be made in the driver's direct view. This is generally the area covered by the driver side windshield wiper.
- are possible because the visible damage is mostly air trapped between the outer layer of glass and the plastic laminate. The air can be drawn out and replaced with resin, making the damage nearly invisible.

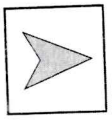
A windshield exposed to fire damage should be replaced. A windshield exposed to excessive heat will have a shortened life cycle and may not perform as it should in a collision. Also, laminated glass is more susceptible to delaminating when exposed to fire.



B-2 This type of repair system positions a fixture over the damage to pump out the air and replace the vacuum with clear resin.

There are several different glass repair systems available for repairing laminated glass. With all of these systems:

- the repair is designed to keep the damage from spreading. The repair is more for strength than for cosmetic appearance.
- air is drawn out and replaced with a clear resin.
- the damage is still present after the repair, but not as visible without the trapped air.
- proper equipment and training is required.

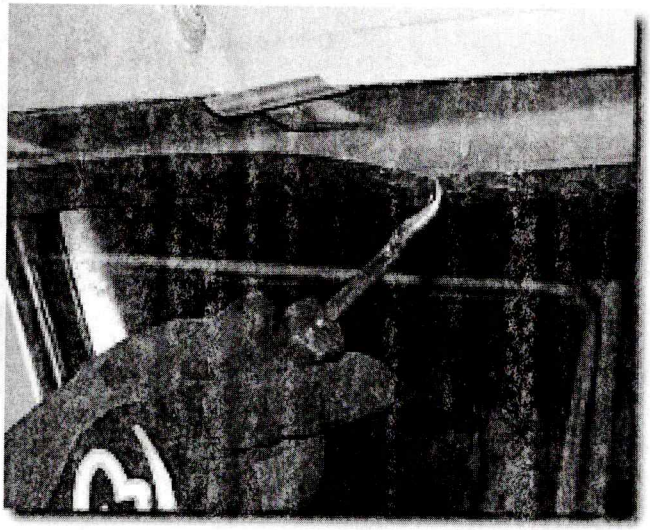


LAMINATED GLASS REPAIR

Refer to screen B-3v of your CD-ROM for a video on repair of laminated glass using one repair system.

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Topic C. Gasket-Set



C-1 A hook tool is used to remove a gasket by pulling the lip of the gasket off the flange one small section at a time.

Stationary glass set in with a rubber gasket:

- used to be common on windshields. Today, only large trucks have a gasket-set windshield.
- is still used on some backlites and side glass.
- may be bonded with adhesive to the gasket and the gasket bonded to the pinchweld.
- requires special tools and procedures for both removal and installation.

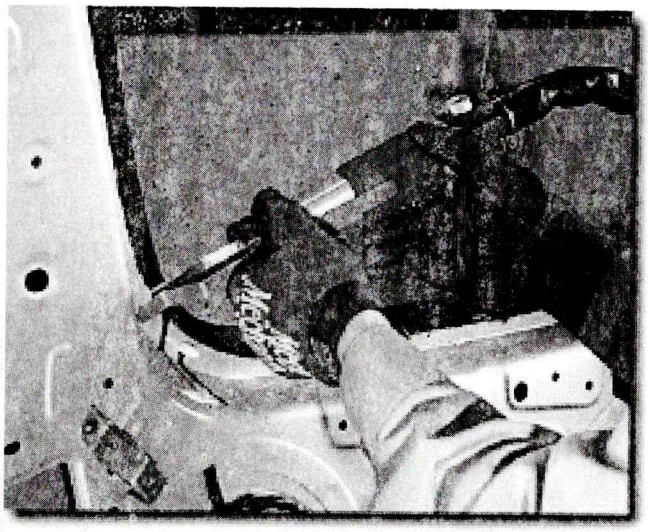
GASKET-SET TOOLS

Select the Demonstration Icon found on screen C-1 of your CD-ROM for examples of tools used for installing gasket-set stationary glass.

REPLACING GASKET-SET GLASS

Refer to screen C-2v of your CD-ROM for a video on a method of replacing a gasket-set glass.

Topic D. Stationary Side Glass



D-1 A reciprocating power cutter is used from the inside to remove this urethane-set side glass.

Stationary side glass may be:

- urethane-set.
- gasket-set.
- bolted on.

There are often locator pins on the original glass. These are used on the assembly line to help automated installation. They are not needed for replacing the glass, though some pins may help hold bonded glass in place until the adhesive cures. Try to not cut off these pins when removing the glass, but sometimes this is unavoidable.

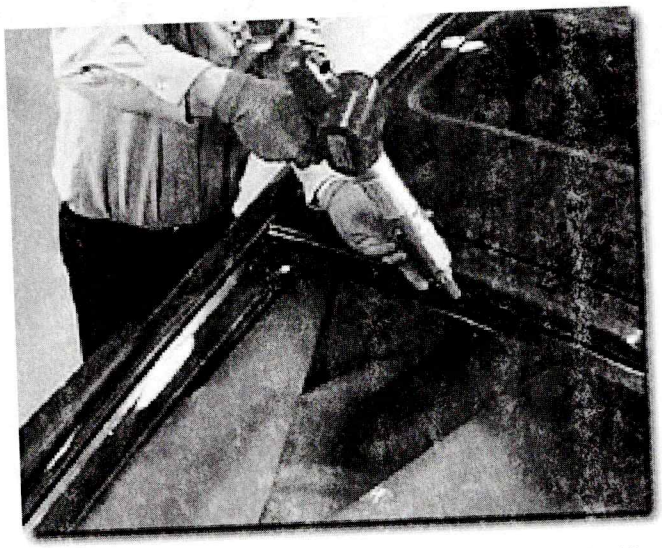
Locator pins do not serve a function of preventing the glass from shattering into the interior during a collision. It is the urethane adhesive, the inset of the pinchweld, and the curvature of the glass that reduces the amount of glass that shatters into the interior. Also, if the direct impact is into the side glass, it will shatter into the interior regardless of whether there are locator pins on the glass or not.

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REPLACING STATIONARY SIDE GLASS

Refer to screen D-2v of your CD-ROM for a video on replacing two types of stationary side glass.

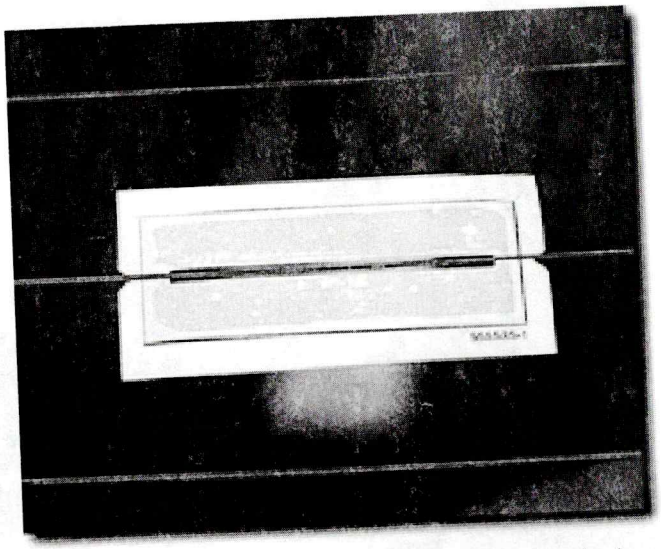
Topic E. Backlites



E-1 Urethane adhesive is applied to this pinchweld for a stationary backlite installation similar to installing a windshield.

Stationary backlites:

- are often installed the same as the windshield.
- are usually tempered glass.
- may require disconnecting the terminals for a defroster grid or antenna.



E-2 This stencil makes it easy to apply conductive paint on just the damaged grid line.

Some repairs can be made to the grid system on backlites. This may include:

- repairing loose terminals with a conductive epoxy or solder.
- repairing damaged grid lines with a conductive paint. Repair kits are available.
- testing the grid lines for continuity.

REPAIRING A BACKLITE HEATING GRID

Refer to screen E-3v of your CD-ROM for a video on steps for repairing a backlite defogger grid.

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Glass module #3 Quiz

ⓘ This is a preview of the draft version of the quiz

Started: Nov 8 at 11:19am

Quiz Instructions

Glass module #3 Quiz

Question 1 — 1 pts

Which of these laminated glass defects may be repairable?

- ◯ chip on the edge
- ◯ damaged laminate
- ◯ starbreak
- ◯ distortion

Question 2 — 1 pts

With most glass repair systems, an indication that a scratch can not be repaired is if the scratch:

- ◯ is on the windshield in the drivers field of view
- ◯ is more than a hands lenght long
- ◯ has an off white color
- ◯ can be felt with a finger nail

Question 3

1 pts

Technician A says that gasket set glass may be bonded with adhesive to the gasket.

Technician B says that gasket set glass may have the gasket bonded to the pinchweld.

WHO IS RIGHT?

- ○ A only
- ○ B only
- ○ Both A and B
- ○ Neither A nor B

Question 4

1 pts

Which of these tools is the most common when replacing a gasket set glass that is not bonded with urethane?

- ○ roping tool
- ○ powered applicator gun
- ○ cold knife
- ○ wire tool

Question 5

1 pts

Technician A says that the pins embedded in some stationary side glass might help hold bonded glass in place until the urethane cures.

Technician B says that if the pins embedded in some stationary side glass are cut off during removal of the glass the glass must be replaced.

WHO IS RIGHT?

- ○ A only
- ○ B only
- ○ Both A and B
- ○ Neither A nor B

Question 6

1 pts

Technician A says that loose terminals on a heated back lite can be repaired with regular epoxy adhesive.

Technician B says that loose terminals on a heated back lite can be repaired with solder.

WHO IS RIGHT?

- ○ A only
- ○ B only
- ○ Both A and B
- ○ Neither A nor B

Not saved Submit Quiz