



**Using plastics in auto “glass”
can lightweight a vehicle and
help prevent passenger injuries**

plastics
&
autos

Using plastics in auto “glass” can lightweight a vehicle and help prevent passenger injuries

- Generally, windshields today are made of laminated glass. For reference here, laminated means a multilayer unit consisting of a thin plastic layer (currently polyvinyl butryal or PVB) layered between two sheets of glass.¹
- Due to the lightweight embedded plastic, laminated glass windshields can be both thinner and stronger than those made of tempered glass alone. In fact, using laminated glass can result in a typical weight savings of 11%.^{2,3}
- In addition to saving weight, laminated glass can bend slightly under impact and is less likely to shatter than normal safety glass, reducing the risk of passenger injury.⁴
- If a laminated glass window or windshield does break, the shattered pieces tend to remain bound to the inner tear-resistant plastic layer helping prevent injury, and the broken sheet remains transparent, maintaining visibility.⁴
- Laminated glass can also help reduce the incidence of passenger ejection—a possible result of impact that can make the occupant three times more likely to be killed than if he or she had stayed inside the vehicle. The strength of the plastic can allow windows and windshields to stretch and yield, serving as a “safety net” to keep passengers inside.⁵
- Recently, a glazing technology has been developed for a virtually unbreakable polycarbonate plastic resin windshield, eliminating glass and achieving even more of a weight reduction—40–50% compared to laminated glass.⁶
- This weight savings was demonstrated in the windshields of nine electric security vehicles featured at the 2005 World Exposition in Aichi, Japan. While these electric vehicles were the first commercial application of glazed polycarbonate windshields, the manufacturer is currently working around the world to drive new application opportunities in similar uses.⁷



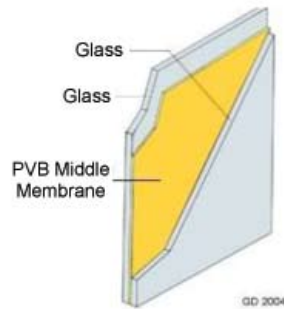
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When damaged, the outer glass of the windshield adheres to the inner layer of plastic to help prevent shattering, protecting passengers from injury and ejection.



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Glazed polycarbonate windshields were used for their strength and light weight in these electric security vehicles.



Cross-section of laminated glass

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Additional Information

- About 7,800 vehicle occupants are killed after being ejected through side windows of thin tempered glass that easily shatters, primarily in rollover and side impact accidents.⁵
- In the U.S., over 250,000 lacerations occur each year due to broken tempered glass in vehicles.⁸
- Dr. Carl Clark, former crash safety scientist with the National Highway Transportation Safety Administration (NHTSA), recommends the use of laminated glass in all vehicle windows, saying, "if you could have a layer of plastic that reduces the ejection possibility, you would have a much safer car."⁸
- When a windshield is destroyed in the course of a rollover accident, the strength of the roof is instantly reduced by 33%.⁹
- Approximately 100% of vehicles manufactured in the U.S. utilize laminated windshields.¹⁰
- Plastics are also used as adhesives to bond the windshield directly to the car, enhancing vehicle structure and helping to prevent the windshield from popping out in an accident. Plastic windshield adhesive has effectively halved windshield bond separation and occupant ejection through the windshield portal, saving 105 lives per year.^{11,12}



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Laminated glass in a factory



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Laminated glass adheres to the inner plastic sheet, preventing shatter

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Pictures

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