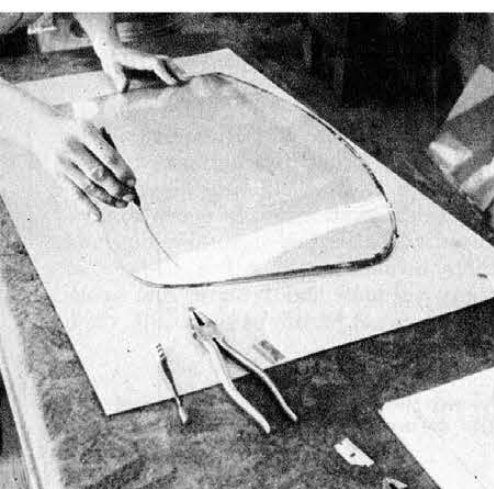


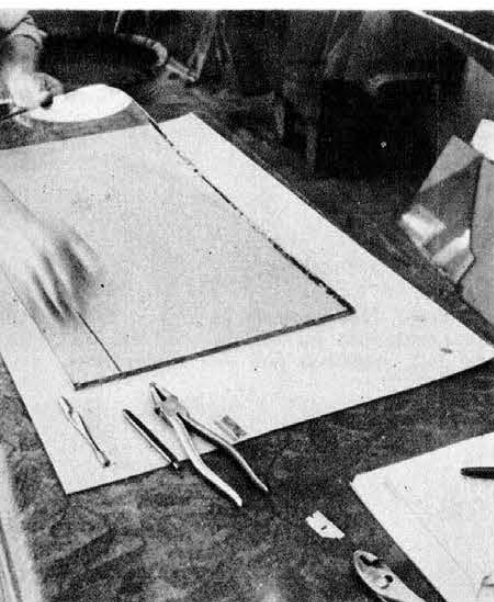
AUTO GLASS

WHY AND HOW



Marking the glass for cutting is first step in reducing height of windshield.

The second step is the actual cutting of the glass with glass-cutting tool.



The glass in your car may be removed and replaced with a minimum of tools and with very little expense to you.

By ROBERT JOHNSON

Photos By Poole

THE GLASS used in cars has been taken so much for granted lately that we decided to look into the situation and see what developments have been made in the last few years. In order to fulfill the assignment we had to rely on the Jewel City Glass Co. here in Glendale, Cal., for information. They were so helpful, in fact, that we now know so much about auto glass that we have been thinking of going into the business. Seriously, though, we found that it is reasonably simple to replace any or all of the glass in a car with a minimum of trouble and without special tools. We also discovered that there are several types of glass available and, for the economy minded, there is a wide price range.

The first thing that we found out was that there are no *windows* in a car. This may come as a blow to many motorists who may wonder what they have been looking through for so many years. Technically speaking, the front glass is called the *windshield*; the wind wings are known as the *door vents*; the door windows are properly called *door glasses*; the rear side windows in coupes, two doors, and convertibles are called *quarter windows*; and the rear glass is called the *backlight*.

A law was passed on January 1st, 1936, governing the type of glass that can be used in a motor vehicle. Prior

to this date plate glass (as is used in homes, store fronts, etc.) was installed in cars but with the increasing number of cars on the roads and the resulting increase in the number of accidents in which people were injured by flying glass, it was generally decided that a new development in glass manufacture was imperative. The product of the resulting research was called *safety glass*.

Safety glass is, in reality, two pieces of plate glass separated by an insert of vinyl plastic. The sheets of glass and the insert are bonded under combined heat and pressure. When the safety glass is removed from the press the individual sheets are, for all practical purposes, inseparable.

With the advent of curved safety glass, as used in the windshields of cars, other ways of manufacture had to be developed. After much experimentation, a press was finally perfected that heated, bonded, and bent the glass in one operation.

When safety glass is broken, the danger of flying glass is minimized to such an extent that injury from this cause is greatly reduced. Although the glass itself will shatter, the individual pieces remain bonded to the vinyl plastic insert.

To further reduce the possibility of injury in the event of an accident, windshields are generally installed from the *outside*. Theoretically, this causes the glass to pop out of the

windshield frame as was advertised, to great extent, by the Tucker Automobile Co. when they attempted to get their cars into production. However, to properly seal the glass into its frame (to prevent the leakage of air and water around its outer edges) it is necessary to use an insulating cement. This cement, when dry, remains reasonably flexible but a tremendous blow is necessary to dislodge the safety glass.

Although the danger of flying glass was reduced with the introduction of safety glass, it was not entirely eliminated. In the case of windshields, being on the front of the car, little trouble was experienced since such pieces of glass that did come free continued forward causing only a minor hazard to the occupants. With backlights, however, the slivers of glass were thrown *through* the car thus endangering the occupants, so another type of glass had to be developed. As a result of experimentation, a tempered glass was finally developed that had five times the strength of ordinary safety glass having the same thickness. This tempered glass has two trade names, Herculite and Tuflex.

Like windshields, backlights are installed from the outside of the car. This is to prevent the pane from breaking free of its seal and continuing through the car.

Herculite or Tuflex is nothing more than plate glass that has been tempered (much as steel is tempered). A sheet of glass is cut to the desired outline and placed in a press that both heats and forms it to the desired shape. The temperature is such that when the glass is allowed to cool it has become tempered.

So seldom does a tempered backlight become broken that with three years experience in a body shop, we have seen only three of them shattered due to an accident... and one of them was our own!

Tremendous internal stresses are set up when the glass is tempered, so much so that if they are broken up the entire piece of glass will break instantly. A solid blow with a hard rubber mallet will not phase tempered glass in the least. In fact, if it is struck with a ball peen hammer the glass will only emit a ringing sound, similar to a gong. It is said that a curved piece can be set on the ground and jumped upon without it breaking. However, if a sharp instrument, such as an ice pick, hits the glass it will shatter quite violently.

Occasionally, a backlight may come from the factory in which the internal stresses are improperly aligned. There is no way to determine whether a piece

of this glass is sound or not. Ordinarily, with the rough handling given the glass in the auto factories, the faulty piece will end up, shattered, on the factory floor. Once in a while, though, a faulty pane will be installed in a car and shipped out. There is no way of telling when the glass will "go" but any one of a number of things may affect it; possibly a quick change in temperature or a sudden vibration caused by rough road conditions. Although the entire pane breaks into very small pieces, no harm will come to the occupants of the car since the pieces will stay in their relative positions. Not until the broken glass is touched will the pieces fall through onto the package tray or the rear seat of the car.

Personal experience has shown us that tempered glass cannot be cut or ground in any way. Although this is never necessary when installing a backlight in a car (because it is pre-cut), many custom enthusiasts have attempted to change its shape to conform to new body lines, with saddening results. In our own case, we were attempting to install a stock size backlight in a chopped '49 Chevrolet about three years ago. We had been told that neither Herculite nor Tuflex could be cut so we had left the rear glass opening in the body the original size. We were experiencing a little difficulty with the lower corners of the glass, though; proper alignment was off by approximately 1/16". The glass was subsequently taken to the Jewel City Glass Co. with orders for the lower corners to be ground back the required distance. To prove that this could not be done, the worker put on a pair of protective goggles and heavy gloves. Delicately, he held the glass against the polishing belt and, sure enough, the corners were ground away without mishap. We were quite concerned while the grinding was going on but we breathed a sigh of relief when the operation was over. The worker shrugged his shoulders and we set the glass in the opening of the car to see if it would fit. It worked beautifully and we were very much relieved that the troublesome corners had, at last, been taken care of. We left the glass sitting in the body opening and walked around to the front of the car to discuss cutting the curved windshield. Without warning, there came the sound of breaking glass from the rear of the car... our \$25.00 piece of glass lay in a heap on the rear seat! Such are the joys of restyling a car.

Windshields and backlights are mounted in rubber to allow the body to flex slightly without causing glass breakage. If the glass were mounted solidly it would break before the car was driven over a mile or two. A cross

section of this rubber molding roughly resembles an "H." The glass is held between two of the legs of the "H" while the other two are locked over a metal ridge built into the car body. A third slot is sometimes included in the rubber used on some cars to hold the chrome reveal molding surrounding the windshield.

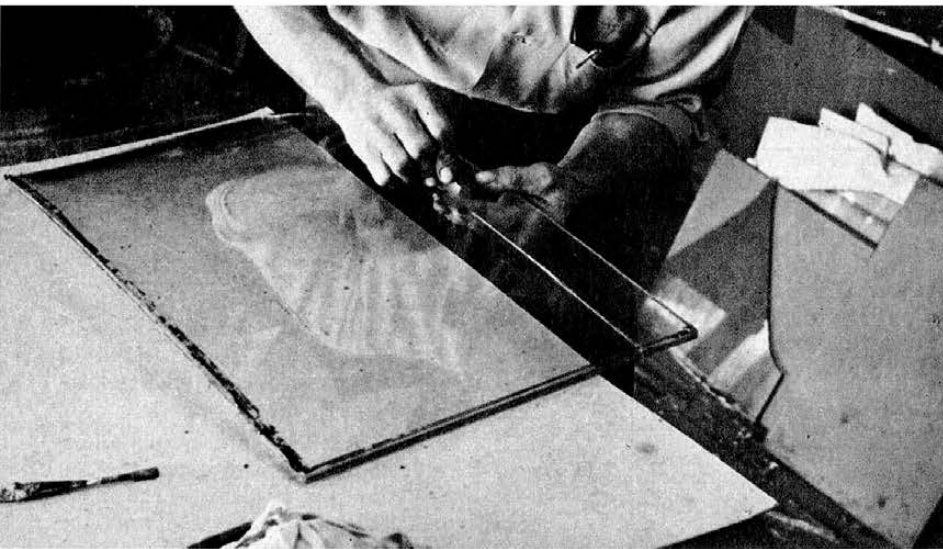
Because of the many makes and models of cars in use today it would be useless to try to describe in detail the glass installation in each type but the methods mentioned in this article are those most generally used.

To remove a broken or pitted windshield, the glass man first removes the windshield wiper blades and the inner garnish rails which serve to hide the rubber molding from view. By working a screw driver or similar tool, between the rubber and the body ridge, the rubber can be pried away from this ridge. With the top and sides worked loose the glass and the rubber can be removed from the outside. (In the case of a broken windshield, the hood and cowl should be covered with a tarpaulin to prevent scratching the finish). Any bits of glass or pieces of dried rubber cement should be carefully removed from the ridges in the rubber molding so that it may be reinstalled without difficulty.

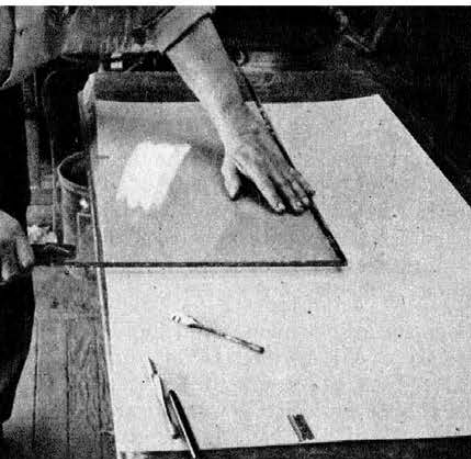
Reinstallation of a windshield, especially a curved one, is not difficult but it does require a little practice. The rubber molding is worked around so that the glass is held in the grooves. A little lubricant may be necessary because the molding is a good deal smaller than the glass and has to be stretched and worked back and forth. With the rubber around the glass a length of strong twine or cord is set into the remaining slot in the molding. The glass is then set against the opening. The next step generally requires two people. One person must hold the glass tightly against the opening from the outside while the other person, on the inside of the car, carefully pulls the string through the opening. As the string is pulled from the slot, through the opening, the inner lip of the slot is forced through and catches on the inner side of the metal ridge on the body. This usually requires a lot of experience and a good vocabulary, but it works successfully. The only other alternative is to work the rubber lip over the metal ridge with a tool, much the same as it was removed. If, for any reason, a backlight has to be removed and replaced, it is handled in the same manner as the windshield.

To remove a door glass or movable quarter window from a car it is, generally, necessary to remove the inter-

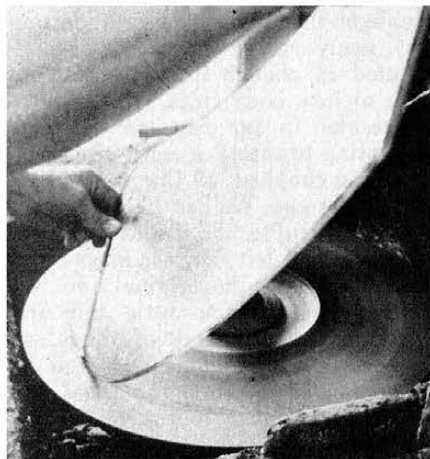
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After glass has been cut, razor blade is used to part vinyl plastic insert.

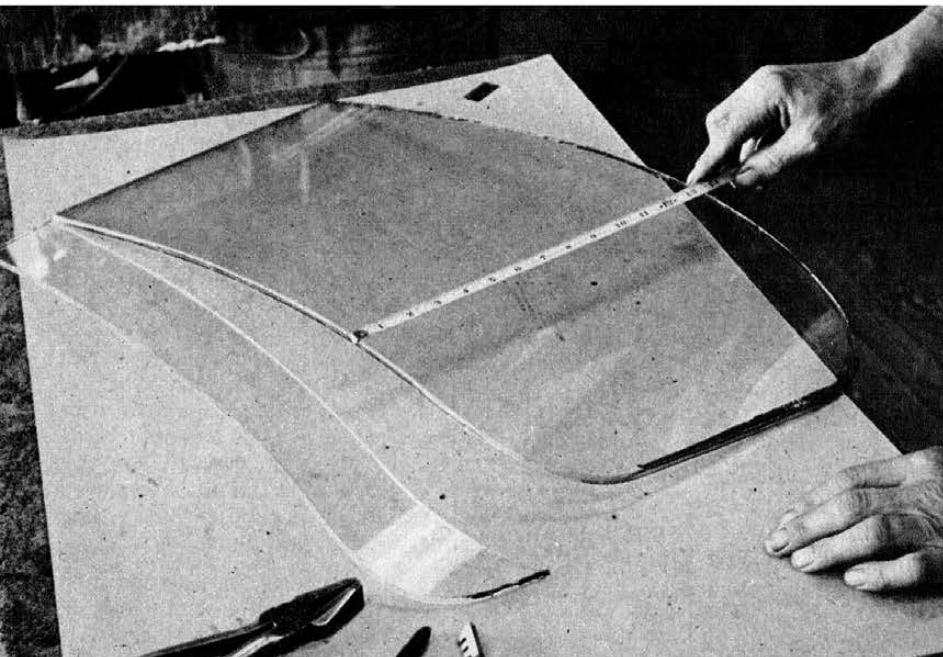


Pliers being used to break glass along surface cut made by glass-cutting tool.



After cut is completed, rough edge is ground smooth by carborundum wheel.

Final check in height is made by measuring. Severed piece remains unbroken.



ior trim. This means taking off the door and window regulator handles, the arm rest, window garnish rails and the upholstery. The glass is held in a metal channel that, in turn, is fastened to the window regulating mechanism. To obtain access to the screws holding the glass channel, it is necessary to lower the window until the screw heads are visible through one or more of the inspection holes provided for this purpose in the inner door or quarter panel.

With the screws removed, the glass and the attached channeling can be raised independently of the regulator mechanism. In most cars the glass can be worked free of the side channels and taken out through the top of the door.

Inspection of a door glass mounted in its channel will show that the glass is held in by pressure and nothing more. There is a length of cork or rubberized material over the base of the glass and this is pressed into the metal channel. Removal of the glass merely requires a light tapping on the channeling with a hammer. Replacement is done in the same way but new fabric should be used.

We have seen that tempered glass cannot be cut or otherwise altered in any way, but that does not hold true for laminated safety glass. As a matter of fact, most glass shops cut door glass, etc., from large sheets. If a shop were to stock ready-cut glass for the hundreds of different models, makes and years of cars, their warehouse would be so large as to be impractical. Rather, each shop has cardboard patterns for all the more popular sizes of glass.

To cut a flat door glass to shape, a large piece is placed over the pattern and the lines carefully followed with a glass cutter. Since safety glass is composed of two pieces, the glass must be turned over and the opposite side similarly cut with the glass cutter. The cutter does not entirely penetrate each section of glass so the glass must be flexed by hand to complete the break. By heating the glass along the break, the vinyl plastic insert expands causing the glass to part so that a razor blade or other sharp instrument can be inserted to cut the vinyl plastic.

To avoid any mistakes on his part, the glass man cuts the glass slightly outside the line scribed on the pattern. The corners of the glass are, necessarily, quite sharp and the opposite sides of the glass may not be quite even along the edges due to the fact that they had to be cut individually. The next operation is done on a rotating cast iron wheel dampened with a mix-

ture of carborundum and water. This serves to smooth out the edges of the glass and to round the corners. When this operation is complete, the glass is, next, polished on a rotating belt of emery cloth. This removes any small chips or nicks on the edge of the glass that may have been caused by the grinding wheel. With this last step completed, the glass is ready for installation.

To save considerable expense when chopping the top on a car it is a good idea to carefully remove all the glass and place it where it will not be in danger of being stepped on or otherwise broken. When the car is ready for glass installation, the original glass may be cut down. If you have a glass shop install the glass in your chop job, even more expense can be saved by making your own cardboard patterns and taking them with you when you leave the car.

In the case of chopping a late model car with a curved windshield, it is a good idea to have the glass cut *first*, (two, three or four inches, whatever your plans call for) then the top can be cut to fit the glass. The above procedure is highly recommended as it is difficult to make an accurate template for a curved surface.

The various manufacturers have recently come up with an idea that is both practical and adds to the beauty of the car. This is the development of tinted glass. The greenish tint, which is introduced to the glass while it is in the molten state, cuts down the glare and heat caused by the sun by 30%. Although a little more expensive than regular safety glass, it is very restful to the eyes. Both safety glass and tempered glass are available with this greenish tinge.

The latest development is one that has only recently been legally allowed on automobiles in some states. It was first introduced on General Motors products and, while it has a weird look when first seen, it is even easier on the eyes than tinted glass. It is known as shaded glass and may be identified by the varying band of green that runs the length of the windshield at its top. The tint, in this case, is in the vinyl plastic insert.

Flat safety glass, either clear or tinted, is sold by the square foot. In the case of, say, a triangular door vent, that is nine inches across the bottom and eleven inches high, it is cut from a rectangular piece of glass that measures ten inches by twelve. It is this larger piece that the customer pays for, *after* which the door vent is cut to shape. Clear safety glass runs about

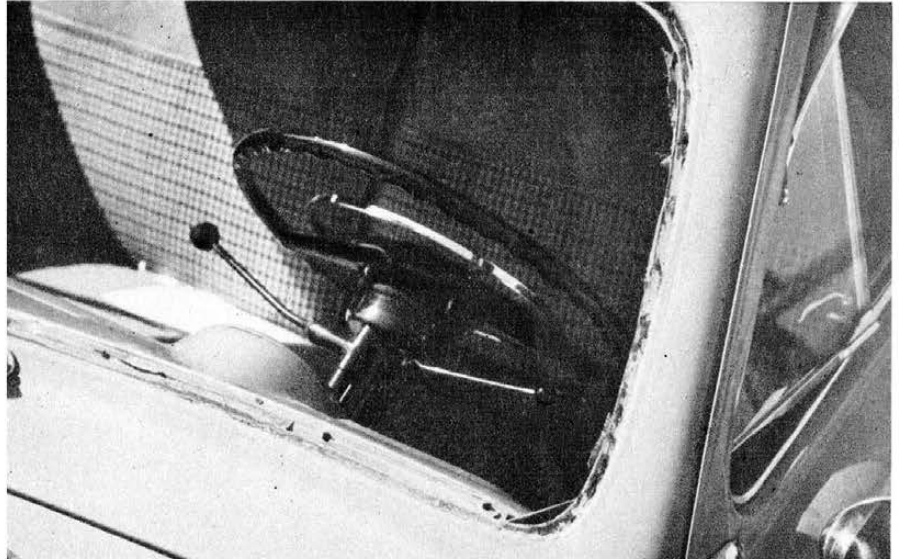
\$4.00 a square foot and, by way of comparison, tinted glass is \$5.50. The average labor charge of most glass shops is \$4.00 an hour but windshields and backlights are generally installed for a predetermined flat rate.

We have received many letters from our readers asking whether an Oldsmobile one piece windshield ('49 and '50) can be installed in '49-'52 Chevrolets and Pontiacs. The answer to this is, very definitely, yes. The Oldsmobile 88, the Chevrolet, and the Pontiac cars for these years are listed as having A type bodies. The remaining cars in the G M line have the B type.

The three A type bodies have the same cowl section and it is interchangeable with either of the other two. There-

fore, the windshield from an Olds 88 will fit either a Pontiac or a Chevrolet providing the particular body styles correspond. There are four different windshields used in the smaller GM line and they vary according to height. The lowest windshield is used on convertibles and hard top convertibles. The second larger size fits the Fleetline, or slope back series, in either the two or four door sedans. The third size fits the coupe and two or four door sedans in the notch back series. The fourth and largest windshield is used in station wagons. Therefore, to install a one piece glass in a Chevy or Pontiac, it is only necessary to remove the original glass and the vertical metal and rubber dividing posts and install the new windshield.

View of 1950 Ford with inner garnish rail, flat windshield and the rubber molding removed, exposing metal lip on body. The lip holds glass and rubber in position.



Rear window of tempered glass in 1950 Cadillac broke for an unknown reason. Although the glass shattered instantaneously, particles remain in position.

