GM (Fisher Body) Evolution of Stationary Glass Setting Methods 1963-1973

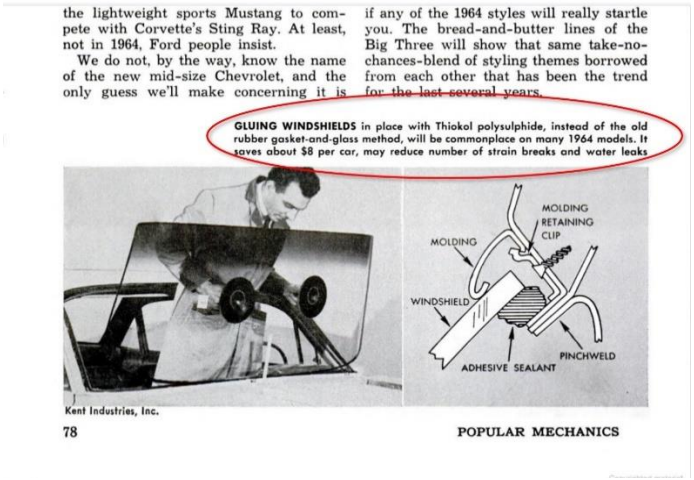
The installation of the fixed glass (windshield and rear window) in the 1964-1972 GM cars is a topic that continues to be controversial to many enthusiasts. The dialogue typically focuses on the use of either Urethane, or Butyl to adhere the glass to the window channels. This document takes no position on which is "best" for the installer, it merely provides the facts as to how Fisher Body installed the glass originally.

From the 1940's through the early 1960's the state of the art for installation of the fixed glass at Fisher Body employed a rubber gasket which retained the glass mechanically in the window channel by having a profile that captured both the glass and the "pinch weld" in the window channel[1,3].

From the beginning of the automobile business, concern surrounding safety had prompted many developments in glass design. Most, if not all developments were centered on reducing injury from broken glass, or designing windshields that kept people from being ejected from a car in the event of an accident. Safety glass kept getting stronger and more effective, but highway safety data was not showing continued decreases in ejections[1].

Focus continued on glass development and crash data and it was found that windshield separation from the vehicle could be a contributing factor in ejection rates. Some argued that bonding of the glass to the windshield frame is where the next level of injury rate reduction could be found. Data was pointing to the gasket installation as an inferior method and adhesive bonding was evaluated. And then something very interesting happened…

From the August 1963 Popular Mechanics Magazine



the lightweight sports Mustang to compete with Corvette's Sting Ray. At least, not in 1964, Ford people insist.

We do not, by the way, know the name of the new mid-size Chevrolet, and the only guess we'll make concerning it is if any of the 1964 styles will really startle you. The bread-and-butter lines of the Big Three will show that same take-no-chances-blend of styling themes borrowed from each other that has been the trend for the last several years.

GLUING WINDSHIELDS in place with Thiokol polysulphide, instead of the old rubber gasket-and-glass method, will be commonplace on many 1964 models. It saves about $8 per car, may reduce number of strain breaks and water leaks

Kent Industries, Inc.

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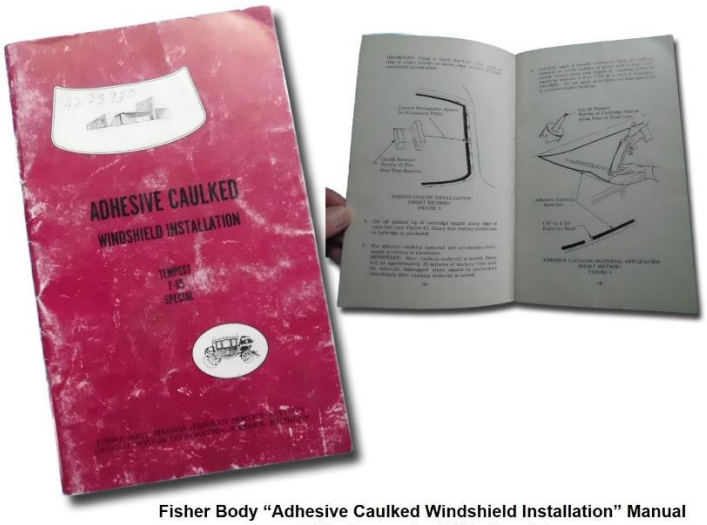
The studies done to determine the risk differences between gasket-installed windshields and adhesive installed windshield showed no discernable difference in ejection rates[1]. It was found that the cost of adhesive bonding was significantly cheaper than the gasket installation process[1,6]. At this time (very early 1960's) a variety of adhesives were evaluated; among them Butyl and Polysulfide.

So, in 1963 GM (Fisher Body) began converting from gasket-installed fixed glass to adhesive-installed fixed glass[2,3,4,6]. The 3 first models to employ this "new" glass setting technology were the Tempest (Pontiac), Special (Buick) and the F-85 (Oldsmobile). The adhesive was referred to as "a synthetic rubber compound"[4]. In 1964 all of the GM A-Body cars had been converted and in 1965 the full-sized B & C Body platforms were adhesive bonded[1].



Fisher Body "Adhesive Caulked Windshield Installation" Manual
1963 Tempest – F-85 - Special

The adhesive chosen by GM was a Polysulfide compound which was initially a 3-part adhesive (meaning there were 3 components that had to be mixed to be applied)[5]. It was a catalyzed polymer which is a thermal setting resin that once cured retains its shape and physical properties over a wide temperature range. The supplier of this adhesive was a company called Thiokol who pioneered polysulfide technology and it has generically become know as simply "Thiokol" adhesive.

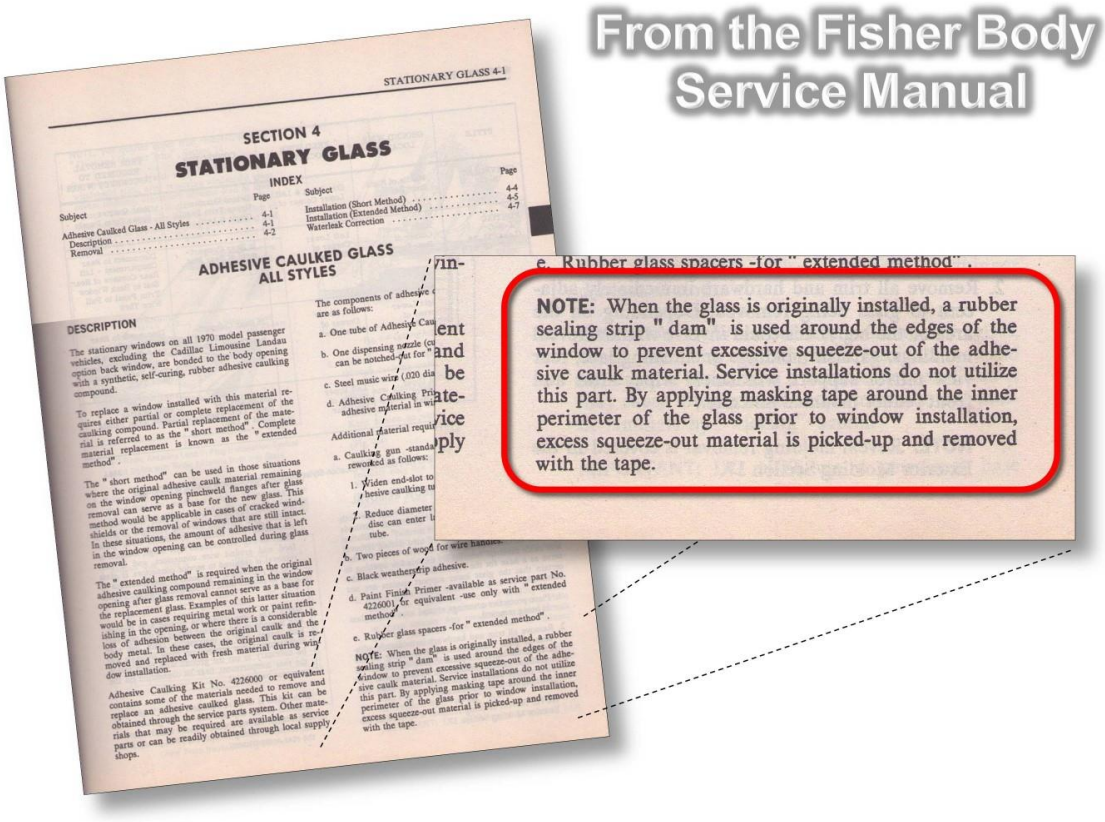
To install the glass, a foam "dam" tape was applied approximately ¼" from the outer edge of the glass around its perimeter. The tape had a "J" profile that captured the Polysulfide. Its purpose was to retain any squeeze out of the liquid Polysulfide so that it stayed in the window channel and was not visible from either the passenger compartment, or when looking from the outside into the window. It would all be hidden by the window trim once installed and the UV rays from the sun wouldn't degrade the adhesive.

A bead of the Polysulfide was applied by a pressurized "gun", glass spacers were installed to set the glass height and the window was installed in its opening and within a few hours the Polysulfide cured. This process was a manual process throughout the 1960's and early 1970's.

The Polysulfide technology did evolve, new chemistries emerged to make it a 2-component product as opposed to a 3-component adhesive which greatly reduced the installation complexity as well as cost[5]. Finally, in 1973 Urethane technology had developed to the point that GM began its conversion from Polysulfide adhesive to Urethane adhesive which it still uses today[3].

Today's cars do not use a "dam" tape to contain the Urethane, nor do they use window trim. Instead, they paint the edge of the glass with a black "frit" which hides the sealant bead as well as protects it from the harmful effects of the UV from the sun.

So why the debate regarding the use of Butyl tape verses Urethane? It's not easy to understand. It is true that both Ford and Chrysler (as well as VW) used Butyl technology to set some of their fixed glass, but GM never did[1]. Those who debate this need only to review any of the Fisher Body manuals in their "Stationary Glass" Section (usually section 4). It's very clear that Butyl is never used – even for repairs.



Section 4 – Fisher Body Service Manual

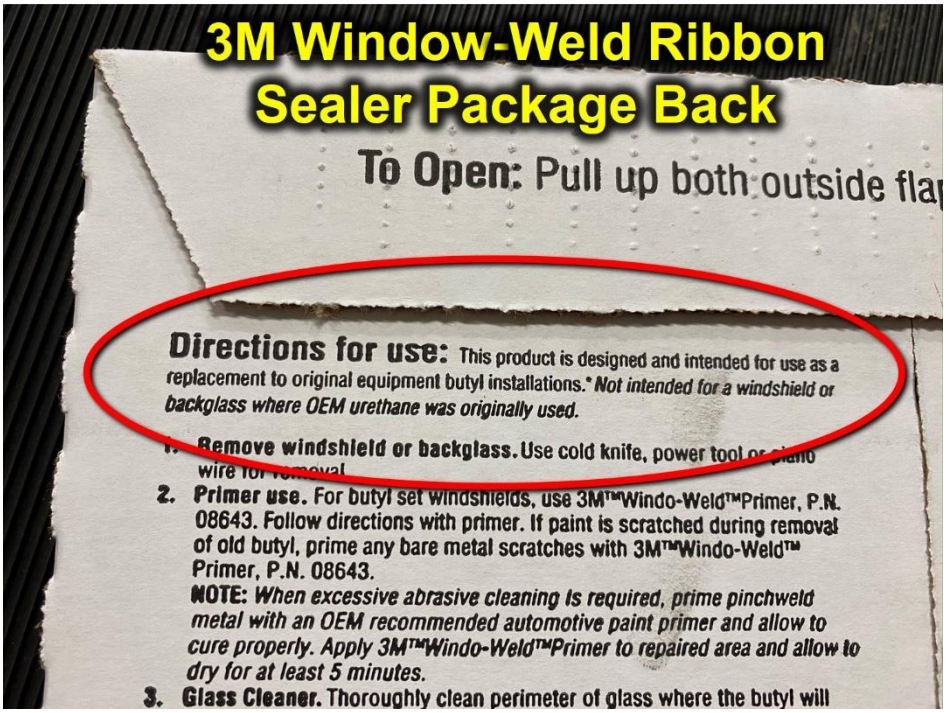
It is true that Butyl tape is much more convenient and certainly less messy, but it has its draw backs as well and this is why GM chose not to use it. So just what are the drawbacks? Well, there are 2 which are significant.

The first is that the Butyl technology was difficult to "cross link". Butyl rubber can be "cross linked", but it was challenging. So, what does "cross linking" mean? Well, the easiest way to understand it is when a plastic or rubber is "cross linked" it becomes cured. Meaning its molecular structure becomes bound. This physically equates to what we call hardening. Now that doesn't mean it can't still be soft, but it can't creep. So, while it can remain soft, it's no longer pliable. Think about silicone sealer, it remains rubbery after it cures (cross links), but it's no longer able to be smeared.

So, what is the problem with Butyl if it can't harden? Well, it means it can creep and move and when you have a piece of glass that has stainless trim around it, the glass can sink away from the trim causing aesthetic and mechanical problems with the trim. If you are GM, do you want phone calls from angry customers on a hot day in Florida, New Mexico, Arizona, etc.? Likely not. Now, note – Fisher Body did use glass setting blocks, so setting glass in Butyl alone shouldn't have been an issue in this regard, but setting blocks required a human to place them and humans do make mistakes. Once the Polysulfide cured on the line, the glass height wasn't going to change and the dam tape was capable of holding the glass up. NOTE: Setting blocks were used by Fisher Body with Polysulfide.

The second issue is one of its shear strength. Butyl has a very low shear strength as compared to Polysulfide and Urethane. This is important when it comes to the strength of the bonded joint. Again, it appears GM took a cautious approach when it came to the bonding decision. But it could also be that you can use a thinner bead of Polysulfide for an equivalent bond. Said another way, your sealing surface would have to be wider and you would need more Butyl to get an equivalent bond to Polysulfide. This means the car would be more expensive.

Some will argue that Butyl will not pass the FMVSS 212 code and that you must use Urethane to set glass. This appears not to be true (at least at the time). Windshields installed by a few auto makers (General Motors was not one of them) with gaskets or Butyl were available until 1979 and did pass the 212 code. Others will say companies like 3M would not expose themselves to the liability and sell Butyl tape to set glass if it was inferior. You don't need to look too closely on the 3M packaging to see they have absolved themselves from liability for installations where Butyl was not used by the OEM. In the case of GM – they never used Butyl.



So, the Butyl/Urethane debate will continue, but know that your GM car from 1963-1973 had its fixed glass set in Polysulfide ("Thiokol") and post 1973 (through today) it was set in Urethane. If you chose the Butyl route understand what you've got.

ENDNOTE:

Federal Motor Vehicle Safety Standards – National Highway and Safety Administration

FMVSS 212

The Standard No. 212: Windshield Mounting Scope and Purpose: This standard establishes windshield retention requirements for motor vehicles during crashes. The purpose of this standard is to reduce crash injuries and fatalities by providing for retention of the vehicle windshield during a crash, thereby utilizing fully the penetration-resistance and injury-avoidance properties of the windshield glazing material and preventing the ejection of occupants from the vehicle. Effective for vehicles manufactured after 1/1/1968

FOOTNOTES:

1. "An Evaluation of Windshield Glazing and Installation Methods for Passenger Cars", February 1985. US Department of Transportation. NHTSA
2. US Patent #3,155,422, "Windshield Mounting", US Patent Office filed 11/6/2961, granted 11/3/1964
3. Dr. Allen Skidmore AGRR "Industry Insider" Volume 17, Issue 6 Nov/Dec 2015.
4. Fisher Body, "Adhesive Caulked Windshield Installation" manual for Tempest, F-85, Special 1963
5. Julian R Panek, John Philip Cook, "Construction Sealants and Adhesives", December 1, 1991
6. Popular Mechanics, August 1963